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Clinical Bio-chemistry (*Contd.*) BLOOD ANALYSIS

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THE application of the study of the chemical composition of blood to the interpretation of clinical phenomena is of recent growth. As a matter of fact it is only after 1913, on the introduction of micro-chemical methods, that this branch of clinical bio-chemistry began to develop rapidly. True enough in 1848 Sir A. Garrod estimated the uric acid of blood in gout and in 1850 Carl Schmidt described the blood analysis of cholera patients; but the methods of analysis used by them and others before 1913 required large quantities of blood and great expenditure of time and consequently could not be of much importance in routine chemical work.

With the introduction of micromethods, that is methods of analysis which require only minute quantities of blood for quick and correct estimation of the constituents of blood, by Bang, Benedict, Folin, McLean, Van Slyke, and a host of others, chemical analysis of blood became an integral part of routine clinical work and it is

now very freely used by the clinicians in arriving at diagnosis, guiding them in treatment and forecasting prognosis of diseases. But caution should be exercised in drawing our inference from blood analysis as it is obvious that the chemical composition of blood is extremely complex; for the products of digestion are absorbed into the blood and are distributed by it; the waste products are conveyed by it to the excretory organs; and again the constituents of blood are unequally distributed between the corpuscles and the plasma, as for instance the corpuscles contain an excess of potassium and phosphorus while they are comparatively poor in calcium and chlorides.

However by analysing the plasma or blood withdrawn in the morning after the night's fast a satisfactory standard has been set up for normal and comparisons are made in different diseased conditions with the normal.

The procedure intended to adopt is to discuss the source and significance of the different organic and inorganic constituents in health and disease and then examine how far their estimation will be helpful to the clinicians in the diagnosis, prognosis and treatment.

As diabetes and glycosuria are so common in Southern India perhaps the estimation of blood sugar is the most familiar to our readers and hence it shall be discussed first. Carbohydrates of the food are converted by the digestive enzymes to the simple monosaccharides of which by far the most important is glucose. The monosaccharides are absorbed into the portal vein and conveyed to the liver. At first glucose is allowed to pass to the systemic circulation until a concentration of about 0.167 is reached, which happens normally in an hour or thereabouts, when the internal secretion of the pancreas is stimulated

and 'insulin' is poured into the circulation which brings down the blood sugar by helping the liver and muscles to hold back the glucose and store it as glycogen and also by helping the tissues to burn the glucose for energy purposes. Levulose being a good glycogen former the rise in the peripheral blood sugar after ingestion of levulose is very little and takes place only when the liver is damaged. Galactose also is on a par with levulose and so both levulose and galactose tolerance tests are used for estimating liver efficiency.

The sugar of the blood is glucose but the exact isomeric form of this sugar which is present is uncertain. In the fasting condition blood sugar in normal persons is distributed between the corpuscles and plasma in about equal concentration. After ingestion of carbohydrates the plasma sugar exceeds the corpuscular sugar due to the diffusion of sugar into the corpuscles. For estimation of blood sugar oxalated or citrated blood withdrawn in the morning after the previous night's fast is utilised. In this fasting condition there is very little difference between the sugar content of venous blood and arterial blood and so for estimation of blood-sugar, finger blood (arterial) or venous blood may be used. Two chief methods of estimation are colorimetric and reduction methods. The latter, I prefer to the former for the obvious reason that the personal factor and the interference of other substances than sugar in the chromogenic reaction of the former are avoided in the latter. McLean's method in laboratories fitted with regulated gas flames and Hagedorn-Jensen's method in private practice prove very satisfactory.

All are agreed that the fasting blood-sugar of normal persons lie between 0.08 and 0.12 but no satisfactory explanation has been put forth regarding the mechanism that regulates the amounts of sugar in

the blood and that maintains a fairly constant fasting level. It is true that the internal secretion of the beta cells of the islets of Langerhans has a decided influence on the blood sugar content. It is established by the experimental evidence brought forward that (i) insulin causes an increase in the rate of oxidation of glucose and (ii) that when insulin is present in excess a great portion of the glucose is changed into some form which escapes detection by the available chemical means and then the formation of new sugar from fat and proteins is simultaneously depressed. In the condition called Pancreatic Diabetes the output of insulin is defective due to the degeneration of beta cells of the islets and therefore both synthesis and oxidation of glucose are defective resulting in a condition of hyperglycaemia with consequent evils.

Besides pancreas other endocrine glands also have some influence on the blood sugar content. The Toronto workers demonstrated that the hypoglycaemia produced by insulin and the symptoms accompanying it could be relieved by an injection of adrenalin, but attempts to show a direct antagonism between the two hormones have so far failed. Adrenalin is stated to increase the blood sugar by glycogenolysis and it is shown when the liver holds a large glycogen deposit the removal of sugar from the blood under insulin is compensated by its output from the liver and that an increased output of adrenalin is responsible for this conversion of the liver glycogen. The hyperglycaemia of fear, excitement, asphyxia and inhalation anaesthesia are attributed to the increased output of adrenalin.

The action of pituitary extract is rather more obscure. Injection of pituitrin produces only very slight hyperglycaemia in the normal, but it checks the production of

hypoglycaemia by insulin rather effectively. Diminished glucose tolerance and hyperglycaemia are observed in acromegaly and often in pituitary tumours.

Again the action of thyroid also influences the blood sugar. For removal of the gland in animals leads to a diminished concentration of blood sugar and increases the sensitiveness of the animal's response to insulin. Thyroid feeding on the other hand increases the resistance to insulin, raises the blood sugar, and diminishes the carbohydrate tolerance. These effects are due to modification of the compensatory output of sugar from the liver. This is under control of the sympathetic nerves and of adrenalin and the interpretation of the effect of thyroid is to suppose that its secretion increases the sensitiveness of the liver's response to its natural sympathetic stimulus. When the liver contains a store of glycogen the first effect of thyroid feeding is to produce so rapid a compensatory output of glucose that the action of insulin is held in abeyance while the sensitiveness to a dose of adrenalin is very much increased with the net result that the adrenalin effect is noticed. After prolonged thyroid feeding another condition is produced. The liver is emptied of its glycogen store and is incapable of further response. Now the animal becomes more sensitive than ever to the artificial injection of insulin. Not only that the response to a natural output of insulin from the pancreas, unopposed by the compensating supply of sugar from the liver becomes so great that after the injection of glucose, the artificial hyperglycaemia is followed by a fall of blood sugar so rapid and to so low a level that the animal dies of hypoglycaemic convulsions. P. J. Cammidge has put forward other suggestions in explanation of the regulative blood sugar mechanism, but confirmation or otherwise of his views are awaited.

However, the estimation of blood sugar is of value to the clinician chiefly in three ways, (1) in estimating the significance of a glycosuria (2) in controlling the results of treatment in the diabetic and (3) in the recognition of certain endocrine disorders.

Pronounced glycosuria accompanied by the cardinal symptoms of polyuria, thirst, hunger and emaciation in a person below the age of fortyfive with ketone bodies in the urine may be diagnosed as diabetes mellitus without the estimation of the blood sugar. But these symptoms are only the result of intense hyperglycaemia and so too much importance should not be given to these clinical symptoms. Whether the hyperglycaemia is due to the defective internal secretion of the islets of Langerhans or not, is what is required to know. This information is elicited under our present state of knowledge from glucose tolerance test. It may be stated here that glucose from the renal standpoint is a "Threshold" substance normally absorbed by the renal tubules from the glomerular filtrate. Normally it is only when the concentration of blood sugar reaches above 0.18 — renal threshold value for glucose — glucose is excreted in the urine.

To be Continued.

Old Friends with New Faces!

BY CAPT. J. CHRISTODOSS DAVID., M. B. B. S.

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In the course of a conversation, a certain highly placed government official asked the writer why European and other physicians of the 'Western school' never wearied of calling the indigenous systems of medicine unscientific and empirical, as if science was their monopoly. He challenged them to prove that the many drugs they put together in their daily prescriptions really did exert the action they claimed for them. He who accepts this challenge must be an optimist indeed! Empiricism still surrounds the so-called 'Scientific medicine' and will continue to flourish as long as responsible physicians prescribe not only the latest fads in the realm of patent medicine, but also insist in giving their patients the doubtful benefits of 'Shot-gun prescriptions'. In the following few pages an attempt will be made to sift empiricism from reality, for that is the aim and purpose of Experimental Pharmacology. The drugs that are discussed are not new but many of them so old that we shall be surprised their real faces have been hid from us!

Opium is one of the most familiar and useful drugs in our armamentarium. Its effect in banishing pain is phenomenal. The patient is racked with the most unbearable pain, but even before the needle is withdrawn after an injection of morphia, the pain becomes less or may even disappear. It has been experimentally proved that the site of action of morphia in allaying pain is in the cortical centres of pain perception. Its local application to the skin or painful spots has no effect in

removing pain. The effect, if produced at all, is due to absorption of the alkaloid. But in the way it is applied very little is or can be absorbed. But how common it is for us to prescribe opium, in the form of lotions or dusting powder! Another example of the misuse of opium is in the form of suppositories. The drug cannot remove pain in virtue of its local action, for it hasn't got any such effect. If the idea is to produce the action after absorption, the drug might as well be injected subcutaneously rather than be left to the uncertainties of absorption from the rectum or vagina.

Some of us may lose sight of the fact that morphine has a great tendency to cause vomiting. The effect is more marked in the case of women, in whom also euphoria is a prominent symptom. This effect comes on a few hours after the injection and is not due to any local action of the alkaloid on the stomach, for it is rare after oral administration, and moreover, the alkaloid is rapidly excreted into the stomach. It is possibly due to the formation of an apomorphine like substance with central action. In rare cases, morphia also causes diarrhoea. This effect as well as the vomiting is quite a constant feature in lower animals like the dog. The marked increase of peristalsis which is produced after intravenous injections of morphia can be well shown in these animals experimentally. Morphine depresses the ganglia along the course of the splanchnic nerves, which are the inhibitory nerves of the gut and thus the vagus freed from this inhibition is enabled to augment the peristalsis to a marked extent. This action does not as a rule occur in human beings, where the main effect is retardation of peristalsis due to the local action of morphia after excretion into the stomach and the intestines. Another interesting feature is the spasm of the bladder and the

sphincter causing retention of urine. This occurs in a number of cases and can also be shown experimentally in the laboratory.

Belladonna has for its active principle *atropine*, whose main action is to paralyse the endings of parasympathetic and secretory nerves. Therefore it is used to cause a decrease of certain secretions. We have seen it used often in the form of pigment or emplastrum belladonna for the purpose of drying up the secretion of milk. But in employing belladonna for this purpose we lose sight of the physiological fact that the mammary gland continues to secrete after all its nerves have been cut and allowed to degenerate; in other words the mammary secretion is largely independent of the central nervous system. The secretion of milk is not materially changed by atropine, whether the alkaloid is carried to it by the blood or is applied locally. The belladonna plaster besides being an anodyne, probably acts as a mechanical support; and the same result, according to Cushny, follows the application of simple adhesive plaster.

Pituitrin is a vaso-motor stimulant in virtue of its action on the musculature of the blood vessels. But there is a tendency to inject this drug indiscriminately with the idea of stimulating the heart. The main effect of pituitrin on the heart is a slowing and a little depression consequent on vagal inhibition. Moreover a second injection after the blood pressure has returned to normal either lowers the blood pressure or causes quite an imperceptible rise, the vessel walls apparently having lost their power of response to the active principle. So it stands to reason that this drug must not be given when a direct stimulant action on the heart is desired, but may be of great use when a vaso-motor stimulant is indicated owing to general dilatation of the blood vessels as obtains

with a condition of shock. It must also be pointed out that pituitrin must on no account be given for asthma, for it causes a constriction of the bronchial muscles.

Chloral hydrate has come into local prominence lately. It cannot be too greatly emphasised that there is a vast difference between administering a drug orally or by injections in concentrated solution and its administration in a dilute state. It has been again and again demonstrated in the laboratory that a drug which causes a great fall of blood pressure when given in concentrated form does not elicit any such toxic effect when sufficiently diluted. Another point that is important in connection with the hypnotics of the methane group and also bromides is that while these produce sleep in conditions of insomnia associated with worry etc., they do not influence pain and are absolutely of no use when the sleeplessness is due to much pain.

Digitalis is a drug, in giving which in cases of emergency, one should not be afraid to step over the limits of the B. P. dosage. 5-15 m may be alright for ordinary conditions. But in cases of cardiac dilatation with lack of compensation, such caution is unnecessary. It has been calculated that the adult human body can destroy as much as 22 m of the tincture of digitalis, in 24 hours, and what remains is fixed by the heart and used up by the cardiac muscle. So 1 m per pound of the body weight can be easily given to an adult if it is required to get the body under digitalis effect, in a couple of days. Symptoms of poisoning by digitalis rare and long before the heart is poisoned, symptoms of vomiting etc., manifest themselves in sufficient time for stopping the administration.

Digitalis and *Strophanthus* are glucosidal bodies which easily decompose and are therefore best given alone and not in mixtures. The dose required may be

diluted with an adequate amount of water just before administration.

Aspirin and the *antipyretics* are credited with a great depressant action on the heart. Acetanilide is the worst offender in this respect. Phenacetin, the least among the antipyretics; aspirin has no direct action on the heart. To combat the supposed toxic effect, caffeine is usually mixed with the prescription. The work of Hale (1909) and Salant (1912) shows that caffeine does not prevent the depressant action of acetanilide but rather increases its toxicity; and that many deaths attributed to acetanilide were the result of the administration of such mixtures with caffeine.

Caffine is the alkaloid of coffee, the popular beverage of South India. In addition, a small amount of an oil is developed in the process of roasting—caffeoil—to which the aroma is due. It is not a generally recognised fact that coffee increases the acidity of gastric juice; and that in the intestines the beverage acts as a laxative promoting peristalsis. This should be borne in mind in the case of persons with hyperchlorhydria.

Quinine has a reputation for producing abortion, even in the earlier months of pregnancy. Experiments as well as clinical observations have shown that quinine has no such effect. It may at the most, increase the intermittent contractions of the pregnant uterus. But its action is marked only when the pregnancy is advanced to full term or if labour has already commenced. In such conditions, quinine, will reinforce the contractions and help to expel the foetus.

Uterine sedatives. A number of drugs of ill-defined actions are popularly credited with 'quieting the excitability of the uterus' especially the pains of premature labour; with contracting dysmenorrhoea; and even with

correcting uterine malposition. It is difficult to conceive a mechanism by which a drug could produce all these actions; except to stimulate them by the imagination. Many of these complaints are so uncertain in their course, and indeed so largely nervous that it is easy to imagine any results that are desired. The chief of this group are *Aletris* and *Viburnum*.

Potassium ion is depressant to the heart muscle. But this effect is obtained only when it is given by intravenous injections. When given by the mouth it is excreted by the kidney and exerts no such action on the heart. The fears of some people that potassium salts should not be given in such conditions as pneumonia are quite unfounded.

If we could multiply such instances of misconception of the action of known drugs and their irrational application in therapeutics, what would be the rationale of the indiscriminate prescription of patent and bogus preparations that we are flooded with every mail day, not to speak of the many boosted remedies of the indigenous quacks who trade in the name of Ayurveda!

Herein lies the importance of a proper training in experimental pharmacology. It helps to foster the judicial attitude of mind, which requires the objective demonstrations of statements and theories and which deduces from these objective data the conclusions that they justify no more, no less. And this attitude of mind will stand us in good stead when we go out of the precincts of the college into the stress of medical practice. The belief in the efficacy of drugs is an ancient one, but sad to say, even in the present day, an unbounded belief in the efficacy of drugs alone in the treatment of disease persists very strongly among the lay public. Unfortunately in the present state of the education of the public

mind we have to pander to this belief to some extent if we are to succeed in practice. At the same time, a knowledge of pharmacological methods will stand us in good stead against falling into a state of mind that imagines that materials that can be dispensed by the pharmacist are the alpha and omega of medicine treatment. As we know, in many cases drugs play a subsidiary role in the recovery of the patient, rest, diet and careful nursing being more important agents.

Plasmochin in the Treatment of Malaria

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During the course of the last two months 12 cases of malaria were treated with Plasmochin, careful observation being made with regard to (1) Disappearance of the fever (2) Disappearance of the parasite. (3) Changes in the motility of the parasite in case of B.T. (4) Toxicity of the drug and (5) Relative value when compared with quinine.

Mode of administration:—

- (1) $\frac{1}{3}$ gr. three times a day for 5 days.
- (2) 3 days rest without any Plasmochin.
- (3) Another 3 days course with $\frac{1}{3}$ gr. 3 times a day.

The following conclusions were drawn:—

- (1) In cases of B. T. and Quartan, the parasite disappeared by the end of the fourth or fifth day after the administration of Plasmochin. Fever disappeared twentyfour to 36 hours before the disappearance of the parasite.
- (2) Diminished motility of growing trophozoites of *Plasmodium vivax* could be seen by the second day.
- (3) No Gametocytes could be seen after a third day.
- (4) In Malignant Tertian infection Plasmochin had no effect at all, the temperature

remained and the parasites persisted.

- (5) When a dosage of quinine sulphate fifteen grains, was added on with the Plasmochin, temperature came down and parasites disappeared.
- (6) With control cases treated by quinine, in the same number of days the parasites disappeared at least 48 hours before the disappearance of parasites in the case of Plasmochin.
- (7) Toxicity. Only mild toxic symptoms were present in our cases. Headache, giddiness and abdominal pain were present in three of the patients. Only one patient showed slight cynosis but no change could be deducted in the urine. Deafness and ringing in the ears were present in one case, but was temporary and lasted for only two days.

My thanks are due to Lt. Col. G. E. Malcomson for the kind premission he gave to carry on the work in the wards.

Pulmonary disease and Bronchograms

BY K. NARAYANAMURTHI.

(Final Year)

Since the introduction of X rays, the study of pulmonary diseases has advanced very far. With the help of it, it is now possible to diagnose deep seated cavities shut off from the bronchial tubes, enlargement of hilus glands, deep tumours, abscesses in the lungs etc., which is otherwise impossible to find even by careful physical examination. Developments in Roentgenology have gone further in marking out the bronchial tubes by the introduction of a substance opaque to the X rays. The method of mapping out the bronchial tree is known as Bronchography and the picture itself is called a Broncho-gram.

History.—Chevalier Jackson first suggested the use of bismuth in 1905, Yankauer introduced iodine through a bronchoscope in 1917, Weingaertner used thorium oxide in 1919 and in 1920 and 1921 Lynah and Stewart studied abscesses of the lung with the help of bismuth subcarbonate in oil introduced through the bronchoscope. In 1922 Sicand, Forestier and Leroux brought to the forefront a substance known as *lipiodol*—which contains 40% of iodine in poppy seed oil—which is considered to be non-irritating to the bronchial mucosa, non-toxic and proved to give a more definite Roentgenogram. Now the recent study of the subject is centered around lipiodol, and many investigators have been using this substance freely especially the French and American clinicians.

The German physicians are using a similar product of iodine called *iodipin*. Recently in the year 1925 Landau

and Dryoff have advocated the use of an oil containing bromine, which is called *contrastol*. Though all these substances are in the market, *Lipiodol* is more extensively used.

Indication and uses of broncho-grams.—Broncho-grams are prepared to get additional information about the condition of the lungs, trachea, bronchi etc. They are also used in cases of doubt, to localise the lesion and to find the extent and the character of the lesion, of which the physical examination by itself may not give any valuable information.

They are useful in furthering our knowledge of physiology of respiration. They give valuable information of stenosis, distortion of the bronchi; and almost a clinching diagnosis between bronchiectasis and chronic bronchitis or certain types of peribronchial inflammatory infiltrations, where physical and even X-ray examination may mislead and give an erroneous diagnosis.

In pulmonary tuberculosis it is particularly valuable in the determination of cavities and the differentiation of cavities from localised pneumothoraces simulating cavities. Bronchiectasis and destruction of lung tissue can be much more distinctly seen in a bronchogram than in X-ray photograph. After a thoraco-plastic collapse, the help of a bronchogram is invaluable; for it shows the cavities, where X-ray fails to show owing to the density of the surrounding tissue. If cavities really remain, they indicate the pathological condition of the lung and prognosis depends upon the amount of collapse. In diagnosing bronchitis from bronchiectasis and other pathological conditions of the bronchi, broncho-grams are indispensable, and they are to be taken in all cases before any surgical operation of the thorax.

Methods of introducing the oil.—(i) The easiest and simplest

method is to drop the oil slowly and carefully into the larynx from above, with or without the help of a reflecting mirror. This is done while the patient is sitting and the method is known as supra-laryngeal instillation. (ii) The oil can also be introduced intra-laryngeally by means of a syringe provided with a long curved needle. The third method advocated by the French clinicians is infra-laryngeal instillation through the crico-thyroid membrane, locally anaesthetising the part first. The oil can be introduced with the aid of a bronchoscope, but this requires some skill. Iglauer in 1926 installed the oil with help of a modified intubation tube. Much more recently Nather and Ochsner suggested the idea of anaesthetising thoroughly the deglutition reflex, and then asking the patient to swallow the oil. Though inhibiting the deglutition reflex is theoretically possible, it is a difficult method.

Of all these methods, intra-laryngeal, infra-laryngeal and supra-laryngeal methods of introducing the oil are the easiest and the least dangerous and they can be used in hospital practice under the guidance of a trained surgeon. Intubation and bronchoscopic methods require much skill and they require the aid of a specialist—a bronchoscopist and a laryngologist—to introduce the oil. Local anaesthesia is necessary in all the methods, but if the patient is tolerant no anaesthesia is necessary in supra-laryngeal method. We ought to be careful to see that the oil does not infiltrate into the tissues, for it causes swelling accompanied by stridulous breathing and dyspnoea, when a tracheotomy may be necessary. But in some patients the oil may be absorbed uneventfully, though introduced into the tissues.

Choice of the method.—This depends upon the skill of the surgeon and the method which he is accustomed to

use. But a specialist ought to be thoroughly acquainted with all the methods, so that at his discretion he may use any one of them, which cause little discomfort to the patient. For instance if the condition of lower lobes of the lung is required to be known there is no necessity of adopting either a painful infra or intra or deglutition method. In that case a supra-laryngeal instillation is enough. If the upper lobes are to be seen, the injection is made infra-laryngeally—which is one of the best methods—while the patient is in a recumbent position and inclined to one side towards which the oil is desired to flow. Where there is difficulty to make the oil flow owing to obstruction of the air passages, the bronchoscopic method can be used.

Quantity of the oil used.—All observers agree that 10–20 c.c of the oil will be enough by whatever method the oil is introduced. Some clinicians say that 40 c.c of the oil will be the maximum that can be used without danger to the patient. But this amount is believed by J.A. Miller and E. Perey Eglee to be the quantity which may overflow the bronchial tree and finally obscure the bronchogram. On the other hand some go to the other extreme to say that even with 5 c.c of the oil a good bronchogram can be taken. In a great majority of cases bronchograms can be taken easily with little discomfort to the patient. Fluoroscopic examination is immediately made on installation of the oil, to see whether the oil has gone to the desired place. Often a stereoscopic view of the chest is taken to have a good idea of the condition.

Elimination of the oil.—X-ray shows the oil in the lungs for 10–15 days or at some times a much longer period. Cough disseminates the oil to each and every corner of the lungs and the interpretation of the shadows now taken are of no significance. Through urine iodine is

eliminated. Miller and Eglee are of opinion that "the iodine test in urine becomes negative after 6 or 7 days, even though the shadows are still present in the lung." Knowledge of the instillation of the oil in every case is always to be had before one ventures to interpret the bronchogram. Even though the oil may persist for several months no untoward symptoms appear.

Interpretation of the broncho-grams.—This requires much skill, practice and experience. The interpretation of them is always combined with the knowledge of the clinical symptoms observed. The classical club-like shadows of bronchiectasis—as a bunch of grapes—is pathognomonic of the condition. Various fistulae, deflection, stenosis of the bronchi etc., can be easily made out.

In pulmonary tuberculosis interpretation is very difficult, for it is complicated by the existence of cavitation, bronchiectasis, and peri-bronchial infiltration. It is not always possible to get the oil drops exactly into the cavities of the lungs to fill them up, but a single oil drop moving in the cavity may be enough to interpret the result as one of cavitation in the lung.

Abscess of the lung is difficult to make out. Somehow the oil does not get into the abscess cavity; most probably due to the plug of pus. In such cases a sharp discontinuance of the bronchogram at that part, with the hazy appearance of the lung, surrounded by a clear view of the lung is diagnostic of an abscess.

In cases of a tumour, we find a similar discontinuance of the bronchus shadow, besides a constriction at the part where the tumour is pressing.

Disadvantages and dangers.—1. Iodine poisoning is likely to occur in a few cases. With lipiodol iodism is rare. Erythematous rash may be one of the symptoms of iodism, which appears just a week after the injection; but in some

severe cases oedema of the larynx, face and body with a mild degree of fever may occur. Such cases are extremely rare.

2. The oil persists for months in the lungs, but it does not cause any discomfort to the patient.

3. Extension of the disease by dissemination of the oil into deeper tissues as the patient coughs is a source of danger. This is quite possible in tuberculosis of the lungs and may make the patient worse. But this is remote.

4. Miller and Eglee report a fatal case, in which a patient died after an injection of lipiodol into a sinus of the thoracic wall. An hour after the injection, coma and convulsions occurred which was diagnosed to be a cerebral embolism. P. M. was not allowed to be made, but the two doctors say that the oil might have possibly reached the blood stream. An abscess may cause a cerebral embolus, but the reporters of the case believe that "this particular accident seemed too close to be entirely unrelated to it." The case was one of broncho-pulmonary fistulae.

5. Cellulitis of the neck almost leading to a gangrene may follow upon the introduction of the oil through the cricothyroid membrane. This may be due to the oil being in-filtrated into the adjacent tissues.

6. Swallowing the oil causes rapid absorption and symptoms of iodism may manifest. Bronchial mucosa does not seem to absorb so rapidly as the mucous membrane of the stomach. In those cases where lipiodol is swallowed, lavage is recommended.

7. Another disadvantage is the rapid change of the X-ray photograph induced by cough and respiration. No time should be lost in taking the X-ray after the oil is instilled.

8. Owing to persistent shadows there is a possibility

of wrong diagnosis being made by subsequent observers. These shadows often simulate the cavities of a pulmonary tuberculosis; and so one has to ask the patient before pronouncing an opinion whether the patient is given any lipiodol, and if so how long ago.

On the whole there are not many dangers and difficulties in the method of using lipiodol for taking broncho-grams. The ease with which they are taken gives a tendency to the practitioners in Europe, to use them indiscriminately. but strictly speaking broncho-grams are to be taken only when they are expected to give more information which normally cannot be obtained by ordinary roentgenography. Broncho-grams are not substitutes to the X-ray photographs but are supplements.

In conclusion it may be said, that intra-bronchial injection of lipiodol is found to give relief of cough and expectoration in cases of asthma, chronic bronchitis, and bronchiectasis. In the treatment of such cases, periodical injections of lipiodol may be of some therapeutic value.

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Radium and a Hospital Radium Service

BY CAPTAIN T. W. BARNARD, M. S. R., F. R. P. S., AND
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Owing to the keen interest of His Excellency the Governor and the then Chief Minister, the Rajah of Panagal, Madras, now has the nucleus of a Radium service for its medical work, and it may be instructive to medical students, and others, to have placed before them, in a concise form, some facts about this wonderful element, which is proving so useful and has so great a future.

Historical.—A physical characteristic of Radium is the emission of radiations powerful enough to penetrate substances which are opaque to ordinary light. X-rays, discovered by Professor Roentgen, in the autumn of 1895, gave us our first popular acquaintance with this type of ray. In 1896 M. Henri Becquerel, at Paris, while making experiments in connexion with phosphorescent light, discovered that similar radiations to those emitted by the phosphorescent Uranium salts, were also given out by the metal Uranium and the non-phosphorescent salts of Uranium Oxide and Uranium Protoxide. From these experiments he concluded that spontaneous radiation was independent of phosphorescent properties and was produced by the uranium atom. Later he found that these radiations, like X-rays, acted on photographic plates and he was able to obtain a radiograph of an aluminium medal in which the head, being of thicker metal than the

remainder of the disc, was distinctly visible. These rays were named "Becquerel Rays"

In 1898 Madame Curie and M. Schmidt, working independently, discovered similar rays in Thorium. Continuing her experiments Madame Curie ascertained the degree of activity possessed by radiations from the metal Uranium. She then studied the Uranium compounds, such as Pitch Blend (Uranium Oxide Ore) and was surprised to find they emitted rays more powerful than those given out by Uranium. Madame Curie concluded that the compounds contained other radioactive substances.

In 1900, after a great deal of research Professor P. and Madame Curie discovered that by the disintegration of the Uranium atom, two new bodies were produced. These were separated and named Radium and Polonium, the latter being named after Madame Curie's native country. Radium was found to be extremely active and Polonium comparatively weak.

Professor Debierne in the same year, while investigating the residue left by the chemical extraction of Radium and Polonium, discovered another radioactive body which was called Actinium, and finally, in 1904, Ramsay and Hahn discovered Radiothorium.

The most active of these bodies is Radium, its activity being about 2,000,000 times greater than that of Uranium. It appears to be a metal of the alkaline earths similar to Calcium, Magnesium, Barium and Strontium and its existence as an element has been exactly ascertained by spectroscopic analysis. Its symbol is *Ra.* and its atomic weight is 226.45, these figures having been obtained by Madame Curie. Its melting point is 700° C.

As a disintegration product of Uranium, Radium is never found in a natural state apart from its parent

element. They occur together geologically in the ratio of one part of Radium to 3,200,000 parts of Uranium. This proportion is constant and its determination we owe to Rutherford and Boltwood. Radium ore exists in all Uranium compounds. The only instance of a Radium ore free from Uranium is in Pyromorphite (Green Lead Ore) a natural lead chlorosulphate.

It is necessary to chemically treat about 100 tons of the richest deposits of Pitch Blend etc, to secure one gramme of Radium. In its metallic state Radium is a pure white metal but as it changes quickly when exposed to air it is never used in that form for therapeutic purposes but is prepared as Radium bromide or Radium sulphate.

The Radium in use in Madras is $Ra\ SO_4$ and was supplied by the Radium Belge of Brussels through Messrs. Watson & Sons of London, to whom we are indebted for the following interesting account of the extraction and purification of the element.

"The processes involved in the efficient extraction and purification of radium are both intricate and time consuming and, therefore costly.

When the uranium-radium ore is taken from the ground in the Belgian Congo, there is but a small proportion of radium present as compared with the other compound materials with which it is associated.

The radium must be separated, and this entails the treatment of large amount of ore with great quantities of chemicals for the eventual recovery of comparatively minute quantities of the rare element.

The ore is first packed in sacks at the mine and then conveyed overland a distance of 1600 miles to Beira, when it is shipped to the reduction plant at Oolen (Belgium) for treatment.

The first stage in the process of reduction is to grind the ore to a suitable degree of fineness. The ground ore is then leached with acid or alkali to bring the radium into a form in which the separation from the other metals may readily be accomplished.

During the next stages of the treatment, barium is added and precipitated with the radium in solution to simplify its recovery. The resulting sulphate is then converted into a chloride solution. Under the influence of heat, the radium chloride and barium chloride are separated. Radium chloride crystallizes more quickly than barium chloride and, as soon as the radium chloride crystals commence to form, they are removed.

This process is repeated many times with a resulting enrichment of radium chloride with each new crop of crystals. Eventually all, or practically all the radium, as radium chloride, is recovered at one end of the series, and the barium-chloride crystals at the other. Accurate chemical control of every stage of the process is essential, especially the final series of fractional crystallisations following the conversion of the chloride into carbonate and thence into bromide.

To separate one gramme of practically pure Radium bromide requires long and complicated processes and several million times its own weight of ore. No other chemical process can compare with this extremely fine concentration.

The finally purified radium bromide is then sealed in glass tubes and delivered to the physical department for measurement of radium element content.

Upon completion of the measurements, the radium salt is transferred to the Laboratories of the Radium Belge at Brussels and there distributed into a variety of tubes, needles and plaques designed for therapeutic application;

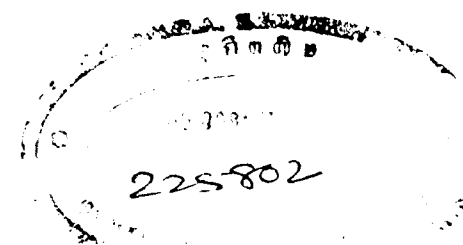
these are then separately measured for radium element content and officially verified before being supplied for use."

Life of Radium.—Until Radioactivity was discovered atomic changes such as the transmutation of the element, atom by atom, into other substances, had not been actually observed. It is now established that this process is dynamical and always goes on at a definite and unalterable rate. In the case of Radium about 1% of its mass disintegrates in 25 years and Professor Rutherford, from his experiments and those of Sir William Ramsay, Professor Soddy and many others, came to the conclusion that the average life of Radium is about 2500 years, one half of its atoms disintegrating in 1690 years. The end product is lead of atomic weight 206; there being about eight stages between Radium and the lead.

Radiations from Radium are composed of three types, these having been designated by the terms alpha, beta and gama, by Sir Ernest Rutherford, who made the first analysis of these complex rays. They are emitted simultaneously, differ in character and penetrating power, and have different effects "medically".

Alpha Rays.—Are atoms with a positive electrical charge; they are the least penetrating of the three types, having a velocity of a tenth to a twentieth of that of light. They are absorbed by three inches of air or a thin sheet of paper and are practically useless for external treatment of patients.

Beta Rays.—are similar to cathode rays, only more penetrating. They are negative electrons with a velocity varying between 60,000 and 180,000 miles per second. The softer radiations are quickly absorbed and the hardest do not penetrate more than three-eighths of an inch of soft tissue. A filter of 1 millimeter of lead or



metals. Monel metal is as hard as steel and does not corrode. The whole applicator is made of this metal, the $Ra\ SO_4$ being placed in a chamber whose walls and back are about 1 m. m. thick, the Radium sulphate being sealed within by a cover of the same metal, 1 m.m. thick.

This thickness permits about 50 of the primary *beta* rays to pass, and these radiations being of great value in superficial lesions. The applicators vary in size from 1 to 8 sq. centimeters, containing 2.5 to 10 milligrammes of Radium element per sq. cm. Radium costs about £ 12,000 per gramme. Madras now has 230 milligrammes in the form of Radium sulphate, this being equal to 429 milligrammes of Radium bromide. This is contained in 2 platinum tubes, 55 needles (of which 48 are platinum and 7 of monel metal) and three plaques of monel metal. The element contents vary from 1 to 25 milligrammes $Ra\ SO_4$. This distribution of the Radium was made on the advice of Mr. Alton of the Radium Institute, London. Dr. Stanord Cade of Westminster Hospital, London, Dr. Arthur Burrows, late of the Radium Institute, Manchester, and Messrs. Watson & Sons., London.

It enables us to provide suitable applicators for the use of the physician, surgeon, Gynaecologist, ophthalmologist and the Ear, Nose and Throat department in Madras city. It is not practicable to send the Radium into the districts for use on patients in mofussil hospitals and to get over this difficulty in part, the Radiologist intends seeking the Surgeon-General's approval and Government's sanction to install a Radium emanation apparatus so that emanation may be sent by post to District Medical Officers and medical practitioners, outside Madras.

HOSPITAL RADIUM SERVICE

There are many difficulties to be overcome when organising such a service, especially in Madras where, instead of special departments in one hospital, we have special hospitals at a considerable distance, one from the other. There is also the difficulty of the "demand being greater than the supply" but, with co-operation between the heads of the departments and hospitals, these difficulties can be overcome. The arrangement in Madras, at present, is for two or three days notice to be given to the Radiologist by the medical officer concerned intimating (1) the number of milligrammes of Radium he requires or the number of milligramme hours treatment he wishes to give; (2) the applicators and instruments he desires to use. The "appointment" is then entered in the diary kept for the purpose and at the time arranged one of the assistant surgeons of the X-ray Institute conveys the Radium and accessories to the theatre or hospital and remains until the Radium is placed in position in or on the patient. He is present again when the Radium is removed and carries it in a lead lined box, back to the X-ray Institute when it is replaced in the Radium safe.

Professor F. L. Hopwood, the physicist of St. Bartholomews Hospital, London, read the following instructive paper on the organisation of a Hospital Radium Service, before the First International Congress of Radiology held in London, published in the British Journal of Radiology for April 1927.

"The organisation of the Radium Service of a Hospital can be regarded from many different points of view, and will vary in scope and complexity with the quantity of Radium element available, its form, whether

used as a solid salt or in solution, the number of containers, number of users, methods of application, etc, etc. In what follows I propose to base my remarks on experience gained as physicist and radium custodian to a large General Hospital.

Local conditions are likely to differ greatly from hospital to hospital, but certain general similarities will exist between most of them. It is with the hope of assisting others in setting up or reorganising a similar service that these notes are published.

The three main objects to be kept in view in organising a Radium Service are:—

- (a) The efficient use of the radium,
- (b) The protection of patients, operators and assistants against injurious radiation.
- (c) The safe custody of the radium itself.

In carrying out these objects various rules and regulations have to be adopted and a multitude of instruments and appliances and protective devices used. An important principle governs the efficacy of these things. It is: *Only those regulations will be fully effective and only those instruments and protective devices used continually and by choice, which render the work of the radium user easier than it would be in their absence.*

To take a simple illustration. If instead of merely forbidding a nurse to pick up radium needles with her bare fingers and leaving her to her own devices, she is provided with a simple tool, the picking up is rendered easier than with fingers, and the tool is used by choice and not under compulsion.

Let us now consider the points (a), (b) and (c) mentioned above.

- (a) The efficient use of available radium.

This implies.—(1) That the number of milligram-hours

of treatment should be as large as possible (otherwise the radium is idle for periods when it might be usefully employed), and

- (2) That the radium is used under the direction of an experienced radiologist.

If the supply of radium is in the form of solid salt—and this is generally the case where the amount of radium element is less than half a gramme—then (1) is achieved by having the salt distributed amongst a large number of containers, thus permitting the use of the whole or any fraction of the total quantity, on a single case.

(In the case of S. Bartholomew Hospital London to which the writer is attached, the whole stock of radium, say 450 milligrams of element, is in the form of sulphate and is distributed amongst 220 containers of platinum-iridium alloy, ranging in content from 50 mgms. to 0.5 m.gms). Equal flexibility would have resulted from using the emanation from this radium in solution, but mainly on account of the desirability of exact repetition of dosage in certain research work, the solid form was retained and has proved of great convenience.

The second implication that treatments are carried out only under the direction of an experienced radiologist, calls for no further comment on my part.

- (b) The protection of patients, operators and assistants against injurious exposure to radiation.

The protection of the patient usually amply secured by the attention to (a) 2 above, and by enforcing a rule prohibiting the patient from discharging himself from hospital with the radium containers still attached to him.

The main problem of protection is, of course, to safeguard those who are habitually engaged in a Radium Service, i.e., surgeons, nurses and assistants. The success-

ful solution of the problem is largely dependent upon the thorough education of all concerned in matters radiological. During manipulation, protection is best afforded by the provision of convenient instruments leading to short exposure times, whilst when manipulation is not taking place, the radium must be completely enclosed in lead as thick as possible. The instruments include various special forceps, a stand for holding during threading, a radium carrier, a simple microscope stand for the rapid examination of radium needles for flaws and reading identification marks, and finally the "Radium Safe."

The "Radium Safe" is so designed that the custodian is never exposed to the full radiation of the whole stock of radium whilst removing any single container. He also has both hands free, since the "drawers" do not require to be completely withdrawn from the lead block for complete access to their contents. When "shut" the safe gives a minimum filtration of 4 inches of lead in *every direction* and with its 21 "drawers" should suffice for efficient main storage of upwards of a gramme of radium element.

Whilst utilising all artificial aids to protection, emphasis should be laid on the great advantages to be derived from exploiting, whenever possible, that assistance given by Nature which is embodied in the "Law of Inverse Squares."

As a final precaution, periodic examination should be made of the blood of all persons habitually engaged in a Radium Service. These afford test both of the efficiency of the protective devices and of the carefulness of the personnel.

(c) Safeguard against loss of radium.

The price of radium is so high that the custodian of a large number of radium applicators which are in

constant use, occupies, in some respects, a position analogous to that of a cashier establishment having a large number of bank-notes in circulation amongst its different departments. Not only on account of the value of the Radium but also of the possibility of injury to the health of some unsuspecting person when an applicator is not in an approved place, it is essential that a daily audit or census of containers should take place, and that the custodian should always know where any given applicator may be found.

This can be ensured by keeping a suitable log book and receipt book and only issuing radium against the receipt of a responsible person, and by the provision in every department in which radium is used, of a Radium box. *When the Radium has been issued to any department and is not being used, it should always be found in the Radium box.*

Further details of the organisation of a Radium Service can be obtained from the appendix, which shows the rules which are in force at the hospital to which the author is attached. (The special allocations are in this case due to the fact that a portion of the radium is reserved for special clinical researches and is only available for routine treatment when the research demands have been satisfied.)

It will be seen that the regulations are designed not only to avoid loss due to accident or carelessness in use, but also to protect against loss due to fire, etc., i-e., to have such working and storage conditions that an insurance company will grant its lowest rates for insurance against loss due to any cause.

Testing.—It is obvious that regular testing of the radium applicators must be carried out, to see that their contents are intact. In the writer's depart-

ment, doubtful applicators are tested on a Radium Balance (designed by Prof. Russ) and routine tests made for emanation leakage. In performing the latter, it is well to realise that an expensive electroscope may be rendered worthless by exposure to a small quantity of emanation. The writer uses for this purpose a simple electroscope which is so inexpensive that the whole or any part may be thrown away when contaminated and replaced at a nominal cost.

In conclusion, I wish to acknowledge the collaboration of my colleagues in drawing up the above scheme, and also to express my indebtedness to Prof. Russ for some valuable ideas which I have freely adopted.

Appendix

(FROM PROFESSOR F. L. HOPWOOD'S PAPER)

On

Radium Service.

1. For the time being the radium shall be divided into four portions, A, B, C, D, allocated as follows:—
 - A. To the Surgical Unit.
 - B. To the Gynaecological Department.
 - C. To the Throat Department.
 - D. To the General Hospital Department.
2. (a) The Surgical Unit has prior right to portion A.
 (b) The Gynaecological Department has prior right to portion B.
 (c) The Throat Department has prior right to portion C.
 (d) The portion D is available after suitable notice

has been previously given to the custodian (notice of one week or more is desirable), on any day until the treatment of cases begun on that day is concluded.

3. When portion D is used by non-Research Departments, this must be done in consultation with the head of the X-ray Department.

4. When any fraction of A, B, or C is not required by a Research Department notice of this shall be given to the custodian stating the period for which it will be free; such fraction shall then be available as if it belonged to portion D.

Rules concerning the Issuing and Return of the Radium.

1. The radium shall be in the charge of the Physicist to the hospital.
2. It shall be kept in the main safe especially provided in the Radium Assistant's room.
3. The containers shall always, when not in use, be kept in the lead box provided. The walls of the box shall be at least 3 in. in thickness.
4. There shall be three keys only to the main safe. The keys shall be in the charge of:—
 1. The Physicist.
 2. The Radium Assistant.
 3. The Clerk to the Governors.
5. Under the instructions of the Physicist the radium shall be issued by the Radium Assistant, and brought to the Theatre or Department requiring its use and placed under lock in the radium box in that Department.
6. The radium shall be issued only to those persons whose names are on the list supplied by the Physicist.
7. The radium shall not be left in any Department

until a signed receipt for it has been obtained from the Sister-in-Charge or her deputy.

8. Tubes or needles requisitioned but not required in the treatment of a patient, or those removed from a patient in any Department, shall be returned to the radium box in that Department, and immediate notice given to the Radium Assistant or Night Sister.

9. All radium containers not required for treatment shall be removed daily by the Radium Assistant from the several radium boxes and placed in the main safe.

10. Upon its receipt at night, the person authorised to receive the Radium shall lock it up in the night safe in the Curator's room.

All radium containers in the night safe shall be removed each morning by the Radium Assistant, and placed in the main safe.

Care of Radium when in Use.

1. No mercury or iodine solutions of any kind may be placed in contact with any radium containers. (Tubes and needles may be sterilised by boiling.)

2. Patients whilst being treated with radium are not allowed to leave their beds or chairs on any pretext whatsoever except to move into a stretcher to be taken to and from the Operating Theatre or X-Ray Department.

3. No patients are permitted to discharge themselves while the radium is attached to them.

4. No dressings from a patient under treatment by radium are to be destroyed until after the radium is removed from the patient. All excreta to be carefully examined before they are thrown away.

5. Radium needles shall only be inserted by means of the special introducers provided. Needles must not be held in ordinary types of pressure forceps.

Protection of Patients and Operators.

1. The radium tubes must not be held by the fingers, but forceps used instead.

2. In the event of the radium slipping out of position, the House Surgeon or Intern is to be communicated with at once, whatever the hour of the day or night."

Radium Therapy.

The famous "Becquerel Burn" gave birth to Radium therapy. In 1901 Becquerel was experimenting with a glass tube containing Radium and placed the tube in his waist-coat pocket, in which it was left for several hours. Two weeks later there developed a severe dermatitis on the skin in the neighbourhood of the pocket. This reaction drew the attention of the medical profession to the biochemical action of such radiations and upon this accidental beginning the medical application of Radium has been evolved.

We have already seen that Radium gives off three types of rays *Alpha*, *Beta* and *Gamma*. The platinum containers absorb all the *Alpha* and *Beta* radiations and it is the *Gamma* rays which are used when we give patients what is known as deep therapy. *Gamma* rays when passing through or striking any substance give off secondary *Beta* radiations. These may be partially absorbed by suitable screens or used if required.

The methods of applying the Radium in use in Madras are as follows:—

For Implantation.—Platinum needles containing Radium, ($Ra\ SO_4$) varying from 1 to 10 mg., are threaded with silver wire and fish gut ligatures and implanted by the surgeon. These having been made secure, are removed two or three days later, the time depending on the number of milligram hours desired.

For external application.—either plaques or needles mounted in gold alloy carriers and imbedded in wax, are used. In gynæcological patients, the needles or tubes are mounted in a ring pessary or metal applicators suitable for insertion into the cervix. Additional screens to cut off secondary radiations may be made of rubber, aluminium or other metal.

The following brief summary will give an idea of the results of Radium treatment of pathological conditions.

Warts, nævi, small keloidal growths and other non-malignant conditions are often satisfactorily dealt with by a few applications of Radium. Laryngeal warts are treated by suspending the Radium container, enclosed in a rubber tube, within the larynx. Rodent ulcers are effected equally well either by X-rays or Radium. Repeated small applications around the periphery give the best results; if the treatment is found to be ineffective after three months and when the deeper structures such as cartilage and bone are affected, excision is the treatment of choice, followed by radiation.

Curtaneous epithelioma are not so favourably affected as rodent ulcers and consequently excision is always to be undertaken when possible and followed by post operative treatment with X-rays or Radium or a combination of both.

In treating malignant growths, the Radium needles are buried in the tissues around the cell mass, in the boundary line between the normal and the abnormal tissue and left there for the prescribed time, this depending upon various circumstances, the general condition of the patient, the nature of the tumour, its duration and stage of progress, the part affected and other factors.

If the neoplasm or the abnormal growth is one that breaks down easily and bleeds profusely the application

of Radium for long, may cause rapid disintegration and necrosis resulting in a large sloughing ulcer. This may involve a blood vessel of considerable size and serious consequences of auto-intoxication, due to too rapid a destruction of the neoplastic tissue, and the absorption of the disintegrating products, or fatal hæmorrhage may follow if due care is not maintained during the treatment.

It is essential to understand clearly that Radium is a double-edged weapon in that it may do good or infinite harm. It appears, under certain conditions, to stimulate the growth of living cells instead of disintegrating the neoplastic tissue and accordingly the question of dosage and method of application should be carefully considered.

It is held to be beneficial in the majority of cases to combine X-ray exposure with Radium treatment as the combined effect is often more satisfactory than treatment by either alone.

It has been the experience of many that cancer of mucous membranes do not so readily yield to irradiation as carcinomatous conditions of the skin.

The treatment of cancer of oesophagus by introducing into it a tube of Radium enclosed in a rubber catheter, preceded by a gastrotomy, has not been satisfactory and no good results are obtained so far.

Cancers of stomach and intestines are not suitable cases for treatment by implantation in as much as serious consequences, such as erosion of large vessels and perforation of the bowels, resulting in fatal hæmorrhage, may occur. Deep X-ray therapy or external Radium are the only alternatives to surgical interference but the results in any case have not been encouraging—the large doses of X-rays needed for such conditions often produce persistent colitis and diarrhoea. Rectal carcinoma may

be treated by burying Radium into the growth, with fairly gratifying relief of pain.

Cancer of bladder and prostate have been treated by introducing the needles through a supra-pubic cystotomy opening but except in cases of early malignancy of prostate no good results have been achieved so far.

Cancer of cervix uterus has been greatly benefited by Radium treatment. Inoperable cases are reported to have been made operable by the absorption of the peri-uterine thickening and the surrounding infiltration, after Radium treatment; but in any case the prognosis depends entirely on the stage at which the patient comes under treatment.

Sarcomata are considered to be more amenable to Radiotherapy than carcinomata in that the direct implanting of Radium into their substance causes cessation of growth. But the late condition under which cases come to the notice of the surgeon and the early secondary deposits that take place often renders Radium treatment practically useless. The deep therapy treatment with gamma rays for these secondary deposits chiefly in lungs may be attended with grave complications and, consequently, the rapidly spreading sarcomata are difficult to deal with.

Enlargement of lymphatic glands with various causes have been treated with Radium and X-rays with satisfactory results. Tubercular glands and lymphadenoma in early stages yield readily to treatment. Lymphosarcoma patients are beneficially effected but the rapid dissemination of the secondary deposits often make the treatment finally ineffective.

Patients suffering from leukaemia are considerably improved by irradiating the spleen, long bones and lymphatic glands.

Lupus, ringworm and various conditions of the skin considerably improved by irradiation with Radium or X-rays. In the case of ringworm in particular a depilatory dose is given with X-rays and the offending hairs are removed. In the treatment of scalp considerable caution is to be observed to prevent a permanent balding.

Gliomata, arising as these do from the neuroglia, and the stroma of the central nervous system, are mostly confined to the brain. Though of benign nature, these may lead to serious symptoms by reason of their position, and finally prove fatal. As surgical measures are generally contraindicated, deep therapy treatment with gamma radiation is advised quite justifiably as this may tend to reduce the size of the tumours, inhibit the growth and lessen the pressure symptoms.

As the nerve fibres and nerve cells are said to be peculiarly insensitive to Radium irradiation, maximum "cross-fire" radiation of long duration is advised.

Myelomata, which are now recognised to be of a benign character, generally are said to respond fairly well to Radium treatment, while lipomata, chondromata, and osteomata are found to be unaffected by Radium.

It is interesting to note that the Government X-ray Institute received its first supply of Radium early in 1927; the first patient to receive treatment was sent by Lt. Col. R. E. Wright I. M. S., on March 2nd 1927, this being a case of angioma of the upper eyelid.

The first implantation was done by Major K. G. Pandalai I. M. S. on March 17th 1927, when he inserted Radium needles into a growth of the tonsils. Since then about 438 exposures have been given, these being distributed among the following conditions.

I have known patients who have suffered from symptoms of ulcer for many years, who have been fortunate enough to escape haemorrhages or perforation and who have been doing their normal work without interruption or sick-leave; but the point to be emphasised is this, as in all cases of hidden abdominal lesions, that the risk of a catastrophe in surroundings where help may not be readily available, is a real one; and there is no knowing which of our patients are going to perforate or bleed to death. I am not emphasising the remote dangers of the malignant transformation of an ulcer; this, although possible, is a comparatively less urgent indication for treatment; but the above mentioned three points, painful dyspepsia by itself, the ever present dangers of haemorrhage and perforation are all sufficiently strong indications for adopting a definite line of treatment when consulted about these cases. If therefore, a fairly well-to-do patient and one intelligent enough to co-operate with you, who is not far away from a surgical centre and whose general condition is not rapidly going down-hill prefers to give medical treatment a prolonged trial, it is right to adopt this course; but even in this case it is our duty to point out the risks and let the patient choose for himself. On the other hand, when required to treat large numbers of these cases in a congested hospital ward, with patients who have neither the means nor the time necessary for medical treatment and who require quick relief from their pains, there is no alternative to surgery at present. There is no doubt that surgery does afford prompt, even dramatic relief to a majority of these patients. It may be said against surgery that a certain number of patients are not improved. The reply is that such cases would not improve under any treatment. It is said that some of the cases improve for a time, but re-

lapse later. This is granted; for, no one pretends that by surgical treatment the cause of the ulcer is being permanently removed and there is no doubt that new ulcers may occur although it is known that the old ulcers generally heal. It is also admitted that one of the complications of surgical treatment is a new ulcer at the anastomosis. These latter patients suffer considerably more pain than before and their treatment involves another operation which is far more difficult and shock-producing than the original one. The mortality of gastro-jejunostomy has also to be considered. Thus putting together the mortality of the operation and the dangers of recurrence and the complications, it must be admitted that there are strong arguments for a careful trial of medical treatment before resort is had to surgery. But one must not lose sight of the mortality and the dangers of the disease itself, not to mention a protracted life of semi-starvation. A case would, therefore, appear to be made out for giving surgery as good a chance as any other line of treatment.

It is now realised that the great error in the past has been the neglect of medicinal and dietetic regulation subsequent to operation, particularly, during the period immediately following operation. Surgery thus becomes in this disease, not a substitute for medical treatment, but an aid. This is the real position at present and should be explained to patients to avoid later disappointments. The question arises—what is the best surgical measure in this condition? For, in the evolution of the surgical treatment of this disease, many surgical measures have been tried and discarded in turn; but today the general opinion of surgeons the world over, seems to be in favour of gastro-enterostomy of the posterior no-loop type as the safest routine operation in

duodenal ulcers and in gastric ulcers where from local or general conditions, a better step could not be adopted. But in the case of gastric ulcers, where the patient is considered to have a fair risk, partial gastrectomy is the operation of choice. In Madras this operation is increasing in favour and with the growing experience of surgeons and the anaesthetists, better results, almost as good as after a gastro-enterostomy are being obtained. There is no doubt that in the former an extra half hour or so may be required; but this does not seem to matter and one is invariably struck by the smooth convalescence of these cases in contrast with gastro-enterostomies.

Partial gastrectomy which has been done for gastric and duodenal ulcers in the past five years in 26 cases, has been attended by a mortality of 11%, a mortality which is steadily falling with a careful selection of cases. None of these patients have returned with recurrences and although it is too early to form conclusions, the method would appear to be an advance on existing operations in suitable cases. The post-operative treatment which is so important after gastro-enterostomy is equally imperative after a partial gastrectomy.

Time alone can prove if we are making a real advance in our methods of treatment but a case has been made out for a cautious move forwards in the direction above indicated.

Current Medical Literature

Surgical Treatment of Pyorrhoea

J. W. E. Graham discusses the surgical treatment of Pyorrhoea with the object of saving the teeth, the gums being operated upon in sections with ten days' interval between each sitting. Having painted with iodine and under infiltration anaesthesia a transverse incision is made, linguallly and labially, around the cervical margins of the teeth down to the bone. From the extremes of the horizontal incisions two vertical incisions labially and two linguallly are made downwards for about $\frac{1}{2}$ an inch and the two flaps are reflected with a periosteal elevator. The necks of the teeth are cleaned and polished and all diseased bone is cut away, pockets are curetted in the same way. After flushing with saline solution or a mild antiseptic the flaps are trimmed and stitched back in position with fine No. 3 silk interdental stitches which are removed on the 4th day. In selected cases with not too much bone absorption the operation is said to produce good results, and though there is a certain amount of gum recession in healing the pockets and pus disappear. Treatment with electric cautery, the loops being passed deeply into the pockets and around the tooth, is another effective method, for which it is claimed that all micro-organisms are killed and that the healing cicatrization tissue effectively tightens the gum around the tooth. (Jour. of Med. Assoc. 1927.)

Painless child-birth

A. Harran states that during the last 3 years, the Gwathemy method of rectal ether analgesia in labour has been used in 5,800 cases with very satisfactory results. A quarter of a grain of morphia is given hypodermically with 2. c. cm. of 50% solution of magnesium sulphate to prolong the action of the morphia. In half the quantity of ether required for rectal anaesthesia, is dissolved about 20 grains of Quinine alkaloid and 4 cc mixture is instilled into the rectum as a retention enema. After an interval of 1—4 hrs. following the injection of morphine and magnesium sulphate, when the 1st effect of the first ether instillation has worn off and the patient again complains of pain, which is usually in from 2—3 hrs. a second or even a third rectal instillation of ether may be given at intervals of 3 hours or

more. In 85% of cases pain was greatly relieved, there was no prolongation of the perineal stage or increase of forceps delivery. The only contra-indication to the procedure is uterine inertia and the only restriction is, not to start too soon. The patient should be in active labour with pains every 4—5 minutes and in a 2-para the cervix should be allowed a dilatation of two or more finger-tips. Harran claims that the applicability of this method is much greater than that of scopolamine amnesia. It can be used safely and effectively by the practitioner in confinements at home and does not require the service of a trained anaesthetist. (*Amer. Jour. Obstet. and Gynecol.* April 1927.)

Serological Test for Kala-azar.

L. E. Napier describes a test founded on the accidental observation by Major Chopra that when the serum of a kala-azar patient is mixed with certain pentavalent compounds of antimony a heavy precipitate was formed. Trial was made of six such compounds, and the intensity of the reaction appeared to vary directly with the therapeutic efficiency of the drug used; stiburea (urea stibamine) proved the best. The test was performed in a series of sixty clinical cases, the results being compared with those of the aldehyde test and of spleen puncture or other positive test for the presence of *Leishmania*; a small number of control tests on cases other than kala-azar were also made. Napier believes that the reaction is very reliable and equal in diagnostic value to the aldehyde test at least. It requires only a very small quantity of serum and gives a clear-cut result, even when the serum is milky. The test is performed by adding two drops of twenty-four-hour-old serum to 2 c. cm. of a 0.25 per cent solution of stiburea, or two drops of fresh serum to 2 c. c.m. of a 1 per cent. solution of stiburea, agitating and setting aside for ten minutes. If the donor of the serum is suffering from kala-azar a heavy flocculent precipitate will form, and in ten minutes will separate, leaving a clear supernatant fluid. (*Indian Med. Gaz.*, July, 1927.)

Pneumonia

Pneumonia is pre-eminently a disease in which prevention is better than cure. Although much can be accomplished by rational treatment, a high mortality persists in spite of all forms of medication.

Very many cases of pneumonia follow in the wake of influenza,

bronchitis, or even an apparently innocent upper respiratory infection. The pneumococcus, it has been proved, finds it difficult to penetrate the healthy mucous membrane of the bronchial tubes and alveoli; but, when this membrane has already been damaged by bronchitis or influenza, the micro-organism gains a foothold and pneumonia may be the result.

The best time to treat pneumonia is before it develops. If every attack of bronchitis or influenza were handled as a potential case of pneumonia, there would be far fewer actual cases.

By relieving internal congestion, by stimulating the superficial blood flow, by increasing the phagocytic power of the protective white blood cells, and by restoring normal circulation in the inflamed bronchial tubes and alveoli.

Antiphlogistine is found to be an invaluable auxiliary to the physician practising modern preventive medicine.

Treatment of Eclampsia, Epilepsy and Pernicious- anaemia.

Eclampsia.—Treatment can be classified under two headings.

I. *Pre-eclamptic* II. *During eclamptic convulsions.*

I. *Pre-eclamptic*—When the pre-eclamptic symptoms as albuminuria, head-ache, oedema, and high blood pressure are observed (*a*) First keep the patient in bed (*b*) Open the bowels freely with hydrogogue purgatives (*c*) Give diuretics and diaphoretics, e.g.:—R Pot acets gr. XX, Pot citras gr XXX, Spts. Aeth. Nit. m XXV, Aqua camphor ad 1 oz. (*d*) Give copious drinks of water or barley water (*e*) Completely starve the patient for 24 hrs, followed by a low diet of milk and carbo-hydrates, with as little proteid and extractives as possible, (*f*) Try daily infusion of saline and glucose per rectum (*g*) Give thyroid extract gr 2. with sodi licarb gr 15, T. D. S. is given, on the supposition that it may rectify a perverted metabolism and may also serve a useful purpose in reducing blood-pressure. It is important to remember that about 13% of eclampsia cases in our hospital do not show the albumen in urine before, during or after labour. The more the albumen and greater the oedema, the more serious is the case.

Labour should be induced if (1) No improvement in albuminuria-quantity of urine, oedema, or blood-pressure occurs in a few days (2) Albuminuric retinitis is present and vision is getting worse (3) Repeated vomiting and jaundice occur (4) Lung complications and rise of temperature are found (5) And if during treatment (*a*) A sudden exacerbation of symptoms are present or (*b*) sudden onset of fresh symptoms occur.

The methods of induction of labour are:—(1) In mild cases, gum elastic bougies (2) In moderate cases, Horrock's bag (3) And in severe cases Caesarean section especially in a primi-gravidas, if any obstetric complication is present eg; malpresentation or great oedema of vulva.

Our hospital authorities hold strongly that *Accouchment force* as a distinct contraindication in cases of eclampsia. In our clinics the severity

of the case can be estimated by the sodium bicarbonate test. In a severe case a very large quantity of sodium bicarbonate has to be absorbed per rectum before the urine becomes alkaline or neutral. In a patient with a pulse 90, temp. below 100°, or 100°, B. P. less than 120 m.m. there is no coma and lung complication, the urine becomes alkaline or neutral with a very few drams of sodi bicarb; and such cases are termed mild.

Treatment during convulsions may be sub-divided into:—

(1) Elimivative and sedative (2) Obstetric.

When the patient is observed in a fit, all tight fitting garments are removed, and she is put in a special bed 'the eclampsia board,' in a room which is kept quite and semi-dark. The room should contain everything ready at hand to carry on the treatment. A mouth gag is gently introduced to prevent the patient biting her tongue, and she is put on her side to allow a free exit to the saliva from the mouth. Then ¼ gr. of morphia is given hypodermically; and the B. P. is taken with a Tycos Sphygmo-manometer. If B. P. is above 120, 1 c.c of veratrone (Park Davies and co) is given hypodermically. The B. P. is taken every 15 minutes. Within ¼ of an hour of the injection, there will be a marked fall of B. P. If the B. P. is found to rise again, over 120, ½ c.c. of veratrone can be given. When the patient is found quiet, a good bowel wash of sodi bicarb 1 dram to a pint, of several pints is invariably given. If the patient is conscious 4 drams of mag sulph in an ounce of water is given to relieve constipation.

If fits continue morphia is repeated. Veratrone does not appear to have is control over restlessness. Sometimes after an injection of veratrone the B. P. falls down to 60 m.m; but this need not cause anxiety. If there collapse, it is counteracted by saline and glucose per rectum. In some cases if the patient is plethoric, and has deep cyanosis, cardiac dilatation, and obviously very marked, cerebral congestion, venesection can be done; and as much as 1—24 oz. of blood can be with-drawn. Administration of bromides-chloral, and morphine, according to the scheme of Stroganoff does not appear to be so effective as morphine and veratrone treatment.

Lung complications are avoided by keeping the B. P. low and also by reducing the temp. and keep it down to 100° by iced enemas. Iced enemas are preferable to wet-packs in these cases. Thus (1) Blood pressure is kept low by veratrone (2) Temperature is kept low by iced enemas. If these two clinical symptoms are properly dealt with, coma, fits and lung complications

can be controlled in a great majority of cases. By adopting the above treatment the mortality is found to be very low in our hospital.

(2) *Obstetrical Treatment.*—(a) First puncture the membranes. Often this manoeuvre, by lessening the tension of the uterus, may alleviate the symptoms. (b) If the fits continue, and labour is not actively proceeding the cervix must be dilated either (1) digitally or (2) by Hegar's dilators. (c) If labour is proceeding well, do nothing. (d) If labour is protracted, do either (1) Bipolar version, when os admits two fingers, bring down a leg and deliver by gentle traction thereon or (2) Apply forceps to vertex and deliver. (e) Craniotomy may be called for, especially as child is often dead. (f) Caesarean section. The mortality here is very high both in severe and mild cases.

N. B. No obstetrical manipulation must be done without anaesthesia, for the reflex irritation sets up convulsions.

For heart failure give hypodermic injection of digitalin 1/100 gr. or 1/100 gr. of strophanthin intravenously. For cyanosis clear the mucus from the throat, give oxygen inhalations and also do a venesection. Other more drastic methods of treatment are:—(a) Renal decapsulation which is indicated when there is suppression of urine not rapidly yielding to treatment. This can be done on both sides during the abdominal Caesarean section operation. (b) Nephrotomy by the lumbar route is more efficacious than capsulotomy, and is of great value in promoting flow of urine during a state of anuria.

These are desperate methods, and the mortality is very high.

Epilepsy.—It has to be treated on general principles and with certain drugs. In the interval all sources of peripheral irritation, such as bad teeth and errors of refraction, should be dealt with. General treatment consists in giving a salt free diet—sodi bromide can be given as a substitute for sodi chloride if the patient likes—and moderate exercise. The patients' activities ought to be such that give immediate results, as polishing a boot, trimming a shrub, weeding etc. These activities must be liked by the patient, otherwise even open air exercises are not advocated.

In chronic cases treatment in so called epileptic colonies where the habits, diet, exercise and re-creation are systematically ordered, has been found to be beneficial.

Drugs.—As a rule before drugs are administered, the reflex cause of

the fits must be eliminated. Some drugs are known as 'specifics' for epilepsy. Of these pot. bromide is one. 10—15 gr. of it is given well diluted, 20 minutes after food, twice daily and double this dose at bed time. This is continued for years. The bromide rash is prevented by giving 2 min. of liq. arsenicalis or salol gr. 10 at bed time occasionally. And *bromism* can be counteracted by giving glycerophosphate of soda 20-30 gr daily or nuxvomica. The maximum amount of the bromide that can be given daily is 90 gr. Unfortunately all cases are not cured by the bromides. When potas. bromide is partially successful, one may get better results by adding tinct. digitalis, tinct. belladonna or liquor trinitrni to the bromide or the triple bromides may succeed where a single salt fails.

Sodi-bi-borate commonly known as borax is a more effective drug than bromides in some cases. It is given in 5—10 gr. doses. It is a gastro-intestinal irritant and may set up psoriasis. Therefore some care is necessary in its administration.

Zinc-oxide can be tried if borax also fails. It is a useful drug in *Petit-mal*. It is best given combined with belladonna in a pill form.

Luminal in 2 gr. doses after food—the maximum during the day being 6 gr.—can be tried. Viguer of Paris claims good results by the use of luminal with bellafoline 5 m. gm. given twice daily. Bellafoline contains alkaloids of belladonna leaf, chief of which is hyosayamine.

When fit follows fit without return of consciousness, whiffs of chloroform or 1/4 gr. morphia, 1/50 gr. hyoscine hydro-bromide, sub-cutaneously or chloral hydras per rectum are successively tried. In spite of all this if the same state continues strychnine injections to support the heart have to be given.

Now Bechterew and Pewsner of Russia claim efficacy with *Adonilen* an alkaloid of *Adonis Vernalis*. The mixture named after Bechterew as it 'Bechterew's Mixture' contains infusum *Adonis*, bromides, and co-deine, and appears to act very well.

Lastly it is interesting to note that Julius. Caesar, Mahomed and Napoleon were epileptics. They were aware of their complaint, yet they became great men.

Pernicious anaemia.—First remove all septic foci. Intestinal antiseptics such as salol can be given. The flora and fauna of the intestinal tract may be taken, cultured and injected sub-cutaneously.

In cases of achlor-hydria, dram doses of dil-H.cl in plenty of water can be given preferably with meals. To dispel the acid taste, a dram or two of syr. lemons can be added to it. A vertebrate liver 4-6 oz after being cooked if given along with the diet seems to do good. Sodi cocodylates $\frac{3}{4}$ gr. injected sub-cutaneously or intramuscularly seem to act better than salvarsan or Neo-salvarsan. Strychnine orally or by injections can be given if symptoms of sub-acute combined degeneration are noticed. Ampoules of 1 c.c. containing together sodi cocodylate $\frac{3}{4}$ gr. arsenic cocodylate $\frac{3}{4}$ gr. and strychnine nitrate 1.60 gr. are available in the market. Injections of them can be given either on every alternate or the third day. While arsenic is the main stay in the treatment, some of the following may be tried. Normal horse serum is given in 10 c. c. doses by the mouth or hypodermically is found effective in some cases. It causes nausea if given by the mouth and so the patient is not informed of it.

Some clinicians now claim satisfactory results by intravenous injections of mercurio-chrome. The strength of the solution is 1 % and 15-30 c. c is injected every third or fifth day. Transfusion of blood can be done as an emergency measure but as a curative measure it does very little help.

By K. N. MURTHI,

Anatomical Abnormalities

To

THE EDITOR,

'MADRAS MEDICAL COLLEGE JOURNAL'

Sir,

The notes on the following two Anatomical abnormalities will be of interest to your readers.

While dissecting in the Govt. Indian Medical School dissection hall (1) a small muscle arising from the inferior surface of the Coracoid process of the scapula is found. It is about $1\frac{1}{2}$ c. m. broad and 7 or 8 c.m. long. It runs beneath the tendon of insertion of the Pectoralis minor and gets inserted in the fascia above the Teres major, near the middle of the medial wall of the axilla, in a silvery white tendon. It passes between the posterior and medial cords of the brachial plexus. It is supplied by the sub-scapular circumflex artery.

This is a *new muscle* which is not described either in Gray's or in Mustafi's or Buchanan's or Cunningham's Practical Anatomy books. Further investigation about it is to be made. The corresponding arm of the same body is also dissected, and the same muscle is found.

The second thing is a *third head to the Bicepsbrachi*, which is described in Gray's Anatomy under abnormalities. It arises from the upper and medial part of the origin of Brachialis. It (third head) does not blend with the belly of the Biceps proper, or Brachialis. But is inserted partly into the lacertus fibrosus and partly into the medial part of the tendon of insertion of Biceps brachi proper. It lies lateral to the Brachial artery.

The above two abnormalities are found in the same body.

Y. SURYANARAYANA ROW,

(Student, Govt. Indian Medical School.)

Editorial Comments

As we are going to press, considerable bustle is manifest all round in connection with that inevitable half-yearly visitation of the University Examinations, and we confess that we have had considerable difficulty in bringing out the magazine as a result of a paucity of contributions. We crave the forgiveness of our readers for an unusually small Number, and hope to make up in our next issue for any deficiencies there may be in the present one.

* * * * *

We feel it our duty to correct certain misapprehensions arising out of our remarks in a previous issue of this magazine, concerning the status of a sister institution, the Medical College at Vizagpatam. Those views were directly the result of criticisms passed on the working of this institution by the Inspectors deputed by the General Medical Council of Great Britain and were made in a spirit of fair and friendly comment. We regret that our remarks have given room for misunderstandings particularly with colleagues for whom we have always felt nothing but sincere regard and sympathy.

* * * * *

The hand of the Reformer has been at work all over the world in recent years in matters relating to Medical Education and our own college has not escaped his busy attentions. Among several proposals which are now under consideration by the University, one, viz., the lengthening of the course from 5 to 5½ years, has given rise to many apprehensions in the minds of the student

population. We have received more than one letter on the subject from our student readers, all of which voice dissatisfaction with the measure and a fear is expressed that the course may be further lengthened with the lapse of time. We have always been champions of the students' interests and can assure our readers that there is no cause for pessimism on this occasion. We are intimately acquainted with the reasons for the recent remodelling of Medical teaching in this University and are certain that the revision of the curriculum and the slight lengthening of the courses have no other motive than that of bringing Madras into line with the rest of the World, and of making the Madras student as good as any abroad.

* * * * *

We might be permitted to allude briefly to certain matters intimately affecting our College and Hospital which came up for debate in the last session of the Local Legislature and in the Press. As regards the College, complaints are persistently made that there has been a great increase in the teaching staff, with a corresponding increase of expenditure. As educationists engaged in the production of efficient Medical men and as exponents of a progressive Science, we must confess that we do not keep our eyes constantly fixed on the treasure chest and do not hesitate to advocate large expenditure where such, in our opinion, is necessary for educational advancement. We cannot sympathise with those who perpetually cry for economy in educational matters; for, it is the one direction in which money thoughtfully spent is well invested. We feel, therefore, from our knowledge of the expansion that is steadily being effected in our various College Departments that there is no room here for retrenchment; and on the other hand we can think of more than one

department in which a greater rapidity of development is immediately desirable.

* * * * *

Every tourist from foreign countries who has visited the Hospitals of Madras has had nothing but admiration for the manner in which these institutions are being managed. Appreciation of the work carried on in them comes, not only from foreigners, but also from the public of the Presidency as is evidenced by the crowding in the wards and the large waiting lists which have become a feature of these institutions in recent times. We are convinced that they are conducted and administered by enthusiastic and self-sacrificing men second to none in the world and that the conditions prevailing therein are as perfect as human ingenuity could make them in the circumstances obtaining in Madras. We concede, however, that there may be small defects here and there; but these are inevitable in an institution which caters for a large and mixed population with widely differing requirements and tastes. No handiwork of man can be absolutely perfect; but to magnify minor flaws into serious crimes is as absurd as to minimise serious defects into trivial errors. We have always been of opinion that the only way to solve the problem of increasing demands for admissions into state hospitals, is the provision of other institutions, run by philanthropic individuals or corporations in which the large and growing body of gifted private practitioners could utilise their abundant energies for the alleviation of the sick and the suffering, of whom this city appears to have an unlimited number.

* * * * *

We commend to our readers a lucid article appearing in this issue from the pen of Capt. T.W. Barnard, Radiologist to Government, on the present position of Radium

treatment. It is not generally known that Radium as a therapeutic agent is being utilised with success on a large scale in the Madras X-Ray Institute, and that it is possible to obtain relief in suitable cases, particularly of malignant disease, without having to proceed on a long pilgrimage to other distant Provinces in India.

* * * * *

We have received with thanks, 'The Patna Journal of Medicine' (formerly called the Quarterly Journal of Medicine) Vol. 3. No. 1. Editor, H. Hyderali Khan F. R. C. S. (Edin.)

The first paper deals with the "Determination of Sex" by S. S. Chaudhury, Professor of Biology, and he concludes by saying "Nothing is known to science yet by which it is possible to control the sex of man artificially." The second paper deals with "Food and Vitamines" by Rai Bahadur Chunnilal Bose. Another paper deals with an introduction to Embryology by H. Hyderali Khan Professor of Anatomy. This small and concise journal is interesting from the point of view of students and practitioners.

* * * * *

We deeply regret to announce the death of Mr. Damodaran, a reverted student of the second year class. We offer our heartfelt condolences to the bereaved family.

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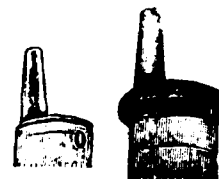
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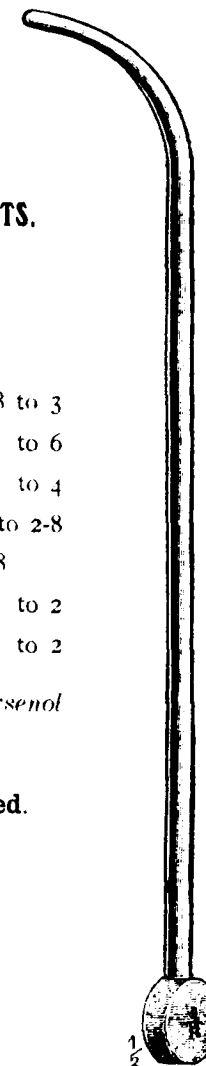


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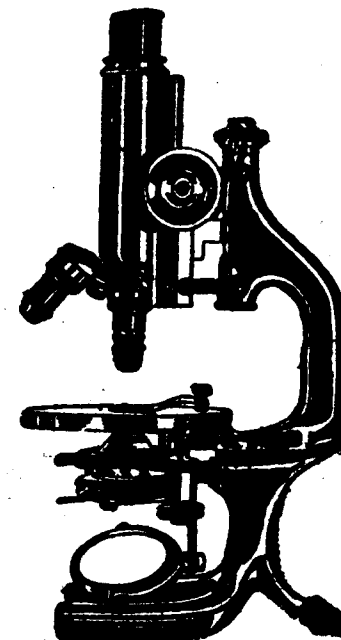
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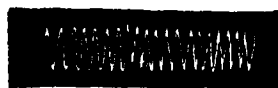
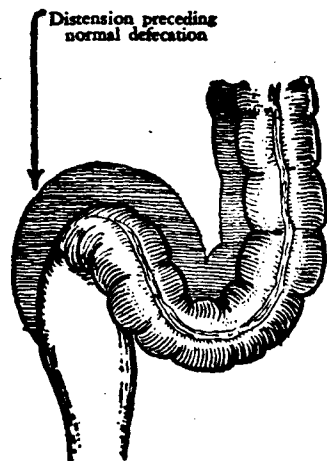
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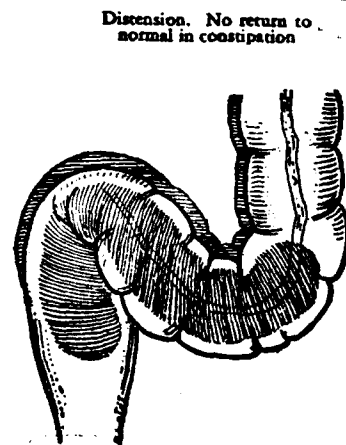
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Graph of normal peristalsis



Graph of peristaltic fatigue

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CONSIDER the energy required to propel a pound or more of miscellaneous food components through the twenty-plus feet of the intestinal tract under normal conditions. Someone has said that it requires as much real energy to accomplish this as to walk more than a mile.

Now consider the wasted energy in the presence of intestinal pathology. An over-residued diet may induce segmental hyper-peristalsis or reverse peristalsis, depending upon abnormal physiological or mechanical factors in the colon. This unproductive peristalsis leads ultimately to intestinal invalidism.

The lubricant Nujol by softening and lubricating the hard faecal masses, facilitates their expulsion, thus minimizing excessive peristalsis. Viscosity specifications for Nujol were determined only after exhaustive clinical tests in which the consistencies tried ranged from a water-like fluid to a jelly. The name "Nujol" is a guarantee to the profession of absolute purity and insures that the viscosity of the liquid paraffin so labeled is physiologically correct at body temperature and in accord with the opinion of leading medical authorities. Nujol is the highest quality liquid paraffin made by the Standard Oil Co. (New Jersey).

Nujol

TRADE MARK

For Lubrication Therapy

Made by STANDARD OIL CO. (NEW JERSEY)

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