

The Antiseptic

A Monthly Medical Journal

Edited by

Dr. U. Rama Rau, M.L.C. & U. Krishna Rau, M.B.

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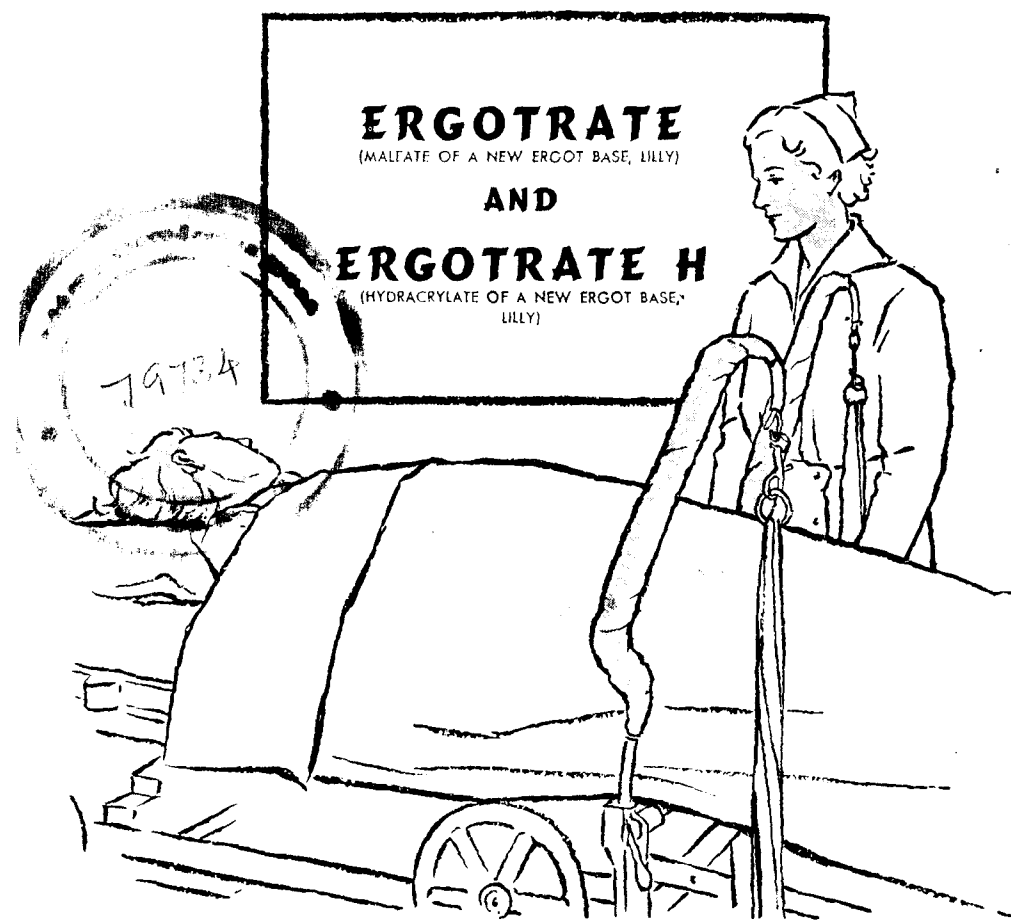
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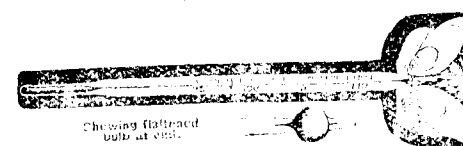
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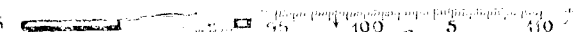
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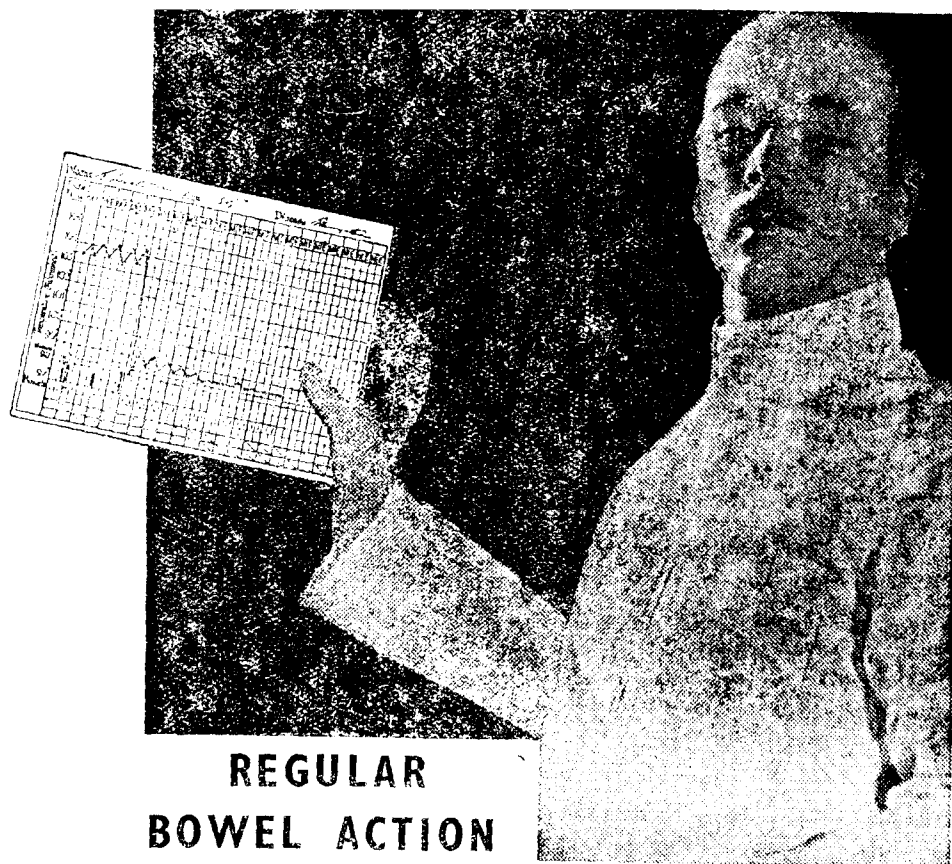
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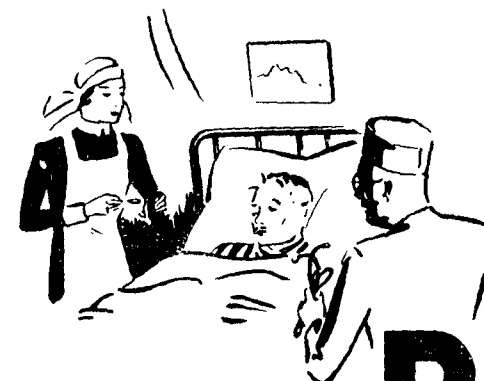
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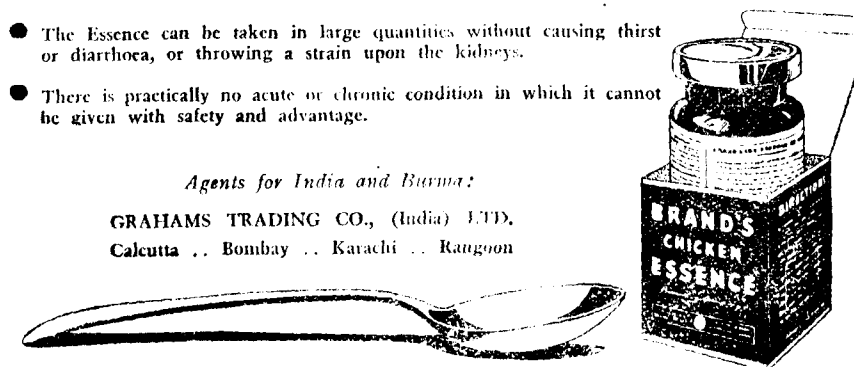
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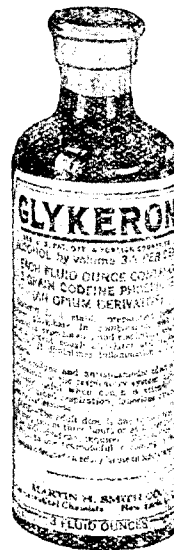
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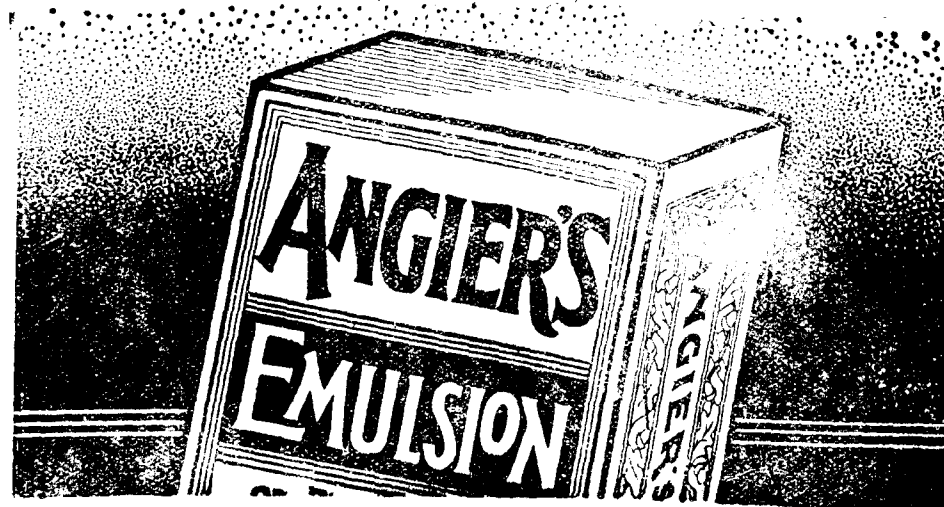
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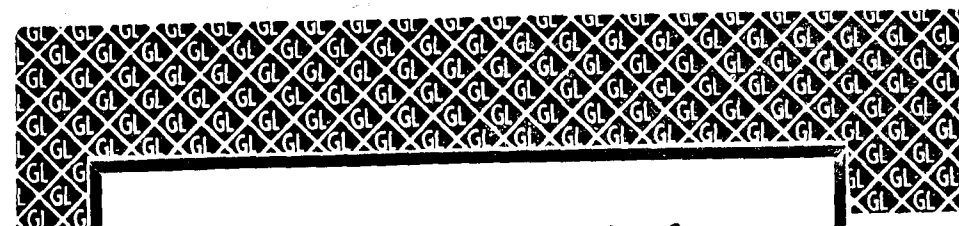
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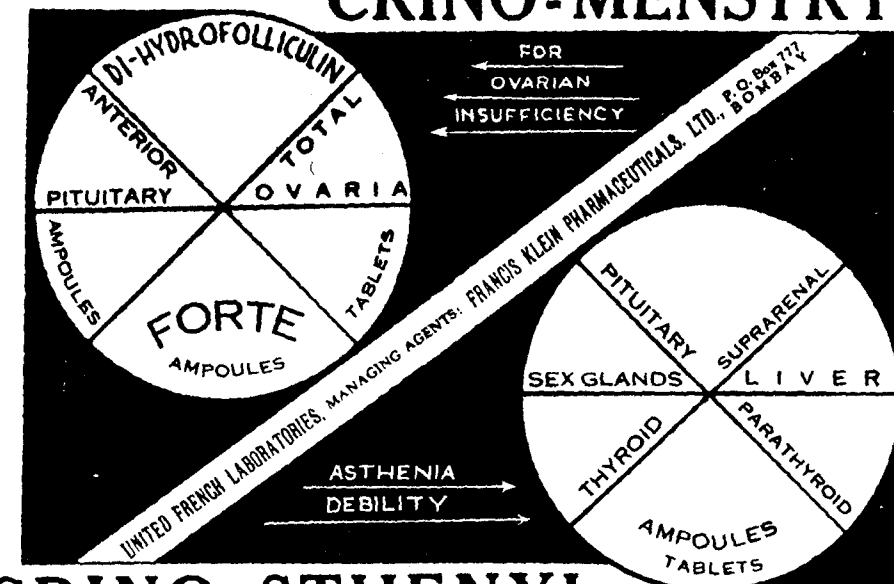
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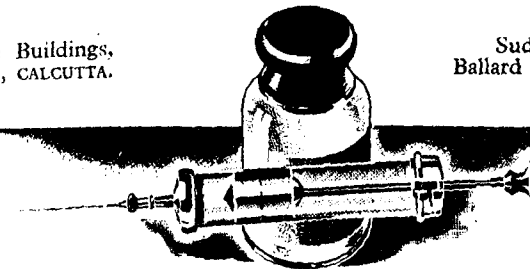
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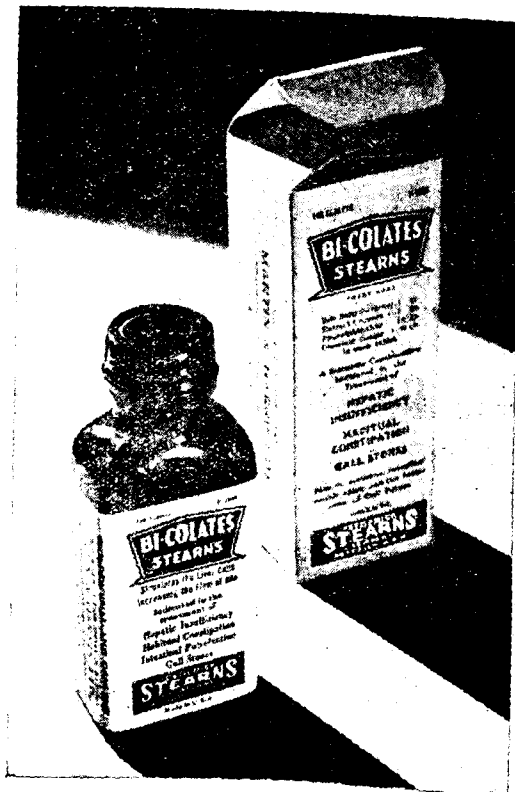
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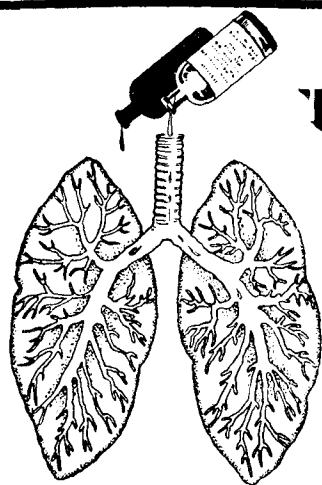
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ORIGINAL ARTICLES

Intestinal Tuberculosis

BY

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INTESTINAL tuberculosis occurs either as a primary tuberculous infection of the intestinal wall or more commonly as secondary to tuberculosis of the lungs or any other part of the body.

Primary intestinal tuberculosis is very rare. It occurs more commonly in children. BIEDERT found it 16 times in 3104 cases of tuberculosis. In a series of 22,725 autopsies, collected by GAUT, primary intestinal tuberculosis was said to be present in 7.22 per cent. In adults primary intestinal tuberculosis is particularly rare occurring in but one instance in 1000 autopsies upon tuberculous adults at the Munich Pathological Institute. The disease sets in with irregular diarrhoea, moderate fever and colicky pains. In a few cases, hæmorrhage has been the chief presenting symptom. Regarded at first as a chronic catarrh, it is not until emaciation becomes marked or signs of disease appear in the lungs that the true nature is apparent. Still more deceptive are the cases in which the disease starts in the cæcum producing signs simulating appendicitis-like pain in the right iliac fossa, constipation, or irregular diarrhoea and fever. These signs may disappear gradually, only to recur again after some time, thus simulating recurring attacks of appendicitis. Fatal hæmorrhage has occurred. Perforation into the peritoneum may take place, a pericæcal abscess may form. In rare cases, partial healing with great thickening of the wall and narrowing of the lumen might occur.

* Specially contributed to "The Antiseptic".

Secondary intestinal tuberculosis is ever assuming more importance in the treatment of pulmonary tuberculosis, for it is the most frequent of all tuberculous complications not even excepting laryngeal tuberculosis. Until recently when X-ray diagnosis was perfected, it was very difficult to say when exactly this complication began in the course of pulmonary tuberculosis, as it can exist for a long time without exhibiting any symptoms. If it were only a terminal complication arising, when all bodily resistance has vanished and all hope of recovery has gone, it might demand less serious attention than it does to-day, when we know that it complicates even some minimal or very early cases.

BROWN and SAMPSON divide the history of intestinal tuberculosis into 4 periods, namely:—(1) the 'dysentery' period when it was noted that diarrhoea occurred later in the disease but was not attributed to the same cause; (2) The period of 'tuberculous diarrhoea' during which diarrhoea was attributed to definite tuberculous lesions in the intestines; (3) the period of 'pathologic study' when the pathological changes were studied and attempts made to correlate the symptoms in retrospect; (4) the period of Roentgenological diagnosis during which diagnosis and scientific treatment could be accurately pursued by means of X-ray examinations.

Pathology.—Tuberculous lesions in the intestine occur most frequently in ileo-cæcal region which is that part of the intestinal tract extending from 5 inches above the ileo-cæcal valve along the ileum to 2 or 3 inches along the ascending colon distal to the ilio-cæcal valve. As the infection is brought about in nearly all instances by direct contact with the contents of the bowel, it is to be expected that the first lesions would appear in the submucosa of those parts, where the contents remain longest in contact with the walls, and where lymphoid tissue is most abundant viz., the terminal ileum and the caecum.

Early lesions are in the form of gray translucent nodules occurring most commonly in the solitary or aggregate follicles. Caseation sets in before long and the nodules become yellowish. The contents soften to form thick puriform matter. The mucous membrane over such nodules varying in size from a pea to a bean which project into the lumen of the gut is often injected and reddened or purplish in colour. At this stage the tuberculous matter may inspissate and even calcify or the mucous membrane over the apex of the swelling may necrose, turn yellow and burst to form after the contents are discharged a craterlike ulcer. The edges of such an ulcer are disinfiltated, flaccid and undermined.

Histologically, the follicle is first infiltrated with round cells but scarcely at all enlarged. Infiltration is found around the follicle as well so much so it is difficult to determine the borders of the follicle. Within the follicle the cells undergo coagulation-necrosis, caseation and softening which affect the whole follicle and sometimes extend further. The overlying mucous membrane also gets infiltrated and necrosed subsequently. The perifollicular infiltration consists of

three zones, the first composed of lymphoid cells and second, of proliferated connective tissue cells and the third, of spindle cells and lymphoid cells. In the granulation tissue about the follicles are found giant cells. The arterioles show arteritis obliterans.

In the small bowels the ulceration frequently extends through the muscularis and the serosa is frequently injected and at times covered with a few strands of fibrin under the peritoneum and over the base of the ulcer and along the course of the lymphatics tubercles are often seen and, the nodules felt. Extension of the tuberculous process follows often the lymphatics and circular ulcers result. The ulcerative process in the large bowel is often arrested by the muscularis and the serosa is rarely affected. In the large bowel sloughing and false diphtheritic membranes may occur.

In about 56% of cases of intestinal tuberculosis, the mesenteric glands are found enlarged. The comparative incidence of lesions in different portions of the gastro-intestinal tract is given by GOLDBERG, SWEENEY and BROWN as follows: Tongue—6%; Stomach—6%; Duodenum—3.8%; Jejunum—21.2%; Ileum—83.2%; Caecum—87%; Appendix—39.1%; Colon—71.7%; Sigmoid and Rectum 16.3%.

Many observers have found that healing does take place in some cases of intestinal tuberculosis. Healing can take place not only by simple scar formation but also in changing degrees of perfection depending upon and by the formation of new epithelium. The muscular coats of course do not regenerate.

Mode of Infection.—GARDINER experimenting on animals has shown that specialised conditions are necessary for the development of the characteristic tuberculous ulcer in the intestine. A large number of organisms must continually be present within the lumen of the intestine, but in addition the natural defences of the mucosal cells must be overcome by the dietary deficiency.

In the human being it is said by some that the infection is hæmatogenous in character. No doubt in some cases the infection is blood-borne. In such cases the lesions will be disseminated throughout the intestines. But such reactions are not characteristic of chronic ulcerative intestinal tuberculosis.

The lesions are in many cases localised to the region of the ileo-cæcal valve. The infection in these cases is evidently due to the stasis of intestinal contents mixed with swallowed sputum in the terminal portion of the ileum which abounds in lymphoid tissue.

Pathology of Complications.—Stenosis is found more commonly in the small than in the larger bowel. It is much more common in the primary rather than in the secondary intestinal tuberculosis, as death in the latter usually occurs before healing sufficient to produce stenosis. The cause of the stenosis is thought to be the result of cicatrization due to more or less imperfect healing of previous ulceration. Besides the shrinking and pulling of the scar, there is present a faulty action of the musculature by which the circular

muscles due to the breaks in the longitudinal muscular layer produce an invagination of the serosa. BUSSE thinks that there might be partial or complete obliteration of the blood vessels as well, leading on to stricture of the part supplied.

Perforation:—According to GARDINER perforation is as common in intestinal tuberculosis as in typhoid. Ileum is the usual seat of perforation closely followed by cæcum. The cause of the perforation may be mechanical and due to increased pressure which occurs, for example, just above the ileo-cæcal sphincter or above a stenosis, or due to a severe acute ulcerative process.

Peritonitis:—FENWICK in an excellent study discusses 15 cases of his own and 28 cases collected elsewhere of acute general peritonitis. Localised peritonitis is usually found covering the areas of the ulcers whether superficial or deep, though the serosa may be normal in appearance or covered with white tubercles.

Fæcal abscess is more frequent than general peritonitis. The sac is found in the peritoneum usually or even in the muscle. It occurs more frequently in the rupture of the large intestine than in the small bowel.

SENCKENBERG and his co-workers hold that large numbers of tubercle bacilli gain entrance from the intestinal lesions into the portal circulation and thoracic duct greatly influencing the course of the pulmonary lesions and causing general miliary tuberculosis.

Clinical Symptoms are extraordinarily variable and, unfortunately for both the patient and physician, resemble those produced by fleeting disturbances of no movement. In some cases no symptoms may be found with extensive ulceration of the bowel. The symptoms often do not run parallel with the extent and intensity in the gravity of the intestinal lesions.

In any case slight digestive or abdominal symptoms should always suggest the possibility of intestinal tuberculosis. When any patient even in the incipient stage begins to do poorly and shows no increase of pulmonary symptoms or signs or presents a lessening of signs and symptoms referable to the lungs, intestinal complications should be borne in mind. Exhibition of extreme nervousness, constipation, slight dyspepsia, a feeling of fulness or discomfort in the the abdomen after eating accompanied in all probability by gas or failing to regain weight under suitable condition, in such cases, the probability of intestinal complications is strengthened. These symptoms may be followed or accompanied by a brief attack of diarrhoea easily controlled by simple drugs.

As the disease progresses the symptoms usually increase and depend on the location of the ulcers, the irritation of the nerves and involvement of the peritoneum, the condition of the mucous membrane and of course on the changes in the intestinal contents produced by the ulceration.

It is important to emphasize the fact that in the early stages

the symptoms of intestinal tuberculosis may be as slight and as indefinite as those of early pulmonary tuberculosis.

Pain and Diarrhoea are the most common symptoms of the fully developed condition.

Pain is not present in all cases. It may be preceded by slight discomfort noticed more particularly after meals. Later on, pain at or below the epigastrium, about the umbilicus or most frequently in the right lower quadrant, may occur at irregular intervals. The pain gradually becomes more persistent, recurring from day to day, resembling that of neuralgia, may encircle the body or may be crampy or stabbing in character aggravated by food and relieved at times by fasting. Sharp and sometimes lancinating pains may follow a glass of cold water or milk due to increased peristalsis. The ileo-cæcal region is nearly always sensitive to pressure. Pain often precedes diarrhoea. Some patients complain that an attack of pain is soon followed by a loose motion.

Pain is usually brought about by increased peristalsis in connection with some resistance to the onward movement of the intestinal contents or to localised peritonitis. Pain, soon after food, is due to reflex peristalsis in the ileum or colon. Throbbing burning excruciating pain is at times due to involvement of the mesenteric glands.

Diarrhoea:—The disappearance of a previous constipation may be the first manifestation. Patient may joyfully remark that his bowels are moving without drugs. Later the stools become mushy. The diarrhoea which next sets in may be so transient that it may not attract attention. Later the diarrhoea becomes more continuous and persistent. Some may have only one large loose stool a day. In others it may be 10 or even more. It is not unusual to have non-specific diarrhoea lasting for 2 or 3 weeks in the course of pulmonary tuberculosis. LOUIS found ulceration only in 50% of his patients who had had diarrhoea. In a patient with pulmonary tuberculosis, the diarrhoea must be chronic, continuous and frequent in order to enable one to say definitely that ulceration was present which is further upheld, if the stools are foul.

BURNAND found diarrhoea alternating with constipation in 9 out of 14 cases. In the later stages, owing to profuse diarrhoea the dehydration may be so much as to reduce the sweat and the amount of expectoration. This is the Colliquative diarrhoea of Bayle, the intestinal 'sweats' of Graves.

Tenesmus is often absent on account of the rectum not being involved. All those who have studied intestinal tuberculosis have come to the conclusion that the number, size and depth of the ulcers play often a secondary part to other conditions as catarrhal and inflammatory changes produced by swallowed sputum, indiscretions in diet etc.

Constipation:—In some cases even though the whole alimentary canal be empty in 24 hours patient feels 'constipated' to relieve which he resorts to purgatives. The spasm which may cause definite

constipation is the cause of the feeling. ENGELMANN found constipation in 18 of his 100 cases, 7 times with general ulceration, 8 times with ileo-cæcal disease, twice with lesions in the small bowel and once in large. He thinks it is a valuable sign of ileo-cæcal tuberculosis.

Temperature is variable but often subnormal at some part of the day. It runs no regular course, the curve irregularly varying from day to day.

Gastric symptoms:—In ERICKSON's 100 cases, nausea was present in 52 and vomiting occurred in 37. Amongst other digestive disturbances, he found distress after eating in 28, disturbances of appetite in 26, sour stomach in 20, acid eructation, water brash etc. in 14 and heart-burn in 3.

Loss of weight is often so rapid that the patient may lose several pounds a day.

Intestinal hæmorrhage is of rare occurrence. But fatal cases of hæmorrhage have been reported. CRUCI has collected 26 cases of large hæmorrhages and added four fatal cases.

Some patients have marked mental depression and great and often unaccountable nervousness.

KLINE, after very intensive examination and careful clinical notes-taking has come to the conclusion that few patients would be without symptoms. No symptom or symptom complex is pathognomonic for intestinal tuberculosis but some symptom was present in 85%.

Clinical Examination.—Faeces in early cases are normal in appearance. Later they become mushy, then soft and little formed, and finally very watery with a foetid, more or less characteristic penetrating odour due to the albumin, pus and peptone found in them. The liquid stool may be pale, due to larger fat and fatty soap content or dark in colour at times frothy, and may contain besides particles of undigested and unabsorbed food, mucous blood, pus with shreds of the mucous membrane and much fat due to the rapid peristalsis and extensive ulceration. When a patient is on a mixed diet bacteria compose 4 to 10% by weight of the dried faeces. The jejunum and upper part of the ileum are relatively bacteria-free. The jejunum and motility of the intestines is disturbed the greater the amount of changed carbohydrate passes into the large intestine, and so more surely occurs stormy fermentation.

Blood:—The most characteristic finding is a leucocytosis. MEDLER thinks that the blood picture is always septic as he has found it always associated with an ulcerative pulmonary condition. Such, however, is not always the case as evidence is accumulating to show that intestinal tuberculous ulceration is also accompanied by leucocytosis in the absence of any evidence of pulmonary cavitation. In most of the cases there is relative increase of neutrophils and monocytes.

LEMON noted in nearly all cases a low blood pressure.

Relation of Symptoms to the Site of the Lesions.—This subject has been carefully studied by ARCHIBALD. When ulcers occur in the small bowel constipation is often marked but in a few cases diarrhoea has been noted. The pains due to gas are transient, crampy, not severe, generalised and felt irregularly here and there. Anorexia may be troublesome while slight detention of flatulence and occasional nausea may occur. When such a pain comes on 2 or 3 hours after meals followed by soreness and is associated with a palpable cæcum, ulceration of the caecum or involvement of ascending colon or appendix must be suspected. In such cases constipation usually alternates with diarrhoea. The transverse and descending colon are silent areas.

Physical Examination.—In early cases abdomen may be normal in every particular of outline and on palpation. In caecal involvement, even in early cases, careful palpation usually reveals some thickening. Later, of course, distention or at times retraction of the abdomen is present. There is usually increased muscle tone. Pigmented areas may appear in the hands and faces. Fistula-in-ano occurs often in connection with intestinal tuberculosis.

The pulmonary condition in the majority of cases of secondary intestinal tuberculosis is advanced, for, usually not until a great part of the patient's resistance is lost do symptoms of intestinal tuberculosis become apparent. CAPRIANI thinks the ulcerative process in the intestine is associated with a fibro-caseous lesion in the lung, while the hyper-trophic form usually occurs with a fibrous process. CRUSCHMANN however states after careful study that there is no such relationship.

Diagnosis of intestinal tuberculosis has undergone a revolutionary change recently. Even now many eminent physicians have only feebly grasped the newer methods of diagnosis. The diagnosis of secondary intestinal tuberculosis is so notoriously uncertain and many gastro-enterologists have until recently been very reluctant to make a positive diagnosis of intestinal tuberculosis, even in the presence of active pulmonary tuberculosis. A study of 100 cases autopsied by ENGELMANN, showed that a diagnosis had been made in only 33; of the 67 cases without a diagnosis, 35 presented no clinical symptoms and 23 had severe intestinal tuberculosis.

Although the presence of tuberculous ulcers in the intestine cannot be ruled out by the absence of symptoms, it may be said with a negligible degree of error that diarrhoea in far advanced phthisis becoming more and more persistent practically always justifies a diagnosis of their complications. If in addition there are colicky pain and meteorism, the diagnosis is certain.

A careful physical examination might reveal a thickening of the caecum. On the other hand, ulceration in the ileum, colon etc. may be occurring without any thickening of the intestine. Tenderness is more often present when the ileocæcal valve is involved.

Laboratory Methods.—The presence of tubercle bacilli in the stools is not diagnostic of intestinal ulceration as bacilli may occur

in the faeces due to swallowing of sputum. Blood and pus may occasionally be found in the stools.

Any patient with characteristic phthisis who fails to gain weight or to make satisfactory progress, no matter how slight the abdominal symptoms are, should be studied for latent tuberculosis entero-colitis. But for a positive diagnosis roentgen study of the intestines is essential.

X-ray Study.—After a barium meal, the normal stomach empties in 4 to 6 hours. Between the 1st and 3rd hours the meal appears in the terminal ileum. Rate of passage here is usually slow. Ileum empties itself in from 5 to 9 hours depending on the emptying time of the stomach. Caecum is seen usually in from two to four hours after ingestion and by the 6th hour the head of the barium meal is usually in the hepatic flexure again. Complete evacuation of the meal usually takes place in from 36 to 48 hours.

Appearances in Intestinal Tuberculosis.—In the large bowel the emptying time is shorter than normal. The barium is completely eliminated in 24 hours. The origin of this generalised hypermotility is in the ileo-caecal region. Whereas caecum is usually filled between 4th and 12th hours after the meal, it is found completely or partially empty in intestinal tuberculosis. When hyper-motility is not so marked, the ulcerative area relaxes barium to a long time called by the term 'spastic filling defect'. At 24 hours quite frequently a mottled appearance of the residue with caecum is seen which is quite different from the usual residue in normal cases and suggests at times barium adherent to the ulcer.

In the small bowel segmentation and dilatation occur. Ileal stasis at the seventh or eighth hour without any barium in the large bowel is suggestive evidence of ulceration in the ileum and ileo-caecal valve.

Complications.—MAYLARD has classified as follows:—

- (1) Mixed infection.
- (2) Haemorrhage.
- (3) Stricture: (a) from cicatrix of old ulcer; (b) from cicatrix of old granulation tissue; (c) hyperplastic tissue formation of active ulcer.
- (4) Localised peritonitis: (a) causation of adhesions; (b) formation of localised effusions; (c) formation of localised abscess; (d) formation of fistulae either: (i) into a neighbouring viscus; (ii) into the surface of the body.
- (5) Generalised tuberculous peritonitis.
- (6) Perforation into the general peritoneal cavity.
- (7) General miliary tuberculosis.
- (8) Amyloid disease.
- (9) Intussusception.
- (10) Carcinoma.

Prognosis.—'Diarrhoea' wrote Hippocrates attacking a person with phthisis is a mortal symptom. Such views have been held until very recently. That is because until recently it has been impossible to say when intestinal tuberculosis began in patients with pulmonary tuberculosis. If the general condition of the patient is good, if the pulmonary condition is not far advanced and if the patient can be placed under proper treatment, the prognosis is decidedly favourable. When the pulmonary condition is advanced and general condition of the patient poor, the prognosis is very bad. And when the diarrhoea is intractable, it can be taken as a terminal symptom.

Prophylaxis.—The patients should be warned not to swallow the sputum. Constipation should be relieved as otherwise faeces containing tubercle bacilli will be kept in contact with the bowel walls for a dangerously long time. If the patients have hypochlorhydria they should be given HCl. A well balanced high vitamin diet is always a good prophylactic.

Treatment.—The abdomen should be protected by asking the patient to wear a binder. It is a wise procedure to keep patients with pronounced diarrhoea in bed until it ceases or lessens markedly.

Diet should be regulated until the diarrhoea ceases. Increased peristalsis may be caused by cold drinks, milk, strong coffee, beef-tea, fruit juices, and many vegetables. Boiling or warming milk may prevent this unpleasant action. Fluids may have to be restricted. Coarse food with leaves, much detritus and especially raw fruit or cooked fruit containing fine seeds may cause slight but sufficient mechanical injury to increase the peristalsis. Coarse food with fibre skin, seeds and gristle are to be omitted as well as salads with celery tomatoes, cucumbers, pineapples many green vegetables, raisins, berries, nuts and many raw fruits. Beans, cabbage, cucumbers, melons, onions, pepper, peanuts may produce much gas and pain.

Sugar in concentrated form should be avoided. Avoid eating in a rush or when mentally distraught. Lemon, meat, rice, little tea and coffee, hard-boiled eggs can form the basis of diet. Chillies and curries should be avoided. Many people get worse with milk.

High vitamin diet:—McCONKEY has called attention to the excellent results that he has obtained with the use of cod-liver oil and orange, or tomato-juice in the treatment of intestinal tuberculosis. It is based on the sound experimental evidence of GRANT.

Heliotherapy:—In this country the tropical sun has very little ultraviolet rays within. Hence it is best to use quartz or mercury vapour lamp. A dose daily which will produce slight transient erythema is all that is required. The lamp is kept at a distance of 36 inches from the part. Before exposing the whole body, the patient can be accustomed by first exposing the feet on the 1st day, then the leg, then the thighs as well. Finally, the whole body is exposed. Back and front are exposed, increasing the period by 2 minutes a day, until the back and front are exposed for 30 minutes each.

This form of treatment is contra-indicated in those running high temperatures.

Roentgen Ray Treatment.—The danger in this form of treatment is the occasional activation of the disease process. Since it is difficult to judge which cases do well and which would react adversely, this form of treatment must be adopted with very great care.

Intraperitoneal injection of Oxygen:—Excellent results are reported by BAMBRIDGE, ROSS and others.

Surgical Treatment.—Operative interference is necessary when there is obstruction due to stasis and in perforation.

Resection of the affected part as in the caecum can be resorted to if it is localised.

Medicinal Treatment.—*Diarrhoea*:—Castor oil $\frac{1}{2}$ to 1 ounce at regular intervals seems to yield excellent results in some.

Calcium Chloride intravenously can be tried in cases where the former treatment is not satisfactory—5 c. c. of 5% solution can be given.

Bismuth is very widely used either alone or with other astringents. The astringents used contain tannic acid; acorn coffee, or red wine can be taken. Kuoo as powder 10 grs. t.d.s. combined with Bismuth is a good astringent. Certain inert powder as animal Charcoal or Kaolin controls the diarrhoea in some cases.

In advanced lesions, when other drugs fail, resort must be made to Opium.

Pain is usually relieved by Calcium injection or Heliotherapy. In severe cases fomentations may have to be ordered. POTTENGER gives Atropine to relieve spasm.

Bacterial Treatment—*Bacillus Bulgaricus* in milk has proved of benefit in relieving symptoms in some. MORRIS has prescribed *Bacillus Acidophilus* milk with helpful results.

Some patients with an early intestinal tuberculosis will no doubt recover under any form of treatment. People who have lost all powers of response, who are in terminal stages can only rarely be snatched from the gaping jaws of death.

Errors and Difficulties in Infant Feeding*

BY

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WHICHEVER method is adopted in feeding an infant, success is assured if only the underlying principles are kept in view. But certain difficulties are met with and problems are likely to crop up in dealing with the individual case in actual practice. We propose to discuss this aspect of infant feeding. Recent work on the subject has moreover elucidated certain points which need be taken into consideration and adjustments made in its light.

Failure of breast feeding is not very common. On the other hand, one frequently meets in his practice children who may be rightly designated as '*Feeding Problem Children*'. The usual history is that the baby is an artificially fed one in whom every known proprietary infant-food, various milk-mixtures, goat's milk etc., have been tried in succession, nothing seeming to suit the infant. While in the majority of cases it indicates a simple failure of infant feeding perhaps due to badly balanced mixture or a quantitative error, a few cases may be encountered where it will be found that the baby had all along been suffering from some definite disease of the gastro-intestinal tract which has been overlooked. It is possible that a particular individual idiosyncrasy of the baby has not been recognised or the failure may be attributed to a non-detection of the focus of some parenteral infection.

Who is responsible for this 'massacre of the innocents',—this tragedy which is being enacted year in and year out? Certainly the advertisement of the infant-foods in the lay press and their indiscriminate use by the public have something to do with it, but that is not all; for, in our country very few can buy these costly foods. The problem of problems is our ignorance of the principles of infant-feeding and their practical application. The crown all, it is the appalling poverty of the masses who have adapted themselves to a state of forcibly imposed semi-starvation and who can hardly meet the requirements of the growing infant.

It is difficult to predict how long organised national planning will take to achieve for the masses a minimum healthy standard of living. Meanwhile, our main concern should be to find out a cheaper and more effective substitute for milk.

Soya Bean Powder which bids fair to approach the ideal has all the essential amino-acids necessary for growth. Its composition is as follows: Protein 45%, Fat 20% and Carbohydrate 25%. It also contains vitamins A, B and D and minerals. Animal experiments have however shown that soya-bean powder alone does not ensure normal growth. The best results are obtained with a combination of

* Specially contributed to 'The Antiseptic'.

soya-bean and milk-powder. Indeed, ERIC REID thinks dried powder from soya-bean and egg-yolk as the most effective substitute for milk. Thus the solution is still evading us and will continue to do so until we can get a vegetable protein which is biologically as active as the protein from the animal source. Investigations need be carried out with a view to prepare an adequate dietary in terms of the easily available and cheap food-stuffs, consistent with the purse of the average man.

Seeing that there is nothing comparable to breast-milk, the question of organisation of "Breast-milk Dairy" should not be lightly dismissed. In maternity hospitals it should not be difficult to arrange breast-milk service.

At the outset it is well to remember that abnormalities of secretion, viz., hyperchlorhydria or achlorhydria may be present from birth being only an instance of hereditary characteristic.

On rare occasions, instances of *intolerance of mother's milk* may be seen where the baby gets loose stool and there is excoriation of the buttock. This is supposed to be due to hypersensitiveness to the acidity of the breast-milk stool. This should be no indication for weaning. Complementary feed of cow's milk which renders the stool alkaline owing to its high content of protein will set everything right.

Difficulties arise from time to time due to *change in the quality of breast-milk*. It will be seen that the milk of the wet nurse is well tolerated but mother's milk does not quite suit the infant. The milk may be poor having a low percentage of fat and protein or it may be rich in both fat and protein or in fat alone. Infants on poor milk are constipated and don't thrive well. Over-rich milk which is secreted by women of well-to-do class, who take very little exercise, eat a generous and rich diet and digest quite well, may produce symptoms of indigestion of protein or fat or both. Paradoxically infants fail to gain weight on over-rich milk.

Rich milk may be modified by reducing the total food intake of the mother, increasing fruits, vegetables, salads, insisting on physical exercise and drinking a glass of water before each nursing. Poor women can be improved by generous diet and treatment of the underlying condition.

Before coming to the conclusion that the milk is at fault, one must be sure that the symptoms are not simply the result of indigestion.

Milk may disagree owing to *idiosyncrasy of the baby to the amount of fat normally present in cow's milk*. This is shown by vomiting of sour smelling curds and mucus and the presence of soap curds in the stool. All these may also be due to milk, rich in fat. In the artificial feeding of an infant it is well therefore to begin with a half-cream dried milk. This is continued for a month when a change may be made to a mixture of half and full cream and finally the full cream powder may be used.

In the preparation of a milk mixture *cream is better not added*. The calorific value of the mixture may be increased conveniently by addition of sugar.

Milk Allergy.—Hypersensitivity to milk protein is exhibited by eczema, urticaria, asthma, erythema etc. This may even be inherited, transmission probably taking place through the placenta which is permeable to proteins. The protein of milk may be altered by boiling for an hour or two and also by drying and evaporation. In allergy to cow's milk, goat's milk or human milk may be substituted. Tolerance to cow's milk may be produced by giving it in gradually increasing amount beginning from .1 c.c. or less, so as to avoid any reaction. It may be necessary to exclude milk altogether when soya-bean flour or other milk-free products e.g. 'sabee' consisting of soya bean, olive oil, barley flour and salt, may be used.

Some Errors in Infant Feeding.—*Duration of exclusive milk feeding*:—A dangerous practice often followed here is that infants are fed exclusively on milk for a year or more. Such infants become rapidly anaemic and are very prone to infection. It must be clearly understood that exclusive milk-feeding should not be continued beyond six months. It is time that starch, cereal and vegetables are gradually added.

Maximum amount of milk allowable:—Milk is undoubtedly the ideal food for infants. But this does not mean that it can be pushed in any amount as some very fond parents are in the habit of doing. 'Milk dyspepsia' so often given the diagnostic label of 'Infantile Liver' even by the laity is a not uncommon occurrence. This is due to over-feeding with cow's milk i.e. with a diet rich in protein and fat but low in carbohydrate. These children pass pale white stools, look pale and flabby. Growth is arrested and there is loss of weight. An undue fuss is made over the presence of a slightly palpable liver which is but a normal phenomenon in boys upto the fifth year or more. The white colour of the stool has nothing to do with the deficiency of hepatic function. The high protein causes a retardation of peristalsis thus allowing the biliary pigments to be changed into colourless urobilinogen.

The maximum amount of milk allowable after the first year is slightly more than a pint including that used in the preparation of cereal gruel. We generally do not exceed 24 oz. which is given in three meals each of 8 oz. of which 8 oz. is given in the form of cereal gruel, porridge or pudding.

Too much cereal and too little milk:—Carbohydrate being the most economical of all food-stuffs, a diet consisting of a preponderating amount of cereal gruel or decoction is used in the feeding of infants by people of the lower income group. In other words, the diet lacks in the protective food-stuffs. Sometimes milk is totally excluded and barley or wheat flour is used. These flour-gruels are very rich in carbohydrate but contain about 12% protein. They also contain a certain amount of essential amino acids. The result of feeding on this

highly amylaceous diet is mal-nutrition which may be exhibited by hypertonia (rigidity of muscles, opisthotonos and flexion of extremities), atrophy of the muscles and œdema (hunger or nutritional œdema.)

Proprietary infant-foods:—In the majority of these, the basis is starch, whether converted or not. Protein is deficient and in some it is of vegetable origin. They are intended to be used as a means of introduction of starch. It offers no special advantage to use them with that object for equally good results can be obtained without these proprietary products. In the feeding of normal infants these should never be used.

Dried milk is quite different: for, when reconstituted with water (generally 1 in 8), it resembles whole cow's milk. The special advantage is that it can be given without further dilution because of its early digestibility.

Condensed milk:—The unsweetened variety is recommended for infant-feeding. The difficulty is that it does not keep for long once the tin is opened. Whenever used, it should be full-cream and supplemented by the addition of vitamins. In the sweetened variety, cane sugar is added raising the percentage of carbohydrate to about 55. The reconstituted milk is therefore very low in protein and fat. So it should not be used in infant-feeding.

The usual fault is that condensed milk is given much too diluted and under-feeding not uncommonly occurs.

Milk dilution:—What should be the ideal ratio of the milk water mixture? This can be calculated from the protein requirement of the baby. Roughly an artificially fed baby requires 2-4 gms. of protein per kilo of body weight daily. One and half ounces of cow's milk per pound per day supplies 3 grams of protein per kilo. The ratio is therefore $1\frac{1}{2}$:1 milk-water mixture. According to some, the optimal amount of milk needed after the first month is 1.75-2 ounces per pound per day. Practical experience however shows that even a new-born baby can tolerate 2/1 milk-water mixture. Whole milk can be given after the sixth month.

Cow's milk is generally given diluted with equal parts of water. One disadvantage of this mixture is that the proportion of lactalbumin (the portion which contains the essential amino acids) which is already very low in cow's milk is reduced still further. For the same reason the so-called humanised milk is not to be used. Moreover, humanised milk does not satisfy the protein requirement of the artificially fed baby who should receive more total protein. Percentage feeding in which the diet is calculated in percentages of protein, sugar and fat is not recommended by pediatricians. It is only used as a check to ascertain the actual percentage of any milk-mixture calculated according to simple dilution method.

Goat's milk:—The general impression is that it is superior to cow's milk. In composition it closely resembles cow's milk and there

is nothing which cannot be equally gained by cow's milk. On the other hand severe hyperchromic anæmia (Goat's milk anæmia) has followed its use. It is recommended only as a substitute for cow's milk when there is hypersensitivity to the latter.

Technique and Management of Feeding.—It is usual for a baby to swallow a certain amount of air. This he normally regurgitates. We should see that he does not gulp a large amount of air. He should be helped to expel the swallowed air.

It is often seen that the bottle is offered with the baby lying flat on the cot. The technique is wrong for the swallowed air has a tendency to accumulate in the stomach in this position. The baby should be supported in the semi-sitting or full-sitting position at feeding. So also an infant at breast should be so held up that the nipple and the child's face lie in the same plane and that he has not to suck from the breast lying above his face. If he is found to suck too fast and noisily it is likely that he is getting wind. In such a case the baby should be taken off the breast at intervals. A slight pull exerted on the bottle will help in the development of his jaws and teeth.

Management of weaning:—Real difficulty is sometimes experienced in the management of weaning. Weaning implies that the baby shall be changed to cup and spoon feeding, sucking which is merely a reflex act has got to be replaced by voluntary swallowing and he shall have a semi-solid diet. The feeding bottle or breast should be altogether discarded at the ninth month. Early training of the baby together with preparation for weaning, plus tact, patience and firmness will save the mother from unnecessary troubles and worries, later on.

The breast-fed baby may refuse to take anything but the breast. Water and orange juice given from the bottle early in life will avoid this difficulty. Similarly a bottle-fed baby may refuse to take fluid except from the bottle. He must be taught to drink from a cup from 5-6 months. In making a change over to cup and spoon, each feed should be started with a cup and spoon and finished from a bottle and finally the bottle is given up. Once the bottle and breast have been omitted, under no circumstances (even in illness) should one revert to them. If he is very obstinate and won't take from the cup, fluid should be withheld till he is thirsty when he will not refuse the cup. In the process of change over, even if one or two meals are missed, no harm can result and the mother should not get alarmed at this.

Semi-solid food may not be swallowed at all. The infant may be accustomed to the spoon from the first by giving orange juice and water from it so that he will not refuse the semi-solid food from it. If he will not swallow, a little of the semi-solid food should be placed inside the mouth and lips shut closely. In this way one or two teaspoonfuls are given daily and the amount increased gradually till the whole meal is accepted in this manner. The less the struggle the better for the mother and the infant.

Quantitative error:—Under-feeding is the commonest error in the breast-fed. Either the milk secretion is scanty or the baby is unable to obtain it. It should be suspected when the weekly gain in weight is not satisfactory, the motions are scanty, the baby seems unhappy and cries before the next feed is due. 'Test-feeding' for 24 hours should be carried to determine the exact amount he is receiving and the deficit supplied in the form of a simple milk formula as complementary feeds with a spoon. Overfeeding is also likely to occur which can be prevented by taking off the nipple at intervals, exerting pressure against the breast so as to diminish the rate of flow and also by giving unsweetened water from a bottle at the beginning of the feed. Vomiting after feed, by itself has no significance: for it may be present in the overfed as well as in the deficiency of breast milk. It is therefore all the more important that test-weighing is done whenever any doubt exists.

The bottle-fed who is supposed to be given the required amount measured, may also be underfed, despite adequate intake because of frequent small vomits which may pass unnoticed and neglected.

A dangerous mistake so often made is to take starvation or hunger stools for diarrhoea and institution of further starvation and restricted diet. It is to be remembered that diarrhoea except due to parenteral causes is very rare in breast-fed babies. Starvation stools are passed loaded with mucus, frequently, small in quantity and during or after each feed. That it is due to starvation is shown by steady gain in weight with the increase in quantity or strength of the feed as the case may be.

Another error made is to feed a wasted baby on the basis of the actual low weight. It is thus that a state of chronic starvation is perpetuated. The food requirement of a wasted baby is greater than that of a normal baby of the same weight. The feed is to be calculated taking the mean between the actual weight and that expected for the age. As the tolerance for food in such babies is likely to be low, we are to increase the total amount gradually.

It is common to find infants kept indefinitely on a milk-free diet or on whey and butter-milk in order to improve the stool in diarrhoeal conditions. With qualitatively inadequate diet they become rapidly converted into mere skin and bone. Bronchitis, furunculosis, otitis, pyelitis etc., are added on to the original disease. Nothing is more injurious than this dietary restriction to a growing infant. So long as there is weight, gain and improvement in general condition this is not called for.

The increased katabolic processes and accelerated basal metabolism during an illness call for an increased food intake. As this is not possible owing to the bowel condition, this increased demand must be met during convalescence. The optimal or maintenance diet should be prescribed without undue delay. What is usually done is that the therapeutic dietary is continued too long with resulting permanent damage.

In the management of premature babies it is to be noted that they cannot produce sufficient heat from metabolism to maintain normal temperature. They should, therefore, be given milk-mixture of high calorific value. The calorific value of drawn-off breast-milk can be increased by the addition of sugar. Half-cream lactic acid milk is advantageous in many ways in the feeding of these babies. It can be given undiluted. Thus without increasing the volume of the feed, a high caloric diet can be supplied. There is an additional advantage in that a larger percentage of sugar may be added to the mixture without any harm since this is easily tolerated in an acid medium. Condensed milk may also be used or some dextrinised cereal may be added to the milk-mixture.

It sometimes happens that the quantity used is either inadequate or in excess of the maximum requirement because of ignorance about the measures used. The domestic spoons also vary widely in their capacity.

Other qualitative errors include too early introduction of starch and addition of excess of cream, cod-liver oil etc., to the mixture by rich parents with a view to fatten their children.

Difficulties in Infant Feeding.—*Inability to obtain the feed*:—The premature baby may be too feeble to suck. He should then be fed by a dropper or a spoon. With a specially small and loose teat the stronger ones may be able to take the bottle. If he fails to swallow, gavage *i.e.* feeding through an œsophageal tube, is advisable.

Sucking may be difficult because of cleft palate and depression of the nipple. Pendulous breast and tense overfull breast are disadvantageous. Thrush may make it impossible for the baby to suck. Paroxysms of cough which is intensified during feeding and rhinitis leading to virtual blocking of the nasal air-way are great obstacles. In the latter condition the baby feels suffocated whenever he attempts to suck. These conditions should receive proper attention and care.

Vomiting:—There may be occasional regurgitation after feed but a healthy baby should not vomit. Some infants are seen to enjoy rumination in which the food is brought out in the mouth sometime after ingestion. Most of it is swallowed again while a part is spilled out. This habit can be checked by keeping the mouth of the baby closed everytime he is seen engaged in the process.

Over-feeding, fat and protein indigestion may cause vomiting. But the most important—because it is often overlooked—is that due to *aerophagia*. Deficiency of breast milk and too long an interval between the feeds encourage air-swallowing. The larger the time taken to nurse or feed a baby the greater is the chance of swallowing more air. The reverse is also true. If he takes his food too rapidly, he also gets wind. A tight teat used in the beginning of the feed will prevent this. Too small or too large a hole in the teat helps to perpetuate the error.

Thickened feeds are less commonly vomited than liquid ones.

Thus, when other causes of vomiting are eliminated, thick cereal gruel may be added to milk. Thick paste of arrowroot or potato-cream may be used. Condensed milk is often helpful owing to its consistency.

It is the monotony of the diet which is responsible for vomiting in some cases and this must never be lost sight of.

Habitual vomiting:—Habitual vomiting in infancy without other signs of gastro-intestinal disorder occurring after each feed and not responding to ordinary dietetic measures, has been successfully treated with sweetened condensed milk. It is thought that there is a psychological background in this type of vomiting for it ceases no sooner than he can be satisfied by giving sweetened feeds.

Refusal of food:—An innate absence of desire to eat may be noticed from birth. In others, the appetite is lacking. Premature babies show a great disinclination to food. The urge to satisfy the appetite is absent. The use of metabolic stimulant (Thyroid) helps to develop the impulse to eat. They become lively and take their feed easily. Primary dentition as a cause of refusal of food is fairly common in infants.

One great thing about appetite is that it must be allowed to develop. If the baby refuses one feed nothing should be offered until the next meal is due when he will take it in its entirety and with relish.

Anæmia whatever its cause is always associated with loss of appetite and refusal of food. It is always a problem to feed these gravely anæmic infants. Of course the first line of action should be to improve the anæmia. Acids, Vitamin B complex, palatable peptone, Brand's Chicken Essence etc., should be tried. Unfortunately, failures are not uncommon notwithstanding all sincere efforts.

Fads about food:—This is entirely a creation of parents and relations. While real difficulties regarding a particular article of diet must be appreciated and attended with sympathy, undue indulgence is harmful. The child must not be allowed to have his own way with regard to his food. His dietary should be as simple as possible. Otherwise feeds are likely to develop. He likes the lime-light as much as the adult and always prefers to be the central figure in the drama. He will use refusal of certain foods as a weapon if that would bring him into prominence. Parents should not therefore, comment on the appetite nor discuss about his likes and dislikes, and talk about tasty and nasty things in the diet in his presence. The food should not be forced upon him. The mother should take an attitude of wilful unconcern. She will do well not to show her anxiety.

Management of an infant not thriving well:—In spite of an adequate intake of a balanced diet it will be seen that some infants stop gaining and may actually lose weight. It may be that the child is over-active and restless thereby using up all his energies nothing being available for growth. Rest is indicated which must be assured by sedatives if necessary and an extra allowance of carbohydrate is needed to meet the energy requirements.

A baby who is otherwise normal but not making satisfactory gains in weight may be helped if a little more protein e.g. Casein is added to his milk-mixture temporarily.

We have used rice gruel with milk in the feeding of quite young infants and the gain in weight has been very satisfactory in resistant cases. In our experience, potato and sooji are good fattening agents. A steady and rapid gain in weight has followed the addition of inorganic iron to the feeds. The use of cream e.g., Brestol (Cow and Gate) may also be helpful.

'True marasmus' meaning thereby a condition in which the baby does not thrive in spite of adequate intake and no obvious loss in stool, is quite rare. However, in a wasted baby where everything seems alright, the administration of thyroid may help in initiating a gain in weight.

Diabetes mellitus and congenital syphilis as causes of thinning should be remembered.

Treatment of Cholera*

BY

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I. Prophylactic.—(A) An Anti-Cholera vaccine, containing 4,000 millions of bacilli, is given as a first dose. Double the dose is given at the end of the week. The reaction passes off in a day or two. The immunity lasts for six months. The vaccine retains its efficacy for one year.

The Negative Phase: There has been much discussion regarding the occurrence of a negative phase of decreased resistance to the disease during two to four days after the first dose. Experimentally in animals no such negative phase has been demonstrated, while there appears to be very little evidence of its occurring to an appreciable degree in man, and it is quite certain that if it occurs at all, it is so slight as not to be considered as an argument against the use of prophylactic inoculation against cholera during an epidemic of the disease, as will be clear from the examples, mentioned below, of severe outbreaks having been rapidly controlled by this invaluable measure. It has been proved that cholera vaccines produce in the human system the development of agglutinative, bacteriolytic, and sensitizing powers of the blood just as occur after recovery from an actual attack of the disease.

Inoculation during an epidemic of cholera:—Inoculation during

* Specially contributed to 'The Antiseptic'.

epidemics of cholera has several times been reported as most successful in rapidly stopping the outbreak; e. g.:—

- (1) In 1919, on the advice of SIR LEONARD ROGERS, nearly 90,000 Indian labourers were given a single full dose of cholera vaccine very shortly before travelling through an extensive cholera-stricken area from Bengal to Assam, with a reduction in mortality, which was a little more than one-fourth of the previous rate among uninoculated persons, and with no evidence of injurious effects, the existing condition not permitting of their being detained for a second dose.
- (2) In a camp of some 3,500 Servian prisoners, inoculation during an epidemic produced no bad effects, but on the contrary this measure brought the disease to an end in from eight to fourteen days, while the number of carriers rapidly fell to zero.
- (3) In the Roumanian army in two series of 250 and 125 carriers respectively, inoculation produced no bad result and they cleared up in from two to four weeks.

(B) Careful disposal of the excretas and disinfection of the clothes of the patient.

II. **Curative.**—1. *Bacteriophage*:—Bacteriophage (i. e. a filter-passing lysin capable of dissolving or otherwise modifying bacterial activity. This is present in nature in pathological tissues, exudates, bacterial cultures, soil and water. This is also considered as a living corpuscular entity, capable of multiplication.) The organisms most sensitive to its lytic action are the members of typhoid, dysentery and coli groups. Dysentery, cholera and mixed intestinal phages have been prepared.

Administration:—One ampoule—2 c. c. dissolved in 20 c. c. of water to be given on empty stomach every four hours. Give gr. 1 Sodi Bicarb to the patient before each dose. No antiseptic should be taken during the time. The administration should be started on the onset of symptoms. It should be discontinued, if no improvement is seen within 48 hours. The results are not still satisfactory; but fairly promising.

2. *Kaolin*:—One oz. of Kaolin is shaken up with 4 to 6 ozs. of water and half oz. of it is given every 15 to 30 minutes; or 7 ozs. of Kaolin with 14 ozs. of water to be given in seven doses each half-hourly. Kaolin forms a soothing coating on the intestines. It fixes up cholera toxins; but it does not destroy the bacilli. In cases of bloody stools, Kaolin acts beautifully by stopping the blood in no time.

3. *Calomel*:—Indirect cholagogue, antiseptic and general disinfectant to the alimentary canal. Fractional doses check vomiting, are least harmful to the system and have increased recovery rate.

Calomel ... gr. $\frac{1}{8}$ } One powder every $\frac{1}{2}$ an hour for
Sodi Bicarb ... grs. 11 } 10—12 doses.

If the colour of the stools does not change after giving 8—10 powders, it should be repeated with caution and at less frequent intervals, say, one or two hours.

4. *Pot. Permanganate Pills*:—2 grains each. Two such pills are given every quarter of an hour for the first two hours; then, two every half an hour, until the stools are dark brown or of dark green colour. This treatment is now-a-days not much popular, as the Permanganate causes gastro-intestinal and renal irritation. Permanganate as oxidising agent was strongly advised by SIR LEONARD ROGERS.

5. *Atropine Sulph*:—It is a cardio-vascular and respiratory tonic. It is used morning and evening in 1/100 gr. doses in cases of collapse or where there is any apprehension of oedema of the lungs.

Indications:—(1) Extreme collapse with cyanosis. (2) Pulmonary complications. (3) When the heart is failing. (4) Where response of pulse is not satisfactory after saline transfusion.

Contra-indications: (1) High rectal temperature. (2) Tympanites.

6. *Caffeine et Sodi Benzoas*:—It acts nicely in cases of cholera. It gives excellent results in profound cardiac weakness. It acts like a charm in the early stages of uremia by producing a fair secretion of urine.

7. *Salines in Cholera*:—

(1) Hypertonic saline:—	...	grs. 120
Sodium Chloride	...	grs. 4
Calcium Chloride	...	pint. 1
Aqua destilata	...	
(2) Normal saline:—	...	grs. 90
Sodium Chloride	...	pint. 1
Aqua destilata	...	
(3) Normal saline et Sodi Bicarb:—	...	grs. 90
Sodium Chloride	...	grs. 60
Sodi Bicarb	...	pint. 1
Aqua destilata	...	
(4) Hypotonic saline with Sodi:—	...	grs. 60
Sodium Chloride	...	grs. 160
Sodi Bicarb	...	pint. 1
Aqua destilata	...	
(5) Glucose et Sodi:—	...	oz. 1
Liquid Glucose	...	grs. 60
Sodi Bicarb	...	pint. 1
Aqua destilata	...	
(6) Glucose saline:—	...	oz. 1
Liquid Glucose	...	grs. 90
Sodi Bicarb	...	pint. 1
Aqua destilata	...	

(7) 4% Sodi solution :—

Sodi Bicarb	...	grs.	360
Aqua destilata	...	pint.	1

(8) 50% Glucose solution :—

Glucose	...	oz.	2	} sterilized by heat.
Aqua destilata	...	oz.	1	

(9) Hyponormal saline with Sodi :—

Sodium Chloride	...	grs.	60
Sodi Bicarb	...	grs.	90
Aqua destilata	...	pint.	1

NOTE:—Never boil Sodium Bicarbonate. First boil the water with Sodium Chloride, then, when cool, add the requisite amount of Sodium Bicarbonate previously sterilized by heat.

Routes of saline injections:—(1) subcutaneous. (2) intravenous, (3) intraperitoneal and (4) rectal.

Intravenous route :—Indications—(1) profound collapse with cyanosis, restlessness and cramps, (2) feeble or no pulse at the wrist, (3) specific gravity of blood above 1056, (4) suppression of urine, (5) B. P. below 70 mm. Hg.

Contra-indications :—(1) Extreme cardiac asthenia. (2) Bronchitis or Broncho-Pneumonia. (3) High rectal temperature (above 100°). (4) Distressing tympanites.

The rate of flow should be 4 ozs. a minute *i. e.*, 1 pint in 5 minutes. The following principles should be observed before giving intravenous salines :—

- (1) If the duration of the disease is within 24 hours hypertonic saline in adequate quantities should be given.
- (2) If the duration is over 24 hours but within 48 hours, normal saline with Soda.
- (3) If the duration is 48 hours, salines with maximum quantity of Sodi Bicarb *e.g.* hypotonic saline with Soda.

The quantity of saline to be injected should be according to the specific gravity of the blood, *e.g.*, if 1062—2 pints of saline ; if 1063—3 pints of saline and so on.

Before each saline, 1 pint of alkaline saline should be injected in each case to guard against acidosis and then the remaining quantity of hypertonic saline should be injected.

The temperature of the saline should be according to the rectal temperature. If the rectal temperature is above 102°, cold saline is to be injected.

Fluid should be given orally.

Sodi Bicarb	...	1	oz.
Pot. Bicarb	...	1	oz.
Glucose	...	1	oz.
Aqua	...	1	pint.

to be given freely for acidosis.

Rectal saline :—1/2 pint of isotonic saline should be given by drop method every two to four hours.

7. *Glucose* :—It is to be given freely, as it is diuretic and is absorbed direct from the intestinal canal, and being less fermentable and more suitable for administration by mouth.

For intravenous or rectal use, Glucose is more suitable. For intravenous injection 20% or more concentrated solution can be used, provided it is injected very slowly. But per rectum, 5% solution is preferable, which is isotonic and a solution of higher strength causes local irritation and is likely to be rejected. (When Glucose in hypertonic solution is required to be given intravenously, please note the condition of the cardio-vascular system carefully. Further, in all cases, it should be injected very slowly ; for introduction of Glucose into the blood stream induces liberation of insulin from the pancreas. If a large amount of Glucose is suddenly thrown in, so much of insulin may be poured out that there may be hypoglycæmic shock.)

8. *Diet* :—During the acute stage Glucose and green cocoanut water and barley water. Afterwards sago gruel and rice gruel.

9. *Post-choleraic complications and their treatment* :—

(1) Tympanites—If slight, apply Turpentine stupes on abdomen and insert flatus tube. Inject Pituitrin 1 c.c., if it is severe. In spite of marked tympanites if the patient is collapsed and pulseless, never hesitate to transfuse at least 1 pint of fluid to keep the patient going. Always supplement by subcutaneous saline. Strychnine to be injected, if Pituitrin fails.

(2) Oedema of the lungs—Transfusion is contra-indicated. 50% Glucose 15 c.c. intravenously. Castor oil 1 oz. to be given immediately. Præcordial distress during transfusion—slower rate—push subcutaneous and rectal saline and 25% glucose 20 c.c. I. V.

(3) Uræmia—(a) Alkaline mixture given freely, 1 oz. every 4 hours. (b) Glucose et Soda drinks ad lib. (c) Glucose et normal saline per rectum by the drop method. (d) 1 oz. of Castor oil followed by intravenous 4% Soda, 10 ozs. (e) Dry cupping and fomentation over the loins. Caffeine and Atropine injections. (f) Diuretin in 7 to 10 grain doses twice or thrice daily. (g) If no urine, repeat 4% Soda intravenous after 24 hours. (h) If still there is suppression, 4% Soda intravenous must be repeated. Give 25% Glucose 15 to 20 c.c. I.V.

The patient should not be disturbed unnecessarily. Attend to the eyes, clean the mouth, guard against bed sores. Alkaline sponging of the body will relieve itching of the skin. Feed with barley water, fruit juice and glucose solution. Examine urine for albumin and acetone bodies.

Cases complicated with epistaxis, bleeding gums and malæna are treated with Calcium Lactate in 15 grain doses or intravenous injections of Calcium Chloride 10%, 2 to 5 c.c. Headache is to be treated with Bromides or Chloral Hydras. Gastric irritation is treated by T. Iodine, m. 2, in a drachm of water.

(4) Hiccough—an obstinate complication—is usually toxic in origin causing irritation of the phrenic nerve. Castor oil in an ounce dose acts nicely at the outset.

Tr. Iodine, m. 1, in 1/2 oz. of water given every half an hour for 6 to 8 doses. Chloretone, grs. 10, b. d. Atropine Sulph, gr. 1/100, injected hypo. Mustard plaster on the epigastric region. Gastric lavage with 4% Soda solution.

(5) Corneal Ulcer—A normal saline wash, Liquid Paraffin drops, cauterisation of the ulcer with Tincture of Iodine. Atropine drops and H. O. F. ointment at night.

(6) Rash—Usually appears in the convalescent stage. Its appearance indicates that the patient is getting over the disease.

(7) Cholera typhoid state is a very severe complication. Patients get continuous typhoid-like temperature and it usually terminates fatally.

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Essential Hypertension*

BY

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WE find in the course of our practice that in certain individuals the blood pressure is raised without any apparent cause. This is called *essential hypertension*. An increased blood pressure, like an increased body temperature or an increased metabolic rate can only be considered as a symptom and the patients suffer from a disease or from diseases of which the only manifestation that we can detect is a raised blood pressure.

Clinically, the condition is well defined and is characterized by organic changes in the vessels with vascular spasm leading to ischaemia and hence degenerative changes in the viscera. Ultimately death ensues either from cardiac failure resulting from increased peripheral resistance associated oftentimes with coronary degeneration or thrombosis or rupture of a vessel or failure of the renal function through ischaemia or peripheral vascular lesions and gangrene. When it occurs in the young it runs a rapid course and is called *malignant hypertension*, whereas in the elderly, it is a benign condition and may not appreciably shorten life.

The disease is characterised by increase of both the systolic and

* Specially contributed to 'The Antiseptic'.

diastolic pressures and occurs in about 1.6% of all individuals in America. Often there is a history of heredity. Climate is believed to play a part. It is low in the Chinese and the Indian. The intake of protein food does not raise the blood pressure. The disease generally begins after 40 or 50.

Theoretically, increased blood pressure may be produced by increased cardiac output, increased blood volume or increased peripheral resistance. The increased peripheral resistance may again be due to increased viscosity of the blood or increased constriction of the peripheral vessels. It has been found out that the cardiac output varies from 60 cc (Grollmann) to 100 cc (Haldane) per minute and the total blood volume is about six litres in an average adult. The conclusion therefore is that the increase of pressure is due to increased vascular tonus and the result is also an increase in the peripheral resistance due probably to overstimulation of the sympathetic nervous system.

Certain observers have found that the pathological changes associated with hypertension are well marked in the splanchnic area and experimentally sudden occlusion of the splanchnic vessels leads to a temporary rise of blood pressure but section of the splanchnic nerves has been of doubtful value. Again, if there be increased resistance in the splanchnic vessels, the blood flow through other areas must be increased. This has been done in the forearm and the blood flow per 100 ccm of arm tissue has been found to be normal.

Clinically we find that the blood vessels of the retina are undoubtedly constricted. The conclusion therefore is that probably the vasoconstriction is generalized and the vascular mechanism is still adapted to the pathological requirements of the body as is evidenced by medial hypertrophy.

Ætiology.—The disease may be considered as due to failure of inhibitory nervous mechanism allowing pressor bodies to act peripherally or it may be due to the absence of dilator, depressor substances.

Nervous origin:—In the lower animals section of the buffer nerves arising from the aorta and the carotid sinus leads to hypertension owing to the removal of their inhibitory influence on the medullary centres. As a result of hypertension vascular and renal damage is observed in those animals but in the human subject rapid onset of hypertension as in eclampsia produces bradycardia whereas in essential hypertension bradycardia is exceptional. There is at present little evidence to show that the sinus mechanism is at fault whereas there is evidence to show that it is probably due to peripheral causes.

Pressor bodies:—There are two great pressor bodies in the blood, namely adrenalin which is formed by the suprarenal gland and vasopressin beside which there are two others: one is *guanidin* which is a normal product of metabolism and the other is *tyramine* which is a product of disintegrating kidney tissue but as yet there is no evidence to prove that these cause hypertension.

Endocrine glands :—Paraganglioma of the adrenal medulla is a tumour derived from the chromaffin cells of the adrenal medulla and contains a large amount of adrenalin. They cause at first paroxysmal rise of blood pressure, tachycardia, albuminuria, and glycosuria. Later on there will be permanent rise of blood pressure, vascular nephritis, arterial degeneration and retinitis. Removal of the tumour in the early stages results in cure. This probably indicates that hyperadrenalism may produce hypertension. Against this is the fact that certain cortical tumours will also produce hypertension though no pressor body has been discovered in them.

Certain cases of Cushing's syndrome are the result of a basophil adenoma of the anterior lobe of the pituitary. Here hypertension is marked with vascular nephritis and advanced arteriosclerosis. With it there is acquired adiposity about the face, neck and trunk or pinkish discoloration of the abdominal skin and hæmorrhagic diathesis. Death occurs from failure of the left ventricle.

In thyrotoxicosis and acromegaly the blood pressure also becomes increased.

It appears therefore that we have failed to prove that the endocrines cause hypertension. An excess of cholesterol has been demonstrated in the blood but this is also seen in other cases.

Guanidin and tyramine have also been found in the blood in hypertensive patients but the proof is unconvincing.

It has been contended that raised blood pressure is the result of want of normal depressor substances in the blood but here again we find that the action of these substances is regional and not general.

Renal disease :—It is generally seen that there is often a rise of blood pressure before there is any sign of kidney damage such as albuminuria. In these cases the phenomenon is probably compensatory and the only method by which the glomerular filtrate can be maintained at the necessary level is by increase of the filtration pressure.

Infection :—A chronic infection is sometimes associated with hypertension and the following are supposed to be causes—(1) chronic naso-pharyngeal infection :—(2) dental sepsis : (3) tonsillar infection : (4) syphilis : (5) typhoid fever : (6) pneumonia and (7) chronic rheumatism. Of these the most important are chronic naso-pharyngeal infection and typhoid fever. Emotional states may produce a temporary rise of blood pressure.

Chemical factors :—It has been proved that products of metabolism of proteins such as amines produce a pressor effect on the blood vessels. The uric acid content is high and hypocholesteræmia with low calcium content is found in a large number of cases.

Symptoms.—Generally the patient with high blood pressure is of a phlegmatic temperament and complains less than he suffers. Polycythæmia is often present. Clinically there are no symptoms for years so long as the heart is competent and this may last from a few months to a few years. Then, headache appears which is probably

the earliest sign : it may occur in the morning and is then throbbing in character or it may be occipital accompanied by dizziness, tinnitus aurium and flashes of light before the eyes. Sometimes either a blotchy or a confluent blush is seen on the forehead and cheeks which spreads down the neck and trunk and is probably due to irritation of the sympathetic and parasympathetic centres in the diencephalon and the premotor area of the cortex. During these attacks the hands and fingers become cyanotic and cold and palpitation occurs with a rise of blood pressure and deepening of the respiration.

The symptoms can be divided into three groups, cardiac, cerebral and gastric.

Cardiac symptoms :—At first there is dyspnœa and this is followed by præcordial pain which may be either diffused and dull or it may be only a sensation of heaviness lasting for hours : rarely it is paroxysmal in character accompanied by palpitation. Peripheral œdema, congestion of the bases of the lungs or unilateral hydrothorax may develop. Occasionally acute œdema of the lungs may develop especially at night. These patients are liable to suffer from frequent severe attacks of broncho-pneumonia. The heart becomes enlarged and the aortic second sound is often accentuated. An aortic systolic or an apical murmur may develop. The radial artery is often soft and the temporal and retinal arteries are tortuous. There is often a high systolic and low diastolic pressure. Angina pectoris or coronary occlusion may occur either early or late. Extra-systoles, pulsus alternans or auricular fibrillation may occur. In the last stage a third sound becomes audible in the heart and according to some authorities this is auricular in origin whereas in other cases the third sound is ventricular in origin.

Electrocardiography may show a left axis deviation : T_1 and T_3 may be inverted.

Of the *cerebral symptoms* hemiplegia, monoplegia or aphasia are common. General convulsions may occur and are preceded by a rise of systolic blood pressure to 280 mm Hg or higher : usually the convulsions are epileptiform in character.

Amongst the *gastric symptoms*, fullness and gaseous distension may occur. Hyperchlorhydria and borborygmi may be present.

Extreme irritability is often seen. Numbness and tingling may be present in the extremities. Hæmorrhage may occur from the nose, gastro-intestinal tract, uterus, kidney, urinary tract and lungs. The retina may show hæmorrhagic spots. Renal symptoms may develop.

In about 5% of the cases malignant hypertension occurs. When superimposed on essential hypertension, it might be the result of acceleration of the mechanism of the latter.

In this the chief complaints are headache, nausea, vomiting, visual disturbance, fatigue, dyspnœa, convulsions, fainting, weakness, præcordial discomfort and œdema of the ankles. Some are emotionally unstable. Marked hæmaturia may occur. Urea clearance test shows

20% to 55% of normal. There is intense constriction and tortuosity of the retinal arteries. Oedema and detachment of the retina, papilloedema, exudates and hæmorrhages are often present. The systolic blood pressure varies from 230 to 260 mm Hg and the diastolic is rarely below 140 mm Hg. The urine, as a rule, contains a trace of albumen and occasionally hyaline and granular casts. Gradually, as the case progresses symptoms of azotæmia develop. Some have found an increase of guanidine in the blood.

Electrocardiogram shows a negative T wave in lead 1 in about half the cases. Preponderance of the left ventricle may be seen in the majority. Stereorontgen photographs show frequent occurrence of calcification of the pineal gland.

The usual causes of death are uræmia, cardiac failure and apoplexy.

Treatment.—Rest, both bodily and mental, is essential. Glucose or better still sucrose in 50% solution given intravenously is useful. Mild laxatives and colonic irrigations are indicated. Warm baths or hot vapour baths produce sweating and give some relief to the patient. Diuretics in the form of Theobromine preparations are useful. Iron transfusions may be tried. The diet should be so selected as to suit individual cases: spices, Sodium Chloride and sweets should be withheld if possible. If the oedema is marked, the patient should be put on Karell method of treatment which consists of milk diet only not exceeding one litre a day for twenty-four to forty-eight hours: if hunger is marked, he may have one or two bananas or apples in addition. After this the food may be gradually increased till he is getting 1600 to 1800 calories a day. The treatment may be repeated after a fortnight if there is no improvement.

For auricular fibrillation Digitalis should be given. For malignant hypertension the treatment is unsatisfactory. A mixed nourishing diet with a minimum of protein is useful. When symptoms of azotæmia develop, 50 to 100 cc. of 10% Glucose solution should be given intravenously twice weekly. For nocturnal dyspnoea, Euphyllin 0.35 gm by mouth thrice daily should be given. If there is Cheyne-Stokes breathing, Euphyllin should be given intravenously. For sleeplessness, Phenobarbitol preparations are very useful.

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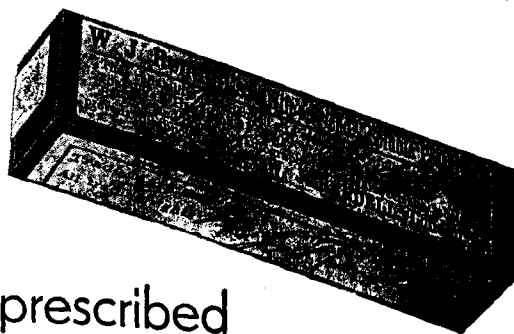
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The Treatment of Asthma *

BY

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I PROPOSE to discuss the treatment of Asthma under two distinct headings:—

- I. The immediate treatment of the acute attack.
- II. The intensive treatment of the asthmatic sufferer to prevent further attacks.

I. The Immediate Treatment of the Acute Attacks.—The drug that is most effective to relieve the spasm through stimulation of the broncho-dilator fibres, is Adrenaline Chloride. Adrenaline Chloride prepared by Parke Davis & Co., has been in my practice found to be the best.

The dose depends upon:—(1) The severity of the attack; (2) The duration of the disease, and (3) The patient's previous experience with the drug.

Usually 5 to 15 minims of a one in thousand solution of the drug given hypodermically should bring relief in a few minutes. The earlier the injection is given, the smaller the dose required. In "Status asthmaticus" the attack can be arrested by the continuous method of Adrenaline injection advocated by Hurst. The needle of the syringe is kept constantly in position and after the initial injection of a dose that is known to cause unpleasant symptoms, one or more minims are injected every thirty or sixty seconds. The injections are continued if necessary for half an hour or more. Relief always follows.

Some authorities consider that "Status asthmaticus" is due to an outpouring of very viscid mucus into the finer bronchioles resulting in a very serious loss of lung capacity. For worst cases of "Status asthmaticus" the following solutions can be injected by Hurst's method.

Solution 1.	Adrenaline Chloride	...	1/1000
Solution 2.	Morphine Sulphate	...	½ gr.
	Atropine	...	1/100 gr.
	Adrenaline Chloride }	...	10 m.
	solution 1/1000 }		

Using Hurst's method with the needle left in place solution 1 is given in 1 minim doses each half to one minute. Each fifth minute in place of solution 1, one minim of solution 2 is given and this process is continued until the spasm is relieved, or the 10 minims of solution 2 have been injected, as it is unwise to give more than ½ gr. of Morphia. Morphia relieves the patient's mind and body from the strain of breathing. It does not have any effect on the lumen of the bronchi. Atropine has a stimulating effect on the respiratory centre and

* Specially contributed to "The Antiseptic".

diminishes the bronchial secretions in addition to paralysing the parasympathetic system.

II. The Intensive Treatment of the Asthmatic Sufferer.—

Many varying forms of therapy have been advocated to cure the asthmatic sufferer, but I think very few survive the test of time. I shall discuss in this paper the more important of these.

I. Avoidance or removal of the specific cause. (1) Active removal. (2) Passive avoidance.

II. Desensitisation.

(A) Specific or Homologous. (1) Ingestion of gradually increasing doses. (2) Repeated cutaneous reactions. (3) Subcutaneous injections. (4) Denaturisation.

(B) Non-specific or Heterologous. (1) Peptone. (2) Tuberculin. (3) Milk. (4) Auto hæmo-therapy. (5) Vaccines. (6) Proteose. (7) Liver extract. (8) Histamine. (9) Sanocrysin.

III. Avoidance or removal of contributory factors. (1) General Hygiene. (2) Diet. (3) Reflex Irritation. (4) Endocrine Dysfunction. (5) Psychopathic States.

IV. Symptomatic treatment. (1) Drugs. (2) Surgery.

V. Physical therapy. (1) Electro therapy. (2) Actino therapy. (3) X-Ray therapy. (4) Pyrogenic therapy.

VI. Remedial Exercises.

I. **Avoidance on Removal of the Specific Cause.**—This method, theoretically though ideal, practically is possible of accomplishment only in a minority of cases, because no clue as to the cause may be afforded by a careful history, skin reactions or elimination of diets. Further, such a multiplicity of causes are present in general that it may not be possible to avoid them all.

1. *Active removal* may be accomplished in the case of specific foods by their complete avoidance and in the case of animal emanation, by the removal of pets. Dust probably is the most difficult to avoid. A minimum of articles of furniture in the room is essential.

2. *Passive avoidance* is accomplished by advising the patient a change of climate or altitude. This procedure can be of temporary benefit only.

II. **Desensitisation.**—It is of value when only the specific causes cannot be avoided or removed entirely. The methods employed may be specific or non-specific in nature. Specific or homologous desensitisation is the term employed when the definite causative allergen is used.

1. The ingestion of gradually increasing doses is recommended when the allergen is a common food. The minute amounts of the offending substance may be made into a pill form. With such common factors as egg and milk, desensitisation is rapidly brought about if

doses of the food are given with Pepsin and dilute Hydrochloric Acid mixture.

2. Repeated cutaneous reactions, specially the intradermal type, at times lead to desensitisation and this line of therapy is employed at times in case of dust or pollen allergy, but the results are not so constant as with other methods.

3. The subcutaneous route is the one commonly employed.

4. Denaturisation is employed in dealing with food sensitivities. The allergic reactions due to lactalbumen hypersensitivity may be counteracted by boiling the milk and many patients know that they can take certain foods cooked which when ingested in the raw state lead to reactions.

B. **NON-SPECIFIC DESENSITISATION.**—Many types have been suggested by different observers.

1. *Peptone*:—Since 1917 AULD has advised the use of Peptone injections in the treatment of bronchial asthma. Though his methods of preparation and technique have altered from time to time he still holds to the efficacy of Peptone therapy. Suitable cases for Peptone therapy are patients having favourable intervals with freedom from bronchitis and much attendant emphysema.

2. *Tuberculin*:—VAN LEEUWEN and VAREKAMP (1921) introduced the tuberculin treatment of asthma prompted by the frequency of positive tuberculin reactions in asthmatic patients.

3. *Milk*:—In 1923 SCHIFF suggested the injection of whole milk as a non-specific agent in the treatment of asthma.

4. *Auto-hæmotherapy*:—The initial dose is 4 c.c. of whole blood and is repeated at intervals of 2 to 7 days until a dose of 10 c.c. is reached.

5. *Vaccines*:—Many bacteria may produce a specific immunity to the particular varieties employed when injected as vaccines. But in asthma, since Stock Vaccines appear to work equally well, the effect must be non-specific one due to the protein content. Vaccine therapy proves of value in only a minority of cases.

6. *Proteose*:—JOHNSTON (1934) advises the injection of filtered urine with the addition of a preservative giving doses every three or four days until 9 c.c. have been injected.

7. *Liver Extract*:—MOLL (1932) has obtained good results in the treatment of asthma by the intramuscular injection of liver extract.

8. *Histamine*:—Injections have been suggested by THIBERGE (1935) and DZSINICH (1935) and good results in some cases of asthma are reported.

9. *Sanocrysin*:—Good results with gold therapy have been described by DUDEN (1931) SOBY (1934) and CRUCIANI (1934) but frequently allergic reactions to the drug are experienced.

III. **Removal of Contributory Factors.**—1. *General Hygiene*:—A well ventilated room should be chosen by an asthmatic patient for

sleeping. The room should be absolutely dust-free. Bedding should not be filled with materials from animals.

2. *Diet*:—The diet of the asthmatic patient should be regulated according to such complicating conditions as gastric anacidity, flatulence, constipation, and over or underfeeding, late meals, heavy meals and bulky diets are frequent forerunners of severe attacks. The principal meal should be at midday and light diet during the night. No manner of beverage should be taken by an asthmatic after going to bed. Flatulent dyspepsia should be corrected by Hydrochloric acid. Constipation should be corrected by abdominal massage and well-regulated exercise.

3. *Reflex irritation*:—The commonest cause of reflex irritation besides distension of the stomach is a septic focus. The common location of these foci is in the sinuses and throat. Surgical intervention is at times necessary to eradicate these irritants. This immediate relief is only temporary.

4. *Endocrine dysfunction*:—Excessive or diminished functional activity of the endocrine system at times has a bearing on the precipitation of allergic responses. The association of asthmatic attacks with menstrual disturbances suggests in some cases that the hyperactivity of the sex glands may be a contributory factor whilst the onset of attacks after the menopause may be due to their lessened activity.

5. *Psychopathic states*:—Disappointments, worry of sex conflicts are sufficient sometimes to initiate attacks. When these disturbing factors find a natural solution, there is an immediate improvement in the frequency or severity of the attacks. Possibly this prolonged mental depression and worry lead to adrenal exhaustion, a fact which would explain the immediate improvement in the asthmatic condition on their banishment.

IV. **Symptomatic Treatment.**—1. *Drugs*: Hydrochloric acid is indicated in the presence of hypochlorhydria and may be given in doses of $\frac{1}{2}$ to 2 drachms in a cup of orange or lemon juice thrice daily before or with meals.

Glucose:—Biochemical investigations in a majority of cases reveal a hypoglycæmia. ORIEL advises 2 oz. of powdered Dextrose dissolved in water and flavoured with orange or lemon juice night and morning on empty stomach.

Calcium is of no value. Patients who suffer from nervousness or loss of sleep obtain great relief from Luminal and Bromide.

2. *Surgery*:—Besides the removal of the septic foci and nasal growths etc., surgical treatment that has had ardent supporters includes bronchoscopy and Neurectomy.

Bronchoscopy has as its aim the removal of the excessive tenacious secretion and the application of drugs directly to the bronchial mucous membrane.

V. **Physical Therapy.**—Many physico-therapeutic methods have been suggested in recent years. During the attack the physical agents are said to (1) lessen the excitability of the vagus, (2) induce Peripheral vasodilation and cause reflex lessening of bronchial spasm and (3) excite the sympathetic nervous system. In the free intervals they are said to (1) improve states of passive congestion or oedematous infiltration or factors causing pressure and (2) lead to glandular stimulation of the liver, spleen, and endocrine glands. The methods employed under physical therapy are (1) electrotherapy, (2) actino-therapy, (3) X-ray therapy, (4) pyrogenetic therapy (artificial introduction of feverish state.)

VI. **Remedial.**—*Exercises*:—An illustrated booklet entitled "Physical Exercises for Asthma" has been published by the Asthma Research Council and copies may be obtained by sending a postal order for 2sh. to the Secretary, Asthma Research Council, C/o King's College, Strand, London, W.C. 2.

Remedial Exercises are necessary in all cases of Asthma in which the attack follows each other so rapidly that the over-expanded lungs do not have an opportunity to return to their normal size and in consequence of which the thorax assumes the so-called barrel shape, the shoulder shrugged and the spine unduly curved and the epigastric angle wide.

The pulmonary enlargement in asthma differs from that in true emphysema in that the former is functional in origin and the latter organic. Though the asthmatic distension is primary during an attack, in advanced cases during the free interval the distension is still present, though not so marked but is then a secondary effect to the changed postural length and tone of the thoracic muscles. The respiration of the chronic sufferer is almost entirely upper thoracic in type, the lower part remaining fully expanded and immobile, the diaphragm having but slight excursion. The exercises are designed to teach the patient to use the lower part of his chest and the diaphragm to a larger extent than he had been accustomed to. These exercises should be carried out each morning before breakfast for the rest of the patient's life even if completely free from symptoms. If the patient is in a condition of slight but continuous dyspnoea, attempts should be made to overcome this by giving 6 to 8 gr. of Caffeine Citrate or the injection of a small dose of Adrenaline before the exercises.

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1. *Recent Advances in Allergy*—by G. W. Bray.
2. *Tice Loose Leaf Medicine.*
3. *Auld (B. M. J.)*
4. *Physical Exercise for Asthma.*

Guinea-Worm (Dracontiasis)*

(Naharu, Vala, Arkmadni, Rishta)

BY

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Municipal Hospital, Ajmer.

NATURALLY one asks what Guinea-worm disease is?

Definition:—This is a parasitic disease caused by infection with the above worm conveyed through cyclops Fig. 3, through the medium of drinking water. This disease is very much common in India especially in Rajputana (Mewar with its capital Udaipur and through out the whole of the district where the step wells abound, Kherwara, Dungarpur, Kotah, Bundi, Alwar, Jaipur, etc.), Deccan, Central India, and Western parts of Madras Presidency. This disease, though preventable, incapacitates thousands of people annually.

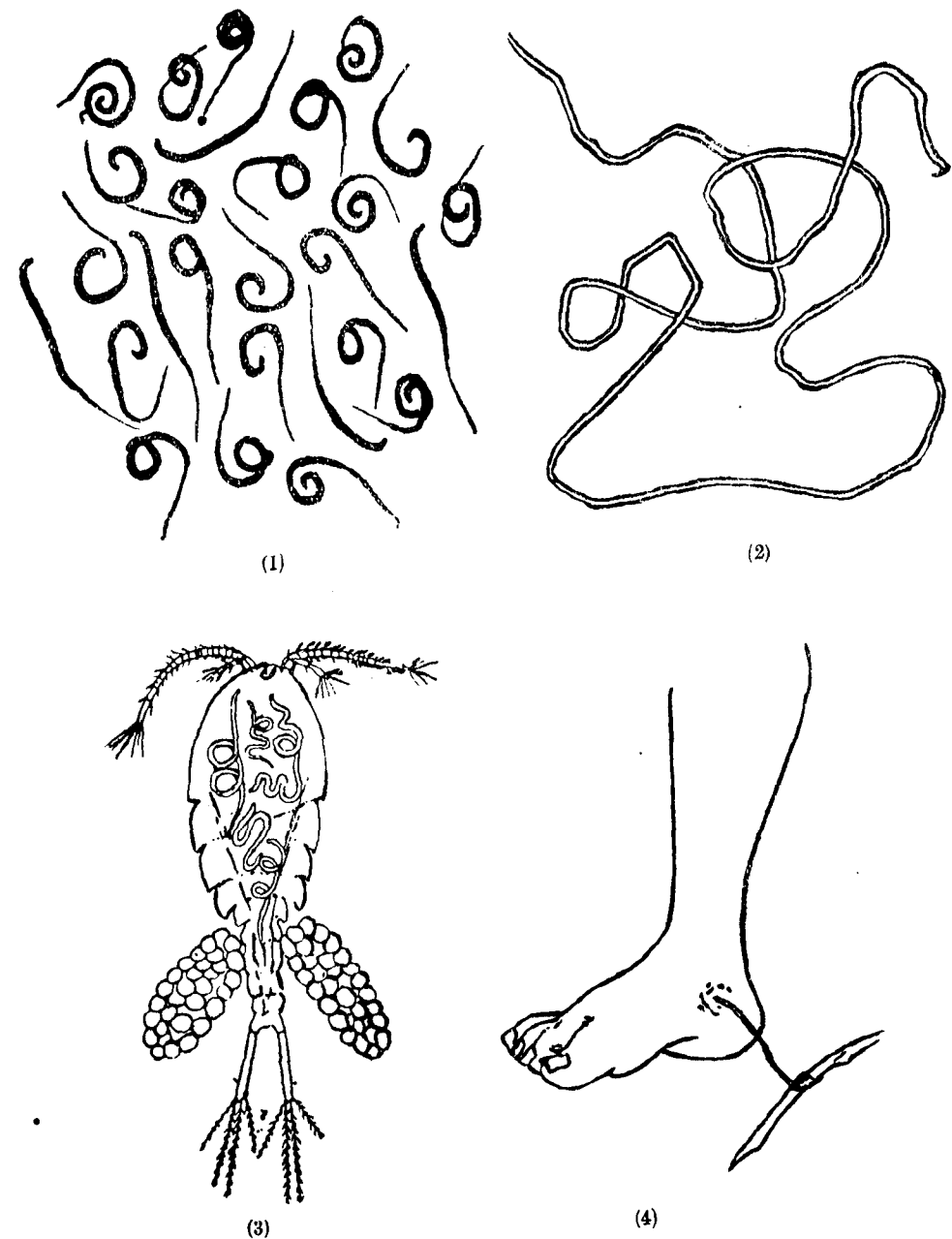
Cause.—The Guinea-worm disease is caused by *Filaria* or *Dracanculus—medinensis*—a cylindrical body about 35 inches in length vide figure 2 overleaf. This is the "Fiery serpent" of Moses introduced into India from Medina. The male and female grubs, young ones—larvæ vide figure 1, are introduced into the stomach of human beings, most probably through the medium of unstrained water, containing cyclops (figure 3) infected with young ones of Guinea-worms.

Mode of Spread.—*How the people get infected:*—In Rajputna and in some parts of India, where Baoris (Step wells) abound, most of the people are in the habit of washing their pots and infected feet in the very water reservoirs from which they draw their water supply for drinking. Thus, young ones of the Guinea-worm conveyed by their hosts (human beings) gain access to the water and are set free there as they have great love for it (water).

Guinea-worm Disease.—In the water, they are taken up by cyclops and the cyclops containing Guinea-worm young ones in turn, are drunk by the public. Thus they reach the human stomach, where most of them are killed by the hydrochloric acid of the stomach, where a few escape into the body tissue. Fertilization then takes place and the male generally dies but the impregnated female which has great affinity for water, travels towards the feet, in about 9 months generally in search of making a home (lying-in-room) for the delivery, of her young ones. She ejects a drop of poisonous secretion from her mouth which gives rise to a blister causing intense itching. The blister bursts open through scratching and itching. The infected person gets into water for drinking and bathing and the larvæ (young ones) are set free there, and taken up by cyclops, and the cyclops by human beings and thus the life cycle of the worm is completed. These people rarely strain the water, and even if they do, their mode of straining is quite nominal being defective and faulty.

* Specially contributed to 'The Antiseptic'.

Guinea-Worm



1. Larvæ=grubs=or young forms of Guinea-Worm or Naharu.
2. Guinea Worm adult.
3. Cyclop containing Guinea-Worm.
4. The Guinea-Worm in the human body.—(Guinea-Worm in Ankle.)

Symptoms.—Generally, before the onset of rains, and after about 9 months of gestation period, the impregnated female of the guinea-worm travels downwards towards the lower extremities and appears on the surface, giving rise to a blister, which soon bursts leaving a superficial ulcer with a central depression, through which the head of the worm in the form of a thread (filament) is seen. The blister is generally heralded or followed by symptoms of urticaria, giddiness, nausea, vomiting, itching, swelling of the face and the like. In a few instances, when the worm is deeper down in the tissues or near joint, and unable to come to the surface of the body, it ejects its toxins there, giving rise to symptoms of toxæmia—locally, oedema and inflammation and constitutionally, head-ache, vomiting and fever. In rare and fortunate cases, there are no symptoms whatsoever and the worm comes out of the body by itself especially through cold applications. Sensible persons when they detect it travelling under the skin feel it and have it carefully removed by an expert.

Treatment.—*Preventive*:—1. Educating the public and impressing upon them the importance of purity of water as already dictated centuries ago by the *Great Law-giver-Manu* “Bastra putam jalam piveta”—“Water should only be taken, after it has been thoroughly strained through a fine cloth.”

2. Infected persons should not be allowed to go into reservoirs of drinking water. No bathing, no swimming and no step-wells (Baoris).

3. The wells and drinking water reservoirs should be well covered up and provided with a draw-pump. In the absence of the above, a bucket and a rope should be provided for.

4. Disinfection of wells and Baoris by chlorinating, liming or “potassium-permanganating” them.

5. Always drink boiled water.

6. If above measures are impracticable, always use water carefully strained 3 or 4 times through a fine muslin. There must be several filter cloths (Muslin pieces) so that each may be washed and dried after use.

7. Fresh young leaves and shoots of Bamboo tree are known to kill cyclops, when they are put in the pitcher of water for an hour or two before it is taken. A type of fish named ‘Barbus pucker-tre’ also destroys cyclops.

8. It is really best to boil the drinking water.

Curative.—It is divided into Medical and Surgical. As regards (1) medicinal, there is nothing specific yet. The very multiplicity and variety of drugs proves that there is no specific remedy yet found. Anyhow, Ammonium Chloride, Asafoetida and Calcium Salts in big doses are worth trying.

Surgical Treatment of Guinea-Worm.—Surgical treatment depends on and varies according to the symptoms, positions of the worm etc.:—

(1) When detected superficially travelling about under the skin, incision and its extraction is the only best treatment. As soon as the worm is seen and detected travelling about under the skin, and in favourable positions as arm, abdomen, thigh and leg etc., (loose subcutaneous tissues) it should be caught hold of, between the left index finger and thumb and after thorough sterilization of the parts and instruments and the hands of the operator, the skin should be slightly incised, with the nick of a sharp pointed knife, just parallel and close to the worm and as soon as a white thread like thing is seen, its sheath should be carefully dissected out and the worm hooked on an aneurysmal needle, or on a bent probe, because it very often slips away and runs into the deeper tissues, rendering the operation futile and unsuccessful. After hooking the worm, cold douching should be applied and the parts slowly massaged with oil and a slight intermittent traction given and the worm, patiently and gradually taken out. Patience and gradual intermittent extraction (pulling) are the only secrets in its complete and successful removal and cure to the patient.

(2) If during the process of extraction, it fixes itself into the tissues, by its hooked tail and refuses to come out, the protruded portion should be wrapped round, on a sterile piece of lead, with cold pad on and left for some time, without any interference. After a few hours, it should be handled again and gradually taken out with massage and cold douching. No force must be applied, as it will snap (break) into two and give rise to serious consequences. There should be no hurry about it.

(3) Sometimes, when it is not clearly palpable and is in awkward positions, as in hip-joints, knee or ankle joints or plantar surfaces of foot, cold applications as Ethyl Chloride, or ice should be applied and it will travel away from the joints and appear superficially under the skin. When it is superficial, it is easy to take it out by cold douching, incision and intermittent traction as already stated.

(4) When it is unluckily and accidentally broken and a blister is formed, then it should be made palpable by cold applications and incision made at some distance from the previous opening and the worm gradually taken out. Even then, if it refuses to come out, another opening should be made and it should be gradually taken out by the terminal end. Never again should the free end of the worm be allowed to travel through the previous opening as the wound will become septic.

(5) When it is broken into too many pieces, and has given rise to abscesses and cellulitis, the parts should be fomented and poulticed and free incisions should be made and the guinea-worm gradually taken out by pieces.

(6) Sometimes, when it is superficial, it is taken out after making an incision by Suction Pump, cupping or by applying electric battery.

Points never to be lost sight of:—(1) Never interfere with the guinea-worm surgically, when it is not palpable and is embedded in the

joints. Apply cold sterile pads and it will travel from the area and appear superficially.

2. Never insist on taking out the worm at one sitting, when it refuses to come out and hooks itself by its tail in the deeper tissues. Always attack it, when it is superficial, in favourable and loose situations. When it is detected under these favourable situations don't postpone the operation for the next day, as otherwise it will travel away from the favourable site and become invisible.

3. Patience, tact, intermittent traction, with massage and cold douching are the only secrets for its successful removal.

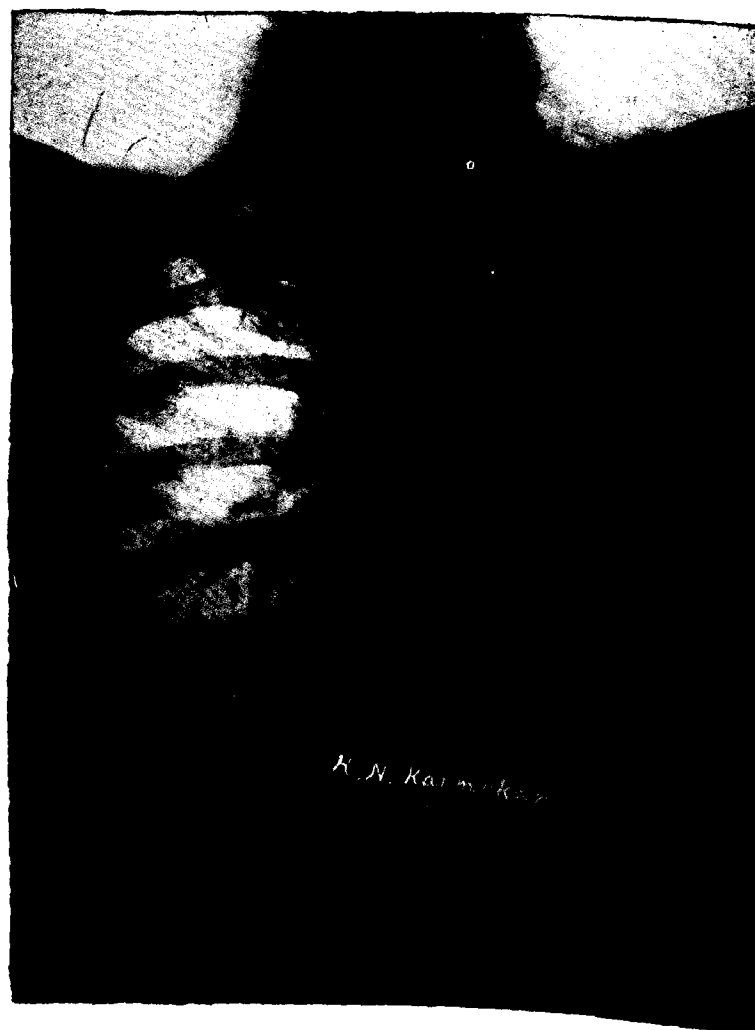
4. Never use force in extraction and traction even if the hooked tail is out, because the worm somehow or other doubles itself in the host's tissues and baffles all attempts at extraction even, at the cost of its life.

Dietetic Treatment :—

ALLOWED.	FORBIDDEN.
Vitamins:—A++++ B+++ C++++ D++++.	
Tastes:—Sweets and sugars. Sugarcandy.	
Salines : +++++.	Acids.
Pungents :—Asafoetida, Ammonium Chloride, Turmeric.	Urad.
Cereals :—Wheat, barley, bajra, oats, rice.	
Pulses and Dals:—Moong, moth, toor, masoor, grams.	Bhindi.
Vegetables:—(1) Roots and Tubers :—Turmeric, garlic, onions, ginger.	
(2) Beans, peas and Others :—Karela, parval turai.	Fats.
(3) Leafy :—Mint, maithi (Fenugreek), spinach.	Meats.
Chatnis and Salads of above.	
Fried articles:—Sparingly.	
Fruits:—Papaiya, limes, oranges, pomegranates, figs, raisins.	
Nuts:—Cocoa-nut, wal-nut, almonds, monkey nut.	
Fluids:—Boiled and strained water.	
Naturo-therapy or other accessory measures:—Fresh air.	
Water:—Cold baths, cold pads, cold douching and ice.	
Sun and heat :—Hot fomentations and poultices to inflamed parts, hot water bottles, X-ray therapy.	
Rest to the parts.	
Food :—as above.	

Pulmonary Tuberculosis

By Rai Dr. G. C. Chatterjee Bahadur



Film showing extensive proliferative lesion covering whole of the left lung.

CASES AND COMMENTS

Pulmonary Tuberculosis

Clinical notes taken over a period of a year and a half of a case of pulmonary tuberculosis which changed during the period from hypersensitive ulcerative condition to that of desensitized proliferative one

BY

Rai Dr. G. C. Chatterjee Bahadur, M.B. (CAL.), F.R.I. (LOND.).

Calcutta.

DETAILED clinical notes extended over an year and a half of a case (S. 125), extra-ordinary condition of whose lungs is depicted in Plate No. LXIV taken recently at the end of the period, when he was absolutely free from any complaint and carrying on his ordinary avocation, being in balanced physiological condition, but whose lung (left) was in ulcerative condition in the beginning, he being in hypersensitive condition with fever and cough, will give an idea as to how clinical signs change as fibrosis gains upper-hand over the ulcerative process. This went on *paripassu* with the general improvement of his condition.

It is necessary to add to this the information in order to create interest in the case, before the detailed notes are given, that these notes were jotted down in his case sheet in the course of his routine treatment along with other cases. It was not suspected that it would terminate in this condition till lately, when the finding of extensive dullness and loss of breath sounds over whole of the lung which were not present before and which did not make the least impression on his constitution but improved it remarkably, made me suspect it, but the physical signs gave, however, sign of thickened pleura only and not extensive fibrosis involving almost the whole lung, as had been found out by X-ray since. So clinicians, helped by the light thrown by recent advances in science, should try to interpret the physical signs, in a way different from that they used to do before the advent of X-ray, avoiding following the beaten track.

Fortunately for the patient, interference by mechanical treatment such as A.P. and phrenicectomy and thoracoplasty, by his previous medical advisers, was not suggested even, as due to absence of any bleeding, they did not suspect even tuberculosis. The hoarseness of voice and cough which were not accompanied as they were, by much loss of flesh, misled them. On this they fixed their attention. For this they suggested removal of tonsil or uvula which they incriminated, in the way of radical treatment after preliminary throat paint.

Report of the case (for details, see copy of the Case Report):—

In the first week of January 1938, the patient, aged about 30,

came to seek my aid for fever and cough and hoarseness of voice: about the last, he was much concerned from which he had been suffering for about a year and for which he consulted several doctors in Calcutta, some prescribing throat paint, others suggesting removal of tonsil or uvula. As I found definite physical sign in the apex of the left lung and he was febrile, he was advised rest in his home situated in a village about 10 miles from Calcutta. The fever stopped after a month and half, after which he started visiting me every week, for taking a course of tuberculin, he coming in a palki from his house to the station. For two months, this limited movement and tuberculin did not only produce no reaction but he started improving in health, his weight increasing from 110 to 114 lbs.; then he started getting fever again. Rest being given again, fever stopped; then he started coming weekly at first by taxi and then later on by train. This limited movement was allowed in the beginning till he, becoming desensitized, was allowed to resume his old occupation of goldsmith—no restriction being placed on his movement. His weight increased altogether from 110 to 130 lbs. It is needless to state that all symptoms including hoarseness of voice disappeared. The physical signs which were at first confined to the left supraclavicular region, showed marked loose consonating rales, suggesting ulceration. These gradually changed to rhonchi—sometimes to friction sound. All along, these signs were confined to the supraclavicular region, lately it was found out that the whole of his left lung except the base, showed wooden dullness, and loss of respiratory sounds but no rales of any kind. As the heart was not pushed to the right side, pleuritic effusion was excluded. As there was no sign of any portion of the lung except the apex, being involved, the wooden dullness over so extensive a region of the lung could not be explained. As his health was improving all the time, involvement of lung tissue could not be thought of—I thought the pleura only was involved but X-ray however settled the matter, the whole of his left lung being in proliferative condition.

Discussion.—The first point is when the fibrosis originated and second point, about the prognosis.

It seems that the fibrotic condition of his lung originated recently, after the detection of apical mischief—that it did not exist before is proved by the fact that when I took charge of the case in January 1938, only apical mischief was found, the rest of his lung being found healthy.

Before we discuss the prognosis of the case, it is necessary to compare with the reports of the cases of similar nature of other workers as well as with those which I had occasion to observe before.

In Pottenger's treatise on tuberculosis is depicted film of a remarkable case No. 9967 page 543, Plate No. 70. In this, whole of the left lung is the seat of proliferative lesion with a big cavity. Mediastinum was drawn to the left side. The patient, a female, was aged 50 when the film was taken. She had a history that 25 years ago, she had her

first hæmoptysis and she got, off and on, acute attacks in the intervals. She conceived and got children during this period. At the time, when the film was taken and when she was an inmate of the sanatorium, she was getting occasional fever and cough. By rest and tuberculin she gained 8 lbs. in weight, and became apyretic. The writer remarked that A.P. was not desirable—thoracoplasty to produce better mechanical condition would be disastrous. Phrenicectomy was done, but no improvement took place, due to adhesion. As to future, Pottenger's remarks are as follows: "To be sure, the patient will always be seriously handicapped, but at the same time she may be able to enjoy a limited activity so long as heart will be competent to stand up under its increasing load". Second case from the same text book is No. 9663 which was dextro-cardic and had not walked for over 1½ years. Film showed whole of the right side as the seat of proliferative lesion. Third case is No. 10,137, treated by rest and tuberculin still T.B. found and gained 3 lbs. Film showed extreme contraction of the left lung. In Goldberg's treatise, a case on page 345, Fig. No. 10 is given in which whole of the right side is the seat of proliferative lesion—no notes have been given. These cases have been cited, to show that no T.B. was found in sputum but was found in gastric contents. Two of my published cases are referred here. In one, whole of the left side is seat of proliferative lesion and a small lesion in the right side. For over 5 years, I am seeing the man. He is a thin man but afebrile occasionally oozing of blood takes place. There is some amount of dyspnoea which prevents him taking to manual labour, he being a cultivator, but he can walk a good distance.

In the second case, whole of the left side is seat of lesion. In the right side, there is a cavity. He is under observation for 4 years, working hard. There is no fever nor any dyspnoea.

As in the present case, there is absent any dyspnoea, unlike some of the above cases, so we presume occurrence of compensatory emphysematous change in the lung; this is not expected to embarrass his heart in undertaking any labour, incidental to his carrying on his ordinary avocation. So we can say that so long as the defensive mechanism of his system prevents tuberculosis, which may remain dormant in his system, from flaring up, there is every chance of his enjoying ordinary span of life.

X-ray film (Plate No. LXIV)—shows extensive proliferative lesion over the whole of the left lung.

Copy of Case Sheet of Case No. 125 Plate No. LXIV.

Left apex and laryngeal—High-fever.—Fever and cough for 2 years—
By rest normal.—First seen January 1938.

Date.	Dose of tuberculin.	Physical sign, weight.	REMARKS.
1-2-38	1 M	110	
28-2-38	900,000	111½	Left apex (supra-scapular and supra-clavicular region)—loose crepitation audible.
1-3-38	800,000	112½	Left apex—marked crepitation.
8-3-38	500,000	113	Crepitation (left) dry in nature. Coughless. Had 101° for two days.
9-3-38	300,000	114½	Sounds markedly dry. No fever.
26-3-38	200,000	112½	Crepitation over whole of the apex, dry in nature.
2-4-38	128,000	114½	Crepitation dry.
Extension of lesion—fever		111½	
18-4-38		Temperature.	
24-4-38		102°	
		100°	
Interval—rest—no injection.			
14-5-38	1 M	112	Apex—marked crepitation.
22-5-38	700,000	112½	Crepitation—apex.
31-5-38	500,000	113	Loose crepitation—left apex.
8-6-38	300,000	113	Supra and infra-clavicular region—loose consonating rales but practically symptom-free, afebrile.
16-6-38	200,000	113½	do—Cough.
23-6-38	128,000	113½	Loose crepitation—left apex.
30-6-38	80,000	113½	Crepitation.
9-7-38	50,000	113½	Crepitation—symptomless.
From 18-7-38 to 20-1-39—for 24 weeks, the portion of the report of the case is left out, as being of similar nature, he being apyretic and his weight having increased from 114 to 128 lbs.—the physical signs becoming less.			
27-1-39	9 M	125	Sounds drier but still audible—whole of the left side from clavicle to 5th space dull on percussion—vocal resonance less than on the right side—evidence of thickened pleura.
3-2-39	M	125	Feeling perfectly well—crepitation not audible—but no respiratory sounds over the apex from first to 5th space.

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An Interesting Case of Congenital Inguinal Hernia

BY

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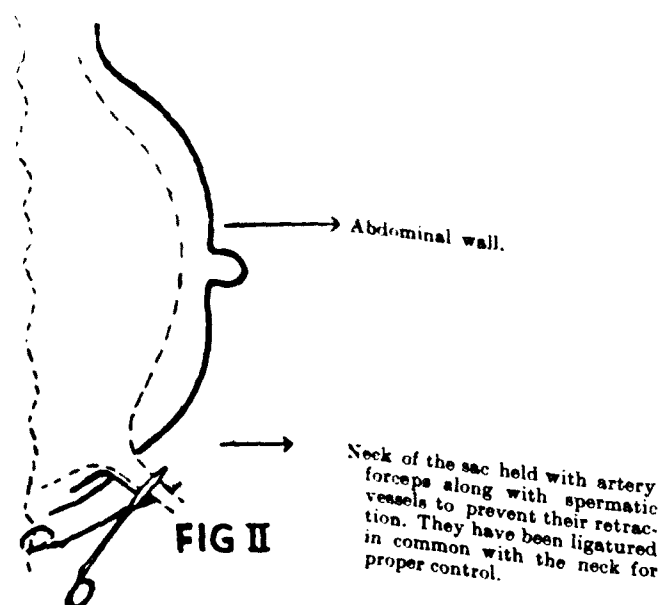
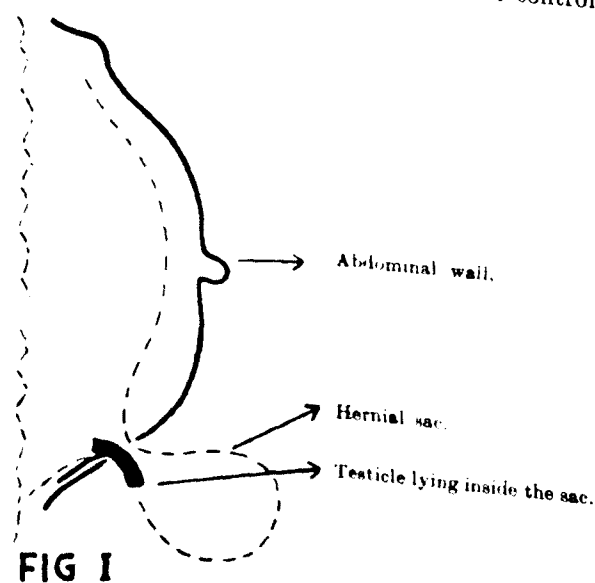
A PATIENT named Mallick Mohd. Shafi, aged 35, resident of Kunjah Dist., Gujrat (Pb.), was admitted on 11th January 1939, at Civil Hospital, Phillaur, to undergo an operation for right congenital inguinal hernia.

History.—He complained of general weakness, physical and mental exhaustion, constipation, indigestion, spermatorrhoea and insomnia, of many years duration. He also complained of sexual weakness, early emission and weak procreative power. He was married about ten years ago, but no child was born to his wife. He further reported that the right scrotum was previously getting swollen up by ordinary exertion which could be reduced by ordinary digital pressure, but lately the swelling is more or less permanent which has exaggerated his agony. He also declared the absence of testicle from right scrotum. His wife is quite a healthy young girl in appearance with normal menstruation and no uterine trouble.

Clinical Manifestations.—By physical examination, I found that the patient was suffering from indirect reducible congenital hernia with undescended testicle. His thoracic and abdominal organs were healthy but the patient is neurasthenic, possessing nervous temperament and is seedy. He was kept in the hospital for observation for about a week and was treated medically to sooth his nervous system. During that period, he was examined by me frequently and no suspicion ever arose in my mind regarding the diagnosis, particularly about the non-descent of the testicle. As the patient belongs to my village, I thought it advisable to seek the assistance of Doctors MANGA MAL, Assistant, Surgeon Phagwara, and RAM KRISHNAN, M.B.B.S. Bilga. Both of them are popular for their surgical aptitude.

Operation.—On 23-1-39, the operation was performed under intrathecal anaesthesia of Stovaine. When the sac was opened the undescended testicle was found within the sac; about half of it was inside the abdominal cavity and the other half was protruding out of the internal abdominal ring. By pulling the sac, whole of the gland was exposed and the vessels of its spermatic cord were indentified which were ligatured and cut out, their proximal ends were kept under control by holding with artery forceps so as to prevent their retraction into the abdominal cavity, lest the ligature might slip away and kill the patient by internal haemorrhage. The testicle with its covering about half an inch all round was dissected out and kept in a clean sterilized bowl containing saline solution. The neck of the sac was transfixd with catgut after the proximal cut-end of the cord (above

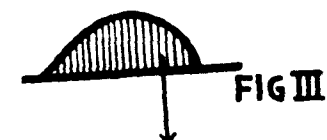
mentioned) was pulled out with the artery forceps holding it so as to keep it outside the abdominal cavity and well under control to avoid



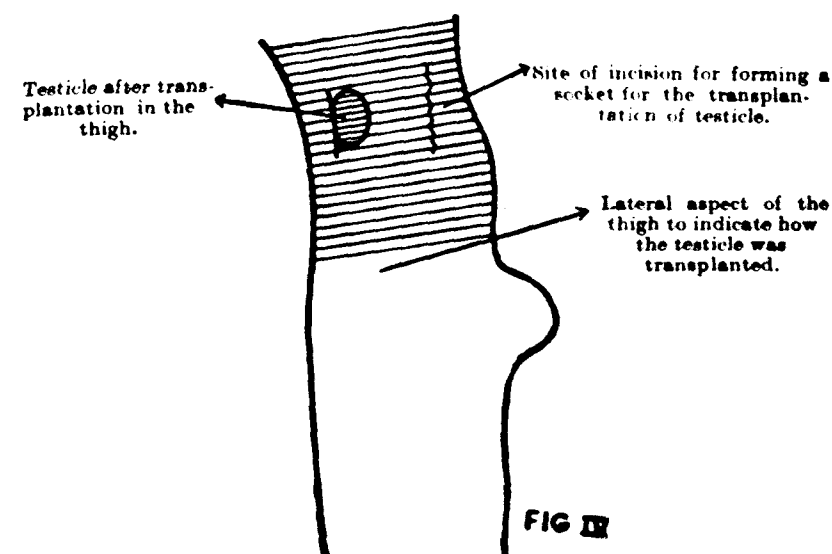
internal haemorrhage. The sac was then excised distal to the ligature applied for transfixing and closing the neck to shut its communications

with the abdominal cavity. The operation was completed and the wound was closed as usual.

After the operation was completed, I, in consultation with my colleagues, decided to transplant the removed testicle in the thigh of the patient. Consequently, I gave a longitudinal incision about three inches in length on the lateral aspect of right thigh. The skin and the fascia lata were incised and a long closed artery forceps was inserted into the wound upto the extent of three inches directed towards its posterior aspect and its blades were opened wide as much as possible and by two or three such attempts a sufficiently wide sac was formed under the fascia lata. The testicle as a whole was placed in that sac sufficiently away from the external wound. There was practically insignificant oozing from the newly-formed sac which was well washed with saline solution before placing the testicle into it. The wound was stitched by interrupted sutures and dressed. Both the



Testicle after being removed from the sac and redundant portions of the coverings snipped.



wounds were healed up within a fortnight by first intention. The convalescence was a bit protracted on account of the skin of the sacral region of the patient being scalded by hot water bottle kept on his bed after the operation.

The size of the testicle grafted into the thigh was as follows:—

It was $1\frac{1}{4}$ " in length, 1" in breadth, $\frac{1}{2}$ " in thickness. There was a slight local reaction at the site of grafted testicle which gradually subsided and after about three weeks, the size of the testicle was reduced and after about eight weeks it was hardly palpable.

An Interesting Point.—On 21-2-39, LT. COL. JAMAL-UD-DINE, I.M.S., Civil Surgeon of Jullundur District, happened to visit the Hospital. The case was shown to him who examined the patient thoroughly. He surprised the patient and me by feeling a new testicle in the scrotum with well formed cord and epididymis. The scrotum was previously empty as above described. The Civil Surgeon asked me to palpate the scrotum and I was much astonished to find both the testicles present in both the scrotal cavities. I then asked the patient to feel his scrotal sac himself which he did and was very much pleased to see the two testicles in the scrotum for the first time in his life. I immediately sent a message to my colleagues—DRS. MANGA MAL and RAMA KRISHNAN who visited the patient and were surprised to see the presence of both the testes in the scrotum.

Let me discuss now, how the right testicle reached the scrotum and wherefrom it had come, when it was transplanted by me in the right thigh in the presence of expert colleagues. It might be that I could not feel its presence in the scrotum, neither before, nor after the operation on account of an error of my judgement. It might be so but the patient himself bears me out that he never felt its presence in the scrotum. Even a few hours after the operation, the patient who felt his scrotum asked me why I could not succeed in putting the testicle in his scrotum to which I replied that I got hold of the testicle but it was not possible to put it into the scrotum, so I had grafted it in his right thigh. It was not only the patient but also the Doctors as well as my two dispensers testified that there was only one testicle in the scrotum both before and after the operation. So, I am in a position to declare that the second testicle appeared into the scrotum a few weeks after the operation. A possibility as suggested by laymen was that the grafted testicle might have travelled from the right thigh to the right scrotum, which is impossible and it is put forward only for condemnation. The third possible solution of the problem might be that a third testicle might be present on the right side of abdomen which descended down after the operation. This carries conviction but it is to be decided how the descent of the testicle was stimulated. It might be the effect of operation or some hormonal substances like pregnyl secreted by the grafted testicle which might have stimulated the descent of the third testicle. I am induced to think that the latter might be the actual cause but we have to decide whether the testicle could actually secrete hormonal substance similar to pregnyl to help the descent of the testicle during intra-uterine life. I beg to draw the attention of those engaged in this research. I beg to be able to put some more light on the subject. They might strike me at this stage that the gland grafted by me may not be a testicle. It some

thing else allied to anterior pituitary body producing hormone similar to pregnyl. I didn't take the section of the grafted gland for microscopic examination. Otherwise it might have proved something else. What I could conclude by the help of my colleagues by examining the gland by its appearance, shape, consistence, tactile sensation and its vascular supply, was that it fairly resembled testicles. I may also mention at this place, that I didn't cut it into two halves, but transplanted it as it was. There is another problem to decide again, why this gland was not producing a hormonal substance like pregnyl before the operation when it was lying inside the hernial sac near the internal abdominal ring and why it started producing when it was grafted into the thigh; the only solution according to my conviction is that at the new site, the circulation of the gland was much improved by the regeneration and formation of new vascular tissue. I am also inclined to think that the hormonal substances secreted by the grafted testicle might have stimulated the anterior lobe of pituitary body to produce the gonodotropic substance like pregnyl. H.M. EVANS and G. A. LANG in 1923 demonstrated the existence in the anterior lobe of pituitary of a gonad stimulating hormone which appeared to control the activity of the ovaries and testes.

In 1928, I. S. ASCHHEIM, B. ZONDIK reported the existence of Gonodotropic principle in the urine of a pregnant woman, similar in its effect to that produced by the anterior lobe of the pituitary.

In 1923, E. T. ENGLE put the therapeutic possibilities of the gonodotropic principle in use. Working with immature mice in which the testes lie at the upper portion of the inguinal canal, he found that it was possible to induce descent of the testes into the scrotum if the animals were injected with anterior pituitary extract as found in the urine of pregnant women. Another side of the picture was presented by the work of H. BURROWS. During an experimental enquiry into the effect of oestrogenic substance in mice, he found that scrotal hernias developed with considerable proportion of the animal when they were treated with a biweekly application of oestrine to the skin of intrascapular region. He was inclined to believe that the action of the oestrine was to induce relaxation of the various muscles which regulated the calibre of the passage-way between the abdominal cavity and the scrotum so that hernia resulted. This carries conviction that the hernia in this case was also the effect of some hormonal substance.

This is the first case of its kind, I happened to deal with during the long course of my service. My knowledge of Endocrinology is however, limited, but the careful reader will be in a better position to suggest the new theory of which I might be unaware at this moment. This case would provide fresh material to the Research Scholars for further investigation, who could put more light on the subject.

Foreign Body Remaining in Oesophagus For Seven Years

BY

M. Bhupathy,

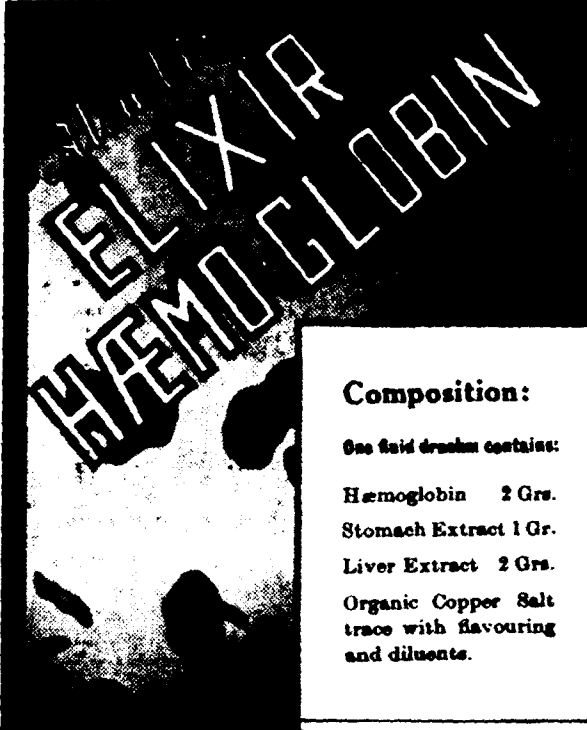
Medical Officer, Palankuruchi.

On 28-11-39, a boy aged eleven years, named Lakshmanan, was brought to me for difficulty in swallowing even liquid. The boy was very weak and thin, and his mother told me that the boy swallowed a quarter anna copper coin when he was four years old and that she saw him swallowing it with her own eyes. The boy was then taken to the Ayurvedic Hospital at Murayur, in Ramnad District. The doctor examined the throat and could not find anything and gave castor oil purgative.

From that time onwards, the child used to swallow even liquids with difficulty. While swallowing, the child used to bend its neck towards the right side. He used to masticate the solid food well and then swallow with great difficulty by bending its neck towards right.

On examination, I found no swelling on the neck. On deep pressure on the jugular notch, he felt pain. The mother told me that the boy was taken to various medical men and that she was fooled by all for saying that the boy swallowed a quarter anna coin, that too seven years ago. She affirmed that she was an eye-witness for the boy swallowing the coin and that it never came out.

She is a very poor woman and hence unable to take X-ray photo or to go to the District Headquarters hospital. She brought the child to me because he could not swallow even water for the two days preceding her visit to my hospital for treatment. The liquid he used to take was regurgitated. I advised her to go and take an X-ray photo and told her that if she did not do so, the boy's life was in danger. I asked her to come to me the next day and promised to give her a letter to the Mission Hospital at Tirupattur to take an X-ray photo, free of cost. To my surprise, she came to the hospital the next morning and informed me that the boy vomited and brought out the coin swallowed seven years ago. The coin is coated with a greenish substance to the extent of a thickness of 1/8 inch. On removal of this greenish substance, the coin bears no letters and the thickness of the coin is only about 1/3 or 1/4 of its original thickness of the period of seven years, the function of respiration was not affected but the function of deglutition was affected. Any slight trauma on the right side of the chest caused pain. Now the boy has increased in weight and he has absolutely no difficulty in deglutition, of even solid food. I am sending the coin which may be kept there and shown to any medical man who may like to inspect it. Impaction of the coin lower down the gullet had not been followed by ulceration, perforation and death either from hæmorrhage owing to one of the large vessels being opened, or from suppurative mediastinitis as described in text books, though the coin had remained there for a long time.



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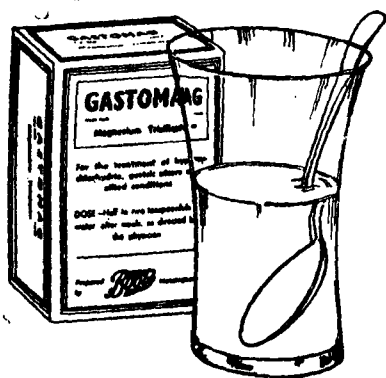
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EDITORIAL

1940

THE New Year has dawned amidst gloom and sorrow in every hearth and home in all parts of the world. In Europe, since September last, England and France are at war with Germany. There has been loss of life on the front and on the high seas. The recent catastrophic and calamitous cataclysms of Nature—the quake and the floods—have devastated portions of Turkey, claiming a heavy toll of about 50,000 souls, and leaving as many or even more, injured and crippled and rendered homeless and impecunious. There is war between China and Japan which, though it has paled into insignificance when compared to the troubles in Europe, is still claiming its victims. Our hearts go forth in sympathy for the dead, and the wounded, the sick and the suffering and the unfortunate victims of these calamities. We pray, therefore, to the Almighty to restore peace and prosperity in this world and make the world safe again for all to live in.

Our own country, India has also got to tell its own tale of misery and misfortune. It has been declared a belligerent country and must necessarily sacrifice men, money and munitions to fight aggression. In view of the fact that His Majesty's Government and the Government of India have not consulted the autonomous provinces, on this subject, the Congress Ministries who have been successfully carrying on the administration of eight of the eleven provinces in this country, have all resigned leaving their programmes half-done. This is unfortunate since the people of these provinces have not yet had the opportunity to reap the benefits of the wise Governments that controlled their finances for the last two years and more.

The Great War of 1914-18, though it taught the world many lessons, left in its wake widespread disease and suffering. "The assembling of great masses of men under conditions in which sanitation

is difficult, if not impossible, and the movement of great numbers of men across wide areas of country where they come in contact with new populations, invariably results in the spread of disease. The louse, the rat and many other insect and animal carriers of disease seem to wait to demonstrate when the favourable opportunity comes, that man is but a morsel in the great cosmic scheme and that when he seeks to destroy himself, Nature stands cynically to assist him. In practically every war, disease has always caused more deaths than military manoeuvres and engagements. Typhus, plague, cholera, typhoid, dysentery, pneumonia and influenza do more damage than dynamite, torpedoes, gun-powder and poison gas. As a great writer once said, 'Epidemics get the blame for defeat, generals the credit for victory'. It ought to be the other way around. For, in many a great war of the past, epidemics have come to terminate the conflict." It took the world many years to recover from the devastating effects of the last war and just when everybody seemed quite settled after years of peace, another war has overtaken humanity.

In order to combat diseases of such virulence and of such devastating nature as those mentioned above that may usually be expected in the trail of war, two things are essential (1) self-sufficiency in Medicines and (2) a sufficient number of fully-equipped medical men. Does India satisfy these two essential conditions? We are afraid, it does not. Even after the Great War of 1914-18, India did not avail herself of the opportunity of starting her own industry for the preparation of medicines, but continued to be dependent on foreign countries for her drugs. The Indian Government never made any earnest endeavour to start Pharmaceutical Industry on a large scale, nor did they encourage private concerns engaged in manufacturing pharmaceutical products. On the other hand, they allowed drugs in large quantities to be imported from abroad. The Drug Enquiry Committee appointed by the Government of India in 1930 under the Presidentship of BREVET-COL. R. N. CHOPRA, I.M.S. submitted an exhaustive report and prayed for immediate action and legislation for the control of drug trade and the enactment of a Pharmacy Act. But, nothing came out of this report. The Government of India shelved the report for seven long years and it was only recently they took steps to start a Central Bio-Assay Standardisation Laboratory at Calcutta, under the direction of COL. CHOPRA. No Pharmacy Act and no starting of a Pharmaceutical Industry in India have been attempted. And now India is faced with a severe drug famine, as the doors of Germany are completely closed and those of England partially, for England would like to fill her wants first before thinking of India. We have no doubt that the policy of drift, delay, and short-sightedness adopted by the Government of India, in spite of timely warnings both by the Press and the Public, is solely responsible for the awkward predicament in which India is now placed. At the 16th All-India Medical Conference recently held at Lahore, DR. BHUPAL SINGH, the President, observed with regard to Drug Industry, that an All-India Planning was urgently required in order to make India independent of foreign countries in the matter of drugs and medical and surgical

appliances and urged the need for the formation of an influential committee by the Indian Medical Association. We hope that the Association will soon be formed and it will take early steps in the matter and bring to bear adequate pressure on the Government to see that India is made self-sufficient with regard to drugs and medical and surgical appliances.

BT. COL. CHOPRA, in his presidential address at the Science Congress held in Madras recently, described India as a veritable emporium of drugs, deplored the lack of research facilities in India and emphasised that if these resources could be utilized and the finished products manufactured, treatment of many diseases could be brought within the means of the Indian masses whose economic condition was unfortunately of a very low order. According to COL. CHOPRA, there are more than 700 important fodder plants including about 260 species of valuable fodder grass. More than 2000 plants, out of a total of about 11,000 species found in India, are stated to have medicinal properties of some description or other and are enumerated in the literature of Indian Medicine. Nearly three-fourths of the drugs mentioned in the British and other Pharmacopoeias, grow in a state of nature and others can be easily grown. In conclusion, he said: "Collaboration between botanists, chemists, pharmacologists and agriculturists in work of the type indicated in a country such as India, is pregnant with possibilities which should not only be of very great scientific and academic interest, but also prove of great practical importance to the country from the economic point of view." We trust the Government of India and the various Provincial Governments will at least now pay heed to this wholesome advice tendered by COL. CHOPRA and set to work immediately and in right earnest to solve the drug problem, which is essentially a problem of life and death for India.

Let us now come to the doctors. The present war is mostly a war in air and Indian medical men do not have sufficient training in Air-raid precautions and the like. "Aerial attacks which are a feature of modern warfare have introduced new problems and your duties lie not only with regard to the troops in the battle-fields but also with the civil population even at great distances from the actual seat of war. It becomes incumbent on you to train yourselves in Air-raid precautionary measures so that you may be able to give help in an emergency", thus observed DR. BHUPAL SINGH in his Presidential address. It is regrettable to note that the lessons of the Great War of 1914 and those of the recent Spanish and Sino-Japanese Wars have been lost on the authorities. "Throughout Britain, during this period (1914-18), as a result of German Air-raid, only 1414 persons were killed and 3416 were wounded, even though 8500 bombs were dropped. But in the recent Spanish War, the insurgents dropped 24,000 bombs on the civil population of Spain and as a result 7000 non-combatants had been killed and 11,000 wounded. In China, 2500 Air-raids were carried out by 17,000 Japanese planes and 33,000 bombs were dropped resulting in 16,500 non-combatants being killed and 21,752 being

wounded. These are harrowing and staggering figures, indeed, well-worth remembering by medical men!

Turning to ourselves, 'The Antiseptic,' we are glad to announce, has finished 36 years of its existence. It has been, all these years, trying its very best to destroy that caste-system among medical men, and it is happy to find that in the year of Grace 1939, it had succeeded and we are glad to find that so far as Madras Presidency is concerned, this caste system has been abolished. Many other reforms which it voiced forth, had also been effected in this province, such as the greater association of Honorary Medical men in State hospitals, to mention only one. We are happy that our endeavours have not been in vain and that our fight has not been unrewarded. We are quite aware that in the advocacy of these reforms, we might be treading upon somebody's corn here and there. We can assure our readers that so far as we are concerned the benefit of the Medical Profession is the only one that matters.

'The Antiseptic' will continue to cater as hitherto not only to the numerous general practitioners but also to the specialists in the various branches of Medical Science. To all those distinguished medical men, who have been contributing to its issues, 'The Antiseptic' expresses its heartfelt and grateful thanks; for, without the solid support of the profession behind it, no medical journal can hope to prosper and progress. We trust, the medical profession both in India and abroad will, in the years to come, continue to give their unstinted support and render all help they can, to 'The Antiseptic' in its onward march. To the various advertisers, who in the midst of world-wide difficulty are continuing to proclaim their products to the medical profession through the medium of 'The Antiseptic' and who have been, to certain extent, the back-bone of the journal, we offer our heartfelt thanks.

We wish all our readers and advertisers a **Happy and Prosperous New Year**. We trust that their business will grow from strength to strength and that before long, there will be peace on earth and good-will among men.

GLEANINGS FROM MEDICAL PRESS

Medicine and Therapeutics

The Treatment of Alcoholism.—Prof. J. Levy-Valensi (Paris): Acute alcohol poisoning, drunkenness, rarely requires treatment. It is, however, necessary to intervene at times, *e.g.*, when the drunken person indulges in melancholic speeches, talks of suicide; when he becomes violent and stumbles about from lamp-post to lamp-post, thus seeming to be in danger of getting hurt. The first step is to evacuate the stomach, either by tickling the pharynx or administering coffee with salt, apomorphin, ipecacuanha or by lavage. As a stimulant

the patient is given 1 or 2 gm. of ammonium citrate or an enema with 10 drops of ammonia to 300 c.c. of water. Peasants of certain regions simplify this therapy by placing the intoxicated person on a dung-heap; the released ammonia does the rest.

Alcoholic coma may develop in the course of an occasional drunkenness, but it is usually observed in chronic alcoholism. It shows no specific characteristics. The patient is unconscious, his face bright red, the pupils dilated, the sphincters relaxed; hypothermia is present. All these signs may also be found with unconsciousness of another genesis; only the alcoholic odour of the respired air points to the real cause of the condition. But one must not be misled by this odour. There have been cases where patients in diabetic coma were given alcohol as a stimulant before the arrival of the physician, and this led him to think of alcoholic coma. In the treatment blood-letting is interdicted; deaths have presumably been observed following this. Nevertheless, small quantities of blood may be removed by applying cupping-glasses. Routine treatment of unconsciousness is otherwise applied: heat (without causing burns), purgative clysmata (coffee clysmata have been recommended), lumbar puncture and administration of strychnine. Americans advise a mixture of 20 parts oxygen and 10 parts CO₂ to be inhaled for 30 minutes or more.

Chronic alcoholism is a chronic disease, whereas drunkenness is an intoxication. All organs are affected; there is cardiac weakness, the arteries are extremely tense and sclerotic, the central nervous system shows a tendency to convulsions, the cerebrospinal fluid contains an increased amount of polypeptides; the residual nitrogen level indicates renal damage, the gastric mucosa is atrophied, above all there is insufficiency of the liver. This organ either forms harmful substances or permits them to pass through without sufficiently changing them, and this matter is poured into the centres. The first part of the therapy consists of the usual treatment of such conditions, *i.e.*, cardiac insufficiency, gastritis, convulsions, etc. Along with this one should in every case administer large quantities of liver preparations for a long time; for example, Mattei recommends injecting 10 c.c. liver extract in 5 c.c. salt or sugar solution twice daily. In chronic alcoholism the character and morals become blunt, alcoholic dementia develops with unwillingness to work, brutality, amorality and jealousy. As a result acute, subacute or protracted episodes occur, treatment of which represents the second problem of the therapy. Abnormal drunkenness has become less common in France ever since absinthe went out of fashion. Various forms may be distinguished. In the maniacal stage the patient fights constantly, bites and may even commit murder if not detained; convulsive attacks are not uncommon. In the hallucinatory form the patient has unpleasant illusions in which, for example his wife betrays him. They may lead him to violent acts. The deliriant form leads particularly to false self-accusations. In all three above types the patient usually falls asleep after the pathologic manifestations, and on awakening has no recollection of the affair. Delirium tremens is marked by trembling,

fever, and in the evening the patient is greatly excited, bordering on despair. The face is bathed in perspiration; it reflects anxiety and fright. The patient thinks he must protect himself from gigantic or repulsive animals which he sees. He flees from the flames which surround him or from the masses of water which gush forth at his very feet. In milder cases there is some connection between the illusionary idea and the patient's occupation. Thus each evening a coachman vainly tried to get his team up a slippery, steep hill. Persecution mania is very common in cases of chronic alcoholism, especially jealousy mania. Finally, polyneuritic psychosis, the so called Korsakow syndrome, must be mentioned.

In treating these sequelæ of chronic alcoholism we must first of all avoid doing three things. (1) The patient must not be restrained forcibly. The exhaustion resulting from the fight against strait-jacket or ropes increases the intoxication and may prove to be fatal. (2) He must not be left in the dark. Darkness increases the visions and the auditory hallucinations. (3) He must not be given any alcohol, as was formerly done out of fear for the consequences of sudden withdrawal. The purpose of the therapy should be to detoxicate, soothe and stimulate the patient. For detoxication one prescribes exclusively water, milk or a lactovegetable diet, repeated clysters and injections of normal saline. Permanent baths (36 to 37° C.) or wrapping in moist towels have a detoxicating and sedative effect. The Belgian physician Bodart recommends subcutaneous injections of emetin hydrochloride 0.02 gm. as a means of stimulating secretion, on the first day 3 ampoules, from the second to the sixth day 2 ampoules daily and on the following six days 1 ampoule daily. Sedatives to be administered include extract of opium (5 to 15 cgm.), morphine (1 to 3 cgm.), chloral hydrate (5 to 10 gm.) by enema. These medicaments, however, are dangerous if the heart is weak. Barbituric acid derivatives, such as gardenal sodium, evipan sodium, sonetyl and particularly somnifen (6 to 10 c.c., depending on the weight of the patient, slowly injected intramuscularly or intravenously, 2 c.c. a minute), are now used extensively. As a stimulant strychnine is the sovereign remedy, 1 to 3 cgm. in severe cases up to 5 cgm. (!) subcutaneously. Some physicians use strychnine as routine treatment in every type of chronic alcoholism and continue its administration a few days after all symptoms of the disease have disappeared. Under the action of strychnine fever, trembling and hallucinations cease, diuresis and liver function recover. This may be considered a type of antagonistic intoxicating action as strychnine increases the electrical excitability of the central nervous system, which the alcohol had lowered. The fact that sedatives have the same effect in this sense as alcohol requires that they be given to alcoholics, if at all, only with the greatest of care. Three new methods of treatment have recently been added to the above. Three new Pikers, an American colleague, has found that mental disorders of alcoholism are due to cerebral œdema. He therefore recommends a dehydrating regimen and lumbar puncture. (2) French, Swiss and Spanish physicians advise insulin treatment since alcoholics suffer from acidosis, loss of water and disorders of glycogen metabolism. 10 to 15

units are injected twice a day after having given 15 gm. of glucose by mouth or a grape-sugar solution by injection. (3) Klotz strongly supports vitamin therapy (vitamin B). The atrophic gastritis of alcoholic patients prevents resorption of vitamin B from the food; liver insufficiency makes storing impossible. Alcohol neuritis, therefore, is probably not of toxic etiology, but a result of vitamin deficiency, and administration of vitamin B, is actually beneficial.

Withdrawal of alcohol is a very difficult task. Attempts have been made by some physicians to overcome the need for alcohol by injecting antidotes (Strychnine, Emetin, Vitamin B). Others have tried to obtain a serum containing antidotes from alcoholized horses or sheep. Still others sought to disgust the alcoholic with the taste of alcohol, similar to the experience with patients who dislike all meats after recovering from sausage poisoning. Quinine was added to the alcoholic drinks or alcohol to all foods in order to arouse the patients' aversion to it. All of these methods failed just as Pilocarpine (so as to increase the intolerance of an alcoholic, who is already vagotonic anyway, and thus cause nausea when consuming alcohol), Apomorphine and Ipecacuanha had failed. Hypnosis and psychoanalysis have had better results; expert psychoanalysis in particular is at times successful. Thus, for example, the writer had a butcher as patient who wanted to be cured of the drinking habit. Treatment at an institution was naturally suggested, but that was of course rejected. As the writer was in a bad mood on this particular day, he painted the consequences of the patient's vice in the darkest colours to him: cirrhosis of the liver, constantly recurring ascites, delirium tremens, certain ruin. Trembling violently, the patient vowed never to drink again; strange as it may seem, he kept his word. Genuine prophylaxis of alcoholism can be achieved gradually only through both private and national care. Suitable aid must be given the family by the physician, teacher, priest, etc.; social measures (higher wages, good living quarters, utilization of free time) and anti-alcoholic laws (tax on alcohol, limited number of bars) are necessary; abstinence associations deserve support. Good institutions for treatment must obviously be established. On the other hand the writer, like most physicians, is of the opinion that there is no objection to moderate indulgence in alcohol by healthy people. (Paris medical, No. 19, 1939.)

Debre, Lamy and Kaplan presented to children, aged 9 and 4½ years, at the Paris Association for Pædiatrics whom they had treated for alcoholic coma. This condition does not always have a favourable prognosis in children. The lethal dose seems to be about 6 or 7 c.c. of pure alcohol per kilogram body-weight. These children had received only 1½ to 2 c.c. per kilogram. They recovered in a short time. All the same, the possibility of alcohol poisoning must be considered when confronted by unconscious children. Lavage verifies the diagnosis and is at the same time the most important part of the treatment. Fevre had to operate on a 4-year-old child with intestinal invagination who had emptied a few glasses of wine that had been left on the table. Genevrièr found signs of meningitis in a child with measles whom the

family had given a strong dose of rum. Weil-Halle observed abdominal symptoms that strongly suggested appendicitis in a child who was drunk. (*Revue Franc de Pediatrie*, vol. XV, No. 1, 1939.)—*Ars Medici*.

Trauma of Heart.—Major-General R. Priest reports the case of a young Indian Sepoy who, while playing cricket and keeping wicket, was hit over the left breast by the cricket ball. After a short interval he continued the game and played again on the following day until the match was ended. He did not complain of any pain until that evening, when he borrowed some liniment to rub his chest with. Some minutes later he was heard groaning as he lay on his charpoy, and when asked what was the matter he was unable to speak, and expired just before being placed on a stretcher to be taken to hospital.

The necropsy showed some bruising of the skin, but no fracture of the ribs. The pericardium was full of blood-stained fluid. The anterior surface of the heart was oedematous and there was some evidence of bruising. There was a small tear near the interventricular septum causing a communication between the right ventricle and the surface of the heart, that is, a rupture of the right ventricle. The coronary vessels and aorta appeared to be healthy.

The effects on the heart of trauma to the chest wall may be fatal without any obvious lesion of the heart; there may be contusion or partial rupture of the heart; and lastly, certain irregularities of rhythm, valvular lesions and cardiac pain may also be sequelæ to injury to the front of the chest wall. Experimentally it has been shown that it is possible in the dead subject to rupture a cardiac valve by striking the chest vigorously, but without causing injury to the bones of the thorax.

Amongst other instances (Barber, 1938), is the report of a boy, aged 6, whose chest was pressed against some railings by the shaft of a pony trap and one month later, while out for a walk, he collapsed and died. At the necropsy there was no external bruising but the left ventricle was ruptured posteriorly. In another instance, a boy, aged 9, was knocked down and received multiple injuries. He died 47 days later and a perforating slit was found at the auriculo-ventricular junction with hæmorrhage into the pericardium. In a third case, a child, aged 7, was brought into hospital dead; the front wheel of a car had passed over the chest wall without causing any external bruising or damage to the bones. At the necropsy both ventricles were found ruptured. These cases show that trauma can cause a fatal result which may be immediate or after a few or many days.—*Clinical Journ.*—Dec. 1939.

Sulphonamide Treatment For Infective Colds.—PRIMARY infective colds of more than two days duration and secondary infective colds responded promptly to the administration of Sulphonamide. The drug, which was given orally in doses of 1/10 grain per day per pound body weight in afebrile cases and $\frac{1}{4}$ — $\frac{3}{4}$ grain per day per pound body

weight in febrile cases, was only administered when examination of the excretion showed the presence of free streptococci with inefficient phagocytosis. Within twenty-four hours of the beginning of treatment phagocytosis began; but if the drug was stopped before this process was complete, micro-organisms reappeared in some cases and the phagocytosis became inefficient. It was also noted that a second course of Sulphonamide did not have the same restorative effect on phagocytosis as the first, and whereas a person who had had a cold showed some transient immunity those in whom the cold had been cut short by Sulphonamide given by mouth did not possess this immunity and commonly became reinfected. As regards complications, the course of streptococcal tonsillitis was cut short by administration of the drug (except when the infected tonsil was fibrotic), streptococcal bronchitis responded immediately, and in early streptococcal mastoiditis and acute otitis media the course was generally shortened and operation was avoided. With local spraying of sulphonamide into the nose it was found that owing to frequent administration so much was swallowed that the amount used approached the dose required to kill the micro-organisms. This method of local application proved ineffective when the infection had spread to the chest, and was useless in sinusitis, middle-ear infections, and tonsillitis. The instillation of a Sulphonamide ointment in the nose in early cases produced the same effect as when the drug was given by mouth. The ointment was kept *in situ* for three days, and caused little irritation. This method appeared to stop the infectivity of the patient to others almost immediately. The value of Sulphonamide therapy in the treatment of carriers for the prevention of epidemics is stressed, and the results obtained are considered sufficient to warrant further trial.—A. L. Yates (*Canadian Medical Association Journal*, September 1939, 41, 275).—*The Practitioner*.

Recently Developed Test Improves Prompt Diagnosis of Diphtheria.—The prompt diagnosis of diphtheria apparently has been improved by a recently developed sodium tellurite test, *The Journal of the American Medical Association* for Sept. 16 points out.

The test consists of swabbing the throat of a suspect with Sodium Tellurite. If the exudate turns black or gray ten minutes later it represents a positive reaction for diphtheria. However, it is pointed out that some of the positive reactions may be "false positives."

Eric Tomlin, M. D., who studied a series of such tests, *The Journal* points out, concludes that a negative result is of value in that it supposes with great accuracy that the disease is not diphtheria. Such a high percentage of false positive results occur, however, that no positive diagnosis of diphtheria should be made on a positive result alone.

"In spite of these shortcomings," *The Journal* says, "the test will probably prove extremely useful, especially in relation to epidemics or in cases in which the technical difficulties of isolating patients make it exceptionally important to procure an immediate presumptive diagnosis."

The contagious nature of the disease, as well as the increased effectiveness of antitoxin when it is administered early, emphasizes the importance of an immediate diagnosis of diphtheria.—*Texas State Journal of Medicine*.

An Allergic Reaction to Menthol.—Menthol has not been included in the long list of substances which can produce allergic reactions, but a case has been recorded by Hansen in which it came under suspicion. The patient had suffered for 4 years from severe and persistent coryza, which was traced to the use of a soap containing thymol and menthol. It was found, however, that the coryza was provoked by the thymol and not by the menthol. A case of menthol idiosyncrasy is recorded by W. Gronemeyer in a housekeeper, aged 41, in whose family were two relatives subject to hay-fever and an aunt who suffered from migraine. The patient had been operated on for gall-stones in 1929, and in 1937 she had suffered from rheumatism in several joints with an effusion into the left knee-joint. More than once urticaria had broken out after the consumption of strawberries and tomatoes.

When admitted to hospital for the treatment of constipation, which had lasted some 10 years, it transpired that she had been troubled for some time by severe itching about the anus. She traced the itching to hæmorrhoids, for the relief of which she had used various suppositories and ointments. Of late the itching had become so severe as to be almost unbearable, and the preparation she had hitherto used no longer gave her any relief, and even made matters worse.

On examination no sign of any parasitic disease could be found, in spite of repeated examinations of the stools and the surface of the anus for the eggs of worms. The skin about the anus showed redness inflammatory infiltration, and small wet patches. A flaccid, non-incarcerated hæmorrhoid, of the size of a pea, was visible. It was evident that the chronic constipation had favoured the development of hæmorrhoids, which in turn had prevented complete closure of the anus, and had thus allowed alkaline intestinal secretions to escape and set up irritation of the skin about the anus. Suspecting that some article of food or other substance might be provoking an allergic reaction in the skin of the anus, Gronemeyer carried out skin tests with the most likely offenders, but he could convict none until he tested the suppositories and ointments. In as many as four of them he found menthol. Accordingly he carried out skin tests with 1 per cent., 2 per cent. and 5 per cent. menthol glycerine ointments, which were kept in contact with the skin under sticking-plaster for 24 hours. The patient reacted with a flaming erythema and violent itching to the strongest ointment, and with definite redness of the skin even to the 1 per cent. ointment, whereas none of the controls showed the slightest reaction, even to the 5 per cent. ointment. When the use of menthol-containing suppositories and ointments was discontinued recovery was prompt.—*Clinical Medicine*.

Acetylcholine in the Treatment of Arthritis.—The effect of acetyl-beta-methylcholine chloride on the peripheral circulation and thereby on the clinical course of arthritis has been studied by administration of the drug by ionization to a series of arthritic patients. Saturated asbestos fabric (using 1 per cent. solution) is wrapped in close contact about the part to be treated, and a metal foil strip, $\frac{3}{8}$ inch in width, wound spirally round the saturated material; the positive pole of the galvanic current source is connected to the distal end of the main strip and the negative pole of the apparatus to the patient's back by means of a dispersive electrode, 10 in. by 12 in. in diameter. The strength of the current is largely decided by the individual tolerance but, after the first treatment, in most cases can be 40-50 milliamperes for twenty minutes. The strength of the current is increased gradually; the necessity for this is emphasized. Usually three or four days elapse between each treatment and the results were studied after five, ten, twenty, and twenty-five treatments had been given. D. R. Markson (*Archives of Physical Therapy*, July 1939, 20, 406). The beneficial results noted included reduction of pain, increased flexibility, marked relief of muscular fatigue, and increased powers of endurance. The patients obtaining most benefit from the treatment were those with circulatory disturbances of the extremities, and the maximum effects were evident after the eighteenth to twentieth administration. Cases of far-advanced rheumatoid arthritis, with bone changes and fibrosis, showed little benefit from the treatment.—*Practitioner*.

Hepatopulmonary Syndrome in Lobar Pneumonia.—Vilkovisky sensitized rabbits by intravenous injection of horse serum or of a dead culture of pneumococci or streptococci, after which the horse serum was administered either by inhalation or by the intratracheal route, or by the combination of the latter with simultaneous injection of pneumococci into the blood stream. The effect of cooling, analogous to "catching a cold," was likewise estimated. The experiments, carried out on eighty animals, demonstrated the role of the allergic factor in the genesis of lobar pneumonia, the possibility of producing sensitization by various agents, such as heterogeneous proteins, non-specific or specific micro-organisms, the possibility of producing pneumonia through hematogenous introduction of the infectious agent, the relatively greater importance of the pneumococcus as the determining factor, and the role of cooling, which increases the hyperergic reactions but is of little influence outside the conditions of sensitization. The author points out an analogy between some of the metabolic functions of the liver and the lungs, such as the removal of excess lactic acid, and the nitrogenous and the chloride metabolism. In order to study the carbohydrate metabolism in experimental pneumonia, the author first determined the glycogen content of the liver, the muscles and the lungs of five control rabbits. A similar study was made of fifteen rabbits in which experimental pneumonia was induced by sensitization with intravenous injection of horse

serum, followed by intravenous injection of a culture of pneumococcus, and by intrathecal introduction of horse serum. There was noted a lowering of the glycogen content of the liver to almost one tenth of the normal, while the muscle glycogen of the altered pulmonary tissue exceeded that of the control animals by 167 per cent. These experiments demonstrated marked alteration of liver function at the height of the hyperergic inflammation of the lungs. Tissue metabolism of the liver, of the unaffected lung and of the affected lung of nineteen rabbits was studied. There was noted a marked lowering of tissue respiration in the liver and a slight increase in glycolysis. In the pathologically altered lung there was a fall in tissue respiration and an increase in glycolysis. A diminution of respiration was likewise noted in the normal lung, a fact having a bearing on the anoxemia of pneumonia patients. On the pneumonia patients observed by the author, 22 per cent had an enlarged and tender liver. Many of these had urobilinuria. On the theory that the detoxication function of the liver depends on its glycogen content, the author applied insulin-dextrose therapy, first suggested by Kogan-Yasnny in cases of lobar pneumonia. In a group of seventy-four patients with pneumonia treated by the insulin dextrose therapy, the mortality rate amounted to 5.4 per cent, while in a group of 131 patients treated during the same period on an orthodox regimen, the mortality amounted to 15.2 per cent. The author believes that the beneficial influence of the insulin-dextrose therapy is due to the improvement in the glycogen synthesis with the resulting increase in glycogen storage in the liver, which in turn increases the antitoxic function of the liver. The increased glycogen content also may exert a favorable effect on the allergic reactions.—*Vrachebnæ Delo, Kharkov*, 21: 291-370 (No. 5) 1939—*Jour. A. M. A.*

PROCEEDINGS OF CONFERENCES, SOCIETIES, ETC.

The Tinnevely District Medical Association, Palamcottah.

(Tinnevely Branch of the Indian Medical Association.)

The monthly meeting of the Tinnevely District Medical Association was held at Palamcottah, on Sunday, the 24th of December 1939, under the Presidentship of Dr. T. N. Govinda Aiyar, M.B. & C.M., Vice-President of the Association.

A resolution was unanimously passed congratulating Dr. L. Mahadevan M.B.B.S., D.O.M.S., for his elevation as Ophthalmic Surgeon.

Dr. K. Rama Ayyar, M.B.B.S., Hony. Assistant Medical Officer, Government Headquarters Hospital, Palamcottah, read a paper on meeting came to a close.

The Krishna District Medical Association, Masulipatam.

(The Krishna District Branch of the Indian Medical Association.)

I

Special Meeting.

This meeting was held on 13-12-'39 at 5 p.m. and was presided over by Lt.-Col. T. S. Shastry, I.M.S., the President.

Dr. Jayasurya, M.D. (Berlin), spoke at length on the indigenous drugs which he was investigating and which would cheaply but equally efficiently one day replace some of the foreign preparations that now dominate the market. He also entertained the gathering with the details of the Leprosy Campaign that is being tried by him in certain selected areas of Hyderabad State under his supervision.

The meeting came to a close with the President's concluding remarks.

II

The 8th monthly meeting of the Krishna District Medical Association, Masulipatam, was held at Vuyyur on 16-12-'39.

The following resolutions were unanimously passed:—

1. Resolved to send hearty congratulations to Dr. B. C. Roy, M.D., M.R.C.P. (London), F.R.C.S. (England), first non-official President of the Indian Medical Council, Delhi—Simla.
2. Resolved to ratify the proceedings of the special meeting held on 13-12-'39 at Masulipatam in honour of the unexpected visit of Dr. Jayasurya, M.D. (Berlin), son of Major M. G. Naidu, M.B.Ch.B. (Edin.), of Hyderabad (Deccan).

Then the clinical meeting began at 6-30 p.m. The following Clinical case notes were read:—

- (1) A case of Molar Pregnancy read by Dr. M. V. Subbarao, L.M.P., Resident Medical Officer, Masulipatam.
- (2) Dr. Ramarao, L.M.P., of Collapalli read a very stimulating address on Female Sex Hormones.
- (3) Dr. Satyanarayana Chowdary, L.M.P., of Mudinepalli, read an interesting address on Calcium in treatment of tuberculosis.
- (4) F. B. Oesophagus—(a safety pin).

There was much discussion on these cases. An appeal from the Chair to the members to take to Red-Cross work and training of the public in First-aid etc., was made and the meeting was brought to a close.

BOOK REVIEWS

Savill's System of Clinical Medicine—By *Agnes Savill, M.D. and E. C. Warner, M.D., F.R.C.P.* 1939 Eleventh edition, pp. 1141, London: Edward Arnold Co. [Price: 28/- net.]

This popular book on Clinical Medicine is in its eleventh edition. The object of the authors has been to produce a book written entirely on clinical line so as to be of great use and assistance to general practitioners in diagnosing diseases. The present edition has undergone a thorough revision, much new matter has been added and several chapters were rewritten to make it up-to-date. With all these the size of the volume has not gone up very much. The new additions to this edition are: Gaisbock's disease, the Uveoparotid Syndrome, Crohn's Disease, Tomography, Central Pneumonia, Obliterative Pleurisy, Chronic Miliary Tubercle of Lungs, Suprarenal Tumours, Internal Haemorrhage, Sterility, Urobilinogen, Leuko-erythroblastic Anaemia, Cooley's Anaemia, Conserved Blood, Niemann Pick's Disease, Hand Schuller-Christian Disease, Leukæmoid Pictures, Convalescent serum in measles and table of dosage, electro encephalography, Pre-senile-Dementia, Sternal Puncture and the Xenopus Pregnancy test. Several other chapters have been entirely rewritten and recast. Special diets used in many forms of disease have been included. The book has been contributed by about nineteen well-known men on the field, and we have nothing but praise for the new edition.

We feel that this is an unique work on Clinical Medicine in the English language and we hope our readers will not hesitate to add this new edition to their book shelves if they have not done it already. We recommend it to all our readers and students.

The Rhythm of Sterility and Fertility in Women—By *Leo J. Latz: M.B.B.S., M.D., LL.D.,* Sixth Revised edition, pp. 151, vii, Chicago, Latz Foundation. [Price: \$1.00.]

Limiting offspring and in that way cutting down the family responsibility and family budget is a burning problem throughout the world.

The problem of contraception has therefore been discussed threadbare, not only by medical men but also by statesmen, sociologists and clergymen and yet no satisfactory solution has been found. Various theories regarding the control of birth have been put forth, of which the most acceptable to one and all alike seems to be that propounded by Drs. Ogino and Knaus. According to them every woman is found to have a period of fertility lasting for about a week from the 10th to the 16th day after menstruation, and only during this period is conception possible. While scientists are still sceptic about this theory, clergymen hail it as the only natural method of birth control.

Dr. Latz has clearly enumerated the advantages of this new theory in his book on "The Rhythm" of sterility and fertility in women

JAN. '40]

BOOK REVIEWS

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under three aspects (1) Physiological (2) Practical and (3) Ethical. Written in popular style, the book will be found interesting, instructive and convincing.

Sixteenth Annual Report for 1938 of The Nowrosjee Wadia Maternity Hospital—By *Sir Mangaldas V. Mehta, O. B. E., F.R.C.P., F.C.P.S., F.C.O.G.,* Honorary Principal Medical Officer.

During the year under review, 114 more cases were admitted to the Hospital than the previous year, the total number of admissions being 6980. The total number of confinements was 5163 i.e. 93 more than in the previous year. It is gratifying to note that the honorary workers of this institution are carrying on their duties to the best of their abilities in spite of the heavy strain that has fallen on them.

We find from Table No. XXVI that mortality rate is 1.54% and out of this the highest mortality is due to anæmia, septicaemia ranks next and pneumonia stands third. We find that a research work has been undertaken on Anæmias of Pregnancy in this hospital. It is therefore not too much to hope that it will help to reduce maternal mortality from this cause not only in this hospital, but in the whole of India.

The statement of infant mortality for the year under review shows a figure of 797 i.e. about 11.42%, deaths of premature babies being the highest. This, we think, can be reduced by giving adequate ante-natal instructions to the prospective mothers.

The hospital has continued to be a training institution for medical students, nurses and post-graduates and has been recognised by the British College of Obstetrics and Gynaecology, London, and College of Physicians and Surgeons, Bombay. We wish greater progress and prosperity to the Institution in future years.

CORRESPONDENCE

Dr. R. J. Adhvariju, L.C.P.S. (BOM.) Surat, Bardoli Dist., T. V. Ry., writes:—

I have found in many cases of Renal colic the pain being stopped by the following method:—

The patient should lie on his back with his thighs and knees flexed. The pain of the Renal Colic will be at once stopped by applying pressure with the hand on the side of the affection, upwards and downwards in the abdomen just lateral and above the symphises pubes. The pain is likely to restart as soon as the pressure is removed. This method is likely to be useful in making out Renal Colic.

I hope you will be kind enough to publish this in the next issue of the Antiseptic and oblige.

Dr. Bankim Chandra Sen, Gopalichuck East Colliery, Jharia, writes:—

During the last Pujas, my father was attacked with Malaria. He was asked to take Atebrin, which he did for three days. On the 4th day i.e. when he took 11 Tabs of Atebrin, at about 6 O'clock in the evening, he began to talk big and haphazardly. During the same night he suddenly got up from the bed and went out as if he had turned mad. I forcibly made him lie down but he did not. He began to bite and beat me and other inmates who happened to be present near by. I could not resist him. He rose up and said that he had micturated on the bed. But there was no urine as he did not pass it at all. This he did several times but there was not a single drop of urine anywhere. Then he began to strike his head against the wall and floor repeatedly.

His temperature was normal for the last 3 days, pulse was quite all right. I gave him a sedative draught containing Potassium Bromide and Chloral Hydras each 30 grs. in 1 ounce of water. But it did no good. Then I injected 1 amp. of solution of Morphine and Atropine (P. D. & Co.) with some good result for a short time.

One of the renowned practitioners was called for. He came and saw my father very restless and delirious. He examined the case thoroughly and it was decided to give him an injection of Luminal Soln. Within 15 minutes he became drowsy and slept a sound sleep for the rest of the night. From the next morning, he became quite all right though tired. He was asked not to take Atebrin any more. The treatment was more or less symptomatic without a proper diagnosis being arrived at.

I hope the readers of this esteemed Journal will let me know what these symptoms were due to. Are these all due to Atebrin poisoning?

NOTICE

Warning to Registered Medical Practitioners.

Dr. Henry S. Hensman, O.B.E., M.R.C.S., L.R.C.P., Registrar, Madras Medical Council, writes:—

Instances have been brought to the notice of the Madras Medical Council where registered medical practitioners have issued certificates in favour of certain proprietary and other medical preparations. Such certificates have been utilised as a means of advertisement for the products, thereby indirectly advertising the practitioners themselves, with or without their knowledge and consent.

The Madras Medical Council warns the registered medical practitioners that the issue of such certificates or association in any other manner, with proprietary or other medical preparations comes under the provisions of Sections 21 and 22 of Part II of the Code of Medical Ethics recognized by this Council, and will be dealt with seriously.

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*Davidson and Fullerton, Edinburgh Med. J. 1938, 45, 193.

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Edited by

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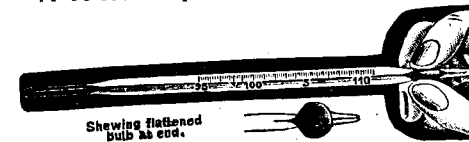
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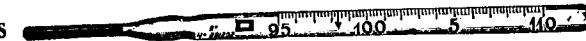
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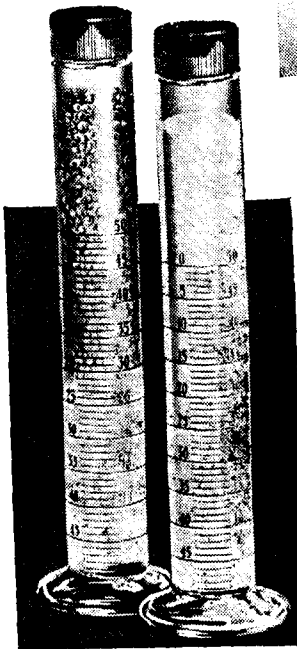
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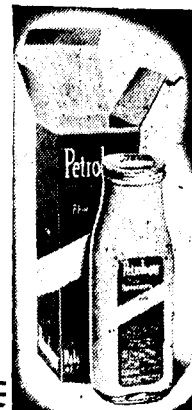
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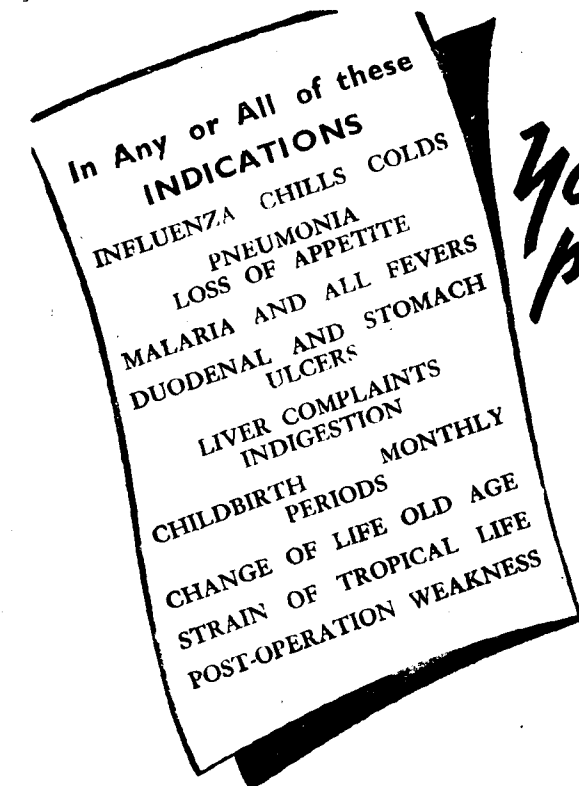
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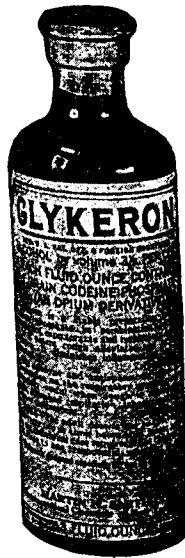
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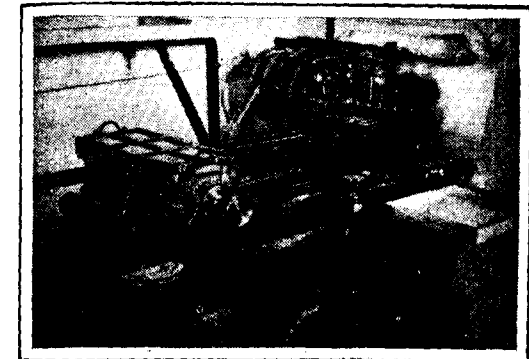
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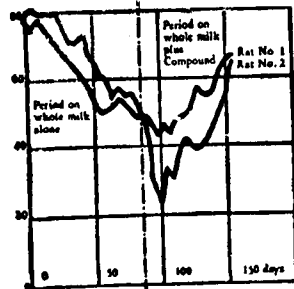
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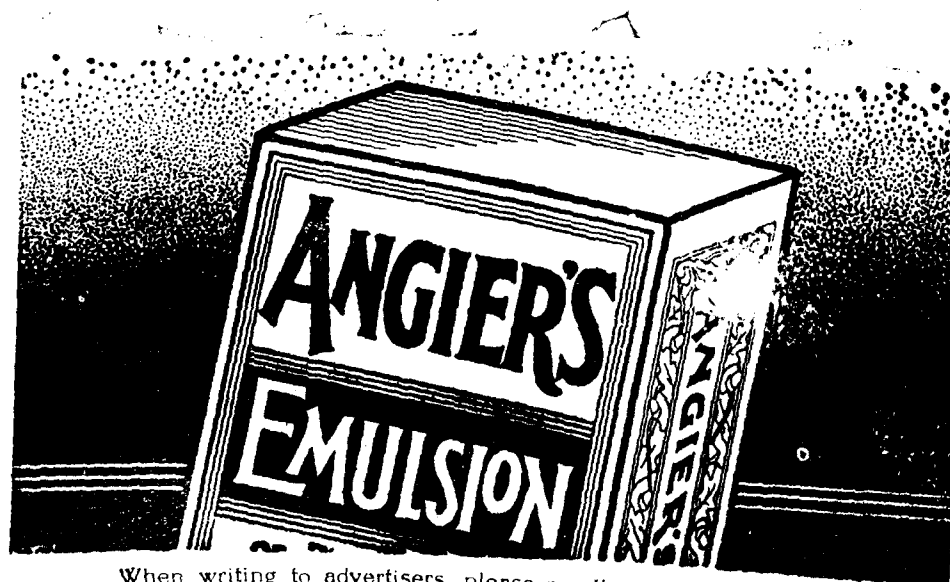
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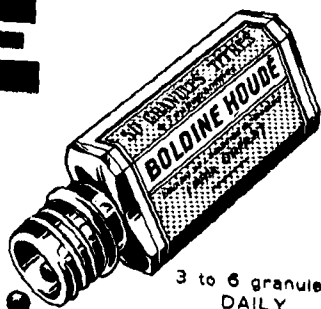
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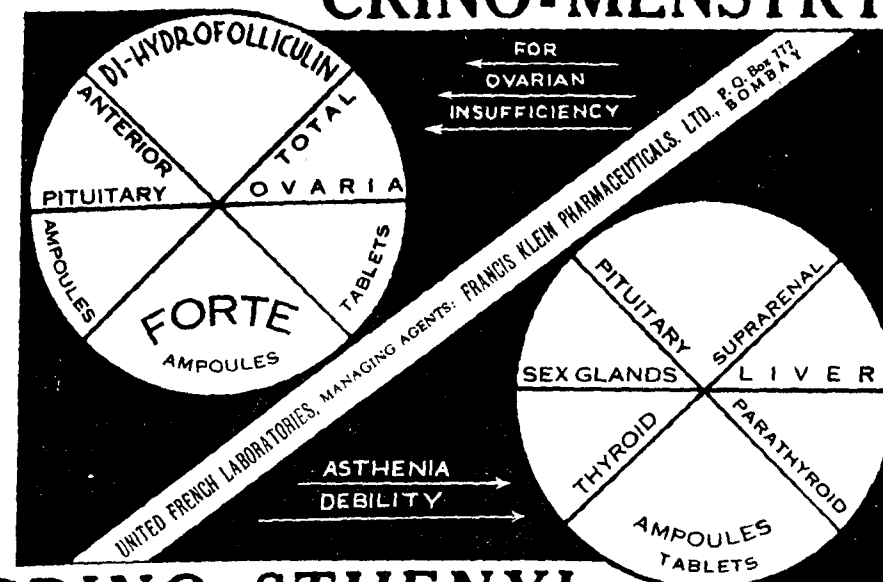
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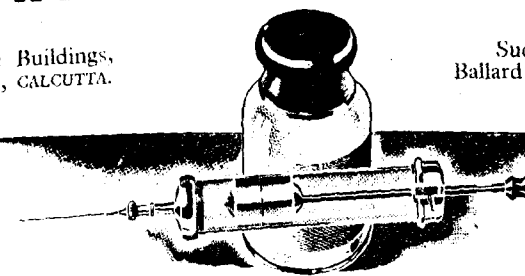
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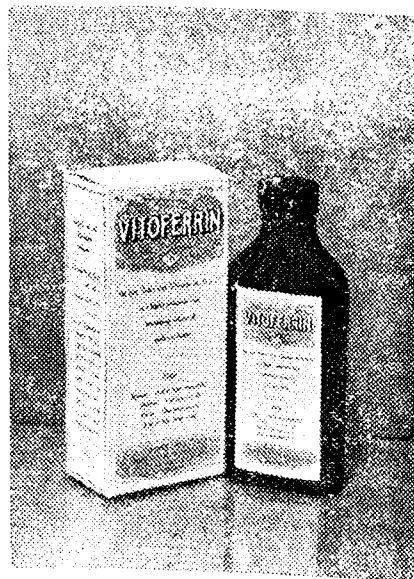
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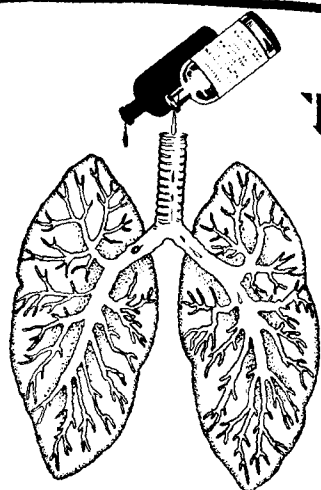
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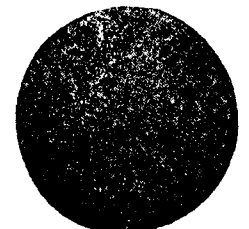
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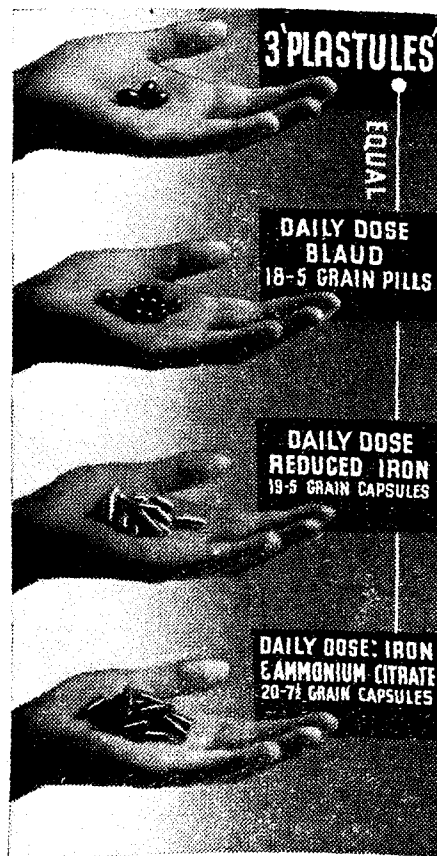
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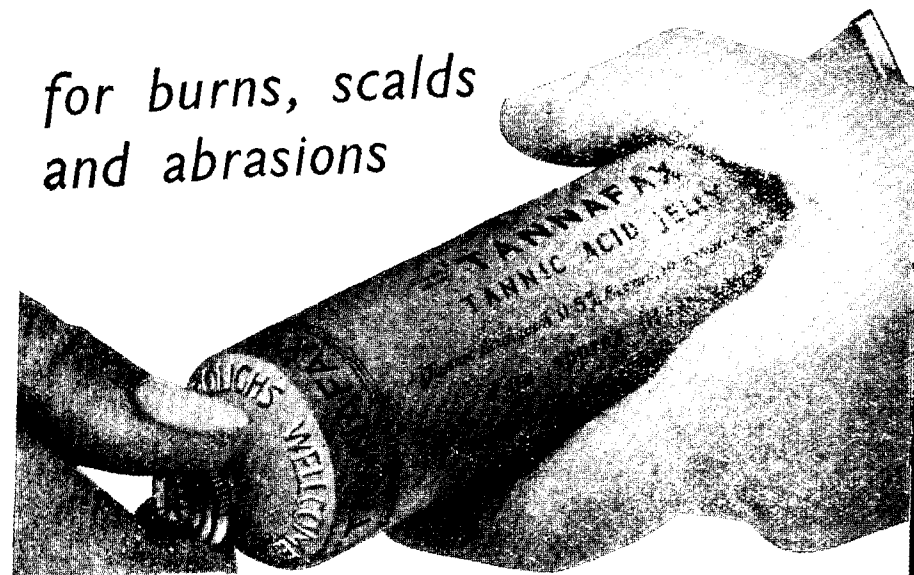
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FEBRUARY, 1940.

No. 2.

Peri-Urethral Abscess and Fistula

BY

Dr. T. Howard Somervell, M.A., M.B., B.Ch., F.R.C.S.,
South Travancore Medical Mission, Neyyoor, Travancore.

AMONG the commonest conditions of the urinary apparatus, which any practitioner may have to treat, is urethral stricture and its consequences—peri-urethral abscess and urethral fistula. Curiously enough, this important subject is usually dealt with at medical schools in a very inadequate manner; and the reason for this inadequacy is that it is practical experience more than anything else which is necessary in order to impart a surgical judgment on these cases.

The purpose of this article is not primarily to describe the treatment of stricture, except to say that the writer never performs internal urethrotomy; if a stricture be not dilatable by metal bougies (passed always with the greatest care and gentleness to avoid the making of false passages), it is usually best to operate and to excise the stricture. Excision of more than one inch of the urethra should not be made, but if the strictured portion is less than an inch long, excision of the stricture, and joining up of the ends of the urethra with four fine catgut sutures, is an excellent operation. This operation will now be described, as it is the basis of much of the operative treatment of peri-urethral abscesses and fistulae. It is advisable in these cases to do a preliminary supra-pubic cystotomy. The internal meatus is found, and a No. 8 or 10 bougie is passed retrograde to the stricture.

A metal sound of size 8 or so is passed down to the stricture, but no attempt is made to pass it further. An assistant then holds the sound in position, while an incision in the axis of the urethra (i.e. in the middle line) is made over the ends of the two sounds. The bulbo-cavernosus muscle is exposed, divided in the middle line, and

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stripped off the urethra. The urethra is carefully defined and dissected free from other tissues all round its circumference. It is then divided at the end of the No. 8 bougie. First $\frac{1}{4}$ inch of the urethra is removed, then (if the stricture is still in evidence) half an inch, and so on up to an inch. If there is still a stricture remaining, it must be dilated, and a No. 8 rubber catheter is passed through the penis and out into the wound; the catheter is then passed on into the bladder, and the urethra is sutured with fine catgut around it. A single silkworm-gut stitch fixes the catheter to the end of the penis (to the foreskin if there be one). The bulbo-cavernosus muscle is closed with fine catgut over the urethra. The wound is well douched out with normal saline containing Flavine 1 in 1000, and sewn up in surgically clean cases. In the presence of infection the wound is left open. The catheter is passed over the top of the thigh and fixed there with a stitch or elastoplast, and drained into a bottle beneath the bed for six or seven days. If no gonococcus is present in the bladder or urethra, the catheter can be safely left in for 10 or 12 days. After that it must be taken out, and an occasional passage of a No. 8 or 10 metal catheter or sound will ensure that the urethra is permeable.

Peri-urethral abscess results either from acute infection, or chronic infection of the urethra, or from injury, and except in the latter case is almost invariably behind a stricture.

Urethral fistulæ usually result from the bursting of these abscesses through the skin, and may consist of fairly long and complicated tracks. A recent case of mine, discharging urine on the side of the penis just behind the glans, was found on dissection to arise from the posterior urethra.

Other fistulæ result from previous operations, from malignant disease, as a complication of false passages made by unskillful catheterisation, or from excessive retention of an indwelling catheter.

Peri-urethral abscesses must be opened and scraped out; loculi and pockets are cut away so as to leave a simple cavity bounded if possible by soft tissues and not by hard inflammatory scar tissue. At this stage the urethra need not be treated either for stricture or for fistula. Pack with Flavine gauze, and leave open. After a week or ten days, deal with the stricture by dilatation or excision, as described. The wound is of course left open; a small fistula may persist, but will usually heal; it may have to be dealt with at a later date by operation, but should be given a chance to heal for a month or so.

Urethral fistula may be single or multiple, a small fistula occasionally passing a drop of urine or a large hole through which all the urine passes. It is practically always accompanied by stricture, and the treatment of the stricture is of primary importance. Dilatation or excision of this may be sufficient to enable a small fistula to heal up. The routine treatment of a case of single fistula is therefore to dilate the stricture, if one be found; if it can be dilated, a bougie or catheter of the largest size passed at the dilatation should be passed once a day, but no catheter tied in.

The urinary sepsis if any must be treated, Ammonium Mandelate being best for *B. Coli* pyuria or bacilluria, and Proseptasine (in doses of $7\frac{1}{2}$ grains every 4 hours day and night for 4 days) for Gonococcal infection. Mixed infections should be treated by Proseptasine, a bladder-wash with 1 in 2000 Potass. Permanganate in a 1% solution of Boric Acid being given daily in addition to the medication. Even a single fistula may not heal after dilatation; and multiple fistulæ will always require operation.

The essential features of the operation are:—

- (1) Excision of the fistula, including its wall and any associated fibrous tissue. All fistulæ must be completely excised, from their opening on to the surface right down to their exit from the urethra.
- (2) The stricture(s) being in front of the opening of the fistula(e) into the urethra, no supra-pubic cystotomy nor retrograde catheterisation is usually required. The stricture should be defined by the passage down to it of a No. 8 or 10 metal bougie. If the stricture and the fistulous opening are within an inch of one another, the urethra including both stricture and opening may be excised and joined end to end as already described.
- (3) The wound is left open, only the urethra itself being sewn up, and even that is left open on its lower (superficial) surface. Flavine gauze pack, or dry gauze only, is the best dressing.
- (4) A tied-in catheter should not be left for more than a week, and if the fistula is re-established after operation, a second operation must be done after supra-pubic cystotomy.

Usually all fistulæ lead from the surface into a single cavity near the urethra, which is the original abscess cavity and which communicates with the urethra by one hole only. The walls of this cavity are often of thick fibrous tissue, covered with granulation tissue, and if possible they should be completely excised. All bleeding must be dealt with as it occurs, for it is possible for these cases to lose a lot of blood, and on one occasion I have even known the operation to prove fatal from hæmorrhage. Arteries should be tied with fine catgut, inserted if necessary with a needle to avoid slipping.

If (as rarely occurs) there are two fistulous openings, in different parts of the urethra, the dissection and excision of all fibrous tissue should first be done. We then have exposed to view a urethra with (usually) two holes and at least one if not several strictures.

Excision of the diseased part of the urethra may seem to be a formidable procedure, but in a very septic case it should be done. No attempt is made to approximate the ends of the urethra; the whole wound is kept open, and supra-pubic drainage established. As the wound closes, for a few days an indwelling rubber catheter should be

used, and daily thereafter a metal catheter or sound is passed along its track, to ensure the patient every chance to re-form a urethra in the normal position. It is surprising how nature manages to do this in the worst cases. On one occasion I had to remove the urethra from the front of the prostate forwards for at least two inches. The wound was kept widely open, and a sound was passed every day; this case healed up in a month without supra-pubic drainage and without producing ultimate stricture. But one is not always so lucky as this. In such cases a fistula usually persists which necessitates a second operation some months later, after all sepsis has subsided.

The following points should be noted:—

- (1) Should the wound be closed or open? Close it completely only if you have done excision of a single stricture of not more than half an inch in length, and if the urine is free from all infection. In all other cases, partial closure is the rule, and in very septic cases the wound should be left open. If in doubt, always leave the wound open.
- (2) Should there be supra-pubic drainage? Once more the answer is—if in doubt, yes. If the first attempt at healing is unsuccessful, probably supra-pubic drainage may make all the difference by a second attempt. But this *alone* is of no use; a second excision of the scar tissue must also be done.
- (3) Should an indwelling catheter be used? In gonococcal cases with gram-negative diplococci in a smear taken at the time of operation from urethra or bladder or fistula, a catheter is best avoided; or if used, it should be retained only for a few days. In other cases, an indwelling catheter is usually useful, and it is said that pyogenic infection of the urethra around an indwelling catheter never results in stricture. But in any case it must be remembered that indwelling catheters sometimes *cause* fistulae, and therefore they are best avoided if any fistulous channel exists. Their use is that in urethral excision cases they preserve the alignment of the urethra and make it easier to pass sounds etc. without damage. In such cases with a soundly healing wound and no sign of recurrence of fistula, I usually keep a catheter in for 10 or 12 days. But one must always be prepared to take it out again.
- (4) Should fistulous openings in the urethra be excised? Only if they are hard and fibrous and adjacent to an excisable stricture. If soft, or at a distance from an excisable stricture, they can be left to heal up, after being carefully scraped free of granulation tissue with a small spoon. Hard, fibrous tissue should always be excised in any portion of a fistulous track. A hole in a soft urethra is more likely to heal than is a much smaller one which is surrounded by fibrous urethral wall. In all cases, the

urine (catheter specimen) should be examined at least once a week and oftener if there be an indwelling catheter. Force must never be used with a catheter, even though it be made of the softest rubber. Personally I prefer metal catheters for all purposes except for indwelling. In supra-pubically drained cases, the supra-pubic tube may be removed as soon as the perineal wound shows signs that there is repair of the urethra and of the deeper parts of the wound.

It must always be borne in mind that these cases are often very difficult, and it is no disgrace to appeal to a colleague for advice or to send the case to a well-equipped hospital. Above all, avoid the *causing* of trouble by the making of false passages, and by the retention too long of an indwelling catheter. And don't keep your cases lying in bed too long. Exercise and good food may help to heal up a case which is indolent and unhealing while lying in bed.

The Management and Treatment of Injuries to the Male Urethra

BY

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THE management and treatment of injuries to the Male Urethra are directed not only to the healing and repair of the urethra but also to the prevention and treatment of the very serious complications of extravasation of urine and stricture which so often follow injuries to this part.

With the exception of the prostatic urethra, no part of the urethra is immune from injury. Injuries may be of any grade of severity from a simple contusion to rupture, either complete or incomplete. For purposes of treatment, the urethra is best considered as consisting of (a) Extra-pelvic and (b) Intra-pelvic portions.

The causes which give rise to the injuries act either from (1) within or (2) without the urethra.

1. *Causes acting from within the urethra:*—These usually affect the extra-pelvic portion i.e., both the penile and bulbous urethra. Undoubtedly, the commonest agent of this type is the injudicious use of a fine metal sound in an attempt to dilate an inflammatory urethral stricture. It is indeed so common that we rarely see in hospital a case of urethral stricture which has not one or more so-called false passages brought about by such means. I have even seen a patient in whom the floor of the penile urethra had been torn for a distance of two inches in front of an impassable stricture. Cases are seen in which a double rupture has been brought about by the sound leaving the urethra in front of a stricture and re-entering it behind.

The urethra is also frequently injured by the introduction of such widely different objects as pins, hair-pins, needles, wooden pens and pencils. Such objects are introduced sometimes as an aid to masturbation and sometimes for the relief of retention. The result of such interference is an incomplete rupture of varying degrees of severity depending on the size of the object introduced.

2. *Causes acting from without the urethra:*—These may affect any portion of the urethra i.e., the injury may be either extra-pelvic or intrapelvic. The usual varieties result from a fall on the perineum whereby the bulbous portion of the urethra is affected or they arise as a complication of fractured pelvis in which the membranous urethra is torn.

The penile and bulbous portions of the urethra are sometimes injured by gun-shot or stab wounds.

Clinical features.—The escape of blood from the external meatus is a sign of urethral injury irrespective of which portion has been

involved. In external injuries such as stab wounds, etc., hæmorrhage from the wound is usually the most prominent feature, but extravasation of urine does not usually occur for the urine is able to escape through the wound of injury. With injuries in which there is no external wound extravasation of urine is a constant danger and if the patient is seen early enough, he must be warned against any attempt to urinate. Injuries to the bulbous urethra resulting from a fall on the perineum will present additional signs of a perineal hæmatoma and the patient will probably complain of inability to micturate.

The possibility of injuries to the membranous urethra should be considered in every case of fractured pelvis. If such an injury has occurred, there will be a history of retention of urine, a few drops of blood may have escaped from the external meatus, and later with extravasation of urine into the pelvic cellular tissues, an asymmetrical swelling will appear above the symphysis pubis. If the rounded dome of a distended bladder can be determined apart from the swelling caused by the extravasated urine the diagnosis is certain. Unfortunately it is rarely possible to distinguish it with certainty, and this injury from the practical point of view can rarely be differentiated from one of extra-peritoneal rupture of the bladder. In all such complicated cases of fractured pelvis, shock is severe, and should in itself arouse suspicion.

An injury to the urethra having been diagnosed, we have to consider its management and treatment under the two headings:

I. Extra-pelvic injuries.

II. Intra-pelvic injuries.

I. Extra-pelvic injuries.—It is known that injuries of the extra-pelvic urethra are prone to be followed by stricture formation of a peculiarly intractable type, and that the hæmatoma which forms about the site of injury and its ultimate conversion into fibrous tissue is a potent factor in this stricture formation. Extravasation of urine which so commonly occurs and gives rise to sepsis is also an aid in this stricture formation apart. The extravasation of urine is in itself a definite danger to life. In those cases in which the urethra has completely ruptured we have as one of our objects in the treatment of the case the restoration of its continuity.

Treatment.—The patient must be instructed not to attempt to micturate. If the desire to pass urine is unbearable the bladder will be distended sufficiently to enable a trocar or, better a lumbar puncture needle to be introduced supra-pubically with relief. This can be repeated as often as necessary and will allow time to transport the patient to hospital. *Under no circumstances should any attempt be made to pass even a soft rubber catheter.* Such an attempt is permissible only in an operating theatre under the strictest aseptic precautions. In cases in which there is an external wound perhaps the most urgent necessity will be the arrest of hæmorrhage, and the application of sterile or at least antiseptic dressings after a preliminary cleansing

of the wound. If shock is marked appropriate measures must be taken to combat it and the patient made as comfortable as possible.

If these preliminaries are observed, the practitioner will have served his patient well, for he will have gone far to prevent both extravasation of urine and the onset of sepsis. The patient should as soon as possible be removed to hospital where the above preliminaries will be extended to determining the continuity or otherwise of the urethra and to carrying out measures for its repair if rupture has occurred.

The injury can only be dealt with properly in the operating theatre, where under the strictest aseptic precautions an attempt is made to pass a soft rubber or bicoide gum elastic catheter. Subsequent treatment depends on whether this manoeuvres carried out *once* only, is successful or unsuccessful.

1. *A bicoide catheter is passed successfully at the first attempt:—* This means that only a slight injury or at the most an incomplete rupture is present and the catheter may then be tied in and the bladder drained for seven days.

In all cases it is desirable to make a small incision in the perineum in the line of the urethra and to evacuate the hæmatoma which is usually present. This will go far to prevent subsequent stricture formation. The wound is left open and lightly packed with Acriflavine gauze. It heals rapidly. If extravasation of urine has occurred and unfortunately it appears to be the rule rather than the exception, free incisions will have to be made into the affected areas and the extravasated urine allowed to escape.

2. *The attempt to pass a catheter fails.*—This necessarily means that a more serious type of injury is present, at the least an incomplete rupture and most probably a complete rupture. In such a case the next step must be to open the bladder supra-pubically and then to put the patient in the lithotomy position and cut down on the urethra in the perineum. Either an incomplete or a complete rupture will be found.

(a) If an incomplete rupture is found, the hæmatoma is evacuated, hæmostasis secured, and the wound lightly packed with gauze. The bladder is drained supra-pubically in order to divert the urinary stream. After seven days an attempt to pass a gum-elastic bougie will usually succeed when the suprapubic drainage tube can be removed. The bougie is passed once a week until the patient leaves hospital. After this he should be instructed to report periodically at lengthening intervals in order to test the patency of his urethra, until finally he is seen once or twice a year only. When the intervals between sounding have lengthened to this extent, the patient must be instructed to report immediately if he experiences any difficulty in micturition.

(b) If, on exploring the perineum, a *complete rupture* of the urethra is found, both the divided ends must be sought for and the

urethral tube opened out into a ribbon for a short distance on either side of the rupture and then brought together by three interrupted No. 0 plain catgut sutures. If the divided ends are widely separated, the anterior urethra must be mobilised to an extent sufficient to allow approximation without tension. Hæmostasis must be carefully secured. The perineal wound is again left unsutured and lightly packed with Acriflavine (1 in 1000) gauze.

Contrary to what might be expected on account of its close proximity to the anus, the wound usually heals without much sepsis. The bladder is drained for a period sufficient to allow healing of the perineal wound when a bougie may be passed. It does so readily.

The same rules for following up the case as enumerated above must be carefully observed.

In patients in whom there is an external perineal, scrotal or penile wound, the bladder is drained supra-pubically, and in addition to restoring the continuity of the urethra, a careful wound-toilet must be carried out. Lacerated tissues must be excised and thorough cleansing of the wound with Saline and Ether done. All bleeding points should be carefully tied off. These wounds are always best left unsutured and again it is advised to pack them lightly with Acriflavine gauze.

When the injury to the urethra has been brought about by the introduction of a foreign body, the treatment to be adopted will depend partly on the object introduced and the time it has been there. An X-ray may be a useful aid in determining the nature of the object. A recently introduced pin can be removed through a urethroscope, and possibly also a recently impacted stone. If the object has been there for any time, it is better to cut down on it in the perineum and remove it through the floor of the urethra. Such a procedure is essential if a peri-urethral abscess and/or extravasation of urine has occurred. In all cases in which the urethra is cut down on, it is desirable to drain the bladder supra-pubically. The perineal wound is left open and lightly packed with Acriflavine gauze.

Injuries to the urethra brought about by attempts to dilate a stricture should never occur. Art—not force—should be the motto. The fine metal sound is a truly dangerous instrument and should never be used. For really tight strictures, the gum-elastic bougie should be used upto size 18 or 20 French, after which size, a metal sound may be safely used.

If the urethra has been perforated, extravasation of urine and/or a peri-urethral abscess usually follow. This requires supra-pubic cystostomy, combined with perineal exploration of the site of perforation. The stricture can be dealt with at the same time, in some cases by excision and resuturing of the urethra, in others by external urethrotomy. Free incisions will have to be made into any extravasated areas in the perineum or scrotum.

II. *Intrapelvic injuries.*—Intrapelvic injuries as stated previously are practically always a complication of fractured pelvis and usually

take the form of a complete or incomplete rupture. In these cases, shock is usually a very prominent feature and steps must be taken to make the patient as comfortable as possible and to relieve the pain of the fracture. Every case of fractured pelvis should be removed to hospital where steps must be taken to eliminate the possibility of injury to the urethra or bladder. It is again the practitioner's duty to warn the patient not to attempt to micturate and if the desire to do so is prominent, the bladder should be relieved by supra-pubic puncture only. An attempt to pass a catheter is doomed to failure and can only add to the risks of sepsis.

On arrival at hospital, it may be found that the degree of shock so dominates the situation that very little can be done for a time to effect continuity of the urethra. Fortunately, it is usually possible to overcome the shock sufficiently to enable more active treatment to be proceeded with, but in those cases in which it is particularly severe it is probable that all that can be done is supra-pubic drainage of the bladder, drainage of the cave of Retzius and of the pelvic cellular tissues. Active treatment to restore, if need be, the continuity of the urethra must not be long delayed; for, a most hopeless situation will develop if the rupture of the urethra is complete. This is because when complete rupture occurs it does so at or just beyond the junction of the prostatic and membranous urethra and the pubo-prostatic ligaments are also torn. The neck of the bladder is then free to roll backwards and is aided in this tendency by the pressure of extravasated blood and urine. The prostatic urethra then comes to point backwards and away from the membranous urethra. If it is not brought forward soon, the neck of the bladder will become fixed in this abnormal position and the patient left with a permanent supra-pubic fistula.

If it has been possible to overcome the shock sufficiently to enable exploration of the neck of the bladder to be proceeded with the steps of the operation are as follows:

The patient is anaesthetised and an attempt is made to pass a No. 9 soft rubber or bicoude catheter. In cases with rupture of the membranous urethra, either complete or incomplete, the attempt will be unsuccessful. Sometimes, the catheter passes into the cave of Retzius and the surgeon must be careful not to be misled into imagining that it has passed into the bladder.

A midline supra-pubic wound is then made and the cave of Retzius opened. (It is usually not until this stage that the diagnosis between an injury to the urethra and an extra-peritoneal rupture of the bladder becomes clear). The perivesical tissues will be found full of blood-clot and urine. The bladder is then opened, and a No. 10 rubber catheter passed retrograde through the internal meatus. If the rupture is incomplete, it will usually pass through the external meatus, where it is attached to a second rubber catheter. On withdrawing the retrograde catheter, the second catheter is drawn along with it and enters the bladder. It is then attached loosely to a supra-pubic drainage tube with a silk stitch. This is done to permit

"railroading" of successive catheters, every 5th or 6th day. This is to say, on the 5th day, a catheter is attached to the one lying in the urethra and on withdrawing the supra-pubic tube, both catheters are drawn along the urethra until the tip of the second catheter lies in the bladder, when it in turn is loosely attached with a silk stitch to a fresh drainage tube. After 15 days, the supra-pubic drainage tube can be removed and the wound allowed to close. The catheter can be removed at the same time or a week later. The patient is instructed to report for sounding at periodic intervals or at any time when he experiences difficulty in micturition.

If, however, a complete rupture is found, the procedure adopted is necessarily different. As direct repair is impossible, steps must be taken to bridge the gap in the urethra with a rubber catheter (size 10 to 12); for, by so doing the neck of the bladder is drawn forwards and continuity restored. Somewhat complicated procedures are usually described to bring this about, but the following relatively simple manoeuvre has, in my experience, been sufficient. A catheter is, as before, passed retrograde through the internal meatus and in these cases, will appear at the side of rupture at the bottom of the cave of Retzius, whence it is drawn up to the surface of the wound. A second rubber catheter of similar size is passed down the urethra through the external meatus and when it appears at the site of rupture, it is likewise drawn up to the supra-pubic wound. It remains merely to cut off the tip of the retrograde catheter, to thread the open tube over the end of the second catheter and to affix them with a silk stitch passed through and tied around them. On withdrawing the retrograde catheter, the second catheter follows it into the bladder where it is attached loosely to a supra-pubic tube. The catheter is changed every 5-6 days by the "railroad" method previously described. In cases of both incomplete and complete rupture, the bladder is irrigated three times daily with 1 in 8000 Acriflavine-Saline solution. The cave of Retzius is drained with three tubes—one medial and two lateral. These tubes can be removed after one week or even a little earlier in some cases.

It is to be noted that whereas in injuries of the extra-pelvic urethra, stricture formation is greatly to be feared, this tendency in injuries of the membranous urethra is relatively slight, despite the fact that the principle of *not* tying in a catheter cannot be followed in these cases, and that direct repair is out of the question.

Summary.—1. Various types of urethral injuries and the methods of their production are briefly described.

2. The principles and details of their management and treatment have been enumerated.

Treatment of Injuries of Urethra

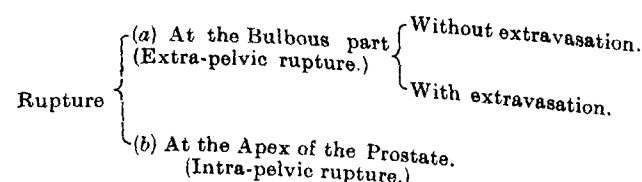
BY

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ON receiving first independent charge of an institution, some of us at least remember to have answered, with a feeling of apprehension, an emergency call from the hospital, regarding a patient who has not passed urine for some time and is unable to do so even if he wills. Amongst the great variety of causes responsible for this symptom, the writer proposes to limit his discussion to the present subject because the condition is sometimes very difficult to treat and often taxes the skill and ingenuity of an operator when handicapped by limitations in personnel and suitable instruments in most of our district hospitals.

The history is obvious and the bladder may or may not be full but the symptoms nevertheless are pressing. Mis-handling of such cases may bring in its aftermath permanent suffering to the patient or even cost him his life. It is rather unfortunately peculiar but true that these cases turn up at the gates of the hospital after a busy and tiresome day for the surgeon when his physical powers and mental faculties are at the ebb level, and it is a sort of endurance test for him when the stomach is crying for a much needed meal and the body for an equally needed rest or relaxation. Makeshift or sketchy treatment or according scant attention to such major surgical emergencies has no place in modern therapy and it is highly injudicious to leave such cases for inexpert and inexperienced house-staff to deal with.

With this preamble, I would classify the injuries into contusion and rupture—and the latter into



Traumatism applied to the urethra may result in tearing or crushing of the canal (contusion) and the sites are usually at (a) bulbous urethra just in front of the urogenital diaphragm (junction of fixed and movable parts of the urethra) or (b) behind the urogenital diaphragm at the apex of the prostate. This latter injury is often complicated by fracture of the pelvis and often early intra-pelvic, extra-peritoneal extravasation of urine in the perivesical space (Cavum Retzii), backward spread of urine is prevented by the attachment of Denonvillier's fascia to the superior layer of the urogenital diaphragm.

Rupture Urethra is very often accompanied by great shock—out of proportion to the clinical findings—(often there is no local sign except hæmorrhage per urethram with inability to guide a soft catheter into

bladder means tearing or avulsion of the canal, whereas little or no external bleeding with a catheter gliding fairly easily into bladder connotes contusion or crushing of the canal. The injury in (a), being distal to sphincter is not associated with extravasation of urine unless the patient has inadvertently and voluntarily tried to ease his bladder while in (b) there is usually but not invariably deep extravasation of urine, the extravasation depends upon the tonus of the sphincter vesicæ and the state of distension of the bladder at the time of injury.

Management.—The patient is immediately brought to the theatre and the part is shaved and ice compresses are applied locally (to the perineum), while the surgeon and his assistants are washing and the instruments are being made ready. I have always deprecated the use of enema in these cases, firstly because the procedure, soon after the receipt of injury, is painful and secondly, with the enema result there is always some extravasation in cases which had none before.

Excepting those cases where the injury is of the nature of slight contusion and a fair sized rubber catheter slips easily into the bladder and with no hæmorrhage from the urethra and no bruising—hæmatoma or ecchymosis in the perineum, the author always opens the bladder supra-pubically, often a very tricky problem with an undistended bladder. Further treatment depends upon whether a catheter can be passed into the bladder from below. If a catheter slips in easily it is left in situ (indwelling catheter) and the bladder is left to drain supra-pubically for nearly a fort-night—the indwelling catheter functioning as an internal splint to the injured urethra round which healing proceeds with ease and least disturbance. At this point, I would like to impress one practical hint regarding the indwelling catheter—it must be soft, pliable and the external surface well lubricated with carbolized olive oil and its calibre must be of such dimension that it does not stretch the urethral canal i.e. it should be just a loose-fit catheter. French school deprecates the use of an indwelling catheter because of risks of sepsis and subsequent stricture formation. It is true that the sojourn of a catheter gives rise to initial urethritis but with exhibition of urinary antiseptics and daily bladder irrigations, the tissues respond favourably and in the majority of cases perfect healing can be expected, provided the perineal hæmatoma is incised and clots are turned out.

If a catheter cannot be passed per urethram, there is probably a complete or almost complete rupture of urethra with separation of the ruptured ends. Opinions are divided as to the best course to adopt in these cases, but in the writer's opinion, the following method is universally applicable. It is sheer waste of time to make first a median perineal incision and try to locate the divided ends of the urethra within bruised and blood-infiltrated tissues like the proverbial needle in a haystack. Supra-pubic cystotomy should be done quickly and a No. 10 (new) rubber catheter is pushed through the internal meatus (retrograde route) as far as it will go. Next, putting the patient in a lithotomy position, an olivary metallic bougie is passed *via* the external

urinary meatus till it impinges on to the region of ruptured urethra. Very carefully and strictly in the middle line with a sharp scalpel perineum is opened and exercising a little patience, both ends of the urethra are readily accessible, the bougie and the catheter helping the process. Hæmostasis is effected by warm Adrenaline Saline packs. The catheter and bougie are slightly withdrawn from the field of operation and with eyeless needle threaded on to '000' Catgut (preferably) urethral roof is sutured with three interrupted sutures—one median and two side stitches—taking a bite of the corpus spongiosum with each stitch. No attempt should be made to stitch the floor of the urethra. Perineal wound is lightly packed with Bipped gauze and bladder drained supra-pubically. As soon as possible, after operation and when the patient regains consciousness after the general anæsthetic, lower bowels are emptied by a compound enema, and thereafter for about five days bowels are kept locked. This procedure ensures perfect healing of the perineal wound which is so near the anal canal and chances of infection from the latter site are thus greatly circumvented. Diversity of opinion exists regarding leaving an indwelling catheter. In author's particular hospital practice, a small calibre rubber catheter is left inside the urethra which is changed on the fourth or fifth day and daily bladder irrigations with 1 in 10,000 Silver-Nitrate solution carried out—first through supra-pubic route for about a week and thence onward per urethram. In the latter procedure, perfect asepsis is procured by thorough cleansing of the glans and anterior urethra by some mild antiseptic (1% Mercurochrome soln.) before any instrumentation through the urethra is attempted. Further, I never attempt any catheterization without preliminary anæsthetization of the urethral canal by either Canny Ryall's soln., or 2% Decicaine or 2% Novocaine with Adrenaline. Perineal pack is removed after 48 hours and thereafter weak E.C. soln. irrigations are carried out for the perineal wound for about a week and later changed on to hypertonic saline, till the wound is healed, when the bladder ceases to be drained supra-pubically—usually a question of a fortnight. It is necessary now to pass once daily a No. 10 rubber catheter and wash the bladder every morning and the rest of the day the patient passes urine himself *i.e. via naturalis*. I have always at this juncture enjoined on my house-staff to inject 10–15 c.c. of sterile Liquid Paraffin into the bladder after the morning bladder wash and my patients have felt very comfortable during subsequent acts of micturition. Liberal doses of Hexamine, Amon. Chloride and Hyoscyamus are always prescribed during this regime and only stopped if the urine tends to be unduly acid and patients begin to complain, when Bromides with Hyoscyamus are prescribed for a couple of days. Patients are only discharged when the flow of urine is free and unimpeded and a fair sized metallic bougie can be passed into the bladder with its own weight. Discharge tickets are issued with full instructions for subsequent intermittent dilatation preferably at our own institution.

I have often been confronted with such a case when our theatre sister ran short of a suitable DePezzer's catheter or said she had none

like that at all to suit my purpose. To make best of the situation, I have improvised an expanded ended catheter out of ordinary rubber tubing $\frac{1}{2}$ " calibre by folding one end of it three times in succession, grip with a couple of hæmostats at diametrical points of the tube essentially helps the process. This method has provided me with a sufficiently widebore flanged rubber catheter for my purpose. For facilitating supra-pubic drainage, I prefer raising the foot-end of the bed.

Rupture with extravasation is a more serious problem. Supra-pubic cystotomy—perineal section with retrograde catheterization in succession are carried out as before, but no attempt should be made to suture the urethral roof already devitalised by extravasation. Extravasation requires usual treatment, *i.e.*, multiple incisions to open up the infiltrated tissue spaces in addition to adequate drainage of the Cavum Retzii. Careful irrigation and dressing of the extravasated area and meticulous attention to all the post-operative details, already sufficiently stressed and enumerated, will be rewarded by earning life-long gratitude of the patient and with almost perfect healing excepting probably the necessity of passing bougies occasionally. This is obvious if the enormity of the damage is considered.

Rupture behind the Urogenital Diaphragm is a much more serious condition as imperfect or inefficient treatment leads to not a stricture at all but to a complete loss of continuity of the canal and any treatment when this has happened once, short of ureter transplantation is nearly useless. Treatment from the very beginning aims at remedying this complication. The author has personal experience of at least two cases both of which came late, one, on the 4th day with a stinking wound on the inner side of the thigh with fracture of the Ischio-pubic rami caused by a fall from a tree—a broken branch of which lay inside the wound. Patient died within 48 hours from effects of extensive extravasation in the space of Retzius. The other case came after 48 hours, the floor and roof of this part of urethra were lacerated by being gored by a bull—the horn entering through the pararectal space and the patient passing urine a little through the wound and a little through the meatus—happily not much extravasation having occurred. After prolonged treatment covering over two months, the patient had to be satisfied with a small urinary fistula at the site of the original wound. The two cases are sufficiently illustrative to show the prognosis and end results of cases not treated immediately. Special difficulties of these cases are:—Deep extravasation of urine—tremendous shock—impracticability of stitching the divided ends of the urethra at this place and backward displacement or dislocation of the urethra due to associated rupture of pubo-prostatic ligaments. Treatment aims at circumventing these difficulties as best as is possible. One redeeming feature in these cases is that stricture formation is not so liable to occur in this part of the urethra as it is in the bulbous part.

Supra-pubic cystotomy is performed and the space of Retzius is drained. Correction of the displacement of urethra is effected by an indwelling catheter. The question which now naturally arises is how to manipulate a catheter deftly through the gap. All aim at

retrograde catheterization but techniques differ. Bank's technique is certainly ingenious and effective in early cases. In brief the method consists in introducing two metallic catheters or bougies—one through the external meatus and the other through the internal meatus *via* supra-pubic opening in the bladder and they are gently manipulated into the site of rupture and their beaks are made to come into contact. The lower instrument is then made to traverse the gap while the upper instrument is withdrawn gently while this contact is kept up. The tip of the lower catheter is next made to protrude through the supra-pubic opening and the abvesical end of a self-retaining rubber catheter is attached to it by means of a silk thread. On withdrawing the metallic bougie or catheter from the urethra, the rubber catheter is drawn into the urethral passage by retrograde route.

In late cases, it may not be possible to engage the tips of the catheters as detailed above and the tip of the retrograde catheter in the perineum may have to be cut down upon before the continuity of the urethra can be restored indirectly by an indwelling catheter.

I have found the following technique very helpful and easy. An olivary metallic bougie of medium calibre is passed along the urethra from below and forced up gently to the site of rupture and the tip of the index finger of the right hand is pushed down through internal urinary meatus. By gentle manipulations and feel of the tip of the index finger, the olivary bougie can now be steered into the bladder past the ruptured posterior end of the urethra, even if it is displaced or dislocated backwards (as the index finger can easily hook the displaced organ forwards). Once the instrument finds its way into bladder, it is easy to thread on its olivary tip the abvesical end of a suitable rubber catheter and if the fit be not sufficiently tight the catheter may be tied to the bougie just below the olivary end by '00' Catgut. On withdrawing the instrument gently, the rubber catheter following in its wake finds a snug place inside the torn urethra comparatively easily.

Supra-pubic drainage ensures freedom from further contamination with urine to the injured site—catheter functioning as an internal splint and the aim being perfect anatomical alignment and healing.

After a week, the catheter may be changed by "railroad" method and thereafter, every 4th or 5th day, bladder should be washed regularly as mentioned before and fracture pelvis is treated at the same time by usual method. Roughly in the course of a fortnight, if nothing untoward happens, a metallic bougie can be passed from the meatus into bladder and after a day or two, a fair sized rubber catheter may be made to traverse the injured urethra and guided into the bladder. This is the signal for discontinuing supra-pubic drainage and daily bladder irrigations with adequate precaution are now started and the rest of the treatment and after-care not differing from that already noted for rupture of bulbous urethra.

For those late cases of intra-pelvic rupture of urethra, where unfortunately the continuity of the canal is lost, I would refer my

readers to the reconstructive urethroplasty described by E.M. WATSON in the Journal of Urology, 1935—but the majority of patients will either have to be satisfied with a permanent supra-pubic drainage or must submit to Coffey's operation of ureter transplantation in the sigmoid colon. In this particular condition much remains to be desired in our present-day Surgery.

In my nearly 13 years of practice, I have not seen a single case of rupture of the *female urethra*. Probably, feminine mode of living and anatomical considerations make the condition so rare as to be practically non-existent.

I am aware of two criticisms which might be levelled against this paper—one, the objection to an indwelling catheter and the other omission on my part to any reference to progressive contracture of the bladder which results from a supra-pubic drainage tube or an indwelling catheter draining away continuously. Regarding the first one, I might quote a well-known book on Operative Surgery which states that an indwelling catheter is a source of irritation and is not necessary for preserving the calibre of the urethral passage. I am in total agreement with the first part of this statement, but my experience has certainly taught me to doubt the latter part. Sufficient hints have already been given regarding the means to cope with the disadvantages of an indwelling catheter and by meticulous attention to those details, preferably by the surgeon himself, the catheter may be tolerated by any patient with fair amount of comfort. Once the supra-pubic wound has closed and the ruptured urethra has healed, institution of automatic Tidal drainage of the bladder introduced by Munro—or some modification of it, helps to increase the capacity of a contracted fibrotic bladder in 2/3 weeks. This method is difficult to carry out in a district hospital but has many excellent features to recommend it.

I would end this paper by quoting from the writings of Prof. RUTHERFORD MORISON who aptly describes the rupture of the urethra as one of the serious accidents and "unless our skill can prevent the development of a stricture, we will be presiding at the opening of a life-long tragedy." I have not attempted to say anything new or revolutionary but have put forward the present-day views of the treatment of ruptured urethra in their proper perspective and in the light of my personal experience and if any of my younger colleagues, working under less favourable surroundings than mine, derives some benefit out of this paper, I will feel my labours amply rewarded.

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Prostatic Hypertrophy

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HYPERTROPHY of the prostate is one of the most common diseases of old age and, in the majority of cases, diagnosed very late. This is due to "the curious belief among the male public, that increased frequency of micturition and nocturnal frequency are normal accompaniments of advancing years. Nothing could be more erroneous. The senile bladder is, if anything, less sensitive than the young bladder, and any persistent increase in the frequency of micturition, nocturnal or diurnal, is pathological, and requires careful investigation" (Thomson Walter). So, patients usually see the surgeon when there is acute retention of urine or too much frequency of micturition disturbs the peace of their mind and body. Naturally, all such cases are advanced ones.

The prostate is analogous to the breast as regards its structure. It is enclosed in a definite fascial sheath. There are no peripheral processes. It consists of stroma with gland tissue. Although it is a multiple gland, lobules are not distinct. The lobules end in ducts opening into urethra. The epithelial lining consists of cubical cells with a deep layer of germinal cells. The secretion is mucoid and specific.

The stroma in the breast consists of fat cells. In the prostatic stroma fat is absent but it contains non-striped muscle. In the breast non-striped muscle occurs round the lactiferous ducts near the areola.

In the prostate fibrous and non-striped muscular tissue is abundant at the periphery. When adenomata develop, they push aside, stretch and condense the cortical portion and convert it into a capsule. When adenomata are shelled out, capsule is left behind, which may be thick or thin.

The sheath lies outside the cortical portion and is formed by the pelvic fascia. It resembles the sheath of the thyroid formed by the cervical fascia. Between the sheath and the capsule, there is cellular space in which lies the plexus of veins.

Early changes of benign enlargement of the prostate in man is primarily a multiplication of the fibro-muscular elements. It resembles in its early stages the uterine myoma which is derived from the muscle cell of the uterus. Since the posterior urethra and the internal vesical sphincter contain muscle-fibres, which are derived from the same embryological building material as that of the uterus, it is fair to assume that these two tumours have the same origin. The glandular portion of the tumour has its origin in the ducts adjacent to the fibro-myomatous nodule. The sub-urethral glands of Albarran are not involved in early lesions. It is probable that the solid nodule produces some stimulating and proliferating effect upon the

epithelium of the duct wall, causing the epithelium to invade the solid nodule and form glands within it. The fibro-myomatous tissue is invaded and overgrown by a more rapidly growing duct and glandular tissue, with the result that the nodule in its later stages, develops the appearance of an encapsulated glandular tumour. Benign prostatic enlargements are not hypertrophies but are true hyperplasias, derived from muscle, fibrous tissue and ducts.

Glandular tissue is developed more posterior to the urethra, while anteriorly, there is more stroma. When the gland tissue lying posteriorly hypertrophies, giving rise to an adenoma, it is described as "*lateral lobe enlargement*." This enlargement is felt easily per rectum.

When the gland tissue lying at the base of the prostate behind the urethra enlarges, a ball-like projection forms behind the internal meatus—"the so-called *middle lobe enlargement*."

When the whole of the glandular tissue enlarges an *annular collar-like swelling* projects into the bladder and causes elongation of the prostatic urethra.

When the base of the prostate grows up, the fascial sheath is not present at the base of the gland, but the latter is applied to the neck of the bladder. As the gland grows toward the bladder, it may advance within the sphincter and expand it. Thus, the adenoma projects within the sphincter. The thin cortical part separates the adenoma from the thin muscular fibres forming the inner coat of the bladder and continuous with the prostatic urethra and also the mucous membrane of the bladder.

Pathology.—1. *Fibro-myomatous enlargement with stroma.*—This is rare.

2. *Glandular hypertrophy.*—This is very common.

In the *fibro-myomatous enlargement*, the prostate is uniformly enlarged and the condition is analogous to the diffuse fibrous type of mastitis.

In the more common adenomatous type, certain lobules enlarge and produce an adenoma. The lobules vary in number and size and they compress the fibrous supporting tissue. This condition is analogous to chronic lobular mastitis.

Signs and Symptoms.—The general symptoms, common to all cases of enlarged prostate, are of some sort of abnormality with the act of micturition. This may vary from frequency to complete retention. But, in the majority of cases, the early symptom is frequency of micturition, especially at night. Every man of prostatic age i.e., after the age of forty-five, must have his prostatic condition examined if he complains that he has to get up at night frequently to pass water. Students are often taught that the criterion for diagnosing an enlarged prostate is the inability for the examining finger to reach the top of the gland on rectal examination. Many early cases of senile prostate are left undiagnosed and untreated by following this dictum.

In such cases, the enlargement of the gland is very slow and more towards the urethral lumen. Thus, the obstructive phenomena progress steadily and the urinary organs are found to be damaged considerably, when active treatment for the enlarged prostate is considered imperative.

As regards the clinical symptoms, the enlarged prostate can be classified into three varieties:—

(1) The enlargement of the organ is accompanied by initial symptoms of "prostatic irritation". The patient who is usually a man over sixty, notices frequency of micturition said to occur at night and to some extent during day time as well. When call arises it is urgent, pain exists but water does not flow freely. There is irritability of the detrusor and spasm of the sphincter. The more he strains the less is the flow. Stream of the urine is not powerful. There is tendency to dribbling at the end. This condition may go on for two or three years. Sooner or later, retention of urine follows. Immediate cause of this condition may be too much drinking, congestion, local irritation, not passing urine regularly, giving rise to distension of the bladder and cold.

In such cases of retention, catheter should not be passed at once. Belladonna suppositories and hot sitz baths should be tried and if the condition is not relieved, a soft rubber catheter should be passed very carefully with due aseptic precautions and the bladder is emptied gradually. The patient is given bland diet and complete rest in bed. As soon as the patient's general condition improves, the prostate should be removed. This is the most common type of prostate found in surgical practice—the pathological growth being a fibro-adenoma.

(2) In this variety of prostate enlargement, the patient is not aware of anything being wrong with his urinary apparatus. Retention of urine occurs suddenly and on straining there is hæmaturia with severe pain. The history given by the patient is that similar attacks of retention had occurred about three or four times during the course of two or three years and that they were sudden, and lasted for about twenty four hours and relieved by some medicine or hot hip baths. In this variety, the prostate is found to be more of an adenoma with little fibrous tissue and is comparatively soft in consistence. The treatment is removal of the prostate about a week after the acute condition is relieved.

(3) In this type, the patient develops symptoms of prostatic obstruction very insidiously. He comes for retention but acute pain and spasm are absent, there may be a dull ache. He is usually a weak-looking man, elderly, thin and pale. He complains of a terrible thirst. On palpation, the bladder is found to have extended to the umbilicus and the abdomen is rather protruding. He may not have a complete retention, but with some effort, he is able to pass an ounce or two of urine every two or three hours. He may be complaining of incontinence—false incontinence. The patient in fact is suffering from chronic uræmia due to a slowly increasing prostatic obstruction. The bladder

becomes at first hypertrophied and dilated and then gradually develops an atonic condition. He has a slowly increasing back pressure, which compresses the kidney substance, causing atrophy of its epithelium and increase of its interstitial tissue. He is found to be suffering from thickening of the blood vessels, high blood pressure and dilated and hyper-trophied heart. He complains of dyspepsia and nausea.

In such cases, the whole of his urine should not be drawn out at one sitting as death may follow from uræmia. If all the pressure from the pelvis of the kidney is taken away at once, a rush of blood takes place in the kidney, and acute nephritis follows. It is better to drain the bladder supra-pubically in these cases and remove the prostate when the kidney condition is found to be normal.

The prostate in this variety is found to be of the fibrous type—small and hard in consistence.

Malignant Disease of the Prostate.—About 10% of cases of enlarged prostate are supposed to develop malignancy. In early stages it cannot be diagnosed as the malignancy is confined to the glands inside a lobule. The symptoms are: (1) Dense, hard feel of the gland with nodules. (2) Normal grooves are obliterated. (3) The normal notch at the posterior and upper border of the gland between the two lobes disappears. (4) Between the prostate and the rectum, a shelf-like induration is felt spreading upward and downward. (5) The whole gland is found fixed, and the rectal wall not freely movable over it.

Treatment.—Removal is done either by the supra-pubic perineal or trans-urethral method. The trans-urethral method requires special instruments and is the ideal method for the fibrous type of prostate. The supra-pubic method is the one most commonly followed and is comparatively easier than the Young's method of perineal prostatectomy. Perineal method, although technically a little more difficult than that of the supra-pubic, gives a lower mortality rate than the latter.

Certain Considerations in Connection with the Diagnosis and Treatment of Bladder Stone

BY

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From early times, the urine has been the subject of interested observation and even of veneration. The use of the urine of man and of various animals as a lotion or as a medicine to be taken by mouth and as a constituent of various kinds of magical preparations is recorded in the ancient writings of many countries. Long ago, also, examination of the urine became a part of the technique of the physician. In the middle ages, this took the form of what might be called "urine-gazing". After looking at a specimen from different angles and in different lights for quite a long time, the practitioner of this art would claim to know all that was needed to be known about the patient, whether he saw him or not.

Some would explain this early interest in the urine as a type of modified erotic curiosity, while others are inclined to believe that there must have been some empirical basis for the use of this fluid in medicine and of the type of examination which preceded modern urinalysis. The findings of the latter as well as such discoveries as the presence of very potent hormones in significant quantities in the urine, have tended to increase rather than diminish the interest of modern physicians in this product of the excretory and secretory function of the kidneys.

Certain it is, that the urine is one of the most remarkable fluids commonly found in nature. Like blood, lymph, bile and certain other of the body fluids, it is a most complicated physico-chemical mixture, which is able to keep in solution or colloidal suspension, a number of ordinarily insoluble substances. But, unlike these other fluids, the composition of which is kept relatively constant, the urine is able to keep its various ingredients in solution under ordinary conditions despite rather wide changes in the concentration of these constituents. This fact is worthy of wonder. It is more remarkable that all of us do not have gravel and stones in our urinary tracts at some time or other, than that only a relatively small number of people should suffer from these precipitation products.

As there has been great progress in recent years in the knowledge of the properties of solutions, so has there been an increase in our understanding of the mechanism of stone formation. Yet, despite the the contributions of many observers in the fields of nutrition and

urology, as well as in bio-physics and bio-chemistry, we must still admit that there are important gaps in our knowledge of the etiology and pathogenesis of urinary calculus. However, certain factors are known which undoubtedly play a part in this process.

While it is our purpose in this paper to consider mainly some practical points in connection with the diagnosis and treatment of bladder stone, some consideration of etiology and pathology seems advisable because of the direct bearing of the latter upon problems of diagnosis and treatment.

Infection; stasis brought about by stricture, hypertrophy of the prostate or occasionally tight phimosis; concentration of the urine because of prolonged fever, or lack of sufficient intake of water; foreign bodies introduced from outside, small stones passed down from the kidney and remaining as nuclei in the bladder, and hair from dermoid cyst ulcerating into bladder—all these are recognised as possible factors in the formation of stones in the urinary bladder, and are discussed fully in the various text books. McCARRISON,¹ however, opened up a new field for thought when he produced stones experimentally in animals, and thus called fresh attention to the factors associated with nutrition, especially the mineral content of ingested food and water, and deficiency in vitamin A. Following this work at Coonoor, there has been a tremendous amount of laboratory and clinical research on this subject. As in many other fields, however, early enthusiasm has been dampened by longer observation, and results obtained in animals under controlled and sometimes extreme conditions have failed of complete applicability in man.

In animals fed on diets deficient in vitamin A, the typical lesion which has developed in the urinary tract has been hyperkeratosis, the replacement of the usual columnar or cuboidal epithelium with a squamous type. The exfoliated squamous debris acted as foreign body for the development of stones. In man, however, most observers have failed to find this hyperkeratosis in kidney pelvis, ureters and bladder, even in those suffering from rather marked vitamin A deficiency. Nevertheless, it has been rather conclusively demonstrated that patients who develop stones in bladder and kidneys do have a shortage of this vitamin, not necessarily in their diets, but in the amounts which are effectively absorbed. The demonstration of this has been by the dark adaptation test, which depends on the function of the visual purple in the retina, which in turn, depends on vitamin A for its production. EZICKSON and FELDMAN² in 1937 demonstrated by this test that 96% of their patients with renal lithiasis had deficiencies in visual purple, and therefore in vitamin A. But they were unable to change either the faulty reaction in the eyes or the calculous condition in the urinary tract by giving large quantities of vitamin A in the diet. They concluded that while vitamin A deficiency does exist in those patients who develop stones, it is dependent on lack of assimilation or utilization of this vitamin rather than on dietary lack.

HIGGINS³ however, claims not only to have prevented recurrence of stone by dietary means but also to have observed "solution" of

existing stones with his high vitamin A and acid-ash diet. This would be important if it were true. His work received a great deal of premature publicity in the lay press, and there was consequently a demand by many stone patients that they should be treated by that method. This has given many urologists the opportunity of testing the value of this method. Unfortunately, most of them have failed to corroborate HIGGINS' claims. While EZICKSON and FELDMAN² noted improvement in general health and no increase in the size of stones in their patients, OPPENHEIMER and POLLACK⁴ found that in five out of 27 patients, on the acid-ash, high vitamin A diet there was an increase in size of stones, and in another case, a new stone formed. Therefore, the present status of our knowledge in this matter is well stated by CLAUSEN⁵:—"Although urinary calculi may be produced in experimental animals by feeding special diets, the factors involved are not yet clearly defined. Further study is required before the results can be applied to man. The view that diets deficient in vitamin A cause urinary lithiasis in man is not supported by the clinical evidence".

This conclusion is of significant practical importance. It means that the treatment of bladder stone, as well as of stone in other parts of the urinary tract, continues to be surgical. This should be emphasized, especially for those physicians whose patients have read prematurely optimistic accounts of medicines or diets which are supposed to dissolve stones. The most that we can hope for at the present time from dietary and medical treatment is in connection with pre-operative and post-operative help in the building up of general health, in helping to eliminate or control infection, and in trying to prevent recurrence of stone formation. Even in this latter respect, early hopes have not been fully realized. HIGGINS,⁶ who has been perhaps the chief advocate of the value of vitamin A, in addition to acid-ash or alkaline-ash diets, in a recent paper also called attention to the many other factors which must be considered as well. FLOCKS⁷ discusses these, with especial reference to his finding that a large proportion of stone-forming-patients have an abnormally high total output as well as high concentration of Calcium in the urine, and concludes that "in the management of patients with urinary calculi, it is important to consider not only such factors as vitamin A deficiency, infection of the urinary tract, hyper-parathyroidism and stasis, but also the quantitative urinary concentration of Calcium and the quantitative influence on this concentration of any treatment instituted". He showed that not uncommonly the acid-ash diet as well as vitamin D (these patients are usually given vitamin A in some form such as Codliver oil which also contains vitamin D) markedly increases this already high Calcium output.

All of this work brings us to a very important concept, that the patient who has a stone is a peculiar person, in whom there has been a disturbance of that remarkable property of the urine which we mentioned at the beginning of this paper—the ability to keep the various constituents of the urine in solution despite rather wide range

of variation in concentration. In such a person, precipitation, especially of the Calcium which is in an abnormally high concentration, takes place more easily than in the normal individual. This must be kept in mind in prognosis as to recurrence and also in taking care that as we remove one stone, our operation and after-care will not lay the foundation for another stone.

In this connection, we should mention briefly the subject of foreign bodies. Any such body remaining for some time in the bladder will act as a nucleus for the formation of a stone, in the same way that a small kidney calculus which has successfully passed through the ureter can so act. KEYES⁸ gives an impressive list of articles found in the bladder, which had been introduced through the urethra "under the influence of morbid erotic fancies". We would call attention also to the possibilities of stone-formation in connection with blood-clots resulting from injury to the bladder-wall during surgical operations on bladder or prostate, and from foreign bodies introduced into the bladder by the surgeon. We have all observed the precipitation which occurs on indwelling catheters and on drainage tubes. One needs to be careful that small deposits are not broken off from these and left in the bladder. Sutures should not be placed through the mucosa, as they may act as nuclei. In cases where there has been prolonged drainage of the bladder, it is wise to cystoscope the patient before discharge to be sure that concretions have not been left in the bladder. But it is still better to avoid drainage in bladder-stone cases, whenever possible.

This was the advice given by DOUGLASS⁹ after considerable experience with stone-cases in China. He avoided catheterization as much as possible, both before and after operation—he used suprapubic cystotomy for most cases. We have followed this technique in a number of cases with a large percentage of good results.

Thus far we have discussed the relationship of certain concepts of etiology to practical points in treatment. Let us likewise consider some etiological factors which have a bearing on diagnosis. Knowledge of incidence—the factor of probability—is always helpful in diagnosis. Bladder-stones are very uncommon in the female, because (1) the short urethra, (2) the relative infrequency of urethral stricture, and (3) the absence of the prostatic "collar" around the bladder neck favour early and easy passage of small stones which have come down from the kidney or of other substances which in the male might become nuclei of vesical calculi. However, when one finds urethral stricture, sphincter spasm, large cystocele, procidentia or other condition favouring urinary stasis and infection in the bladder in women or girls who have symptoms of dysuria, one should look for stone especially if they live in regions where calculi are common or if their family history includes mention of kidney or bladder stone in some male relative. Likewise, in the male, family history as well as a past history of renal colic not followed by passing of small stone may help in diagnosis of doubtful cases.

The incidence curve for males rises from about the second

year until the tenth year and then drops smartly not to rise again until about the twentieth year. From that point, it rises steadily with age, until it reaches the high point in old men of the "prostate age". There is often a marked contrast between the small boy with bladder-stone and the man with the same affliction. Diagnosis in the former should never be difficult. Yet, we have seen cases which were being treated with some diuretic mixture or urinary antiseptic despite the fact that they presented the typical *bladder stone syndrome*. It has been said that the dog is chronically constipated and that each defecation is a minor tragedy. To the small boy with bladder stone each urination is a tragedy, and the frequency and urgency of micturition is usually such that his whole day is spent in enduring intense pain. He may grovel on the ground, rubbing his buttocks until they are raw, or he may bite himself or his parent. Not infrequently, he will pull at his penis. The boy who has been a sufferer for a long time will sometimes have learned that he can get relief by pressure on the perineum which seems to dislodge the stone from its position in the bladder neck. Such a change in the location of the calculus seems to explain the fact that these boys usually have relief when they are asleep. Prolapse of the rectum and involuntary defecation may also accompany the straining which occurs if the stone is smooth and is acting as a ball valve in the internal urethral orifice.

Though a similar picture is sometimes found in men, the symptoms are likely to be less intense. Therefore the problem of diagnosis is more difficult. The so-called "silent" stone may occur in the presence of a firm, enlarged prostate which keeps it from entering the bladder neck. When dysuria, burning and occasional hæmaturia are present, a differential diagnosis must be made between bladder stone and a number of other conditions, especially acute cystitis, chronic cystitis associated with pyogenic or tuberculous or mixed infection in the kidneys, and bladder tumour. It is unnecessary for us to discuss this subject which is dealt with fully in the text-books.

We would, however, mention briefly one case which is being reported elsewhere but which illustrates the occasional difficulty met with in diagnosis of bladder stone in adults. A man of about 45 was admitted with ascites who gave a history of burning on urination which had been treated with native remedies including crude mercury. The pain and burning had diminished, however, as the œdema and ascites had increased, so our diagnostic and therapeutic attention was directed first to the obvious chief complaint and to his markedly weakened general condition. It was when his œdema and ascites had disappeared that the man again complained of dysuria. We discovered a stone during a cystoscopy which was done with the idea of investigating possible tuberculous infection in the kidneys.

As we have stated, diagnosis is usually not difficult in small boys. However, we did have one interesting case in which, while the clinical picture was very suggestive of bladder stone, examination of the bladder did not reveal any calculus. The symptoms were relieved

after sounding, which suggests that the boy must have had a spasm or other functional stricture at the bladder neck, since there was no obstruction to the passage of the sound under anæsthesia. We have wondered whether we were dealing here with a condition which might precede the development of bladder stone in some of these boys.

KEYES⁸ and other text-book writers¹⁰ mention three methods commonly used for the diagnosis of bladder stone. These are sounding, cystoscopy and X-ray. Cystoscopy is not possible in many small boys unless one has the child-size instrument. And the X-ray is not geographically or financially available in some of the regions where stones seem to be most frequent and where patients with stone are characteristically poor. Sounding is often sufficient, but it should be kept in mind that as there are two meanings to the word *sound*, so also there are two uses of the instrument. The ear as well as the hand of the examiner must be trained if this method is to be effective. However, in cases of doubt, sounding should be checked by some other method. We would recommend the more frequent use of the bimanual examination—one finger in the rectum and the other hand on the lower abdomen. This might be said to be the contribution of the gynæcologist to urology in exchange for several contributions which the urologist has made to gynæcology. The bimanual examination is easy and effective even in small boys. Anæsthesia is required less frequently in these patients for this examination than for sounding. However, if brief Chloroform anæsthesia is given for the passage of the sound, that examination may profitably be followed by the rectal-supra-pubic palpation, relaxation for which is facilitated by the anæsthesia.

We have said that the treatment of bladder stone is surgical. The transurethral (litholapaxy) and the supra-pubic (lithotomy) approaches are now the most common, though the term—"lithotomy position"—calls attention to the fact that in years gone by the perineal approach was most frequently used. KEYES⁸ presents the relative merits of litholapaxy and supra-pubic lithotomy as follows:—

"Supra-pubic lithotomy exposes the patient to more dangers and inconveniences than does litholapaxy. Yet, lithotomy is appropriate to all cases, while litholapaxy is not; while litholapaxy requires a special training, which lithotomy does not." "The general surgeon who interferes but rarely with the bladder cannot fail to prefer—the supra-pubic operation. On the other hand, the surgeon who has been educated in the deft manœuvres of litholapaxy will subject almost every case to that operation."—"Supposing a surgeon equally skilled in all these operations, he may be expected to select his operation according to the following indications:

"For children, whose urethra will take a 16 F. sound—litholapaxy; otherwise supra-pubic lithotomy.

"For prostaties—supra-pubic lithotomy and prostatectomy in one or two stages.

"For cases with grave stricture—perineal lithotomy.

"For sacculated bladders—supra-pubic lithotomy.

"For cases requiring good drainage, such as have severe pyelonephritis, uncontrollable ammoniacal cystitis, or prostatic abscess—perineal or supra-pubic lithotomy.

"All other cases may be submitted to litholapaxy. Very large stones are, however, better cut for than crushed."

We would recommend for the cases in which supra-pubic lithotomy is selected, the following procedure which we have found of value:—

- (1) Diagnosis by sounding and bimanual examination, supplemented in a few cases by cystoscopy.
- (2) Pre-operative treatment of associated infection by mouth medication rather than catheterization and bladder washing. The possibility of introduction of new organisms to which the patient has not acquired immunity and the trauma to an at least theoretically abnormal mucous membrane should be reduced to the minimum. Sulfanilamide is likely to be effective in many cases for this purpose.
- (3) Pre-operative preparation for a few days if possible with vitamin A because of its recognised value for the general health as well as the possible value in restoring the mucous membrane to normal. The experimental work referred to above, would seem to favour the use of pure vitamin A without D. But where this is not available, certainly those preparations which contain only small amounts of vitamin D should be chosen. It is often hard to secure this preparation period, especially in the case of the small boys. While the parents will watch their suffering, apparently unmoved, for months and sometimes years at home, they become restive at the hospital unless something definite is done quickly.
- (4) The usual supra-pubic cystotomy, taking care that the peritoneum is well retracted, and using a silk muscle suture to lift up the bladder.
- (5) Avoiding unnecessary trauma to the bladder in removing the stone by making an adequate incision.
- (6) Fine interrupted sutures which do not include the mucous membrane for closure of the bladder without drainage. (We use A silk ordinarily). Only in cases where there is gross infection or a smell of colon bacillus pus do we recommend leaving the bladder open. In such cases, it is better to avoid dead space by bringing the bladder up into the abdominal wound and suturing it to the fascia, and inserting a drainage tube which can usually be removed in 3 or 4 days.
- (7) Closure of the anterior rectus sheath and of the skin with fine interrupted sutures. Here again, we prefer fine black

silk, which is easily found in case sutures must be removed. A small piece of rubber tissue or a few strands of heavy silk are left at the lower end of the wound down to the space of Retzius. This drain should be removed in 48 hours. Within this time the bladder will leak if it is going to do so. This will happen in some infected cases but really in a surprisingly small number; it usually occurs where there has been a smooth stone acting as a ball valve in response to which the muscle wall of the bladder has greatly hypertrophied. However, even when there is leakage, except where there seems to be a very virulent infection, no more is needed than to remove a couple of the stitches. If no drain is put into the bladder, healing and closure are usually very prompt.

- (8) No instrumentation or catheterization through the urethra unless absolutely required.

While the results of surgical treatment of bladder-stone are usually good, and the difficulty of the procedure small, in comparison with the immense and immediate relief given to the patient, a small percentage of cases will have complications and there will be an occasional death. These are usually in the cases which have been long neglected and where a large or pointed stone has caused erosion or perforation of the bladder wall. The most common and serious complication is therefore peritonitis. In such cases, it is well to drain the bladder as indicated above. One will obtain much better results in the treatment of complicating peritonitis, when one uses the Wangenstein apparatus for stomach and duodenal suction and drainage in addition to intravenous Saline and Glucose.

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Supra-pubic Lithotomy

BY

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IN experienced hands, this operation is one of the simple operations in surgery; but for the beginner, it presents many difficulties and it is for the purpose of pointing out those difficulties and of explaining a few details that I am writing this article so that it may prove of some value to the junior doctors in charge of mofussil hospitals.

Although the relatives of the patient bring him to the hospital with the complaint of stone according to their own diagnosis, the bladder should always be sounded. Last year, I saw two children sent to me for operation as their symptoms pointed towards vesical calculus, but on sounding, no stone was felt. One had very adherent prepuce with retention of the smegma which caused considerable irritation. The other had a valve-like obstruction in the urethra near the bladder; obstruction was felt and after a little gentle manipulation, the sound passed into the bladder.

On the day of admission, urine should be examined for pus. Albumen is always present in more or less quantity—the amount depending upon the duration and severity of the associated cystitis. If the urine is turbid and contains pus, put the patient on Acid Sodii Phosphas and Hexamine for 4 or 5 days, these drugs being given three times a day in separate mixtures with intervals of two hours between the two mixtures. The dose of Hexamine need not be more than gr. 20 in 24 hours for an adult, the dose being proportionately less for a child. Patient is given liberal diets.

On the day before the operation, the patient is prepared: he is given Castor oil in the morning. He is given only milk and sugar on that day. Next morning, he is given enema saponis.

Just before the operation, the bladder is washed out with Boric lotion with canula and ordinary irrigator which is not raised more than 2 feet above the level of the bladder. While washing, it is easy to know the average capacity of the bladder. After the last washing, some lotion is left within. The canula, with the thumb pressed against its opening, is gradually withdrawn when the penis is compressed with fingers and a piece of gauze is lightly tied round the penis with only one knot to prevent escape of the fluid.

The pelvis is raised by placing a pillow beneath the buttocks.

Operation.—A longitudinal abdominal incision about 3" long is made in the median line starting from just above the top of the symphysis running upwards. The skin, subcutaneous tissue and the fascia lying in front of the recti muscle should be clearly divided. As soon as muscle fibres are seen, the knife is discarded. Opening the peritoneal cavity is a real danger for a beginner if further incision is

made with the knife. Insinuate your index finger or handle of a knife between the muscle fibres of the two recti (or pyramidales when well developed) in the middle line just above the pubes. Go deeper and deeper till you have a peculiar feeling of having reached the retro-pubic loose connective tissue. In a few cases, resistance may be felt; in that case, knife may be used to cut a few tough fibres only in the lowest part of the wound. After this, the finger can be run up and down along the whole length of the incision to separate the muscle fibres longitudinally. Now, insert broad retractors to retract the edges of the separated muscles. Take a small thin abdominal pad and insert its one corner just behind the pubes and with the finger, press it directly upwards and not backwards gently and several times. The pressure may be continued upto the upper angle of the incision. By this procedure, you expose the anterior (really antero-inferior) surface of the bladder and at the same time raise the peritoneum away from the field of operation. If you now look into the depth of the wound, you will see the veins on the surfaces of the distended bladder and just above these, folds of peritoneum. You can feel with the finger the tense rounded outline of the bladder. The assistant now protects the peritoneum by pressing with one finger on the pad in the upper part of the wound. The bladder is picked up by an artery forceps and an anchoring suture is passed in the uppermost part of the bladder with a fully curved needle and catgut. A good grip of the bladder wall should be taken with the needle to avoid tearing only the superficial capsule. The long ends of the thread are grasped by an artery forceps. The artery forceps with which the bladder was picked up is removed. By pulling on the anchoring suture, bladder is brought nearer the surface and an opening is made into it in the middle line from up downwards so that the sharp edge of the knife looks downwards away from the site of peritoneal reflection. Swab out the lotion which comes out on opening the bladder, insert your finger to pass it all around the stone to make sure that it is lying free in the cavity. Lithotomy forceps (or ordinary tongue forceps in its absence) is introduced and the stone grasped by its shortest axis and withdrawn. Again, feel the inside of the bladder to ascertain whether any further calculi are present. The bladder is pulled up gently with the anchoring suture and two or three catgut sutures are applied. The sutures pass through all the layers of the bladder wall except the mucous membrane. In the lower angle of the opening, a $\frac{1}{4}$ " rubber drainage tube is inserted which rests just inside the bladder wall which is carefully closed around it with another suture if necessary so as to prevent leakage; the tube should have no side openings. A rubber or gauze drain is provided for the retro-pubic space, a few interrupted catgut sutures are used to approximate the muscles and the fasciæ. The skin is united by means of interrupted silkworm-gut stitches. Both the drainage tube and the rubber drains pass out through the lower end of the wound, the former being stitched to its one edge. The skin around the wound should be smeared with a very thin layer of sterilized vaseline. The wound is now dressed. Gauze knot around the penis is removed.

Urine may be allowed to soak in the dressing or a rubber tubing with a glass window may be connected with the tube in the bladder and urine can drain in a bottle placed by the bed side.

I have not described many modifications which can be effected in the details of the operation which one learns to apply as experience advances. To mention only one, the opening in the bladder can be closed altogether by double layer of sutures in clean cases and a rubber catheter tied for drainage of urine for a few days.

After Treatment.—Wound is dressed twice a day. At the time of dressing, the bladder is washed with Boric or Condy's lotion through a canula passed per urethra in the mornings and through the drainage tube only in the evening. The cotton wool is changed as often as it gets soaked. Retro-pubic drain is removed on the 3rd day. The bladder tube is removed and changed on the 5th day. The new drainage tube has a safety pin at the outer end to prevent its slipping into the bladder cavity. Drainage tube is changed at each dressing. Skin stitches are removed on the 9th day. The tube is gradually shortened till it is altogether dispensed with, when it is replaced by a gauze drain. If at any time, the tube cannot be easily inserted, use gauze drain. Patient can change sides from 2nd day onwards. He is allowed to sit up against pillows after 7 days. He is allowed a little walk after the 15th day.

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Transplantation of Ureters

BY

Ida S. Scudder, M.D., D.Sc., F.A.C.S.

Women's Christian Medical School, Vellore.

ONE of the gravest complications of vesico-vaginal fistulæ is the complete rupture of the urethra. Every effort should be made to form a new urethra before any attempt is made to close the fistula. If it is found that it is impossible to make a new urethra, the patient cannot be cured, and more drastic methods must be adopted—i.e. the transplantation of the ureters into the sigmoid colon.

This is a grave operation and it should be undertaken only as a last resort. Given a good urethra, I believe it is possible to repair all other fistulas by repeated, painstaking operations, either by vagina or supra-pubically.

The following technique is the one which we have found most satisfactory:—

I. **Pre-operative.**—For nine days before the operation wash the rectum with saline or weak Potassium Permanganate solution.

For the first three days give the following mixture every four hours:—

Pot. Cit.	...	...	gr. xxx
Mag. Carb. Pond.	...	...	gr. xxx
Glucose	...	...	3 i
Aqua	...	...	3 i

For the third to the sixth day give: Acid Sodium Phosphate 3 i first thing in the morning: Urotropine gr. x. t.i.d.

The last three days, give the alkaline mixture.

Day before the operation, Castor oil.

Two hours before the operation, the bowel is flushed out thoroughly by enema.

II. **Anesthetic used** is spinal unless contra-indicated.

III. **Intravenous Glucose**, 200 c.c. of 20% is started as soon as the patient is under anesthesia.

IV. **Operative Technique.**—

1. Place the patient in the Trendelenberg position.
2. Open the abdomen—median incision, low down.
3. Pack off the intestines.
4. Pass a sigmoidoscope into the rectum from below and guide it into the sigmoid under the operator's guidance. With a long handled forceps, a long strip of gauze is introduced into the sigmoid and the gut is lightly filled. This absorbs all fluid and supports the bowel.

5. Grasp the uterus and pull forward.

6. Dissect out the right ureter down to the bladder, leaving as much of its peritubular fascia around it as possible. Pass a piece of tape or blunt hook under it and leave it uncut until the next stage is complete.

7. Threads are now placed in the sigmoid near the mesentery and about three inches apart. These two silk threads are now held taut and a gutter is made in the bowel wall $1\frac{1}{2}$ inches long between the two threads. This incision should extend downward and obliquely toward the anti-mesenteric border, avoiding vessels if possible, and going through peritoneum and muscle until the mucosa pouts out. Use the handle of the knife to reflect the peritoneum and muscle.

8. Catch the ureter with rubber covered Kocher forceps, tie with linen and cut near the bladder. Touch the distal end with Carbolic and Alcohol. Liberate the proximal end by splitting the peritoneum three or four inches.

The proximal end of the ureter is brought up to the surface and the proximal lumen which has been cut pen-shaped is secured with a fine linen suture, carrying a fine non-cutting curved needle on both ends of suture.

A very fine rubber catheter is now passed up the ureter for five or six inches and is tied in.

9. Thread the proximal end of the catheter into the bowel. This may be done in one of two ways:

- (1) A stab incision is made at the lower end of the gutter into the mucosa of colon, and a straight metal tube with a screw top is passed through it down to the anus. An assistant grasps it, unscrews the cap and then the proximal end of the catheter is passed down the tube until it lies in the line of the ureter and in the gutter previously made. The metal tube is then withdrawn from the rectum and reboiled ready for the next ureter.
- (2) A stab incision is made at the lower end of the gutter, and a little piece of the gauze packing in the bowel is withdrawn through the incision. The proximal end of the catheter is attached to this by a ligature which is already attached to the catheter. Then the gauze is gently withdrawn from below by the assistant until the ureter itself has been drawn into the bowel at the orifice prepared for it. (If the lower end of the catheter is not easily withdrawn from the rectum during the operation this may be done at the end by inserting the finger into the rectum and securing it).

10. The linen threaded curved needles (the ureteric fixation suture) are then passed through the stab wound to emerge three inches below the gutter and about $\frac{1}{4}$ inch apart. They are drawn upon, thus bringing the ureter down through the stab wound, and are tied. Thi

anchors the ureter loosely to the sigmoid at a point at least one inch below the stab wound.

11. A suture is tied around the ureter proximal to the incision.

12. Three or four fine catgut sutures are passed from one edge to the other picking up peritoneum, muscle and ureter in order to close the incision and secure the position of the ureter. The edges of the stab incision are brought in close contact by fine catgut which traverses the wall of the ureter, thereby further anchoring the ureter and preventing back leakage from the colon.

13. The remaining portion of the ureter containing the catheter is then covered by a continuous Lembert suture up to the point where the ureter emerges from its bed under the initial incision in the peritoneum.

14. If the two ureters are being transplanted at the one operation, the technique is the same on the opposite side. The incision in the bowel is on the left of the longitudinal band and one inch below that of the right gutter.

15. Look for any oozing of retroperitoneal hemorrhage. Remove sponges, draw down the omentum, close the abdomen. No drainage is used.

16. Thread the catheters through a short flatus tube. Place the catheters in a bottle containing carbolic lotion.

V. Post-operative Care:—Keep up the fluid intake by copious alkaline drinks, fruit juices, etc. Castor oil on the fourth morning. Remove the catheters and rectal tube on the fifth day.

As this is a grave operation, attended by the risk of interference with kidney function, the post-operative period may be stormy for a few days.

Death is rare early, but an ascending infection to the kidney may later develop.

For this reason it is wiser, in my opinion, to transplant one ureter at a time. But if a spinal anaesthesia is used, there must be at least a six weeks' period between operations.

Transplantation of Ureters into the Colon

BY

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TRANSPLANTATION of the ureters into the Colon is not a new operation. STILES was the first British surgeon to perform the operation successfully towards the end of the last century for a case of ectopia vesicæ, but the operation does not appear to have been generally successful until recent years. In 1929 GREY TURNER published a series of 17 personal cases, all done for the condition of ectopia vesicæ. COFFEY has been the pioneer of the operation in America and it is the various modification of his original operation which is most usually performed to-day.

The indications for the performance of the operation may be classified according to whether it is done for:—

I. Congenital or

II. Acquired lesions of the bladder or ureters.

I. Congenital Lesions.

1. Subsymphyseal vesical extrophy i. e., epispadias with incontinence.
2. Pure epispadias.
3. Hypospadias with incontinence.
4. Congenital vesico-vaginal fistula.

II. Acquired Lesions.

1. Chronic cystitis with a systolic bladder.
2. Malignant neoplasms of the bladder, as a preliminary to Total Cystectomy in operable cases, and as a palliative measure in certain inoperable neoplasms.
3. Carcinoma of the uterus involving the bladder or the ureters. In a few cases of this type, the operation may be worthwhile as a preliminary to pan-hysterectomy.
4. In certain cases of very extensive stricture of the male urethra. This is not an uncommon indication in India.
5. Neglected cases of intrapelvic rupture of the urethra.
6. Injuries to one or both ureters in which direct repair or transplantation into the bladder is not feasible.
7. *Acquired vesico-vaginal fistula*:—The various operations designed for the repair of these fistulæ are both numerous and ingenious. Despite this fact there still remain many which are locally irreparable on account of their size or situation. In many of them the internal sphincter has been destroyed and so much of the bladder trigone has been lost that suture of the bladder wall is impossible or undesirable. Sometimes also the amount of scarring is so great that

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approximation is not possible. Fistulæ situated very high up (vesico-cervical), very low down and lying behind the symphysis pubis (marginal fistulæ) and some of the laterally situated fistulæ are the types in which frequently the only treatment possible is transplantation of the ureters into the colon.

The success of the operation, which may be done in one or two stages, is dependent on:—

- (1) Thorough investigation of the patient with special reference to the anatomy and function of the renal system and the integrity of the anal sphincter.
- (2) Careful pre-operative preparation.
- (3) Scrupulous attention to technical details in the performance of the operation.
- (4) Post-operative care.

I. Investigation of the Patient.—In all cases a plain X-ray of the abdomen should be taken, followed by an excretion pyelogram. If this is not done a surprise is likely to await the surgeon who does the operation in one stage. Some months ago in neglecting to follow this precaution, I was considerably surprised to find the patient still excreting urine after a one-stage operation. A double ureter on the left side had been missed at the time of the original operation. Excretion pyelography also gives very valuable information about the function of the kidneys and apart from congenital abnormalities will demonstrate also the presence or absence of hydro-nephrosis and/or hydro-ureter. In cases with obstruction to the urinary outflow, the ureters are often dilated, but it is to be noted that this is no bar to operation.

The urine has to be thoroughly examined, both macroscopically and microscopically.

In all cases with urinary obstruction the blood urea should also be investigated. It is hardly necessary to add that the local lesion requires careful examination, and that the functional integrity of the anal sphincter has to be perfect. In malignant cases, a careful search for secondary deposits in bones and viscera should be made before operation.

II. Careful Pre-operative Preparation.—The patient should be in hospital for at least a week before operation and on a high carbohydrate diet and encouraged to drink large quantities of water or barley water. A bowel washout with 1 in 4,000 Acriflavine is given for the three days preceding the operation and again once on the morning of the operation. If the urine is infected the patient is put on three tablets (7½ gr. each) of Streptocide or any of the Sulphanilamide group for a week before operation but in cases without urinary infection this drug is only given on three days before operation. Alkaline diuretics are given as well throughout the pre-operative period. Anæmic patients are given iron and often vitamin B in one

form or other before operation until it is considered that the general condition justifies an abdominal operation.

In all patients with good renal function it is now my practice to perform the operation in one stage. Where renal function is not good and in some cases where the operation is a preliminary to cystectomy, I should prefer to do it in two stages.

1. *Transplantation of the ureters in one stage.*—My preference for the one-stage operation is based on the belief that the great danger of the operation is peritonitis, which is no less in a two-stage operation than in one, and in fact may even be greater, for the patient has the risk of two operations. The second, moreover, is performed usually within three weeks of the first and it is to be doubted whether the patient is in as good a condition for this operation as he or she was for the first. With adequate pre-operative and post-operative treatment directed against urinary infection, I believe that the danger of acute pyelitis or pyelo-nephritis has considerably diminished and in fact need hardly be feared at all.

III. **Operative Technique.**—The operation is done under spinal Anæsthesia, and for this I always use Percaine 1 in 1500 solution in amounts varying between 8 and 9 c.cs. depending on the size of the patient.

The abdomen is opened by a right or left lower paramedian incision in which the rectus muscle is reflected outwards. The head of the operating table is then lowered about 15° and the small intestine and cæcum packed out of the way. *The left ureter is exposed first* on the outer side of the sigmoid mesocolon, and just below the pelvic brim. It is carefully mobilised and clamped with two long straight artery forceps and divided with a diathermy knife. The end of the lower ureter is carbolised, ligatured with No. 0 catgut and allowed to drop out of view. The mesocolon is then held up and at a convenient place a hole is made through it, as suggested by Wade of Edinburgh, and the ureter brought through so that it comes to lie above the mesocolon. It is covered with a piece of gauze soaked in Acriflavine solution and left for the time being. The *right* ureter is then exposed just below the pelvic brim and divided and ligatured in the same manner. In the mobilisation of each ureter *gentle handling is essential* and special care must be taken to preserve their blood supply. The length mobilised is not more than 2½ inches. The sigmoid colon is then studied with reference to the *two* ureters and the most suitable site selected for the transplantation of each *with special reference to the avoidance of kinking*. The right ureter is usually transplanted at the level of the pelvic brim and the left somewhat higher.

The transplantation of the *right* ureter is proceeded with first. The bowel is held with two Allis forceps at points 3 inches apart. An incision at a little more than 1 inch long is made along a longitudinal band down to the submucous coat. The edges of this incision are slightly undermined by blunt dissection with the bundle of the scalpel. I regard this as an important part of the technique for it guards

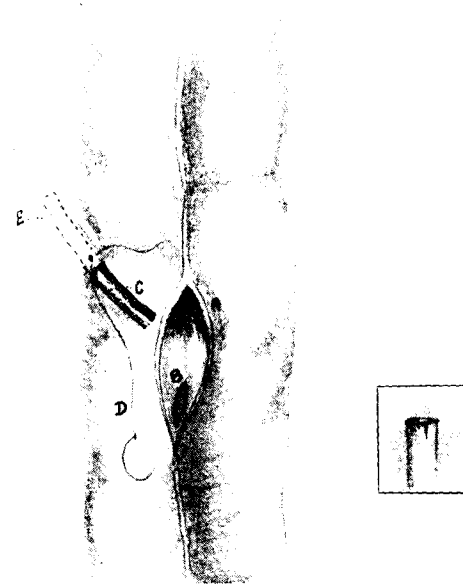


Fig. 1.—A. Sero-muscular incision in bowel wall. B. Stab wound in mucosa. C. Tube in ureter. D. Fixation stitch. E. Ureter. Inset shows ureter with slit down one side to enlarge terminal opening.



Fig. 2.—The tube has been introduced through the opening in the bowel wall and the ureter is about to follow.



Fig. 3.—The ureter is lying along the sero-muscular incision. C. the rubber tube is still lying partly within the ureter. D. The fixation stitch has been tied. E. Sutures to approximate the edges of the muscular incision.



Fig. 4.—The transplantation of the ureter has been completed except for its covering of peritoneum. The rubber tube (C) has been "milked" out and is lying free in the lumen of the bowel.

against the danger of too tightly oversewing the ureters, and so obstructing them. The clamp is then removed from the ureter and the cut edges opened out. It is slit down the left side for nearly half an inch and a No. 00 catgut stitch is inserted and tied on the opposite and unslit side. (*Vide Figs. 1 and 2*).

A rubber tube which accurately and comfortably fits the lumen of the ureter (about the calibre of a No. 4 rubber catheter), 5" long is then placed in the ureter so that 2½" lie within the lumen and the other 2½" project. A small stab incision is made through the mucosa of the gut at the distal end of the sero-muscular incision and the ureter together with its rubber tube is introduced into the bowel and fixed by means of the previously introduced fixation stitch at a point ½" beyond the incision in the bowel wall. The stab incision in the mucosa is then inspected and may require one stitch to close it more accurately (*Vide Figs. 3 and 4*) around the ureter. The edges of the sero-muscular coat are then approximated with interrupted No. 00 catgut sutures across the ureter, the first stitch picking up but not penetrating the wall of the ureter. Four or five sutures are required. A second continuous layer of catgut is then sewn so as to bury the cut ends of the fixation stitch and the layer of interrupted sutures. A sufficiently wide margin is taken to avoid compression of the ureter. The portion of ureter which lies outside the bowel is then covered by drawing the peritoneum forward to the bowel and by using if necessary one of the appendices epiploica. The rubber tube is then "milked" out of the ureter until it lies free within the lumen of the bowel.

The *left* ureter is then similarly transplanted at a higher level. It must be stressed that every possible care must be taken to avoid kinking and oversewing the ureters too closely and producing obstruction. The insertion of the rubber tube guards against this.

All that remains to be done is to close the openings in the posterior peritoneum through which the ureters have been exposed. The abdomen is then closed, a tube being placed down to the pelvis and brought out through the lower end of the incision. Finally a rectal tube is inserted high up in the rectum and fixed to the anal margin with a silk stitch.

I have abandoned the practice of inserting a catgut wick for I feel that it adds the risk of encouraging infection to travel up the lumen of the ureter. I am also convinced that if the ureters are not kinked or too closely oversewn, the passage of urine will be free and uninterrupted and that ascending infection is less likely to occur.

16 patients have been operated in this manner, with one death. The death was due to peritonitis and occurred in a case in which the transplantation of the right ureter did not proceed as smoothly as usual. The bowel preparation also had not been as thorough as usual and coincided with a change in the nursing staff.

IV. Post-operative Care.—The patient is put on free fluids and a light and non-residual diet from the beginning. Alkaline diuretics

are continued and short courses of Streptocide given throughout the convalescent period. Urine is usually passing freely through the rectal tube the day after the operation and I have only once felt it necessary to stimulate diuresis by the administration of intravenous Sodium Sulphate solution. It is as well though to keep such a solution ready, and if triple distillation is not possible, the solution can be purchased from Messrs Crooke's Laboratories ready for immediate use. WADE advises the use of Sodium Sulphate as a routine and seems to attribute the results of his large and successful series to its use.

Some of the patients have a slight lower abdominal distension for a few days after the operation but this need occasion no anxiety. The pulse also is often slightly raised for some days after operation and gradually slows down. No laxative and no enema is given and the bowels usually act naturally on the 6th or 7th day. The abdominal tube is removed on the 4th day after the operation, and the rectal tube is finally removed on the 7th to 10th day. It is found that during the first 14 days urine is passed every 3 to 4 hours, but as the time after the operation increases the intervals lengthen, until ultimately it is passed only two or three times throughout the day and once during the night.

2. *Two-stage transplantation*:—The abdomen is opened by a left paramedian incision below the level of the umbilicus and the left ureter transplanted first. Three weeks later the right ureter is dealt with. The technique of implantation recommended is the same as for a one-stage operation.

In the event of the sigmoid mesocolon being too short to permit easy transplantation of the right ureter into the sigmoid colon, it may be easier to transplant it into the caecum. No qualms need be felt about transplanting the ureter into the right and absorptive portion of the colon, as nothing untoward will happen.

The ultimate outlook of these cases is excellent, though they may from time to time suffer from mild attacks of fever, apparently due to recurrent pyelitis. I have recently performed Caesarian Section on a patient who had been operated on nearly three years before, and who was in excellent health.

The appended few temperature charts are included to indicate the smoothness of the convalescence following a one-stage operation by the technique above described in the average case:—(1) P. Christian aged 23 years. (2) N. Hindu aged 30 years. (3) U. Hindu aged 16 years. (4) M. Hindu aged 20 years. (5) G. Hindu aged 24 years. (6) K. Hindu aged 30 years. (7) T. Hindu aged 15 years. (8) A. Hindu aged 16 years.

Summary.—1. The indications for the performance of the operation have been briefly enumerated.

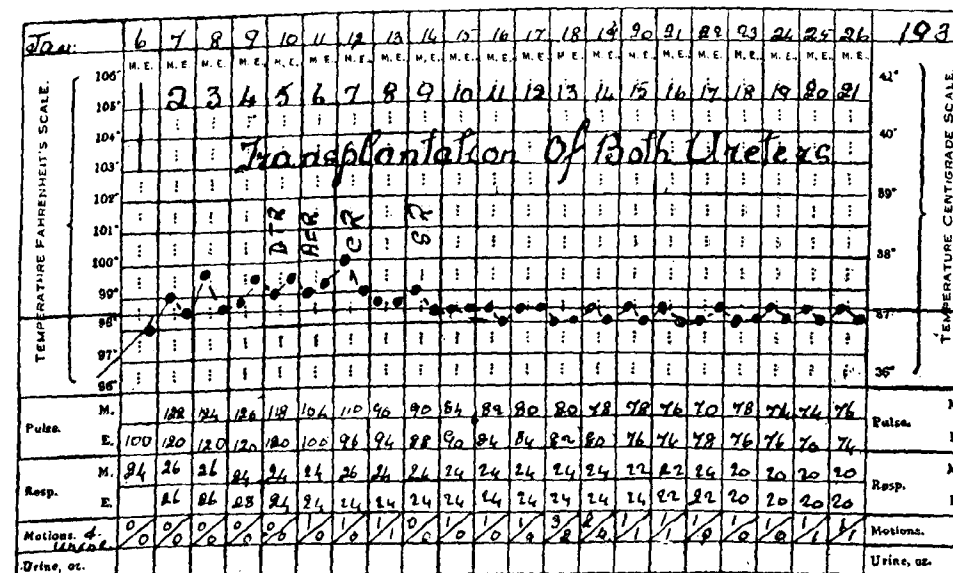
2. The management and operative technique have been described in detail.

3. Temperature charts of typical cases have been included to indicate the immediate post-operative course.

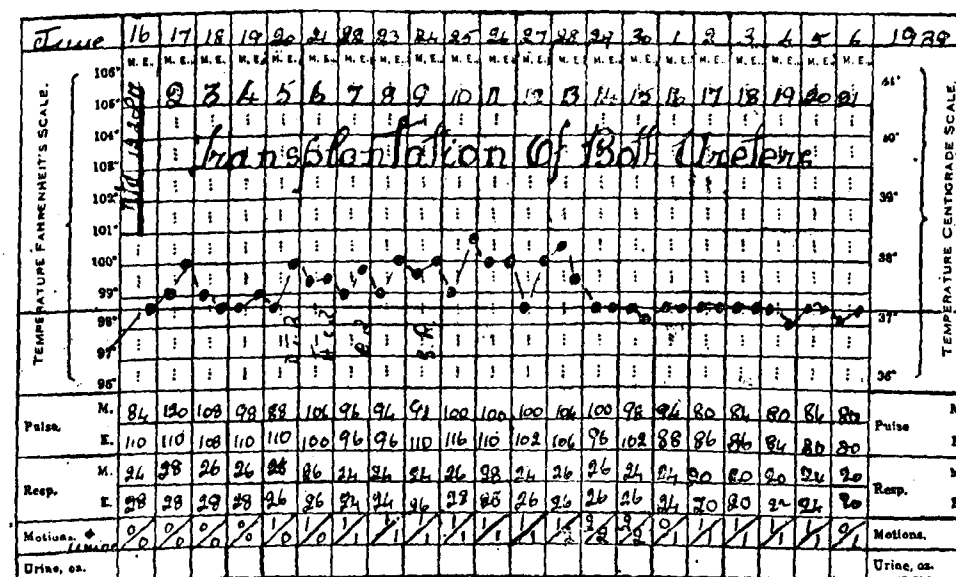
Transplantation of Ureters into the Colon

By Capt. F. A. B. Sheppard, I. M. S.

Name: Perianayagam, Age: 23 years.



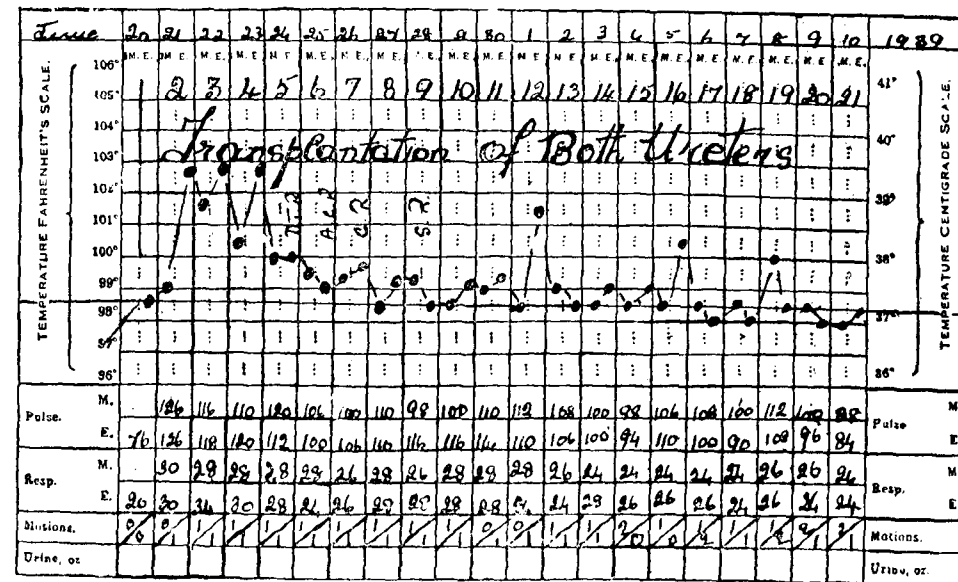
Name: Nallamma, Age: 30 years.



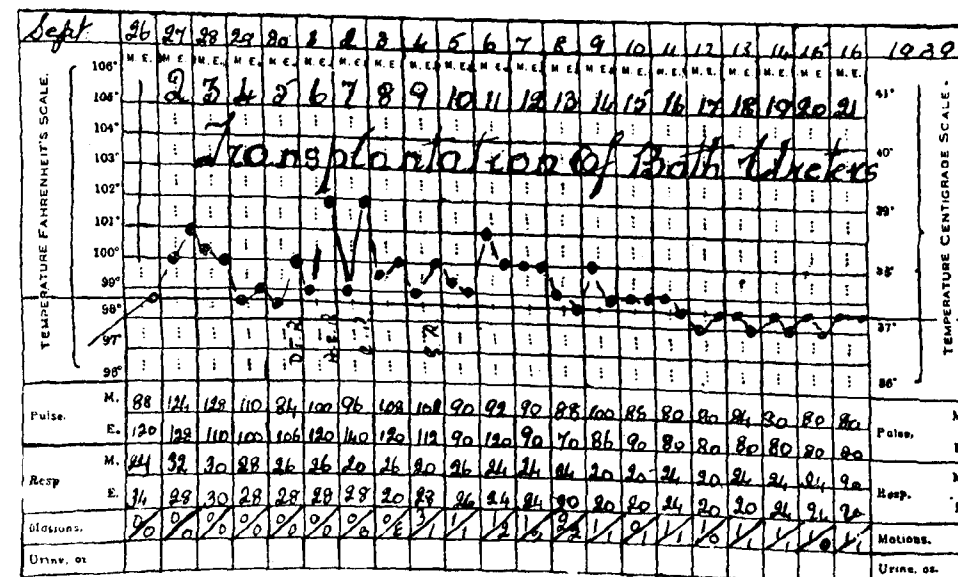
Transplantation of Ureters into the Colon

By Capt. F. A. B. Sheppard, I. M. S.

Name: Umayaparvathi, Age: 16 years.



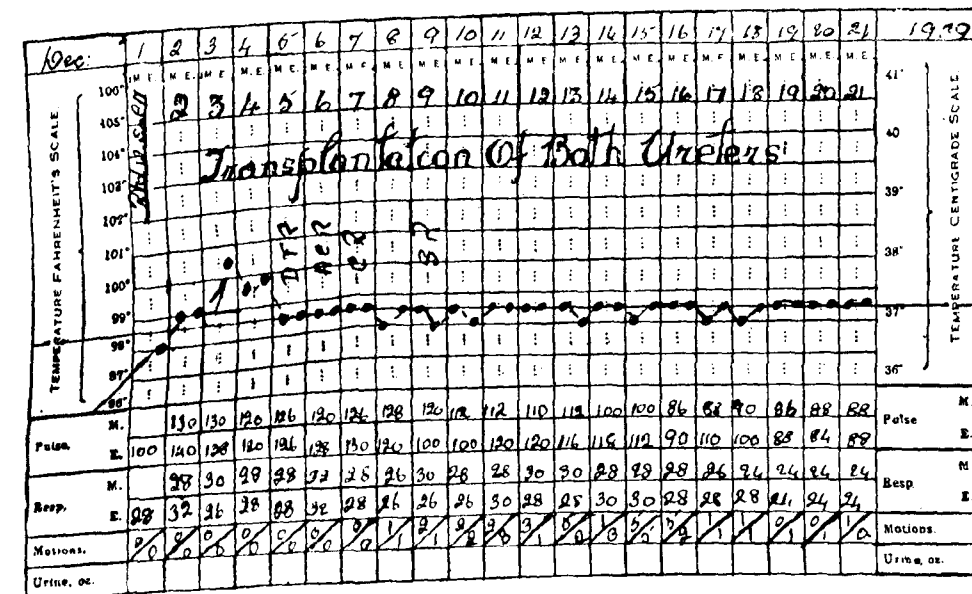
Name: Mangathai, Age: 20.



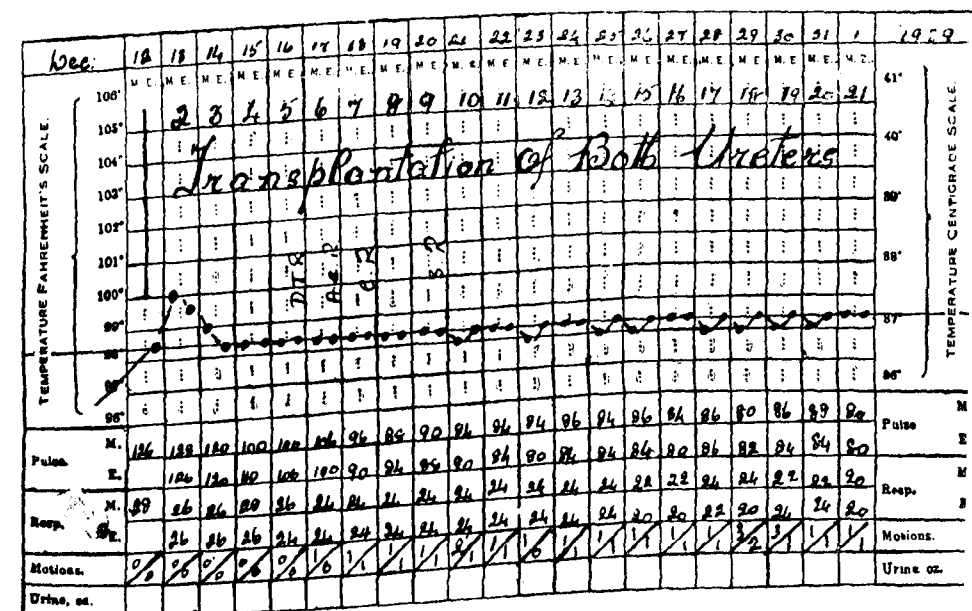
Transplantation of Ureters into the Colon

By Capt. F. A. B. Sheppard, I. M. S.

Name: Gangi, Age: 24 years.



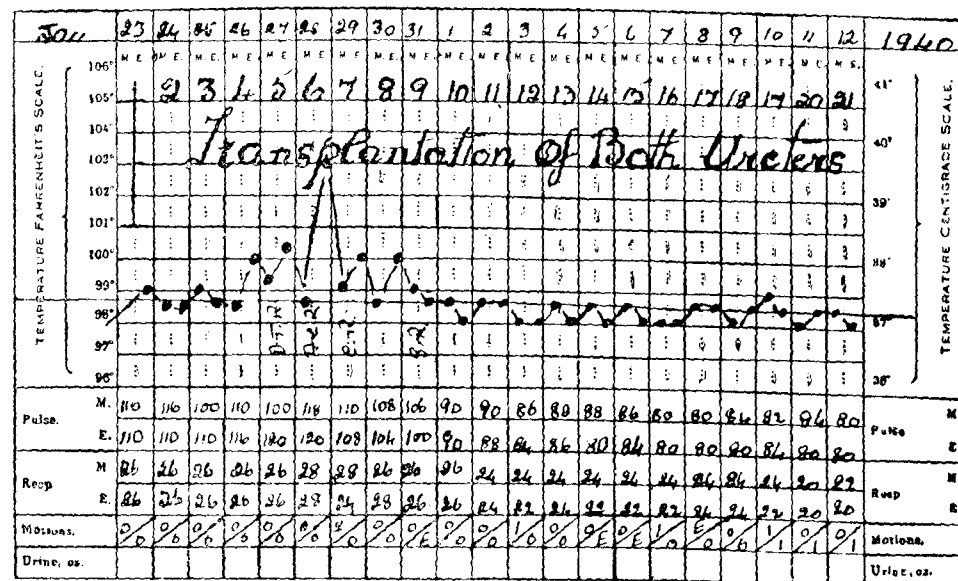
Name: Karupai, Age: 30 years.



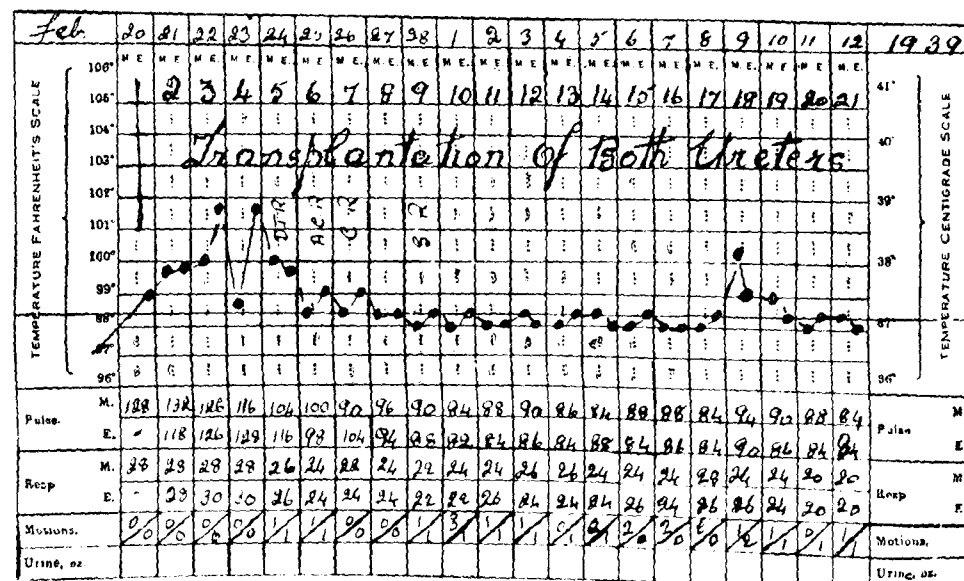
Transplantation of Ureters into the Colon

By Capt. F. A. B. Sheppard, I. M. S.

Name: Thannamma, Age: 15 years.



Name: Amritham, Age: 16 years.



The Modern Treatment of Pyelitis

BY

Jyoti Dhar, B.Sc., M.B.

Alipore, Calcutta.

THE term 'pyelitis' is used in this paper in the broad sense of suppurative infection of the renal pelvis as well as the associated infection of the ureter and the urinary bladder. Pyelitis may come on suddenly or it may develop insidiously. The condition may occur in a previously healthy urinary tract or it may follow some abnormality, such as calculus, enlargement of the prostate, stricture of the urethra, tumour, or tuberculosis. The predisposing factor may be an acute infection such as influenza or an exanthema, renal or cardiac disease, malignant disease or tuberculosis. The infection may come from the alimentary tract and may follow an attack of appendicitis or cholecystitis. Chronic constipation, colitis, diverticulitis, anal fissure, infected hæmorrhoids are some of the well-known causes of *B. coli* infection. Pyelitis is a well-recognised complication of pregnancy, and it is not uncommon in infancy and childhood, especially in the female. It is very troublesome in the elderly patients with hypertrophic prostate in whom the infection of the urinary bladder is very resistant. This also happens with women with prolapse and cystocele.

In the acute form of pyelitis there is high fever with rigor, headache, pain in the loin and general prostration. A microscopic examination of a catheter specimen of urine reveals the presence of pus and micro-organisms. There may be a pure culture of *B. coli* or it may occur as a mixed infection with the coccal organisms. *B. proteus* infection is not very uncommon. The underlying infection may even be tuberculosis. A thorough investigation of the etiological factor is thus necessary for a proper diagnosis and a rational treatment of the condition.

General Management.—The treatment of acute pyelitis consists of absolute rest in bed, flushing out the kidneys with large quantities of fluid and regulation of the bowels. Rest in bed is essential in acute and subacute cases and should be rigidly enforced until fever has settled down to normal and all acute symptoms have disappeared. Later on, the patient may be gradually allowed up. But he should avoid exposure to cold and any possibility to chill and over-exertion. To avoid chill the patient should wear flannel next to the skin and should remain between blankets.

Bowels should be attended to. For constipation a preliminary dose of half to one ounce of Castor oil or a soap and water enema should be given.

Green soft soap ... 1 3/4
Warm water ... 1 pint.

If faeces be very hard, an Olive oil enema will help in dislodging it. Ten ounces of warm Olive oil should be run in, under gravity, through

a rubber catheter. Cathartics are better avoided. Small doses of cascara and Belladonna or Hyoscyamus, given daily, will help in producing a normal evacuation of the bowels. The following mixture given three times a day after food will serve the purpose.

℞ Ext. Cascara Sagrada liq.	...	℥ 10
Tinct. Belladonna	...	℥ 5
Tinct. Hyoscyamus	...	℥ 5
Syrup	...	3 1
Aqua ad	...	3 4

Diet :—During the acute febrile period the diet should be mainly fluid and should consist of plenty of plain water, barley water, lemon water, dab water, glucose water, imperial drink, light vegetable soups, fruit juices sweetened with glucose and diluted milk. Alcohol should be prohibited. As the temperature comes down to normal, milk gruel, milk puddings, bread and butter, toast, biscuits or fried cheera may be added. Later with improvement of the condition egg, fish and vegetable purees should be gradually added.

Fluids :—Fluids should be drunk at frequent intervals and the total quantity for an adult should vary from five to eight pints a day. This will promote proper diuresis and will wash out pus and micro-organisms. The daily fluid intake and the urine output should be charted. Where restriction of fluid is not necessary, large quantities of milk such as fresh milk, butter milk or milk shakes (milk flavoured with fruit syrup) may be allowed. If there be severe and persistent vomiting the fluid intake should be maintained by saline infusions which may be given by rectum, subcutaneously or even into a vein.

Control of Pain and Pyrexia :—The dull aching and discomfort in the abdomen and loins are relieved by hot-water bag or bottles, electric pads or blankets or fomentations and, if necessary, the following powder may be given.

℞ Aspirin	...	gr. 5
Phenacetin	...	gr. 5
Codein Phosphate	...	gr. $\frac{1}{6}$

If the above measures fail to relieve the pain, a hypodermic injection of Morphine Sulphate gr.1/6 and Atropine Sulphate gr.1/100 may be given. Irritability of the bladder and dysuria may be relieved by giving ten minims of Tincture Hyoscyamus in half an ounce of water, thrice daily. Pyrexia is best treated by tepid sponging.

Medicinal Treatment.—In the initial stage of an acute attack in which there is acute fever and toxæmia, the alkaline diuretic treatment ensures the best results. Sufficient Alkali must be given by mouth to make the urine alkaline. If necessary, drugs of the Sulphanilamide group may be combined with the alkaline treatment. The acute symptoms generally subside within three days of the alkaline treatment. In the majority of cases, within a week to a fortnight of the commencement of the treatment the pus will disappear from the urine, which on culture will become sterile. In resistant cases in which the infection still persists, a Mandelate preparation should be

prescribed, unless otherwise contra-indicated. The Mandelate preparations are more effective when there is little or no urea-splitting (particularly in pure infections with *B. coli*), while drugs of the Sulphanilamide group are more effective in those cases where urea-splitting takes place freely as in infections with *B. proteus*, *streptococci* and in mixed coccal and bacterial infections. Mandelic Acid has a tendency to produce irritation of the kidneys and there is a necessity of restriction of fluid intake. It is therefore not desirable to use the drug in the initial stages of acute pyelitis. When the patient is febrile and toxic, the alkaline diuretic treatment should be used until the acute phase has passed off. Hexamine and Hexyl-Resorcinol and Pyridine dyes are useful in chronic cases only. Drainage and lavage of the renal pelvis, which is sometimes required, should be done by an experienced urologist. Residual cystitis will require lavage of the urinary bladder.

It should be borne in mind that the success or failure in the medical treatment of pyelitis depends to a large measure on the successful regulation of the reaction of the urine. In pyelitis due to infection by the coliform organisms, the urine is acid in reaction. By altering the reaction of the urine the growth of these organisms may be inhibited. In the common type of urinary infection the urine is highly acid. In these cases we aim at producing a sudden change to alkalinity by the administration of a sufficient dose of Citrate, Acetate or Bicarbonate of Sodium or Potassium. In the other type where the urine is alkaline in reaction, we change alkaline urine to an acid one by giving suitable doses of Ammonium Chloride or Sodium Acid Phosphate.

Alkaline Diuretic Treatment.—The alkalis are the safest and the most effective drug in the treatment of the acute stage of pyelitis. The alkaline diuretic treatment not only inhibits the growth of the common types of infecting organisms, but it also produces a large amount of non-irritating urine which flushes out the urinary passages. The object of this treatment is to 'render the urine alkaline and to keep it so'. In many cases the alkalis alone will arrest the infective process; but in other cases the alkaline treatment is combined with a drug of the Sulphanilamide group.

The first essential for a successful alkaline diuretic treatment is to ensure a daily intake of not less than five pints of water, spread evenly over twentyfour hours. The water may be plain or in the form of barley water, aerated water, fruit drinks, tea or dilute milk. This is checked by the daily output of urine, which should be about one hundred ounces. The next important point is the dosage of the alkali to be given. For the first day or two the following mixture may be given every two hours.

℞ Potassium Citrate	...	gr. 30
Sodium Bicarbonate	...	gr. 30
Liq. Ammon. Acetas	...	3 4
Inf. Gentian Co. Conct.	...	℥ 6
Aqua Menth Pip.	...	3 1

The reaction of the urine to litmus should be noted each time it is passed. When the urine is frankly alkaline, the above mixture may be exhibited every four hours. If however the subsequent samples of urine fail to maintain the alkaline reaction, the two-hourly doses of the mixture should be resumed at once and maintained until the reaction of the urine is frankly alkaline. Drachm doses (gr. 60) of Citrate of Sodium or Potassium alone, given in the above schedule, will also render the urine alkaline. Later with the improvement of the condition, the alkaline mixture should be continued in smaller doses three times a day. The alkali given should always be in sufficient quantity to keep every specimen of urine alkaline, until seven to ten days after the temperature is normal and all acute symptoms have subsided. In children the alkalinity of the urine should be maintained for two to three weeks after the acute attack has subsided. In pyelitis of pregnancy some authors recommend continuance of the alkaline treatment until full term.

A bacteriological examination of the urine is necessary on the subsidence of the acute symptoms in order to be sure that the pyuria and bacilluria have disappeared. If the infection persists after the above scheme of treatment, the case should be considered to have passed to the chronic stage and should receive treatment with urinary antiseptics. To prevent hypochloremia from the free diuresis, one or two drachms of Sodium Chloride should be included in each day's diet.

Urinary Antiseptics.—1. *Sulphanilamides*:—When the alkaline diuretic treatment alone fails to cure, treatment with Sulphanilamides should be started. Some authors combine Sulphanilamides with the alkaline treatment even in the acute stage of pyelitis. The general consensus of opinion is in favour of using this preparation in the sub-acute and chronic stages. Sulphanilamides are more effective when they are combined with the alkaline treatment, especially in *B. proteus* infection. This combined treatment reduces the time required for the sterilization of the urine. The dosage usually recommended is seven and a half grains (one tablet), four times a day. During treatment with this preparation avoid giving any drug containing Sulphur (e.g. Magnesium Sulphate) and any diet which is rich in Sulphur (e.g. onions, eggs etc.)

2. *Mandelates*:—In a sufficiently acid (pH 5.3) urine, *B*-hydroxy-butyric acid prevents the growth of micro-organisms. Unfortunately this acid cannot be given by the mouth as it is destroyed in the upper alimentary tract. ROSENHEIM found Mandelic Acid an effective substitute for it. Experience has proved the latter and its salts very successful in the treatment of resistant cases of *B. coli* pyelitis.

In giving Mandelic Acid or one of its salts the reaction of the urine must be maintained at or below 5.3. If the acidity of the urine becomes less than this, Mandelic Acid loses its antibactericidal properties, and it becomes useless to attempt to continue the treatment with this preparation. When the fluid intake is restricted this degree of acidity may develop spontaneously; but if it does not, Ammonium

Chloride gr. 20 must be given four times a day. The following mixture given four times a day *before* food will serve the purpose:—

R Ammonium Chloride	... gr. 20
Ext. Glycerrhiza liq.	... 3 ½
Aqua Chloroform	... ad 3 1

If this dose (gr. 20) of Ammonium Chloride fails to render the urine highly acid, larger doses (upto six or eight grammes in twenty-four hours) may be given. Such heavy doses of Ammonium Chloride unfortunately has irritating effect on the kidneys.

The usual basic dose of Mandelic Acid is forty-five grains (three grammes) four times a day. Newer preparations such as Calcium Mandelate and Ammonium Mandelate are less irritating and less nauseating and are preferable to Ammonium Chloride and Mandelic Acid. The usual dose of Sodium Mandelate is forty-five grains. The following mixture may be given four times a day *after* food.

R Sodium Mandelate	... gr. 45
Syrup Auranti	... 3 1
Aqua	... ad 3 1

The reaction of the urine must be tested regularly.

In Mandelic Acid treatment the fluid intake is restricted to two pints in twenty-four hours. In renal disease the drug is likely to produce irritation of the kidneys, which is manifested by hematuria, gross albuminuria or a heavy deposit of casts. In such cases the drug should be stopped. Mandelic acid preparations should not be continued for more than a fortnight. If pyuria still continues a thorough urologic examination is necessary.

Excellent proprietary preparations have recently been introduced in the market. Such preparations are Mandelix (dose: two drachms, four times a day), Mandecal (four to give grammes or one level dessert-spoonful, four times a day), Ammokat (four drachms, four times a day) and Neokat (two drachms, four times a day). Neokat contains Mandelic Acid, Sodium Bicarbonate and Acid Sodium Phosphate, but no Ammonium Chloride. These proprietary preparations are a little more costly; but they have the advantage that with these preparations the reaction of the urine usually reaches the proper degree of acidity. But if there is failure to get a pH 5.3, doses of ten grains of Ammonium Chloride may be given three or four times a day until the reaction is corrected.

3. *Hexamine*:—Hexamine is the time-honoured urinary antiseptic. Its bactericidal action depends upon its breaking down in an acid medium with the liberation of Formaldehyde. In using Hexamine the urine must be rendered acid. This is done by giving Sodium Acid Phosphate (gr. 20 to 30), Sodium Benzoate (5 to 30 gr.) or Ammonium Chloride (gr. 5 to 20), three times a day, *after* food. When the urine is slightly alkaline, give gr. 30 of Sodium Acid Phosphate in an ounce

of infusion of Buchu, three times a day after food, to render it acid, as in the following prescription :

℞ Sodium Acid Phospate ... gr. 30
Inf. Buchu ... ad $\frac{3}{4}$ 1

When the urine is strongly alkaline, give Ammonium Benzoate (gr. 15) preferably combined with Boric Acid (gr. 10), three or four times a day, *after* food, as in the following prescription :

℞ Ammonium Benzoate ... gr. 15
Boric Acid ... gr. 10
Ext. Hyoscyamus liq. ... m 3
Inf. Buchu ... ad $\frac{3}{4}$ 1

Hexamine is recommended in doses of ten to fifteen grains, three or four times a day, with a total of from forty to sixty grains in twenty-four hours. Hexamine and the acidifying drug are given separately—Hexamine being given *before* food and the acidifying drug following sometimes *after* food.

℞ Hexamine ... gr. 10
Aqua ... ad $\frac{3}{4}$ 1

Hexamine may also be given intravenously in doses of from two to five c.c. of a forty per cent solution—preferably with twenty c.c. of a twenty-five per cent solution of grape sugar.

If fluid intake is restricted during treatment with Hexamine, there is liability to irritation of the kidneys. If large quantities of fluid are administered in these cases the concentration of formaldehyde in urine tends to become so low that it has little or no bactericidal properties. The usefulness of the drug in the more acute forms of infection is, therefore, very limited. It is best given in chronic catarrhal infection of the urinary tract. Hexamine is contra-indicated in all acute and sub-acute cases of urinary tract infection. Even in chronic cases it is inferior to Sulphanilamides or Mandelates.

4. *Pyridine* :—At one time the use of Pyridine was much in vogue. It has certain disadvantages. The action of Pyridine is uncertain and it stains underwear and bed linen. The best known proprietary preparations of this series are Pyridium and Neotropin. Each dragee contains gr. $1\frac{1}{2}$ (0.1 gramme) of the dye. Two or three dragees are given three times a day. Very recently a combination of Sulphanilamide with Pyridine ring has been effected, resulting in two well-known proprietary products, *viz.*, Uleron and Dagenan (M. & B. 693) which promise to have very far-reaching therapeutic effects.

5. *Hexyl-Resorcinol* :—Hexyl-Resorcinol, which acts in either an acid or an alkaline urine, is a powerful bactericide in suitable concentration. It acts mainly by lowering the surface tension and when it is given fluid intake must be restricted. It cannot be given with Sodium Bicarbonate. Hexyl-Resorcinol is inferior to alkaline diuretic treatment or to Mandelic Acid treatment in acute cases, but it is

useful in sub-acute cases, particularly where cystitis is causing irritation of the urinary bladder. It is dispensed in gelatin capsules containing 0.15 grammes in Olive oil. It is also obtainable as a 2.5 per cent solution in Olive oil. The dosage is two to four capsules three times a day, *immediately after* food; or three to six drachms of the solution, each drachm containing 0.1 gramme of the drug.

6. *Vaccines* :—Autogenous vaccine which is sometimes employed has very limited application in pyelitis. In recurrent or resistant cases vaccines are usually tried. Vaccines do not render urine sterile, but may alleviate symptoms. Sensitized autogenous vaccines may be pushed in bigger doses than the plain ones.

Drainage of the Ureter.—There may be difficulty in maintaining satisfactory drainage of pus from the renal pelvis. If there is stagnation of urine and accumulation of pus in the ureter and renal pelvis in spite of free diuresis, catheterise the ureters and wash out the renal pelvis with Acriflavine (1 in 5,000) or Silver Nitrate (1 in 5,000). This should be done by an expert urologist. If the interference with the drainage is due to achalasia of the ureter, give five to ten minims of Tincture Belladonna in water, three times a day.

Lavage of the Bladder.—For residual cystitis lavage of the bladder is very satisfactory. This may be carried out daily or on alternate days, for one or two weeks, and after that at longer intervals. The fluid used should be a non-irritating one, *e.g.*, normal saline, boric acid lotion, Acriflavine (1 in 5,000) or Silver Nitrate (1 in 10,000). After the bladder has been washed out and emptied, 10 c.c. of Argyrol may be injected into the bladder immediately before the catheter is withdrawn.

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Pyelitis in Children and What Then?

BY

M. S. H. Mody, M.B.B.S., M.R.C.S., L.R.C.P., D.T.M. & H.
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IN this country of ours, atleast so in this province, the study and progress of medicine is rendered difficult and beset at times with obstacles, partly due to legislatures, and partly due to the habits and sentiments of our peoples.

Post mortem examinations to enable the follow-up study of one's case from the ward to the dead house are rarities, being only possible with medico-legal cases or with those who have no relatives nor friends to claim the body and deprive us from an illumination and exposition of those pathological conditions which eluded us ante-mortem. Also it is most disappointing to find your follow-up cases not turning up to the out-patients at regular intervals, cases whose periodical examination and investigation are essential for estimating the ultimate progress and end result of different lines of treatment given to them.

Do most of us know what happens to our cases of pyelitis in children? What is their ultimate effect especially in girls? Does urinary infection occurring in early childhood, have any bearing or effect during adult life? The term urinary infection probably would be more appropriate of use, as strictly speaking pyelitis should be restricted to infection of the upper renal tract or infection in the kidneys alone. If the old view of ascending infection were correct, then there is first cystitis and hence it would be more in the fitness of things to designate it as "pyelocystitis", (W. SHELDON), whether the route of infection is along the ureteral mucous membrane or along the peri-ureteral lymphatics. Nowadays we know that the majority of our cases of pyelitis, especially so in male infants, are due to a hæmatogenous infection, and the term pyelitis or pyelonephritis is appropriate.

WHARTON, GRAY and GUILD of Baltimore in a very illuminating and interesting article in the *J.A.M.A.* give the results of their extremely far-reaching and laborious work on the follow-up studies of cases of pyelitis during infancy. They have restricted their findings, *in the case of girls only*, and it will be evident to those who carry out such follow-up work, that how difficult a task it must have been, in attempting to gather and induce young grown up girls, young women and young mothers to subject themselves for a complete urological study, especially so when most of them were in good health and had either forgotten all about their childhood infection or were not aware of it.

Their investigative procedure consisted of:—(1) history, (2) physical examination, (3) examination of catheterized specimen of urine from the bladder, (4) culture of such catheterized urine from the bladder (5), intravenous phenosulfonphthalein test for thirty minutes,

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and (6) intravenous urography and yet they modestly affirm "that such an examination falls short of our ideal in many ways".

In the nine cases of those that had *only one attack* of pyelitis during childhood, they found, that all but one were in good health. Three of the nine revealed no urologic trouble; in the six remaining, one had nocturia, one had enuresis, and one had pain in the back. Three had leucocytes in the catheterized sample of urine, five had positive urinary cultures and one had a distinct diminution in renal function.

And five showed urographic abnormalities, in one having a small stone in her left kidney, and four showing slight grades of ureteral or pelvic dilatation. The ages of these 9 cases under investigation ranged between 10 and 20 years, and the time interval that had elapsed since their first attack of infection, was on an average 13 years.

In their second group, they examined those that had *repeated attacks* of pyelitis during childhood. The ages at the time of examination varied between 9 and 27 years, and the time interval that had elapsed since their former attacks, varied from 8 to 19 years after their first attack and 3 to 14 years after their last attack. In this group, WHARTON, GRAY AND GUILD found one case with marked renal deficiency, with pain in the right side and œdema of the extremities. Ten years ago, her left kidney was removed, presumably for infection, and the remaining kidney was found infected, hydronephrotic and ptosed. She went through two pregnancies, both being complicated by renal trouble, and she was advised by urologists never to undergo a cystoscopy. In their own words "this case illustrates the extreme consequence of neglected pyelitis in childhood—chronic, recurring infection which persists throughout life, a nephrectomy which may have been unnecessary, pyelitis in pregnancies which should never have occurred, and subsequent advice which has kept her an invalid. The greatest damage was done when she was neglected as a child."

They further found in this group in one case, a functionless shrunken kidney and moderate pyuria with colon bacilli. In another case they found which is described as an interesting syndrome "recurring pain in the right side with fever from 100° to 102° F. during menstruation. The removal of her appendix had no effect on this situation. She had a urinary infection with the same organisms (colon bacilli and staphylococci) which were present seven years ago, during her last definite attack of pyelitis".

In this group urograms were normal in four, whilst in others a variety of abnormalities such as ureteral dilatation, hydro-nephrosis, calculus, blunting of the calyces. The vast majority of cases also showed albuminuria and pyuria in varying degrees, with cultural examination positive to *B. coli* and staphylococci.

Thus is brought home the fact, that how neglected urinary infection during childhood assumes serious trouble in later life; hence it behoves us to handle all such cases when met with, with respect,

and not dismiss them casually, for we never know what percentage of cases from amongst them will go on to develop permanent damage to their urinary tract, whilst it may also be said here, as may have been already perceived, some of them even after a severe grade of infection go on to complete recovery and possess a normal urinary tract.

Before I give a list of causes that are mainly responsible for this infection in childhood, let me say that the presence of a few cells in the urine of a child does not call forth for a diagnosis of urinary infection, whilst on the other hand I have so often, unfortunately met with cases where the urine of a sick child has not been examined for many a day; and I must emphasize that no sick child has been completely investigated, if a specimen of the urine has not been examined. The cause of this generally is, that the urine of the infant cannot be saved. If the mother or nurse fails in succeeding to persuade the child to pass urine—a cold sponge or splash on the pubis may succeed—or the placing of scrupulously clean mackintosh around the child's hip in such a way as to be able to collect the next sample of urine—or in the case of a male infant a wide test tube may easily be fastened to the penis and held by means of an adhesive tape. But when all measures fail, and when diagnosis remains in doubt, catheterisation may become unavoidable.

I have said above, that the presence of a few occasional pus cells does not by any means justify a diagnosis of urinary infection: (hence SHELDON, in trying to give some guide as to what number of pus cells should be regarded as of pathological significance, had the urine of 88 healthy boys examined and found pus cells in the case of three of them, the greatest number being 4 cells per c.m.m.; whilst in eighty healthy girls, fifty-five had pus cells upto 64 per c.m.m.). Further DR. ALICE DICKIE, in investigating 900 children's urine and using a high power lens, found that urine from boys had no pus cells, whilst in the case of the girls, the highest number of pus cells found were two per field. Therefore, it can be taken as a working rule, that the presence of six or more pus cells in any one field denotes urinary infection. (PARSON and BARLING).

There are three possible pathways of renal infection: (1) Hæmatogenous, (2) ascending, organisms passing up the lumen of the ureters which is unlikely, but more likely that they travel along the peri-ureteral lymphatics and lastly (3) the contiguous, from neighbouring viscus.

Recent work has shown that the infection is generally blood borne, but in girls an ascending infection is more likely. In the list of causes responsible in children special place must be accorded, I think, to congenital abnormalities of the urinary tract, such as stricture and kinking of the ureter, accessory renal vessels, ectopic kidney and anomalies of urethral passage.

Other conditions that take the place of importance are pharyngitis, tonsillitis, sinusitis, bronchitis and broncho-pneumonia,

gastro-enteritis, otitis media, chronic otorrhœa, extensive skin diseases and burns. Also calculus, either renal or vesical, is very occasionally responsible.

SHELDON quoted that out of fifty children, under 2 years of age that were treated at St. Giles Hospital during 1936-38, sixteen could be claimed as having primary infection, in the remaining 34, the following diseases were responsible for the urinary infection amongst them:—respiratory infection (bronchitis, pneumonia) in 2 cases; otitis media in 2 cases; gastro-enteritis in 6 cases; skin infections in 5 cases; meningococcal meningitis in 1 case. *Bacillus coli*, streptococcus, staphylococcus, pneumococcus, typhoid and paratyphoid bacilli, gonococcus, are amongst the infecting organisms responsible for this unfortunate malady of infants and children.

Symptomatology of this condition is too well known to be described here, but the treatment of infantile pyelitis deserves a place and consideration *per se*, and may be dealt with at some subsequent date.

Summary.—Importance of microscopical and cultural examination of urine of children ill with obscure continuous pyrexia.

Parents of children who have had pyelitis to be made aware of it. As such information from them might be of help, to diagnosis and investigation of pains and illnesses in adult life.

Appendix easily blamed for right-sided abdominal pain of a recurring nature.

Importance of urography.

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Renal Tuberculosis

BY

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THIS may be part of a generalised tuberculosis when both kidneys are often found infected. MEDLER found tubercular lesions in the kidneys in over 60 per cent of cases that died of pulmonary tuberculosis, and in the majority they were bilateral.

Miliary type of renal tuberculosis is often bilateral forming part of a generalised infection and is more often seen in children.

Renal tuberculosis may also be localised to one kidney with no active tuberculous lesion elsewhere in the body in 95 per cent and in 5 per cent there may be an active lesion in the lung.

It is in unilateral renal tuberculosis that surgery is of great value in eradicating an active and progressive lesion. Hence, this type is often referred to as "Surgical Renal Tuberculosis". Latent or healed foci are found in the lungs or mediastinal glands.

Surgical Renal Tuberculosis.—*Age*: This type is most frequent in young adults during the age period of 20 to 40 years. It is rare in old age.

Incidence: 85 to 90 per cent of this group start as unilateral infection but become bilateral sooner or later and prove fatal in 5 to 7 years if left untreated.

Unilateral renal tuberculosis forms about 30 per cent of surgical renal lesions and is twice as common as renal tumours.

But in India few of these cases are diagnosed early enough for a successful issue by surgery. Further, owing to the aversion of the laity for surgical treatment, a number of these cases arrive too late for a successful nephrectomy.

Sex:—Renal tuberculosis is a little more common in young men than in women, as the kidneys in the former are liable to infection from genital tuberculosis which is rare in women.

Mode of Infection.—It is chiefly haematogenous in origin from foci in the lungs, glands, bones, etc. In men the kidneys may also be infected by the blood stream or by an ascending lymphatic infiltration from a homolateral infected genital organ.

Renal tissue is very resistant to tuberculous infection owing to its vascularity. Renal embolism from debris of foci elsewhere plays an important part. Most of the early lesions are in the cortex with a great tendency to heal. MEDLER, KAYES and others hold the view that passage of tubercle bacilli in the urine is impossible without producing lesions in the kidneys. Such infection is fairly common but is overcome where general health is good. Where general health is poor or one of the kidneys is damaged by some other disease or trauma, the infection may persist and progress.

Pathology.—The bacilli are deposited in the region of arcuate arteries, 75% in the cortex, 13% in the cortico-medullary region and 11% in medullary region (MEDLER). The cortical lesions often heal. But the others are often progressive and spread both towards the cortex and papillae. Finally the whole kidney becomes involved. Those that start near the papillae ulcerate into the calyces and progressively involve the adjacent calyces and renal pelvis. When they start in the cortico-medullary region owing to caseation, the kidney becomes enlarged, and bosses and tubercles appear on the renal surface followed by adhesions to the peri-renal fat. This type may give rise to showers of bacilli in the urine now and then or become massive caseous type. This type more often ends by ulcerating into a calyx after destruction of the corresponding pyramid and papilla. Some of them however may remain as a closed type, the caseous areas being walled off by fibrous tissue. In this the kidney is found enlarged and shows bossing and later an irregular deposit of lime salts occurs.

With the involvement of calyces and renal pelvis the fatty tissue surrounding them becomes greatly increased, thickened and sclerosed. This may lead to partial obstruction resulting in tuberculous pyonephrosis. With extension of the tubercular process to the cortex the peri-renal fat becomes thickened and sclerosed, and densely adherent to the kidney on one side and to the surrounding structures on the other. The fat round the renal hilum, pedicle and the adjacent portion of inferior vena cava becomes thickened and sclerosed. The glands along the inferior vena cava become enlarged and adherent.

Changes in the ureter:—The constant passage of tubercular debris causes local infiltrations especially at the anatomical constrictions. This is followed by ulceration, fibrosis and thickening of the ureter. A descending periureteral lymphatic infiltration also occurs. The ureter becomes thickened, hard and rigid and adherent to the peritoneum. Caseation and ulceration lead to narrowing of lumen and sometimes even to occlusion. Irregular dilatations alternating with constrictions and a general thickening of the ureter results. All gradations from a slight deformity to a greatly deformed ureter may be seen.

Bladder:—Bladder becomes similarly infected by the tubercular debris brought down by the urine and also by the descending tubercular lymphangitis. In the early stages, the lips of the ureteral orifice may be oedematous and angry looking or a halo of redness is seen in the mucosa where the impact of efflux occurs. Soon grey and yellow tubercles are formed. These caseate and break down into small ulcers. These ulcers join together and give rise to larger ones with irregular undermined borders and a greyish or haemorrhagic base. Yellow tubercles surrounded by a reddish halo are seen scattered around. The infiltration of the lower end of the ureter pulls the opening upwards and out-wards into an asymmetrical position and renders it quite patent as a rounded open hole and hence known as "Golf Hole". As the ulcerative process extends the submucosa and muscularis become infiltrated with round cells followed by fibrosis and contraction, leading to the reduction of the capacity of the bladder.

Where secondary infection has been super-added by instrumentation, lavage, etc. bullous oedema and masses of granulation tissue (called tuberculomas) may hide the ureteral opening. But in chronic cases without secondary infection, the lesions are discrete with healthy mucosa intervening.

In the later stages, pericystitis occurs followed by thickening and sclerosis of peri-vesical fat. This further reduces the capacity of the bladder to a couple of ounces or less. In women, owing to the short and wide urethra combined with the increased frequency, the cystitis and pericystitis, the capacity is so reduced that the bladder holds no more than a thimble and hence is called "a thimble bladder".

Affects on the opposite kidney:—It may become enlarged from compensatory hypertrophy. This hypertrophy is more evident after nephrectomy of the tuberculous kidney. It may also suffer from toxic nephritis, and later may be the seat of tubercular infection, if the primarily infected kidney is not removed.

The clinical types of renal tuberculosis may be classified into:

I. Bilateral Type.—1 *Miliary type*, more often seen in children forming part of a generalised infection.

2. *Bilateral ulcero-caseous type*:—This is seen in the late stages with advanced tuberculous cystitis.

Neither of these are amenable to surgical treatment.

II. Unilateral:—Surgical Renal Tuberculosis.

1. *Ulcero-caseous (ulcero-cavernous) type*:—This is the commonest of the surgical types in which nephrectomy is so useful.

2. *Massive caseous type*:—This is a more chronic form that does not open into the renal pelvis and bladder symptoms are absent or few. Several caseous areas are formed involving the cortex and bases of the pyramids. These become surrounded by a wall of tuberculous granulation tissue, and later become encapsulated. In long standing cases the caseous areas become infiltrated with calcium salts.

3. *Tuberculous nephritis*:—A subacute nephritis from heavy infection is occasionally seen in youngsters between 8 to 16 years. The urine is smoky in colour with blood, albumin and casts. It usually settles down into type 1 or 2 mentioned above.

4. *Tuberculous pyonephrosis*:—Partial obstruction in the pelvis or ureter leads to dilatation of calyces and pelvis into a sac filled with tuberculous pus and urine.

5. *Chronic fibrotic type*:—It is rare and often missed. It is found occasionally in grown up people. Fibrosis is marked and a few scattered tubercles are seen. The kidney is shrunken resembling a kidney with chronic interstitial nephritis. The only symptom is the presence of a trace of albumin in the urine.

6. *Closed renal tuberculosis*:—In this the bladder symptoms are absent but a tumour in the renal region may be palpable. It

occurs in the massive caseous type, or where the ureter is occluded by stricture. Secondary infection of a tuberculous kidney may occur especially after careless instrumentation with serious consequences. Secondary stones may form in a tuberculous pyonephrosis. Tuberculosis may affect also an ectopic, a polycystic or a horse-shoe kidney.

Symptoms.—The disease is of insidious onset occurring in young adults. The symptoms at first are entirely referred to the bladder and the condition is mistaken for a simple cystitis. For a long time *frequency of micturition* is the only symptom complained of. It may be slight and intermittent depending on the weather, climate and diet. The frequency increases, being at first diurnal and later also nocturnal. With the onset of cystitis frequency becomes more marked and is unaffected by rest. Soon scalding during micturition is added. Polyuria as a result of interstitial nephritis increases the frequency. When bladder ulceration sets in, the frequency is so marked that the patient is obliged to pass urine every 20 or 30 minutes.

Urine is at first pale, opalescent, faintly acid or even neutral and hazy from a small amount of well mixed pus. Albuminuria is an early sign and may occur independently of pyuria or haematuria.

Haematuria is variable. In 5 per cent it is visible (sub-acute type) but rarely persists. Microscopic haematuria is present in 40 per cent. of the cases and the urine-deposit shows a greater proportion of white cells to red cells owing to the presence of pus cells.

Pain is present in 40 per cent. Renal pain may be absent or only slight. A dull ache in the renal angle may be complained of. Radiating pain in the form of renal colic may occur during the passage of tubercular debris down the strictured ureter. With the onset of ulceration of bladder, pain may be referred to the perineum, along the urethra to the tip of penis and strangury may be complained of.

With ulceration of trigone, urgency and frequency increase. Tenesmus, terminal haematuria and strangury occur. Bladder capacity is reduced and frequency becomes so marked that the patient has to pass urine every few minutes; sleep and rest become impossible. Owing to urgency wetting of clothes during the day and nocturnal incontinence occur. Patient is obliged to cease work and avoid society. An ammoniacal smell may emanate from patient's clothes at this stage.

Loss of weight:—A continuous slight loss of weight is noticed in the earlier stages. Later, there is a more rapid loss of weight from want of sleep, rest and mental worry from the necessity of giving up work and society.

Tumour formation:—A tuberculous kidney is seldom palpable unless a hydro-nephrosis is present. In the massive caseous type, though the kidney is enlarged, it is often fixed high up under the diaphragm by adhesions and is rarely palpable.

Thickened ureters may be palpable per vaginum or rectum. In thin patients a thickened ureter may be occasionally palpated at the brim of the pelvis.

Fever is absent in most cases in the early stages. A persistent small rise to 90° or 100° F. may be noticed in some. High temperatures indicate a secondary pyogenic infection or active lung infection.

Course and Prognosis.—In uncomplicated cases the progress is slow and fluctuations in the symptoms are frequent. They abate and patient improves to relapse again. Spontaneous cure is rare. In some, pus and bacilli may disappear for months and relapse again. Patients with advanced tuberculous cystitis have to lead a miserable life till death relieves them of the misery. Death usually occurs in 4 to 7 years from uræmia after involvement of opposite kidney or earlier from generalised tuberculosis.

Diagnosis.—It is important to diagnose these cases early and give them the benefit of surgical treatment in unilateral infection. Frequency, scalding, urgency and pyuria with or without hæmaturia in young adults should be suspected. Where urine is sterile for ordinary cultural methods, guinea pig inoculation or special culture for tubercle bacilli should be done. Persistent presence of albumin in young adults with a family history of tuberculosis requires careful investigation. In males, a rectal examination of the prostate and seminal vesicles should be done. Nodules in the prostate in a young man are usually of tuberculous nature. The epididymis should also be examined for tubercular foci.

Examination of urine:—After the usual chemical examination of the urine, the deposit should be examined for casts, pus cells, erythrocytes etc. Next a diligent search for tubercle bacilli should be made by special staining of slides made from the deposit of 24 hours specimen, care being taken to exclude smegma bacillus. Special cultures and guinea-pig inoculation tests are required where bacilli are not seen in the slides. In this way, 90 per cent of the cases can be confirmed. It is only in 10 per cent that one has to depend on clinical and other methods as in the close types.

Roentgenograms:—A plain X-ray picture may show an enlarged kidney with stippling suggestive of caseo-cavernous type. Excretion pyelograms may show a moth-eaten appearance of one or more minor calyces, dilatation of renal pelvis and calyces with irregular dilatations and constrictions of the ureter suggestive of renal tuberculosis. Occasionally, the affected kidney may show no excretion of the dye being either functionally destroyed or excluded as in the closed types of renal tuberculosis. These pictures would also show the existence or absence of the opposite kidney and its functional capacity. 70 per cent of these cases would show suggestive changes in these X-ray pictures.

Cystoscopy:—This should be done with absolute asepsis. Bladder should be gradually distended to hold at least 4 ounces of fluid in the case of contracted bladders. Changes already described above are looked for. If ureteral openings can be seen, ureteral catheters are passed and specimens of urine collected for bio-chemical and bacteriological examinations. Where they cannot be seen 8 to 10 c.c. of 0.4%

solution of Indigo Carmine are injected intravenously. This colours the efflux in 4—5 minutes normally. If the colouring is delayed and depth of colour is poor, it indicates damage of the kidney. Retrograde pyelogram should be avoided except where a diagnosis is not possible by other means. In such cases a 20% solution of Uroselectan B may be used as being the least irritating. But no pressure should be used for fear of dissemination. 86 per cent of cases give cystoscopic evidence. One should make certain of the presence of a healthy kidney on the opposite side.

Treatment.—For unilateral cases where the opposite kidney has been proved to be healthy, nephrectomy with removal of affected portion of ureter gives good results. Complete ureterectomy is required in about 10 per cent of cases. If perirenal fat is infected it should be removed with the kidney. In some cases the wound may break down but heals in course of time. Sanatorium treatment in a warm climate with rest in open air, a nourishing diet rich in fats, vitamins A and D, solar therapy or U. V. Ray treatment are carried out subsequent to the operation.

In surgical renal tuberculosis, tuberculin (T. R.) injections are very useful. Injections are given weekly without producing reactions, starting with 0.001 c.c. and working up to 1 c.c. If reaction occurs the subsequent dose is the same as before.

In most cases the bladder symptoms clear up and ulceration heals in about six months. No bladder lavage should be done, but patient is given alkalis with small doses of Ol. Santali.

Bilateral cases should be given sanatorium treatment. Unilateral cases with active lesions in the lungs should have sanatorium treatment first and after satisfactory improvement, operation may be done.

Mortality of operation is 8 per cent. 70 to 80 per cent of women patients do well. In men owing to complication with genital tuberculosis, only 40 per cent recover. Average duration of life after nephrectomy is 10 to 12 years; cases have survived and remained free for 15 to 20 years. 50 to 60 per cent become quite free of trouble, 15 to 20 per cent improve, the rest end fatally. Prognosis in children is not good as renal tuberculosis is often bilateral and of miliary type in them.

Anterior (Transperitoneal) Approach To the Kidney

BY

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I HAVE performed nephrectomy by the anterior abdominal route six times, five of which were due to mistaken diagnosis, and one, deliberate.

It may be asked whether it is possible to make a mistake in diagnosis in the matter of kidney swellings. Yes, quite possible. On the right side certain kidney lesions are mistaken for the gall-bladder and *vice versa*. I have seen Mr. THELWALL THOMAS, Surgeon, Royal Infirmary, Liverpool, (1917) first making an abdominal para-rectus incision, supposedly for the gall-bladder; and then finding no pathology there, turn the patient round on the side, and do a lumbar incision. I have seen the reverse also.

But in a hospital equipped with none of the more recent apparatus for the investigation of the urinary tract, as the one in which I was working in the Cochin State, these mistakes are all the more possible. The wonder is, they do not occur oftener.

I particularly remember one case, a young man of about 24, who came to the hospital with a swelling, exactly where a distended bladder would be. He did not complain of any particular discomfort in passing water, nor give a history of any trouble in that direction. The swelling was fluctuant, and so much like a distended bladder that my assistant had already passed a catheter to make sure of the condition of that organ. The catheter passed in easily; a little urine came off; but the swelling remained as before.

The patient was then subjected to a more thorough examination. He passed urine in fairly normal quantities, of rather low specific gravity, which I attribute to the poor hospital vegetarian diet. (He was a non-meat-eater). There was no sediment. The kidney regions were carefully palpated. I thought that I could feel the anterior surface of the right kidney a little more extensively than normal. There was nothing palpable or noticeable in either lumbar region. The possibility of a hydronephrosis was entertained; but the hypogastric swelling did not show any sign of shifting or lessening in size, in whatever way the patient was turned.

His main complaints were constipation; occasional, vague, colicky pains in the left side, with passage of mucus; general discomfort, due, he said, to this swelling.

Exploratory laparotomy showed a retro-peritoneal swelling which was found to be an enlarged pelvis of the left kidney. The fluid had sagged to the most dependent part, so much so the swelling had the appearance of the big pear-shaped purse of cotton-cloth,

once so much in vogue. The kidney had atrophied to a thin ribbon. I cannot say by what mechanism the fluid was so persistently held in the lower part of this pelvic bag.

The lumbar route, of course, is the method of choice for approach to the kidney. But there are conditions where the anterior (transperitoneal) route is preferred. These conditions are:

- (1) Intra-abdominal rupture of the kidney with or without rupture of or damage to some abdominal viscera.
- (2) Tumours, which by their size are much too difficult for removal by the lumbar route. Indeed, an experienced surgeon, by enlarging the wound, will remove pretty big kidney tumours by the lumbar route, but not without much sweating and a good deal of difficulty.
- (3) In cases where, on account of the possibility of infiltration of tissues at the pedicle, there is considerable trouble of rupture of big blood-vessels when isolating the pedicle before ligaturing. The bleeding may be very severe if one of the big veins is injured; and there is considerable difficulty in getting at it in the space available. The patient would have lost much blood before the bleeding is controlled. The pedicle is always easier to control by the anterior than by the lumbar route—cancerous and tuberculous infiltration almost always gives trouble by the lumbar route.
- (4) Ectopic kidney:—In most cases of swellings of the kidney and its pelvis, the textual description of lumbar fullness, swelling, perhaps tenderness and pain, obtains, and the diagnosis is easy. But there occur cases occasionally in which the lumbar signs are so vague that one cannot rely on them. Some kidneys have a tendency to show enlargement anteriorly and push up the peritoneum in front, and make their presence felt on one or other side of the abdomen.

Operation—There is nothing very dramatic in a procedure that avoids the orthodox lumbar route, for exposing the kidney and chooses the anterior (transperitoneal) route. One great advantage of this route is that it allows palpation of the opposite kidney and noting its characteristics. Several kinds of incisions have been recommended. There is the Rutherford Morrison incision, which is an epigastric incision in the mid-line from the ensiform to the umbilicus, with a lateral incision across the rectus, to the right or the left as the case may be. Personally, I prefer the Beck incision or the Langenbuch incision as it is called in Germany. This consists of a perpendicular incision, to the right or left of the middle line according to the kidney to be tackled. The incision extends from the costal border to the iliac crest in the anterior axillary line. (The incision may be prolonged up or down as the case may be). After opening the abdominal cavity by incising either of these ways, we come upon the caecum and

ascending colon on the right, and the descending colon on the left. The left kidney is easier felt than the right; it lies to the inner side of the upper part of the descending colon, covered by peritoneum. The pulsations of the renal vessels can be very clearly felt and often seen. On the right side the kidney is best felt to the outer side of the gall-bladder, which may be displaced if not adherent, to the mesial plane. The ureter of this kidney lies behind the colon and the caecum.

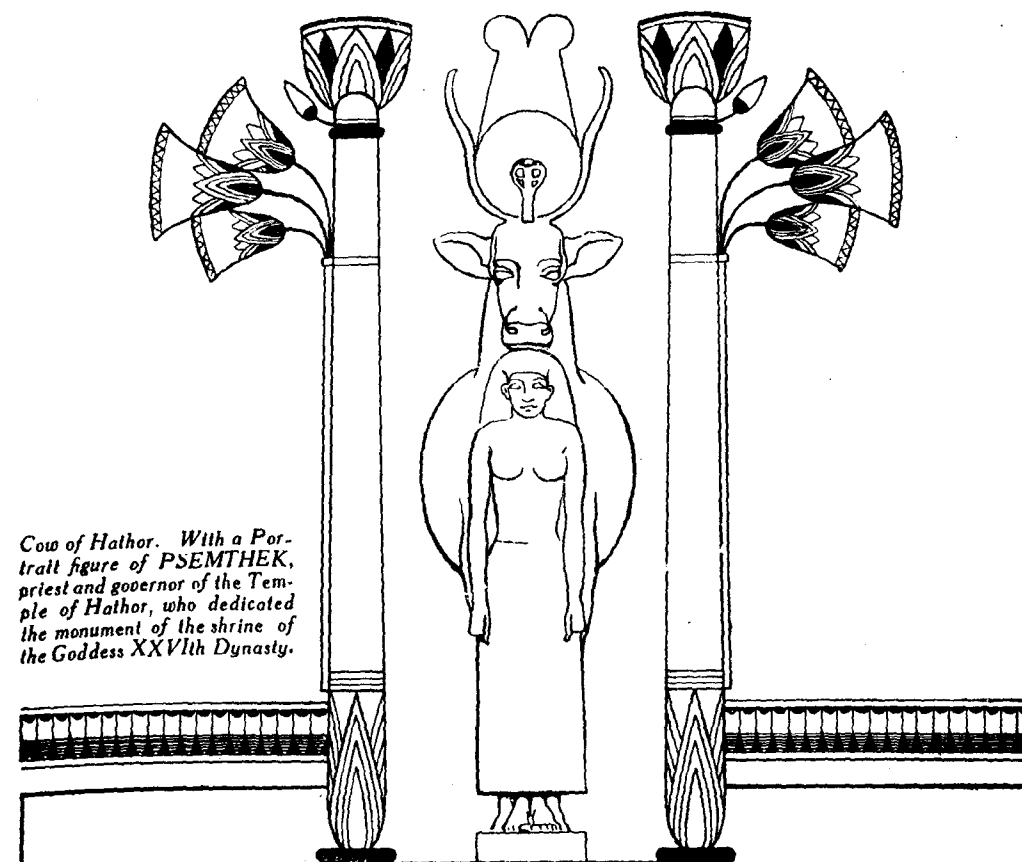
To expose the kidney, the intestines are carefully packed off towards the middle and a vertical incision is made on the peritoneum in the paracolic gutter, lateral to the colon. The colon and its mesentery are now mobilised towards the middle line by gauze-dissection. The pedicle of the kidney is easily seen and can be ligatured in sections. By making the incision in the peritoneum of the paracolic gutter sufficiently long, kidneys of considerable size allow themselves to be easily removed.

Before making the vertical incision in the peritoneum lateral to the colon, it is advised to protect the general peritoneal cavity by a wall of gauze around the line of incision, in case there should be an off chance of any inflammatory exudate in the kidney area. Personally I prefer catching the lips of this peritoneum, the parietal peritoneum, and the lips of the abdominal incision, all together with a series of forceps, T-shaped, or running a temporary suture through all these layers. After dealing with the kidney, a stab wound in the loin may be provided for drainage, and the para-colic peritoneal layer closed.

In certain cases, LEJAR, advises getting on to the kidney without opening the peritoneal cavity at all. He halts at the extra-peritoneal tissue after making Bevan incision, and displaced the whole peritoneum from the sides, and arrives at the kidney. I have not tried this method, and cannot say whether it is easy or difficult in practice.

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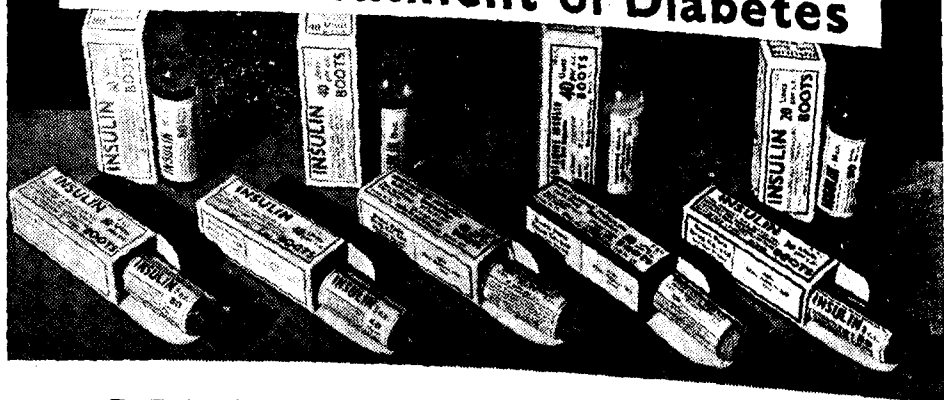
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Action of General Anaesthetics on the Kidney

BY

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IN this article, the important actions, on the kidney, of the commonly used general anaesthetics during kidney operations, are discussed. Chloroform diminishes the secretion of urine when the anaesthesia deepens during the course of the operation, but a couple of hours after the patient recovers from the effects of the anaesthetic, there is generally more secretion of urine. However, Chloroform being a very potent anaesthetic, the patient takes a longer time to come round after the operation. Excretion of chlorides is increased during and after Chloroform administration, so also is the total excretion of nitrogen, and reducing substances other than glucose; sometimes albumin appears in the urine after its inhalation, for several days. Repeated and prolonged use of Chloroform may cause fatty degeneration of the organ, and can produce acidosis or acetonuria, particularly in cases which are predisposed to it, and also when the excretory functions of the kidneys are diminished. Chloroform is decidedly very toxic in kidney cases and should not be used.

Ether causes much less harm to the kidneys than Chloroform. In some cases albumin appears in the urine for a few days after its administration. There is increase in the excretion of chlorides, but it is not so marked nor so persistent as after Chloroform narcosis. In the later stages of anaesthesia, the flow of urine is diminished and the excretion of nitrogen is also proportionately decreased. In nephrectomy cases if the other kidney is hypofunctioning, and if the operation is a prolonged one under Ether, there is risk of the patient subsequently dying from anuria. Ether and Oxygen anaesthesia is safer than Ether alone.

Nitrous Oxide and Oxygen has much less toxic effects on the kidneys than Ether, and is good for kidney cases, though it causes some constriction of the renal vessels and lessens the urinary secretion, if the operation is a prolonged one.

Cyclopropane or Trimethylene which is a newly discovered hydrocarbon gas, and is used with a high percentage of Oxygen, has not been found, so far, to have any injurious effects on the kidneys. It however, diminishes the urinary secretion during deep and prolonged anaesthesia. The flow soon increases after the patient recovers from the anaesthetic. Though it is a highly potent anaesthetic, the recovery from the anaesthetic is very rapid, and this is an advantage, as the flow of urine also occurs soon.

Ethylene administered along with Oxygen is said not to have any harmful action on the kidneys.

Avertin which is used per rectum as a basal anaesthetic is not usually harmful in healthy kidneys, though sometimes albuminuria occurs for a few days. As Avertin is eliminated by the kidneys, it is contraindicated in operations where the kidneys are unhealthy.

Hence, Cyclopropane and Oxygen, and Ethylene and Oxygen are quite satisfactory general anaesthetics for kidney operations; and can be used even if there is hypofunction of the kidneys. Nitrous Oxide and Oxygen is also satisfactory provided the operation is not a very prolonged one.

The Role of Pyelography in the Diagnosis of Diseases of Genito-Urinary System

BY

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THE discovery of X-rays and its utilisation in the elucidation of the causes and effects of disease has been a distinct mile-stone in the study of clinical medicine. Pyelography is one such aid in the elucidation of the causes and effects of diseases of the genito-urinary system. KLOSE (1904) used Bismuth suspensions to visualise the genito-urinary tract. VOELCKER and LICHTENBERG (1906) were the real originators of pyelography. They, while outlining the bladder by using 2% Collargol solution as a radio-opaque fluid, accidentally were able to visualise the ureter including the renal pelvis due to the passage of this fluid from the bladder up the ureter. Gases were employed in the early part but they were found impracticable and in some cases dangerous. Later BRAASCH and THOMSON-WALKER used higher strengths of Collargol. Thorium Nitrate was also tried. Ultimately, CAMERON in 1918 suggested the use of Sodium or Potassium Iodide in watery solution. This is the radio-opaque solution used at present in instrumental pyelography. In recent times, the discovery by VON LICHTENBERG of Uroselectan which is an organic Disodium Diodo Salt to which is linked the Pyridoxyl Methyl and Dicarboxylic Acid groups, has revolutionised the pyelographic investigation. This is done by the administration of the radio-opaque substance by the intravenous route. The discovery of Hippuran by M. SWICK has also enabled the visualisation of the genito-urinary tract by the oral administration of the drug.

The auxiliary tests have enabled the early recognition of the nature of the disease in the genito-urinary system including its effect on the functional capacity of the genito-urinary tract. Thus, it has also advanced the scope of surgical interference in the genito-urinary system. The advance of bio-chemical investigation has enabled the assessment of the genito-urinary function and, coupled with the radiographic visualisation, has increased the facilities for early diagnosis, early recognition of impairment or failure of renal function, and early treatment, thus avoiding the accidents in genito-urinary surgery which used to be the nightmare of the genito-urinary surgeon.

Pyelography is of two types.

I. The Intravenous type.

II. The instrumental type which is also called the retro-grade pyelography.

I. **Intravenous Pyelography.**—The intravenous pyelography has been made possible by the discovery as has already been stated of a

radio-opaque substance which is called by the proprietary name of Uroselectan or Parabrodyl. This is usually excreted by the renal epithelium and later finds its way into the renal pelvis which becomes opaque to X-rays. By this means, the outline of the genito-urinary tract and incidentally the visualisation of the function of the kidney and in some cases the anatomical configuration of the kidney, is obtained. LICHTENBERG himself has described the principles of the scheme thus :

1. That this method supplies evidence of renal function by radiography and also by the qualitative and quantitative estimation of the drug in the blood and in the excreted urine.
2. It visualises the urinary tract.
3. It permits the interpretation of the dynamics of the urinary tract without the aid of instruments.
4. It increases the intensity of the renal tissues due to the deposition of the contra salt in the parenchyma. This substance is non-toxic and can be given without any ill effects in all cases with the exception of a few contra-indications.

The Method of Administration.—Preparation of the patient:—

Before the administration of this drug it must be the usual rule to take the blood pressure and to have the estimation of blood urea and urea excretion tests done. The patient is usually given a very mild purgative of the type of Ext. Glycerryhae compound, drachm 1 at bed time on the night previous to the pyelographic examination. He is kept on light diet also. Drinking of fluids is prohibited after 10 o'clock at night till the test is completed next day. If the patient gets a comfortable motion the next morning, a flatus tube is passed followed by injection of 1 c.c. of Pitressin or Doryl which stimulates the easy exit of gas through the flatus tube. If the patient had no motion, an enema is given and followed half an hour later by the same process of passing a flatus tube and injection of Pitressin or Doryl. When the patient is comfortable after this procedure, he is taken to the radiographic room and Uroselectan-B is administered intravenously slowly taking about 2-3 minutes to administer 20 c.c. containing 15 grams of Uroselectan-B in a 10% solution of invert sugar. Films are taken at intervals of 5, 10, 15, 30 minutes and if necessary an hour later and may be modified according to requirements. If physiological function is to be interpreted, visualisation by screen examination without any compression has to be done. If anatomical configuration is desired, then compression of the ureters at the pelvic brim has to be done and radiograms taken first of the upper half of the genito-urinary tract and later of the whole of the urinary tract. After half an hour the bladder is emptied and a radiogram of the whole of genito-urinary tract including bladder is also taken.

Contra-indications : Severe diseases of the liver, uræmia, anuria.

Interpretation of this method :—On radiographic examination, the first pictures will give the functional capacity of the cells to excrete the dye. Later when the excretion is greater, it fills the pelvis and

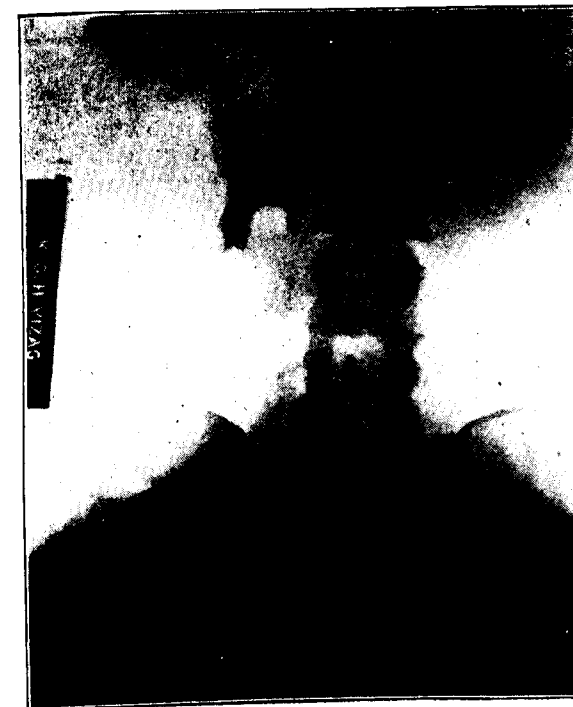
enables the visualisation of the upper part of the excretory tract, the function of the kidney, the pelvis, and the ureters. Sometimes the contra salts remain in kidney parenchyma thus enabling the visualisation of the whole of the kidney, its shape and its size. If it is pathological, we find the elimination on the diseased side is poor and in cases where the kidney is absolutely thrown out of action, there will be no excretion of this salt and thus the radiographic picture will be negative. A negative picture on one side indicates a diseased condition of the kidney. The qualitative and quantitative tests to find the renal efficiency can be done with this dye by bio-chemical estimation of the dye in the blood and in the urine at the same time. It must be admitted that in the majority of cases one cannot assess by this method the anatomical configuration of the urinary tract except when there is obstruction as in cases of calculus hydronephrosis. Where there is doubt with regard to the delineation of the urinary tract compression has to be applied so as to concentrate the dye above the seat of compression in order to bring out in relief the urinary tract. When this method is not satisfactory, retrograde pyelography has to be done.

II. Instrumental or Retrograde Pyelography.—The same ritual with regard to the preliminary preparation of the patient has to be gone through in instrumental pyelography also. The main object of this ritual is to get rid of the gas in the large bowel which will obscure the radiographic findings. In addition, in male the lower part of back of the patient has to be prepared as for an operation as all these instrumental pyelographies are done under Caudal anaesthesia by the injection of 25 c.c. of 2% Novocaine solution. In the case of women simple local injection into urethra of 2% Pantocaine solution anaesthetises the urethra permitting easy instrumentation of the bladder. In this method with the help of a cystoscope the bladder is visualised and the condition of ureteric openings are studied along with the condition of the mucous membrane of the bladder. Ureteral catheters are then passed up the openings through the cystoscope as far as the catheters can be fed in the ureteric channel. If there is any urine secreted it is collected and the time taken to collect a definite quantity is noted and the fluid is sent for bio-chemical and bacteriological examination. Later 12.5% of Sodium Iodide solution is injected slowly until the patient complains of discomfort in the region of the kidney and the quantity that causes this discomfort is noted. It shows the limit of capacity of the renal pelvis. Normally, the capacity of the renal pelvis is from 5 to 8 c.c. If more than this volume can be injected, it shows that the pelvis is dilated and if less, it shows the irritability of the pelvis of the kidney. This method is more useful when we want to delineate the pelvic and the ureteric part of the genito-urinary tract as the outline is more clear by this method than by the previous method and is a useful adjunct when doubt arises regarding the anatomical configuration of calyces, pelvis and ureter of the kidney. Indications for this type of pyelography are the following:—(1) As a supplementary test to intravenous pyelography. (2) When there are

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By M. G. Kini and P. Kesavaswamy.

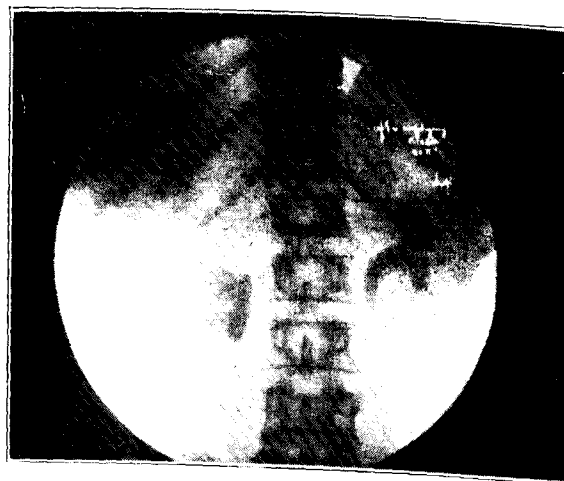
Picture No. B.—is a radiogram showing the ureteral catheter and the limit to which it could be passed up.



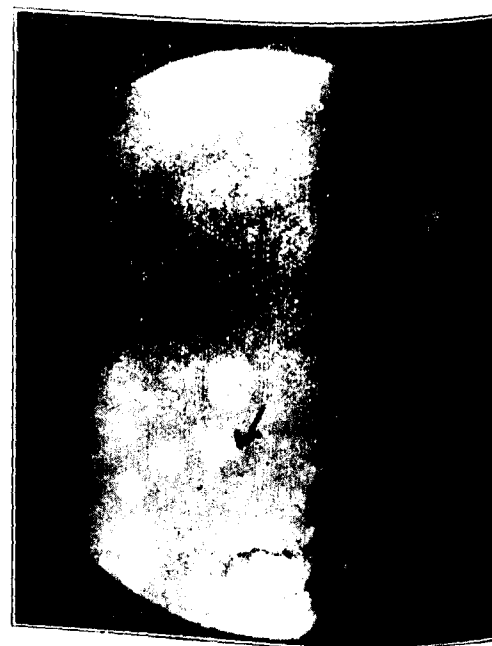
Picture No. B. 1.—is a radiogram showing the shape of the pelvis. Note the level of the pelvis after the injection of Sodium Iodide. There is some distortion of the calyces as shown in the picture. The level of the pelvis is about the 3rd lumbar vertebra.

The Role of Pyelography in the Diagnosis of Diseases of Genito Urinary System

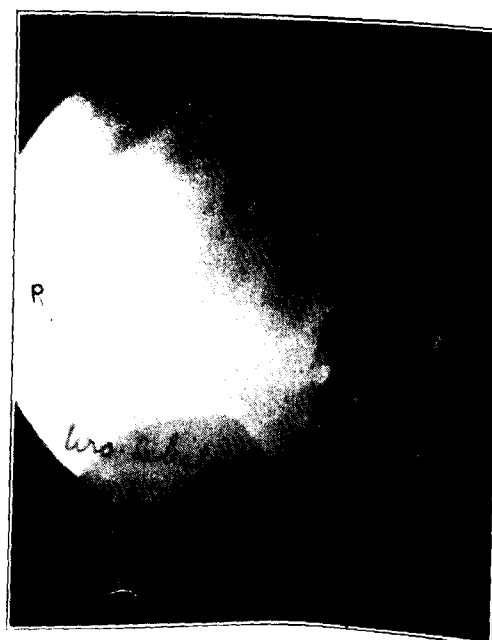
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Picture No. C. 1.—is a radiogram after intravenous pyelography showing calculus hydronephrosis with calculus at the level of the 4th lumbar vertebra.



Picture No. C. 2.—shows a shadow at the lower margin of the 2nd lumbar vertebra



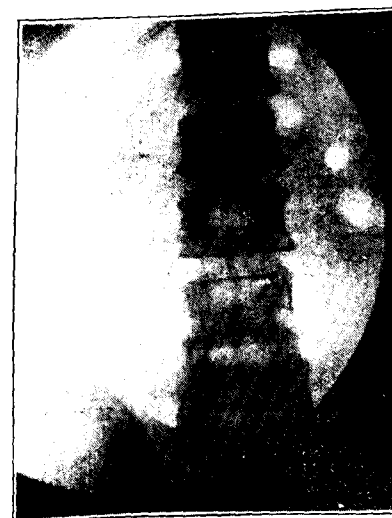
Picture No. C. 2.—is a radiogram taken after the injection of Uroselectan-B. It shows the inclusion of the shadow noted at the lower margins of the 2nd lumbar vertebra.



Picture No. C. 3. is a retrograde pyelography of the same showing the same result as Picture No. C. 2.

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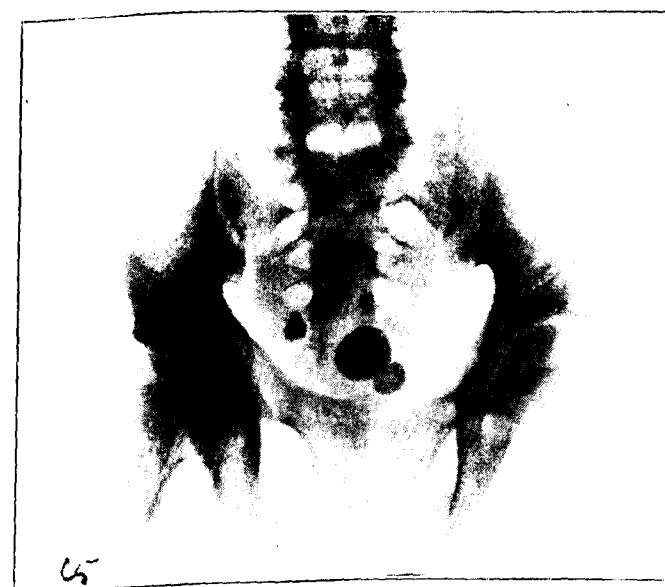
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Picture No. C. 4.—shows the absence of the shadow after the removal of the stone by operation.



Picture No. C. 5.—is the clinical photograph of the case after the operation.



Picture No. D.—shows 3 calculi in the region of urinary bladder, 2 together in the centre and one away towards the right side. Two stones were removed by supra-pubic cystotomy and the 3rd stone which was on the right lateral side could not be removed as it was in the ureter. It was localised by the picture D. 1.

The Role of Pyelography in the Diagnosis of Diseases of Genito-Urinary System

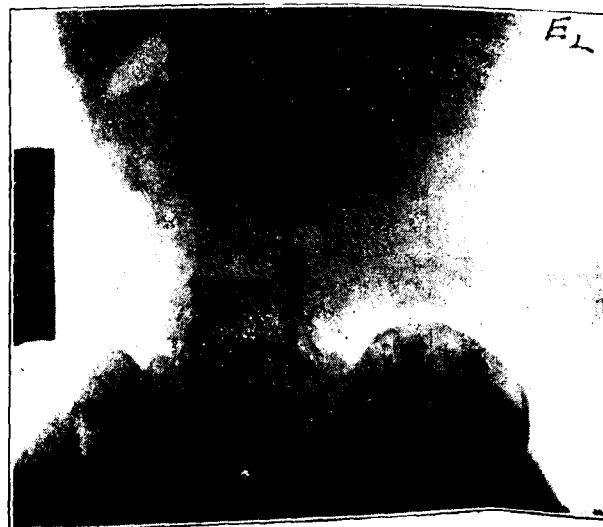
By M. G. Kini and P. Kesavaswamy.



Picture No. D. 1—shows a retrograde pyelography and the relationship of the stone to the ureteral catheterisation. Note the enormous calculus hydronephrosis and hydro-ureter.



Picture No. E.—is a clinical photograph showing a varicocele on the left side, one of the important clinical signs of kidney tumour. (At operation the tumour was found to be a hypernephroma.)



Picture No. E. 1. is a radiogram taken after intravenous pyelography of the case mentioned here. Note the excretion of the dye in the right kidney and absence of excretion on left side.

obscure shadows in the region of the kidney to define them and to find out their relation to the pelvis of the kidney. (3) When there are obscure swellings in the neighbourhood of the kidney which could not be easily diagnosed by other known tests. (4) When there is an abdominal pain of obscure origin on one side. (5) In cases of hæmaturia of renal origin. This is an absolute indication and no time should be lost in performing this useful test. It gives a valuable guide to determine the seat of the trouble and helps in arriving at localising the diseased organ.

These methods have helped the author to diagnose various kinds of diseases of the kidney from congenital abnormalities to various other pathological conditions of kidney. Pyelography is definitely useful in diagnosing congenital abnormalities and in the experience of the author, 4 such cases have been diagnosed by the retrograde and intravenous pyelography.

A. (1) Hydronephrosis due to abnormal renal artery and double ureters. (KINI AND KESAVASWAMI, British Journal of Urology Vol. IX p. 376-80 Dec. 1937.) (2) A case of congenital fused kidney. (KINI AND KESAVASWAMI, British Journal of Urology Vol. X p. 66-68 Sep. 1938.) (3) A case of polycystic kidney. (KINI AND KESAVASWAMI, British Journal of Urology Vol. X p. 66-68 Sep. 1938.)

B. Diagnosis of preternatural mobility of the kidney. One case of floating kidney was diagnosed clinically and by retrograde pyelographic examination. See Picture No. B. B-1.)

C. Diagnosis of hydronephrosis due to calculus obstruction. (1) By excretory pyelography (See Picture No. C.) (2) By retrograde pyelography (See Picture No. C-3, D, D-1.)

D. Relationship of obscure shadows in the region of the kidney. This method is a useful guide in defining the relationship of shadows of stones which are in the calyces, in the pelvis and along the urinary tract. When the shadow is included in the pyelogram the presence of a renal calculus is indicated while the situation of the shadow at a distance from the pyelogram will generally exclude a renal calculus. (C-1, C-2, C-3.)

E. Tumours of kidney. Two cases of hypernephroma of kidney were diagnosed clinically and confirmed at operation. The notable feature of pyelographic findings in both cases was the absence of the shadow on the affected side (Intravenous pyelography). (See Picture No. E-1, E-2.)

Conclusion.—In this paper, a brief summary of the value of pyelography is shown. The technical details of cystoscopic examination are not mentioned and no attempt is made to describe in detail all the possible inferences that can be drawn by pyelographic examination. Only such cases which the author had experienced in his surgical practice are mentioned. Pyelography has got its own limitations. It may not show the cause of the disease so clearly as the effect the disease has produced on the organ. Intravenous pyelography is useful in assessing renal function in addition to renal contour and delineation but the retrograde method is very useful in determining the anatomical configuration.

The Use of Local Anæsthesia in Genito-Urinary Surgery

BY

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THE object of this article is only to stimulate the interest of the general practitioner in Local Anaesthesia. This form of anaesthesia ought to be more extensively used and the correct technique of local anaesthesia for the different operations ought to be developed by the General Practitioner in view of the following advantages:—

It is of great value to the single-handed operator: it has no unpleasant smell or taste commonly complained of in the administration of Chloroform or Ether: it does not produce any post-anaesthetic vomiting or chest complications: and it prevents traumatic shock by blocking the sensory nerve fibres. It has not only a place in the minor surgery of the genito-urinary system, but it is also well indicated in major operations, when the patients are elderly and feeble, when the patients are highly toxic, with hepatic and renal deficiency and in such cases of enlarged prostate, where spinal anaesthesia is contra-indicated. Moreover, it may be mentioned here that the least harmful of the general anaesthetics like Nitrous oxide and Oxygen, and Cyclopropane which are supposed to be as safe as local anaesthesia are not yet available to the average general practitioner.

The Drugs and Apparatus for the employment of local anaesthesia are few and can be easily obtained by the general practitioner. Novocaine or its substitutes like Ethocaine are the most efficient and safest drugs employed for injections. The usual strength of the solution is $\frac{1}{2}$ to 2%. The strength of the solution does not make much difference. The 2% solution is generally used for nerve blocking. The following is a favourite combination:

R Novocaine	...	grs. vi.
Sodium Chloride	...	grs. xv.
Adrenalin (1 in 1000)	...	℥ xv.
Dist. Water	...	ad 200 c.c.

The whole of this solution can be used for one operation, while grs. xv is the safest maximum dose of Novocaine used by many experts in one single operation. Adrenalin should always be added just before the injection in the proportion of 5 drops to 1 oz. of the solution. The addition of Adrenalin increases the efficiency of Novocaine, prolongs the period of anaesthesia and it produces a certain amount of haemostatic effect which is very helpful during the operation. Addition of a fractional dose of Thymol will help to preserve the Novocaine solution: the following is a good combination.

R Novocaine	...	1.5.
Sod. Chloride	...	0.92.
Thymol	...	0.025.
Aqua Dist.	...	100.

This makes 1.5% in Normal Saline to which 1/3gr. of Thymol has been added. The Epinephrine is added at the time of use.

For surface anaesthesia of the mucous membranes of the urethra and bladder, Pantocaine 2% or Percaine 1 in 1000, has to be used: these drugs are much less toxic than Cocaine and they have almost replaced Cocaine in this form of anaesthesia.

Diothane is the newest drug reported and is said to have some distinct advantages. It is employed in 1% solution: the anaesthesia is efficient and is prolonged even lasting for four days after the operation. It is efficient even when locally applied: but Adrenalin cannot be applied with it.

It is always advisable to combine local anaesthesia with preliminary narcotics or sedatives like Sodium Bromide grs. 20 t.d. for a few days prior to the operation, Sod. Amytol (3 grs.) night previous to the operation, and a small dose of Morphia or Omnopon one hour before the operation.

The simplest apparatus that is required is a 5c.c. record syringe with three sets of needles:

Needles of 25 gauge $3\frac{1}{2}$ inch long; needles of 22 gauge $3\frac{1}{2}$ inches long; needles of 19 gauge 5 inches long.

The small needle is used for the preliminary intra-dermal injection, which is the only prick to be felt by the patient and subsequent injections should be made through areas already anaesthetised.

The long needles are used for the deep injections e.g. the paravertebral injections in the anaesthesia of the kidney and for injections into the broad ligaments of the uterus. The success of the anaesthesia largely depends upon the rigid adherence to the details of the technique and the sharpness of the needles will contribute to the comfort of the patient. Hence the syringes and needles are to be kept in good condition: they are to be cleaned after every operation: wire stylet should be inserted after the needle is cleaned and dried: and the syringes are best stored after cleaning, with piston and barrel separated by a piece of gauze. Syringes which lock the needle to the syringe by a half turn are to be preferred and syringes with an extra nozzle at the side with two-way valve are a great convenience when a large amount of the fluid has to be injected.

Preliminary Preparation and the Technique of Operation: In cases of local anaesthesia, no elaborate preparation for operation is needed. A full bath, a normal movement of the bowel and a restful night are all the general preparations that are required. Purgatives and starvation are particularly to be avoided, as they inspire appre-

When local anaesthesia is used, care in speech and delicate handling of the tissues to avoid traction and pulling upon the sensitive tissues both in and outside the field of operation are important.

There are three methods of local anaesthesia :

1. Surface anaesthesia.
2. Nerve blocking, and
3. Local infiltration. One or two or all the three methods can be combined in many operations.

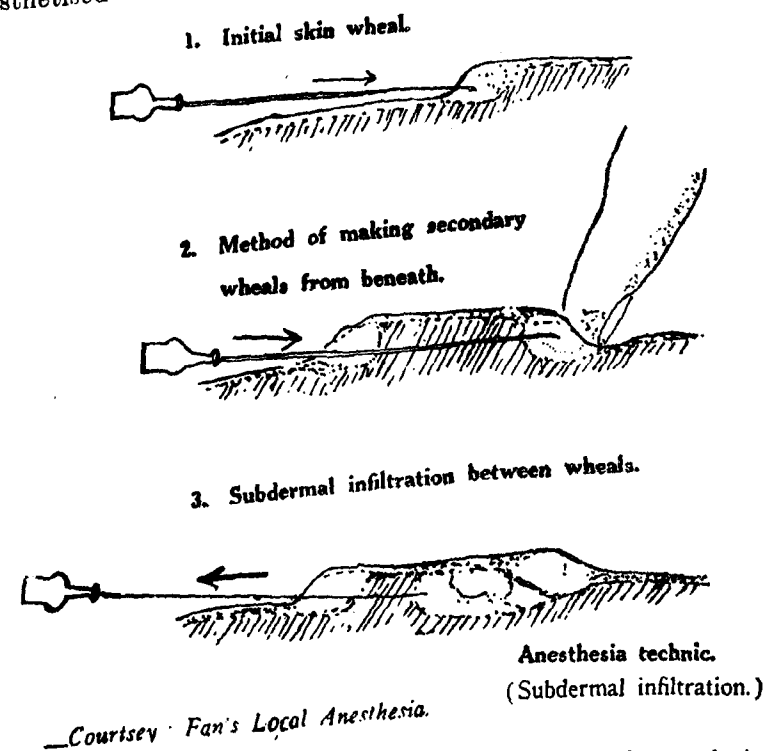
1. **The surface anaesthesia** is very useful in genito-urinary surgery for catheterisation, and for urethroscopy and cystoscopy. For surface anaesthesia, Pantocaine or Percaine is used. Novocaine is not an efficient drug for surface anaesthesia.

2. **Nerve blocking** is anaesthetising all nerves supplying the area to be operated upon. Para-vertebral anaesthesia and caudal anaesthesia used largely in operations of the kidney and bladder are forms of nerve-blocking. In para-vertebral block, for operation of the kidney, the last four dorsal and the first two lumbar nerves are infiltrated. For operations in the bladder and urethra, caudal or sacral anaesthesia is a trustworthy and safe method, although caudal takes 10 to 20 minutes for the anaesthesia to develop and demands great skill in administering the same.

Caudal Anaesthesia:— The most convenient position for this method is the one with the patient lying on the face with a pillow under the pelvis. The left lateral position with the knees well drawn up may also be used. Ordinarily a plain 20c.c. of 2% or 30c.c. of 1% solution of Novocaine with the addition of a few drops of Adrenalin (5 drops to 1 oz) is used. But the addition of a small amount of Sod. Bicarb ($2\frac{1}{2}$ grs. to 1 oz.) and Sod. Chloride ($1\frac{1}{2}$ grs. to 1 oz.) generally helps the diffusion of the anaesthetic into the nerve sheath. The sacral hiatus is situated 1 in. to $1\frac{1}{2}$ in. above the tip of the coccyx: the sacral cornua are made out and the needle is introduced perpendicularly through the membrane. The needle should be of stainless steel, fine and sharp of 17 to 21 gauge and 3 to $3\frac{1}{2}$ in. long. As soon as the needle is felt to have passed the sacro-coccygeal membrane, the butt end of the needle is pushed downwards towards the perineum and the pointed end is pushed up into the sacral canal to a distance of 1 to $1\frac{1}{2}$ ins. The needle should not be passed too high lest it should injure the dura. The injection should be given slowly about 3c.c. in one minute and care should be taken to avoid puncturing the veins of the sacral canal. The anaesthesia becomes complete in about 20 minutes. This form of copy of an irritable bladder and in amputation of the penis.

3. **In local infiltration**, the skin in the line of the proposed incision and the subcutaneous tissue in the area are extensively infiltrated with the anaesthetic solution. An initial intradermal wheal is produced by using a fine needle: a long fine flexible needle (Figs. 1, 2, 3.) is introduced through the skin wheal advancing the point beneath and

parietal to the skin. The solution is deposited directly beneath the skin layer, either while the needle is advancing or receding. An area of the approximate length of the needle may be anaesthetised at one stroke. The subdermal infiltration produces anaesthesia in a period of 1 to 3 minutes. When a longer area is to be anaesthetised, a secondary skin wheal is made from beneath by depressing the skin by the tip of the index finger. The needle is passed again through the second intradermal wheal without giving the least pain to the patient. It matters not how many times the skin is pierced by the needle: but the unanaesthetised skin must not be pierced. This painless method of



anaesthetising the skin is the most single factor in the technique of administration of local anaesthesia. The deeper layers are anaesthetised before the skin incision is made: except in the extremely fat subject, layers are quite accurately recognised as they are reached by the needle point and the required amount of solution may then be deposited. Provided the needle is advanced slowly, producing anaesthesia in front of the needle point by flooding the tissues with the anaesthetic solution, there is no danger of perforating a hollow viscus, while infiltrating the abdominal wall. The peritoneal tissue becomes swollen from the out-flowing fluid and the peritoneum generally floats away from the needle point and is not subject to puncture, provided the needle is advanced slowly, and when no peritoneal adhesions are anticipated. The subcutaneous tissue and the different layers of any deeper structure can thus be anaesthetised methodically.

Anaesthesia Technique for the different Operations:—1. For catheterisation, urethroscopy, and cystoscopy, surface anaesthesia with 2% Pantocaine or 1 in 1,000 Percaine is often sufficient with the addition of a few drops of Adrenalin. But in cases of very irritable bladder, sacral anaesthesia is often necessary for cystoscopy.

2. For circumcision, the base of the penis may be injected, thus blocking the nerves at this level or a circumferential infiltration of the skin just proximal to the glans penis may be done. The skin on the dorsal aspect is infiltrated with a small needle first, and the rest of the portion is done later. We have to remember that the fraenum is the most sensitive part of the organ. When once the glans is exposed, a submucous ring of anaesthesia is made at the junction of the glans with the body: this will produce complete and satisfactory anaesthesia and the operation becomes an absolutely painless procedure.

3. For stricture of the urethra: A combined sacral and surface anaesthesia with Pantocaine or Percaine is the ideal for dilatation and urethrotomy.

4. For cancer penis, a combined sacral with infiltration block for the involved inguinal glands is satisfactory for the amputation of the organ.

5. Vericocle: A subdermal infiltration is made along the line of incision: this infiltration is carried down to the cord at the point where it emerges from the external inguinal ring. About 10 c.c. of 1% Novocaine solution are introduced, care being taken to keep the needle moving during the injection and thus to avoid the injection into the veins.

6. Hydrocele: A subdermal infiltration along the line of incision is first made, and then this is carried well round the neck of the scrotum to a point well past the middle line both on the anterior and posterior surfaces. The cord also may be infiltrated at the level of the external inguinal ring.

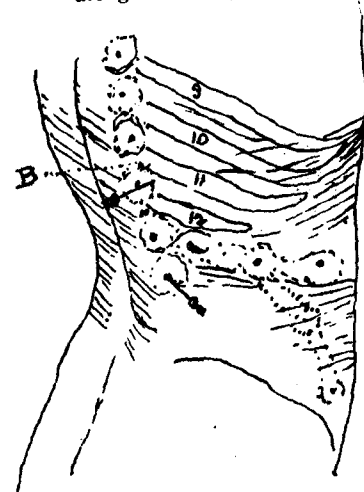
7. Operations on the female genitalia (external): Sacral anaesthesia, infiltration block combined with direct infiltration are quite satisfactory. Labial cysts and the non-malignant tumours can be excised under infiltration block. In cases of infection like the abscess of the glands of Bartholin, sacral may be desirable. Perineorrhaphy may be done under sacral combined with infiltration block.

8. Operations on the bladder: Sacral anaesthesia is the ideal method for all operations of the bladder.—eg., cystoscopy, supra-pubic cystotomy and prostatectomy. This has to be combined with local infiltration of the lower abdominal wall in the supra-pubic region for prostatectomy.

9. Kidney: Local anaesthesia is resorted to in major genito-urinary surgery, only in patients crippled with cardio-vascular or renal disease. The nerves to be blocked are the last four dorsal, the first two lumbar, and the splanchnic nerves to the kidney. The patient must be kept in the lateral position with two pairs of rubber pads

employed to secure the thorax and pelvis. Attention to the bodily comfort of the patient is a prime essential in this form of anaesthesia. A substantial pillow may be kept between the lower limbs. The lower

Kidney: Anaesthetic technique:
Intercostal and infiltration block at border of quadratus lumborum. Vertical subdermal infiltration and transverse subdermal infiltration along the line of incision.



—Courtesy: Fan's Local Anaesthesia

arm is placed by the patient in a comfortable position, and the other arm is placed upon an arm-rest and secured by straps loosely applied. Local infiltration and infiltration blocking of the last four thoracic nerves and the first two lumbar nerves to build a wall of anaesthesia between the central nervous system and the kidney will give satisfaction. A considerable amount of solution, and long fine needles are needed. The area is blocked methodically from one end to the other, along the anterior border of the quadratus lumborum, concentrating upon the regions where the nerve trunks lie. A subdermal line of infiltration is made along the site of the proposed incision and subdermal wheals are also established along the vertical line at the anterior border of the quadratus lumborum at a sufficient number of points to allow the intercostal and infiltration blocks to be made. The needle is inserted deeply at each point and the infiltration continued to the level of the anterior superior spine of the ileum. The kidney pedicle will require further infiltration under direct vision before it is clamped and ligatured, in nephrectomy operation. A certain amount of strategy for getting a good exposure of the organ—complete mobilisation and delivery of the kidney—is also required.

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Pre and Post-operative Treatment in Surgery of the Urinary Tract

BY

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UROLOGICAL conditions form a large proportion of the everyday surgery of Indian practice, yet at present it is an almost unexplored branch in this country. It is with a view to helping, perhaps a little, to stimulate an interest in this absorbing line of work and to clarify our ideas upon the treatment which must precede and follow any effective operative work on these cases, that this article has been written. Careful and precise work is a *sine quo non* to success in urinary surgery; without this painstaking effort it would be as well to leave the cases to someone else, willing and capable of the conscientious effort required to conduct the case to a successful issue.

The success and renown of the famous Continental and American clinics specialising in this work is entirely due to recognition of the fact that operative surgery is only a very small part of the whole picture. The pre-operative care, including the diagnosis and the steps leading to it, as well as the post-operative care are vastly more important. The man who operates without these preliminaries is no Surgeon, he is a quack. A surgical operation is the final Sacrament of a highly organised piece of team work involving the highest form of Faith, Hope and Charity welded by unremitting conscientious and truthful preparation. As LORD MOYNIHAN used so often to say:—"Surgery has been made safe for the patient; we must make the patient safe for Surgery". Thus, it is clear that an operative plan must be made for each individual, and we must cease to speak of "a case of Renal Calculus", etc., as we are so inclined to do.

In order to attain the standard we have set ourselves; three conditions are necessary:—

1. **Competent Nursing.**—Not only can the patient's stay in hospital be cut short, but it can be made a comfortable stay, by attention on the part of the nurse. Vigilance in such matters as calling attention to obstructed tubes and catheters, arranging tubing so that there is no tension on or kink in the tube, diplomatic forcing of fluids, etc., make a good nurse invaluable to the patient and to the doctor. In order to get this standard amongst the nursing staff, it is necessary for the medical staff of any hospital to agree on certain principles of treatment, and to each teach the same principles throughout. This avoids confusion and consequent lack of interest and understanding on the part of the junior staffs.

2. **Efficient Equipment.**—Efficient but fool proof, not elaborate. For instance, catheters and drainage tubing should be replaced fairly frequently in patients requiring urethral drainage. Nothing will irritate the patient mentally and physically more than a hard rubber

catheter. On the other hand an old catheter which is soft will kink easily, and if suction drainage is being applied it will collapse, becoming a mere obstruction.

3. **Co-operation of a Urologist.**—The Specialist's decision will be taken in all matters, and his gentle skill will be a boon in all technical procedures. One of his chief cares will be to see that adequate fluid intake and drainage is taking place. An ordinary individual loses 1,000 to 1,500 c.c. through the respiratory tract and skin per day, without sweating with only slight activity and a normal temperature. 50 to 150 c.c. are eliminated through the intestinal tract under normal conditions. 35 gm. waste material should be turned out in the urine daily; with approximately normal concentrating efficiency 600 c.c. of urine per day is necessary to remove these products. With diminished renal efficiency and retained waste products, in addition to a raised temperature, more than 1,500 cc. of fluid output *via* the urinary tract is required to clear the materials. Thus in many of these cases an intake of over 3,000 c.c. of fluid is essential. "Forced Fluids" therefore comes to mean an intake of at least 150 ounces or 4,500 c.c. in the twenty-four hours.

For the sake of clarity and limitation of the subject to the space available it is convenient to divide up the material for consideration under five main headings:—

- I. Kidney.
- II. Ureter.
- III. Bladder.
- IV. Urethra.
- V. Pyelography.

I. **Kidney.**—Pre-operative.—Certain data are required for the prevention of errors in the treatment of surgical affections of the kidney. Amongst the most important of these are:—

1. Pyelography, by which demonstration of the presence of both kidneys is made, and other information as regards their size, position, rotation, and potential troubles, obtained.
2. An attempt to estimate the function of each kidney either by Indigo or Carmine at cystoscopy,—a more reliable method than intravenous pyelography, or by separate estimation of the urea of each kidney.
3. Blood chemistry gives an estimate of the total function.
4. Chemical and microscopic examination of the urine of each kidney.

This means that we must have an accurate diagnosis before operation. One would be but rarely justified in undertaking nephrectomy without the above data. To obtain all this it may be necessary to carry out more than one pyelography or cystoscopy. In addition to these more or less special investigations a very full study of the general condition of the patient must be made, by *all* the means at

our disposal. Insistence should be made on having catheter specimens, particularly in the female. X-rays of the chest, skull, and long bones will be required before undertaking operation where there may be a tumour present.

The next, and equally essential part of all pre-operative treatment is that directed towards adequate preparation of the physical condition of the patient to withstand the operation. To this part may be attributed the smoothness of convalescence. For example, operative intervention sooner than forty-eight hours after retrograde pyelography is not wise except in an emergency, as there is a distinct risk of suppression of urine, especially if either anaesthesia is to be used. The daily fluid intake for at least four days before operation should be a fair 100 ounces a day; diet should be normal with sufficient sugar: a smoothly working intestinal tract, regulated long before the date of operation and not by the usual dose of purgative the day before, will decrease the amount of post-operative distension. If a patient already has the habit of taking a daily aperient, then, evidently, it is better to continue in his habit. But if this is not the case, I have learnt from experience that cases do better without purges or enemata; they have less discomfort from distension and derangement of intestinal function.

Post-operative.—Much has been written about the position of the patient after operation. I believe that the renal cases do best on their backs with an ice bag under the operated side, for the immediate period after the return from the operating theatre. In this position neither side of the chest is restricted, the tight abdominal binder does not limit chest movement and intravenous saline and dressing can be done with the minimum of turning.

It has been shown that during laparotomy and the next four hours after, a patient loses 1,000 c.c. to 1,500 c.c. Thus it is only reasonable to give an intravenous drip saline of at least 2,000 c.c. immediately after operation, no matter how well the fluid balance has been maintained before. In any case an excess of fluid intake is always required in renal cases to ensure the level output. So long as the fluid intake by mouth has not reached 100 ounces there must be no hesitation to continue the intravenous Salines. A careful record of the fluid intake and output should be kept in all cases.

Narcotics can be given during the first forty-eight hours without danger of interfering with renal function.

Nothing need be done to activate the intestine until at least 48 hours after operation. Then it will be found that Olive oil warmed and run into the rectum, left for one hour and followed by a very small soap and water enema will suffice to start up the evacuation. Diet may be normal after this period, other things being equal.

Mild arm and leg exercises are useful after the third day when it will be found that the average case loses the soreness and can move and sleep comfortably. No longer than 12 days in bed are necessary for the uncomplicated case.

Urological Complications.—The most common urological complications are:—(1) Sepsis, (2) Extravasation of urine, (3) Continued fever, (4) Suppression or Anuria, (5) Persistent urinary sinus.

The treatment of sepsis is the same as in any wound, *i.e.*, free drainage.

Anything that may contribute towards an inadequate drainage channel from the kidney bed to the surface will set up a urinary sinus. The usual factors are lack of a drain or badly placed drains, or too tightly sutured wound around the drain. In cases subjected to pyelotomy or nephrotomy the usual fault is in the too early removal of the drain. The minimum time to leave a drain in these cases is 7 days, because it is common experience that a kidney wound may remain for 5 or 6 days and then start to drain urine.

In order to know what we mean by continued fever, it must be understood that the normal expectation after a kidney operation is that there is likely to be a rise of temperature of 100° or 101° F. during the 12 to 72 hours immediately following the operation. If it was known that the kidney was infected before that operation, then these limits might easily be passed without causing undue alarm. The peak of the temperature would be expected to be passed by the fourth post-operative day. Nevertheless, because of this general rule there must be no neglect to seek the cause of any temperature occurring post-operatively. There is far too easy a mind in this country with these temperatures, malaria being invoked as the cause on very slender evidence, if any. This attitude is to be deplored as being unscientific, lazy and unworthy of any one taking on himself the grave responsibility of conduct of a major surgical case. The field of operation must be searched as well as all the other systems. Pyelitis and Pyelonephritis are causes often overlooked, but the fever, in these cases, should not last longer than 10 to 12 days if adequate drainage has been obtained. A temperature running for more than 14 days demands very careful urological study of the case to find and let out the infected urine or pus.

The pre-operative assurance of an adequate intake of fluid will generally forestall suppression or anuria. By the routine intravenous drip of at least 2000 c.c. of fluid per day after operation the patient may be easily carried over the critical period when fluid intake by mouth is limited. A total fluid output of 20 to 30 ounces for the first 24 hours following operation may be considered to be satisfactory. During the next few days it should climb in proportion to the fluid intake increase, until its level is reached. This entails the careful routine measurement of intake and output. Where there is doubt about the output, it may be necessary to catheterise the unoperated kidney in order to prove the amount of excretion by that kidney.

Where pyelotomy or nephrectomy has been carried out, leakage of urine from the wound may be expected to continue for 7 to 10 days; there is no cause for alarm. Where no drainage has been employed, only about 50% of cases heal by primary union. Those

cases which leak urine from a wound not primarily drained need not cause concern unless the leak continues for more than 14 to 18 days, in which case cystoscopy, ureteral catheterisation and dilatation may be necessary to rule out obstruction of the natural passages as a cause of delayed healing. X-rays with both intravenous and retrograde pyelograms may be of assistance, and no hesitation should be felt in employing these aids at this stage. A catheter reaching the renal pelvis on the leaking side signifies that healing will ultimately occur. It should not be forgotten that a rise of temperature, due to temporary blockage of the ureter, by oedema of its mucosa, may follow on the removal of an in-lying catheter used for drainage of a kidney. This type of constant drainage should only be resorted to on rare occasions. Where there has been drainage of the kidney or pelvis, the fistula usually closes within five days of removal of the tube.

Special post-operative Measures.—Each type of kidney operation requires attention to one or more special points for the successful conduct of its post-operative stage.

Nephrectomy.—Adequate fluids, a measured output from the remaining kidney, and a sharp look out for any hæmorrhage, are the main points requiring attention. If it had been found necessary to leave the pedicle clamps in position, it is quite usual for them to remain for 5 to 7 days.

Nephrotomy.—How long should the tube stay in position, is the main problem. This will depend upon the amount of infection, the condition of the ureter, and surgical damage to the cortex. Ten to fifteen days is not an unusual time for the tube to stay in position, without interfering with the ultimate healing. Irrigation may be required, daily, with some weak suitable antiseptic. In cases of calcium phosphate stones, 1% is an average with urates and cystine. During irrigation, over-distention of the pelvis should be avoided; 10 to 15 c.c. of the chosen solution given slowly and repeated a few times, would be quite sufficient.

Nephrostomy.—Requires considerable attention if the patient is to be made comfortable. A mushroom tube is probably the best type of drainage, and it should be changed every 3 or 4 weeks. A member of the patient's family should be taught how to clean, sterilise, remove and replace the tube. There are many types of apparatus on the market for the handling of permanent nephrostomy. The choice of one is a matter for decision according to the individual surgeon's taste.

Pyelotomy.—There are no unusual features here. The drain to the kidney bed should remain in place for 5 to 7 days.

II. Ureteral Surgery.—The same general recommendations already made for kidney pre-operative care apply here.

If the apparatus is available in the operating theatre, it is a wise precaution to take a plain X-ray of the region of the

operated upon, in order to make sure that the ureteral calculus is still in the region where the surgeon proposes to operate.

Post-operative Care.—Much the same procedures as are used in kidney cases will be required here. About 50% of cases will heal by primary union. No concern over drainage of urine for a period of 9 upto 16 days may be felt and any wound drain should be left in position for at least 7 days. Suspected obstruction will require cystoscopy with the dilatation, and possibly the passage of a ureteral catheter left in situ for 48 hours, may be required to insure drainage.

Transplantation of the ureter into the colon requires special care in its after treatment, the points varying with the technique used. However, maintain adequate drainage, fluids, a rectal tube to allow escape of urine and flatus, to guard the anastomosis line, and prevent peritonitis. The introduction of 12% Sodium Sulphate and normal Saline into the vein will do much to avoid suppression of urine.

III. Bladder Surgery.—**Pre-operative.**—The usual accurate history and physical examination will of course be required. When acute infection is present, a dilute alkaline urine may be produced by a large intake of fluids combined with 10 grains of Potassium Citrate, four times daily. A hot bottle on the abdomen, warm douches, warm irrigations, will give much relief. Two ounces of sterile mineral oil instilled into the bladder is a valuable adjunct. Gross hæmaturia can render the bladder very irritable and hence increase the bleeding. Most clots can be evacuated through a No. 20 two-holed rubber catheter by alternate irrigation and suction with some mild antiseptic. Once the bladder is free of clots, active bleeding will subside if the organ is put at rest by constant drainage. Should these measures not suffice, the question of cystotomy must be considered. Having got the patient comfortable, the detailed diagnostic procedure is the next step. The usual blood urea, non-protein nitrogen, blood counts, hæmoglobin, &c. will be required; cystoscopic examination, pyelograms and cystograms, with X-rays of other parts of the body from metastases may be included. A proper fluid balance for at least 48 hours before operating, a normal temperature and an adequate glycogen reserve are necessary before operation on an elective case.

Post-operative.—It is wise, except in the very rare cases where primary closure of the bladder can be done, to employ supra-pubic drainage. A No. 34 open-ended mushroom catheter is a very comfortable drainage tube. Bring it out of the upper end of the mid-line supra-pubic incision, surround it with adhesive tape where it emerges from the patient's binder and pin the tape to the binder on the opposite side to the connecting tube. This will balance the weight and pull off the tube. Free fluid by mouth or intra-venously should be pushed to the upper limits. During the first 48 hours, the tube should be watched carefully in case a small clot may block it and cause an overflow of urine through the wound beside the tube. A small drain in the pre-vesical space is a safeguard not to be forgotten. With suitable arrangements and reasonable general recovery of the patient from the

immediate effects of the operation, there is no reason why these patients should not become ambulatory between the 4th to 10th days.

Complications.—Apart from complications involving the heart and lungs, there are 8 principal local complications which occasionally follow in bladder cases:—

1. *Bladder spasms*:—Placing the supra-pubic tube too deeply in the bladder will bring it into contact with the trigone, this will cause violent spasm. Blockage of the drainage tube by clots or shreds of mucus will obstruct the flow from the bladder and cause spasms. Acute infection is another common cause of spasms.

2. *Hæmorrhage*:—This may be due to failure to include the bladder mucous membrane in the closure around the drainage tube. A temporary urethral catheter in place will set the bladder at rest and allay hæmorrhage from such a cause usually. Should it persist, the wound must be re-opened and the bleeding point sought for.

3. *Infection in the pre-vesical space* is essentially due to omission to place a small drain in the lower end of the wound as already mentioned. It will require free opening of the wound with drainage and possibly counter openings.

4. *Abdominal distension*:—Acute dilatation of the stomach should be ruled out before treatment is instituted for simple gaseous distension of the great bowel.

5. *Nausea and vomiting*:—The surgeon must be on his guard against too placidly assuming this to be due to the effects of the anæsthetic. Dilatation of the stomach is again a possibility, but most frequently deficient renal function will be the cause. Intravenous fluids will be the method of attack.

6. *Hiccough* is often a troublesome complication; undoubtedly the most effective remedy is inhalation of CO₂, 10 to 15% with 85 to 95% Oxygen delivered through an ordinary gas inhaler is an excellent method of treatment.

7. *Pyelitis*:—This may occur from the 5th to the 10th day after operation. There will usually be a rise of temperature, but there may or may not be any kidney pain. It usually responds to medical treatment within a week. This should not be confused with the slight rise of temperature which often accompanies healing and closure of the supra-pubic sinus.

8. *Leakage of urine* around the supra-pubic tube, with proper care should not cause worry, and if wound drainage is maintained, a dry wound will be obtained in 5 or 6 days.

Special Post-operative Measures.—Diverticulectomy will require the same general after-care as cystostomy. Special care must be taken to detect evidence of any undrained extravascular inflammation or urinary extravasation. The usual signs of this are tenderness of one or other lower quadrant, or high rectal tenderness. Bladder irrigations must be done with very great care in order not to disturb the

suture line. If the diverticulum lay close to the ureteric orifice, obstruction of the ureter on that side must be watched for. At least two weeks' interval must be allowed between this operation and prostatectomy, should the latter be necessary. Ureteral drainage is very advisable to keep the bladder from distending.

Prostatic Surgery.—**Pre-operative Care.**—Cases presenting themselves for prostatic surgery may be divided into two groups:—Those with acute retention and those without acute retention but with residual urine.

Acute Retention.—Most cases of acute retention can be catheterised with a soft rubber catheter. If difficulty is met with, it will usually be due to straining by the patient, in which case, administration of $\frac{1}{4}$ grain Morphia half an hour before the next attempt at catheterisation will probably allow easy passage of a catheter. Occasionally especial difficulty may be encountered, when certain special treatment may be required. A suitable selection of catheters for meeting most eventualities is as follows:—

Catheters, two-holed No. 16, 18 and 20 F., a coude tipped silk catheter, 3 filiforms with followers No. 14 and 18 and a stylet. The silver catheter should be avoided, it has done much harm; the stylet used with the two-holed catheter will enter a difficult bladder neck with less trauma than a metal instrument. The filiforms are occasionally useful in the case with marked and painful distention of the bladder.

The question of how much urine to remove from a patient depends upon the estimate of the general physical condition, the history of local and general systems, and any previous record, together with the answer to the question: Was there any residual urine before acute retention came on?

If it is known that there was no residual urine, then it is reasonable to draw off the whole of the urine especially if the catheter is to be withdrawn and constant drainage not instituted. If there is any suspicion that there was residual urine previous to retention, 6 to 8 ounces withdrawn will be sufficient to relieve the patient's distress and the distal end of the catheter may be temporarily clamped in situ.

There are many methods of decompression of the bladder in vogue, probably the simplest and the most serviceable of these is one which can be arranged without any special apparatus except a dropper from a saline infusion set, and a small piece of bent glass tubing. The bent glass tubing connected to the rectal catheter by rubber tubing should be supported at a height of one foot above the level of the symphysis pubis. The other limb of inverted "U" tube is connected with the glass dropper and a rubber tube conducts the overflow of urine from the dropper into a suitable receptacle. By this method, steady decompression of the bladder can be instituted and the height of the "U" tube adjusted so that the out-flow of urine, each hour, will be about 3 ounces more than the intake of fluid per

hour; 24 to 72 hours should be taken to complete the decompression. The drainage may be kept up after this, care being taken that the catheter does not set up acute urethritis and that any infection of the bladder is controlled. Constant lookout must be kept to see that the catheter and tubing do not become plugged with mucus or deposit of phosphates. The period which the catheter may be maintained without replacement varies from case to case, from 3 days up to 10 days. In any case, it is wise to replace the catheter with a fresh one after suitable irrigation of the urethra with 1:5000 Potassium Permanganate solution. Bladder irrigation with weak Boric solution twice daily will clean the bladder and comfort the patient.

Residual Urine without Acute Retention.—The manner of pre-operative treatment of such a case will depend upon whether or not infection is present and what type of operation is contemplated. If prostatic resection is to be carried out, daily catheterisation with irrigation, is probably the best plan. On the other hand, the two stage supra-pubic operation with residual urine less than 6 ounces will require cystotomy in the first place. The period of drainage in either case may be fully occupied in carrying out a complete investigation of the case clinically and in the laboratory. The following conditions should be known about any case upon which it is proposed to carry out an operation:—

- (1) The cardiac reserve.
- (2) The blood pressure stabilised over a period of a few days, and a pulse pressure at least equal to one half of the systolic pressure.
- (3) The presence of any coronary disease.
- (4) The fluid intake and output should be stabilised on a definite ratio for several days.
- (5) A fair appetite.
- (6) Regular bowel action.
- (7) Tolerance of any existing urinary tract infection as shown by a normal temperature and lessening of the amount of sediment.
- (8) Non-protein nitrogen of 40 or under.
- (9) Blood urea of 20 or under and any other kidney function test should show at least 30% or better. If these requirements can be fulfilled, the patient may be considered to have been made safe for surgery. In the case of a two-stage operation, these requirements must be fulfilled for each stage if possible. The second stage may be carried out about 8 to 10 days after the first.

Post-operative Care.—Post-operative care follows along the lines already laid down under previous sections.

Special Post-operative Measures.—The great fear of the surgeon at this stage is the hæmorrhage, no matter what type of operation has

been performed. The particular system of drainage employed must be familiar and receive adequate attention.

1. *Supra-pubic prostatectomy*.—The routine intravenous saline should be instituted at once. The drainage system must be connected up, and the surgeon certain that it is functioning efficiently. Morphine will be required as a routine. Enemas should not be given for at least 48 hours. No matter whether a bag or a pack has been used for hæmostasis, the colour and consistency of the supra-pubic drainage fluids should be carefully watched for the first 24 to 48 hours. Over this period, the colour should begin to clear and the fluid become less thick. There should be no clots after the first 24 hours and the flow of fluid should be free. If some bleeding of a minor degree occurs, the bladder may be irrigated with hot normal Saline or Boric lotion, without distension of the bladder. The presence of clots indicates the absolute necessity of gentle irrigation from time to time during the first 48 hours. Hæmostatic bags should be removed 24 hours after operation. It is wise to empty the bag one hour before removal, at the same time releasing the clamp holding the urethral tube taut. By this means the possibility of any bleeding taking place can be estimated before removal of the hæmostatic agent. In those cases where a urethral catheter has been used, urine will not drain supra-pubically after the third day and one week after operation the wound should be dry. Should the prostate have been adequately removed, the case should heal without supra-pubic drainage. The urethral drainage may be left for 10 to 14 days or until there is solid union of the supra-pubic wound. This prevents fibrosis of the bladder neck becoming complete and keeps the wound dry. The criterion of adequate healing of the wound is a dry wound after the introduction through the urethral catheter of several ounces of Boric lotion. Two days later, the catheter may be removed.

2. *Prostatic resection*.—Hæmostasis must be complete before the patient leaves the table. A No. 23 F. whistle tip catheter must be inserted through the resectoscope sheath before its removal. If everything goes well, this catheter may be removed on the second post-operative day. If there is anything abnormal, retain the catheter for two or three days longer. It is wise to remove this catheter in the morning so that, should the patient not pass urine for the next 4 or 5 hours, sufficient time will be on hand for the re-insertion of the catheter before night-fall, thus ensuring a comfortable night for the patient and sound sleep for the surgeon. Irrigation with hot Boric will control most cases of hæmorrhage after this operation. Should the bleeding be uncontrollable by this means, re-introduction of the resectoscope, evacuation of the clots and coagulation of the bleeding point must be carried out. Should it be impossible to control the case by this means, then cystotomy will be required. The urine of these cases should be kept strongly acid.

3. *Perineal prostatectomy*.—Leakage of urine through the wound will continue until the internal sphincter resumes its function. At this moment, the patient will void through the perineum and continuous

leakage will cease. At a latter date, the wound will heal and urethral continuity be re-established. This latter part of the healing process is much assisted by the passage of large sounds to dilate the friction between the membranous and prostatic urethra. The average time for closure of the perineal fistula is between 18 and 21 days. When gauze packing is used it is advisable to soak it in Vaseline and pack it around a large tube lying in the wound. Beginning 24 hours after operation, and completing by the 2nd-day, the packing may be gradually removed. The tube is removed on the 3rd or 4th day, provided the urine passing through it is clear. The remainder of the programme is as detailed above. Each manipulation with sounds should be preceded by irrigation with a mild antiseptic and followed by insertion of a soft rubber catheter corresponding in size to the largest sound passed.

It is not usual in these cases to give an enema until 7 days have elapsed since operation. Their use tends to encourage haemorrhage. Should abdominal distension trouble the patient very much and remain obdurate to treatment by poultices, etc., then an enema of equal parts of milk and molasses will usually prove effective. The uncomplicated patient may be up and about by the 5th day.

Complications.—The most likely of these to be troublesome are the following :—

1. *Urinary suppression.*—This complication has been discussed.
2. *Epididymitis and central abscess of the testicle.*—These complications have almost disappeared since vasectomy has been introduced as a routine preliminary to prostatectomy. Rest and scrotal support are the main lines of treatment, and usually as successful, but if the affected side remains swollen and tender for longer than ten days, the question of a central abscess of the testicle must be considered. Orchidectomy may be required for relief in this case.
3. *Secondary haemorrhage.*—usually encountered sometime between the third to the 12th operative days, may cause great trouble. The measures for its control have already been discussed.
4. *Hiccough.*—A common complication, the treatment of which has already been discussed.
5. *Continual fever.*—Pyelonephritis is not unusually the cause. The fever may continue for some 10 or 12 days. Infection may remain in the trabeculae or diverticulae of the bladder. Urethritis must be excluded as a cause. Pelvic phlebitis may be difficult to diagnose except by exclusion of the above noted causes of fever. It is a dangerous complication.

IV. Urethral Surgery.—The general measures already noted apply here. The main operations will therefore be considered without further preamble :—

1. *External urethrotomy.*—If urethral drainage is used, catheter is left in place for 10 days provided the patient will tolerate it. It

can then be removed. After four days sounds may be passed to the bladder preceded by irrigation. In ten days time, sounds are again passed and the process repeated at intervals of one month to six months. If perineal drainage is used, the tube may be removed after six days, urine being voided both perineally and by the urethra.

2. *Extravasation of urine.*—Although incision and drainage are obviously necessary, it must not be forgotten that these patients are toxic and dehydrated and so will require large quantities of fluids. Convalescence is usually protracted.

3. *Plastic surgery of the penis* usually involves post-operative care of a supra-pubic, of urethral drainage in addition to the primary site of operation. Oedema may be troublesome and will be reduced by an ice bag over a dry dressing. Diversion of the urinary stream should be persisted in for 14 to 16 days.

V. Pyelography.—*Retrograde pyelography.*—It is better to insist on a 24 hours' stay in hospital following on this examination in case of urinary suppression, rise of temperature or pain following the passage of instruments. Immediately before examination, kidney function should have been estimated, the intestinal tract completely freed of gas and barium. Some form of twilight sleep is a suitable narcotic for the operation. After the operation, a soft solid diet may be taken, hot stupes may be applied to a painful kidney and Morphia may be needed. Mild alkalis, liquid and free fluids by mouth may alleviate any bladder and urethral irritation.

Significance of Bio-Chemical Analyses in Urology

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URO-GENITAL tract, though anatomically may be divided into a lower or genital tract and an upper or urinary tract, with the bladder in the middle being considered a mid-tract, in all pathological lesions, should be considered as a whole, as a lesion in one part sooner or later may affect the other parts. In every uro-genital abnormality the function of the kidneys is an important consideration: for any lesion whether it be obstruction or infection or both in any part of the tract may ultimately affect the renal function unless relieved early. Urologists employ, besides the usual clinical methods, bio-chemical, bacteriological, radiological and instrumental methods of examination for the solution of their problems regarding the nature, seat and extent of the lesions.

The examination of urine, and tests of renal function, (a) total and (b) relative, are the main bio-chemical methods employed by urologists for diagnostic and prognostic purposes.

Analysis of Urine may be considered the very foundation of urological practice; but the chemical report alone is not enough unless the manner of collection and the freshness of the sample are simultaneously noted. For urological purposes a fresh sample of uncontaminated bladder urine is required. In the case of women a catheter specimen is better while in the case of men, the midstream generally the seat of bacteria and muco-purulent secretion and so the first portion of the urine is contaminated with them and also with the secretions of the external genitalia. The last portion of the urine on the other hand carries pathological contents of the prostate and seminal vesicles, squeezed into urethra by the peristaltic action of the urethral musculature at the end of urination. Hence for urological purposes, the collection of urine is done by the classical three glass method, care being taken not to interrupt the stream in transferring from one glass to the other.

Physical Tests.—The appearance of urine is of some diagnostic importance. It may be cloudy or contain shreds in it.

Cloudiness of urine may be caused by pus, blood or bacteria, chyle or lymphocytes, or again by precipitated phosphates, urates, carbonates or oxalates. To differentiate the cause of cloudiness the simple Heat Test and the addition of a few drops of dilute (10%) Acetic Acid are employed. Cloudiness is increased on heating when it is due to phosphates, pus or albumin. Addition of a few drops of Acetic Acid clears the urine in the case of phosphate, no change in

the case of pus, and increases the cloudiness in the case of albumin. No change in the cloudiness is noted on heating when it is due to carbonates or bacteria but addition of acetic acid causes effervescence and clears the urine with carbonates while no change is observed with bacteria. Cloudiness disappears on heating when due to urates and addition of Acetic Acid has then no effect.

Shreds in the urine:—They indicate infection of the lower genital tract and inflammation of the urethra. The shreds may be long, light filaments floating in the urine, when due to superficial mucous irritation, thick heavy shreds which sink to the bottom of the glass on account of the accompanying pus-cells, when due to subacute inflammation, or large or small coma-shaped shreds floating about in the urine, when due to chronic inflammation of the glands in the urethra.

The presence of cloudiness or shreds is of chemical value in three glass test. When only the first urine is cloudy, it indicates acute or subacute urethritis, anterior or posterior or both. When first and third samples are cloudy, severe posterior urethritis is indicated, although sometimes even the middle portion is cloudy on account of the pus draining back into the bladder. When all the three samples are cloudy, it may be due to cystitis, pyelitis or pyelo-nephritis. Similarly when shreds are present only in the first urine, urethritis is indicated, anterior urethritis producing small coma-shreds, posterior urethritis producing heavy shreds. When the third glass urine is cloudy or contains large coma-shreds, prostatitis is indicated. These inferences have to be substantiated by further examination.

Phosphaturia is more medical than surgical and has very little to do with the formation of stones, although phosphates form an important constituent in most urinary calculi.

Oxaluria rarely produces cloudiness and is little affected by heat and Acetic Acid. Oxalate crystals are readily spotted under the microscope. They are as a rule due to fermentation in the alimentary canal and the passage of the sharp crystals through the ureter can give rise to renal colic. Similarly precipitation of uric acid crystals in the renal pelvis can cause pain or renal colic and therefore, the presence of uric acid or oxalate crystals in the freshly voided urine is of clinical significance especially in a patient with colic or backache. Even if they are precipitated in urine on standing for twenty four hours, they have some importance as a probable cause of pain or renal colic.

Chyluria produces a milky urine rather different in appearance from pyuria which settles down on standing. It may be, especially in tropical countries, due to parasites like filaria, ascaris, echinococcus or cysticercus. Obstruction of thoracic duct or aneurysm of a lymphatic vessel can also give rise to chyluria. Often the mechanism producing chyluria is not understood.

The other physical tests like colour, odour and their changes in pathological conditions are more medical. However, hæmaturia and pyuria are of much importance to the urologist and shall be dealt

with under microscopic test. In hæmaturia urine may be smoky, red or even of coffee ground colour, according to the amount of blood contained in the urine. Urine is generally black in vesical carcinoma as a result of change from retention.

Microscopic Test.—This is an important test and should be carried out carefully. Identification of pus cells, red cells and epithelial cells is not always easy. Leucocytes are sometimes mistaken for round epithelial cells. But addition of a drop or two of dilute Acetic Acid to the slide helps to differentiate the single round nucleus of the epithelial cell from the polymorpho-nucleus of the leucocyte. Before the addition of Acetic Acid which lyses the blood, red cells appear as non-granular biconcave discs, smaller than pus cells and epithelial cells. Another point to note is the presence of motile or non-motile bacteria. But they are better identified by examination of stained slides. Epithelial cells are not of much urological significance except when present in very large numbers when tumour may be suspected.

For microscopic examination, it is better to prepare three or four slides, one of uncentrifugalized urine, one of the centrifugalized sediment, and one or two of the sediment stained with special stains. From urological point of view, four observations are important: (i) Pyuria (ii) Hæmaturia (iii) Bacteriuria (iv) Tumour cells.

Pyuria.—When pus cells are few, urine is clear and pus cells are noted only under the microscope, but when marked, urine will be cloudily and even milky in appearance, the pus cells however settling down to the bottom of the conical flask on standing. The three glass test helps to determine the source of the pus. When all three urines are uniformly cloudy, pus may be from the kidney, from the bladder or from the prostate, pus being drained back to the bladder. Rectal examination helps, when pus is from the lower genital tract. The lower tract must first be investigated before instrumental methods are employed to investigate the upper tract. However, it must be remembered, ureteral or pelvic occlusions sometimes prevent the pus draining into the urine, thereby producing clear urine in spite of the presence of pus in the upper urinary tract.

Hæmaturia is very important and almost always pathological, requiring a careful study and investigation. The cause may be general or local. Under the former, you have (i) abnormalities of blood like hæmophilia, erythræmia, scurvy, purpura, or (ii) infectious fevers like typhoid, malaria, small pox or (iii) from toxic drugs like cantharides, turpentine urotropine, or again (iv) in nervous diseases, like Tabes Dorsalis and hysteria. Local source may be from the lower tract or upper tract. Three glass test will be here also of help to determine the source. Stone, infection, stricture or tumour in one or other part of the tract or tuberculosis of the kidney or glomerulonephritis may be the underlying pathology. Bacteria in urine may be investigated by microscopic examination of plain and stained slides or by cultural methods which are not considered in this paper. Cytological examination can be done by addition of 20% Formalin to

an equal amount of urine, obtained by catheterization, and the sediment deposited on centrifugalisation, being fixed and embedded in Paraffin sections cut and stained, and then examined under the microscope. This procedure is of particular value in undiagnosed hæmaturia when the characteristic cells will help the diagnosis.

The ordinary chemical examination of urine for albumin and sugar, though not of such importance to the urologist, are generally done. But the reaction of fresh specimens of urine is of considerable importance. *Bacillus proteus* and *micrococcus urea* produce alkaline urine by splitting urea into ammonia. Red litmus paper is turned blue on testing the ammoniacal urine but the blue colour disappears on drying the paper in the air. If the alkalinity is due to fixed bases, the blue colour of the litmus paper does not disappear on drying. The following simple indicators may be used to determine the reaction of urine. Their strengths, pH. ranges and change of colour are given below. The method of testing is done by addition of 4-5 drops of the indicator to 5 c.c. of distilled water and then adding 4-5 drops of the urine, noting the colour change.

	Strength in 50% Alcohol.	pH. Range.	Colour Change.
Methyl Red	0.3%	4.3—6.1	Red—Yellow
Brom Cresol purple	0.2%	5—6.6	Yellow—purple
Phenol Red	0.6%	6.7—8.3	Yellow—Red.

For the diagnosis of renal tuberculosis, guinea-pig inoculation test is done; but a positive guinea-pig test does not necessarily indicate renal tuberculosis as tubercle bacilli in the blood stream are eliminated by a normal kidney. However, microscopic finding of tubercle bacilli from stained slides of urinary sediment gives a more definite diagnosis of renal tuberculosis.

Tests of Renal Function.—Total. Various tests have been employed to determine the total function of the kidneys. They may be divided into three categories: (i) Tests of excretion (ii) Tests of retention and (iii) Combination tests.

I. Tests of Excretion.—1. Substances normally found in urine:

(1) *Water*.—The quantity of urine output in 24 hours is considered, to determine the function of the kidneys, when total intake of water should also be taken into account. On an average with mixed diet urine output in 24 hours is found to be 1200 c.c.—1800 c.c., the outside limits being 800 c.c. and 2500 c.c. If the volume is below 800 c.c. it is called oliguria and when it is above 2500 c.c., polyuria.

(2) *Solids*.—Cryoscopic methods were used to determine the concentration of solids in urine to test the kidney function; because of the chemical difficulties involved and as the same information can be obtained by specific gravity, cryoscopic methods are not now employed. Specific gravity of urine gives valuable information regarding kidney function and is much used by physicians. But the usual urino-meter marked 0—1060 is one not accurate enough for the

purpose. Three urino-meters with ranges 0—15, 15—30; and 30—45 more accurately calibrated will be more accurate in measuring specific gravity and are strongly recommended for use. For medical purposes two tests are generally employed, *concentration test* and *dilution test*. The former tests the kidneys' capacity to produce a concentrated urine when fluids are withheld and the latter tests the capacity to produce a dilute urine when fluids are liberally administered. A normal kidney can produce urine with a specific gravity 1030—1032 and dilute urine of 1001—1002. When the kidneys' function is impaired both the concentration and dilution powers are diminished; so the specific gravity of concentrated urine comes down while that of dilute urine goes up; eventually when kidneys are severely damaged they produce a urine of a specific gravity of 1010, more or less fixed, which is isotonic with the blood, whether fluids are withheld or administered liberally. But these tests are not of as much importance to urologists as they are to the physicians.

(3) *Nitrogenous constituents*:—Estimation of total nitrogen output in 24 hours or uric acid output or urea or creatinine output may not be of use in testing kidney function as their output depends on protein intake and also on tissue metabolism. The same objection applies to the chloride output.

2. *Excretion of substances ingested*.—(1) *Substances found in urine—Urea*.—Urea concentration test of McLEAN and DEWESSELOW which was of much use before, is not used now. It is replaced by blood urea clearance test. After 12—18 hours' deprivation of water and food, the patient empties his bladder in the morning. He is given 15 grammes of urea dissolved in 200 c.c. of water and exactly one hour and two hours after the administration of urea, bladder is emptied. These specimens are measured and their urea concentration estimated by hypobromite method. If the volume of urine exceeds 120 c.c. the test is discarded and repeated again. If the kidneys are functioning normally the urea concentration in at least one specimen will be above 2% after administration of urea. If all the specimens contain urea below 2% the kidneys are considered to be deficient. This test is not of much importance in urological practice.

(2) *Excretion of a foreign dye administered*:—Different dyes have been used for estimating renal function, the simplest and best of them being Phenolsulphonaphthalein. This is a most widely used test in America and it is considered the simplest, accurate and reliable and not at all harmful to the patient. 0.6 mg. of the dye contained in 1 c.c. (Monosodium Phenolsulphonaphthalein) is injected into the lumbar muscles after thoroughly emptying the bladder. A glass of water is given to drink. The bladder is emptied again one hour and ten minutes after the injection, ten minutes being the time taken for the dye to make its appearance in the urine, and another sample one hour after the 1st sample. The dye contained in these two samples of urine are estimated colorimetrically. Urine is diluted with 10% Sodium-Hydroxide till the maximum colour is produced and then diluted to 1,000 c.c. with water. A standard is prepared likewise with 1 c.c. (0.6 mg.) of the dye and diluted with alkali and water to make up

1,000 c.c. The unknown solutions are compared with the standard in a colorimeter and the dyes excreted in the 1st and 2nd hour are calculated. Normally, the excretion in the first hour is three or four times that of second hour.

1st hour 40%—60%. 2nd hour 15%—25%. Total 55%—85%.

There is variation in the excretion rate if the dye is injected, subcutaneously, intragluteally, intravenously or by intralumbar route. For total function test intralumbar route is employed. For relative function, the much quicker intravenous route is employed. When the excretion in the first hour is less than the usual proportion with that in the second hour, although the total output may be within normal limits, renal insufficiency is indicated.

II. *Tests of Retention*.—When substances normally excreted in the urine accumulate in the blood above their normal concentration, renal insufficiency is indicated provided extra renal causes are excluded. The retention may be only temporary as in anuria of calculus or permanent as in damage of the renal tissue. Retention of all substances, urea, uric acid, creatinine and chloride have more or less the same significance, although retention of urea (azotoemia) is differentiated by retention of chlorides. One or the other appears to be retained earlier in different cases. Normally blood urea ranges between 20—40 mgs. %. Above 50 mgs. % may be considered abnormal. Blood urea is easily estimated and is of value in measuring kidney function. But it should be remembered there are extra renal causes of azotoemia as in dehydration caused by vomiting, profuse diarrhoea or hæmorrhage, or in diseases of the liver and biliary passage or in traumatic or surgical shock or infections. In these cases kidneys may be normal and yet there may be retention of the urea in the blood. Blood urea estimation is of considerable importance to urologists especially in cases of obstruction like enlarged prostate when its level determines the operative procedure.

III. *Combined Tests of Excretion and Retention*.—Ambard's constant, Maclean's modification of it, Addi's Ratio are not now much used and so are not discussed. Vanslyke's urea clearance is widely used both in medical and surgical cases and so shall be discussed. VANSLYKE and co-workers as a result of a series of investigations found that the excretion of urea is proportional to the blood urea-concentration and the ratio of urine urea to the blood urea is proportional to the volume when the volume of urine excreted per minute, is above 2 c.c. and proportional to the square root of the volume when it is below 2 c.c. per minute. This 2 c.c. per minute they called augmentation limit. When the volume is above the augmentation limit the clearance was called maximum clearance and when it is below the limit, standard clearance. Maximum and standard clearances are calculated from the following formula.

$$\text{Maximum clearance} : \frac{U}{B}$$

$$\text{Standard urea clearance} : \frac{U}{B} \times \sqrt{V}$$

Where U = concentration of urea in urine—mgms. per 100 c.c.
B = concentration of urea in blood—mgms. per 100 c.c.
V = volume of urine per minute.

The average maximum clearance for adults is found to be 75 c.c. and standard clearance 54 c.c. The clearance calculated for a particular patient according to the above stated formula is expressed as a percentage of the average maximum or standard clearance according to the volume of urine per minute.

The technic of urea clearance is as follows: The patient is examined after a light breakfast which does not contain coffee as it acts as a diuretic. The patient empties his bladder completely noting the time of evacuation. In the case of old men and women catheter is used to empty the bladder. The patient is then given 200 c.c. of water to drink. The bladder is emptied again one hour and two hours after the initial voiding of urine. These specimens are collected and kept in separate bottles. A sample of blood is taken for estimation of blood urea during this interval, say 50 minutes after the start. Urea concentration is estimated in the sample of blood and two specimens of urine. Then the clearance values are calculated for the 1st hour and 2nd hour using the volume of the two specimens and the formula. The clearance values are expressed as percentages of average normal. The two percentages of the 1st hour and 2nd hour will be within 10% and then the average of the two is given as the urea clearance value. If the percentage of the average normal is above 70% the kidney function is normal. The range between 50% and 70% is doubtful. Below 50% it is deficient and below 20% inefficiency is marked and below 5% uræmia is threatening. A single test is not of much value. Repeated tests alone give the correct picture. There are other clearance tests like creatinine clearance, uric acid clearance and chloride clearance but they do not give any better information.

Limitations of Total Renal Function Tests.—All functional tests are at best empirical and cannot be considered an accurate measure of the renal activity. The functional test gives no indication of structural damage. The tests so far cannot differentiate tubular function from glomerular function. There are reflex inhibitions of urinary secretion in unilateral and even in bilateral lesions. Further at the time of the test the kidneys may be hyper-permeable. Finally inaccuracies in the technic must be borne in mind. In spite of these, tests of renal function are of very great importance in urological practice.

Relative Function.—The urologist often desires to know, besides total renal function, the work done by each kidney. For relative renal function test the amount of dye excreted by each kidney in a definite time is noted. Phenol-Sulphonephthalein is by far the best dye for the purpose. Here after ureteral catheterization 1 c.c. of the dye (0.6 mg.) is injected intravenously. The dye appears in 2—5 minutes. Then the urine secreted in 1st 15 minutes and the 2nd 15 minutes are collected separately from each kidney and the dye in each specimen is estimated as described before. Normally each kidney excretes 20%—25% in first 15 minutes (total 40%—50%) and 5%—10% in second fifteen minutes (total 10%—20%).

Here also one should remember that temporary inhibition of one or both kidneys occurs and may give a wrong impression. The inhibition may be ureteral reflex which follows the passage of a catheter or due to stone in the opposite kidney or may be produced by vesical irritation or cerebral irritation or again may be due to pressure as in obstruction of the lower tract in enlarged prostate or may be due to toxic causes as in renal tuberculosis or in pyonephrosis. But if total renal function has been determined before, the inhibitory influence in relative function can be detected.

Indigo Carmine is another dye used in urology. On account of the marked blue colour of the dye it is generally used to localize the meatus of the ureters when they are obscured by disease. The dye generally appears in 6—10 minutes. Relative function can also be estimated by collecting urine for a definite period, say, 15 minutes from each kidney and determining the percentage of urea 'in' each specimen but the Phenol-Sulphonephthalein test is preferred.

Studies of relative function in hydronephrosis must be taken with a good deal of doubt. If the tip of the catheter is below the obstruction, a low function will be the result, which however does not mean that the kidney is damaged. On the other hand, if the catheter is in the pelvis and above the point of obstruction, with the pelvis draining freely, the kidney will be found normal or even hyperactive. In these cases, uretero-pyelography will be of considerable value in determining the degree of nephrosis and the probable cause.

Again in hypertension renal tests are employed to differentiate non-renal type from renal type. In oligurias and anurias resulting from nephrosis, necrosis or acute or chronic glomerulo-nephritis, estimation of blood urea is helpful and decapsulation restores the kidney function which again can be watched by the tests stated above. In pyelo-nephritis repeated periodical examinations of urine and blood urea help to watch the course of the disease. Blood urea estimation and renal function tests are to be performed periodically in prostatic hyperplasias in watching the progress of the condition and in deciding the need or otherwise of surgical intervention. If the blood urea is above 50 mgs % the operation should be performed in two stages. After supra-pubic cystotomy and drainage, blood urea, if above normal, will come down to normal and the resection can then be successfully carried out.

In renal lithiasis also repeated examination of urine and microscopic examination of fresh specimens are of value. Total and relative renal function tests will be called for in renal lithiasis to help the urologist in his line of treatment.

In conclusion, it must be admitted that bio-chemical analyses and renal function tests are only one of the weapons used by urological diagnosticians and must be interpreted along with the information obtained by history, physical examination, bacteriological examination of urine, radiography, intravenous urography and instrumental methods of examination and undue stress should not be laid on the laboratory findings without considering all the findings together and attempting to reconstruct the picture as a whole.

Diathermy in Genito-Urinary Diseases

BY

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I PROPOSE to present for the benefit of the general practitioners in India a discussion on the value, uses and limitations of diathermotherapy as applied to the disorders of the male genito-urinary system and wish to deal with the subject in a manner that may induce them to take interest and evaluate this well established and useful therapeutic agent, the diathermic heat, with a view to intelligently understand, prescribe and use it in their day to day practice.

The details of diathermic waves and currents, their physiology, indications and methods of application to female diseases were given by me in my paper, "Diathermy in Gynaecology" published in a previous issue of this journal (Feb. 1939).

Why Genito-Urinary Affections are so Resistant to Treatments.—The male genito-urinary organs and their ducts are anatomically so complicated in their structure, so awkwardly placed in their position and so inaccessible to old therapeutic methods that infections, specially with gonococcus when once get access to them become almost unassailable and, of course, very difficult to deal with.

Why old Gonorrhoea was considered to be almost Incurable.—Gonorrhoea in male has acquired the notoriety of 'once gonorrhoea, always gonorrhoea' not because gonococci are very resistant to known germicides but because they lodge in the very complicated structure of the genito-urinary system and remain safe from the local and even general action of the remedies so far employed by the profession though the new Sulphonamide group of drugs are holding out a great promise.

How Diathermy has Revolutionized the Treatment.—The immunity of the position that the germs have enjoyed in this system has, to a great extent, been broken by all-pervading electric currents, producing different wave-lengths capable of generating heat in the tissues themselves by their own ohmic resistance and dielectric capacities and thus killing all the germs that are lodged in them and which have lethal temperatures below or even above the actual heat generated there. The germs are either killed outright or get attenuated and so weakened as to be easily acted upon by the other beneficial effects of heat on the body tissue like the increased lymph flow and phagocytosis.

Broad Divisions of the Common Infections.—The infections of the male genito-urinary tract could very conveniently be divided into gonococcal and non-gonococcal and by far the largest number of cases met with in general practice in India are gonococcal in origin though mixed infections play an important part in bringing about acute exacerbations in subacute and chronic stages.

How Diathermy acts in these Diseases.—It produces optimism to know that gonococci thrive best in the tissues at such low temperatures as 93° to 98°F. (CUMBERBATCH) and that the majority of their strains have very low lethal temperatures and that they are instantly destroyed at 108° F. (CORBUS AND O'CONOR) but this optimism is soon damped when we find that the last two inches of male urethra has a normal temperature of 93°F. only (ROBINSON 1923) and that cultures of certain strains of gonococci are not killed even if the temperature is raised to 115° F. However, apart from experimentations on gonococci in cultural tubes it has been abundantly proved that local pyrexia produced by diathermy so acts upon the infected tissues that they are enabled to get rid of the organisms at a much lower temperature than it is necessary to kill them outside the human body. Even streptococcus haemolyticus gets sterilized by that amount of diathermic heat which could easily be tolerated by even very delicate and sensitive tissues like testes and epididymis as clinical results of some of my cases to be described later will clearly show to you.

The uniform heating of the tissues to the intensity required for the therapeutic results particularly in the case of male urethra is not an easy affair but with the improved methods of local diathermic applications the task of an electro-therapist is becoming easier day by day. The so-called "incurable" affections of the male genital tract have become amenable to pleasanter treatments as compared to old painful and messy ways and are no more to be dreaded by the patients nor shirked by the physicians. The gonococci do not defy the diathermic currents which raise the tissue temperatures anything from 108°F. to 118° F. and sweep everything that lies in their path or their range of action. The heat does not only pick out the organisms from the infected tissues but takes care, to a great extent, of the mischief that their reaction and damaging influence on the tissues may have created in the system, relieving pain and tenderness, subsiding oedema and tension and restoring impaired anatomical and physiological activities of the part as a whole.

A Few Facts regarding the Therapeutic Agents used and The Patients met with in Practice.—Before I detail the methods of treatments and their results in the case of individual parts of the system under discussion let me briefly recapitulate a few facts regarding the therapeutic agent and the system of the body on which its action is to be detailed:—

I. The Therapeutic Agents.—1. *Kind of currents used:*—Old conventional diathermy machines produce long and medium waves (600 to 300 metres) which are "Conduction Currents", i.e. during the half cycle of these currents the electrons move away from their protons to other ones forming "conduction currents" while short wave apparatuses produce short (30 to 3 metres) waves which are "displacement currents" i.e. the electrons only get displaced and do not move away from their protons to other ones.

2. *Ways of heat production:*—The heat produced in the tissues is not brought by the currents to the body from some outside source but is produced in the tissues, in the case of "Diathermic Currents"

by the ohmic resistance that the tissues offer to the passage of the current through them and in the case of short wave currents by the 'dielectric' or 'specific conduction capacity' of the tissues.

3. *Conduction currents (Old Diathermy):—*

- (a) They give sparks and burns or do not pass at all through the body if the electrodes are not intimately applied to the part.
- (b) The heat is not produced only in the direct path but in the outlying ones as well and there is an "Edge effect" which means the tissues between those edges of the electrodes which are near each other will be heated more than the tissues which are between the other edges of the same electrodes which may be placed further apart.
- (c) The heat produced is not uniform all along the path. It is more where the local contact is produced than inside the body cavity and this quality makes the current very suitable for local treatments through special electrodes.

4. *Displacement currents (Short wave):—*

- (a) They can pass through air and the electrodes need not be brought in contact with the body. They, in fact, have to be properly "spaced" in actual practice.
- (b) The heat is produced in the direct path only and is uniform subject to the dielectric capacity of the tissues through which they pass. The lower the dielectric capacity the higher the heating. Thus 'fat' which has lower dielectric capacity than muscles is heated more than the muscles. Fat also offers resistance to "conduction current" more than the muscles do and is therefore heated more but a normal patient, in this case, all along feels the heat sensation while in the case of Ultra short waves heat-necrosis of the subcutaneous fat is possible without a man feeling any heat-sensation.
- (c) No measurement of dosage, guidance through patients' feeling of heat-sensation, nor production of local pyrexia through special electrode is yet possible.

5. *Different spheres of old diathermy and new short wave currents:—*Old conventional diathermy is very suitable to treat subacute and chronic conditions with its special local electrodes which could raise the local parts like prostate, testes, epididymis and cord to desired high temperatures while short waves include in their range the acute septic and inflammatory conditions as well and are not so very suitable for local pyrexia. The "Fever therapy" or heating the body as a whole has of course becomes very simple and is easily controllable with a modern short wave apparatus.

II. The Patients.—1. The majority of the cases met with in general Indian practice are subacute or chronic in nature. The reasons are not far to seek:—

(a) *Causes of neglecting the diseases in initial stages—Social Outlook—*The commonest cause of genito-urinary disorder in male is a gonococcal infection. The man with gonorrhœa produces a positive and demonstrable proof of his indiscriminate sexual gratification. The society, the other members of which, at least, a good number of them, who had once suffered from it themselves and had been in the same predicament, condemn the new victim in no uncertain terms. He, therefore, hides his disease in the so very easily curable initial stage and seeks help from private and advertised remedies and later on falls in the hands of the quacks amongst the lay public or ignorant and careless medical practitioners. He after all seeks 'expert advice', which is usually too dear to be conveniently available to him, either in a subacute stage when he finds the trouble very resistant or in a chronic stage for some troublesome complication or sequelæ which he considers a fresh trouble or a new disease and gives the history of gonorrhœa casually if you are tactful enough in eliciting such a confession out of him.

(b) *Incomplete cures—*There is a tendency amongst the general practitioners to treat acute gonorrhœal anterior urethritis with Sandal oil and other balsams, vaccines, "Aolan" and a few urethral washes with strong Permanganate lotion and unsuitable syringes and to pronounce him cured when pain and discharge subside. This is almost criminal but the doctor is not always to be blamed. The patient thinks he is cured and takes no further treatment nor advice. Thus, for general practice in India, an old conventional diathermy machine serves the purpose very well and the modern short wave apparatus may safely be left to the specialists.

2. *Differences between male and female urinary tracts and their effects on the course of genito-urinary diseases:—*In females, the urinary tract is almost entirely separate from the genital canal but in the males the urethra serves the purpose of the passage of urinary as well as seminal discharge. The ascending infection from female urethra goes to bladder and the rest of the urinary tract but from a male urethra it also goes to prostate and the genital tract and other organs. In females, the infection is primarily in the genital canal and the urethra is secondarily but invariably infected due to its proximity to vagina while in males the anterior urethra receives the infection first and keeps it confined to itself for sometime if not injudiciously interfered with and is promptly and efficiently treated in that period.

3. *Why gonorrhœa is more virulent in males as compared to that in females:—*The normal temperature of the anterior two inches of male urethra where the gonococci initially gain entrance is 93°F. while that of female vagina which gets first infected is 98.6° and of female urethra 99.2° F. and of cervix uteri 99° F. Gonococci thrive best at

temperatures of 93° to 98° F. The male urethra is, therefore, an ideal place for their culture while the female parts are a degree warmer for them. Thus, a mild infection which gets easily aborted in a female rapidly assumes a virulent form in the male owing to favourable conditions of gonococcal growth. The length and direction of the canal and the presence of follicles and lacunæ there, make it easy for the infection to spread upwards and gain a firm footing in its new abode.

4. *Relative involvement of internal male and female pelvis*:—The genital organs of the male are not so very intimately related to the internal pelvis as those of the female. The result is that the "acute" female pelvis so commonly met with in gynaecological practice is rare in the domain of 'Andrology'. We therefore see again that the short wave apparatus which is so very useful in gynaecological practice is not indispensable in the treatment of male genito-urinary diseases.

The Necessary Equipment.—I. *Diathermy Machines.*—Let us, therefore, take it that unless we want to do "fever therapy", in a good number of cases we really use old conventional diathermy machine to treat the genito-urinary troubles in our male patients. We also assume that our machine is provided with adjustable spark gap and is fit to do electro-coagulation work. Of course, a good diathermy machine may be utilized for "fever therapy" as well for it is not the heat-production but prevention of heat-loss that matters so much.

I use a Siemens' Thermoflux D with adjustable spark gap.

II. *Electrodes.*—1. *For ordinary daily routine work*:—

- (a) A good prostatic electrode. I use a Stein's prostatic and Lindemann's rectal type.
- (b) A belt electrode.
- (c) Tin-lead alloy sheets. For cutting out flexible electrodes adapted to required sites and organs.
- (d) A urethral electrode. I use Eitner's type.

2. *For a little elaborate specialized work*:—

- (a) A scrotal electrode of "Corbus type."
- (b) Prostatic electrode of "Waddington type."
- (c) Urethral electrode of "Rowell type."
- (d) Endovesical and urethral coagulation electrodes of "Frank" or "Victor" type

Other accessories for specialised work:—

- (a) A urethroscope or urethral cystoscope.
- (b) Mechanical urethral dilator of Kollmann's type.
- (c) A prostatic vibrator and a psychrophore.
- (d) A microscope and its accessories for control of treatment.

Let me now describe the actual practice and the results of

diathermo-therapy as applied to the gonococcal and non-gonococcal genito-urinary disorders of male.

Gonorrhœal Disorders—The value of diathermy in various involvements.—There is no group of disorders in which diathermy gives better results than what it does in gonorrhœal disorders of genito-urinary tract. I believe that modern treatment of gonorrhœa, specially in subacute and chronic stages, is never complete without diathermy. It does not only free the local organs from infection but prevents extension and metastasis and thus saves the patient from such painful affections as arthritis and fibrositis and greatly damaging involvements as ophthalmia and iritis. Its effects on epididymitis and orchitis are nothing short of marvellous and dramatic. The pain, swelling and redness abate after the very first application and the patient is cured with three to four applications given within ten days. I have seen cases of epididymitis and orchitis treated by other methods suffering for 10 to 15 days from acute incapacitating pain, getting relief from signs and symptoms after 4 to 6 weeks and even then going about with moderately tender thickening of the parts for months. Diathermy gives much superior results and within less than one sixth of the time taken by other methods. In prostatitis and vesiculitis, it is in the very resistant type of cases that one gets to appreciate the true value of diathermo-therapy. Take a few of those cases which resist vaccines, "Gonoyatren," "Gonoderm," milk, dyes, Mercurochrome, Bismuth and arsenical injections and also those which listen to no digital and vibratory prostatic massages and sounds and medications to posterior urethra and also include those in whom discharges return with every sexual, alcoholic and dietetic indiscretions and climatic changes and put them under prostatic diathermy, avoiding re-infection from a possibly imperfectly treated anterior urethra and watch the results. I am sure, the results will be so convincing and clear that you will never treat your cases of a similar kind with anything else but diathermy. One of the causes of anterior urethritis being kept up for ages is folliculitis and lacunitis. They yield to one or two diathermic coagulation under guidance of a urethroscope. Urethral strictures causing retention of urine due to superimposed secondary infection and inflammation need not now have painful and blind catheterization or urgent relief through suprapubic route. They all so easily yield to diathermic influence. Mechanical dilatation of strictures also becomes a much easier task after a 20 minutes' session of diathermy than it is otherwise. Fresh cases of gonorrhœa with acute anterior urethritis of less than 14 days' duration are altogether on a different footing. They generally do not easily yield to general or local pyrexia. The antigenic factor has probably something to do with such cases. It has been noted that four to nine sessions of 5½ hours' duration at a time and with continued general pyrexia of 104° to 106.5° F. have left acute anterior urethritis unaffected (OWENS) and gonococci could be found in a urethra where local pyrexia of 114° F. was maintained for full one hour (ROBINSON).

Various Modes of applying Diathermy.—For the treatment of gonococcal disorders of genito-urinary system, diathermy is utilized to produce:—(1) General pyrexia, (2) Local pyrexia.

1. *General pyrexia*:—It is induced by a good type of diathermy machine or better still, by a short wave apparatus. It is giving very encouraging results in all forms of gonococcal manifestations, except perhaps in anterior urethritis of less than two weeks' duration. It is of particular use in generalised painful complications like fibrositis or arthritis of multiple joints due to metastasis from diseased prostate and seminal vesicles. The treatment is of such a severe type—the patient remaining in a closed bag with 104° to 105° F. for 4 to 6 hours and the application of it needs such elaborate equipment and strict supervision that the general practitioners at present should have no more interest in it than that of acquiring the knowledge of its existence as one of the modes of diathermic treatments of gonorrhoea. I, therefore, do not propose to deal with it any further.

2. *Local pyrexia*:—This could be prostatic, urethral, scrotal and funicular. The first gives diathermia to all the genito-urinary organs except the kidney and a part of ureters and anterior urethra.

I. *Prostatic Diathermy*.—It is given with a prostatic electrode passed about 3" to 3½" into the rectum and a belt electrode round the body at the level of the groin. I use Stein's prostatic and Lindemann's rectum electrodes. Waddington electrode enables one to give the treatment in sitting posture. Cumberbatch rectal electrode, the stem of which is partly ebonite and partly metal, has the advantage of heating prostate and vesicles without raising the temperature of anal canal and the lower part of rectum. The belt electrode may be replaced by a 6" × 4" flat flexible plate-electrode placed on the abdomen a little above the level of the symphysis pubis. Prostate, vesicles, prostatic portion of urethra, bladder and the abdominal portion of the Vas receive varying amounts of heat but with sufficient intensity for therapeutic purposes. It proves beneficial in prostatitis, vesiculitis, prostatic urethritis and cystitis, specially when painful spasms are troublesome and as a focal treatment in metastatic conditions in parts, 6 to 8 treatments of 20 minutes' duration at the 'maximum sensation of heat without discomfort,' are given twice a week.

II. *Urethral Diathermy*.—There is no method yet known which could uniformly heat entire male urethra at one session. The prostatic portion gets heated during prostatic diathermy. The membranous portion could be locally heated by prostatic electrode in the rectum and a pad electrode on the perineum. It is the anterior urethra which lies outside the pelvis that needs special attention. However, the entire urethra can be heated by the following method.

III. *Diathermy to entire Urethra (CUMBERATCH)*.—Press down the penis so that it may lie on the scrotum between the testicles in contact with the perineum and apply a plate electrode on the dorsum of it. Insert a rectal electrode into the rectum. 8 to 12 treatments

of 20 minutes' duration on alternate days with tolerable intensity of heat are given as one course.

IV. *Anterior Urethral Diathermy*.—1. *External method*:—Use anterior and posterior plate electrodes. The method is not very satisfactory but has the advantage of avoiding the passage of instruments into the urethra which is generally very painful and attended with risks.

2. *Internal method*.—(a) Eitner's method.—Urethral electrode inside the urethra and a pliable electrode enveloping the penis.

(b) Rowell's method.—A straight perforated, nickel-plated electrode inside the urethra and a bakelite frame with two adjustable pieces of metal 4½" long curved to fit the penis. 4 to 12 treatments of 40 to 60 minutes at 108° to 110° F. daily or on alternate days are usually given.

V. *Scrotal Diathermy*.—This is given to heat the testes, epididymis and other contents of the scrotum. Anterior and posterior pliable electrodes with testicle in between may be used. A bag electrode for scrotum and a rectal electrode placed in contact with the prostate as a directing electrode are also used. A corbus scrotal electrode is very convenient and makes the local scrotal diathermy very easy. 3 to 4 treatments of 20 minutes at tolerable heat are enough in cases of epididymitis and 6 to 8 may be needed for orchitis. A sinus left after a scrotal abscess will heal in one or at the most two applications.

VI. *Funicular Diathermy*.—A rectal electrode in the rectum and a plate electrode to cover the region of the inguinal canal and scrotum up to testicle. Two to three applications of 20 minutes at tolerable heat are enough to resolve the subacute swelling of the inguinal canal due to inflamed vas at that site. An acute attack of funiculitis, if tackled early, could be aborted in one application and certainly needs never more than two or three.

In prescribing and practising diathermo-therapy for gonococcal disorders, the following points should always be kept in mind.

Important Points to be Remembered.—1. *The number and intervals* of the applications should have a relation to the amount and speed of the response that one is getting from the treatment.

2. *The intensity of heat* to the maximum tolerable limits, though desirable in gonococcal disorders of the kind we are discussing, is not always necessary. If a patient is getting benefit at 108° F. it is not necessary to subject him to 110° F. and 112° F. simply because he can perfectly tolerate it. The therapeutic results do not so much depend on the ability of heat killing the germs outright but on the power of the heated tissue to get rid of them in their attenuated state.

3. *Diathermic treatment* should not be made absolute. Its combination with other physical, medicinal or any other form of therapy is not only permissible but desirable. No form of treatment which could help the patient and is necessary for him should be withheld because of diathermy.

4. *In acute anterior urethritis*:—The known methods of treatments such as irrigation and the modern silver ionization are the remedies of choice. Diathermy acts indirectly. It improves the circulation of posterior urethra and guards against the ascending infection while in acute posterior urethritis, diathermy alone could give excellent results relieving the pain and aborting the discharge without the help of other remedies. Ichthyol, Morphine and Atropine suppositories should not be withheld when required and as a precautionary measure prostatic massage and a few prostatic applications of diathermy should always be given.

5. *In cases of chronic antero-posterior urethritis*:—It is the folliculitis and lacunitis that keep up the infection indefinitely. Electro-coagulation *via* urethroscope of the infected follicles and lacunæ ends the trouble permanently. One or two applications prove more than enough.

6. *Mechanical dilatation of urethra* for a few times with a type of Kollmann's dilator as a preventive measure in after-treatment of urethra is a very necessary measure to avoid possible narrowing of the canal and strictures.

7. *In cases of strictures with or without retention of urine*, it becomes an easy affair in majority of cases to pass a catheter for relief of retention and to practise mechanical dilatation during or immediately after the diathermic application. The urethral electrode may itself be used as a dilator or catheter which slips through the obstruction during the diathermic process.

8. *In cases of chronic prostatitis and vesiculitis*:—It is necessary that while the course of diathermy is given, the ejaculatory ducts are kept open through sounds or direct medication to the posterior urethra. It is also necessary to ensure complete sterilization of anterior urethra to avoid reinfection of prostate and seminal vesicles.

9. *In epididymitis and orchitis*:—It is advisable to give a few prostatic diathermy applications in addition to the local application to the epididymis and testes. Sodium Iodide 15 grains in 10 c.c. given intravenously on alternate days or twice a week for a few injections is a useful adjuvant in such cases.

10. *In cases of impotency of gonococcal origin*, diathermy of the spine and prostate combined with prostatic massage by means of a vibrator and cold spray by a psychrophone alternately, proves very useful and is often completely successful.

I wish to present half a dozen cases selected from my records to illustrate some of the points of treatment in question.

Six interesting and illustrative Cases of Genito-Urinary Gonorrhœa:

CASE No. 1. — *Antero-posterior urethritis with prostatitis*:—A zemindar, aged 20 years, complained of annoying heaviness in rectum, pain in the perineum, frequent nocturnal emissions and loss of potency. He admitted having gonorrhœa a year ago and occasional burning sensation during micturition. Gonococci were recovered from

urethral discharge. Antero-posterior urethritis with subacute prostatitis was found. Prostatic diathermy was given for 20' on 17-10-34. Pain during micturition disappeared the next day. Rectal heaviness and pain in perineum were altogether gone after 4th application. Two applications of external urethral diathermy and a course of Aolan alternating with Niltax brand Detoxicated Vaccine was also given. Patient received 8 applications every 4th day and was completely cured. Massage and cold spray to his prostate and Kirby's Phosphorus Pills No. 9 for a fortnight brought his potency back to him. His wife was also treated and conceived two months after cessation of treatment.

CASE No. 2.—*Chronic gonorrhœa of 20 years' duration with recurring attacks of urethritis*:—Patient, 40 years old, contracted infection 20 years ago. Slight indiscrimination in diet or sexual excess would cause burning sensation during micturition and slight discharge. All known methods of treatment were tried for 20 years without success. Six prostatic and urethral diathermic applications and single cauterization with a course of Sulfarsenol between 24-12-34 to 25-1-35 cured him. He had no recurrence for 5 years now.

CASE No. 3.—*Subacute gonorrhœa with epididymitis and orchitis*:—Healthy looking 20 years old man got gonorrhœa six months ago. Was treated with irrigations and instillations all along for 6 months. Had an acute attack of orchitis and epididymitis. He was brought on a stretcher. Prostatic and funicular diathermy 20' each were given. First application relieved all pain and tension. Septicemine 10 c.c. intravenously every 48 hours for 3 injections and 3 applications of diathermy brought him to normal condition. He then received full treatment for thorough cure. No trouble from 1934 up to now.

CASE No. 4.—*Gonorrhœal arthritis of big joints and orchitis*:—A man aged 25 years had severe pain and swelling in big joints crippling him for a few months. He was diagnosed as a case of rheumatism. Salicylates, Iodides, Atophanyl and Sulfarsenol gave no relief. He gave no history of gonorrhœa. He then suddenly got orchitis and consulted me for painful scrotal swelling. His urethral smear was full of pus cells but no gonococci. He then admitted having gonorrhœa sometime back. He was put on a course of Aolan injections and prostatic and scrotal diathermy. No diathermy but only radiant heat was given locally to his joints. His orchitis subsided after 2nd exposure and the joints became normal within a fortnight. He received 5 diathermic applications and 6 Aolan injections. He got so well that nothing could induce him to undergo a complete investigation and treatment. He has had no trouble for the last 5 years.

CASE No. 5.—*Acute gonorrhœal arthritis of sacro-iliac joints*:—A big zemindar, 34 years old, had phimosis and urethral discharge in 1921. Suffered from fibrositis and arthritis for 10 years from 1924. Had urethral stricture which needed dilatation off and on. Treatment of stricture always brought about joint troubles. Was diagnosed to be suffering from gout as the pain almost always started from the

great toe. In September 1934, he had retention of urine and was catheterized by his doctor, had rigor and fever and was treated for malaria. He had some alcohol and sexual intercourse one night and could not get up from his bed in the morning. I was consulted. Patient was unable to move in bed, could not even cough for fear of lightning pain in the lower portion of the back, would not allow anybody to touch him. I straightaway gave him 10 c.c. of Septicemine intravenously and Infra-red for 40 minutes locally, morning and evening. In two days time patient could be taken on a stiff board stretcher to my rooms. Arthritis of sacro-iliac joints was found. The first local application for 30 minutes with 20 minutes prostatic diathermy gave him 80% relief. He was able to sit up the next day. He had daily applications for 3 days. Had a temperature of 105° F. on 4th day which gave him immense relief from pain. Took one more application on 5th day. Went away to his zemindary for some urgent work and reported after 20 days that he had no trouble and then received thorough treatment. The stricture is there but his "gout" never appeared again up to date.

CASE No. 6.—*Gonorrhœal stricture with repeated attacks of retention of urine*:—A heavily built man of 42 years had gonorrhœa (and syphilis?) in 1910. Relapse in 1920. Retention in 1922 when stricture was dilated under Chloroform by a civil surgeon. A renowned homeopath of Calcutta then treated him and the symptoms got exaggerated. Had frequent catheterization. Obstinate retention in 1932 needed dilatation under Chloroform which caused profuse bleeding and a false passage. Got similar attack in 1936. Patient came to me for dilatation. I gave 20' prostatic diathermy. He got severe anal pain after the treatment. He felt something suddenly giving way and obtained relief. Flow of urine became a little free. Refused diathermy and insisted on dilatation. Sound up to No. 5 was passed under Pantocaine. Previous false passage was noticed, bleeding occurred and he had rigor and fever 36 hours after. He agreed to diathermy when retention occurred again after a month. Relief was obtained after the first application and flow established freely after the fourth. He received 7 sittings from 25-12-36 to 14-1-37. He was advised to take diathermy whenever he felt the attack coming on. In 3 months' time he felt the approach of another attack. He travelled 100 miles in a car to get diathermy on 15-4-37 and received 8 applications up to 22-4-37. The attack was prevented. Another attack was feared after 5 months and he immediately motored down 60 miles to his headquarters and then 100 miles to my place to get his attack prevented by diathermy. He got 6 applications of prostatic diathermy from 18-9-37 to 14-10-37. He again came to me in December 1937 for treatment and that time to Calcutta after a 300 miles train journey. He now follows me wherever I may be posted in Bengal, Bihar or U.P. and refuses an operation or any other form of treatment whatsoever. He is of course successful in avoiding the retention and consequent painful dilatations and hæmorrhages for the last 3 years from December 1936 up to now.

Non-gonorrhœal Disorders.—Under this heading, I shall not discuss those maladies for which diathermy offers no advantage over other methods of treatment as, for example, the beneficial effect of it on the severe spasmodic pain felt during the passage of a calculus through the renal pelvis or ureter or in a case of cystitis. I shall here mention only those conditions in which diathermy either proves much more efficient than other known methods of relief or quickly aborts an attack or cuts down a lengthy period of suffering or is safer and more convenient to use. Advantage is taken of the fact that diathermy which is almost a specific in killing and eliminating gonococci from the tissues is also found very successful in sterilising the tissues infected with organisms like streptococcus hæmolyticus and faecalis, coliform and diphtheroid bacilli and pneumococcus. Apart from the clinical results such are shown by the disappearance of discharge in case of cervicitis and of gleet in prostatitis of non-gonorrhœal origin, it has been found that cervix uteri infected with streptococcus hæmolyticus is free from the organisms after it is subjected to diathermy. It is also recorded that in a fatal case of hæmolytic streptococcal infection no organisms were found in the uterus which received diathermy before the death of the patient (CUMBERBATCH).

I. Senile Prostate.—In elderly people the senile hypertrophy of the prostate with nocturnal frequency of micturitions is a very troublesome affection specially when due to exposure or secondary infection the enlarged gland gets congested and inflamed with consequent increased difficulty of micturition and in the end retentive of urine. The elongated and tortuous urethral canal cannot easily be catheterized at the time when immediate relief is imperative. It stands to reason that if we have any method of combating the congestion and inflammation in a short space of time we remove the cause of retention and secure immediate relief. I find that prostatic diathermy does the trick in emergency and a course of 8 applications of it with 6 injections of Erugon (testicular hormone) given twice a week for a number of times at an interval of say 4 to 6 months or a period suited to the individual need of a patient, would do much to keep an old man free from this harassing complaint of his old age. The following cases will explain the points.

CASE 1.—On the night of 11-4-37, I was called to see an old man of 80 years who had not passed urine for five days in spite of many doctors trying to pass ordinary and bicoude catheters without success. The patient was in moribund condition. I drew enough quantity of urine supra-pubically to tide over the danger. The next day, I tried to pass a catheter but failed. There was no history of gonorrhœa but stricture was present. It was a case of traumatic urethral stricture caused by previous forced catheterizations and congested senile prostate. I gave up the attempt and started prostatic diathermy and Neotropine by mouth. Urine began to drip after first, came in a thin stream after 2nd, became rather free after 5th and the flow got established after the 7th session. No catheterization was done. A course of Erugon injections was given and was followed by oral

use. Patient remained very comfortable for 8 months when he came to take another course of Erugon and diathermy.

CASE 2. *Senile prostate with acute pain and difficult urination*:—A man aged 70 years whose prostate was giving him immense trouble resorted to all kinds of remedies. A retired civil surgeon who referred the case to me stated that he himself derived great benefit from diathermy. Prostatic diathermy with Erugon injections was started. Urination became free after the first application and rectal pain disappeared after the second. He took seven exposures in 22 days and felt a great relief.

II. Funiculitis with or without Epididymitis and Orchitis.—Acute funiculitis is generally due to streptococcus hæmolyticus. In areas where the rate of endemicity favours genital manifestations of filaria, acute funiculitis is not rare and if not properly and promptly treated generally ends in death. I have found that in all cases of subacute and chronic and in those of acute, which are diagnosed very early diathermy gives immediate and lasting relief.

III. Funiculitis of Filarial Origin.—A man, 45 years of age, had hydrocele and filarial scrotum. He had a severe pain in his testicle and groin and his temperature rose to 103° F. I found a very painful and tender cord and angry-looking scrotal swelling. The tension at the inguinal region was not yet dangerously raised. I decided to try diathermy first. He was relieved after one application, swelling decreased after the 2nd, no pain after the 3rd and was alright after the 5th. He fainted while taking the 6th. Diathermy stopped. His funicular and scrotal swellings disappeared leaving simple hydrocele. He was given a course of Arseno-typhoid along with diathermy for his filarial trouble and secondary infection.

I wish to sound a note of warning here that if the tension is great at the site of external inguinal ring and where the cord lies on the bone the first thing to do is to make a clean incision and relieve the tension and then apply diathermy or any other suitable treatment.

IV. Infection of Testes, Epididymis and other Contents of the Scrotum.—Apart from gonorrhoeal infections simple septic and filarial orchitis and epididymitis very easily yield to diathermy. I have had occasions of testing its efficacy in genital affections of filarial origin in all its phases. I have found it a great help in pre and post-operative stages of hydrocele and filarial tumours of the scrotum. The following cases will clear the point.

CASE 1. *Chronic infection of the contents of a filarial scrotum*:—A young man aged 21 years noticed his right testicle enlarging in 1932. He had an injury to it followed by redness and pain in the scrotum and fever for a few days. He then began to have bouts of fever off and on which lasted from 4 to 22 days. An infected hæmatocele was diagnosed by a surgeon. He consulted me in October 1934. He was getting neurasthenic, very weak and easily tired. I could detect tender induration spread all over the coverings of the testicle. The

swelling was opaque and appeared to be outside a hydro or hæmatocele. I gave him a 20' scrotal diathermy on 9-10-34. The swelling softened and tenderness decreased. He had 101°F. fever every evening for about 10 days which disappeared after the 2nd exposure on 13-10-34. A 3rd application cleared the mass and a hydrocele of the size of an orange transparent to illumination was found and operated upon successfully on 18-10-34. The recovery was uneventful.

CASE No. 2. *Post-operative orchitis*:—A man aged 42 years was operated upon by me for hydrocele (filarial). He got 102°F. after 24 hours with painful and swollen testicle. His fever subsided under treatment in a week but tenderness and swelling persisted in spite of fomentations and other remedies. He was given scrotal diathermy. The pain disappeared after the 1st, tenderness after 2nd and swelling after the 4th given within 19 days.

CASE No. 3. *Persistent post-operative scrotal sinuses due to orchitis*:—A man of 35 years with double filarial hydrocele of 18 years standing was operated upon by me under local Pantocaine. His right testicle was found disorganised and diseased. He refused its removal. Left side healed in 7 days. Right side became red, tender and swollen. After 15 days' trial of all other methods he was advised to take diathermy. He refused and went away to a civil hospital. Electro-chlorine, Bipp, Acriflavine, Copper and Silver touches were tried by a civil surgeon who in the end opened him up again for exploration which one of my colleagues later on humorously called "Exploratory Scrototomy". The right testicle being found not altogether destroyed was left behind according to the wishes of the patient. He remained there for 1½ months and then saw me. I advised diathermy and he ran away and returned in a fortnight with multiple discharging sinuses. He refused diathermy and was scraped and given radiant heat and Aolan. All the sinuses healed except one which continued discharging pus and was right up to testicle. It was explained to him again that the mischief was in his testicle and diathermy would help. He agreed. Pus stopped after first scrotal application, serous discharge left after 2nd, perfectly healed after 8 daily applications. A tiny hole left in the scrotum closed in 16 days.

V. Non-infective Tenderness and Swelling of Testes and Epididymis.—I wish to draw your attention to a condition of testes and epididymis which is analogous to a strained muscle or ligament or sprain of a joint. The cause of it is excessive and prolonged sexual indulgence, coitus interruptus, masturbation or sudden stoppage of a nocturnal emission. It is the congestive condition of seminiferous tubules in the testes and excretory ducts in the epididymis due to a damming back effect and strain which involve even the vas and seminal vesicles. There is nothing but to approach diathermy in relieving this condition when it assumes a subacute or chronic state. I present two illustrative cases.

CASE No. 1.—*Strained testes and epididymis due to coitus interruptus*:—A young European 30 years of age passionately fond of his wife used to have prolonged sexual connections without emission and

occasionally coitus interruptus. He used to feel slight pain in his testicles after the act and tenderness lasting a day or two. In a year's time he found that his right testicle which was hanging lower down in the scrotum than the left began to enlarge and tenderness remained all the time. In a few months it began to interfere with his normal duties and the pain shot up to the groin. He consulted me. I found his testicle slightly enlarged and epididymis very much enlarged and acutely tender. His cord though tender was normal. Definitely no history of gonorrhœa or any injury to the part. Three scrotal and one prostatic diathermic applications were enough to bring his parts to normal. He abstained from the injurious act and had no trouble for the last 4 years.

CASE NO. 2.—*Strain of testes, epididymis, vas and vesicles due to masturbation.*—A young boy of 16 years complaining of pain, tenderness and swelling of testicle for 3 months was diagnosed as a case of small inflamed hydrocele and was advised treatment by a surgeon. He was brought to me for an operation. I detected no hydrocele but his right testicle was found swollen and his epididymis very much enlarged and the scrotal portion of his was greatly thickened. He complained of shooting pain in the groin, the abdomen below the naval and bearing down feeling in the rectum. The case was clear enough to me but the boy gave a false history of lifting heavy weight and then wrestling with a boy and straining the parts. On my handling him properly he took me into his confidence and traced the trouble to masturbation which he was doing two or three times a day. He was having local tenderness and pain for a year but swelling and general shooting pains for the last three months and was in the end unable to attend the school. I gave 5 scrotal and funicular and 3 prostatic applications. The pain disappeared. Slight tenderness was still felt at the globus major. Some swelling of the epididymis was also left behind. I saw him after 2½ months and found his testes and epididymis perfectly normal but he still complained of occasional tenderness in the globus major which he did not much mind. He said he had given up masturbating.

I purposely abstain from discussing the papillomas of the bladder for which electro-coagulation has become a standard treatment and the removal of prostatic bar by diathermic incisions which is gaining popularity for I have no experience of them and do not consider them of much use for general practitioners in India.

I hope I have not created an impression upon your mind that the question of treatment of genito-urinary diseases in the male is completely solved by diathermy. Many affections which this system is prone to and the question of many resistant types of gonorrhœa in acute stages and of gonorrhœal complications like strictures still remain as puzzling as ever. It is, however, claimed for diathermo-therapy that it is a decided advancement on old therapeutic methods and achieves much more than any single known method could possibly do.

Genito-Urinary Complications in Infectious Diseases

BY

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GENITO-URINARY complications are very infrequent in many of the infectious diseases while in some they are quite common. Besides their importance in increasing the gravity of diseases, some of them also play a part in the spread of disease and thus form a problem in prevention of disease too.

Firstly, it must be mentioned that febrile *albuminuria* is quite a common occurrence in most of the acute infectious fevers and is not of much significance. Thus we find it occurring in a trace or more in small-pox, meningococcal meningitis and ordinary fevers having high temperature and of long duration, quite frequently. It is specially frequent and of importance in diphtheria, streptococcal sore-throat and scarlet fever, where by ordinary heat-test quite a dense cloud could be obtained, as in these latter diseases it is occasionally accompanied or followed by signs of nephritis, such as presence of R. B. C's, pus cells and casts in the urine. In one of our series of 127 diphtheria cases, albuminuria was found in 62% of cases while toxic nephritis in 3%.

Retention of Urine indicating severe toxæmia was found more often in most of the cases of acute meningococcal meningitis, in several of the typhoid cases specially those developing typhoid state during the late second week and in the third week, and sometimes in confluent or hæmorrhagic small-pox cases.

Hæmaturia.—This complication is found to occur commonly in hæmorrhagic small-pox, occasionally in fulminant meningococcal meningitis with petechial rash and rarely in enteric fever as we had one case, in which it persisted for more than a fortnight but responded well to parenteric vitamin C. therapy.

Case report of the latter is as follows:

The patient, a female child of 9 years of age, was admitted for continuous fever on the 9th day of disease. Blood was tested and found positive for B. Typhosus.

She was running a continuous temperature and very toxic. On the 6th day of admission *i.e.*, on the 15th day of disease, there was slight hæmaturia. The next day also there was hæmaturia again and it persisted in all the samples of urine that were voided. Child was given appropriate treatment and also injections of vitamin C. daily.

Hæmaturia stopped after 7 days of treatment and the urine was normal again. There were no other untoward complications and the child made uneventful recovery.

Cystitis, Pyelitis and Pyelonephritis.—These are more frequently found in gastro-enteric and puerperal infections and have a special significance in enteric group of fevers. In one of our series of 106 cases, pyelitis was found in 3.8% of cases.

It is more common in females than in males.

It is important to recognise it and treat it efficiently as it is found to prolong the course of disease for quite a long period, if not diagnosed and treated properly, with great detriment to the patient's health.

Moreover, it helps in spreading the disease, as typhoid and paratyphoid bacilli are discharged in urine more frequently. It may be mentioned that typhoid bacilli are also being discharged in urine during the third and fourth week without the presence of the above complication as a result of a simple bacilluria.

It is an occasional complication in meningococcal meningitis.

Toxic Nephritis.—This is a grave complication and is found to occur more often in scarlet fever and sometimes in diphtheria but one also comes across occasionally in small-pox, enteric fever and meningococcal meningitis. It is the cause of a few fatalities in diphtheria where one is likely to meet with sometimes. It comes on quite early in this disease but may be found later too. It was observed recently to occur in one case on the 17th day of the disease.

Case report is as follows:—

Patient, a female baby of 7 months, was admitted to the City Fever Hospitals on 9-12-39 suffering from fever and pain in the throat for 3 days and had difficulty in breathing. On examination, there was a white membrane on the tonsils and the swab was positive for diphtheria. Under the appropriate treatment, temperature came down and pulse and respirations also settled down on 14-12-39. There developed a slight serum rash on 15-12-39 which subsided the next day and the child looked better. On 19-12-39 child showed slight puffiness of eyelids which gradually increased and there was generalized anasarca on 22-12-39 with very scanty urine which could not be measured as the child was passing it in the bed. There was also repeated attacks of convulsions which persisted for 3 days. The child died on 27-12-39 in spite of all the treatment. There was partial suppression of urine throughout the previous week.

Toxic nephritis is heralded by œdema of eyelids and scanty urine with albumin and casts in it. Sometimes it rapidly leads to suppression of urine with increase in the œdema which becomes generalized and end follows soon.

It is occasionally found to occur in enteric fever as we found in

one case in which it occurred quite early in the first week of the disease.

We had a few cases of scarlet fever where it was found in a mild form and the patients recovered without any untoward effects. We have also noticed it occurring in mild form in some of the severe cases of measles complicated by streptococcal infections with puffiness of eyelids and scanty urine with casts, pus cells etc., in it.

Orchitis.—This is a complication noticed particularly in one infectious disease viz. mumps. In one of our series of 145 cases, it was found in 8% of cases. It comes on quite early in the disease as we found it occurring on the 3rd day of the disease in some cases. Sometimes it is the only manifestation of the disease or the disease may start with it. Swelling, severe pain and redness of the testicular region which is very acute at the onset, subsides usually in 3 to 4 days but may be prolonged occasionally to a week or more. There is no suppuration but atrophy of the testes may occur.

Ovaritis is rarely seen as a complication of mumps. It must be noted that most of the cases of mumps in our series have been found to be occurring in males.

Urethritis has been described to occur in diseases like enteric group of fevers.

Vulvo-Vaginitis.—It has been found commonly in diphtheria. We had one mild case with inflammation and membrane-formation in the vulvar region and a swab and culture from it gave a positive result for diphtheria bacilli.

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Chronic Coli Bacilluria

BY

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THE subject of *B. Coli* infection is of great interest to the medical man and it has been supposed to explain a heterogeneous group of ailments, local and general, acute and chronic. The acute general or local infection is not the subject matter of this paper which purposes to deal with a chronic process of infection by these organisms and to stress upon the features of such an infection as met with in the male. It may easily have been extended to cover the condition of a chronic infection amongst women but such cases in our hospital are as a rule referred to the Gynæcologist. Bacilluria is used generally to denote a temporary condition of elimination *via* urine which clears up soon. It is not used in that sense in this paper but the presence of the organisms in urine may be prolonged and is accompanied with various symptoms as suggesting infection.

The role of these organisms in the pathogenesis of the conditions to be mentioned is certainly open to doubt. The same organisms whose presence in the bowels normally is considered to be of no small use in the process of digestion are considered pathogenic if they may be recovered from the urine of a patient by culture. It may sound strange indeed, particularly when we find that in spite of the presence of these organisms in the urine the subject may be otherwise healthy. However, the presence of agglutinins in the blood—though in low titre—against a homologous strain of organisms recovered from such cases may go to show the pathogenic role assumed by these organisms. In my opinion the question should be considered from the other way round. The question is rather why it does not infect more frequently than otherwise, particularly in view of its constant presence in the bowels and the skin about the perineum. That these organisms, which are all the while awaiting their opportunity for an ingress through the portals of entry, are certainly checked by the healthiness of the intestinal epithelium is well known. At the same time natural anti-bacterial properties of healthy blood prevents their invasion. So that these two conditions—a healthy intestinal epithelium and healthy condition of blood—must be somehow deranged before a suitable condition for infection obtains. That constipation or colitis is a frequent precursor of *B. coli* infection is well known. The general resistance of the patient is also at the same time found to have become lowered as due to malaria, malnutrition, diabetes, pregnancy, just to mention only a few of them. The question of invasion of the urinary tract is not easily settled. It is quite probable, as shown by CABOT and CRABTREE, that the organisms invade the urinary tract *via* the blood stream; on the other hand, it is equally probable that the blood may have been indirectly reached by the organisms from the uro-genital tract. The lymphatic route of infection of the urinary

tract so well contended by FRANCKE by the anatomical considerations has not however satisfied all. A direct ascending invasion seems extremely doubtful in the face of a constant washing out of the tract. But if it so happens that this out-flow is obstructed as in cases of stone, enlarged prostate, new growth, stricture or mal-formation, it does not appear so difficult for an ascending infection to occur. It is not so much the want of the flushing as that of some damage to the tissues concerned which thus become easily liable to be infected. The role of the nervous mechanism should also be considered in these cases.

These chronic cases of infection which start insidiously and not as an aftermath of an acute infection by these organisms, generally show (1) some debilitating condition from which they have been suffering like malaria, diabetes, pregnancy, etc. (2) some definite defect in the nutrition, as amongst the poor or because of some fad or religious observance or because of the concomitant constipation, colitis, etc., they have taken to certain defective dietaries, (3) constipation more frequently than colitis which may occasionally be due to amœbic infection, (4) some obstructive condition to the urinary flow as prostate, stricture, pregnancy, etc.

The appearance of these patients is generally anæmic and definitely adynamic. Whether the anæmia is due to the hæmolytic property of the infecting organism or defective nutrition or chronic toxic factor leading to defective function is difficult to say. That this anæmia is not helped very much by injections of liver extract or feeding them with liver is frequently remarkable. The liver feeding may actually make the condition of the patients worse by aggravating the intestinal complaints. The anæmia is secondary and the hæmoglobin content falls more than the red cell count.

The adynamic condition is generally found to be due, besides the above, to a low cardio-vascular tone with general lowering of muscular tone. How much of this is due to any adrenal insufficiency I am unable to say. But I have not been able to detect any Sergeant's white line nor any pigmentation. In a few cases of chronic non-specific colitis, I detected on the autopsy table no macroscopical defect in the suprarenals. Eschatin in one case did not produce satisfactory result. I am unable to say if the suprarenals were showing amyloid degeneration as no microscopical examination was done. I suppose, the loss of tone in the muscles of the back generally leads to the very common complaint of back-ache which may be due also in certain cases to enlarged prostate or the accompanying chronic infection of the urinary tract or the constipation.

The tongue as commonly noted in these cases is generally flabby, not coated, shows indentations of the teeth at the margin and sometimes fissured and frequently raw.

The pulse is generally of low volume and tension. However, these patients generally complain about their digestion and urination, loss of appetite, nausea, pain in various places in the abdomen with

tenderness generally in the right iliac region or in other places; constipation, flatulence, belching, hiccough or diarrhoea with foetid, pultaceous evacuations generally neutral or alkaline in reaction showing generally no presence of occult blood are frequent complaints. The loss of appetite is certainly remarkable and sometimes may lead to a mistaken diagnosis of malignancy when anæmia, asthenia and achlorhydria together form a composite picture. A constant sense of discomfort about the abdomen generally ascribed to the constipation or winds is very frequent. However, occasional attacks of severe pain which is frequently located in the right iliac fossa may simulate renal or appendicular colic. However, the rigidity or immobility suggesting acute abdomen is generally not found; as a matter of fact the abdominal muscles suffer from the general loss of tone as noted in such cases. Colic due to some pathological changes in the pelvis of the kidney or the ureter is easily imagined as due to the passage of some mucus, fibrin or mass of pus cells or clots through the ureter. In some cases frequent renal colic is a distressing symptom and I know of a case in a boy aged about 12 only suffering from renal colic and hæmaturia showing coli bacilluria, operated upon due to misinterpretation of a shadow in the radiogram as a case of renal calculus when no calculus could be found. The loss of appetite, sallow appearance of the patient, hiccough, headache and arterio-sclerosis with frequency of micturition with albuminuria sometimes lead to a mistaken diagnosis of chronic interstitial nephritis. Of course, in the aged such a diagnosis may be correct when the urea, non-protein nitrogen estimation of the blood show high figures with high blood pressure; but although high blood pressure may occasionally be found in some cases it is unusual, while a low pressure is quite usual. When the biochemical estimation of blood or the functional test by Phenolsulphonaphthalein excretion shows retention, we suppose that over and above a chronic process of *B. coli* infection the kidney must have been damaged. As a rule, these cases do not show defect in the phenol red excretion nor the presence of casts in the urine which go to establish involvement of the kidney. In some cases the whole picture may resemble that of uræmia with dyspnoea, delirium, diarrhoea, vomiting as the presenting features. However, in most of these cases the end is at hand and they are really cases of uræmia, grafted on chronic bacilluria.

The urinary symptoms are however the most important in that they direct our attention to the urogenital tract being involved. They are frequency of micturition, dysuria, hesitancy and occasionally incontinence and dribbling. In one case which is of very long standing wetting bed has been observed through a number of years and has rendered the life of the patient miserable. The characteristics of the urine are the presence of leucocytes, albumin and bacteria in urine together with a fishy sort of odour. Red blood corpuscles may or may not be present. However a sudden attack of hæmaturia may occur. Culture is essential for diagnosis.

Pyrexia is a very variable symptom. These cases generally run

apyrexial or may show irregular rises of temperature which may be remittent or intermittent with or without a chilly sensation or actual rigor. Frequently they are taken for malaria or tuberculosis or other septic infection. Though frequently we find a leucocytosis in these cases we come across cases where no leucocytosis can be observed, whereas we sometimes come across a definite lymphocytosis both relative and absolute. The greatest difficulty arises when we have to differentiate this condition from genito-urinary tuberculosis when thorough bacteriological examination with guinea-pig inoculation tests are to be carried before a diagnosis can be arrived at. In all cases showing the above symptomatology a differential diagnosis from various other conditions like prostatic hypertrophy, cystitis, gonorrhoea or other pathological conditions opening and discharging into the urinary tract has to be made. The help of cystoscopy pyelography, radiography, ureteral catheterisation may be required. It may be stated, however, that in none of our cases the above methods were taken recourse to. I should mention here the contention by certain authors of *B. coli* infection leading to such pathological conditions as cirrhosis of the liver, arterio-sclerosis, chronic interstitial nephritis and various other such conditions, even old age and its disabilities. It is really too big a pill to swallow.

Treatment.—The treatment of these cases is generally unsatisfactory. What with the chronicity of the case, the tendency to exacerbations and relapses, the various toxic degenerations and resultant disturbed function of many organs, these chronic cases may be extremely trying for the physician to treat. Without entering into details it may be stated that certain general principles should be followed in every case with modifications as each individual case may require.

Rest is very important in every case and it should be enjoined even though the patient may not see its benefit. The diet must be highly nutritious, easily assimilable and should supply particular vitamins A, B, and C in abundance and should be composed more of fruits, vegetables, carbohydrates and less of proteins particularly eggs, meat etc. Milk may be allowed particularly with a little citrate. But I generally allow the patients to take buttermilk, lactic acid milk or 'dhai' instead of milk. The role of fats in the diet is to be settled in accordance with the individual. Some easily digest a ketogenic diet with impunity and do improve on such a diet, which helps in ameliorating their symptoms, while others find such a diet nauseating and are made uncomfortable. However, the use of Cod-Liver or Halibut Liver oil as supplying an extra amount of calories and vitamins A and D will frequently be found helpful.

The diet as generally employed yields more bases and is not found to aggravate conditions.

Gastro-Intestinal Tract.—The condition of the gastro-intestinal tract requires attention in every case. The constipation should be remedied particularly by the diet or by the use of such remedies

as Agarol, Sibilin, Desicol etc. Some intestinal antiseptic is frequently employed and Hydrarg Cum Creta, Salol, Pulv. Ipecac combination or an acid mixture with Liq. Hyd. Perchlor certainly meets the necessity in almost all cases. Such antiseptics as Dimol, Kerol, Aniodol etc., I have not found of any great value. The treatment of the intestinal condition by Lactic Acid Bacilli together with Lactose, Lactodextrin etc. for supplying the pabulum of these bacilli is found to be of value in many cases. Treatment with bacterio-phages, like Coli-phage, Intesti-phage etc. may occasionally help but is frequently disappointing in these chronic cases.

Tonic Treatment.—This is essential in every case to improve the tone of the body, the condition of the blood and cardio-vascular system. Liver Extract has been of some value in most cases. Strychnine, Iron and Stomachics and Digestives are also to be employed in these cases. We generally employ at the same time vitamin concentrates like Cevibex, Bemax with Redoxon, Nestrovit etc.

Treatment of the Infection.—Alternate acidifying and alkalizing the urine with alternating "dry" and "wet" days have been found to be of value. The drug universally employed is Hexamine and it is certainly effective. We frequently use injections of Cylotropine in these cases. Various other drugs like Neotropine, Pyridium, Hexylresorcinol (Caprokol) Vestin etc., are supposed to yield good results. We have used them infrequently and have not found them any way superior to ordinary Hexamine properly employed. We have not, for fear of the nauseating taste, used Mandelic Acid preparations nor have we used Sulphanilamide nor Sulphapyridine in these chronic cases though there are reports to suggest their beneficial action on these organisms in acute cases. Vaccines, particularly as Auto-vaccine, yield the most gratifying results but occasionally, they may fail hopelessly leaving us helpless.



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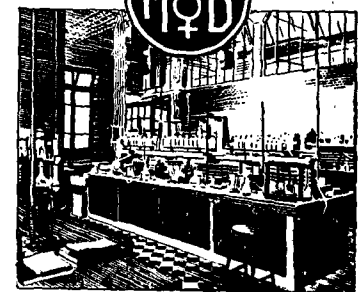
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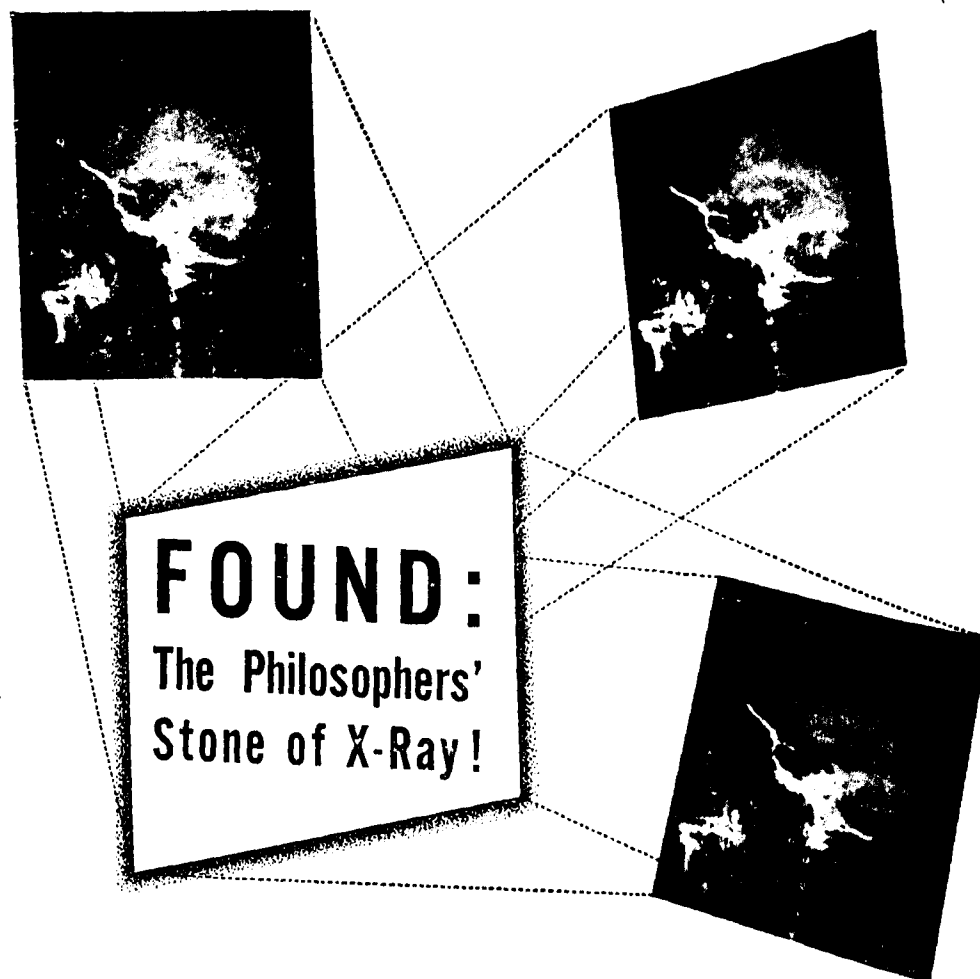
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Infections of the Urinary Tract With Coliform Organisms

BY

Capt. N. Sheshadrinathan, M.B.B.S., D.T.M.

Mylapore, Madras.

INFECTION of the urinary tract with the coli group of bacilli has been responsible for a considerable number of cases of pyrexia from early childhood to ripe old age. Infants after bowel disorders, women during the puerperium, and old men with prostatic enlargement, suffer from the effects of invasion of the urinary tract by coliform organisms.

Why this should be so at those particular stages of life will be clear from a study of the factors bringing about abnormal conditions of the urinary tract.

The older idea that infection of the upper urinary tract takes place by an ascending infection along the interior wall of ureters from the urethra and bladder has been proved to be untenable. BAUREISEN and DRAPER and BRUSCH¹ (quoted by KENNETH WALKER), have shown by experiments that organisms cannot ascend the ureter against the ureter valve unless certain conditions exist, viz, obstruction to the urinary flow and incompetence of the sphincter guarding the opening of the ureter into the bladder. In the great majority of cases such an incompetence is absent.

An ascending infection along the lymph channels surrounding the ureters has been shown to be a common mode of spread from the urethra and genitals to the upper reaches of the urinary tract. PALADINO BLANDINI experimented with animals and showed that organisms placed in the urethra could be recovered from the kidney twelve hours later. KENNETH WALKER who quotes the above experiment, improved upon the same and demonstrated that the organisms reached the kidneys by the lymphatics and not by the blood stream. Working with inorganic substances like Carmine, it was shown that the particles reached the kidneys by travelling up the peri-ureteral lymphatics.

KENNETH WALKER further conclusively showed by tying the ureter after stripping a portion of the periureteral lymphatics and infecting the urethra, that the organisms reached the kidneys only by the periureteral lymphatics. From post mortem appearances of the animals experimented upon and of human beings, with renal infections following severe urethral injuries, or damage to the female genitalis during parturition, or after prostatic operations, it was clear that the lymphatic route was responsible for the conveyance of the organisms to the kidneys. The anatomical disposition of the lymphatics of the urinary tract is attached to explain this. From the above it would appear that an ascending lymphatic route is the

commonest mode of infection of the urinary tract. There are, however, obstacles for accepting this theory. Bacteriological findings show that a high percentage of urinary infections are due to bacterium coli and allied organisms. Pyogenic bacteria like staphylococci and streptococci, the usual causative organisms of infection after trauma of the female genitalia and the urethral canal, are more rarely isolated from urine samples. The theory of ascending infection does not hold good in the usual infections of the upper urinary tract. A descending infection via the blood stream can better explain such infections aided by a theory of selective affinity of *B. coli* for the kidney. Another possibility is a lymphatic spread from the large bowel on account of the close connection between the lymphatics of the upper part of the right kidney and the ascending colon.

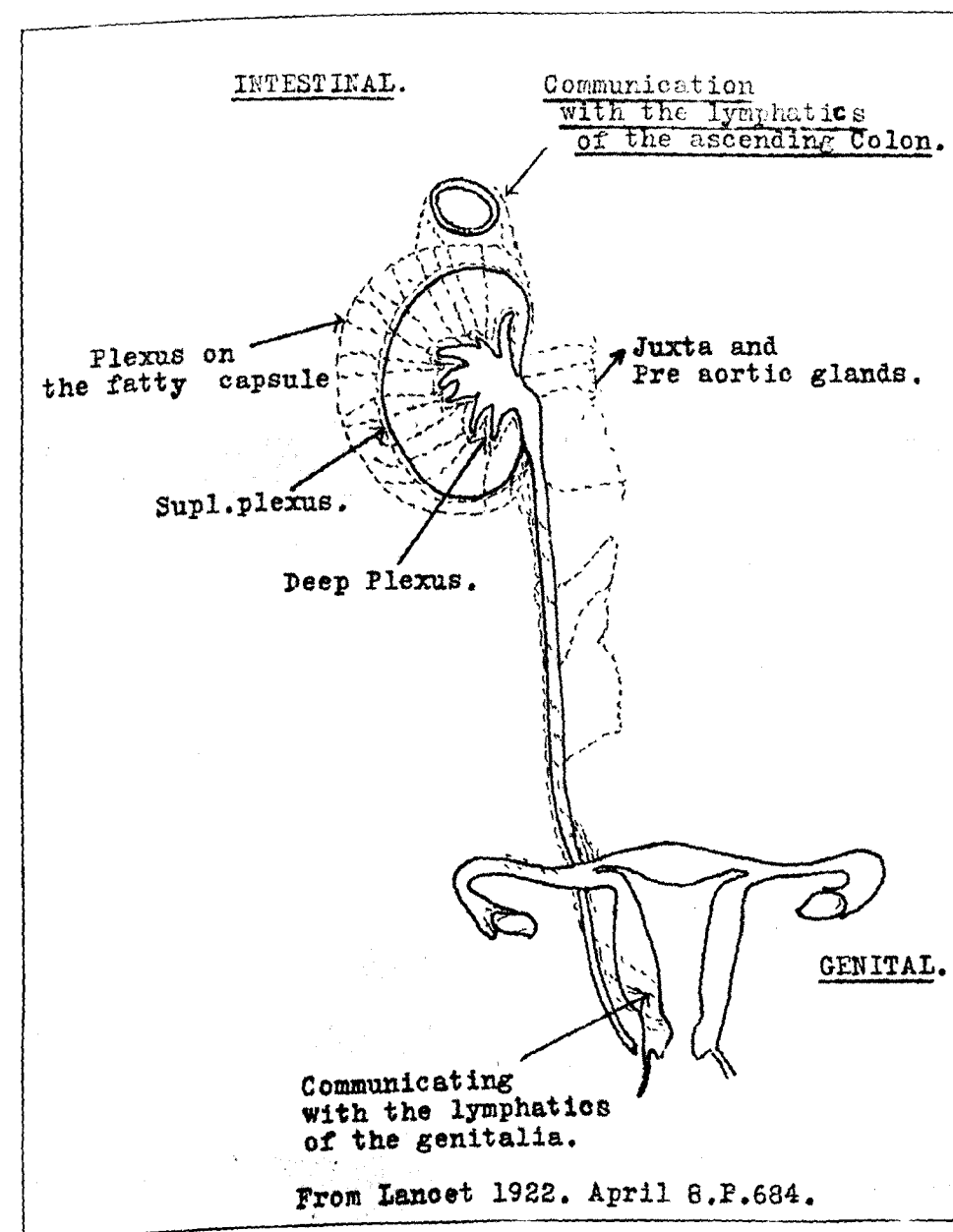
That organisms can escape into the circulation from local sepsis has been amply proved, for example after tooth extraction and after tonsillectomy. The lymphoid tissue of the small intestines forms the source of focal sepsis in typhoid fever from which organisms escape into the blood stream. A similar escape of bacterium coli or allied organisms should not be impossible. An instance can be cited to support this. In a case of suspected typhoid fever, the blood culture proved sterile. The Widal reaction was 1 in 200 positive, with *B. typhosus*. The urine was sent for culture. The organisms isolated from the urine were bacterium coli and bacterium typhosus. On a subsequent culture of the urine after a fortnight the bacterium coli alone was obtained. One could infer from this that the coliform bacterium through the Peyer's patches and remained in the kidneys on account of its selective affinity for the upper urinary tract. Though such operations as tooth extractions and tonsillectomy have been common and streptococci and other organisms have been isolated from the blood immediately after such operations, infections of the urinary tract with these organisms are rare. This is to be explained by the selective preference of bacterium coli for the kidneys. "The trend of recent studies of bacteriæmia indicates that many bacterial diseases such as typhoid fever, pneumonia, meningitis, and even diphtheria have an initial stage in which the bacteria are found in the blood in varying numbers before they localise in the specific organs or tissues for which they have special affinity or preference." With improved technic it is possible to isolate bacterium coli from the blood in the initial stage before it finally locates itself in the renal pelvis.

The subsidiary factors concerned in the multiplication of bacterium coli and similar intestinal organisms in the renal pelvis are conditions that bring about obstruction to the free drainage of urine from the kidneys, such as, a stone in the ureter, pressure by a gravid uterus, prostatic enlargement causing urinary stasis from the bladder upwards, urethra stricture and congenital abnormalities of the ureters, and neuro-muscular disorders.

"In many cases of pregnancy, pyelography has shown that the

Infections of the Urinary Tract with Coliform Organisms.

By Capt. N. Sheshadrinathan.



ureters are dilated, tortuous and displaced especially on the right side. Visualisation of the ureters has been defective. Urethral catheterisation during pregnancy and after delivery confirms the presence of such obstructions in the ureter.

Though such obstructions exist during pregnancy, it is during the puerperium that constitutional disturbance, with associated fever takes place. Perhaps the explanation has to be sought in the sudden relief of tension causing a disturbance of renal circulation sufficient to set up a focus of bacterial infection.

⁷Bowel upset commonly precedes urinary infection: for example, an attack of diarrhoea, or an aggravation of habitual constipation. Purgatives have been known to aggravate an existing bacilluria. The injection of an anæsthetic into the large bowel in too strong a concentration was immediately followed by a coliform bacilluria. In children, dysentery and diarrhoea are sometimes associated with urinary infections. ⁸Appendicitis has been shown to be responsible for pyelitis. Pyelitis which persisted for years was cured by removal of a chronically inflamed appendix. HELMOLTZ⁹ and his co-workers (quoted by DAVID NABARRO) were able to produce pyelitis in rabbits by intravenous injection of bacterium coli. FORBES¹⁰ describes two post-mortems on infants with pyelitis aged 4 and 7 months respectively who had suffered from diarrhoea and vomiting. He considers the pyelitis as the result of a systemic invasion from the intestines.

Definite proof is still wanting that the bowel is the source for urinary infections with bacterium coli and allied organisms.

Coliform infections occur from early infancy onwards. Below one year, more boys than girls seem to be attacked. This is perhaps fallacious, as less number of female infants can be examined, on account of the difficulty of obtaining samples below one year. In later life, the order of incidence is reversed. Symptoms may be acute, subacute, or chronic, high fever, rigor, or in children convulsions occur. Gastro-intestinal disturbance may be a marked feature. Sub-acute and chronic cases are marked by general lassitude, anæmia, diarrhoea and distended abdomen in children, with acute exacerbations now and then. In many cases, the condition clears up completely. In other instances, the bacilluria or pyuria may remain for months or years. In a few cases, renal damage may be present. Such cases have a bad prognosis.

The following is the order of frequency of the coli typhoid dysentery group of bacilli in infections of the upper urinary tract as noted from an analysis of organisms isolated during a year at the King Institute.

1. *B. coli communis* and *aerogenes* group 54 per cent.
2. *B. faecalis alkaligenes* group 12.5 per cent.
3. *B. pseudocarinatus* and other paradysentery organisms 2.43 per cent.
4. *B. typhosus* 1.5 per cent.
5. *B. morgan* unidentified *Salmonella* less than 1.0 per cent.

Of about 53 coliform organisms isolated from urine, 4 belonged to the *ærogenes cloacæ* group.

Regarding treatment, the very fact of the existence of numerous remedies shows that treatment of the condition is far from being satisfactory. Urotropine in acid medium was in vogue for sometime. Recently, we have had the ketogenic diet treatment, which was replaced by Ammonium Mandolate. More recently, we have had the more or less universal bacteriostatic remedy, the Sulphanilamides. The Sulphanilamides are maintaining ground at present. The one remedy which has withstood the onslaught of fashion in medicine is the alkalinisation of the urine. Most cases of bacilluria yield readily to thorough alkalinisation of the urine. The fever can be reduced, pus cells and bacteria diminish or entirely disappear. The urine has to be frequently examined to see if the dosage is sufficient to keep it alkaline. Half drachm doses of Potassium Citrate may have to be given thrice daily, being unpleasant, the taste must be covered by the addition of Syrup. The long continued use of alkalis, however, has to be discouraged, since it is likely to interfere with digestion and bring on anæmia.

The Sulphanilamides have to be given in gramme doses every four hours (for an adult) after a meal with not less than a glass of water. Sulphanilamides are not well tolerated by elderly patients. Idiosyncrasy to the drug has to be watched for by frequent leucocyte counts both relative and absolute.

It is not proposed to deal with the ketogenic treatment as it appears to have gone out of fashion.

Surgical treatment has got an important place in the treatment of persistent pyuria. "Drainage of the pelvis of the kidney by ureteral catheterization has benefited some chronic cases.

Dietetic precautions and general hygienic measures are important adjuncts in the treatment. Copious fluids, especially barley water, flush out the kidneys. The bowels should be regulated. Digestive upsets due to heavy feeding should be avoided. Bland non-irritating diet should be taken.

The value of vaccines, autogenous or otherwise, as curative agents is doubtful; but vaccines can help in augmenting the effect of Sulphanilamide therapy.

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Genito-Urinary Infection During the Puerperium

BY

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THE genital infection in the puerperium still tops the list of the causes of maternal mortality after labour in spite of the recent advances made in the science of obstetrics. But still more surprising is the fact that even though the mortality figures have been somewhat reduced after the therapeutic use of Sulphanilamide group of drugs, a certain percentage of mortality and good deal of morbidity still persists in the obstetric practice. This is because the Sulphanilamide group of drugs is found to have bacteriostatic action on the *Beta* hæmolytic streptococci only and is useless in anærobic streptococcal infection¹. These latter organisms have been shown to be normal inhabitants of vagina of the pregnant women in 30 to 40% of the cases as worked out by LEONARD COLEBROOK AND HARE² and being present in the vagina, they can produce a morbid puerperium, even though the patient may have been delivered naturally without any internal manipulation and with all the modern antiseptic and aseptic methods of obstetrics as should be expected in a maternity home. But if one goes into the detailed history of such a case, one often finds prolonged labour with the premature rupture of membranes and marked tissue damage present, the latter in fact seems to be the essential factor for the infection by the anærobic type of organisms.

Thus, it is evident how much important it is becoming to know exactly the nature of the offending organism before one can proceed to make use of the potent and at the same time the most dangerous drugs like Prontosil, the toxic effects of which are being quoted every day in the literature because of their over-dosage and indiscriminate use in all types of infections.

The sources of infection during labour are stated to be of two types, extrinsic and intrinsic. The hæmolytic streptococcal infection belongs to the extrinsic group, as TAYLER and WRIGHT have shown that these organisms are rarely found in the genital canal of pregnant women and that only 27 women per 1000 harbour the organisms at the onset of labour³. It was further proved by them that a majority of these genital tract carriers have a normal puerperium. LANCEFIELD in 1933, by means of precipitation method and EVANS and VERDER in 1938 by fermentative reactions, subdivided the hæmolytic streptococci into A to G groups and among them the organisms belonging to group A alone were shown to be human pathogens and responsible for the severe type of puerperal infection. GRIFFITH in 1934, by the technique of slide agglutination and LANCEFIELD by precipitative method, further differentiated group A streptococci into 25 types. The human pathogens giving rise to mucoid colony on plate culture are always associated

with very severe type of infection. When such a variety of organisms play in the production of severe infection, one can very well realise why anti-streptococcic sera often failed in the treatment of puerperal sepsis.

Even though nearly 3% of the women harbour the hæmolytic streptococci, only 0.25% actually harbour the *Beta* hæmolytic streptococci of the group A and hence they are not capable of initiating serious infection. COLEBROOK AND MAXTED⁶ have also shown that the strains of group A are not found in the perineal and perianal skin and hence the infection by hæmolytic streptococci from the stools and from the skin of the external genital organs is remote. It must be from the extrinsic source, such as nasal passages and throats of the attending nurses or doctor, who might have recently suffered from infection or be the carriers of those organisms. The latter are coughed up or sprayed directly, while talking, on the hands and instruments which may be introduced into the vagina for examination or for operative interference and may thereby infect the genital passages. The patient herself may be a carrier and if the delivery is being conducted in a dorsal position the organisms can be sprayed on the abdomen and vulva while straining during pains. The other source of infection is conducted by a nurse who may not be careful enough to disinfect her hands properly before taking up the next clean case. If such a mishap does occur, it is often found that each succeeding case suffers from more and more severe type of puerperal infection. Hence the careful use of mask, both by the nurses, doctors and the patients, observance of the surgical aseptic and antiseptic procedure during confinement, limitation of P. V. examination and reduction of internal manipulations to a minimum, maintenance of the confinement room as free from dust and infection as possible and confinement of septic cases or cases with fever in a separate room and conducted by a separate staff, will all favour to reduce the incidence of infection from extrinsic source to a minimum.

As regards the intrinsic infection, *B. coli* and anærobic streptococci, and gonococci and pneumococci to a small extent, are the offending organisms. *B. coli* can come from the anal region but another source, often missed, is the urine which has been previously infected during pregnancy by pyelitis and cystitis and during labour by frequent passage of catheter in a protracted labour case. The infected urine may dribble into the vagina and produce an autogenous infection.

Anærobic streptococci have for a long time been missed as the causative organisms of puerperal sepsis because most of the investigators used only the aerobic method of culture of the organisms from the uterine swabs as well as for blood cultures of septic cases. No wonder that hæmolytic streptococci were not obtained in all the cases, as the causative organisms may have been anærobic type of organisms. It was as early as 1910 that SCHOTTMULLER in Germany detected these organisms in the puerperal infections but no further notice of it was

taken till the second contribution on that subject appeared in 1924 by DICKMANN who gave records of the fatal septic cases due to that infection. LEONARD COLEBROOK and HARE in 1933, worked out the problem more in detail from bacteriological point of view and discovered four groups of anaerobic streptococci, A B C and D. SCHWARZ and BROWN, in 1936, detected that the development of mild sepsis in puerperium and thrombophlebitis of the veins of the broad ligament were due to these organisms and the incidence of mild sepsis could be much reduced by instillation of antiseptics e.g. Mercurochrome, Iodine, and Glycerine into the vagina as a routine at the time of delivery.⁷

As has been stated above, these organisms are the normal inhabitants of the vagina of pregnant women in 30 to 40% of cases and they require a devitalised tissue for their growth. Hence the lacerated decidual tissue and blood clots in the uterine cavity and the œdematous lacerations of the cervix are the fruitful media for their growth. But during the first 48 hours of the delivery, they are killed by the phagocytes or die from want of congenial acid nutrient medium. At the expiry of 48 hours due to the process of involution of the uterus the tissue exudate in the lochia is progressively acidified by the accumulation of metabolic products and also by the fermentative changes in the lochia themselves. Further, the coincident neutralisation of the antitrypsin of the serum exudate by the tryptic ferments liberated by the disintegration and breakdown of the leucocytes affords a better culture medium for the growth of anærobic streptococci. COLEBROOK and HARE³ have found out that the serous discharge from the uterus after the third day of the puerperium is found to have a much reduced alkalinity and loss of antitryptic power so much as to facilitate the growth of anærobic streptococci.

Pathologically, the anærobic streptococci have less invasive action in the healthy tissue so that the lesions often produced by them are of the nature of local sepsis to start with. In the uterus they may behave in two ways. Invading the decidua, they may set up putrid infective endometritis, presenting thick, shreddy, rough surface and emanating offensive discharge. There will be a well-formed very thick leucocytic zone, which devours the organisms and which raises an effective barrier to them. Thus, very few bacteria are to be seen invading the muscle. If they do, there would be foci of inflammation and suppuration in the uterine wall, and these on reaching the surface would set up localised peritonitis with marked adhesions of the omentum, intestines, the uterus and its appendages—thus giving rise to a mass in the lower abdomen. But if by chance the organisms spread along the thrombosed veins of the uterine wall, they may set up phlebitis of the bigger veins and produce spreading thrombo-phlebitis of the ovarian veins and the veins of the broad ligaments. Complications like white leg and embolic septic foci in the lungs are quite common. It is rare for the anærobic infection to produce multiple pyogenic abscesses in the body as the organisms cannot survive long in the normal alkaline blood stream. Hence the septicæmia is easily controlled.

The other organisms, which are sometimes seen to induce puerperal infection, are staphylococci aureus, streptococci viridans, streptococcus faecalis, gonococci, pneumococci, B. welchii and B. tetanus. They may be either alone but very often in association with others, forming a group of them and thus proving to be more offensive.

In addition to the presence of the virulent organisms, certain other conditions are required for the production of infection namely exhausted condition of the patient by protracted labour with early rupture of membranes, ante and post partum hæmorrhages, marked bruising and laceration by operative procedure, severe shock either due to hæmorrhage or rough manipulations and debilitated condition of the patient by the toxæmia of pregnancy or anæmia. Primiparæ and multiparæ after the 7th pregnancy and women above the age of 30, are additional factors for the proneness to infection very easily.

Clinically, in a normally-delivered case without any operative procedure, the onset of fever is after the 3rd day of confinement as can be well expected if the infection is to be of anaerobic type. But it may even appear as late as 8 to 10 days and then the prognosis for the patient is comparatively good, yet such a fever persists for a longer time. In cases with operative manipulations very often *Beta hæmolytic streptococci* are the chief offending organisms along with others mentioned, and due to their rapid invasive properties in the healthy tissues and along the lymphatics, the appearance of the fever may be any time soon after the delivery to the 3rd or 4th day. The earlier the fever appears the graver the prognosis. The degree of pyrexia is not so important as the frequency of pulse rate from the view point of prognosis. Presence or absence of rigors cannot be taken as important though its earlier occurrence in the puerperium is of definite significance. The mortality is often found high in those cases which sleep badly and are toxic and develop diarrhœa, pneumonia and general peritonitis. In short, from the view point of prognosis the moderately low pulse, rarely above 120, freedom from insomnia and diarrhœa and absence of streptococci, both of aerobic and anaerobic types, are definite favourable factors.

The complications met with during the puerperal fever depend upon the nature and virulence of the infecting organisms and the mode of infection. The hæmolytic streptococcal infection, due to the rapid penetrating power of the cocci, is often associated with early blood infection and peritoneal involvement. The spread along the lymphatics produces local peritonitis in abortion cases and general peritonitis after labour at term. But it is very rare to get a pure hæmolytic streptococcal infection and other associated organisms e.g. staphylococci and anaerobic streptococci etc., may in addition produce local lesion. Thus the usual complications are metritis desiccans, abscesses in the uterine wall, pelvic cellulitis, peritonitis, pelvic abscess, ovarian abscess, perimetrial thrombo-phlebitis and superficial necrosis of the vulva and the vaginal wall. The distant complications are the metastatic abscess, pneumonia, empyema, pleurisy, cerebral embolism, multiple arthritis and white leg.

Treatment.—Now regarding the treatment, prophylaxis plays a much more important part. Thorough antenatal care of the patient regarding her diet and vitamin contents of the food and proper treatment for anæmia and for any septic foci in the nose and throat are all essential. The pathological vaginal discharge if present during pregnancy should be investigated and treated accordingly. At the time of delivery, the compulsory use of mask by those who come into the labour room including the patient is essential. The unnecessary prolongation of labour and exhaustion of the patient should be avoided. The nourishment of the patient during the prolonged labour should be adequate and if nothing is retained by mouth on account of reflex vomiting, repeated injections of intravenous Glucose Saline should be given as often as required. The operative manipulations should be carried out with all the precautions of asepsis as in a major surgical operation, and above all, not to admit septic cases or cases with fever of any sort at the time of delivery to the same labour room where normal cases are being conducted.

As regards the actual treatment, the best results are obtained if the treatment is begun early. If the patient gets a rise of temperature above 102° twenty-four hours after delivery, puerperal sepsis should be thought of, after ruling out conditions like malaria and pyelitis by examination of blood and urine. The vaginal swab should be taken from the lochia. Now it has been found that it is not necessary to take a direct swab from the uterine cavity but if a swab can be taken from the uppermost part of the vagina by means of a special tube like Menge's apparatus without the introduction of vaginal speculum fairly good idea of the infecting organisms can be obtained by culture on plate-agar and fluid media by anaerobic and aerobic methods of incubation. The offending organisms preponderate in number and give positive cultures. The blood culture should also be made at the same time.

In addition to the usual careful treatment of the puerperium, the patient should be put in a semi-sitting posture and made to lie flat on abdomen for half an hour two or three times a day, provided the patient is not too severely ill to do this. Thus a free drainage of the lochia can be effected without much local manipulations. Heavy retroverted uterus can very often correct itself and empty the retained lochia. If it fails and uterus still remains retroverted it may have to be replaced by finger. But this latter method has to be avoided as far as possible lest flaring of infection may follow. The douching of the vagina if the lochia is very offensive should be done twice or thrice a day. But in no case should unnecessary manipulations be done. This equally applies to the septic abortion. The use of curetting and intra-uterine washing in the presence of infection and fever is to be strongly condemned. The patient should be prescribed medicine for procuring good sleep.

A few years ago, intra-uterine Glycerine treatment was much advocated and like any new treatment it was at first tried in all cases whether the infection was localised to the uterus or not. But now is

has been established that it can be used only if the septic process is limited to the uterine cavity and in the muscular wall of the uterus, and provided the infection is of a mild nature. Hence it is most suited for post-abortion cases. But there are certain conditions which definitely contraindicate its use and they are: Spreading pelvic infection, even peritonitis and slight degree of effusion, marked toxæmia and definite septicæmia with presence of signs of pneumonia, presence of foul sepsis of the perineum, vagina and cervix, and development of phlegmasia alba dolens.

Quinine and arsenical preparations intramuscularly and the intravenous use of antiseptic drugs had their days but prolonged trial has proved them to be useless. But at present new antiseptic dye stuffs are coming into prominence and actually replacing the old therapy.

The antistreptococcal sera and vaccines were also used blindly but seldom they gave satisfactory results. The sera can however be used to ameliorate the toxic symptoms produced by the exo-toxins of the bacteria. Hæmolytic streptococci, for instance, produce five exotoxins: hæmolysin, leucocidin, fibrolysin, spreading factor of Duran-Reynals and erythrogenic toxin responsible for skin rash. The commercial Scarletinal Antitoxic Serum is therefore useful in treating the toxic manifestations.

In more toxic and septicæmic cases intravenous Glucose Saline repeatedly and even blood transfusion when available are very beneficial.

Recently, the medical treatment of puerperal sepsis has been completely revolutionised by the discovery of Azosulphanido compounds having bactericidal action on the Hæmolytic Streptococci in experimental animals as shown by DOMAGK. LACOMME made use of the drug prophylactically the day following the delivery and COLEBROOK and KENE and PURDIE from the statistical study of the cases of puerperal sepsis treated by Prontosil and Sulphanilamide showed definite decrease in the mortality figures in cases of Beta hæmolytic streptococcal infection. They found the drop in the mortality figure from 22 to 8% in severe septic cases." For its full bactericidal effect the concentration of the drug in the blood should be 10 mgm. per 100 c.c. of blood." As it is equally rapidly absorbed from the intestines the injection treatment of the drug can be supplemented by oral administration in the form of tablets. In order to combat acidosis¹ produced by the drug 10 to 20 gr. of Sodii-bicarb should also be given along with it. It is a drug mainly excreted in the urine and hence it should be used with caution in impaired renal functions. The drug should be at once stopped or the dosage reduced at the appearance of any of the toxic symptoms: headache, nausea, skin rash, vertigo, cyanosis, anæmia and agranulocytosis. Of these the last manifestation is to be dreaded the most and if Prontosil treatment is extended beyond 6 to 8 days repeated blood examination for R.B.C. and W.B.C. count should be done to prevent any mishap from the drug.

The treatment of general peritonitis has also been changed now that we can use Prontosil or drugs with similar chemical composition. The opening and drainage of the abdomen is hardly required. Vigorous treatment with these drugs and the use of Morphia repeatedly to quiet down the intestinal movements give far encouraging results. If actual pelvic abscess develops it has to be drained.

As has been stated in the beginning, Prontosil has very little action on the anærobic streptococcal infection and hence the use of this drug in local and mild type of infection may not prove useful. But the addition of Pyridine group to Azo Sulpho nucleus as in M.B. 693 seems to have definite action on these organisms clinically. If this is proved by further clinical use of the drug, it will go a long way towards reducing the morbidity in the post abortal and puerperal infection.

The urinary infection during the purperium may involve either the lower or upper part of the urinary tract. The former is the result of stasis of urine and overdistension of the bladder during the protracted labour often necessitating repeated catheterisation. In a difficult labour with some degree of cephalo-pelvic disproportion, on account of the pressure of the child's head tightly fitting the pelvis during its passage through it, the base of the bladder and the urethra are severely pressed against symphysis pubis. The blood supply of the bladder is thus affected, the bladder wall becomes congested and cedematous with loss of vitality and resistance of the lining mucous membrane. In such a condition if organisms are carried into the bladder with catheter, a severe type of cystitis may easily be set up. In a very severe infection one often finds on passing a catheter the bladder filled up with very offensive pus as a result of fulminating cystitis and even actual necrosis of the bladder wall. Cystitis may also develop in the puerperium if the bladder is allowed to get overdistended, should the patient be unable to pass urine due to the presence of a few perineal stitches or not being used to passing urine in lying position especially as seen in primipara. Retention and cystitis may also be produced by retroverted uterus after the 5th day in the puerperium.

The treatment consists in the use of all aseptic precautions in passing the catheter; on no account should the bladder be allowed to get overdistended and lose its tone. Urinary antiseptics *e.g.* Neotropin or Urotropin or Albucid may be given orally. But in very severe cases one has to resort to repeated irrigation of the bladder by means of two ways, catheter and using a very mild antiseptic. Patient having low temperature up to 100 may be best treated by giving Cylotropin injection intravenously and Prontosil or M.B. tablets orally.

The infection of the upper urinary tract is of the nature of pyelitis. It is very often seen in a patient who has been suffering from that disease during the pregnancy, and the urinary stasis during labour may be a quite sufficient cause to flare up the old infection. The fever in such a case may manifest itself with rigor within twenty-four hours of labour or it may even appear during delivery.

Pyelitis during the puerperium may occur as a spread of the infection from the lower urinary tract—the infection being carried from the bladder up the lymphatics of the ureters and peri-ureteral tissue. The onset of pyelitis is seen by the end of the first week and the disease becomes quite evident at the end of the third week.

Where a previous history of the disease is lacking the diagnosis becomes rather a difficult problem and one has to rule out conditions like malaria and puerperal fever. Examination of catheter sample of urine both by microscopic and cultural methods may help in diagnosing and in knowing the offending organisms.

During fever the patient should be given diaphoretic and alkaline diuretic mixture, along with plenty of fluids by mouth. The alkalis should be enough to render the urine alkaline throughout the twenty-four hours. Very often this is quite sufficient to bring down the temperature. If the infection is with *B. coli*, streptococcus hæmolyticus or staphylococcus albus or aureus the Sulphanilamide group of drugs is useful, but it is otherwise, if the infection be of streptococcus faecalis variety. Mandalic Acid treatment, as Mandical Powder does produce good results in all varieties of infection and it should be given a trial as the disease becomes subacute. In most resistant cases resource may be had to repeated catheterisation of the ureter, the indwelling catheter being kept in for twenty-four hours at a time.

Perinephric cellulitis and abscess may result in the second week of puerperium as a complication of puerperal sepsis. The cellulitis spreading upwards along the ureter from the pelvis very rarely leads to actual suppuration in the perinephric region and if the general sepsis is got over, the patient is left with a tender palpable mass at the lower pole of the kidney especially the right, and constant backache in the lumbar spine. During the acute stage the fomentation in the loins is all that is required along with the usual treatment for the associated genital infection and it is very rare that the help of the surgical knife is required.

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Urinary Infections in Infancy and Childhood

BY

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I SHALL confine myself to infections of pyogenic origin. The infection is practically limited to the kidney and the upper end of ureter. With a structurally normal urinary apparatus, cystitis is almost unknown. However heavily infected the urine is, the normal bladder is sufficiently powerful to resist any infection. Urethritis similarly is uncommon. Any obstruction favouring urinary stagnation will of course, ultimately lead to infection of the urinary tract.

The infection is never limited to the pelvis of the kidney. Indeed it has been shown that it is a focal interstitial nephritis first (suggesting a blood-borne infection) and then when the organisms have lodged in the pelvis after passing the tubules, pyelitis occurs. The presence of epithelial and granular casts in cases following acute gastro-enteritis in infants points that the process of inflammation extends beyond the pelvis and the lesion is really pyelonephritis. Nevertheless, the parenchyma of the kidney may be infected from the pelvis by way of the perivascular lymphatic structures and by direct passage of the organisms through the pelvic lining over the parenchyma. Due to its proximity, the inflammation spreads to the contiguous parts of the ureter. A congenitally deformed kidney is naturally a weak kidney with a greater liability to infection. Dilatation of ureter, hydronephrosis and diseased kidney also predispose to infection.

Urinary infection is surprisingly common among infants and children. Even infants in the new born period are not spared. In Chittaranjan Sishu Sadan (Children's hospital) 60% of patients running temperature turn out to be cases of urinary infection. There are several possible reasons for this great incidence. It is quite common to note the association of rise of temperature with gastro-intestinal upsets and dysentery (specific and non-specific). The temperature is seen to persist even when the abdominal condition has been controlled. Urine culture in such cases is frequently positive. The frequency of diarrhoea and commonness of urinary infection seem co-related, the communicating lymphatics from the colon to the kidney being the commonest channel of infection. The natural habitat of the colon bacillus is the intestine and since in 60% of cases of urinary infection, the causative organism is *B. coli*, it is possible that the organisms are derived from the intestinal tract. Other organisms responsible for urinary infection are staphylococcus, streptococcus, strepto faecalis, *B. coli* and coliform bacilli, *B. typhosus*, *B. para-typhosus* A and B, *B. proteus vulgaris*, *B. pyocyaneus*. During the stage of bacilluria and the elimination of irritants a mild inflammation is set up in the pelvis and the contiguous part of ureter thus further narrowing the already narrow structures of the nephrons of infants. In fact stasis prepares the ground for infection and also its persistence is favoured

by it. As a result of experiments carried out in the Mayo Clinic HELMHOLZ concludes that with stasis the parenchyma of the kidney becomes rapidly infected from the pelvis. Dehydration consequent on acute gastro-enteritis plays a great role in initiating the infection for it means an anuria or oliguria and in effect is equivalent to stasis. Apart from congenital defect obstruction may be caused by a plug of pus or mucopus, and in rare instances by stone and new growth.

The changes in kidney are however only transitory. We have seen many cases of urinary infection showing pus cells, hyaline, granular and leucocytic casts clearing up leaving no trace. The blood pressure is not raised and blood urea is not high.

Pyelitis is not always of bacterial origin. There is no cultural evidence to label the cases that follow infectious fevers, bronchopneumonia, and cerebrospinal fever as being due to specific organisms. The damage is probably caused by toxins helped by dehydration usual in fevers.

Significance of Pus Cells in Urine.—In a large percentage of cases pyuria indicates infection of the pelvis and kidney. It must however be remembered that there are other causes of pyuria viz, cystitis, urethritis, vulvo-vaginitis, renal calculus and tuberculosis, acute nephritis, pyonephrosis etc. FRIEDMAN and MITCHELL have concluded that when the number of leucocytes exceeds 40 per c. mm. (counted in the ordinary blood counting chamber), an infection of the genito-urinary tract may be suspected. The presence of a few pus cells is quite compatible with perfect health whereas a few pus cells and many bacteria are characteristic of early stage of *B. coli* infection. On the other hand, in the absence of pus cells or albumin urine culture may be positive. Moderate and even fair pyuria may not be accompanied by any symptom whatsoever. It is only during routine examination that such a state is revealed. When the urinary infection is longstanding, large number of pus cells may persist along with casts and slight albuminuria, yet the urine may show no organisms on culture. The lesion has then proceeded on the stage of renal fibrosis which certainly has a bad prognosis. Persistent pyuria should, however, lead one to suspect some urinary obstruction and all such children should have thorough urologic investigation including cystoscopy, pyelography, ureteric catheterisation and detailed examination of urine.

Clinical Picture.—There are two outstanding features. Firstly, in spite of hyper-pyrexia the patient does not look very ill and the expression is bright. Secondly, local symptoms are characteristically absent. Tenderness in the loin and abdominal rigidity are not to be found. Clinically, three different types of cases are met with: (1) Simple febrile (without any physical signs). (2) Meningeal. (3) Diarrhoeal.

The meningeal type is seen only in infants. Hyperpyrexia and convulsion mark the onset. In course of time hypertonia develops as

evidenced by rigidity of neck, head retraction and arching of the body. In the third type the only symptoms are diarrhoea and rise of temperature.

In Infancy.—Even new born infants may be attacked. Sex has no influence on the incidence. The onset is ushered in by convulsion. The temperature rises suddenly reaching to 103° — 104° F. or more. The temperature maintains the high level with slight variation in the range for about a week or 10 days. It then subsides either gradually or all on a sudden. There is no diminution of the urinary output. Physical examination reveals nothing incriminating. Urine is acid in reaction. Leucocytosis, if present, is not marked. During the height of temperature the baby is restless and cries frequently. In other respects the general outlook is hopeful.

In chronic cases, the temperature is very irregular. There may be only small rise of temperature with irregular apyrexial interval. In the presence of a latent renal infection, marasmus has been wrongly diagnosed because of gross malnutrition which may be present in such cases.

In Childhood.—The child is fretful and may cry during micturition. The dysuria is due to the highly acid reaction of urine since there is no hypogastric tenderness to indicate cystitis. Older children sometimes complain of severe headache and aching of the limbs. The onset may be marked by vomiting. If the temperature is of the high intermittent type each pyrexial bout may be accompanied by rigor. The temperature and course may simulate enteric fever but toxæmia is absent and sensorium is not clouded. There is only one feature about the temperature which may be called characteristic viz., that the fever is of short duration, i.e., lasting for a few hours and the temperature may rise and fall more than twice in 24 hours. The disease may also have an insidious onset.

In chronic cases, low intermittent temperature may continue for a long time. The child may be altogether afebrile with only pyuria or there may be occasional small rise of temperature in the midst of good health. The child has a muddy complexion, is moderately or severely anæmic, undernourished and lacking in vigour.

The urine is alkaline in infection with *B. proteus vulgaris* and *B. pyocyaneus*.

Treatment.—We aim at sterilisation of urine. It is left to nature to heal up the renal damage as much as possible by resolution. Even if some of the nephrons are irreparably damaged, sufficient others are left behind to carry on the work quite efficiently. The sterility of urine is not necessarily accompanied by disappearance of pyuria. The temperature has been seen to persist in spite of sterility. Moreover the fall of temperature to normal is not always followed by clearance of the urine of pus cells.

Before commencing treatment a centrifuged deposit should be stained by Gram's method to determine the nature of the bacterial flora (predominance of bacilli or cocci in chains of groups). A hint

may be had from it as to which of the specific remedies will have to be employed.

The newer remedies, Sulphanilamide and Mandelic Acid have been welcomed and are being widely used because of the rapidity with which they produce a sterile urine. In as much as Sulphanilamide can be given in the acute stage and as there is no need to restrict the fluid intake—even renal insufficiency not affecting its bacteriostatic property, it is the drug of choice in pediatric practice. The reaction of urine does not affect its therapeutic value and it exerts its maximum effect when the pH. is on the alkaline side. The danger of agranulocytosis and granulocytopenia has perhaps been exaggerated. Sulphanilamide is prescribed along with alkali so as to keep the urine alkaline and prevent acidosis which sometimes follows its administration.

With Mandelic Acid, treatment is not so easy to carry out. The urine has to be maintained within a constant range of acidity. With 5 drops of 1% Methyl Red and 2 c.c. of urine, the colour should be lightly pink or red. Yellow colour indicates that the urine is too alkaline whereas deep pink means that it is too acid. The required acidity is maintained by Ammon Chlor. or Ammon. Phosphate. With elixir of Ammonium Mandelate (B. D. H.) it may not be necessary to prescribe acidifying agents. Calcium Mandelate has also the same advantage. In addition, it is not unpleasant to taste like the others. Unfortunately Mandelic Acid is not bactericidal to streptococcus and staphylococcus even in acid urine. Alkalisising foods e. g. vegetables and fruits should be omitted during treatment with Mandelic Acid.

Alkalis still hold the ground in treatment. The usual practice is to prescribe it in doses of one drachm in 24 hours to a child of five in the form of Pot. Citras and Sodi-Bicarb. for ten dys. Above five years the dose is one and half drachm daily. The required dose is spread out in frequent doses throughout day and night. The point is to keep the urine alkaline and the reaction is to be maintained for another ten days after the temperature has been normal. A clear and sterile urine often results from this.

If the above treatment fails Sulphanilamide and Alkali are given concurrently for 7 days. This should be sufficient to render the urine sterile. Mandelic Acid should be started forthwith if the culture shows strepto faecalis.

We have found Urotropin specially useful in cases where urinary infection follows some other condition. The urine must be kept acid to Methyl red for the treatment to be successful. It is not toxic and is quite safe to use when there is neutropenia and leucopenia.

Dye-stuffs such as Pyridium and Serinium have proved useful in our hands when others have failed. We are particularly impressed with the value of Pyridium in cases attended with diarrhoea when one would not like to use alkali. The dose for a child is $1\frac{1}{2}$ grs. four times a day, by mouth.

Relapse and chronicity are not infrequent. It is in such cases that we have used Vancott's combined Immunogen in graduated doses

and the response has been fairly well with a structurally normal urinary tract. Non-specific protein therapy should be given a trial in intractable cases.

We must admit that in treating a case of urinary infection, it is difficult to foretell which of the two drugs, Sulphanilamide and Mandelic Acid, will be successful. It often happens that the one tried first fails and the one tried next checks the infection. The failure of treatment may be attributed to the fact that there are various strains of coliform bacillus. Neither Mandelic Acid nor Sulphanilamide is equally potent on all of these. Pyelonephritis is often a mixed infection and with one drug it may not be possible to attack the different causative organisms. The drugs should be pushed to the therapeutic amount before any judgment is pronounced as to its efficacy.

It must be remembered that pyelonephritis may be associated with other diseases. In the case of failure a thorough search should be made for other foci of infection. A mild non-toxic case of enteric fever may pass as one of pyelitis if we rest satisfied with only the urine examination report and the blood is not tested for agglutination reaction. In such cases of apparent coli infection the newer remedies have been unnecessarily blamed.

In our experience Sulphanilamide is the drug par excellence in pyelonephritis associated with hæmaturia.

Dosology of the Newer Remedies.—*Sulphanilamide*:—HOFFMANN et al recommend $\frac{1}{4}$ gr. per pound of body weight for children aged 3—10 years. Others suggest $\frac{1}{2}$ gr. to each pound of body weight. Each tablet being $7\frac{1}{2}$ grs. the average daily doses are as follows:—upto 12 months 1 tablet, upto 5 years $1\frac{1}{2}$ tablet and for older children 3 tablets. The drug is not to be continued for more than 10 days.

Mandelic Acid:—NEWNS and WILSON suggest the following:—upto 6 months, 30 grs; 6 months—2 years, 30—60 grs; 2—5 years, 60—90 grs; 5—12 years, 90—120 grs.

The routine practice is to prescribe 15 grs. of Sodium Mandelate and 10 grs. of Ammon. Chlor. every 6 hours for children between 1—4 years. For 4 years or over—30 grs. of Sodium Mandelate and 15 grs. of Ammon. Chlor. every 6 hours. It takes between 5—10 days for the urine to be sterile. The drug is to be continued for a week after the urine has been sterile.

Conclusion.—An attack of pyelonephritis is never to be taken light-heartedly. The late effects as studied by GRAY and GUILD and revealed by urogram may be so diverse as dilatation of ureter, angulation of the junction of ureter and pelvis, hydronephrosis, blunting of calices etc. Evidence has been adduced to indicate that chronic pyelonephritis may be the cause of hypertension. The tests for cure are permanent sterility of urine, absence of pyuria and a drop of temperature to normal. The late effects result from incomplete treatment and recurrent attacks.

Pyuria

BY

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Existence of Pyuria.—A few numbers of leucocytes may be present in normal urine, and this number may be increased when there is some irritation of the genito-urinary passage, or in general conditions as fevers. But this number is never great. When numerous, they certainly indicate some kind of infection in the genito-urinary passage. The diagnosis of the mere existence of pyuria is comparatively easy, because it involves ordinary examination of the urine. However, when collecting samples for this purpose, it is necessary to see that it is not accidentally contaminated. Vaginal discharges in females is a common source of such contamination, and whenever possible, a catheter specimen should always be obtained in them. Among male patients, when there is no lesion on the external genitals, and no tight fore-skin, urine may be collected after cleansing the external parts. Cases of soft sores with resulting balanitis and phimosis will almost always show pus in the urine, because it is then mixed up with the outside discharge; and therefore it is absolutely necessary to be very certain that pus in the urine sample has not come from outside source from accidental contamination.

Microscopically, the pus-cells appear as spherical cells full of granules. They are bigger than R. B. cells and are 10 to 12 microns in diameter. Their appearance may slightly vary according to the reaction of the urine, and whether the urine is fresh or decomposing. Microscopic examination is the quickest, most reliable and simplest method for the detection of pyuria, of all chemical and other methods. But failing this facility, the chemical tests have to be employed. When abundant, pus forms a tenacious thick sediment. It has to be distinguished from oxalates, amorphous urates and uric acid sediment in acid urine; phosphates and amorphous phosphates sediment in alkaline urine. Phosphatic sediment, as is well known, will rapidly dissolve on addition of Acetic Acid. Amorphous urates will disappear on heating the sample, and uric acid sediment, which is red sand, and very unlike pus-sediment in colour and appearance, will vanish on addition of NaOH; calcium oxalate sediment is quite common, and somewhat resembles pus-sediment in appearance. It is commoner among vegetarian middle-well-to-do class, of sedentary habits, and neurotic temperament. Addition of strong HCl and vigorous shaking dissolve the oxalate sediment. These tests, when negative, exclude common deposits, and when the sediment persists after these tests, chemical tests for the detection of pus have to be performed. Liquor potash when added to the sediment turns it intoropy gelatinous mass. Another test is to add Tinct. Guaiac to the deposit on the filter-paper after filtering the urine. With pus, it gives greenish blue colour. It disappears on heating.

Amount of Pyuria.—These tests are easily applied when pus is present in some amount. It is generally copious in chronic cystitis. However, the amount of pyuria has no reliable significance regarding the severity of the illness, and/or chronicity. In cases with intermittent obstruction, it so happens that the amount of pus suddenly greatly diminishes, and urine-examination alone may suggest improvement in patient's condition. But in reality it is exactly the contrary. Because of the obstruction and damming back of the purulent matter, patient's general condition worsens, the temperature mounts up, the genito-urinary symptoms exacerbate, and any renal swelling if present increases in size. With relief of symptoms, naturally or with successful treatment, there is again copious discharge with betterment in the condition of the patient. So also in chronic gonorrhœa, the discharge is intermittent, and may be present only in early morning samples, in the form of "Good morning drop" at the meatus. It may also be present only in the urine, collected after prostatic massage. The amount of pus therefore, is not a safe ground on which to gauge the severity or the mildness of the infection.

Anatomical Site and Kind of Infection.—Having established the condition of pyuria, it is necessary to try to find out the kind of infection which is causing it. Pus should always be stained for gonococci. They are gram-negative diplococci, found outside as well as inside the pus-cell. Their occurrence inside in the cells, in clusters of 8 to 10, and the formation of the characteristic "Gonococcal cell" may be taken for practical purposes as absolute evidence of gonococcal infection. In non-specific infections, colon bacillus is present in large majority, others being staphylo and streptococci, bacillus proteus vulgaris and bacillus pyocyaneus. Tubercle bacilli are nearly always present in urine in cases of the tubercular infection of the genito-urinary passage. The identification and differentiation may not be certain after only ordinary microscopic examination. Special staining methods, as for instance, for the detection of tubercle bacilli, have to be employed. Occasionally, guinea-pig inoculation may be necessary. Urine culture is in large numbers successful. These are specialized methods requiring technical skill and experience, but they are worth the trial and expense, because the knowledge of the real nature of infection throws light on many obscurities in the case.

Having found out the existence of pyuria and the nature of the offending organisms, the next step is the determination of the anatomical site, from where the pus is coming. It may come right up from the kidney or down from the external meatus, and other lateral openings and structures connected with the genito-urinary system. All these structures form one continuity, and primary infection in one situation may travel in either direction, and start infection secondarily in other regions. It may, therefore, happen that at a later date in the evolution of the disease, secondarily infected regions produce dominant symptoms, and primary focus of infection, if not carefully looked for, may be altogether missed. An old man desperately fighting for life may be on the verge of uraemic coma produced by pyelonephritis.

But this pyelonephritis is likely to have been produced from ascending infection from chronic cystitis, and that in turn from enlarged prostate. It is essential, therefore, without relying too much on the localizing symptoms, to find out the primary focus of infection. For this, clinical and urinary examination, with intelligent interpretation of symptoms provide sufficient data. Presence of tube-casts, specially pus-casts and renal epithelial cells indicate the infection of the kidney. All pyuric urines give positive tests for albumin. It has been calculated that approximately 100,000 pus cells for each cubic millimeter add about 0.1 per cent of albumin. So that any excess above this would be probably coming from the impaired kidney. Epithelial cells, from bladder region, kidney, pelvis, vagina, etc., have characteristic forms and though not to be relied upon as infallible evidence, they provide useful pointer, specially so, if the urine sample is quite fresh; clinical examination is however the bed-rock of diagnosis. A swelling in the kidney region, more marked anteriorly than posteriorly, resembling kidney in shape, resonant in front, dull laterally and in the flanks, not fixed but movable, separated distinctly from the costal margin with resonance in between, and which can be grasped bimanually, all these are evidences of the enlargement of the kidney. With affection of the kidney, there will be pain and tenderness in the same region. Polyuria, diminution in the excretion of total solids, falling specific gravity, cracked and furred tongue, increase in blood urea, and gradual march of uraemic symptoms all these when present leave very little doubt, regarding the renal involvement in cases of pyuria. Pus, when it originates from the kidney, is intimately mixed with the urine, and does not quickly form a sediment at the bottom. In pyuria of bladder origin, pus is generally copious and sedimentation is rapid. Bladder epithelial cells are also present. Albumin which is present is not in excess of that warranted by the amount of pus. Symptoms suggesting the vesical involvement are also present. They are pain in the supra-pubic and perineal region, painful and frequent micturition, and perhaps more constant and reliable, is pain after micturition. Pain after micturition is almost always due to vesical origin, and may be so severe as to produce fainting in patients of the fair sex, among whom cystitis is quite common. Frequency of urination is due to the irritation of bladder mucous membrane, and though necessarily present in cases of cystitis, it may be caused by infected urine coming from the kidney, and causing irritation even when there is no organic lesion in the bladder. This probably explains the frequency in early cases of renal tuberculosis at a time when bladder wall is not involved. Urine as well as clinical examination gives indirect data on which diagnosis can be formulated. But direct evidence is afforded by cystoscopy, which enables one to visualize the vesical mucous membrane. Ascending pyelography which consists in introducing substances opaque to X-ray through the lower ureteric opening and then taking X-ray photographs, enables one to determine the side of the affected kidney. Intravenous pyelography is somewhat similar, and consists in introducing X-ray opaque dyes

intravenously and taking X-ray photographs while the dyes are being excreted by the kidneys. Intravenous pyelography as well as plain X-ray gives information about the size of the kidney, and presence or absence of calculus, but pyelography in addition throws light on renal functional capacity. Having determined the existence of pyuria, the nature of the infection, the anatomical site of the lesion, a further attempt should be made to find out how and by what paths the infection has reached the genito-urinary system, and whether there are any pre-disposing factors present. In addition to the direct path of continuity which can pass infection from above downwards and *vice versa*, there are two other paths—haematogenous and lymphatic. One of the main functions of the kidney is excretion of waste-products, and many organisms are excreted through the kidney. Septic foci elsewhere in the body—septic tonsils, boils, abscesses, tuberculosis of glands, bones etc.—may thus start infective process in the genito-urinary system during the stage of excretion. The resistance of the epithelial lining is quite adequate normally to withstand such onslaughts, but the chances for such infection to succeed become greater if there is any kind of obstruction anywhere in the passages. Lymphatic path may provide another avenue through which again infection may be engrafted. Tuberculous nodules in the testes, infected kidney on one side and impaired condition of the gastro-intestinal tract, and other conditions, by their inter-lymphatic communication may be able to hand over their quota of infection of the genito-urinary tract. In cases of relapsing pyelitis and bacillus coli infection, an endeavour should necessarily be made to find out any predisposing cause. As was said before, obstruction anywhere in the genito-urinary tract, whether in urethra, bladder, or kidney and of whatever nature, retention due to nervous causes, growth, calculus, etc., will render the region more vulnerable to infection. A movable or dropped kidney, by causing obstruction from time to time, may cause relapsing pyelitis, gall bladder disease, chronic appendicitis, colon disease, all these and others may act as primary foci of infection. They must be carefully searched for, because without successful eradication of these primary foci, infection in the genito-urinary tract cannot be successfully treated.

Common Conditions causing Pyuria.—Individual diseases that cause pyuria demand separate articles, but here common conditions causing pyuria shall be reviewed briefly, and for that purpose, conditions will be considered from below upwards.

Urethritis:—Gonococcal urethritis, acute and chronic, is the next common cause of pyuria. A discharge from the urethra, pain in the part, burning and scalding while actually passing water, are present. In chronic cases there is hardly any discharge but sticking of the meatus in the morning, or a few threads now and then. In these cases, urine-examination may be negative, unless it is examined after prostatic massage; haematuria, occurring during the course of urethritis, generally points towards involvement of the posterior urethra, prostatic or seminal vesicles. The pus will show gonococci, but among female

patients, microscopic examination is difficult, because a few gonococci that are present, are not easily detected in the millions of other organisms that are present. In prostatic fluid also, gonococci are difficult to detect, but a number of pus-cells, can be taken as a sign of prostatitis. Urethritis may be also caused by coliform bacilli or staphylococci or by chemical irritants. Prostatic abscess after bursting may also cause pyuria and urethral discharge.

Cystitis.—This may be acute or chronic and may be produced by infection spread from below or above. It may also be hæmatogenous. In acute cases, the cause may be obvious as instrumentation or urethritis. Symptoms of bladder irritation—pain in supra-pubic and perineal regions, frequent and painful micturition, and pain after micturition—are present. In acute cases urine is acid, pus-cells and R. B. cells are moderately few. But very acute attack may produce hæmaturia coming at the end of micturition. The infection is generally a mixed one, *B. coli* being the commonest, others being staphylo—strepto and gonococci, *B. pyocyaneus* and *proteosus*. Epithelial cells are present in large numbers. They are two to four times the diameter of the pus-cells, have a distinct nucleus, which is comparatively smaller in relation to the whole cell. They exhibit various shapes, pyriform, spindle, or large, round; some are squamous, and they are derived from superficial layers. They are large, thin with indistinct angles; As the infection becomes chronic, the amount of pyuria also increases. Some kind of obstruction is generally present in chronic cases. Rectal examination may show enlargement of the prostate, simple or malignant, and in latter case, densely infiltrated bladder wall, and enlarged by lymphatic glands. In cystitis due to malignant growth, hæmaturia may be profuse, and fragments of the growth may be detected. In calculous cystitis, hæmaturia is only present after jolting and exercise. Bladder symptoms, and sudden stoppage of the stream, are present during day-time, when the patient is up and about; crystalline deposit in the urinary sediment is increased. Tubercular cystitis is never primary, but is more commonly secondary to renal tuberculosis, and sometimes to tubercular foci in testes, prostate or seminal vesicles. In these cases frequency is marked both by day and night; pain and frequency may be so great that life becomes a torture. The ulcers formed in the vesical mucous membrane are constantly being bathed from the infected and highly irritating urine coming from the tubercular kidney, and frequency may be so great that urine has to be passed every five minutes and practically the patient becomes a social outcast. It is, however, to be remembered that early history of such cases is different, because much earlier, these patients should have shown signs of renal tuberculosis alone, and it is at a very late date that these bladder ulceration symptoms are introduced into the picture. Chronic cystitis, from whatever cause, is prone to acute exacerbations of signs and symptoms, and the back-ground of chronicity should not be missed while treating the acute attack. In cases where there is retention, the urine is alkaline and ammoniacal in odour. This alkalinity is volatile in nature, the

change in the colour of litmus paper disappearing on heating the litmus paper, ammonia being driven by heating. Urine rendered alkaline by giving large doses of alkalis, has a fixed alkalinity, and the change of colour in litmus paper will persist even on heating it. X-ray and cystoscopy have to be employed in obscure cases, cystoscopy enables one to find out the severity of infection, presence and characteristic of ulceration, presence of growth, condition of ureteric openings. These openings have a characteristic appearance in renal tuberculosis, and it is possible to collect by ureteral catheterization urine-sample separately from each kidney.

Ureteral causes.—The commonest cause is the impacted calculus. The frequent situations, where this occurs, are the upper end of the ureter, at the brim of pelvis, and at the vesical end. The impaction near the vesical end will produce bladder symptoms. If obstruction is complete, the kidney on that side becomes functionless, and atrophies. But if the obstruction is incomplete, or intermittent, hydro-nephrosis and later pyonephrosis will supervene. There will be a history of renal colic, hæmaturia, pyuria, and other signs and symptoms of a calculus will be present. X-ray may be indispensable, as it alone can definitely locate the site of impaction.

Kidney causes.—*Pyelitis and Pyelonephritis*:—It is now-a-days rightly doubted whether pyelitis alone can ever occur. They together are the common causes of renal sepsis. The path of infection may be one of the three—hæmatogenous, ascending or lymphatic. The attack may be very acute and fulminating or sub-acute and relapsing. Urine is acid. Pus cells are few in the beginning, but soon become very numerous. Epithelial cells from the kidney, fresh or showing fatty granules, and quadrate cells from the kidney pelvis, with a few tube casts are present. Albumin present, is greater than warranted by pyuria. R. B. cells are not very numerous. Pain, tenderness, and aching in kidney region are present, but hardly a swelling. These attacks are more common at certain age-periods in life, amongst children and pregnant in women. They may come on during puerperium, and are ushered in generally a week after confinement. Urine culture is positive and it is not difficult to determine the nature of the offending organisms. *B. coli* impart a fishy odour to the urine, and reaction is generally acid, except in cases of infection by *B. proteosus* and staphylococci. Hæmatogenous infections are acute in onset, while those due to ascending path, exhibit other signs and symptoms of pre-existing pyuria,—from the lower region. However this added element of renal sepsis may turn the scale against the patient. Relapsing attacks require very thorough examination; some obstruction in the genito-urinary passage is likely to be present, or some predisposing condition in the alimentary tract, such as gall-bladder and appendicular sepsis, constipation, hypochlorhydria. In chronic cases, the predominant symptoms are vesical, cystitis being secondary to pyelitis. Acute attacks of the exacerbation of the dormant process flare up from time to time.

Pyonephrosis.—There are always some factors which cause obstruction. This obstruction is either incomplete or intermittent. Necessarily the amount of pyuria varies. When the obstruction takes place, pyuria suddenly diminishes. Renal tumour which is present increases in size, chills, rigors, sweating, higher and vasculating temperature, wasting and other signs and symptoms of suppuration are evident. Sooner or later, the obstruction is overcome, general condition of the patient improves, while urine contains large amount of pus. Pyonephrosis advances intermittently with varying periods of comparative well-being. Common causes of this condition are calculus and renal tuberclosis. Renal tumour is present. Renal cells, tube-casts, albumin are present in the urine. R. B. cells are present in varying amounts, and crystalline deposit may be increased. Albuminuria is in excess of pyuria. In cases due to tuberclosis, the organisms can be detected in the urine, and the bladder wall shows changes of tubercular cystitis.

Renal Stone.—The mere existence of stone does not produce pyuria, but its presence renders the region more vulnerable to infection. The calculus causes some obstruction, and produces symptoms of irritation, which may be vesical in nature. From time to time, it produces by its movements, some trauma to the delicate epithelial lining, with resultant hæmaturia. This is soon followed by supervention of infection. This ultimately leads either to pyelo or pyonephrosis. It is also possible that the calculus may be formed secondarily to primary sepsis, because an inflammatory exudate, however produced, may also start formation of a calculus. X-ray examination, with pyelography is very useful. With the movement of the calculus, there are attacks of renal colic. R. B. cells, tube-casts, renal cells, pyuria, albuminuria, are present. The crystalline deposit may be increased.

Renal Tuberculosis.—It is generally unilateral, and secondary to some primary focus in glands, bones, epididymis, prostate etc. In early cases renal tumour is not present. Pyuria and albuminuria are the only signs. Urine in these early stages is sterile on culture, and in young persons, urine containing pus-cells, which is sterile on culture, should be taken as presumptive evidence of tubercular affection. It is generally possible to find tubercle bacilli in the urine, and in cases of doubt, guinea pig inoculation should be resorted to. In early cases it may cause unexplained hæmaturia. The patient may show tubercular stigmata and diathesis. The disease may be arrested in early stages, but this is infrequent. It generally progresses, and produces in time the clinical picture of pyonephrosis. It is then tubercular pyonephrosis. In addition, there are now vesical symptoms, frequency being very marked. This in the beginning is due to the irritation of the vesical wall caused by the infected urine, but later on, organic changes take place with ulcer formation, and all the characteristics of tubercular cystitis. Then frequency, burning and pain become extremely agonizing. Cystoscopy reveals typical tubercular ulcer, with characteristic ureteric openings. X-ray examination and

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ureteric catheterization may be required before establishing diagnosis. From time to time passage of caseating matter downwards produces attack on renal colic. In advanced cases, the lower part of the ureters feel thickened, on rectal or P. V. examination. The course of this disease is generally apyrexial, but in advanced stages, with the formation of pyonephrosis and supervention of partial intermittent obstruction, there occur bouts of pyrexia from time to time due to secondary infection.

Coliform Bacilli Infection.—This is quite common and causes pyuria with acid urine. It may cause infection anywhere in the genito-urinary passage. The path of infection is generally hæmatogenous, but direct and lymphatic spread also occurs. It is a gram-negative bacillus, averaging 2 or 3 μ . long, 0.5 μ . in breadth. It is many times ovoid in shape, and stains well with ordinary methods. Urine culture is successful. Pyuria is variable, the pus-cells may be very few in numbers. The patient at the onset of an acute attack may present only signs and symptoms of general septicaemia. His mental estate is generally characteristically dull. It may also cause an attack of sharp hæmaturia. Soon these general symptoms abate, and the urine shows increased pyuria. This is probably due to localization of the infection in some part of the genito-urinary tract. B. coli infection is very intractable, and it is difficult to eradicate it completely. It undermines the health, and makes the patient a chronic introspective pessimistic invalid. A careful search for primary foci in the alimentary canal and elsewhere is called for. Any predisposing factors in the genito-urinary tract, for instance, a dropped kidney, oxaluria, or other causes of obstruction should be sought, otherwise, these cases relapse some time or other.

Treatment.—The treatment of pyuria is the appropriate treatment of the condition causing it. It has already been stressed, that a careful search for primary foci of infection in other parts should be systematically made. In cases like calculus, enlarged prostate be cured without surgical measures. In cases where pyuria cannot be cured without surgical measures, attention should be directed to the general well-being of the patient. It is generally from renal or cardiac failure that these patients succumb, and therefore their daily routine should be so adjusted as to postpone these dangers as long as possible. Diet requires careful consideration. Vitamin A is now reputed to increase the resistance of epithelial lining generally, and its deficiency is said to predispose to the formation of stone. It also increases the volume of urinary out-put. Taking of large carbohydrate meals leads to intestinal fermentation, hypochlorhydria and carbohydrate fermentation with starch indigestion increases the excretion of oxalates, causes thereby irritation of genito-urinary passage, predisposes towards the formation of calculus, and makes it more vulnerable towards infection. Under such condition, an attempt should be made to change the intestinal flora, and as such sour milk, administration of B. Acidophil, or Bacteriophages are likely to be

useful. Salol, Hydro-cum Creta, Dimol are trustworthy intestinal antiseptics and should be tried; cocoanut water from raw fruits, apart from its pleasant and cooling taste, is demulcent, slightly nutritive and a good diuretic. Milk is very badly borne by acute cases, and milk diet should not be prescribed for them. Sour milk is much better. Hexamine, its various derivatives and other proprietary preparations such as Neurotropin, Pyridium, Cylotropin, are now falling back, as the Sulphanilamide group of drugs is proving highly successful. It is always better not to stick to one antiseptic, but to change them after sometime. Sulphanilamide group appears to succeed well, when the infection is more of septicæmic type with incomplete localization in the genito-urinary passage, and that too about the kidney. Hexamine group appears to be successful where the lesion is localized round about bladder region. Local measures such as irrigation and others are definitely useful, but during phases of acute exacerbation of the infection, over-enthusiasm in their use must be checked, and more reliance should be placed in increasing the resistance of the patient by properly adjusted immunity reactions. Vaccines—and wherever possible auto-vaccines—give very encouraging results in chronic cases. When stock-vaccines are used, it is better to use Polyvalent Mixed Vaccine: M. B. 693, and Albucid are two drugs, with which dramatic results can be obtained in gonorrhœa. The strides in chemotherapeutics have been so rapid and successful, that in the near future, one can confidently hope the treatment of pyuria with chemicals will be much simpler and surprisingly quicker than present-day methods.

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Mandelic Acid Treatment of Urinary Infections

BY

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MANDELIC Acid is an aromatic Hydroxy-Acid and is chemically known as Hydroxy-Phenyl Acetic Acid. It is obtained from Benz-Aldehyde by treatment with Potassium Cyanide and Hydrolysis of the resulting Cyanohydrin.

The use of this drug for infections of the urinary tract was the direct outcome of the very good results that were obtained by putting such patients on ketogenic diet.

Ketogenic diet treatment required special care and patients disliked the diet prescribed for this purpose. This led to the evolution of a simple method of establishing bacteriostatic and bactericidal urine.

Beta-Hydroxy Butyric Acid was proved by FULLER to be the bactericidal factor in ketonuria along with a low hydrogen ion concentration (pH) of urine. Oral administration of Beta-Hydroxy Butyric Acid was not possible as it was completely oxidised into Carbondioxide and water during normal metabolism of the body.

As far back as 1883 SCHATTEN was able to show that Mandelic Acid, when given by mouth to dogs, was excreted unaltered in the urine and that it could be recovered from the urine in almost the same amount.

ROSEINHEIM in 1935 found the necessary substitute for Beta-Hydroxy-Butyric Acid in Mandelic Acid. It is the least toxic of all the hydroxy acids, most effective and easily obtained. It exerts a definite bactericidal effect on the urine provided it is given in sufficient doses and the urine is kept sufficiently acid. Its bactericidal action is only exerted when the urine is not less acid than pH 5.5. This concentration of acid can be easily tested by litmus paper showing high acidity. Almost all ingested Mandelic Acid appears in urine within 24 hours, the maximum excretion being about two hours after its administration.

The effect of Mandelic Acid on bacteria in the urine depends upon the following four factors :—

(1) Nature of infecting organism. (2) Concentration of Mandelic Acid in urine. (3) Acidity of urine. (4) Presence or absence of urinary stasis or any other complication. Mandelic Acid when given in proper doses will sterilise the urine in about 80 per cent of uncomplicated cases of bacillary infection of the urinary tract. The earliest method of administering this drug was in the form of a 10 per cent aqueous solution neutralised with Sodium Bicarbonate to make

it more palatable. The dose was one ounce of the solution four times a day i.e. 12 grammes of the acid in 24 hours. Later on, Ammonium Salts of the acid were prepared by the manufacturers and introduced as syrups or elixirs. The dose of these preparations varies with the concentration of the salt. The elixirs are generally 26 per cent solutions and a dose of 3 fluid drachms four times a day is necessary to supply the usual 12 grammes of the acid daily. The syrups are usually 40 per cent solutions and a dose of two fluid drachms four times a day is required if 12 grammes of the acid are to be given daily.

The most satisfactory results have been obtained by giving the drug in proper dosage i.e. 3 grammes or 45 grains four times a day making a daily total of 12 grammes which is the dose recommended by ROSEINHEIM for adults. This treatment should continue for six to twelve days. If at the end of that period the urine is not found sterile, it is better to discontinue the drug for ten to fourteen days and then start a second course of the treatment. This is done with two ends in view: Firstly, the organisms seem to build up a tolerance for the drug after a certain period and secondly we do not know precisely when and how far this drug can cause renal irritation.

The organisms which easily respond to this form of treatment include *Escherichia coli* and *Aerobacter aerogenes* and members of the groups of *Proteus*, *Pseudomonas*, *Alkaligenes*, *Salmonella* and *Shigella*. Cocci are not generally affected by this form of treatment but *Streptococcus faecalis* is an exception to this rule. This organism is as easily destroyed as *Escherichia coli*.

HELMHOLTZ and OSTERBERG have shown by laboratory experiments that the usual bacilli found in urinary infections were killed by a 0.5 per cent solution of Mandelic Acid at a pH of 5.5. A lower hydrogen ion concentration does not require such a high concentration of Mandelic Acid. This, along with the time of maximum excretion, at once establishes that (1) the dose of the drug must be repeated at intervals to maintain a proper concentration. (2) the amount of fluid ingested in twentyfour hours must be limited to 1200 c.c. or less, in order to have a proper concentration of the drug in the urine (0.5 per cent or over) and (3) the pH of urine must be maintained at a satisfactory level. This level has been definitely proved to be a pH of 5.5 or lower. Unless proper attention is given to this last named and the most important factor in this drug therapy, the results will be discouraging. In some cases, however, this low level cannot be reached and then other acidifying drugs have to be added. When Mandelic Acid or Sodium Mandelate is employed, acidifying drugs are always needed and Ammonium Nitrate or Ammonium Chloride in doses of 4 to 6 grammes daily usually suffices. Occasionally dilute acids such as Nitro-hydrochloric or Hydrochloric Acids by mouth may be necessary. In some obstinate cases, ketogenic diet has to be given to get the proper acidity in urine. Yet there remains a group of cases which are refractory. In such cases the urinary bladder may be

irrigated with one per cent solution of Phosphoric Acid and if this is not successful, a two per cent solution of this drug may be introduced into the kidney pelvis at frequent intervals through ureteric catheters. Some workers have introduced acid-producing organisms e.g. *Bacillus bulgaricus*, into the bladder or kidney pelvis. Subsequently the acidity is maintained by the administration of acidifying drugs already mentioned. In some very rare cases, the acidity of the urine becomes very high and Sodium Bicarbonate has to be given to partly neutralise the acidity.

If the infection of the urinary tract is complicated by certain conditions, the sterilization of the system becomes much more difficult and in many cases impossible unless the complications are removed.

Residual urine, in either the upper or lower part of the urinary tract, will surely inhibit the action of the drug. Chronic pyelonephritis with cicatricial changes in the renal pelvis, renal calyces or ureter, urinary lithiasis, tumours, foreign bodies in the urinary tract and particularly chronic prostatitis which reinfects the urethra and bladder, pregnancy, pyelitis etc., are frequently responsible for poor results.

The use of Mandelic Acid in cases of known renal insufficiency or with raised blood urea, must be done with the greatest care. These are really cases in which Mandelic Acid treatment is contra-indicated. Even in normal persons Mandelic Acid reduces renal function and may cause death. Even when treatment is given, the results are not satisfactory as badly damaged kidneys can neither excrete sufficiently acid urine nor a sufficient concentration of the acid in urine. Acute pyelitis must be treated by alkalis and then if necessary Mandelic Acid treatment should be started so that the disease may not progress to the refractory chronic stage.

Some persons, put on Mandelic Acid treatment, suffer from buzzing in the ears, temporary deafness, giddiness, nausea, diarrhoea, hæmaturia, severe aching of neck and leg muscles, and urticarial rashes. The last two are toxic manifestations of the drug and the treatment in such cases must at once be suspended.

So with a proper selection of cases and care to details regarding intake of fluid and acidity of urine, Mandelic Acid provides a potent antiseptic for bacilluria.

Use of Sulphanilamide in Genito-Urinary Infections

BY

Jagadish C. Bhattacharjee, L.M.P.,

Darjeeling Himalayan Railway Hospital, Nilguri, Darjeeling.

Introduction.—The readers of this journal are aware of the fact that the Nobel Prize in Medicine for the year 1939 has been awarded to the German Scientist DOMAGK for his discovery of Prontosil, a chemical substance possessing a specific action against haemolytic streptococci. This substance, a derivative of red Azo dye is chemically 4-Sulphonamide-2',4'-Diamino-Azobenzol and was at first marketed as Prontosil Rubrum. Later observation has shown that the streptococcicidal activity of this drug was attributable not to the Azo dye itself, but to the Benzene-Sulphonamide portion of the molecule and then the Para-Aminobenzene-Sulphonamide, commonly known as Sulphonamide or Sulphanilamide was elaborated. This compound, since its discovery in 1935 has been successfully employed in cases of purpural sepsis, streptococcal septicaemia of any origin, erysipelas, infections of nasopharynx, middle ear and tonsils and a host of other similar conditions.

The introduction of Sulphanilamide and its derivatives is of the utmost significance not only because it has profoundly altered the prognosis and treatment of severe streptococcal infection, but it has also opened up new ways of treatment of most diverse conditions such as gonococcal, pneumococcal, meningococcal and coliform infections.

DRES and COLSTON drew attention to the fact that Sulphanilamide has a definite bactericidal effect on gonococcus and in their original paper published in 1937, claimed that in 36 out of their 47 cases, the gonococci and discharge disappeared within 5 days of commencement of the treatment. They were further impressed that the infection under this treatment had not extended from the anterior to the posterior urethra, thereby minimizing the chance of future complications. Since then, Sulphanilamide is being used everywhere in V. D. clinics in Neisserian infection with more or less promising result.

About the same time, HELMHOLTZ at the Mayo Clinic found that the urine of patients to whom Sulphanilamide has been administered, develops organisms as commonly found in cases of infection of the urinary tract. It has thus occupied an important place in the treatment of genito-urinary diseases.

Mode of Action.—The exact way in which Sulphanilamide acts against the bacterial infection has not yet been definitely determined and numerous theories have been advanced to account for its bacteriostatic and bactericidal activity. The drug is bactericidal to a marked degree *in vitro* but to a limited extent *in vivo*. LONG and BLISS at first suggested that stimulation of the phagocytic activity of polymorphs and large mononuclear leucocytes have some importance

controlling the infection but sufficient proof of this theory is wanting. The direct chemical action on the organisms in the blood cannot alone be accepted on experimental ground.

Of late, several workers have expressed their belief that the drug stimulates the phagocytic activity of the cells of the reticulo-endothelial system and the accumulating evidence appears to be distinctly in favour of this view, though time and further work can alone determine the exact role the system plays in controlling the infection. The collective term 'reticulo-endothelial system' has attracted a great deal of attention from workers interested in different branches of medicine and a brief discussion on it here may be of interest to the readers. These cells are of mesenchymal origin and of macrophage or large mononuclear type, widely scattered in the blood and tissues of man and other vertebrates and are capable of phagocytosis and intracellular digestion. They take up all particles, animate or inanimate that find their way into the blood and utilise them in a manner, best suited to the system. They mainly comprise of endothelial cells of the blood and lymph vessels, fibrocytes or connective tissue cells, reticular cells of the splenic stroma and lymphatic tissue and those lining the sinuses of the spleen, bonemarrow, adrenal cortex and hypophysis and histocytes or the large phagocytic motile cells of the connective tissue. They perform a multiplicity of important functions both in health and disease. Normally they are concerned with destruction of worn out R. B. C. and stimulation for their regeneration, bile formation and metabolism and storage of iron and cholesterol. In disease, they deal with the protozoa and bacteria leading to their destruction and antibody formation. The chief characteristic of these cells is the phagocytosis of the foreign substance and as such, reticulo-endothelial system plays an important part in chemotherapy. CHOPRA (1935) summarises the mode of action in the following way:—

- (1) 'It acts as a storehouse for the drug and releases it slowly as required, thereby preventing rapid elimination and ensuring continuous supply.
- (2) 'It carries the drug to the neighbourhood of lesions, where it is most needed.
- (3) 'It elaborates new compounds from the drug with greater parasiticidal power and
- (4) 'It is stimulated by the presence of the drug in circulation and thereby its functions of phagocytosis and antibody formation become more pronounced and effective.'

Elimination:—Sulphanilamide is mainly excreted through the kidneys and acquires a higher bactericidal power against urinary infection. The drug appears in the urine by the third or fourth hour after oral administration and the elimination reaches its maximum by the second day. A small portion is excreted with faeces partly as an acetyl derivative and partly unchanged.

Dosage:—No standard dose can be laid down since the amount varies with individual patient. Forty-five to sixty grains (3 to 4

grammes) suit an average individual for the first few days and then the dose is reduced. A dosage of 80 grains for the first one or two days, at first advised for streptococcal infection, is unnecessarily large for urological practice as serious toxic effect is likely to follow if renal function is at fault. In younger patients, the drug is excreted easily, but in others, continuous big doses raise the blood level high. Hence the possibility of impaired renal function must always be taken into consideration in deciding the dosage.

Rarely the drug is continued over two weeks as the optimal result is obtained within the first ten days of the administration. Long continuance of the drug leads to the growth of germ's tolerance towards the particular medicament; moreover, there is the danger of the possible cumulative effect. In critical cases, peroral administration may be supplemented by intramuscular injection of a soluble preparation.

Toxic Effect.—The drug is well tolerated and serious toxic complications are few. Usually but not always, as a result of prolonged administration, there may arise during or after Sulphanilamide treatment, dizziness, anorexia, nausea, abdominal pain, cutaneous rashes and pyrexia but these may be ignored, if not of a marked degree and may be avoided by conservatism in dosage or by temporary withdrawal. Methæmoglobinaemia and sulphæmoglobinaemia may arise suddenly and are ushered in by appearance of cyanosis. Methæmoglobin is believed to be a true toxic product of Sulphanilamide and Oxygen is beneficial, but sulphæmoglobinaemia is considered to be due to absorption of Hydrogen Sulphide in the system, often formed by the action of bacteria on food residue or as a result of administration of Sulphur or Sulphur-containing compounds, the Sulphonamide acting as a catalytic agent. There are also record of cases of agranulocytic anæmia following large doses of Sulphanilamide.

During treatment, the patient should be kept on a low residue diet (avoiding eggs in particular because of high Sulphur-content), should have an evacuatory enemata at the outset and Liquid Paraffin whenever necessary. Saline cathartics, Sulphur or Sulphur-containing drugs should be totally avoided. No Phenacetin and Amidopyrin may be prescribed during Sulphanilamide medication. The drug should not be prescribed in cases of advanced anæmia owing to its depressing effect on hæmopoietic system.

In order to avoid gastro-intestinal complications, the tablets should be chewed and swallowed with large draught of water after meals. In children and delicate patients 3 to 6 drops of diluted Hydrochloric Acid may be given with the drug.

Clinical Applications.—1. *Gonococcal Infections*:—Reference has been made above, of the use of the drug against gonococcal infection and the numerous reports available now, leave no doubt, that the compound has acquired the most important place in the routine of gonococcal treatment. EVANS (1938) records the result of 113 male cases of gonorrhœa—some with Sulphanilamide alone and others

combined with irrigation. His 68 cases or 60 per cent were clinically cured within two weeks of the commencement of the treatment, and a further 11 were cured by a second course, thus making a 70 per cent. cure-rate. He holds that it makes little difference, if Sulphanilamide is used alone or if combined with other local or systemic treatment. CLARK and BRANHAM (1938), who have treated over 300 cases of gonorrhœa opine that 10 per cent. of their cases who have acute anterior urethritis are cured within 48 hours while 75 per cent. are improved immediately, though their complete cure takes 4 to 6 weeks. The complications are few and the results with chronic cases are also extremely satisfactory. There are other reports to confirm their findings.

However, an evaluation of the result obtained with this type of therapy, especially in gonococcal infection, is somewhat difficult, since the criterion of cure is not the abatement of active symptoms. The cure is based on personal development of immunological response between the infecting organism and the host and it is now believed by many workers that Sulphanilamide cum vaccine is the ideal method of treatment, as vaccine stimulates the development of immunity at an early date. HURUNG (1938), who has treated more than 700 cases of gonorrhœa, has conducted hundreds of gonococcal complement fixation tests, with a view to determine the effect of Uleron upon so called refractory cases and has found that cases with positive complement fixation test react better to Uleron treatment. He recommends preliminary immunization of the patient by small doses of vaccine before Sulphanilamide is enjoined and this has yielded him a cure-rate of 80 per cent.

While the action of P-Aminobenzene-Sulphonamide against gonococcal infection was recognised by all workers, it was further observed that the therapeutically effective dosage of Sulphanilamide in a large proportion of cases, are associated with toxic symptoms, more or less unpleasant to the patient and as a result of further researches, some new compounds have been elaborated, whose action is more marked against gonococci, and which are less toxic to the system. These are Uleron (4 (4-Aminobenzol-Sulphonamide)-Benzol-Sulphon-Dimethylamide) (Bayer), Albucid (Schering) and Dagenan (M. & B. 693) (2-Sulphanyl-Aminopyridine) (May and Baker). By virtue of their being less toxic to the system and having pronounced action on gonococcus, they have practically replaced the plain Sulphanilamide from the field of gonorrhœa therapy.

Pyelitis:—Sulphanilamide therapy has been successfully employed in cases of upper urinary tract infection, except in cases of stone or stasis, where the causative factor calls for attention before chemotherapy is applied. In others, the course of the infection is favourably shortened, there is rapid fall of temperature, and urine is clear and free before long.

Cystitis:—Cystitis of any origin, is uniformly aided by the drug and bladder symptoms are often ameliorated within first 48 hours. It

is also of value in prostatitis and other periurethral gland inflammations.

It is advisable to employ the drug in small doses for a few days before any operative procedure on the urinary tract is embarked upon, as the intensity of possible post-operative infection is reduced, thereby shortening the convalescent period.

B. Coli. Infection:—It has been successfully employed in cases of B. coli pyuria and B. coli cystitis. DOUTHWAITE (1937) describes records of several cases with gratifying results. In B. coli infection, so common in the tropics, introduction of Sulphanilamide therapy may be regarded as an important advance in the line of treatment. HELMHOLTZ points out its advantages over other forms of treatment, such as with Urotropin and Mandelic Acid, that it can be given in the acute stage of the disease in addition to plenty of fluid and alkalis. Moreover, the drug is more effective in alkaline urine and this is no doubt a distinct advantage.

Summary.—Para-Aminobenzene Sulphonamide, commonly known as Sulphanilamide, a derivative of red Azo dye and which was primarily used for its antistreptococcal activity, has been employed with success in all the common genito-urinary infections including gonorrhoea. Details of its application in diseases of the genito-urinary tract, have been discussed in the text of this paper.

Acknowledgment.—I record here my deep sense of gratitude to Dr. S. K. Biawan, Chief Medical Officer, D. H. Railway, for his kind interest in my paper.

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Filariasis of the Male Genitalia

BY

Capt. N. Ahmed, M.B., B.S., F.R.F.P.S.,

Divisional Medical Officer, East Indian Railway, Cawnpore.

General.—Recent advances in the study of filarial diseases point to the existence of definite factors responsible for the causation of genital manifestations of filariasis in the male. In the district of Gaya, where I obtained the greater part of my experience on the subject, elephantiasis of leg used to be a common filarial affection in the early decade of this century; but now, we find there the genital filariasis a common variety and very rarely meet with an elephantoid leg. Observations such as above described and researches done and explanations given such as those of ACRO and RAO suggest that sanitary and other similar factors could change the variety of filarial manifestations in a particular locality, but though the microfilaria is known for the last 76 years and its intermediary host and carrier for the last 61 years, no cure has yet been found for the pathological conditions that filarial reactions produce in the human tissues. CHOPRA and RAO tried a number of preparations in the human tissues. ARSENIC, Bismuth, Antimony and Mercuriochrome, Emetine and Plasmochin and Trypan with a view to find out a really effective remedy for filariasis but failed to find one. There is nothing in the modern science but surgery when indicated that could come to the help of a filarial sufferer. There are evidences to show that secondary infections of filarially affected parts are responsible for much damage and sufferings. Efforts are therefore made with evident success to prevent and counteract the effects of such additional dangers of secondary infections. It has also been observed that those parts of the male genital tracts which are prone to filarial reactions are also susceptible to streptococcus hæmolyticus, (DE and CHATTERJEE). I am, for sometime now (1931-1939), trying to fight against a very troublesome post-operative complication of the filarial attack with rigor and high fever and swelling, redness and pain of the local parts that follow the majority of operations on filarial scrotum and hydrocele. I find no remedy to be effective singly. Arseno-typhoid is a great help to avoid rigor and fever but does not much affect the local trouble. A combination of diathermy and radiant heat with Iodine and Arseno-typhoid and Sulphanilamide preparations have given very satisfactory results. I can now give the prognosis of a post-operative period in a given case with some confidence. As for surgery, I cannot reconcile myself to the old teaching that every bit of the filarial scrotal and penile skin should be removed and the testes put under the skin of groin and skin graft used on the penis. The results of the operation are as drastic and mutilating as those of the original trouble except perhaps the reduction of weight. Functionally, the penis remains the same before and after such operations. I am applying a less drastic surgical procedure and find the results very encouraging as far as could be judged by the follow-up results of my cases for the last six years.

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Causes of Genital Filarial Manifestations.—There are two different views expressed on the subject by eminent workers.

I. Intensity of Infection determines the Type of Filarial Lesions.—

Hyperendemicity above 20%:—Elephantiasis of limbs.

Moderate endemicity 10 to 20%:—All lesions but genital ones are the commonest.

Low endemicity below 10%:—Lymph, Vari and Chyluria.

ACTON and RAO present useful data to prove that in a hyper-endemic area where favourable conditions for the breeding of culex fatigans, the carrier of *W. Bancrofti* exist all the year round and the infection takes place throughout the year and where the micro-filaria rate is found above 20% and the age incidence 8 to 10 years, the heavy infection involves the superficial lymphatics and the obstruction in the inguinal and epitrochlear lymphatic occurs in very early life resulting in elephantiasis of the limb.

If the endemicity is low, i.e. below 10%, filaria passes the distal glands leaving them almost undamaged and reaches juxta-aortic region where it causes partial obstruction and produces varix and chyluria but never elephantiasis.

In areas of moderate endemicity, where the rate is 10 to 20% the distal sets of glands are not sufficiently damaged to cause complete blockage which is found higher up and thus all sorts of filarial lesions are possible. The genital manifestations in moderate endemic areas are the commonest and could be explained on the following lines:—

Why genital lesions are the commonest of all filarial manifestations in a moderately endemic area:—

- (1) The lower extremities are the favourite site for the bite of culex fatigans. The infection, thus, most commonly occurs in the lower extremity.
- (2) The parasite passes through the lymphatic of the groin and causes blockage in pre-aortic set of glands. The adult worm finding the onward passage blocked migrates lower down. The length of the testicular lymphatics and their relation with the juxta-aortic glands makes this migration easy to the genital organs. The fertile adult filariae is thus very commonly found in the spermatic cord (ROMIETE 1933) and epididymis.
- (3) LANE'S (1932) theory, of blood escalator assuming the special use of lymphatics by the infective larvae when taken with the established fact that filarial infection of male genitalia commonly occurs at the period of highest sexual maturity and activity (RAY 1934) also explains why filaria selects the genital tract as its target.

II. Different Species of Filaria determines the Type of Filarial Lesion:

1. *W. Bancrofti*—all types of lesions commonly genital.
2. *F. Malayi*—Elephantiasis only.

At one time, *W. Bancrofti* was supposed to be the only species of filaria which was responsible for human filariasis. In 1904, TANAGUCHI described a filaria which differed from *Bancrofti*. In 1910, BROCHARD noted that in Wallis Islands near Fidji, elephantiasis was the only manifestation of filariasis and that local micro-filaria differed in many respects from *Bancrofti*. KORKE working in Bihar and Orissa in 1927 found in Muzaffarpore, a microfilaria different from the usual *Bancrofti*. He later in 1929 observed that "atypical forms" of microfilaria gives elephantiasis and the 'typical forms' of *Bancrofti* commonly involves the genitalia. LICHTENSTEIN in 1926 was surprised to note that in Bireuen (Sumatra), the filarial index was 30 to 50%, but the only manifestation was elephantiasis and no other lesion and that the development of the local larvae was not possible in culex fatigans. BRUG in 1927 set to work to solve the problem and described a distinct species of microfilaria and named it *M. Malayi*. Reseraches in India have shown that *M. Malayi* exists in India and that KORKE'S "atypical forms" were probably *M. Malayi*. It is now definitely known that:

- (1) *M. Malayi* is a distinct species.
- (2) Its intermediary host is not culex fatigans but *Mansonioides*, the most important of which is *M. annulifera*.
- (3) Its infection is rural in distribution and elephantiasis is the only lesion that it clinically exhibits while *Bancrofti* is urban and exhibits all varieties of lesions.

We thus find that there are two varieties of filaria—*W. Bancrofti* and *M. Malayi*, which are responsible for human filariasis. *M. Malayi* is known to produce no other lesions but elephantiasis and *W. Bancrofti* is more liable to produce manifestations in the male genital tract. However, we are at present not sure about the exact causative factors which determine the type of filarial disease.

Filarial Infection does not always mean Filarial Disease.—

1. *Filarial infection:*—Microfilaria in the blood of an apparently healthy person.

2. *Filarial disease:*—Signs and symptoms of filariasis with or without microfilaria in the blood.

KORKE'S observations in Bihar (1927) show that out of 250 people showing no clinical signs of filaria, 6% had microfilaria in their blood. RAO (1927) gives 10% for 841 cases treated for non-filarial diseases in Tropical Diseases' Hospital, Calcutta. ACTON and RAO (1933) reported cases which were under their observation for 10 years and more and whose periodical examination of blood showed microfilaria without their ever having any filarial disease. On the contrary, there are cases of filarial diseases and specially where obstruction is complete which show no microfilaria in their blood. The people in endemic area are therefore classified into three groups:—

I. Individual Susceptibility to Filarial Infection:—

1. *Non-susceptible:*—People who acquire infection but show no

filarial disease. They harbour microfilaria in their blood and act as 'carriers.' They are 'non-susceptibles' of ACTON and RAO.

2. *Susceptible*:—People who acquire infection and show lymphatic block and signs of filarial disease which remain stationary. No microfilaria is found in their blood. Eosinophilia is moderate in degree.

3. *Highly susceptible*:—People who show high degree of susceptibility and exhibit all clinical types of disease. They usually do not show microfilaria nor eosinophilia in their blood and are liable to recurrent attacks of filarial troubles.

II. Age group for Genital Manifestations of Filariasis.—

1. 1 to 5 years of age—genital lesions—nil.
2. 5 to 15 years—genital affections—rare.
3. 15 to 30 years—All genital manifestations including acute funiculitis—very common.
4. 30 years upwards—Scrotal elephantiasis and increased liability to streptococcal cellulitis, abscesses and septicæmia.

The filarial infection rate rises from birth to full sexual maturity in man. The filarial disease rate is nil up to 5 years of age and then rises steadily with the age (IYENGAR 1937). The earliest genital manifestations are generally not noted before 14 years of age (RAY 1934). They are at its height between 15 and 25 years and the elephantiasis of scrotum is found very common as the age advances. It will thus be seen that filarial diseases of the genital tract are not found in children and is rare up to the age of 15 and is commonly met with in a healthy young man. This age relationship is particularly unfortunate as it affects the potency of male population at just the age when it is at its period of highest activity.

III. How Filarial Diseases are Caused.—The main points are:—

1. *Helminthic toxins* cause high eosinophilia, anaphylactic shock and a state of 'kataphylaxis' of the affected parts, permeability of tissue cells, fibrosis and blockage of the lymphatic vessels and glands and the signs and symptoms due to these changes.

2. *Bacterial infection*—staphylo and streptococcal in nature—play a great part in bringing about acute conditions, bouts of recurrent attacks and final stages of troublesome elephantiasis or fatal septicæmia.

There exists a great confusion as to the causation of clinical manifestations of filaria. ACTON and RAO believe, and do so on very solid grounds, that filaria produces "kataphylaxis" of the part which means localized anaphylaxis or temporary break-down of the defensive mechanism of a local part of the epiblastic or mesoblastic tissues. This phenomenon prepares a nidus for secondary infection from a septic focus which starts the filarial disease. They believe that presence of microfilaria in blood produces a helminthic toxin which gives high eosinophilia and other signs of anaphylactic shock such

as migraine, periodic headache, slow fever, urticaria and pain in the joints and muscles and an epiblastic kataphylaxis which is seen in elephantiasis when the surface protection of epidermis is impaired by hypertrophy and mesoblastic kataphylaxis which lowers the local defensive mechanism of affected mesoblastic tissue by irritation and œdema caused by filaria. All the other clinical manifestations are due to secondary infections from exogenous or endogenous septic foci. Other observers hold that secondary infection by pyogenic organism is not necessary for clinical manifestations of filariasis. BASU maintains that filarial fever is a periodic one which lasts 36 to 48 hours and ends in crisis. TIRUMURTI also considers it unnecessary to advance the 'theory of local sepsis' to explain filarial diseases. However, the position under our present knowledge appears to be that the female parasite, after its entry into the human host, comes to lie in lymphatics where it produces helminthic toxins which give rise locally to repeated irritation and consequently partial blockage and generally to eosinophilia and in highly susceptible persons, anaphylactic symptoms. As long as the obstruction is not complete, the microfilaria escape into the circulation and are found in the blood. In time endothelial proliferation caused by persistent passage of embryos producing irritations give rise to papillomatous growths which bleed and form hæmatomas occluding the vessels. The lymph is diverted to collaterals and causes lymph varix. The adult worms which find their way to the varices after maturity and parturition die and thus may completely block the vessels. The same sequence of events—passage of the worm, damage, irritation, scarring, granulization and fibrosis with consequent blockage, occurs in the lymph glands. If this occurs in the femoral glands elephantiasis of the leg develops, but when the obstruction is in the inguinal gland, the lymph from the leg is deflected into the scrotum and gives rise to lymph scrotum. The scrotal skin is not well supplied with the lymphatics and the extra pressure is therefore borne by the existing vessels through unusual dilatation and formation of small cysts which occasionally burst and give rise to scrotal lymphorrhœa. Once the blockage is complete the microfilaria and toxins cannot pass into the general circulation with the result that in the stage of elephantiasis, eosinophilia and microfilaria are not found in the blood and anaphylactic symptoms are also not possible. In the male the filarial infection remains localised in the scrotum, testes, epididymis and structures of the cords. The filarial toxins act locally on the tissue cells and increase their permeability which combined with pre-aortic obstruction produce hydrocele and chylocele in the case of tunica vaginalis and static œdema in other structures. In the case of scrotal-lymph stasis the subcutaneous tissues remain all the time soaked with lymph and this stagnant lymph with white fibres form the so well-known 'blubbery mass' which every operator notices after the skin incision. The static œdema, formation of blubbery mass and pachydermia which in time follows produces what is known as filarial scrotal tumour or elephantiasis of the scrotum. So far all the workers agree to the points but when the question of the troublesome recurrent lymphangitis and other such signs and symptoms come, ACTON and

RAO believe that the chronic filarial condition produces kataphylaxis which prepares a nidus for secondary infection from septic foci. *Staphylococcus albus aureus* produce local lesions such as lymphangitis, periadenitis, subacute and chronic epididymo-orchitis and abscess with slight fever and moderate leucocytosis while streptococcus infection gives acute funiculitis with fatal peritonitis, filarial colics abscess and cellulitis with fatal septicæmia. ACTON and RAO (1929) quote an interesting case in support of their views. In a case of filarial abscess they cultured streptococcus from the urine of the patient and detected a focus in the teeth. The genito-urinary system was non-pathological inspite of being infected with streptococcus hæmolyticus showing that the infection occurred via blood-stream.

In my experience ACTON and RAO's views hold good in the majority of cases that one notices in general practice but cases of filarial lymphangitis have been reported where no germs could be cultured in any way. I have also come to believe on grounds that I do not wish to detail that filarial fever with lymphangitis at least in early stages could be purely due to filarial reaction independent of any focal sepsis. However, for practical purposes it may be taken for granted that eradication of septic foci and treatment directed to a secondary infection in a filarial patient do prevent periodic attacks of filarial diseases and should delay the development of elephantiasis and its troublesome and often fatal complications.

I shall now give the outstanding points in the clinical history, diagnosis, prognosis and treatment of individual filarial lesions of the male genitalia, but before I do so, let me state that I am not a blind follower of established and defined lines of treatment nor do I strictly adhere to old conservative teachings. I do what I find best for the patient and shall describe the same in the following lines.

The important genital manifestations of filariasis are :—

- I. Funiculitis.
- II. Epididymo-orchitis.
- III. Lymphatic varicocele.
- IV. Lymph scrotum.
- V. Hydrocele.
- VI. Penile elephantiasis.
- VII. Scrotal elephantiasis.

I. Funiculitis.—Acute filarial funiculitis is one of the emergencies of surgery in the tropics. It comes in with rigor, high fever, general prostration and signs of acute septicæmia with local swelling, redness and extreme tenderness of the cord. The cord is under great tension at the external inguinal ring and where it passes over the bone. The abdominal portion gets soon involved but in my cases the signs of general septicæmia always over-shadowed the peritoneal signs. The diagnosis is not difficult if the condition is kept in mind and the patient is examined and questioned carefully. Prognosis is very grave as it is a streptococcal condition and the thrombosis of the pampini-form

plexus usually occurs. The death rate is reported to be as high as 75% but I believe that with very early diagnosis and suitable treatment, the mortality need not remain at so high a level.

Treatment.—It should be prompt and both general and local.

Local:—This should receive the first attention. The amount of tension at the site where the cord passes over the bone should decide the question of surgical interference. If the tension is found great or you are in doubt, err to the surgical side and give a clean but very careful incision and you will soon find the released cord lying outside the incised wound. Be careful of your asepsis or better antiseptics and cover the part with gauze soaked in Electro-Chlorine solution and leave it without a bandage. Apply radiant heat immediately first using a 100 watts tungsten arc bulb or four 16 watts carbon filament lamps at 16 inches distance for 20 to 40 minutes at a time twice or even three times a day. After 12 to 24 hours you may use infra-red rays for heat therapy and later on diathermy if the induration, tenderness or discharge from a sinus is found persisting.

General:—While you are busy with the local treatment your assistant should immediately give 10 c. c. of Septicemine or 2 c. c. of injectable Iodine with 10 to 50 c.c. of 25% Glucose intravenously and repeat the injection twice or three times a day according to the condition of the patient. The quantity of "Septicemine" or Iodine may be reduced to half in subsequent doses. The patient should also be put on adequate doses of one of the Sulphanilamide preparations. I have been using "Prontosil" and recently M. and B. 693 with very good results. I give below a typical case.

A Case of Acute Funiculitis:—A young man of 24 years of age had rigor and fever and acute pain in the left groin and testis. His doctor diagnosed it as a case of torsion of the cord. Another practitioner who was working with me was consulted. He spotted the case and brought him straight to me on a stretcher. He was in a moribund state though the condition existed for about 12 hours only. I painted Tincture of Iodine and gave a clear $2\frac{1}{2}$ " incision within 5 minutes of seeing him. The cord shot out of the wound and the patient felt immediate relief. He was given the above detailed treatment with complete success. I have had three cases of pure acute funiculitis which developed independently of any other filarial lesion and half a dozen of post-operative acute funiculitis and have fortunately not lost a single case as yet.

II. Epididymo-Orchitis.—There are a number of clinical ways in which this lesion exhibits itself.

1. *Epididymo-orchitis associated with subacute or chronic recurrent funiculitis* which when seen during an attack simulates strangulated inguinal hernia but does not present much trouble if history is taken with care. General uneasiness, pain in the lower abdomen, feeling of heaviness in rectum with constipation and a tender nodulated inguino-scrotal swelling all point to both the conditions but temperature is

generally subnormal in a strangulation while it is high during the attack of epididymo-orchitis. If an operation has to be performed to decide a doubtful case the condition is liable to be aggravated and very troublesome complications ensue. The treatment is the same as described under acute funiculitis. Diathermo-therapy and a course of Arseno-Typhoid prove very useful. One should always keep in mind the possibility of gonococcal infection superimposed on this filarial lesion. About 10% to 15% of my cases were of this nature and had to receive gonorrhœal treatment as well. Prostatic diathermy and milk injections are to be particularly added to the routine treatment to ensure quick results.

2. *Suppurating epididymo-orchitis*:—If the condition is not tackled early or is seen in the suppurating condition simple evacuation of pus cannot solve the problem. Scrotal sinuses discharging pus invariably persist for months. I have found nothing better than a few applications of diathermy to bring about a rapid cure of sinuses of this nature.

Fibrosis of Testes:—RAY (1934) draws attention to a condition of chronic epididymo-orchitis which leads to degeneration and ultimately to fibrosis of testicles. The pathological study of his case goes to prove that the condition is purely filarial in origin and the changes that lead to the fibrotic condition in the testes start round a dead and encased adult filaria. Epididymis is found more enlarged than the testes and the lesion is generally bilateral. It could easily be mistaken for a tubercular, caseating testis or a syphilitic testis. It is not a rare condition and one who has a chance of operating on a fairly big number of filarial scrotums carefully observing the condition of the testicles presented to his view during the operation meets with it. 6% of my cases definitely had this condition. The most puzzling question that this condition presents to an operator is to decide whether the degenerated or fibrotic testis should be removed or kept as it is. A degenerated testicle which is in a stage of filarial caseation if left behind and not castrated proves a perpetual source of discharging scrotal sinus which keeps the patient unnecessarily ill and often in bed. In such cases if diathermy does not bring about a clinical cure castration is the only solution if the patient permits it. The diagnosis of such cases in an endemic area should not prove very difficult to an experienced observer but one should keep in mind that a filarial epididymis and testicles cannot be immune to syphilis, gonorrhœa, tuberculosis and malignancy and that a filarial fibrotic testis passes through stages which at one stage or the other simulate any one of the other conditions. Let me give a few of my cases to demonstrate how castration minimises the post-operative period and how a testicle could be preserved where it is imperative to do so in a doubtful case and how even castration does not help when malignancy is also present.

CASE 1. *Malignancy in a filarial testicle*:—A young man, 28 years of age, was operated by me for double filarial hydrocele. On opening I found his right testicle and cord very suspicious. His left healed but

sinuses remained on the right. Even diathermy failed to relieve him. Malignancy was suspected and he was advised to go to Radium Institute for consultation. He instead went to a provincial hospital where he was castrated. His testicle was microscopically found to be malignant and he died within one month of the 2nd operation. I may mention here that in an advanced case of malignant testis castration does not help. It increases the mortality unless one is ready to operate on the whole of lymphatic area right up to the pre-aortic glands or even above them.

CASE 2. *Incompletely disorganised filarial testis*:—A prominent Hakim, 40 years of age, with big filarial scrotum and hydrocele with history of gonorrhœa was operated upon by me. I found his testicles very enlarged and suspicious. There appeared patchy distribution of fibrotic and healthy areas. Castration was suggested but the patient refused on the grounds that he had no child and married a second time and got the operation done with the hope of getting an issue. I suggested to him that his sterility was permanent and his convalescing period would be very tedious and prolonged if he did not permit the castration. He wanted to have a chance. His left side healed but right suppurated. It was reopened after 3 weeks and cleaned but sinuses persisted. Diathermy was applied and sinuses closed in two months. Swelling on the right remained for another 2 months. A course of Aolan, Sulfarsenol, Iodine, intravenously and diathermy brought him to fairly normal condition. His sterility of course persists and he has had no issue though the operation was done 5 years ago.

CASE 3. *Filarial caseation in a testis*:—A 48 years old man with filariasis of the genitalia had epididymo-orchitis which suppurated. He was in bed for 6 months with it. His scrotum was a bag of pus with a foul discharging wound on the skin. He was treated on conservative lines, cleaning the wound, irrigating the cavity, internal medicines and Iodine injections, radiant heat and diathermy for a month. Condition improved but the wound refused to heal. I operated upon him and found his right testicle in a caseating condition. Castration was advised, agreed upon and done. The wound after the operation healed in 8 days and he was discharged cured after a fortnight.

III. *Lymphatic Varicocele*.—This is one of the earliest and sometimes the only manifestation of the genital filariasis. It may often be found associated with a filarial hydrocele, a hernia and a hydrocele, and also with true venous varicocele. It is very essential that this condition is detected before any operation is done at that site. The risk of post-operative infection like dangerous cellulitis running up to general septicæmia and chylous fistula as a sequelæ is a very real one. It is fairly well recognised that excision of lymphatic varix should not be done but I fear it is not yet well known that no operative procedure on scrotum and its contents is justifiable if it could be avoided at all when lymphatic varix of the cord or groin exists. I nearly lost a case once and had trouble with a few others. A history of post-coital

non-endemic area is gonorrhœa and in an endemic place, filariasis. You should, therefore, always enquire very carefully into gonorrhœal history and seek the signs and treat the patient specially with diathermy and Arseno-typhoid injections before and diathermy, Aolan and Sulfarsenol injections after the operation.

3. *Inflammatory condition of the tissues outside the sac*:—Transillumination test in such cases will be negative. The general thickening of the scrotal tissues, persistent slow fever, tenderness and some pain may be present. In case of pus formation or actual abscess with sinuses the fluid in the sac completely escapes the infection. Do not operate on such cases unless the external conditions are thoroughly treated. Arseno-typhoid, Sulphonamides, simple evacuation of pus and a course of diathermy would in time clear the outside inflammation and then you may operate if necessary. Injudicious handling of such cases may give rise to dangerous form of epididymo-orchitis or acute funiculitis and even peritonitis or septicæmia and death.

4. *Lymphatic varix of the cord and inguinal region*:—Operation on hydroceles associated with these conditions should be avoided as far as possible. If you do operate on such cases take all possible precautions and simply open the sac and avert it. Do not touch any varix or other parts. Use radiant heat locally 12 hours after the operation 20 to 30 minutes, 2 to 3 times a day. If chylous or simple fistula is left behind use Ethidol injection and diathermy locally. Fig. 2. shows varix of the cord and inguinal region on left operated side and hydrocele on the right. I refused operation on right hydrocele.

5. *Hæmatocele*:—Filarial hydrocele may develop on an old hæmatocele or hæmorrhage may occur in a previous hydrocele sac. In such cases you will find wet or almost dry brown or mahogany colour saw-dust like material in the sac. Your job then is to wash out the sac with hot saline till the fluid returns clear and unstained. Do not do eversion in these cases but completely remove the sac. Leave the skin wound partially open for 48 hours and put a drain. If all is well put secondary sutures and use diathermy if any troublesome induration or thickening of the parts is left behind.

6. *Malignant testicle*:—If you could detect any signs of malignancy before the operation do not operate but it happens that you get aware of it during or after the operation. In such a case do not castrate but get the microscopic confirmation and ask the patient to seek advice for radium or deep X-ray therapy or radical operation if applicable at that stage. The mortality in operated cases is very high, so leave such patients alone.

7. *Hernia*:—This is not a rare condition but fairly commonly met with associated with hydrocele. 5% of my cases had this association. An interesting case is cited below:—

CASE. *Suppuration in a hernial sac punctured by a quack to cure a hydrocele*:—A young unmarried man of 24 years had filarial hydrocele. A quack claiming to cure hydrocele by electricity punctured

the supposed hydrocele sac and put a silver canula into it to drain the fluid. The patient had a rigor and very high fever the next day. He had 105°F. for 10 days. I saw him and found his scrotum a bag of pus with a freely discharging wound on the right. The inflammation extended up to right inguinal region and inside the pelvis. He had 7% sugar in his urine. He also gave the history of gonorrhœa, syphilis, filariasis, glycosuria, malaria and typhoid fever and sexual weakness amounting to impotency. He was treated for his glycosuria and sepsis. His condition improved and the colicky pain in the lower abdomen decreased in 10 days. He had 101°F. in the evening. He dreaded surgery and was an extremely nervous patient but I had to operate him under 1 in 1000 Pantocaine local analgesia. On opening up, I was amazed to find omentum bathed in pus in the scrotal bag. His right testicle was completely destroyed. I enlarged the field of analgesia, took his permission and castrated him. Two ligatures were put on the omentum, one at the external and the other at the internal ring. Omentum below the external ring was removed. The stump in the inguinal canal was left as it was. Sac was separated, not cut away but stitched at the internal ring with a hope to keep the trouble localized. The inguinal canal was partially repaired and kept open. A good portion of the scrotal skin was removed and the scrotal wound entirely closed. Radiant heat and other suitable treatments were given. Patient made rapid recovery but after two weeks signs of pelvic abscess developed which soon passed into subacute phases. A portion of the stump was removed after 3 weeks. A month after, the patient travelled with me from Gaya to Gulmarg (Kashmir). A month and 10 days after the operation, his inguinal wound gave way and a quantity of pus escaped. The stump of sac and omentum separated completely 10 days after the last happening. His inguinal wound healed by granulation in 2 months. He became hale and hearty in 3 months' time and there is no sign of recurrence of his hernia for the last four years. The case very clearly demonstrates the danger of puncturing a hydrocele, the extraordinary defensive power that kept the infection localized in spite of the septic puncture of the hernial sac and omentum remaining bathed in pus for 20 days and the extraordinary results that could be obtained by intelligent use of a combination of all varieties of therapeutic methods and surgical procedures that modern science has placed at our disposal.

I would, now, like to mention a few important points in the post-operative care of an operated filarial hydrocele:—

1. *Elephantoid fever*:—The attack of rigor and fever 24 to 36 hours after an operation is not always due to sepsis but to an attack of elephantoid fever and local lymphangitis. Four injections of Arseno-typhoid given weekly and Sulphanilamide by mouth given 3 days before the operation and both the medicines continued in the post-operative period with radiant heat started 12 to 24 hours after the operation help to avoid or at least minimize this troublesome and alarming complication.

2. *Hæmatoma*:—Carefully planned incision avoiding veins and

small arteries and tying them immediately when cut, deeply placed but not tightly applied sutures and a pugrie-bandage with sufficient pressure to eliminate cavities, all help to avoid the hæmatoma which when formed invariably suppurates if radiant heat is not applied judiciously. I also use a horse-hair drain for 24 hours in all my cases of filarial hydrocele.

3. *Delayed healing of the wound*:—Primary union in a filarial hydrocele operation is not a rule. A colleague of mine was very worried over one of his cases healed primarily in an endemic area. Local analgesia is blamed in many cases for it. I find that if a horse-hair drain is kept in all cases for 24 hours, tight suturing is avoided, careful bandaging is done, radiant heat is applied early where necessary and this minor operation is not treated with contempt by a Surgeon and his Assistants, primary union results.

4. *Scrotal sinuses*:—They are sometimes very obstinate but with a few applications of diathermy they generally get closed. If they do not respond to diathermy suspect malignancy, tuberculosis or disorganized testes demanding removal.

5. *Retention of urine*:—Patients generally cannot pass urine from 8 to 12 hours after the operation. I always prescribe 30 grains of Pot. Citras every 4 hours for 3 doses after all the operations. After 12 hours hot water bottle on the pubic region and cold metal plates to the soles of feet may be tried. The patient may be allowed to stand for urination. Running tap water sometimes provides a reflex psychical stimulus. Catheter is generally not required but may be used after 18 hours if absolutely necessary.

I do all the operation on the scrotum under local analgesia using $\frac{1}{2}\%$ Novocaine or 1 in 1000 Pantocaine for infiltration and 1% Novocaine or $\frac{1}{4}\%$ Pantocaine for perineural block in the cord for hydrocele operations. I have done more than two dozen cases of hydrocele by infiltration with simple boiled water without injecting round the cord. The only pain felt was the testicular sensation when a testicle was exposed to open air or roughly handled. I only advise an enema 4 hours before the operation and a glass of Glucose Syrup before the operation. Purgatives, starvation and such other preparations are out of date and not at all necessary. Fig. 3 shows the rhomboid of local analgesia and the site of infiltrating the cord for hydrocele operation. Fig. 4 shows filarial scrotum with double hydrocele of the cords simulating double inguinal hernia.

VI. *Filarial Penis*.—Elephantiasis of penis practically always accompanies that of scrotum. Two chief varieties are met with in practice:—

1. *Embedded penis*:—In a huge filarial scrotum the skin of the penis also gets elephantoid and the penis is dragged inside. Urine trickles down the scrotum and produces eczematous condition.
2. *Ram-horn penis*:—In this variety, the skin is thick, dry and nodular and the penis is so twisted that it assumes the shape of a

ram-horn. It never gets embedded but lies on an elephantoid scrotum of a different variety. The skin of the scrotum in this kind is very thick, dark, knobbed and nodular and the size is not very big. No papillomatous areas and fissures exist. Hydroceles of moderate degree are always found. Though truly filarial in origin, it externally appears more like a dermatolysis than an elephantiasis. The diagnosis is easy but I have known cases of phimosis with generalized hyperplasia of penile skin, simple chronic lymphatic obstruction of penile area and the elephantoid conditions of penis brought about by trauma and infection to be mistaken for filarial penis. One of my colleagues recently had a very interesting case:—

CASE—Elephantoid condition produced by a metal ring embedded at the root of penis:—A man of 48 years, married to a young girl, devised a novel method to prolong his retentive powers and erection of the penis during coitus. He put a metal ring at the root of his penis when it was lax. He partially succeeded in his aim but the ring refused to come away, and the penis remained engorged, then swollen, painful and later on almost gangrenous with lymph freely exuding from its surface. He consulted my colleague who wanted to remove the ring under general anaesthesia but the patient ran away and returned after about 3 months with an elephantoid condition of the penis functionally useless for sexual act. His ring was cut off by an iron-smith but the constriction persisted. I am trying to get a photograph but have not yet succeeded. The treatment of filarial penis is very unsatisfactory. Thiersch grafts on the denuded penis always leave it shrivelled up-stunted stump-like structure firmly adherent to the pubic region. CONNELL (1932) used flap-graft from thigh which left the penis very bulky and as functionless as before. CRUICKSHANK (1937) tried 'turned operation' and pedicle-grafts and met with failures. He opined that if the penis could be kept extended for the period sufficient for a graft 'to take' the result should be good. He devised a splint on the lines of Cabot splint for the purpose and did some cases. I do not know what results he got from his ingenious device. I liberate the penis if embedded and under local analgesia remove a sufficient rectangular piece of skin from its dorsum, taking care to avoid injury to the vessels and nerves, and then undermine the entire skin of the penis and remove the blubbery mass. I then fashion the skin and stitch it up on the dorsum. I use an extension apparatus devised on the lines of the external part of Rowells' urethral electrode set for diathermy of anterior urethra. My results have so far been very encouraging. A young educated man of 25 years of age, who had a ram-horn penis and could not perform the sexual act, was able to do so 3 months after I performed the operation on him. The function of his penis is still very good though the operation was done 4 years ago. I understand that the organ has become slightly crooked now due to some fibrosis on one side but is not in any way troublesome to him. The incision for the operation is shown in Fig. 5 a b c d.

VII. *Elephantiasis of Scrotum*.—Once elephantiasis of the scrotum occurs, microfilaria and excessive eosinophiles disappear from the

blood. ACTON and RAO (1933) describe three stages in the pathology of elephantiasis.

1. *Static Oedema*:—This is caused by filarial toxin interfering with tissue permeability. Contrary to the common belief, it does 'pit-on pressure' in early stages and becomes solid only in a very chronic condition.

2. *Blubbery Mass*:—This 2nd stage is due to lymph-stasis.

3. *Pachydermia*:—Is the 3rd stage and is generally brought about by secondary infection due to 'epiblastic kataphylaxis'. The epidermis is thrown into papillomatous growths and fissures are formed between them. Keratinization of the horny layer is interfered with and the secondary infection of the elephantoid scrotal skin becomes very common. Staphylococcal infection and involvement of small lymphatics give rise to cellulitis while streptococcal infection of skin and big lymphatics give rise to abscesses and erysipeloid attacks. Apart from the acute scrotal attacks the weight of the tumour becomes unbearable and the patient seeks relief. Surgical removal of huge filarial scrotum is neither a clean nor a pleasant procedure.

Anæsthesia.—I do all filarial scrotums, however big they may be, under local analgesia. I have used upto 800 c.c. of 1% Novocaine and up to 1000 c. c. of 1 in 1000 Pantocaine without any serious trouble. I put a double line of infiltration using Adrenalin freely and cut in between (Fig. 5). The septal portion is very sensitive and need special attention. I have used intravenous Evipan Sodium, spinal and sacral blocks in suitable cases but prefer local analgesia over all.

Shaping of Flaps for new Scrotum.—We know that the skin on perineal side escapes the elephantoid changes. MANSON-BAHR, (1925) teaches that the skin appears thin and healthy due to 'stretching'. It may be so, but one thing is very noteworthy and it is this:—during an acute attack of inflammation of the filarial scrotum, this portion of the skin generally escapes but when it does get involved, you may say with ease and confidence that the case is going to end in death. Now, the aim of the operation is to reduce the weight and bulk of the huge scrotum and to avoid secondary infections of the affected skin. I therefore believe and have found by experience that the perineal side of the skin could safely be used for shaping a new scrotum for lodging the testicles and the incision could be so planned under the skin of thighs. I have devised an incision of my own which is shown in Fig. 5.

Control of Hæmorrhage.—I do not use a tourniquet of any sort. I drain the scrotum of engorged blood by raising up the part and applying study and elastic pressure 12 hours before the operation and keep the scrotum raised up on pillows or bags during the operation. Adrenalin which is usually not advisable to be used with local analgesia on the scrotum for fear of secondary oozing, could very safely and freely be used in cases of filarial scrotum as there is no question



Fig. 1.—Lymph scrotum (in an un-operated case.)



Fig. 2.—Lymphatic varix of the cord and inguinal region on left after hydrocele operation.



Fig. 3.—Local analgesia and line of incision for hydrocele operation.
P = Deep infiltration of cord.
ABCD = Infiltration rhombus.
AC = Line of incision.



Fig. 4.—Double hydrocele of cords in a filarial scrotum simulating double inguinal hernia.

Filariasis of the Male Genitalia

By Capt. N. Ahmed.

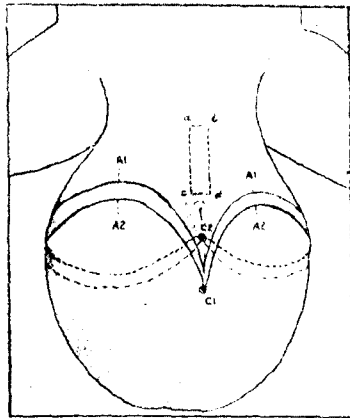


Fig. 5.—Lines for incision under local analgesia for huge filarial scrotums and elephantoid penis. *a b c d*—Infiltration rectangle to liberate penis and to cut away redundant skin. A1—Outer infiltration line making heart-shape figure round the scrotum. A2—Inner infiltration line. All the tissues outside this line are cut away and removed altogether. C1—Convexity in front on raphe which is united to convexity C2 behind to form a new scrotal bag. Dotted line shows the infiltration lines behind scrotum.



Fig. 7. Huge filarial scrotum.



Fig. 6.—Left scrotal hernia simulating filarial scrotum.



Fig. 8.—Malignant right testicular tumour simulating filarial elephantiasis of scrotum.

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of post-operative hæmatoma in such cases. The bleeding is from big dilated veins and very wide-mouthed arteries which could easily be secured as the operation proceeds step by step. On incision, bleeding appears alarming but it very soon settles down to safe limits and could very easily be controlled.

Post-operative Elephantiasis of lower Limb.—This danger with the old method of operation is a real one but with the method which I use, complete blockage of the diverted lymph-flow towards the scrotum does not occur and the elephantiasis of the leg which is the result of removal of every bit of the skin of the scrotum is not to be so much dreaded now. I have followed some of my cases for the last six years and have neither seen this sequelæ in any one of them nor the liability of recurrent attacks of inflammation which occurred before the operation as a routine. A surgeon of some repute, a Professor of Surgery in a Medical College, who worked in an endemic area of the Gangetic basin, assured me that he also followed a similar method and never regretted doing so.

Differential Diagnosis.—It is worth mentioning that an old and big scrotal hernia may so drag the skin that the penis gets embedded and the tumour gives every appearance of a filarial scrotum with hydrocele inside. Fig. 6. shows one of my cases of left inguinal hernia simulating a filarial scrotum. Fig. 7. represents a huge filarial scrotum operated by me 4 years ago and Fig. 8 shows a malignant tumour of the right testicle which was wrongly diagnosed by one of my colleagues who wanted to reduce the size by operating on the supposed 'hydrocele' but closed the incision as soon as he saw the tumour instead of a hydrocele. The case is interesting and is given below.

CASE.—*Malignant testicular tumour simulating filarial scrotum with hydrocele.*—A Pathan, 50 years of age, had attacks of colics for 9 years. His doctors diagnosed them as those of renal colic but always found his urine normal. Five years ago, he had an attack of rigor and fever with acutely congested, red, swollen, painful and tender enlarged right side of the scrotum. It was diagnosed as an attack of filariasis of the scrotum by his physician. Three years ago the attempt was made by one of my colleagues to operate for hydrocele and filarial scrotum but the wound was closed immediately the tumour was detected. On 1-12-39, he appeared before me for operation which I refused. The tumour had the resemblance and the history of attacks very similar to those of filarial elephantiasis of scrotum but on examination, I had no trouble in diagnosing the real nature of the swelling. I have to thank the Editors of the Patna Journal of Medicine for the loan of the blocks of and permission to reproduce Figs. 3 and 5 from one of my articles published in that journal.

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Disorders of the Urogenital System in Diseases of the Nervous System

BY

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Introduction.—The central nervous system is the controller of all the other systems of the body, the ring-leader of the chorus, the head-man of the orchestra. Diseases of the central nervous system affect all the other systems. The effect on the urinary and genital systems are important on account of their far-reaching consequences. The attention of the neurologist is often drawn to these two systems. The cause of death in a vast majority of cases of tabes dorsalis is cystitis which follows on retention of urine, an almost invariable symptom of the disease. Impotence and amenorrhœa which occur in a large number of diseases of the nervous system lead in their turn, in many cases, to psychosis and psychoneurosis which make their sufferers invalid for life.

Disorders of Secretion of Urine.—The flow of urine is regulated by a centre in the hypothalamus. The oliguric influence of the extract of posterior pituitary is well-known. How this influence is exerted is not clear. It was at one time thought that it acted directly on the kidney elements, the nephrons, consisting of the Bowman's capsules, including the glomerules, and the tubules. Later, when the vaso-pressic action of the posterior pituitary extract was established, the oliguric effect was thought to be secondary to its vaso-constricting effect on the afferent arterioles and the capillaries of the glomerules. Doubt has been thrown on this conception. It is now thought that the action of the pituitary is exerted through the hypothalamic nuclei which are connected by nerve fibres with the posterior lobe of the pituitary body. It has also been demonstrated that the secretion containing the hormones of the posterior lobe of the pituitary is carried up the infundibulum to the third ventricle. Of the hypothalamic nuclei probably the nucleus tuberalis is concerned with regulation of the water metabolism of the body and is responsible for diminished secretion of the urine or, accepting CUSHING's hypothesis of the function of the kidneys, for greater absorption of water from the tubules, thus leading to polyuria. Polydipsia or increased thirst is only secondary to polyuria. Experimental and clinical observations support this theory.

CUSHING has shown that the oliguric effect of posterior pituitary extract is more marked when it is injected into the third ventricle than when it is injected intravenously.

Experimental injury to the hypothalamus or to the connection between the hypothalamus and the pituitary by means of Clarke

instrument causes polyuria and polydipsia due to the loss of normal oliguric influence of the hypothalamic centre.

In cases of hydrocephalus, the distended third ventricle exerts pressure on the hypothalamus and causes polyuria and polydipsia long before the pressure is severe enough to cause flattening of the sella or erosion of the clinoid processes or symptoms of hypo-pituitarism.

In cases of encephalitis lethargica, polyuria is a common symptom on account of the common involvement of the region of the hypothalamus whereas symptoms of hypo-pituitarism are very rare.

There is often polyuria following an attack of migraine.

Disorders of Micturition.—The act of micturition is primarily a reflex one. This is complicated by an inhibitory influence which is of the order of a conditioned reflex. This inhibitory influence can further be overcome by volition as in voluntary initiation of micturition.

Both afferent and efferent nerves for the bladder are carried through the sympathetic and parasympathetic fibres passing through the hypogastric ganglion. The sympathetic fibres passing through nerve or the superior hypogastric plexus are connected mainly with the second and third lumbar ganglia and receive a few contributory fibres from the first and fourth lumbar ganglia. The parasympathetic fibres are excitatory to the detrusor muscle of the bladder wall and inhibitory to the sphincters while the sympathetic fibres have the reverse action. The external sphincter has a further supply from the pudic nerve.

In early infancy the evacuation of the bladder is carried out reflexly through the sacral region of the cord. Both the afferent and efferent fibres of this reflex are carried through the sacral autonomic system. With the growth of the sympathetic fibres inhibition of the evacuation reflex is established. This is effected by increasing the tone of the sphincters and relaxing that of their detrusor muscle. Still later, when the pyramidal system is well developed the inhibitory influence of the sympathetic can be overcome voluntarily. The voluntary initiation of the micturition usually occurs in response to awareness of distension of the bladder. The sensory fibres responsible for this information are carried through the posterior columns of the cord. In the lower reaches, it is imperfectly known whether they are carried through the sympathetic or the sacral autonomic system, the latter is the more probable path. The cortical centre for evacuation of the bladder is situated in the paracentral lobule on the medial surface of the hemisphere connecting the precentral and post central convolutions beyond the inner and of the central sulcus, the fissure of Rolando.

Nocturnal enuresis, a common disorder of micturition in children, can be divided into two groups. In the first group, found in younger children, the defect is the continuation of the automatic evacuation of the bladder due to delay in development of the inhibitory mechanism. This may probably be the result of poor development of the sympathetic fibres. Enuresis found in children with spina bifida occulta

also belongs to this group. In the second group, which occurs in older children and even in some adults, the disorder is principally due to psychological reasons, the mechanism being of the order of conditioned reflex effected during sleep or the fulfilment of some unconscious motivation.

The cortical centre for micturition may be affected by meningeal lesions *e.g.* meningioma of the flax cerebri or by vascular lesions affecting the anterior cerebral artery or the superior longitudinal sinus. Other cerebral lesions may also affect the same area of the cortex or the fibres arising therefrom. The result is the loss of power of voluntary initiation of micturition *i.e.* difficulty or hesitancy in micturition and consequent retention of urine. This is commonly found in cases of cerebral tumours and diffuse cerebral lesions. Lesions lower down in the brain, *viz.*, the corona radiata, the internal capsule and the brain stem, which involve the pyramidal tracts will have similar effects. The commonest of such lesions are vascular diseases, cerebral hæmorrhage, embolism and thrombosis, tumours and meningeal affections at the base and disseminated sclerosis. Retention or incontinence of urine and faeces are the rule as long as the patient remains unconscious in cases of cerebral hæmorrhage. The same state of things occurs also during unconsciousness of basal or general lepto-meningitis. Paralysis of sphincters occurs late in the latter disease.

In complete interruption of the spinal cord above the conus medullaris either by transection or severe transverse lesions the sacral reflex centre is set free from the inhibitory and other influences and so evacuation of the bladder occurs reflexly as in early infancy—patient being unconscious of the act.

In cases of partial but severe interruption of conduction in the spinal cord the power of voluntary initiation of micturition is lost so that retention of urine occurs due to the over-action of the sympathetic. This state of things develops in advanced cases of disseminated sclerosis and in cases of spinal compression.

In tabes dorsalis it was thought that retention of urine was due to want of awareness of the fullness of the bladder, resulting from the degeneration and atrophy of the fibres in the posterior column. It is now known, however, that the primary lesion in tabes dorsalis is not in the posterior columns but in the entering fibres of the posterior roots of the spinal nerves and that the sacral roots are affected early in the disease. Such a lesion in the second and third sacral roots means interruption of the sacral reflex arc leading to retention of urine, which, if unrelieved, will, in its turn lead to overflow incontinence. Whether ataxia or bladder trouble comes first depends on whether the lumbar or the sacral roots are affected first.

In subacute combined degeneration sphincter disturbances consist, in the early stages, of difficult and precipitate micturition and, in the later stages, of retention of urine and incontinence.

Lesions of the conus medullaris and cauda equina involving the second and third sacral roots will result in retention. A cauda equina

lesion may however involve the first and second lumbar roots and thus interrupt the path of the sympathetic fibres. The result in that case will be true dribbling incontinence. It has been observed, however, in cases of severe cauda equina lesions of some standing that reflex evacuation of the bladder becomes established. Probably the hypogastric ganglion acts as the reflex centre in such cases.

In cases of paraplegia from any cause the inhibitory influence of higher centres on reflex evacuation of the bladder is diminished and bladder is emptied reflexly by such unnatural impulses as nocuous stimuli applied to the skin of lower limb *i.e.* the parts having sympathetic nerve supply leaving the spinal cord below the level of the lesion (mass reflex).

Emptying of the bladder during an epileptic fit is not a reflex action but is due to spasm of the detrusor muscle of the bladder with simultaneous relaxation of the sphincters.

Retention of urine is a serious complication and should be treated early, otherwise it leads to infection of the urinary tract, with all its graver consequences. The first principle of treatment for retention of urine is drainage. In view of the fact that retention of urine is usually due to relative preponderance of the sympathetic over the parasympathetic, good results are expected from the use of cholinergic drugs *e.g.*, Acetyl-Choline, Doryl, Mecholin etc. Many cures have been reported with these drugs. Interruption of the sympathetic supply of the bladder by resection of the presacral nerve has been carried out in a few cases and good results have been claimed for the operation. If these measures fail recourse must be had to regular catheterisation. When evacuation via naturalis is impossible, supra-pubic cystotomy is advised.

In cases of frequency and precipitancy of micturition and in nocturnal enuresis drugs of the Belladonna group are useful on account of their paralysing effect on the para-sympathetic. Ephedrine may also be used to stimulate the sympathetic.

Infection of the Urogenital Tract.—Cystitis almost invariably follows on retention of urine which results from lesions of the central nervous system. When cystitis is allowed to last for some time the infection spreads up the urinary tract to the pelvis of the kidney, and pyelitis and pyelonephritis ensue. This infection of the urinary tract is one of the most serious complications of neurological disorders and demands careful consideration. It is responsible for the death of a large number of patients in nerve hospitals.

Mental deficiency and moral imbecility which result from defective development of the brain lead to indiscriminate sexual act and consequent venereal diseases. Many of the prostitutes are mentally defective. The same thing happens along with other behavioural disorders in encephalitis lethargica and in mental deterioration resulting from diseases of the brain in later life.

The treatment of cystitis and pyelonephritis, when they exist, is part and parcel of the treatment of the neurological disorder which

gives rise to them. Drainage and urinary antiseptics are sheet anchors of treatment. Hexamine and Acid Sodi Phosphate are useful in many cases. Mandelic Acid treatment has proved beneficial in some. For washing, Acriflavine, Boric Acid, Brilliant Green, Mercurochrome, Oxycyanide of Mercury, Pot. Permanganate, or Silver Nitrate may be used in proper strengths.

Hypogonadism and Genital Atrophy.—Chromophobe adenoma, the commonest tumour of the pituitary, is associated with depression of the sexual function which in women takes the form of scanty menstruation progressing to complete amenorrhœa and in men impotence. Secondary sexual characters also deteriorate, the skin becomes soft and pliable and hairs on the trunk and limbs and face of men are lost.

Frohlich's syndrome, which is due to hypofunction of both the anterior and posterior lobes of the pituitary, is characterised by non-development or atrophy of genital organs along with distribution of fat in particular sites of the body.

Impairment of sexual function is the rule in both acromegaly and gigantism. This takes the form of impotence in the male and relative or complete amenorrhœa in the female.

Intracranial tumour in the region of the pituitary *e.g.* stalk tumours and other tumours pressing on the pituitary also cause atrophy of the genitals.

Internal hydrocephalus from any cause produces regression of sexual function and infantilism in the later stages when the pressure of the distended third ventricle becomes extreme. Basal meningitis invading the pituitary and the tuber cinereum may result in impotence in the male and amenorrhœa in the female. Encephalitis lethargica affecting the hypothalamus has been followed by atrophy of the genitals.

Impotence is sometimes an early symptom in syphilis of the nervous system specially tabes; in other cases it is late or absent. The exact mechanism of production of impotence in tabes is not known. It may be due to interruption in the path for the sexual reflex.

Impotence occurs early in cases of subacute combined degeneration of the spinal cord.

In cases of spinabifida occulta impotence may be present in the male from the beginning of sexual life or it may come after a period of normal potency.

Hysterical impotence is usually the 'expression anxiety' which being associated with excitation of the sympathetic nervous system is inhibitory to the sexual activity. The sympathetic however supplies motor fibres to the seminal vesicles; this is why impotence is often associated with ejaculatio præcox. Of course, apart from this physiological explanation there are psychological explanations for impotence in hysteria *e.g.* feeling of physical inferiority, fear of ill effects of masturbation, a sense of moral guilt evoked by illicit sexual union or even marital sexual relationship. Similarly both physiological and

psychological explanations have been put forward for vaginismus which is found in many female hysterics.

Sexual Precocity, Masculinity and Genital Hypertrophy and Hyperfunction.—Some cases of acromegaly and gigantism begin with sexual precocity but this soon gives place to amenorrhœa, impotence and genital atrophy.

The genital symptoms of basophil adenoma or mere basophilism of the pituitary is not sexual precocity, though this is found in some cases, but masculinity in the female and hypermasculinity in the male.

Tumour in the pineal body causes sexual precocity only in boys, and that too only in some cases. This is associated with premature development and hypertrophy of genitals and secondary sexual characters. The syndrome is called "macrogenitosomia præcox". The picture may later be complicated by symptoms of hypopituitarism due to pressure on the hypothalamus by the distended third ventricle caused by the pineal tumour obstructing the sylvian aqueduct.

In paraplegia-in-flexion, along with exaggeration of reflexes in lower limbs, the cremasteric, dartos and bulbo-cavernous reflexes persist and reflex erection of the penis and seminal emission can be evoked easily. Spontaneous priapism may occur. These sexual reflexes may be associated with contractions of the abdominal recti, leg flexors and the adductors of the thighs.

Seminal emission in cases of judicial hanging has not been clearly explained.

Notes on Obstruction of Urine

BY

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OBSTRUCTION of urine is one of the most common symptoms we meet with in our daily practice both in hospitals and in private. It is not only a disease of the adults, but occurs in every sphere of life. I saw a baby of nine days only three months ago with complete obstruction of urine by means of an impacted stone in the urethra; old men often suffer from retention of urine with enlarged prostate.

Ætiology.—I shall only mention here the main causes and conditions which prevent the normal flow of urine. They may be divided into four principal factors, viz. 1. Mechanical, 2. Organic, 3. Trauma, 4. Neuro-muscular paralysis.

1. **Mechanical:**—In the first place urinary calculus is mainly responsible for the obstruction of the flow of urine, and I can say from my personal experience that it constitutes about 50 per cent. of the total number. A stone may be impacted within the ureter and in the wall of the bladder itself before the ureter opens into the bladder,

in the bladder at the internal meatus and in the urethra. Recently I removed a big urethro-vesical calculus from an old man of 65. It originated in the prostate and gradually protruded into the bladder taking the shape of dumb-bells. Kidney stones as well as stones formed within the bladder, if they are small, often pass out without much difficulty or trouble, but sometimes they stick in the bulbous, membranous or penile portion of the urethra, and cause obstruction of urine. It occurs, as I have said, usually in babies or small children.

Last of all, I may mention in this connection that a large variety of foreign bodies lodged in the urethra of erotic males or females, and also fragments of rubber catheter bougies or other surgical instruments left within the urethral canal or bladder causes or may cause obstruction of urine.

2. **Organic:**—Of this, very common condition is stricture; the stricture of urethra or narrowing of its calibre is caused by cicatricial contraction after epithelial destruction and subsequent deposition of new fibrous tissue in and around the urethra. Of the organic strictures over 90 per cent. of the cases are caused by gonococci, and the rest by traumatic causes, such as fall or kick on the perineum, post-inflammatory condition, peri-urethral abscess and so on. Gonorrhœal strictures are specially confined to males and occurs usually after the age of twenty-five. According to Otis the anterior part of the urethra is usually affected and often multiple, while stricture of the membranous portion is commonly due to trauma, and lies about an inch below the lower border of the symphysis between two layers of the triangular ligament and can be felt through the rectum in front of the prostate.

In long-standing and neglected cases, the urethra behind the stricture becomes dilated or this may be ruptured. The bladder is subsequently hypertrophied as a compensatory measure, and afterwards the ureter and kidneys are also damaged in consequence of the backward pressure.

The Growth within the bladder of either innocent or malignant origin, or any growth outside the bladder causing pressure through the vagina or rectum. Cancer of penis may also cause obstruction of urine by invading the urethra and its surrounding structures. After complete amputation of penis—about 10 per cent. of cases develop strictures at the new artificial meatus—due to bad technique sometimes.

Prostatic enlargement is the usual cause of obstruction in old age.

3. **Trauma:**—There may be rupture of urethra outside the pelvis, or inside at the junction of prostatic and membranous urethra due as already mentioned to direct or indirect violence, such as fall, kick on the perineum, bad catheterization, operations on rectum, or vagina and so on. There may be rupture of urethra either complete or incomplete with or without extravasation, and also rupture of the bladder due to over-distension of the bladder or fracture of the pelvis, causing complete or incomplete obstruction of the flow of urine.

4. **Neuro-Muscular Paralysis** of bladder usually from spinal

injury or spasmodic contraction due to febrile condition, or irritation of the bladder or urethra from reflex cause, such as, injury or operation of rectum, anus or surrounding structures, pelvic inflammation, peritonitis, etc.

Treatment. I shall not enter into any detail about the technique, but only deal with the subject in general.

In any case a rubber catheter (warmed and well-lubricated with some sterilized lubricant) should be tried first of all in order to relieve the bladder; and if the canal is normal the instrument will pass without much difficulty even in spite of any spasmodic contraction or functional disorder. Often a small catheter (specially a metallic one) finds its way with greater difficulty, especially in a spasmodically contracted urethra than an instrument of a larger calibre; besides there is greater danger of making a *false* passage with a narrow catheter than with a large one. If the catheter cannot be passed into the bladder, then the urethra should be anaesthetised by instillation of a 5 per cent. solution of Novocaine (2 to 4 drachms) and a metal catheter should be tried. If it would not go, introduce the left index finger into the rectum and place the tip at the depression on the membranous portion of the urethra in front of the prostate and then gently and gradually push the catheter along the line of curvature without diverting the tip either to the right or left but keeping it steady in the *middle line*, holding the penis up in such a way as to turn the two curves in the urethra into *one*. The eyes of the catheter should be looking direct on either side and the finger can guide the catheter in the right direction by *feel* of the metallic catheter in the urethra through the rectum. The patient having been placed on the back with the thighs slightly flexed, the surgeon standing on the left of the patient introduces the catheter through the meatus, having the *convexity* of the catheter turned towards the thigh and pushing the tip gently as far as possible and at the same time *drawing* the penis upwards and then slowly depressing the shaft which causes the tip to enter into the bladder (LEJARS). In the beginning the tip should be directed against the floor of the urethra, so that it may not catch in a lacuna or a fold of mucous membrane, and then pressing all along against the roof by *pulling up* the instrument. When the catheter passes into the bladder rightly, we can move the tip *freely* by holding on the shaft either from the right to left, or the left to the right.

Foreign Body.—In case of impacted stone or foreign body in the urethra the stone or F. B. should be removed by anaesthetising the urethra without breaking the same if possible by means of crocodile forceps, (Gnoyn's hook, scoop or even a bent probe. If the procedure fails, we must remove it by external urethrotomy. If there be a growth or an impacted stone within the bladder at the trigone, we should try to remove the same by supra-pubic cystotomy.

Strictures.—Dilatation by sounds is the best and simplest method, and hundred times better than urethrotomy, either external or internal.

We should take up the sound with a graduated tip, and being itself heavier than a soft or hollowed catheter, it often slides along the path of the least resistance. As for myself, I rarely had any occasion to perform a Syme's or even internal urethrotomy, as in most cases I was able to *make out* a passage through the narrow or even blocked urethra upto the bladder. If the vesical end of the urethra could not be found at all, the last alternative is supra-pubic cystotomy and retrograde catheterization.

According to BINNIE urethrectomy sometimes gives better results than external urethrotomy, but after all the frequent passage of a sound remains necessary in most cases.

There is no doubt, that few patients can retain a metal catheter for any length of time, so I always try to replace it by a *soft* one. I take a metallic sound of No. 3 or 4 and lubricate it with glycerine and push it within the lumen of a soft catheter (No. 8 or 10) upto the proximal end of the "eye", so that the metal tip may not *protrude* through the eye and injure the urethra, and then by holding the rubber catheter tight against the shaft of the metal sound (so that it may not slip), pass it as a stiff catheter into the bladder, and then remove the metallic sound, retaining the rubber catheter in the bladder by holding it tight against the external meatus.

In prostatic enlargement the special prostatic catheter is to be preferred because of its having greater curvature owing to the growth of the gland inside the bladder, and should be passed as in the case of stricture described above. Coude's catheter of different angles may also be tried with advantage. Hot hip baths, introduction of Bella-donna suppositories into the rectum, urinary antiseptics, regulation of diet, proper movement of bowels etc. are often very useful in reducing the inflammatory conditions.

In any case if the catheter cannot be passed at all, the bladder should be relieved at once either by supra-pubic puncture of the bladder above the upper border of the symphysis, or by Cox's operation.

Trauma:—Amongst others the rupture of urethra is a grave condition specially if it is ruptured in the membranous portion. We have to treat the case according to the nature, position and duration of the rupture. If immediate the bleeding points to be secured at once and the wound repaired leaving a catheter in the bladder till healing, but should not be left for more than two weeks. If micturition is possible, it is better to relieve the bladder every 6 or 8 hours: if not, the condition should be treated according to the method described in the treatment for strictures.

Extravasation of urine:—If it occurs, the tension in the infiltrated tissues should be removed at once by free longitudinal incisions and opening made down to the urethra above the stricture. Drainage should be put in the perineum for the first few days. The wound should be dressed twice or thrice a day by Eusol solution.

When there is obstruction to the flow of urine, and at the same time the catheter could not be passed then either external urethrotomy or supra-pubic cystotomy should be performed and a normal flow of urine restored by a catheter—either supra-pubic, perineal or penile. LAJERS prefers supra-pubic drainage to either perineal or penile, and he puts ruptured urethral segment at rest by *diversion of the stream of urine* through the supra-pubic opening, followed by instrumental dilatation of the urethral canal as soon as healing is sufficiently advanced. According to HAMILTON BAILEY, under no circumstances should the paralytic patients be catheterized. In the report of the late SIR THOMSON-WALKER one third of the spinal injury cases died of secondary sepsis. The best course is to perform and keep up supra-pubic drainage by means of a de Pezzer catheter. Urinary antiseptics, general tonics, nutritious foods and plenty of water should be given and the heart should be supported by cardiac stimulants.

Congenital Mal-formation of The Female Genitalia

BY

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CONGENITAL abnormalities in the female genitalia are not uncommon, and many a family becomes unhappy particularly in India. Since the uterus, tubes and vagina have a common origin in the mullerian ducts, anomalies of these structures are frequently seen in association and are chiefly due to non-union or imperfect union of the canals from which they arise. The ovaries on the other hand originate independently from the Wolffian ducts and therefore exhibit independent anomalies. All pelvic anomalies arise from an arrest of, or perversion in development, the chief cause being disturbed nutritional balance due partly to unfavourable environments but chiefly due to an inherent defect in the germplasm with heredity playing a predisposing fact. Cases which come under my observation have been divided into five groups, depending upon functional activities more than the anatomical conditions.

The common symptom of all of them was absence of proper onset of menstruation.

Group I.—Absence of vulveal opening :—Anomalies of vulva—as regards the size of the different parts, are of clinical importance. Adherent nymphæ is not unusual. What is required is to pass a probe through the small opening at the anterior end of the slit and press down and back to separate the lips.

Next in frequency is the *absence of the vaginal opening when the*

other parts of the genital system are of normal function. The condition becomes evident at puberty as follows :—

One, H. F. 17, came to me for periodical pain in the abdomen with fulness of the lower parts. Examination showed secondary signs well developed. Abdominally, there was a cystic swelling coming out of the pelvis. Over the swelling there was a mobile pyriform swelling—apparently the uterus. Vaginal examination showed vulva to be normal. But there was a tense partition of tissue occluding the vaginal opening. On this partition, there were two puckered areas side by side showing the originality. Impulse could be felt on the partition from the abdomen. Rectal examination showed the pelvis to be filled up by the swelling. A crucial incision was given on the partition and tarry blood came out. The swelling per abdomen disappeared gradually and the patient made uneventful recovery.

Group II.—Absence of vagina though the uterus and the ovaries are present :—The condition is not of clinical importance unless the ovaries and the uterus are functioning as in the case below :—

One, H. F. aged thirteen, unmarried, admitted on 21-8-37, with the following complaints :—

- (1) Pain and tenderness over the lower part of the abdomen for the last three months—the pain was of constant aching character with frequent exacerbation at irregular intervals.
- (2) Absence of any menstrual flow.

Per abdomen—There was a mobile swelling rather cystic and tender on palpation arising about one inch above the pubis.

Vaginal examination—Vulva well developed. In the cleft between the two labia minora, there was a band of fibrous tissue extending from just below the clitoris to the fourchette. The clitoris and other parts were normal. The fibrous band was incised transversely and with blunt dissection attempts were made to reach the vaginal canal with the result that a space filled up with loose areolar tissue was found to be intervening between the urethra and the anterior rectal wall. Through this space finger could be pushed up for about two inches and at the top of the finger could be felt a conical cystic swelling.

P. R. examination—There was a mobile pyriform swelling of about the size of a duck's egg. There was another swelling below the first and filling up the pelvis of doughy consistency. The cervical end could be felt alright. On the right, there was a mobile tender swelling of the size of a duck's egg. On the left there was a similar swelling.

Exploratory laparotomy was therefore undertaken to avoid the risk of sepsis. On opening the abdomen, the uterus was enlarged to the size of 8th week of pregnancy. The tubes were found to be grossly distended at their ampullary parts the isthmic portion remaining unchanged. No detection of the ovary was made. Com-

plete hysterectomy with the adnexa of both the sides was done removing the tarry blood. Blood was sterile and the patient made an uneventful recovery.

The point of interest centres round the fact that the uterus was not very much distended with blood, the isthmie portions of the tubes were normal while the ampullary parts of the tube were greatly distended with dark thick blood. So it is evident that the condition is unlike that of cryptomenorrhœa where there is back flow of blood from the vagina.

Group III.—*Absence of uterus though the ovaries and the vagina are present*:—One, H. F., aged sixteen, well developed, married last two years, came to me for absence of menstruation. On examination, Bimanual examination showed the vagina in good condition with a rudimentary uterus at the top.

Group IV.—*Absence of ovaries though the vagina and uterus are present*:—One, H. F., aged 24, well formed and married came to me from the district of Cuttack for absence of menstruation. Secondary development were absent and there was no desire for the husband. Vaginal examination showed infantile condition of the uterus. This was a case for ovarian graft.

Group V.—*Absence of co-relation of the different ductless glands*:—A young girl, aged 12, brought up in town and under good surroundings, was brought to me by her father complaining of extreme mental disturbance occurring every month. She used to become absolutely unbalanced and would not sleep. She used to become absolutely menstruation as yet. Pelvic condition showed undeveloped genital organs. Nothing special was done except sedatives at the period and the conditions improved and finally became normal with proper advent of menstruation.

Conclusion.—It is clear from the above, that absence of menstruation was the chief common symptom among all the varieties of cases. Therefore, it is absolutely required that contemplation of marriage should not be undertaken before the proper onset of menstruation in any and every girl. *Secondly*, any case of periodical pain without the onset of menstruation should be carefully investigated. *Thirdly*, in any case of cryptomenorrhœa, the patient should be prepared for vaginal as well as abdominal operations, and strict aseptic measures should be observed. In case there is lateral pelvic swelling, abdominal route is of choice as hæmatosalpinx is very prone to infection.

On Urine Analysis in Siddha Medicine

BY

Capt. C. S. S. Sarma, L.M.S.,

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THE examination of urine is an important procedure in both medicine and surgery. No conscientious practitioner can afford to ignore this elementary aid to diagnosis; even they whose main line of practice happens to be the examination of candidates for various industrial concerns, Public Service or Insurance Companies, attach the highest importance to urinary findings and in South India, often a good Insurance prospect is lost by adverse urine analysis report.

It is, therefore, refreshing to note that the Siddha school of medical practitioners, have given a high place to urine examination. Often the Siddhas were given to the practice of alchemy, which was a besetting sin of the scientifically inclined humanity of the middle ages. Medicine was a bye-product of the activity of those sages, who wanted to transmute baser metals into gold; and it is not unlikely that many a skilled physician or may be a surgeon, side-tracked into alchemy and wasted a fortune, only to retrace his steps to his original calling. One such must have been *Therayar*—a Siddha adept or sage of high order who has left behind him a short treatise on the examination of urine. It is written in quaint couplets, in the form of the famous *Kural*—or aphorisms. It shows such an amount of accurate observation and ingenuity to assess the prognosis from rough and ready, naked eye tests, that it is worth while setting them down in English for further light on some of the quaint and didactic conclusions drawn therein. The book is shrewd and written as a result of personal experience, and much of it cannot be dismissed as the prolific latter day quack literature.

It is worth while as a sample of what our medical forebears thought and believed, in the middle ages and shorn of exaggeration, if one were to examine their conclusions with an open mind and in Institutions where there is ample scope to put them to test, one can even venture to accord them an investigation on modern lines.

First, as to how to collect the sample of urine for examination. Man ingests six kinds of alimentation in his feeding arrangement. Some he eats, some he drinks, some he licks, some he bites, some he chews, and some he swallows. Some are sweet, some sour, some acid, some alkaline. Sometimes a man eats an excess of any one article, sometimes he deprives himself of some particular item, sometimes he takes food with great irregularity, sometimes he eats beyond his capacity, at other times he deprives himself of sleep; so if you want the urine to be a good sample of his bodily excretory function, see that the patient takes a well-assorted, complete meal and eats within the limits of his appetite, sleeps well, and voids it in early hours of the morning in a glass vessel and see it is not rapidly cooled and have the urine examined while it is still warm or before it has cooled down or

at all events within an hour or two: This is the direction for examining the urine of normal individual. Of course it does not apply to a diseased individual.

The general characteristics of all urine are: (1) Colour. (2) Weight or specific gravity. (3) Smell. (4) Frothiness. (5) Shrinkage. The colour may be (1) yellow (2) red, (3) green, (4) black, (5) white. There are six kinds of yellow, four kinds of red, five kinds of green, four kinds of black and two kinds of white in the coloration of the urinary sample.

About the Yellow Colour.—You have observed the rain water as it drips from the roofing as well as the water that drops out of wet straw; the urine that resembles the yellow of this type is significant of intestinal dyspepsia.

You observe the colour of the Turinji (தூரின்ஜி) fruit, as well as the peel of an orange or better, country lime. If the urine resembles the yellow of these two objects, it is significant of normal intestinal digestion.

Suppose there is a shade of red in the yellow, then it is indicative of an "over heated" system. Here "heat" is to be understood as "katabolic" excess. And the colour may resemble a wild orange pip.

Suppose it has a reddish yellow tinge like a burning flame. It is then significant of excessive tissue destruction and heat of the second degree.

Suppose again, it has an yellow colour like the saffron flower and further has streaks of red across it, it then denotes heat and tissue destruction of the third degree. Then come the differences in the red.

About the Red Colour.—If the urine is red with an admixture of black in colour it is significant of blood destruction.

If the urine is bright red like the *பொங்கி*, it is significant of blood destruction of the second degree.

If the urine is mostly black with a tinge of red distinctly perceptible, it is significant of blood destruction of the third degree.

If the urine is almost like blood, then it is significant of the highest degree of blood destruction.

About the Green Colour.—Suppose the urine has a dash of black in its green, it is the characteristic of excessive "phlegmatic" diathesis.

Suppose the urine is bluish green like the sky, then it is significant of some poison being excreted. This poison may be a poisonous fungus or the venom of a snake, or some poisonous alkaloids from some roots, shrub, creeper; grass or bark of a tree, or milky gum, resin, leaf, flower, fruit or other vegetable part of a plant; or the bites and stings of snakes, scorpions, centipedes, insects, dog or fox. It is noteworthy how the Siddha physician has depended on the colour to suggest to him the entire range of organic and inorganic poisons and how quickly he should have trained his eye to detect the "bluish green" tinge in the urine by reflected light.

Agitate the sample of urine and splash it against its container. If you detect a bluish shimmer, know it is significant of some nerve disorder both in the old and in the young.

If again this is not merely a bluish shimmer, but a definite deep and deepening blue, know it for certain that all the three "humours" are upset.

If it is distinctly green, it is also equally significant of a total upset of the tissue-balancing forces.

About the "Black Colour" in the Urine.—If there is a dash of black in an otherwise saffron coloured urine, the patient is going in for jaundice. If jaundice has not deemed yet, know his mechanism is heading for disease.

Now to the Varieties of Colours grouped under "White":—If the urine is clear, colourless almost like water, the condition is significant of an excess of "phlegmatic humour." It is difficult of cure. One might as well hold out hope for a sinking man in a sea-storm. So tempestuous will be the preponderance of "phlegm." Probably the condition here referred to is "Diabetes Insipidus."

If in addition to whiteness, the urine has a flaky fibrinous appearance like expectorated "phlegm," the condition is one of excess phlegm of the second degree, superadded to excess of heat.

If the urine is practically like "milk" it is significant of bone marrow destruction. It will land the sufferer in tuberculosis. If in such a sample of urine, pus with a foul odour is present, know there is some acute inflammation of the female or male generative organs, possibly an open ulcer somewhere, or a stone in the urinary tract actually formed or about to form before long.

If the urine is "opalescent" like semen, it denotes that the sufferer will ultimately develop habitual short-breath, actual asthma or frank pulmonary tuberculosis.

If the urine on drying up in the place where it is discharged, does not leave a salt encrustation, it is pathological urine. If it is like thinned butter milk or dilute milk respectively it is of grave significance, almost deathly in its import. Supposing the urine resembles the washings of freshly chopped-mutton, it denotes renal deficiency. The origin of this is very chronic and can be traced to prolonged and vicious functioning of the "phlegmatic" humour coupled with excessive heat due to tissue destruction.

Suppose the urine is thick and heavy like ghee, or merely heavy, these are also of grave significance.

If the urine, on the other hand, is absolutely devoid of specific gravity, it is to be understood that the "phlegmatic humour" is in excess. It is to be accounted for by extreme weakness of the bladder and the seminal vesicles. If the urine is heavy and thick, it is complex derangement of the humours "wind," "bile" and "phlegm." It will be followed by anasarca or ascites or the development of multiple boils and abscesses. If this is fortunately abated from day to day,

well and good, but if the passing of this heavy urine is continued, it will ultimately bring on pyrexia and hyperpyrexia.

So, a sample of urine that is neither too heavy nor too light in specific gravity, one that is a mean between these two is considered a fairly normal sample.

Odour in Urine.—You recognise the characteristic wet earthy smell, so peculiar after a shower of rain. The urine of the “phlegmatic” resembles in colour and odour, the storm-water.

If a foul odour is present in the urine, it is certain that the bladder or the urinary passages are the seats of demonstrable ulcers or atleast chronic inflammation. This is also the result of a complicated derangement of all the three “humours.”

If the odour is like that of tamarind, it is significant of gonococcal infection. Finally this type of urine, will present the characteristics of urine typical of “phlegmatic” urine, just as water is born of fire, as in several chemical reactions with light and heat. The tamarind-like-smelling urine, will land the sufferer in cystitis, pyelitis and pyelonephritis.

If, on the other hand, the urine is of a sweetish molasses-like-odour, it is suggestive of a plethoric or metabolic cause, chiefly excess of “blood”. It is significant of a group of allied disorders, possibly endocrine.

If the urine has the odour characteristic of the body of the black deer, it is significant of “bilious” derangement. If the urine has the odour of “decomposing” or raw flesh, it is due to the destruction of the lipid tissues of the body. Even if there is no such obvious destruction traceable just then, it is certain, that time is not far off. The lipid substances are bone marrow, brain, etc.

Froth in Urine.—Frothy urine is produced when some of the tissues in the body are destroyed or are undergoing inflammation. These substances are of five kinds.

This froth may have an yellowish, blackish or reddish tinge. These are suggestive of jaundice. The wise physician must guard against their appearance and save his patients by careful urine analysis and prevent the onset of jaundice and not wait to cure it after it has appeared.

Some urine is greenish and bile-coloured, some reddish and blood-coloured. These signify grave disorders of the liver, or the biliary apparatus. If the urine froths as well as foams up, or if it is clear and saltless like drinking water, or is fat and oily like melted butter or ghee or of various mixed types, then the urine is significant of various “phlegmatic” derangements. Another grave significance is that the urine exhibits all these composite colours, white, red, yellow and black. If actually blood is seen in urine, it may be significant of various specific conditions associated with “syphilis” and other disorders.

Oliguria.—If the urinary output is diminished, if the diminution continues even after ingestion of large quantities of fluids,

it will eventually lead to nephritis. It may also end in intractable diarrhoea and characteristic languor. So also the white coloured and blood coloured urine result in diseases due to derangement of wind. Some urine is coloured yellow like the grape fruit, some like *சுவைநீர்* some like gingelly oil, all these are significant of “bilious” disorders.

It is impossible to lay down in modern scientific parlance what these terms “wind”, “bile” and “phlegm” denote; whether they are the gross material substances connoted by their name or stand for conceptions like innervation, metabolism or secretory disturbance and disease conditions born of their derangements. The Ayurvedists, I know, deny these suggestions but have not put forward any other plausible theory. I venture to say that Western allopathic literature and science will be the better if a useful and at the same time an accurate nomenclature is evolved for these terms and they are in addition put on a sounder scientific basis. The tentative suggestion to call “wind”, “bile” and “phlegm” (which are both Dhatus or principles and “Dhoshas” or “disorders”) as innervation, metabolism and secretory disturbance is practical and helps to classify certain details of diagnostic procedures according to Ayurvedic and Siddha writers.

In all fevers, the yellow colour will preponderate in the urine. If a sufferer from prolonged fever or various specific manifestations, suffers from excessive urinary secretion, it is of grave significance.

Surface Tension or the Oil Test.—Now we come to a very interesting test. Probably by now all will be familiar with the various surface tension experiments associated with Professor Sir C. V. RAMAN, proving molecular tension as a definite characteristic. He has shown that surface tension is an exceedingly absorbing experimental study, especially when projected on the screen. His conclusions were very graphically illustrated and even ordinary substances like powdered camphor particles behaved in an unique fashion when thrown on the surface of different liquids and were photographed. Suffice it to say that molecules have individual behaviour when they are brought under the law of surface tension.

Here THERAYAR develops an interesting test, probably based on this law of surface tension. It is to float a small drop of oil (sesame) in the middle of a sample of urine, collected in a glass and place it in the direction of the sun's rays, where there is no possibility of a draught of wind agitating its surface and follow the drop accurately with your eyes and observant mind and receive its revelations.

If the oil drop lengthens out in a sinuous snaky fashion, it is a disorder born of derangement of “wind.”

If the oil drop spreads out like a ring, it is a disorder born out of derangement of “bile.”

If the oil drop stays put like pearl drop, it is a disorder born out of the derangement of phlegm.

If the pattern is a mixed one, like snake in a ring or ring in a snake, pearl in a snake or pearl in a ring, then it is a double disorder.

If the oil drop sinks without spreading, then the disorder is a triple derangement of all the "humours". Now there are some data as to prognosis from this oil test—Circular shape to perfection, slow and gradual spread of the oil drop is like that of Vishnu's conch, or his four-cornered pedestal, or like an umbrella, or like a Veena, even if the patient's condition is imminently dangerous, he will pull through eventually. If the shape is like that of the முல்லைப்பூ or the petal of a lotus, these too are of happy import and the patients will recover.

On the other hand, as soon as the oil drop is added, sometimes it froths up and spreads rapidly; this phenomenon may however, happen as a result of untimely alimentation, or incompatible food, or excretion of specific drugs in the urine. Exclude these and test—and test fairly frequently. If still this reaction is got, the significance is really grave.

If the oil drop, immediately scatters itself into minute mustard seed-like granules, then too, you had better take leave of the case. So also according to GAUTAMA, if the oil and urine mix in themselves and coalesce completely, the "Madhava Kalpa" says that it is of grave import if the oil drop sinks into the urine. So also if the following patterns are taken by the oil drop—arrow, sword, iron-rod, trident, dagger, pot, betel leaf, bull, lion, elephant, tiger, goat, pig, man, snake, tortoise, bird, fox, donkey, scorpion—or the oil drop splits into a number of droplets even before touching the surface of the urine, like a sieve, Gauthama says, there is no use or purpose in even waiting to feel the patient's pulse. Even such a case, perhaps may be the result of a pneumonic urine. Possibly a crisis might take place, and such one can be saved only by a miracle.

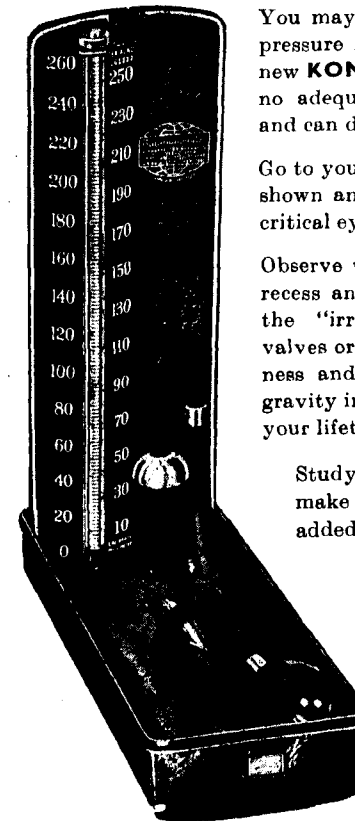
It is difficult to resist the feeling that imagination probably is pressed into service in interpreting these patterns that the oil drop weaves on the surface of the urine. But the whole test is simplicity itself and costs next to nothing. Probably these weird shapes are produced in the urine of lymphatic leucæmia and various other acute destructive diseases like, acute yellow atrophy, acute pancreatitis, and various toxic and toxæmic states and metabolic disorders.

It is not at all an easy matter to give a prognosis in certain cases; often the physician or surgeon assumes enforced silence when pressed to give a prognosis, as he has conflicting data and cannot make up his mind while hours and days might pass and the patients' relations are unfortunate. If he has a half hour to waste and after all a few drops of gingelly oil, I have not the slightest hesitation in recommending this THERAYAR'S oracle of the oil drop. I have tried it with the healthy and the sick, the moderately ill and the dangerously ill and the revelations have been both awfully arresting and not a little instructive.

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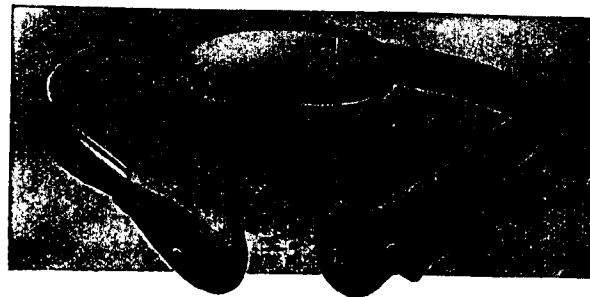
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Announcement

While presenting our readers with this special issue on Genito-Urinary Diseases, we have pleasure in announcing that the second special issue during 1940 will be on "DIABETES" and will be published in June next. We confidently hope that it will maintain the high standard and excellence of the Antiseptic and its past special issues and we look forward to the kind co-operation of the Medical Profession, whom we invite to contribute on this subject. Articles for publication in this special issue should reach this office before the end of April 1940; contributors are requested to intimate the titles of their contributions as early as possible. Articles on the following subjects have been promised so far:—

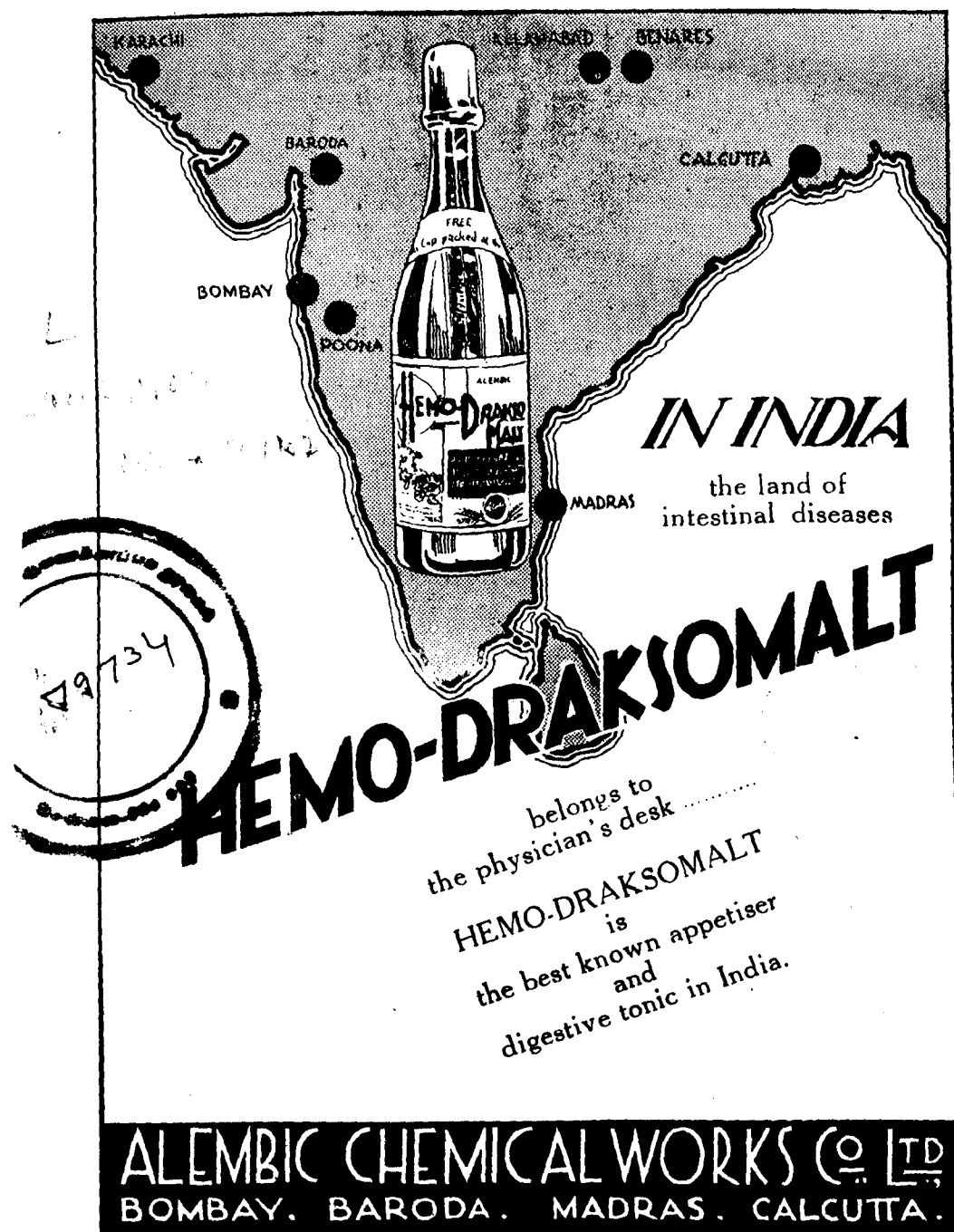
1. Towards the close of diabetic Lives in India.
2. Anæsthesia in Diabetes.
3. Eye in Diabetes Mellitus.
4. Metabolism in Diabetes.
5. Dietetic Treatment of Diabetes.
6. Sidelights on the Treatment of Diabetes from the Ayurvedic Literature.
7. Some Aspects of Diabetes Mellitus with special reference to South India.
8. Diabetes and Pregnancy.
9. The Treatment of Pyogenic Infections in Diabetes by Ultra Short-wave and Deep X-Ray Therapy.
10. The Treatment of Diabetes.
11. Diabetic Coma Or Theories of Action of Insulin.
12. Special Features of Diabetes.
13. Diabetic Gangrene and Sepsis.
14. A Survey of Remedies used in Diabetes.
15. Diabetic Carbuncle and Cellulitis.
16. Laboratory Tests and their Significance in the Diagnosis of Diabetes Mellitus.
17. Diagnosis of Diabetes Mellitus.

There will be another special issue in October 1940 and the subject for the same will be announced later on. Members of the Medical Profession are requested once again to co-operate with us.

For further particulars, please write to:

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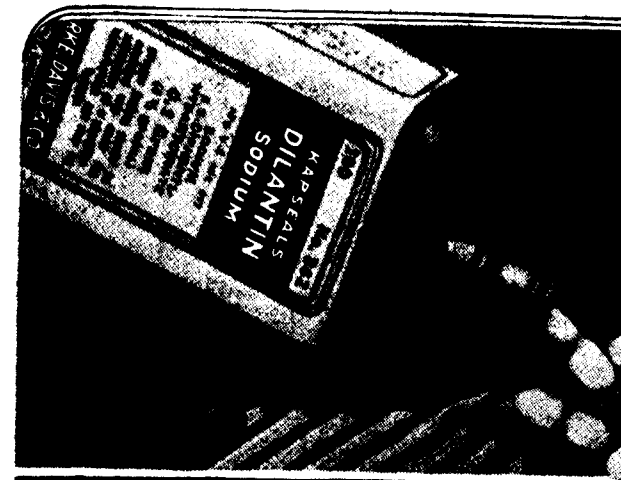
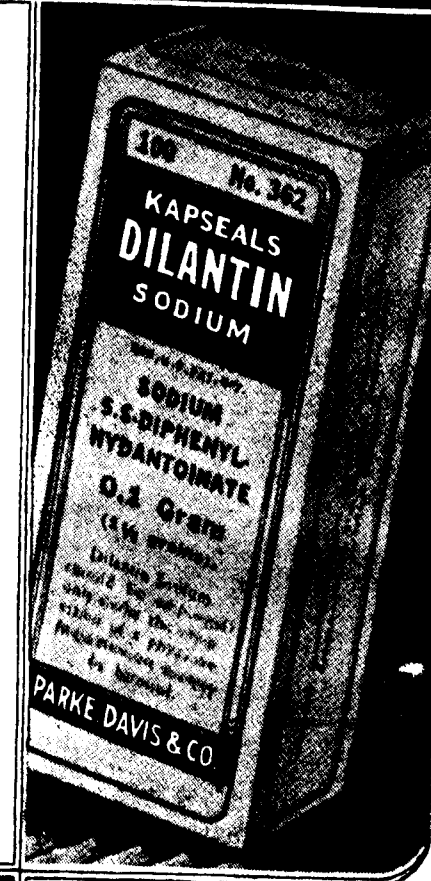
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