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CONTENTS

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FOREIGN BODIES.

By N. Rama Rao,

Gollapalli, Kistna District.

Foreign bodies in any of the natural passages of the human body or impacted in deep tissues are very common complaints that any general practitioner comes across in his daily practice. Every practitioner must be in a position to treat majority of these cases except a few which need major surgical interference by specialists of the concerned branches.

Foreign Bodies of the eye :—These are common enough in any O.P. department. No specialization in eye work is necessary in majority of the cases. A doctor who happens to reside near a quarry or a metal factory as in the case of the writer, where many people work in stone cutting, is sure to get a good number of patients. Travelling in a car or train, carpet weaving, scavenging, stone grinding or cutting, milling or pounding paddy or other edible grains, are all the very common causes. The F. Bs. constitute particles of sand or stone or coal or any metal or any pieces of stick. Rarely living foreign bodies are met with. The writer had two such cases and had to remove six or seven tiny crawling worms from each eye of two Mohammaden boys some years ago.

These F.Bs. may be lodged either in the palpebral conjunctiva or the bulbar portion or in the fornix or they may be imbedded over the cornea. On the corneal surface their position is fixed causing ulceration unlike in the conjunctival sack where they are likely to travel from place to place owing to the action of the lids. The text book description that they are commonly lodged in the palpebral conjunctiva and that removal is easy on mere eversion of the lids does not hold good in many cases. F. Bs. in the fornix require a complete eversion of the lid with a lid retractor so as to expose the entire fold of the conjunctiva. Some are invisible to the naked eye irrespective of their size owing to their color being the same as that of the conjunctive. Difficulties in the extraction arise when they are imbedded in the sub-conjunctival tissue, or when stuck up to the

conjunctival membrane as happens when a tiny thorn pierces the conjunctiva or the husk particle of a grain gets adherent to the surface on all its edges which are rough. Thorns of broom sticks or sharp-edged pieces of metal or stone are instances where such difficulty may be experienced. In one case the piece of a stick pierced through the Anterior chamber in the four-fifths of its length and the remaining one-fifth fortunately standing out prominent. Luckily no secondary infection followed its extraction inspite of its stay there for three days. Accidents in the soda factories are also instances resulting in grave complications causing serious damage to the eye with difficulty in detection and extraction. Caustic substances like lime happen to enter the eye in the case of labourers while doing white washing work in the houses. These foreign bodies no doubt produce very serious mischief unless immediately attended to. Soft powders like a heap of dust blown into the eye or gun powder entering the eye and cornea as happens while firing a badly fitted gun are similar instances causing much difficulty in their removal.

Treatment:—Any general practitioner should have in his O. P. Department, Cocaine, florescine, eye speculum, eye Spud and a small apparatus for washing the eye. For the last item any glass funnel with a rubber tubing and glass nozzle will serve the purpose. In the place of an eye Spud an ordinary writing pen with one point of the nib removed or a blunt pin fixed to a suitable handle will do well. Foreign Bodies lodged and lying on the surface of the palpebral or bulbar conjunctiva can be removed by swabbing with a sterilized wet cotton swab or by thoroughly washing conjunctival swab. This washing is very useful when the foreign bodies are very many like a heap of dust, sand, or gun powder. Those which are imbedded underneath the conjunctiva may require scissoring or cutting the conjunctiva after carefully catching them with a fine pair of forceps. If the detection is not possible though the patient spots out and attemps at their removal are failure the writer has preferred to leave such cases alone for some time till an over growth of conjunctival tissue takes place over and around the foreign body resembling a Phlectemule and then it is easily excised. It is a pity that all most all these cases are only brought to a Doctor after interference at their removal by quacks who only make the condition worse and make the chances of recovery very few. Few of such attempts are the following:—

Trying to remove the foreign body with the tip of the tongue, putting the juices of certain plants into the eye which are liable to cause corneal damage, or a lump of frozen ghee, and keeping the seeds of some plants into the conjunctival sack for an indefinite period on the supposition that these seeds will attract and make the foreign bodies adhere to their surfaces. All these attempts cause trauma to

the eye, setting up an inflammation of a very high degree and result ing in grave prognoses. In one patient a severe ulceration of the cornea in its entire surface resulted after the application of some juice latter on complicated by Hypopyon and neglected from proper treatment till perforation took place and the eye ball had to be removed. Even in ordinary cases it is a matter of common observation that these patients when brought to us have already developed all the inflammatory phenomena with the foreign body still remaining in the eye. The lids are swollen; the conjunctiva fiery red and inflammed and bulging in between the lids and around the cornea, with a ghastly appearance making it difficult even to retract the eye lid, in such cases nothing can be done to remove the cause unless the inflammatory phenomena are attended to by proper treatment.

Simple foreign bodies fixed on to the cornea are very easily removed by cocainising the eye with the aid of an eye Spud.

Foreign Bodies of the ear:—Are very common in children and young boys who not knowing the consequences either put them themselves or allow others to put them into their own ears. These children calmly inform their mothers and so they are brought to us. The foreign bodies comprise smooth round stones, peas or glass beads, seeds of tamarind or maize or beans. Living insects like grass hoppers, ants, beetles, and flies may some times find their way into adult years who sleep flat on the ground without a mattress. The suffering of the patient till the living creature dies inside by its movements is unbearable and so the patient runs to a Doctor for immediate relief.

Extraction is easy either by washing the ear or by a pair of ear forceps. Difficulties arise when the foreign body has remained for a long time and set up inflammation with ulceration resulting in profuse discharge. In the case of vegetable seeds they always show a tendency to swell absorbing the little moisture from inside, especially so when an unsuccessful attempt has been made at removal by syringing. The external meatus is there by blocked and makes instrumental delivery very difficult. In the case of hard and spherical bodies, the foreceps may not be able to catch it and it is probable that during such attempts the foreign body may be driven further. Further, difficulties are not uncommon to experience when they are locked at the junction of the floor of the external auditory canal and the membrane tympany. It is always advisable to give a general anaesthetic in the case of children and young boys so as to stabilise the ear in position. A fine probe bent at its end at an obtuse angle is sure to serve the purpose of a Lister's hook. Whenever instruments are used bleeding in a common complication obstructing a clear view inside and one has also to be very careful not to injure the tympanic membrane especially when the patient is given an anaesthitic.

Foreign Bodies of the Nose:—These constitute the same kinds of F. Bs. as those mentioned for the ear. Young boys take it a fancy to thrust in any thing like seeds, slate pencils, and pieces of paper rolled into a tube and think no more about them. Removal is easy on early detection by suitable instruments. The most common and handy instruments are a Director with a ear-scoop and a probe bent into a hook. It may often times be experienced that the use of a forceps is a failure in most cases. Foreign Bodies remaining for a long time set up a foul smelling discharge which is likely to be mistaken for Caries of the bone or some septic infection of the nasal sinuses. It may therefore be universally taken in majority of cases that a unilateral ozaena should always arouse a suspicion that it is due to a foreign body. A young boy of four years was attending my dispensary for a foul discharge in the nose on one side only with an occasional bleeding. After three or four days' daily syringing with antiseptic lotions a close examination revelaed some F. B. which after removal was found to be a fish bone. It is not understood how this could find a place in the nose. In another similar complaint in a child of three years decomposed paper was removed piece-meal. Maggots are not also uncommon and the writer had a few cases of which in one as many as twenty-two worms removed. These worms give a lot of trouble during extraction owing to their active movements. Few drops of CH Cl_3 are sure to kill them and fecilitate easy delivery. The chloroform may even be sprayed if a spray is at hand. Some F, Bs. which are hard and round shaped may well be pushed into the nose further and removed through the mouth especially when they are very deeply placed and the instruments fail to pull them out. In the case of children and young boys general anaesthesia is inevitable. Few inhalations will easily keep the patient under control.

Foreign Bodies in the Larynx:—These produce immediate alarming symptoms causing asphyxia with a black face and unconsciousness. The immediate treatment which any general practitioner should unhesitatingly do is Laryngotomy which results in immediate relief. Extraction of the foreign body may be difficult unless by expert surgeons.

Foreign Bodies of the Throat and Oesophagus:—Children swallow by mistake coins, buttons, pins, slate pencils, and safety pins. Large masses of solid food occasionally get fixed in the Oesophagus, but most commonly the foreign body is a fish bone. It is not an uncommon thing to happen that an artificial tooth plate may slip back into the throat and cause obstruction. The pieces of broom sticks used for stitching leaves to serve food very commonly go into the throat along with morsels of food. Stammerers accustomed to use marbles for relief of stammering sometimes unknowingly swallow them. Pick pockets when found and caught red-handed have been

reported to have swallowed soverigns. Some adults even educated, are in the bad habit of keeping pins in between the teeth which may slip into the throat and such a habit should be condemned. Small smooth and round shaped foreign bodies may directly pass the Oesophagus and enter the stomach and finally thrown out along with faeces. Bigger and irregular shaped bodies or those sharp pointed are likely to be obstructed causing difficult deglutition.

Treatment:—Probang and coin catcher is the very serviceable instrument in these cases. Either push down the foreign body if you are sure that it will pass through the stomach and intestines considering its size and shape or if the foreign body happens to be one that can be easily digested in the stomach like a piece of meat; otherwise one should try to bring out with the coin catcher. Sharp pointed bodies which are likely to damage the underlying surface should not be pushed down. Occasionally localisation with x-ray and Major Surgical interference may be necessary. It must be remembered that a foreign body impacted in the Oesophagus is a grave condition owing to the rapidity with which ulceration is set up leading to Media stinitis and septic pneumonia. Few years ago a child of ten months was brought to me with a foreign body in the throat causing difficulty in suckling. The history was that the mother placed before the child for playing purposes one of her ornaments, a silver coil used for the toes and the child put it into the mouth and this got stuck up in the Pharynx. Unfortunately one of the sharp ends of the coil pierced through the wall of the pharynx and got entangled there by. The foreign body could be clearly seen and felt completely blocking the throat. Attempts to remove it with fingers were a failure since a definite catch was slipping. Coin catcher was useless being bigger in size for the throat. No other instrument was serviceable. After trying for nearly for half an hour both with and without chloroform I had to devise an instrument with an ordinary cycle spoke. The latter was bent at one end into an acute curve, the spoke itself being arched to fecilitate easy administration into the throat. The hook like curve was made to catch the foreign body and with finger manipulations it could be removed and the life of the baby saved. In another case which was some time ago demonstrated at a meeting of our District Medical Association an adult male happened to swallow a tooth stick about five or six inches long. It is a matter for surprise how the patient managed to keep quiet without the least discomfort for a period of six months, even forgetting the accident, by which time one end of the tooth stick which was piercing through the anterior wall caused an abscess which was pointing on one side of the upper part of the neck. The abscess was opened and to the surprise of the surgeon the long piece of the tooth stick with its brush end on the other side was pulled out. Another case of a similar type with a tooth stick which directly entered the

stomach was also demonstrated. The patient was not feeling any pain or discomfort in the abdomen. A laparotomy was done in the District Head Quarters Hospital and the foreign body removed.

Foreign Bodies in the Urethra and the Vagina:—These are also possible though rarely met with. Children and young boys introduce broom sticks, slate pencils and pins. Urinary calculi some times get lodged in the anterior urethra or the meatus. In all these cases removal is generally with a pair of long forceps. Some times when the foreign body cannot be extracted with forceps or finger manipulation, cutting open the urethra may have to be undertaken. In the case of pins with their heads lost removal is easy but when the heads are introduced first difficulty is encountered to catch it with foreceps and one has to make the point pierce through the skin out and pulled as far as the head and then pushed back with the head forward which then fecilitates easy removal. Urinary calculi may have to be crushed into pieces before removal especially when their size is large.

Hair pins introduced into the Urethra by some young ladies easily slip back into the bladder the female urethra being very small. These cases do not seem to be common in our country. Treatment is dilatation of the urethra to its maximum under a general anaesthtic and introducing a finger, the foreign body manipulated to a convenient position and then extraction with a pair of forceps.

I quite well remember three cases of young boys brought to me to my dispensary from long distances for not being able to pass urine or faeces, with a big distended abdomen. Thinking that constipation was the primary factor responsible, treatment was aimed at it in the first case with no benefit and it was not until an unsuccessful attempt to pass a catheter which was obstructed half way, that I found urethra was the seat of mischief, being blocked by a stone. In the second case two stones were lying one in front of the other causing obstruction while the third was having the stone in the meatus which could be easily crushed and removed.

Little girls unfortunately prefer to keep away their playing articles and hide them in the vagina, in the same way adults keeping letters and covers in their petty-coats. More commonly they wantonly introduce them without knowing the consequences with the result ulceration is set up and a discharge some times very foul smelling, starts according to the nature of the foreign body In the year 1930 I was called on to see a girl of seven years for a complaint of Leucorrhaea of three months duration. Previous treatment with tonics and vaginal douches was a failure. I somehow took a curiosity to thouroughly examine the seat of mischief and found to my surprise a foreign body quite decomposed and emanating foul smell which after removal piecemeal was detected to be a groundnut with its outer shell also. The removal was attended with stoppage of the

discharge from the next day. The girl never revealed this fact to her parents all these months.

Foreign Bodies in the Rectum:—Mere scybalae some times play the part of foreign bodies and also faecal concretions. Some varieties of vegetable seeds which cannot be digested are swallowed and they pass through the whole alimentary canal and get packed up at the rectum and cause absolute constipation. The whole calibre of the rectum and Sygmoid colon with all its capacity to dialate is tightly packed with these seeds. I have seen a fairly good number of cases both in young people and adults. The foreign bodies constituted the seeds of prickly pear fruit, and those of raw unboiled cholam and ragi. The anus was dilated to its maximum and did not allow a finger to enter the rectum. The abdomen was bloated and the patient much exhausted with pain and discomfort, quite unable to walk, and with sweatings on the face. Scraping with a scoop at first and then with fingers and finally finger removal assisted by water enemata removed one or two small basinfulls amounting to roughly two seer measures. Subsequent haemorrhage is common and can be stopped easily. A year ago one robust well built adult of fifty years was brought to my dispensary in a state of agony and unbearble pain with restlessness and discomfort in the region of anus and rectum which it seems has come all on a sudden while attempting to pass his usual motion. Defaecation was not possible and aggravated his suffering. On seeing through a rectal speculum an irregular foreign body of a big size was found transfixed at the lower end of the rectum which was removed with a pair of forceps, of course under general anaesthesia and it was found to be a piece of unripe mango used for pickles with its hard seed nut. The patient admitted having swallowed it entire which, he said, he is generally in the habit of.

Foreign Bodies impacted or imbedded in deep tissues:—These include thorns of various plants and trees, iron nails, needles and pins and broken pieces of glass. Hands, feet and legs are the common parts exposed to these accidents. Extraction is by incision over the part and by disection. Difficulty and even failures may be experienced in some cases in successful removal depending on the nature of the foreign body, the part it enters, and where and how deep it lies. Localisation of these foreign bodies by X-rays may have to be taken recourse to occasionally. Pins and needles that have entered the bellies of big muscles invariably necessitate the use of an X-ray before any attempt to remove them, owing to the fact that they do not remain in one place but travel from place to place along the course of the muscle fibres owing to their contractile actions. Some varieties of thorns show a tendency to cause very severe and unberable pain and others set up inflammation and diffuse cellulitis, and later on leading to suppuration; while peculiarly few

thorns are found remaining in the tissues for months and even years causing minimum or no inconvenience to the person. Those piercing through and entering the joint cavities are attended with very serious complications of joint infections and septic synovitis, with all the attendent symptoms of pain swelling and fever and immobility: incidents have resulted in a permanent, complete or partial ankylosis. Diabetics always fare very badly with these injuries and extreme care is needed on the part of the attending surgeon during treatment. A thorn enters the sole of the foot and points through the skin of the dorsum with or without piercing it, and the easiest and best way to remove is not by cutting through, but by pushing it further till a sufficient length of it appears on the other side to enable a firm catch by the forceps when it can be easily pulled out. Occasionally some foreign bodies may break into pieces in attempts at extractions and then a further and careful disection may be needed; or a few cases may have to preferably be left alone for chances of suppuration which makes their removal easy. Once it has happened that a young boy was chased by a group of Bees as a result of a stone pelted at them resulting in multiple bee stings through out the entire surface of the body not sparing any part. The boy was brought in an unconscious condition which was attended to immediately. Subsequently F. Bs. as many as some hundreds of these stings, which are the pointed ends of the tongues of these flies.

F. Bs. like bullets etc., lodged in deep tissues and entering vital parts like the chest, abdomen and the skull require major surgery and so they are not dealt with in this article.

REDUCED TEMPERATURES IN SURGERY OF LIMBS.

BY FREDERICK M. ALLEN, M.D.

The principle of local tissue refrigeration as applied to the extremities appears to have definite and valuable surgical applications. This spectacular novelty must still have its value tested, its limitations defined and its technique developed before it can receive an established status. This therefore represents a preliminary report.

Experimentally, in order to study conditions of inadequate circulation, observations were made on tissues deprived of all blood supply by a tourniquet. The essential finding was that the modification of local metabolism by temperature enormously influenced the survival, from a few hours or even minutes at elevated temperatures

to 54 hours at a temperature near freezing. It is noteworthy that during 54 hours of refrigeration the blood did not clot, the vessels did not thrombose, and the skin and other tissuesremained fresh and intact. Paralyses and other nerve injuries were either prevented or minimized by cold. Both primary and secondary shock were abolished by a suitably low tissue temperature. No attempt was made to attain a maximum time limit.

These facts are therefore applied clinically for amputations and other procedures. We use a tourniquet consisting of 2 turns of a rubber tube applied tightly enough to stop all blood flow to the part. Clinical experience thus far has shown no signs of serious or lasting damage to the most arteriosclerotic diabetic vessels by constriction up to 5 hours at a temperature near freezing. The technique of refrigeration consists in first surrounding the limb with a few ice bags at the level chosen for the tourniquet. The thinnest and most flexible pure-gum bags should be used, and 3 to 5 teaspoonfuls of salt added to each. Within 5 to 15 minutes, the skin is chilled so that the application of the tourniquet may cause scarcely any discomfort. If the limb contains any important amount of non-infected blood it should be elevated to drain out as much as possible before application of the tourniquet. Temperature readings of slightly above or below 5 degrees C. assure the desired combination of adequate chilling and safety against actual freezing. An ordinary laboratory thermometer inserted between the skin and the ice bags will suffice for the readings.

The time required for complete through-and-through anaesthesia varies with the depth of the tissue. It may be as short as 1 hour for an emaciated shin or as long as 5 hours for a rather thick thigh. The anaesthesia produced by this local refrigeration is not merely limited to nerve tissue for it introduces a new conception of anaesthesia of protoplasm. Apparently, refrigeration inhibits all protoplasmic activity including the shock response. Thus for the first time the surgeon has the opportunity of working in a bloodless and shockless field. As an anaesthetic agent, this offers a radically new approach to the ideal of accomplishing an operation while maintaining a constitutional condition as if there were no operation.

In the operating room the limb is removed from its nest of ice bags, prepared and the operation carried out in routine fashion. No extraordinary haste is demanded. The chilled tissues remain cold during an ample time for an ordinary operation. For a long procedure the limb may be kept on a bed of ice bags. When all is in readiness for closure of the wound, the tourniquet is released. Circulation returns promptly, in a degree proportioned to the existing arterial supply, and bleeding points can be caught and ligated. The anaesthesia then continues at least long enough for convenient completion of suturing.

The guiding principle of after-care is to reduce the temperature to whatever extent may be necessary, but to raise it as fast and as far as may be safe. In cases with adequate circulation, the temperature can be returned to normal immediately. By means of temperature regulation, a number of difficult post-operative problems may well be solved. When there are threatening signs of loss of vitality in wound flaps or mutilated tissues the local tissue metabolism may theoretically be reduced to a level for which the existing blood supply is adequate. Our experience indicates that such control can actually be maintained during a critical period until circulation improves

If operation, shockless in itself, has left damaged tissues which may set up post-operative shock, especially in a weak patient, the danger period can be bridged by temperature control.

A fundamental problem of surgery is created by the tendency of wound edges to agglutinate and thus seal up collections of fluid which are liable to become decomposed or infected. If such a situation threatens, the wound margins may be kept healthy and in close approximation, yet not sealed, by simple local refrigeration. Discharge may continue abundantly, and yet it cannot decompose or become infected because enzymes and bacteria are checked by the low temperatures. This remarkable washing of the wound with fresh exudate offers a new solution to the drainage problem. By raising the temperature at any time the wound margins can be made to agglutinate within a few hours, and the exudate assumes the usual character or ceases.

In cases of spreading thrombosis extending rapidly up a limb and entailing a correspondingly rapid gangrene, refrigeration will suffice to preserve the vessel wall, inhibit the clotting process, retard bacterial activity, and preserve the tissue already partially deprived of its blood supply.

There is as yet no proof that refrigeration can reduce the statistical mortality from diabetic gangrene, or that it is superior to other operative methods in cases permitting of free choice. We are convinced that refrigeration can reduce this mortality by reducing the number of enforced major amputations as well as by making them more easily borne. In desperate cases where an amputation might prove fatal, the limb can be left packed in ice for several days. This simple procedure will often transform both local and general conditions, and may check pain and the advance of sepsis. The time for amputation may thus be deferred until the patient's condition will withstand the procedure.

On the other hand we have observed instances of a severe process continuing to advance in spite of the attempt to reduce the tissue metabolism to correspond to the reduced blood supply.

Retention of a hopelessly infected leg may mean certain death, while amputation often carries extreme risk from shock alone or from lowering of resistance to a beginning systemic infection. Here again refrigeration offers a valuable adjunct.

Refrigeration is applicable to other conditions not handicapped by senility and arteriosclerosis. One of the strongest reasons for presenting this subject at this time is its apparent value for war wounds. Efficient chilling with the aid of a tourniquet prevents or minimizes shock, infection, and local gangrene. The transportation of the wounded can be made entirely painless as far as limb injuries are concerned. The wounded may arrive at a hospital after several hours, ready for an immediate operation without any additional anaesthetic. Bacterial growth and invasion has been held in abeyance until thorough debridement and cleansing of the wound is possible. The preservation of tissue together with suitable temperature reductions in the post-operative care, should facilitate conservative and reparative operations and avoid many crippling amputations.

Embolism of a main artery is one of the conditions in which warming a limb is most disastrous. Reduced temperature can aid in survival until collateral circulation has a chance to develop or embolectomy can be performed. The time limits for embolectomy can thus be extended and the results improved.

("*American Journal of Surgery*," *May, 1941.*)

DIAGNOSTIC STERNAL PUNCTURE.

BY N. WHITAKER.

Examination of the bone-marrow first became a simple and safe diagnostic procedure with the introduction of the Salah sternal puncture needle in 1929. Previous to this the bone-marrow of both the tibia and the sternum had been examined during life by more complicated methods of trephining. The twelve years that have elapsed since then should enable an assessment of its diagnostic possibilities to be made.

The sternal marrow remains active throughout life, and its composition has been shown to be representative of the bone-marrow as a whole. The Salah needle consists of a stout needle bevelled at the end and fitted with an adjustable stop to prevent it slipping and penetrating too far. The puncture is made opposite the third or fourth interocstal space just to the side of the mid-line. The

skin at this point is shaved, if necessary, sterilized with spirit and anaesthetized down to the periosteum with novocain. The stop on the needle is fixed at 1.5 cm. and the needle is inserted as far as the bone and on through the outer table of the sternum. The resistance of the bone then ceases and the needle sticks out by itself and its point is in the marrow cavity. Suction is made with a syringe until marrow just appears in it. Several smears are made and the slides stained in the ordinary way with the Romanowsky dyes. Pain is only felt at the first prick of the anaesthetic needle, when the periosteum is anaesthetized and when marrow is sucked out. The pain is slight that no premedication is required.

The material obtained is a mixture of blood and red bone-marrow. Examination of the smears shows ordinary red blood cells with a large number of nucleated cells. These are of two types, adult granular leucocytes, lymphocytes and monocytes with their parent cells as far back as the most primitive types, and also the nucleated precursors of the adult red cells. The earliest generations of the parent cells of all types are two to three times as large as the mature adult cell, and have a basophil cytoplasm. It is possible to differentiate these cells into their respective types by the morphological characters of nucleus and cytoplasm as far back as the first generation after the primitive stem cell The primitive stem cells are so rare that they do not confuse the picture. The later generations are quite characteristic as soon as granules have developed or the cytoplasm is haemoglobinized.

The bone-marrow reacts to iron deficiency by an increase in the number of nucleated red cells. Normally there are about twice as many white cells as nucleated red cells in the bone-marrow, but in this condition there may be equal numbers, or a majority of nucleated red cells in the severer cases. These vary only slightly from the normal in type and the predominant cell is characteristic. It is a small, mature normoblast with an irregular outline and only a small rim of partially haemoglobinized, slate-grey cytoplasm. After the administration of iron the more primitive, basophilic forms of nucleated red cell predominate and the mature normoblasts are quite normal in type. This picture occurs only in response to iron deficiency, but no clue is given of the cause of the deficiency, whether it be bleeding, malabsorption or malnutrition.

In pernicious anaemia the characteristic cells of the bone-marrow is the megaloblast. This is a large cell about three times the size of an adult red cell in its most primitive form and about one and a half times the size of a red cell when fully haemoglobinized. The nucleus has its chromatin arranged like the spokes of a wheel. It is still a controversial question whether the primitive megaloblasts are the normal first generation of nucleated red cells or represent a pathological mode of red cell production. Megaloblasts

are present in the normal bone-marrow, but in 500 cells there are never more than 2 per cent. In pernicious anaemia they form 10 per cent. and upwards of 500 cells, and they are the more numerous and the more primitive, the more severe the disease. During spontaneous remissions of the disease their number falls to about 3 or 4 per cent., but they are always present. In therapeutic remissions these cells disappear and are replaced by the normal series of nucleated red cells. The changes described are so characteristic as to be diagnostic of "liver deficiency." This makes sternal puncture the easiest and quickest way of confirming a suspected diagnosis of pernicious anaemia. The changes described have also been found in all other anaemias which can be cured by the administration of liver, namely sprue, idiopathic steatorrhoea, the megalocytic anaemia of pregnancy, tropical megalocytic anaemia, *Dibothriocephalus latus* infestation and conditions which disturb absorption in the intestine. A similar condition of the bone-marrow has been described in achrestic anaemia.

Aplastic anaemia shows no characteristic changes in the bone-marrow save that the marrow is very difficult to obtain, and when obtained the number of cells of all types is very few. These findings are not diagnostic, and in any particular instance may be due to faulty technique. Haemolysis does not involve any pathological change in the marrow and the spheroidal cells of acholuric jaundice have no pathological parent cells in the marrow. The anaemias of Bright's disease and of chronic infections show no specific change in the bone-marrow. The bone-marrow changes in the anaemia of scurvy are very similar to those of iron deficiency anaemia.

Among the white cells of normal bone-marrow the more adult forms predominate and the majority are parents cells of the granular leucocytes at a stage after the granules have appeared, so that their differentiation is simple. The lymphocyte series form about 10 per cent. of 500 cells and the monocyte series not more than 1 per cent. In leukaemia the cells of whatever series affected increase in number at the expense of the remaining cells of the marrow, and the more primitive forms predominate. These changes are parallel with those of the circulating blood, but at a more primitive level. It is possible to distinguish between all types in the first generation after the primitive stem cell by their morphology.

Chronic myeloid leukaemia is a disease with such characteristic clinical features and such a typical blood-count that there is no difficulty in diagnosis. Difficulty only arises when the white cell count is not far above the normal figure and the cells are nearly all adult in type. Quite an appreciable proportion of all cases may have such aleukaemic phases and a number of cases are aleukaemic throughout their course. The bone-marrow in these cases will show a relative increase in the number of white cells over the number of

nucleated red cells, and these white cells will be predominantly primitive forms. Sternal puncture is essential to confirm the diagnosis in such cases. If there are many nucleated red cells in the blood-count myelosclerosis will be a possible differential diagnosis. It is usual to demonstrate the sclerosis by having an X-ray film of a long bone with a control bone of the same alongside. The results of this are not always diagnostic. The bone-marrow shows no characteristic changes in a sternal puncture smear in myelosclerosis, so the diagnosis is more easily made by this method. In acute myeloid leukaemia there are so many nucleated cells in the peripheral blood that it is difficult to be sure that the material obtained by sternal puncture is blood or marrow.

In lymphatic leukaemia the bone-marrow is almost completely replaced by cells of the lymphocyte series, predominantly primitive in the more severe cases. The clinical forms of this disease vary considerably, and confusion with Hodgkin's disease, lymphosarcoma and other forms of glandular enlargement is easy. Sternal puncture is a valuable aid to diagnosis, especially when the total white count is low and there are no primitive forms in the differential blood-count. In the acute cases the difficulty of knowing whether the material is blood or marrow reduces its value. The other type of case in which sternal puncture is valuable is that in which specific cells are found in the marrow. Thus the diagnosis of multiple myelomatosis is confirmed by finding plasma cells in bone-marrow smears. Carcinoma cells can also be found in cases of generalized carcinomatosis of bone or of local metastases in the sternum. Sternberg giant cells have also been described in sternal puncture smears in Hodgkin's disease, but gland biopsy is a better method of diagnosis, as this depends rather on the histological architecture of the gland than on the finding of cells. It might be that the parent specific cells of the platelets would be increased as a response of essential thrombocytopenia, but in those cases which have been examined there is sometimes an excess of megakaryocytes, and sometimes an almost complete absence of these cells. This is not important from a diagnostic point of view, as the diagnosis depends on the low platelet count in the blood.

Finally, in some tropical diseases the causative parasite can be found in the bone-marrow when it is absent from the blood. These are malaria, kala-azar and relapsing fever.

—(*University College Hospital Magazine.*)

Extracts.

GOLD INJECTIONS IN THE TREATMENT OF ARTHRITIS.

BY DORIS M. BAKERT, M.D., M.R.C.P. (Eng.)

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Selection of cases. The type of case in which the treatment is useful is a patient suffering from infective or rheumatoid arthritis. Still's disease or rheumatoid arthritis in children may also benefit. It has been found of no value in osteo-arthritic or degenerative group, arthralgias, spondylitis of whatever type, climacteric arthritis, metabolic or gouty arthritis, gonococcal arthritis or rheumatism as it occurs in children. The stage of the disease is immaterial. Chronic cases respond more dramatically but an acute or subacute condition is no contra-indication.

Contraindications. These are disease of the kideney, cirrhosis of liver. purpura, primary anemia and agranulocytosis. It is probably unwise to give it in subjects suffering from urticaria, eczema or asthma though cases have been known in which it benefited both asthma and arthritis.

Before starting treatment septic foci should receive adequate treatment and any secondary anemia present treated by iron.

Toxic manifestations. These are skin manifestations such as pruritus, erythrodermia, morbilliform or pustular rashes or erythema nodosum; digestive symptoms, such as sore gums, stomatitis, nausea, vomiting or diarrhoea; nephritis; epistaxis, purpura and rarely agranulocytosis; conjunctivitis and corneal ulceration.

To avoid toxic symptoms patients should be repeatedly warned to complain of any and every unusual symptom and sign, for example skin irritation, metallic taste in the month, or a slight diarrhoea.

At the first sign of intolerance injections should be stopped and sodium thiosulphate (.06 gm.) ordered intravenously daily or on alternate days. Before giving an injection the urine should be tested for albumin. It is well to give a drink of glucose about 20 minutes before the injection of gold. At frequent intervals during the course the blood should be examined to see that the percentage of polymorphonuclear cells is adequate. Vitamin C & calcium are recommended as routine measures during the treatment. A raised sedimentation rate is an indication for a second or third course of injections, since it always indicates active disease even in the absence of signs.

Very little reaction is to be expected following the injection There may be a slight rise of temperature or an exacerbation of pain on the following day, and it is held by some, and with some justification, that this latter symptom indicates a favourable prognosis.

Patients should be warned that progress will at first be slow, after a few weeks a definite relief from pain and stiffness can be expected, movements will be freer, and the general health will show improvement in that there will be a gain in weight, improvement in the appetite, and a feeling of well-being. From this time on progress is usually steady and uninterrupted.

Action of gold. It has been demonstrated that following the injection the polymorphs become sensitized and very phagocytic. Gold is stored in the reticuloendothelial system and has a long range of action.

The dose is given weekly and by the intramuscular route, the buttock being the best site for the injection. The initial dose is generally a small one to test the patient's reaction. It is ideal to keep the patient in bed for the first four to six doses, but it is not impossible to give the injections while they are up and about. A course can be repeated more than once, but it is well to let six months elapse between each course. The patient's sedimentation rate and general condition should decide whether more gold is necessary.

It is essential for success to give in conjunction with the injections suitable physical treatment. General massage, together with passive and active movements, are useful while the injections are being given. When the course is finished, then Ultra-violet light can be added to the treatment, the carbon arc lamp rather than mercury vopour being the one of choice. During the course of injections sunlight should be avoided, as it appears to make the patient more liable to skin reactions.

In conclusion, gold salts are without question the most valuable therapeutic agent at present for the treatment of arthritis. It is admittedly a very toxic substance, but by giving small doses and possibly by administering other agents at the same time, the danger of intolerance can be greatly minimised.

(*Abstracted from the Medical Press & Circular.*)

ELECTRICAL CONVULSION THERAPY

BY A. M. WYLLIE, M.D. GLASG. D. PSYCH, MAJOR, R.A.M.C.;
Deputy Physician Superintendent of Chrichton Royal Mental Hospital, Dumfries.

The method of producing convulsion by electrical stimulation introduced by Cerletti and Bini in Rome has been used in this country by Shepley and McGregor, and by Fleming, Golla and Grey Walter. In this hospital the author used the simple and inexpensive machine devised by Grey Walter. When this is used in a favourable case there is an immediate spasm of the muscles on pressing the shock button. The thighs are flexed on the abdomen, the arms are extended, and the facial muscles produce a grimace. A few seconds later the true tonic spasm sets in, often heralded by a cry and fixed staring eyes, with conjugate deviation to one or other side. The tonic spasm is essentially the same as that introduced by Cardiazol, but it is a little shorter in duration and less powerful. The veins of the head and neck stand out prominently, and the skin is red and congested, while eyelids close spasmmodically. The mouth, which is open at the beginning of the tonic stage, closes powerfully and there is tendency to bite the tongue. Carpopedal spasm follows with hyperextension of the fingers, and the arms are extended while the legs are flexed on the abdomen. Towards the end of the tonic stage the legs are fully extended. "Goose-Flesh" is often present. The clonic stage follows and the Colour becomes livid. When the clonic jerkings settle down, respiration is spontaneously re-established, there is a short period of hyperpnoea, and the patient quickly returns to consciousness. This description belongs to the majority of cases, but each patient has his own individual reaction. A few patients were extremely restless and difficult to control for 5 to 10 minutes after the fit. In many cases it was necessary gradually to increase the impulse in intensity and duration as the course progressed in order to secure a complete reaction. Treatments are given thrice weekly at first then twice weekly, according to the patient's progress.

It has been claimed for this treatment that the amnesia is complete and fear of treatment consequently eliminated. In the author's experience the amnesia is deeper than with cardiazol or triazol, but fear is not eliminated although it is diminished. Most patients who were sufficiently intelligent to express an opinion disliked the treatment; some hated the "going off" and others the "coming round." Nevertheless appreciating their own rapid improvement, most of them were fully co-operative. One patient who had triazol shortly after a course of electrical shock referred to electrical therapy as "the nice treatment" and triazol as "the bad treatment." Some of the schizophrenic patients resisted being brought for treatment—

partly from general negativism—and so did some resistive melancholic patients. Among the melancholics, however, it was noticeable that resistiveness diminished as the treatment progressed and the patient improved.

The patients recovered quickly from the fit and after a period of convulsion lasting 10 to 30 minutes were able to be up and moving about. Many complained of headache on the evening after treatment and a few vomited. Muscular pains a constant feature of cardiazol triazol therapy—were rarely complained of, only three patients being affected in this way. No. features or dislocations occured in this series but among patients since treated there was one compression fracture of the spine and one dislocated shoulder.

In nearly all cases amnesia was complete for a period lasting from a few seconds before the impulse till 5 to 10 minutes afterwards. Even when a major convulsion was not produced amnesia was complete—an important difference from cardiazol and triazol therapy. An ineffective injection of these drugs often causes fear and apprehension and produces resistance to treatment; failure to produce a major convulsion by the electrical method does not in any way prejudice the continuance of the treatment. After an incomplete reaction the patient recovers quickly and can walk away from the treatment couch. Several patients complained of disorder of memory distinct from the amnesia covering the period of the treatment. There was a transient retrograde amnesia of a batchy type and a retention defect; these memory symptoms were more severe than those following cardiazol or triazol therapy.

Results. Twelve cases of involutional melancholia were treated; three recovered and were discharged; two recovered and are convalescent, one of these being a women of 56 who had been ill for more than 12 months, and the other a woman aged 59 who had been ill for more than 2 years. Six chronic cases showed improvement and another case improved but relapsed. This recovery rate cannot be fairly compared with the spontaneous recovery rate, because the cases treated with selected as being severe and unpromising. Eighteen cases of schizophrenia were treated; only two had been ill for less than a year, of whom one recovered and the other recovered and relapsed and was transferred to the insulin department. Of nine chronic hebephrenic cases six improved and three showed no change. One psychopathic schizophrenic improved in behaviour although there was no essential change in her mental condition. Four chronic catatonics improved in behaviour and became more amenable and sociable. Two chronic paranoid cases improved, but suffered a partial relapse later. Of three patients suffering from manic-depressive psychosis two were melancholic and one manic; one of the melancholic patients, a girl of 24, recovered after six treatments, all which produce fits, mental

improvement being manifest from the first treatment. The other was a woman of 28 who showed only slight improvement after each effective treatment: she had high threshold and only three out of eight treatments were effective in producing major convulsions; triazole was substituted with immediate success in bringing about recovery. In one case of long-standing involutional melancholia (17 years duration) in a woman of 64, and in two cases of senile melancholia in women of 65 and 67, the patients were restored to a condition in which they could enjoy their lives and take an interest in affairs. A woman of 34 suffering from a severe psychoneurosis with suicidal and hysterical tendencies recovered and relapsed, and is still under treatment.

Discussion. Electrical therapy, besides producing less fear than cardiazol or triazol, has other advantages over them. The spasm is not so severe—hence fractures, dislocations and muscular pains are less common. A second fit rarely follows the first and hence there is no risk of the patient passing into status epilepticus, though one of my patients (treated recently and not included in the series) has a second seizure an hour after the first. Long courses of injections of cardiazol or triazol may damage the vital organs such as the kidneys and heart but there seems to be no objection to giving short electrical courses of three or four treatments twice, thrice or four times yearly to patients who recover or partially recover and then drift back again. In this way many patients can be maintained at an improved mental level. Nor does administration of electrical treatment depend on the existence of suitable veins. Finally if electrical treatment fails to produce a major convulsion, the patient is not upset or resistive to further treatment, as often happens after an ineffective injection of cardiazol.

The amnesia for the actual treatment is complete, so it is desirable that the patient should be maintained in ignorance of what happens while he is unconscious. Such words as "fit" "convulsion," "electrical shock," are best avoided in the patient's presence. "Electrical treatment" would lead to confusion with ultraviolet therapy. We have, therefore, referred to the treatment as "Cerleti's treatment."

The retrograde amnesia is more severe than that which follows cardiazol therapy and is associated in some cases with disorder of retention. The cases which the author has so far studied have recovered their memory after a few weeks, which suggests that the memory disorder implies no permanent damage to the mental powers. The question merits further observation.

(*Lancet.*)

SOURCE AND PREVENTION OF SEPTIC INFECTION OF WOUNDS.

BY R. HARE AND REBA E. WILLITS, TORONTO.

Hare and Willits studied cases in emergency departments with the view of determining the source of the hemolytic streptococcus responsible for wound infection and its possible prevention. The study indicates that at the time of infliction the wound is probably not infected, for the air, the projectile, the soil and the dust, the clothing and the skin of normal persons are normally not significantly infected with these organisms. Of 244 wounds examined soon after infliction, only I was found to have hemolytic streptococci in it and the strain was a member of group H which is usually not pathogenic for man. This wound did not become infected. All wounds must be considered susceptible of infection until actually healed. Eighty of the 244 wounds were re-examined later (as far as possible forty-eight hours after infliction); 4 were found to harbor hemolytic streptococci (Streptococcus pyogenes), 3 were acquired within forty-eight hours, but in the fourth they were absent on the sixth day but present and causing clinical infection on the tenth day. Numerous workers have found that 8.7 per cent. of wounds examined from one to three days after infliction had hemolytic streptococci, whereas in from four to twelve days the percentage was 18.5 and after from thirteen to forty days it was 20. Thus Streptococcus pyogenes is not present in the majority of wounds at the time of infliction but is of exogenous origin. The exogenous sources are two: (1) the nasopharynx of patients, convalescents and carriers and (2) pyogenic infections. The importance of the throat carrier or contaminated air from suppurating lesions has the source of many varieties of hemolytic streptococcus infection has been demonstrated by many workers. It is highly probable that infection of wounds by Streptococcus pyogenes expelled from the nasopharynx of the patient himself, from an attendant or indirectly by their hands are the most important avenues, for during such time casualties are not likely to have any contact with an actively suppurating infection. Once in the hospital the same sources may still be responsible, but another menace is added; suppurating wounds of other patients in the ward. The authors state that the majority of their staphylococcic, infections were of exogenous orgin. No less than 68 per cent harbored staphylococcci, but of 67 strains examined only 13 were found to be Staphylococcus aureus. The remainder can be considered as not pathogenic. The clean wounds of 4 patients examined soon after inflication become infected with Staphylococcus aureus between the first and succeeding examination. For preventing infection of wounds the obvious method is the wearing of an efficient mask by all who come in contact with the wounded. If the wearing of masks is not feasible the operator must refrain from speaking,

coughing or sneezing. For the control of infection by indirect transfer by hands, clothing and the like, it is advisable that the bare hands should at no time come in contact with open tissue without suitable treatment: clean sterilized gloves should be changed for each case, unsterilized gloves washed thoroughly with soap and water and dipped in antiseptic of adequate strength or the hands should be well washed with soap and water. The latter alone may suffice to cleanse them of hemolytic streptococci, but it is doubtful whether they will be free from Staphylococcus aureus. The use of handkerchiefs as an emergency dressing should be forbidden, as those of nasoyharyngeal carriers have been shown to be contaminated. The transfer of organisms to a wound from a nasopharyngeal carrier not in direct contact with the patient is by air pollution. Therefore all such patients should be examined bacteriologically and if necessary, isolated in order to guard against this source of infection. An infected wound may be due to the organisms from a nasopharyngeal infection in a patient preceding another on the operating table. The nasopharynx of the wounded man with a suppurating lesion and his bedclothes, skin and dressings should be looked on as potentially infective for other persons. Nurses can decrease air pollution by carefully folding and placing dressings in a covered receptacle at once and by disturbing the bedcloths as little as possible when making beds. Blankets, sheets, pillow cases and bedspreads should be carefully rolled off and as carefully rolled on again. Dirty sheets and other bedding, with as little shaking or disturbance as possible, should be placed into some suitable receptacle. Sweeping and dusting should be done only after a moist or oily dressing has been applied to keep the dust down.

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CONTENTS

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MODERN METHODS OF ANAESTHESIA*

BY DR. A. AZIZ,
Shujalpur.

INTRODUCTION.

Before the advent of anaesthetics, surgeons had to carry out surgical procedures in as short a time as possible—minutes or seconds—but Sir Humphry Davy, Sir James Simpson, Mr. Long and Mr. Morton, have conferred a great boon on human beings by introducing the anaesthetics, after exhaustive researches in the field of anaesthesia, that has made it possible for the surgeons to undertake well thought out and lengthy surgical operations.

Anaesthetics may be divided into two classes—Inhalant and Non-inhalant.

Class I.—Inhalant anaesthetics are :—

1. Nitrous Oxide—(*a*) Pure. (*b*) Gas and Oxygen. (*c*) Gas and ether.
2. Chloroform—(*a*) Pure. (*b*) Chloroform Ether. (*c*) A. C. E. Mixture.
3. Ether.
4. Ethyle Chloride.

Class II.—Non-inhalant anaesthetics are :—

1. Intravenous Ether.
2. Rectal Ether.
3. Spinal Anaesthesia.
4. Local Anaesthesia.

In class I anaesthetics—the vapour enters the lungs with the inhaled air and is absorbed. The first effect is produced on the Nervous System. There is first stimulation of Vital Centres in the Medulla followed by depression.

In class II, anaesthesia is produced by bringing about general anaesthesia by injection of certain chemical substances into the circulation or local anaesthesia by injecting these drugs in the tissues surrounding the operation area when it temporarily paralyses the sensitive nerve endings.

*A paper read at a monthly meeting of the Ujjain Branch of the Gwalior Medical Association.

Spinal or Regional anaesthesia is obtained by injection of fluid within the nerve sheath or around the nerves supplying the area to be operated, the conductivity of the main nerve trunks being thus suspended.

Anaesthesia can also be produced by administering these anaesthesia drugs per rectum.

Preparations of the patient preliminary to anaesthesia—

1. *Feeding.*—Except in local or regional anaesthesia and in cases of emergency as well, the patient should be in bed at least 24 hours before operation. The diet during this period should be light and nourishing containing a larger proportion of carbohydrates, plenty of water with glucose should be given for drinking as a prophylactic against post-operative acidosis. In no case the patient should be starved as there is a danger in lowering the vitality to withstand the shock.

2. *Purgatives and Enematas.*—Brisk purgatives and repeated enematas are not advisable. In a patient whose bowels are acting regularly no purgative is required. If at all a purgative is required, it is better to give one ounce of Castor Oil the evening previous. Except in rectal cases no enema should be given on the morning of the operation.

3. *Mouth cleanliness.*—To free the buccal cavity from sepsis the loose carious teeth should be extracted out and an antiseptic mouth wash given and thus the post operative lung complications of septic pneumonias are avoided.

4. *Pre-operative medication.*—If ether by inhalation is the anaesthetic to be given, atropine 1/100 gr. should be injected half an hour before operation to diminish the secretion of respiratory mucus. In patients of nervous temperament and cases requiring prolonged anaesthesia injection of morphia gr. 1/6 greatly aids the anaesthetic. Morphia produces depression of respiratory centre and hence big doses should be avoided. In abdominal operations the surgeon wants deep anaesthesia and complete relaxation of abdominal muscles, therefore morphia should not be given for fear of respiratory depression.

The following points should also be kept in mind—

(1) See that the patient is comfortable on the table.
(2) Try to avoid the fear of anaesthesia by chatting with the patient and show utmost sympathy.
3. Take out artificial teeth.
4. Apply vaseline to patients face and eyelids and instruct him to keep the eyes closed.
5. Throughout anaesthesia perfectly free airway should be provided. If rubber airway is used it is of great help in obtaining free respiration.

6. The lower jaw should be kept forward by pressure above the angles and dental prop, mouth-gag and tongue depressor should be at hand.
7. There should be all quiet in the operation theatre.

Nitrous Oxide.—Anaesthesia is transitory but when it is combined with air or oxygen, a prolonged and even better anaesthesia is obtained and its toxicity diminished. The preliminary injection of morphia 1/4 gr. an hour before and another of scopolamine 1/150 gr. with atropine 1/100 gr. quarter of an hour before operation greatly aid the anaesthetic. This anaesthesia is commonly used in dental extractions, opening of small abscesses and other minor operations.

Chloroform—The following characteristics of chloroform are worth keeping in mind, while using it as an anaesthetic :—

(*a*) It is irritant to skin and mucous membranes.
(*b*) It is less volatile than ether.
(*c*) It is depressent to cardiac and respiratory centres.
(*d*) It is liable to cause sudden death and delayed poisoning as well. It is a more suitable anaesthetic for cases of bronchitis and pulmonary diseases. Chloroform is administered by—(*a*) Open Method. (*b*) Closed Method.

(*a*) *Open Method.*

Requirements.—1. Schimmelbusch's mask.
2. Graduated drop bottle.

The mask covered by a single layer of lint is held a little distance away from the patient's face and chloroform dropped. It is gradually brought near the patient's face till it is directly applied, at the same time increasing the frequency of dropping. The patient will pass through the following 4 stages:—

First Stage.—The respiration often tends at first to be rather shallow and irregular, slight pauses occur usually after an inspiration. Pulse is rapid from excitement. The eyes may be opened as the first stage progresses and the eyeballs tend to rotate. The pupils are large, but react sharply to light. Both conjunctival and corneal reflexes are present. The muscles are often rigid. In alcoholics and in very nervous patients, this stage is often characterised by struggling, shouting and breath holding.

Second Stage.—Onset of second stage is marked by regular deep automatic type of respiration which succeeds the shallow respiration of the first stage. The rate is generally increased. The pulse tends to become slower. The eyelids are closed and eyeballs at rest, looking slightly downwards. Pupil is medium in size and reacts briskly to light. The conjunctival and corneal reflexes are both lively. Relaxation of the muscles is not complete. For this reason, the second stage while sufficing for many surgical operations, is inadequate for an abdominal operation.

Third stage.—The third stage is that of deep surgical anaesthesia and is characterised by—

(*a*) Full, regular respirations.
(*b*) Colour not much removed from normal.
(*c*) Moderate size pupil which reacts to light.
(*d*) Conjunctival reflex absent.
(*e*) Corneal reflex faint or absent.
(*f*) Relaxed muscles.

Fourth stage.—Fourth or danger stage is that of over dosage and ia characterised by—

(*a*) The respiration is definitely weakened, may show occasional deep gasps.

(*b*) The pulse is small, irregular and rapid. The face is pallid or with respiratory failure deeply cynosed.

(*c*) There is often separation of the eyelids with eyeballs staring and glassy. The pupils are dilated, in severe cardiac collapse, widely so. Both conjunctival and corneal reflexes are absent. The muscles are flaccid.

(*d*) Cessation of respiration and circulatory failure are the final signs of over dosage.

The chief points to be attended to during administration are:—

1. Begin with a very dilute vapour.
2. The strength of the current is increased slowly and uniformly.
3. The drug should be added at regular intervals.

All these things are very well learnt by experience.

(*b*) *Closed Method.*—The most preferable apparatus is that of Junker's Inhaler. My procedure at J. A. Hospital was to make patients under, first by open method and to maintain anaesthesia by Junker's Inhaler.

Complications of Anaesthesia.—Death during chloroform anaesthesia, occurs from asphyxia or overdose or suddenly. The signs of overdose are cynosis, manifested by the bluish colour of the face, nails and tongue and by change of blood colour in the operation area from red to reddish blue. The pupils gradually become dilated and fixed, immediately followed by cessation of respiration. When signs of overdose appear, stop anaesthesia. The head should be lowerd, tongue drawn out and artificial breathing by Sylvester's method commenced. If heart has stopped then immediately inject Adrenaline chloride 1 c c. direct into the heart chamber and start cardiac massage.

Ether.—It is more volatile, therefore it is not a good anaesthetic for open method. It is at the same time inflammable and hence cannot be used in proximity to naked light and when operation is to be done by the help of surgical diathermy. When exposed to light it deteriorates and gives rise to impurities therefore it should

be stored in a dark and cool place. It should periodically be sent to Laboratory for examination before it is used. It causes more irritation of the respiratory passages. It is less depressant to heart than chloroform. Atropine injection should always be given before ether inhalation.

Methods of administration of Ether by inhalation are as below:—

(1) Open ether.
(2) Closed ether.
(3) Intratracheal insufflation.

(1) *Open Ether.*—To induce anaesthesia by this method a 16 layer-gauze is fixed in the Schimmelbusch's face mask and from the graduated drop bottle ether is dropped on different parts of the mask with gradually increasing rapidity. When the patient comes under effect of the drug, the mask is covered with a piece of Mackintosh to avoid evaporation and to increase the concentration of vapour.

Closed Ether.—In closed method, Ether is administered by Clover's Hewitts apparatus.

The disadvantages of ether inhalation by open method are:—

(*a*) Ether being volatile a large quantity of the drug is wasted as well as the total amount of ether cannot be estimated.
(*b*) Due to its diffusibility in the room the other inmates also suffer the unpleasant odour.
(*c*) Due to evaporation of ether the patient inspires a chilled air leading to complications of Bronchitis and Pneumonia. To avoid the chilled air, ether is administered by ether bombs placed in hot water chamber. It is found in practice that patients dislike the feeling of suffocation with a closely fitting face piece and therefore in such cases the mixture of chloroform and ether is advisable. The mixture consists of 2 parts of chloroform to 3 parts of ether. It is administered by the Open Method as mentioned above. The most popular instrument to administer ether and chloroform mixture is Shipway's apparatus.

The advantages of this method are the following:—

(*a*) In intrathoracic operations the lung collapse can be avoided by constant maintenance of positive pressure by the air blown into the lungs.
(*b*) The inspiration of the foreign bodies and blood clots can be prevented by the strong return current.
(*c*) In abdominal operations by providing a perfect air way, the abdominal respiratory movements are much diminished.
(*d*) Lastly it keeps the anaesthetist fairly away from the field of operation, in operations on the head, face and neck.

Ethyl Chloride.—Ethyl Chloride as an inhalant anaesthetic is gradually administered by a special mask manufactured by Messrs. Allen and Hanburry but at J. A. Hospital I was giving the same by ordinary Schimmelbusch's face mask. 2 to 3 c. c. is poured on the mask and the latter covered by a piece of Makintosh. Some 4 to 6 c.c. of the drug is used for a child while 6 to 8 c.c. for an adult. No fatal results occurred in my series. It is a good anaesthetic for short operations on the mouth and the nose, such as extraction of teeth and removal of Adenoids or Tonsillectomy by guillotine ; for opening abscesses, setting of fractures and reducing dislocations.

Sodium Evipan anaesthesia.—Lately this anaesthesia has come into disrepute but I can assure you that if proper precautions are taken it is quite a safe anaesthetic. Accidents are met with in faulty technique, either injecting too big a dose or hurriedly injecting the solution. In weak subjects one grm. is too big a dose. In such cases 0·5 grm. is quite sufficient to induce narcosis. It is contraindicated in cardiac derangement, Bronchitis and Empyema. In my series of about seventy cases not a single death occurred. The solution is prepared by adding 0.5 grm. or 1 grm. as the case may be to 5 c. c. or 10 c. c. of distilled water and thoroughly mixing the drug so that no particles float in the solution. The median cephalic vein is selected and when blood appears in the syringe, the solution is gradually allowed to run at the rate of 1 c. c. per 15 seconds, at the same time patient is asked to count or is engaged in conversation. There will be first a yawn and then snoring starts. The anaesthesia lasts about 10 to 15 minutes. It is a good anaesthesia for extraction of teeth and opening abscesses.

Drugs which do not produce complete anaesthesia but partial narcosis are called Basal Anaesthetics. They are :—

(*a*) Paraldehyde per rectum.

(*b*) Nembutal.

(*c*) Pernocton.

Rectal or Colonic Ether.—The mixture commonly used by Gwathmey is useful. It is 75 per cent. Solution of ether in Olive Oil. The patient is prepared in the usual way by a dose of Caster Oil the night before and a warm water enema next morning. Soap water should not be used because the ether gets emulsified in it. The patient is given the Morphia-Atropine injection half an hour before and taken to a dark room. About 8 oz. of 75 per cent. solution mentioned above is allowed to run in the rectum through a small apparatus consisting of a glass funnel, ¼ inch diameter rubber tubing and No. 8 rubber catheter. The solution is allowed to go in at the rate 1 oz. a minute. Narcosis occurs in about half an hour. The patient is then shifted to the operation theatre. When the operation is over the rectum is washed with warm water again. This anaesthesia has

been used also by me in cases of Rhinoplasty in the mofussil. It is also of great use in operations on nose, tongue, larynx and jaw.

Intravenous Ether.—The solution employed is ether one part and normal saline 20 parts. It can be given by the ordinary saline infusion apparatus. The vein in the bend of the elbow is selected and solution is gradually allowed to run just like saline injection. About 2 to 3 pints can be given to induce the anaesthesia. The method is valuable for patient already collapsed or when collapse is anticipated. The drawback lies in the cardiac embarrassment due to big quantity of fluid injected in this method.

Spinal Anaesthesia.—Analgesia results from the introduction of anaesthetising fluid into the spinal membranes. The fluid acts upon the nerve centres or nerve roots and thereby insensitiveness is produced in the region supplied by the nerves. Two kinds of solutions are used.

(1) Solutions heavier than the Cerebrospinal fluid such as Stovaine in Glucose and Pantocain in Glucose containing 5 per cent. of Glucose in 5 per cent. solution of the drug. (dose 1 to 2 c.c.).

(2) Solutions lighter than the Cerebrospinal fluid are (*a*) Percain (*b*) Spinocain (*c*) Novocain and (*d*) Stovain. Percain is used in strength of 1 in 1,500 with ephedrine gr. 1. It can be used for high spinal and low spinal as well, in doses of 6 to 10 c. c.

Spinocain is a combination of Novocain and Strychnine (dose 1 to 3 c c.) Novocain 10 per cent. solution in sterile water (dose 2 to 3 c c.) Stovaine in 10 per cent. solution of saline (dose 0·5 c.c.)

The favourite solutions used in J. A. Hospital are Pantocain Glucose amongst the heavier ones and pantocain simple amongst the lighter ones. They are locally prepared in the Laboratory and supplied to the operation theatre, in 1 c. c. and 1½ c. c. ampoules. These solutions were used extensively in a number of cases with encouraging results. In no case toxic results were noted and in about only 10 per cent. cases the post anaesthetic retention of urine was noticed. The fall of blood pressure was also slight, ranging between 5 to 10 mm , both in systolic and diastolic pressures before and after anaesthesia.

Method of giving Spinal Anaesthesia.—Position of the patient. Spinal anaesthesia is generally given in 2 postures, (1) Sitting position (2) Lateral lying position. The sitting position is preferable. The patient is made to sit on the buttocks at the edge of the table. The head is flexed along with dorsal spine and thus the intervertebral spaces put on stretch. The site of injection is between the 3rd and 4th lumbar vertebrae. The edge of sterile towel is held by the assistant lightly across the spines from the crest of one Ilium to the crest of another. The skin is cleaned with rectified spirit.—May and

Barker's spinal needle of small size is passed in the skin deep to the intervertebral space and thence to the theca. When there is a sudden loss of resistence and jerking of patient one is sure that the needle has entered the theca. Now the stylet is withdrawn and there will be free flow of spinal fluid. The solution in the syringe should be mixed with C. S. Fluid and then gradually injected. The puncture is sealed. High and low anaesthesia can be obtained by tilting the table. In rectal and perineal operations the patient may be asked to sit and in about 5 minutes anaesthesia is achieved. The signs of successful anaesthesia are –(1) Sensation of warmth and tingling in the feet (time 1 minute), (2) Analgesia of rectum, perineum and penis (4 minutes) (3) Paralysis of legs and analgesia to groin (5 minutes), (4) Analgesia to or above umbilicus (7 to 10 minutes. The average duration of spinal anaesthesia is about an hour.

The advantages and disadvantages of spinal anaesthesia are the follow)ng :—

Advantages.—(1) It is a good anaesthesia for mofussils where no assistant is available. (2) There is complete muscular relaxation. (3) Vomiting and straining are absent. (4) Nervous dread of general anaesthesia is avoided. (5) Postoperative shock is lessened. (6) It can be given safely in Diabetes, Respiratory diseases, Thyroid enlargement and Nephritis where general anaesthesia is contraindicated.

Disadvantages.—(1) It must not be used in old subjects with arteriosclerosis and Aortic diseases. (2) Sometimes bleeding occurs in the spinal membranes due to injury to a blood vessel by a faulty technique. (3) Rare cases of impotency are said to occur. There is toxaemia and headache in rare cases. (4) Pyaemia and local skin sepsis do not allow this anaesthesia to be given. (5) This anaesthesia cannot be given in Osteoarthritis of the spine and tumours of the membranes. (6) In very rare cases anaesthesia does not occur in spite of successful punctures but no such cases have been seen by me. (7) If the operation is prolonged this anaesthesia has to be supplemented by general anaesthesia.

Regional Anaesthesia.—Anaesthesia is obtained in the operation area by injection of anaesthetising fluid either in the nerve sheaths or in the neighbourhood. For this anaesthesia a sound anatomical knowledge is essential. It is a difficult form of anaesthesia because one has to dissect out the nerve to give injection and imparts extra risk of sepsis to the patient.

Local Anaesthesia —It is produced by infiltration of anaesthetising fluid in the neighbouring tissues of the operation area or by direct application of the drug to the mucous membranes or broken skin. The drugs used are :—

(1) Cocaine.

(2) Novocaine.

(3) Percaine.

(4) Eucaine.

(1) Cocaine 4 per cent. solution for eye. Stronger solutions cause erosion of cornea. In surgery of nose, throat and granulating wounds 5 to 10 per cent. solution is used. It should not be used to anaesthetise bladder and urethra for fear of absorption and poisoning. Cocaine gets decomposed by boiling and hence it is not suitable for infiltration use. (2) Novocaine is soluble in normal saline and can be boiled without any deterioration. This is used in strength of ½ per cent. to 1 per cent and 2 per cent. solution for tissue infiltration. 200 to 300 c. c. can be safely given. (3) Percaine is more toxic than Cocaine. It can be boiled like Novocaine without any change and the solution can be preserved for longer period. It is more effective than Novocaine and Cocaine. It is used well diluted in strength of 1 in 2,000. 300 to 400 c. c. can be injected in one time. The technique of injection is simple in local anaesthesia. The skin is first infiltrated with the solution by making a wheal then the needle is pushed deeper on all sides and injection made. Every time the needle is pushed deeper in different zones, the piston of the syringe is withdrawn to ascertain that it has not entered any blood vessel. Few fatal cases have occurred by injecting the fluid in the blood stream. Injection for local anaesthesia should never be made in the inflamed tissues Local anaesthesia is given at the place to be operated upon in conjunction with general anaesthesia to prevent shock.

Ethyl Chloride also produces local anaesthesia by freezing the skin and thereby blunting the sensation of pain.

Choice of an anaesthesia.—In selecting an anaesthetic, preference should always be given to a safer one. It is better for an unskilled man to give an anaesthetic with which he is familiar rather than otherwise.

Open ether is the safest of all and is extensively used in England and America Ether should not be given to children; and in cases of Bronchitis and other lung affections it should be avoided in adults too.

Chloroform is easier to give yet dangerous at the same time. It is a good anaesthetic in—(1) operations attended with pain, (2) operations where muscular action or spasm has to be oversome such as Reduction of Hernia, Reductions of Dislocation, Setting of Fractures, (3) diagnostic manipulation, (4) Parturition, (5) Spasmodic diseases such as purperal convulsions, Tetanus and Hydrophobia, (6) it is preferable in operations near the mouth, (7) when operation by diathermy is to be performed. Patients suffering from

chronic malaria or long standing sepsis are bad cases for chloroform. A. C. E. Mixture is more pleasant and easier to administer than Open Ether. It is less dangerous than chloroform.

Gas and Oxygen and Sodium Evipan are good anaesthetics for operations of minor nature such as extraction of teeth and opening of small abscesses. Spinal anaesthesia is best for operations of lower extremities and other regions below the umbilicus and some of the abdominal ones. Local anaesthesia is good for excision of small tumours and almost all the eye operations Nothing is more confusing for the anaesthetist than is the selection of an anaesthetic.

THE PRINCIPLES OF FRACTURE TREATMENT.

BY A. T. ANDREASEN, F.R.C.S., MAJOR, I.M.S.

INTRODUCTION.

No one can begin a talk on the principles of fracture treatment without a reference to those pioneers of orthopaedic surgery who by their unstinted efforts made possible the healing of the halt and lame.

The one, Hugh Owen Thomas, whose name has been brought down to us by a monument of his own making the Thomas splint — was the teacher and uncle of the other, Sir Robert Jones, the worthy disciple. They are of those whose memory cannot die, whose influence lives after them, whose gifts to humanity can be perpetuated and multiplied by their faithful disciples. It is good for us to remember the High priests of our Brotherhood, for it brings us to the greater side of this glorious thing we call our Profession — this sworn devotion to the Healing Art in the service of Humanity, the Hippocratic Oath which binds us all as priests of the Temple of Aesculapius.

I say it is good, therefore, that we remember these high priests whose example and teaching we are in duty bound to follow.

Hugh Owen Thomas,—a name laden with world renown,—belonged to a small delicate man of 5'4", with bright, intensely intelligent eyes, a penetrating regard, and the acutest power of observation. Hugh Owen was the son of Evans Thomas—a Liverpool bone setter and last of a long line of seven bone setters, believed to be endowed with special gifts of healing, but all entirely without medical education.

His ceaseless activity was his reputation in Liverpool, where, after studying medicine at Edinburgh, he set up in practice in 1857. An inventive brain and a remarkable mechanical intuition led him

to the invention of his splints. Entirely without guile he was always ready to show and teach his methods to anyone who paid him the compliment of listening.

His splints were originally invented for the treatment of tuberculous joints. Their use as fracture apparatus came later. Like a great prophet he ceaselessly preached his doctrine of prolonged and uninterrupted rest. In those days of routine excision of such joints he taught rest and non-interference, so began the new universal conservative surgery of tuberculosis.

He made his own splints; he preached and demonstrated his doctrine of prolonged rest and immobilisation, alike for diseased joints and for fractures; his splints were invented to allow of this principle being put into effect whole, at the same time, allowing the patient that necessary functional activity which is so often forgotten, to-day, when a Thomas' splint is applied.

The diciple of this man Thomas was his own nephew, He came to him Direct from his medical school, and from the master he learnt his work. No lesser man than Thomas was the disciple, for in the course of time he matured into a full mastership of his craft, which under the charm of his powerful and skilled hands, and by his personal indefatiguable effort gave us the science of orthopaedic surgery. Recently it has become the custom to speak of Fracture Surgery as if it was a science of its own. This is an illusion, for it is but a small department requiring a primary and vast experience of the mother science.

Robert Jones became the acknowledged Father of Orthopaedic Surgery throughout the world. Through the medium of the 1914-1918 world war, and the congregation of surgeons on and around the battle fields consequent upon that conflagration, the principles of this young branch of surgery were spread, the world's master surgeons being taught by the High Priest himself.

What were these principles? Were they a new discovery? To answer the last question first: There is a very little new in this world, it is only we who are ignorant, and, in our great ignorance puff ourselves up with pride, when we have rediscovered some old and much used wisdom of Nature. So with these principles,—they are not new. 3000 years before Christ the Egyptians treated fractures along "modern" lines using bandages with plaster of Paris.

There is one golden principle in the treatment of a wound of any tissue, *viz.*, perfect rest of the affected part, at the same time maintaining the functions of the whole.

We shall see how bone conforms to this general law of healing.

In order to understand and enunciate the principles of treatment of fractures it is essential only to review our knowledge of the healing of bone. All the facts required for us to state these principles

are to be found in the study of the condition governing the healing and growth of bone.

Bone, above all else, is a special form of connective tissue. Special only in that interwoven intimately into its cellular substance is a very delicately balanced physiochemical equilibrium of calcium and phosphate ions.

A fracture, therefore, is only a wound of connective tissue, and its repair will be by cellular growth of the same nature, in its general essentials, as that which characterises repair in all living tissues. It is clear, then, that the biological laws to which repair of all tissues conform are of the greatest importance in considering repair in bone. On our knowledge of these laws will depend any principle of treatment we may formulate. A thorough understanding of these laws is of greater fundamental importance for success in fracture work than any knowledge of the mechanics of splints. In other words we must seek for our principles in the field of physiology.

Let us take each step slowly and consider it, beginning with the histology concerned in tne repair of a fracture.

HISTOLOGICAL FEATURES.

Repair of granulation tissue—The histological picture of a healing fracture in its stage resembles that of any traumatic or inflammatory exudate undergoing organisation. The fluid lying between the bone-ends, under the periosteum and in the tissues around is blood,—a haematoma. This partly clots. Along the fibrin strands, so formed, rapidly advances a loose form of fibrous tissue of the cellular granulation type. This is hyperamic, being full of, and formed by, engorged dilated capillaries. These layers of granulation tissue grow out from each of the broken ends and completely resorb the haematoma. If the fragments are immobilised in apposition both layers meet and unite.

Repair of primary callus—Now fibrous trabeculae in the narrow cavity begin to be formed into early bone almost fill up the narrow cavity. The first stage of callus comes from the endosteum. A similar formation occurs beneath the periosteum where it has been stripped up. These bony trabeculae now invade the granulation tissue between the bone ends. Intermixed with this early bone formation is a good deal of cartilagenous tissue. The earlier hyperaemia now gradually disappears an increasing amount of calcification occurs. This rapid growth of a tumour-like mass of calcified cartilage, irregular bone and fibrous trabeculae, marks the end of the first stage of callus formation.

Final consolidation—At this stage a final structural arrangement begins to show signs of appearing. Lamellae of bone appear in the rather irregular mass of mixed tissue. These lie in the lines of stress and strain.

Under the periosteum resorption of the outgrowth of new bone takes place. In the marrow cavity resorption also takes place leading to tubulation and a reappearance of the fat and marrow cells usual to that space.

Usually, in about 12 months, the whole process may be so complete and perfectly carried out that the site of its occurrence cannot be determined, even histologically.

BIOCHEMICAL CONSIDERATIONS.

These histological changes must represent some very vast and remarkable chemical processes. What are these briefly? They are concerned mainly with the deposit and taking up of calcium, and the amount of that mineral available.

If the haematoma of a fracture be aspirated during the first week, and the fluid obtained analysed, it is found to contain a greatly increased amount of calcium and phosphates. An x-ray taken at the same time shows a decrease in density of the fractured bone ends. The calcium and phosphorus are apparently obtained from these bone ends. How then does this decalcification come about? There are two factors: The torn tissues liberate histamine and acetylcholine. These substances paralyse the capillaries and so account for the local hyperaemia. Bone always reacts to adjacent hyperaemia by decalcification.

Next, during the first fourteen days, the haematoma shows a marked acid tide. After fourteen days the pH swings over to the alkaline side of normal.

Now provided that the haematoma is not dispersed by operation or the introduction of metal plates or screws, which have their independent electro-chemical reactions, there is present a haematoma, supersaturated by calcium, invaded by granulation tissue and with pH well on the acid side of normal.

During the third and following weeks there is found the histological evidence already mentioned of calcification and bone formation known as callus. At the same time there is found a concentration of the enzyme phosphatase to twice normal values. Phosphatase is an active enzyme secreted by proliferating cartilage and osteoblastic cells and always found where bone formation is most active. It hydrolyses phosphoric esters and increases the concentration of phosphateions so that the solubility of calcium phosphate is exceeded, and the salt is deposited. The raised phosphatase concentration persists until the third or fourth month, the time when union of the fracture is usually complete, and then subsides to the normal level.

PATHOLOGICAL CONSIDERATIONS.

Hyperæmia of bone is always associated with decalcification, ischæmia with sclerosis. In osteomyelitis there is decalcification just so long as there is active infection and hyperæmia. When

this subsides, and hyperæmia with it, there is recalcification of the bone. Finally, as in all tissues the stage of repair is also essentially by fibrosis, but with a dense deposit of calcium in the close interstices of the scar, and hence the term sclerosis applied to the ultimate appearance of such a healed, wounded bone.

Such decalcification is seen to a similar extent even when natural infection of the bone has not occurred, *e. g.*, a septic finger, or in tonsillar infections which cause a hyperæmic decalcification of the atlas to such an extent that the transverse ligament loses its hold on the odontoid process of the axis: allowing dislocation of the atlas on the axis.

Similarly an injury to bone, or even a simple contusion, may cause decalcification by the traumatic hyperæmia set up. The same explanation accounts for the decalcification of bone occurring after a sprain.

In the case of a fracture which has been perfectly immobilised this hyperæmia lasts 10-14 days. If, however, the fragments are not immobilised sufficiently, the constant shearing and twisting strains tear the young granulation tissue, thus causing a series of small traumata, and with the trauma must come hyperæmia. This in its turn causes more and more decalcification, hence what was a crack becomes a cavity, a linear facture becomes a gap fracture.

This is the explanation of those cases which, X-rayed immediately after injury show no fracture, yet, after a month in a sling or with a bandage and Goulard's lotion. are still complaining of pain and swelling of the part. A further X-ray shows an obvious fracture; on re-examining the original radiogram a fine hair line fracture may be seen, which previously escaped attention.

If, at any stage, the fragments are perfectly immobilised, then decalcification at once ceases, recalcification commences and the fracture will heal. If shearing movements are allowed to continue indefinitely, fibrous tissue is laid down parallel with the fractured surfaces and there is no continuity of the fragments. It is a law of tissue growth that it grows in lines of stress and parallel to lines of shearing strain The law holds good in the case of bone. Healing by scar or fibrosis will always take place if nature can effect it, and hence in this case the recalcification and sclerosis occur not in continuity with the fragments but across their ends and non union is established.

From the foregoing remarks we can easily construct for ourselves what will happen in a compound infected fracture. The amount of hyperæmia resultant on the infection will cause a great amount of decalcification; this will not be repaired until the infection has been eliminated. Hence the early stages of repair may be very protracted. Only after perhaps months of struggle to overcome the infection will the fracture be in the state an ordinary simple

immobilised uninfected fracture would be in, ten days after the injury.

In the case of the infected fracture there may be wide gaps in the bone following these months of hyperæmia. These have to be filled in by granulation tissue and recalcified. This process will obviously take longer than the corresponding process in an uninfected fracture. Absolute immobilisation is even more necessary here, if that is possible, but under its influence even infected fractures usually unite finally by bone.

Rate of Repair of Fractures

In an ordinary average uncomplicated fracture there is continuity of granulation tissue in a few weeks, repair by ordinary primary callus in about two months, and consolidation of bone in three or four months.

Many factors modify this average rate of growth and repair. The power of growth is greater in an infant than in an adolescent and in the latter than in the adult and aged. A fractured femur in a day old infant will probably unite in one month; in a 15 year old youth, in two months, and in a 50 year old adult, in four months.

The various conditions of malnutrition, cachexia, etc., all retard repair. The type of fracture has some influence, the oblique unite more quickly and firmly than the transverse. Impacted fractures unite quicker than gap fractures. Even in patients of similar age, nutrition, with similar injuries, there are wide variations in the rate of repair. To believe that repair is necessarily abnormal because it is slower than the average is a fundamental mistake; a fracture cannot be called a case of non-union merely because it does not heal within an average number of weeks or months. Its progress may be quite normal although slow.

Vascularity and Repair.

Rate of repair depends almost directly upon the vascularity of the fragments. The rapid formation of the granulation tissue upon which the repair of any fracture depends, requires a very free blood supply for the first 8-10 days at least.

The blood supply of normal bone is derived not only from the main nutrient vessels but from many other vessels entering the cortex through capsules, ligamentous and tendinous attachments. At the end of the long bones in the region of the synovial reflections and joint capsules, there are scores of vascular foramina. Through these pass arteries and veins. In children this metaphysial area is more richly supplied with blood than any other region. In adults we know that fractures in these regions unite very rapidly and firmly, *e. g.*, neck of the humerus, supra-condylar fracture of the femur, etc. Non-union is of the greatest rarity in these parts.

On the other hand the lower third of the shaft of the tibia and the humerus are devoid of these foramina and depend mainly on the nutrient artery for their supply. Fractures in these regions will cut off the lower fragment from its blood supply, and, as we know, this is one of the common sites for non-union to occur. The formation of callus is slow. At operation in such cases the proximal fragment is seen to bleed freely, the distal one hardly at all.

A striking example of this relationship of rate of union and vascularity is seen in a case of double fracture of the lower end of the tibia, whose union occurred first at the junction of the proximal and middle fragments in five months. After eleven months of immobilisation the lower fragments were just showing snigs of commencing union.

If the blood supply is completely cut off from one fragment, for example, in fractures of the carpal, scaphoid and certain fractures of the neck of the femur, the piece becomes a vascular and undergoes slow necrosis. In the X-ray it is seen as a denser fragment.

A certain blood supply reaches the cortical bone through the medium of the muscle attachments of the periosteum. If this membrane is stripped up at these points, either accidentally, or by operation, a further source of blood supply is cut off from the bone.

NON-UNION

We have seen clearly that in order for healing of a wound of bone to take place, the ordinary requirements for healing in any tissue must be present until healing is complete. These conditions are perfect rest and a good blood supply. No one of us would dream of allowing a patient with a muscle wound to move the affected part until the wound was healed; we all know too well the consequences of lack of blood supply to the part For some reason it is not fully enough appreciated that the same conditions as apply to any other tissues, apply to bone; if anything, they apply even more strictly.

Throughout the foregoing physiological review of the process of healing in bone we have seen how the bone ends must be kept in contact, and at rest continuously, and how the least disturbance of these conditions results in tearing of the young granulation with resulting hyperæmia and further decalcification, and so a delay in the occurrence of union. We have only to use these physiological indications in order to formulate the one great principle of treatment in fractures: "*Every fracture must be completely immobilised without interruption until the fracture is firmly united.*"

Often another "Principle" is given in text books, before this one:—*i. e.*, "Displacement of fragments must be corrected to a position of apposition "and anatomical alignment." Yet, how obvious it is that the surgeon who attempted to treat a fracture without first obtaining apposition of the fragments, and anatomical restoration of the part, would be nothing short of a fool? So that this

is not really a principle in the sense of the first one we have enunciated, it is a necessary priliminary to the application of the prenciple laid down.

In our consideration of the physiology we have noted that the rate of healing depends upon some inherent constitutional factor as well as an adequate blood supply to the part; and that given the blood supply in the proportion required, there is still a wide variation between individual times of union, due perhaps to the exercise of this unknown constitutional factor. Now many textbooks lay down, to the eternal confusion of the student and practitioner, that such and such a fracture will be united in such and such a time. This is a loose statement copied from one book to another, and has little meaning except as average minimums.

It is quite clear from our knowledge of what goes on during healing, and the factors affecting the rate of union, that the only period that can be fixed is the minimum period of absolute immobilisation. But under no circumstances must immobilisation be disturbed before firm union has occurred. Do not forget that during our studies we found that complete union took about twelve months! But union is sufficiently sound, long before this period has elapsed, to allow of un supported functional activity.

In general, fractures in children unite quicker than in adults; those in the upper limb may be left unguarded earlier than those of the weight-bearing lower limb.

To return for a moment to the question of reduction of the displacement of a fracture. Some authorities lay down dogmatically that "Perfect anatomical reduction must be obtained." A very admirable technical ambition, but it leaves out of the picture the ultimate aim of treatment in any fracture: *i. e.*, "a return to perfect functional activity."—Not only must the limb look normal, but it must function normally. This conception of the ultimate aim of treatment is intimately bound up with the law of fracture treatment we have formulated, but is not quite so obvious and is very frequently lost sight of by the occasional fracture surgeon.

What conditions do we require to establish in order to ensure an ultimate perfect functional result?

Firstly, the reduction must be as perfect as possible. This will require radiograms of good quality in anteroposterior and lateral positions, before and after reduction, perfect anæsthesia, either local, regional or general; the accurate application of a clear knowledge of the functional anatomy of the part to the act of manipulation and reduction.

Secondly, this anatomical reduction once obtained must be maintained strictly for as long as may be necessary for union of the bone wound to occur. In order to carry out this, some means of perfectly rigid immobilisation must be employed—recently plaster

of Paris has come into fashion very much. Next, it is obvious after a little thought that in order to prevent shearing and twisting movements, the immobilising agent must include the joint immediately above and the one immediately below the site of fracture, at least.

Thirdly, if function is to be normal after such a long period of immobilisation, the patient as a whole must be actively exercised; his body must be kept at a good standard of training. As important is the condition of the immobilised part. The tone of these muscles must be maintained if wasting is to be avoided.

Maintenance of tone and exercise will ensure an adequate blood supply to the bone and other parts affected and so fulfil a further essential requirement for healing of a wound of bone.

It is found that if the immobilised part is actively used throughout the period of healing, encased in the plaster, muscles do not waste; joint adhesions do not occur; swelling and oedema of the part do not occur, and if these were present at the start, they will disappear under active exercise.

On the other hand experience with massage and passive movement is a tale of chronic disability ending finally in complete disablement, very often after a short period of seemingly satisfactory progress.

Passive movements and stretching not only cause unnecessary pain, but result in exactly the opposite effect to that which is sought. It injures the joints, tears the capsules, increases exudate and trauma, and in consequence, causes hyperaemia and finally, therefore, must increase the adhesions. If stiffness of a part is threatening or present, than passive exercise and massage is the one way to make that stiffness permanent

Thus we come back to our original thesis that for perfect healing of a wound tissue to occur absolute rest of the wound is required. That bone is no exception to this general law of Nature, although it might appear to be so, from a consideration of the complexity of apparatus, and the conflict of technical opinion extant on the question of how best to apply this general law.

Every fracture must be completely immobilised in perfect position until healing is sound; Functional rehabilitation must take place during this period of immobilisation; the aim of all treatment is a return to normal functional activity as quickly and smoothly as possible. This, the one object of any effort to heal by any doctor is only too frequently lost sight of in the concentration upon the local condition and the technical detail of some fascinating mechanical aid towards the attainment of this final return to full function.*

*Read at the opening meeting of the Cuttack Branch of the I. M. A. in 1940. Major Andreasen was at that time Surgeon-Superintendent of the Cuttack Medical School.

Extracts.

VALUE OF PROCAINE INFILTRATION IN THE DIAGNOSIS AND TREATMENT OF FIBROSITIS.

BY E. G. MOYNIHAN, M.R.C.S. AND E. S. NICHOLSON, B.M., B.Ch.

Fibrositis is the painful "rheumatic" condition of the muscles and fasciae.

Incidence. It is one of the commonest maladies of temperate climates. It affects both sexes and all ages, but is commonest in middle and later life, particularly in the male; occupation and increased liability to trauma may account for this. Exposure to damp and chill is also a factor.

Aetiology is unknown. Trauma appears to be the commonest factor. Faulty posture and occupation are significant factors, local sepsis, exposure, metabolic disorders and infection all have been blamed for it.

Pathology. The pathology of fibrositis is unsatisfactory. Trauma causes inflammatory changes which lead to the development of adhesions in the fascial spaces. Such inflammatory changes involving nerves would readily account for the symptom of lumbago. There is disturbance of the local circulation at the site of the lesion, a condition of the blood vessels induced by vaso-constriction.

Symptomatology. The symptoms are characteristic, and consist of pain, stiffness and soreness or tiredness of the affected tissues, sometimes associated with spasm of the affected or related muscles. Pain may be continuous or intermittent, sharp or dull easily located or diffuse. It is usually made worse by moving the affected part and eased by relaxation of the muscles acting on that part. Pain arising from the more superficial structures is located by the patient with greater accuracy, but a deeper-seated lesion gives rise to pain which is diffuse and is usually referred away from the site of the lesion.

Differential diagnosis.—Sometimes fibrositis may be confused for a serious malady like "chronic appendix" and be subjected to a major surgical intervention. Procaine injections are of diagnostic value in fibrositis, and if the symptoms are not relieved following the injections, then the condition is not a fibrositis and another cause should be sought.

Epicranial and cervical fibrositis may give rise to headache. Pectoral fibrositis simulates anginal attacks, and intercostal fibrositis ("pleurodynia") simulates pleurisy. The differential diagnosis of lumbar and gluteal fibrositis is that of lumbago and sciatica. Periarticular fibrositis is often confused with some form of arthritis but the radiognaphic changes in the latter should enable the diagrosis to be made.

Treatment by procaine infiltration. Injections of procaine hydrochloride in to the tender areas of the structures involved in cases of fibrositis give instant and often lasting relief. The technique is very simple and its success depends upon an accurate mapping out of the areas tender to pressure. These tender areas can be revealed by digital palpation. These areas should be marked on the skin and, after cleansing, a wheal should be raised by injecting a small quantity of procaine over the site of the lesion. The needle should then be driven down until the tender spot is reached; 2 to 3 cc. m of the solution should then be infiltrated. The injection gives immediate relief to the pain, and any associated tenderness or muscle spasm disappears at once.

There is pain in a certain number of cases some hours after the injection. The pain usually wears off in a few hours, and is probably due to the procaine itself. The patient should be encouraged to move the affected part freely and to carry on with his normal occupation. In most cases one injection will suffice but some will require a repetition. It is also of importance to inject tender areas found, until the patient is free from pain at the first sitting.

"Blind" injections of large quantities of procaine in the hope that the tender spot will be infiltrated by chance are usually useless and should not be done.

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MAGNESIUM SULPHATE POWDER IN THE TREATMENT OF WOUNDS AND ULCERS.

BY A. T. ANDREASEN, F.R.C.S, MAJOR, I.M.S.

The standard treatment of all the wounds and ulcers in India at present depends upon some form of chlorine solution for its mainstay with the frequent application of dressings. This method is rather defective. Probably much harm is caused by the powerful action of chlorine upon the growth of young tissue cells. Frequent dressings wet or dry are more of a hindrance to nature than otherwise, in both acute and chronic cases. Treatment of varicose ulcers under elastoplast is successful because ulcers are put at rest, the cells allowed to grow quickly under the stimulus of the vital juices and elastic pressure necessary for all organised growth secured. At the same time as the part was put at rest, active exercise was possible for the limb without disturbing the local condition, and so promotion of blood supply with all the improvements attendant upon that vital requirement of life and healing. was insured. But elastoplast is not available to the poor as it is too expensive.

Frequent change of dressing causes destruction of young fibroblasts engaged in the work of repair. The rational thing is to let the dressings stay in position as long as possible, until healing has occurred if possible. In the base of a wound containing pus much of Nature's offensive defensive and repair work is going on. Its disturbance is to retard the healing procees.

Winett-Orr technique for osteomyelitus, compound fractures and war wounds is based upon the least interference with the Nature's forces of pair.

Following are the requirements of a rational method of treatment of wounds:

1. Some form of dressing which accelerates the transport to the part of Nature's forces, without offering any hindrance to their action.
2. This form of dressing must be capable of being renewed without disarranging the growing cells.
3. It must allow the part to remain perfectly unmobilized.
4. It must be easily available and cheap, easily prepared.
5. It must be applicable to all types of wounds, however, infected.
6. It must clean the wound rapidly.

Magnesium sulphate on account of its hygroscopic powers is used successfully for healing of wounds. At first, a saturated solution on gauze was used but as it required frequent changing it was found to be defective. It continually disturbed the wound and so retarded healing. Next, pure crystalline salt was used direct on the wound. This caused slight pain but the disadvantage was that it was difficult in a humid tropical climate to keep the salt dry. Unless the salt is absolutely dry the effect of the dressing is reduced by at least 50 per cent. The ideal thing is finely powdered crystals dried carefully before application. The results were twice as rapidly attained with no more discomfort to the patient.

The technique is as follows:

1. Excess of pus and crusts is cleared gently from the edges of the wound with gauze and forceps. Any thick crust or creamy pus is gently lifted away from the centre with the forceps or a spatula, without disturbing the essential layer covering the base wound or ulcer which contains all the growing cells.
2. The finely powdered, absolutely dry magnesium sulphate is then poured liberally directly into the wound so as to cover it completely.
3. Over this a light layer of guaze and wool is placed and bandaged firmly with a small many tailed bandage. At the second dressing, which may be done in 12 hours, the many tail bandage obviates the disturbance caused

by undoing a roller bandage. Excess of wet salt is gently lifted off with a spatula and fresh dry salt applied without disturbing the underneath layer of salt now in contact with the base of the ulcer or wound. Fresh guaze and wool are bandaged in place as before. There may be slight tingling but there is no pain due to the salt. After four dressings there is usually need of changing only once in 24 hours.

After 4 or 5 days foul sloughing acquires a granulating healing appearance. Diabetic carbuncles and diabetic ulcers respond quickly to the treatment. When the ulcer bed shows these healthy granulation the crust of salt is raised gently and lifted off. A thick layer of sterile vaseline is laid over the ulcer bed and edges, over a light layer of guazed and wool and a firm roller bandage or best of all a complete plaster case. This dressing is left in place for at least 10 days. In hot damp weather five days is a better period. Healing is rapid, scarring is minimum and often nearly absent.

Either magnesium or sodium sulphate may be used ; they are equally effective.

This method has been used in the hospital over 8 years. About 4000 to 5000 cases have been treated annually. The stay in the hospital of the average large and grossly contaminated wounds has been reduced from 74 days to 21 days.

In children an equal part of boric acid powder may be mixed with the magnesium sulphate to take the sting out of the first dressing.

(Indian Medical Gazette.)

WOUNDS OF KNEE JOINT.

BY W. H. OGILVIE

According to Ogilvie, immobilization of an injured knee until infection has been averted or overcome is the key to successful treatment. In a foreward area local treatment is limited to cleansing the skin, applying an abundant sterile dressing and immobilizing the limb for transport. A prophylactic dose of sulfanilamide should be given if possible. Every wound of the knee joint is an urgent case; the most important cases are those seen within the "preinfective" or "grace" period of six hours. Through and through bullet wounds with punctured entry and exit holes do not usually require operation ; wounds the result of low velocity projectiles often come in the same category. At time of stress these can be evacuated farther, temporary immobilization being replaced by something

efficient and prophylactic sulfanilamide continued. These patients must be watched carefully; the joint must be aspirated if it gets at all tense, and immobilization must be continued until infection is overcome. The early motion of injured joints is as unsound as that of fractures. Most penetrating wounds of the knee joint and all those with injury to the patella or partial injury to the other bones should be operated on. Operation should be done under a tourniquet with the strictest aseptic precautions. Local injuries to bone are treated as radically as possible. A patella splintered by a projectile should usually be removed completely. Holes in the femoral condyles or the articular surface of the tibia may be scraped with a curet or trimmed with a small gouge until they are smooth cavities lined with apparently healthy bone. After excision, suture or partial suture should be attempted. The skin may be closed with interrupted sutures in favourable cases, but if one is in doubt it is better to pack the outer layers of the wound with petrolatum gauze down to the synovial membrane. The only apparatus that gives 100 per cent immobilization of the knee is a plaster spica. Sulfanilamide should be given for a full four days. Dressings are left alone for at least ten days. If evacuation is imperative before this, the surface stitches should be removed and the cutaneous wound packed lightly and left open. Complete fractures of the tibia or femur, seen within six hours of injury, demand primary amputation. After twenty-four hours bacteria have established their entry and the tissues their defenses. The time for debridement is past and the alternative are expectancy or drainage. The wise policy is to continue immobilization and sulfanilamide, watch the condition of the patient and the wound, aspirate the joint if need be, and be ready to drain or to cut down on a foreign body. As soon as septic infection has been recognized, the knee should be drained, the drainage incisions packed with petrolatum gauze and the whole limb (including the foot and pelvis) immobilized in a closed plaster hip spica. If the infection is overcome within four days the joint is saved, as the cartilage has not been affected; if not, joint and cartilage are lost. If all goes well, the cast should be left undisturbed for at least three weeks; if the patient is not better at the end of four days it is best to amputate the leg. Only complete immobilization will insure success. Changes of plaster casts because of offensive discharge can usually be obviated by fluffed gauze applied over the petrolatum packs and covered by one or two layers of wool firmly bandaged. The cast should be so constructed that its strongest strut is away from the wound. These measures will protect the plaster and, if the rest of the cast is unpadded, will not interfere with immobilization.

—(*Lancet.*)

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SENILE ENLARGEMENT OF THE PROSTATE*

S. R. MOOLGAONKAR, F.R.C.S.

Bombay.

I must first of all thank you for having asked me to preside over the Surgical Section of the 18th All India Medical Conference. I wish I could repay this honour you have done me by telling you about something new and wonderful in the science or art of Surgery. I regret very much to say that I have nothing like that to offer you and you will have to be content with a very ordinary consideration of the subject I have chosen supplemented by the little personal experience that I have in the matter.

I have chosen this subject mainly because the cases I have come across have been often in the advanced stage and as I felt that most of the members attending this Conference will be general practitioners who see the cases first, it would be worth while to again draw their attention to this condition.

Senile enlargement of the porstate necessarily means that enlargement which is associated with old age. It automatically excludes all those enlargements which are due to inflammation or due to malignancy.

This enlargement of the prostate is most common after the age of fifty though I have operated on a genuine case aged 43 years. Of course one may come across this condition at a much later period, *i e.*, the patient comes to you at a very late age but careful inquiry will always show that there have been symptoms though in a mild form, traceable back many years. My oldest patient was seventy eight but the history could be traced back quite twenty years. The most common age is between 50 and 60. Of the 123 cases in my series, 2 were between 70-80, 23 between 60-70, 95 between 50-60 and three below 50.

Regarding the causation of this disease nobody can be definite but some general conclusions can be drawn. The prostate is a sexual gland and its secretion has an effect on the semen; the semen as stored in the vesicles is lumpy. The prostatic secretion

*Read at the Scientific Section, XVIII All-India Medical Conference, Hyderabad, Dn., Dec. 1941.

helps to liquefy it and thus allow the spermatozoa to go on their wanderings. The metabolic products and an internal secretion are absorbed from the prostate and probably they have some effect on sexual function. But there is no doubt whatsoever that the testicular hormone has a profound effect on the prostate. The testicular function has reached its maximum in most men by the age 50 or even perhaps earlier in this country. Anyhow in most men the testicular function is on the down grade by fifty years. The prostate is a sex gland and we know that enlargement occurs after the age of 50. It is not at all likely that while one part of the sexual apparatus and that one a very important one like the testicle is on the downgrade, another and that a subsidiary one like the prostate will be on the up-grade. We can take it, therefore, that the enlargement of the prostate is either a degenerative change or a reaction of the prostate to the deficient testicular hormone. A sinile is often drawn between the so-called "chronic mastitis" of the menopause in which there are cystic changes in the breast accompanying deficient ovarian function and senile hypertrophy of prostate. We may cite another example namely, an endemic goitre in which iodine is withheld from the thyroid for one reason or other.

Many have suggested that the enlargement is a result of chronic inflammatory changes. We find no evidence of such inflammatory changes when we examine the ordinary enlarged prostate.

Others have suggested that the enlargement is of the nature of an adenoma. There is no doubt that on section rounded nodules are seen which on microscopic examination show a glandular structure. The fact that these nodules can be shelled out is also an argument in favour of their being adenomata; but the age at which they occur (adenomata occur at a younger age) and the fact that these glandular structures have been shown to have ducts is against their being ordinary adenomata. Of the 123 cases in the author's series, 59 were Hindus, 31 Parsis, 14 •Mohammedans, 9 Jews, 7 Christians, 1 Armenian and 4 Europeans. 48 cases were operated on—3 at one stage, none dying and 1 giving trouble in the bladder and 45 at two stages, 1 dying after cystotomy and 3 after prostatectomy. This cannot be taken as representative as my practice is mainly amongst Hindus and Parsis.

Others have stated that enlargement is more common amongst Mohammedans than amongst Hindus. It is also said that it is not so common in India as it is in Europe. Amongst the Chinese and Japanese the disease is very rare.

Whatever the cause may be we must study the effects of the enlargement. These arise mainly because of the situation of the prostate surrounding the first part of the urethra, The urethra is the part to suffer first. The prostate is contained in a fibrous sheath

derived from the pelvic fascia. Apart from this the prostate has a capsule of its own but it is not as strong as the sheath.

The lateral lobes are the ones most often affected. Usually both are affected equally but sometimes one is much larger than the other. At times the middle lobe is the only one or the most affected. As the prostate gets bigger the urethra which is closely enveloped by it gets longer; it increases in sagittal diameter as well. It also gets compressed from side to side by the enlarging lateral lobes so that on section the urethra appears to be an antero-posterior slit whereas normally the anterior and posterior walls are opposed producing a transverse slit. If one lobe is more enlarged or is irregularly enlarged the urethra becomes correspondingly sinuous.

As the prostate enlarges it fills up the sheath. But with maintained pressure the sheath yields so that horizontal enlargement of the prostate occurs. A certain amount of pressure is maintained within the sheath just as it is in an inflated rubber balloon whose walls yield and yet there is pressure within the cavity. Below, the prostate by its apex rests against the urogenital diaphragm which is unyielding. The least resisting part is towards the base of the prostate *i. e.* in the bladder region and that is where the greatest growth occurs, and that is why the urethra is so much elongated in prostatics. I have seen a prostate which could be felt one inch above the symphisis. Here again things are not so easy. The ejaculatory ducts which enter the prostatic urethra about the middle of the posterior wall hold it down so that in marked enlargement there is an angle formed with its concavity forwards. A similar angle forms when the middle lobe enlarges.

The effect of this compression of the urethra and its sinuosity when it exists, is to diminish the force of the stream of urine, so that with marked enlargement the urine is not projected at all but falls down straight from the meatus.

Of all the explanations brought forward to explain the mechanism of micturition I like the one set forth by Young. He suggests that during micturition the internal sphincter does not passively relax and open out but is pulled open by the trigonal muscle which is attached to the ureteric orifices and to the ureteric bar and is inserted in the verumontanum in the posterior urethra. During micturition this muscle contracts and pulls open the relaxed internal sphincter. As the prostate enlarges the region of the internal sphincter gets less and less elastic, as a result of the presence of increased prostatic tissue. It therefore takes longer for the trigonal muscle to pull open the internal sphincter and allow the urine to flow through. This is in direct proportion to the amount of prostatic tissue present near the internal meatus. It can be easily understood that this difficulty will be most marked with a median lobe enlargement. This lag between the patient getting

ready to pass urine and his actual production of the flow is called hesitation and is an early symptom of enlarged prostate.

One of the earliest symptoms of an enlarged prostate is a sensation of burning during micturition. In an elderly person, free from urethral discharge, burning micturition should arouse the suspicion of an enlarged prostate. This is probably due to the congestion of the mucous membrane.

As the prostate gets larger and larger it projects more and more into the bladder raising the internal meatus from the base of the bladder. This leads to the formation of a post-prostatic pouch. In fact this projection may be so marked as to overhang the ureteric bar. One can see therefore that as the prostate enlarges the trigonal muscle will act at greater and greater disadvantage so that not only is the hesitation increased but there will be a greater and greater difficulty in holding open the internal meatus till the bladder is completely emptied. This results in residual urine, a little at first, but steadily increasing as the prostate enlarges. With the acquisition of the residual urine the patient feels that his micturition has been incomplete.

The increased effort required by the bladder to force the urine through the compressed urethra leads to pupertrophy of the bladder musculature and in the later stages to the bulging of the mucosa between the hypertrophied muscular bundles (sacculation and trabeculation). As the residual urine increases there is dilatation of the bladder till one day as a result of some increased congestion of the prostate the bladder cannot force the urine through and there is retention. I have seen a bladder distended to more than midway between the umbilicus and the xyphisternum as a result of an enlarged prostate.

One of the early signs of enlarged prostate is frequency of micturition. At first this is a nocturnal frequency, particularly towards morning. The probable explanation of this is that the prostate is hyperaemic as a result of the changes that are occurring in it. It is a well known fact that the pelvic organs including the genitalia are congested towards morning as is manifested by the morning erection. This, superadded to the previously existing congestion of the prostate and posterior urethra lead to the desire for micturition. Later this frequency becomes diurnal as well and that is due to the increasing quantity of residual urine not allowing the bladder to completely empty. This frequency which may be as often as once every half hour disturbs the patient's sleep and materially helps to undermine his health.

As previously stated the bladder gets more and more dilated as the residual urine increases till finally as a result of some indiscretion or chill the prostate is more congested, the urethra is more,

pressed upon and the dilated and weakened bladder is unable to force the urine through and there is retention of urine.

Due partly to the increased vascularity but mainly due to the pressure of the newly formed tissue on the veins, the veins of the prostate dilate particularly in the area that is least supported namely the bladder. These may dilate to the extent of being varicose. Such varices may rupture either spontaneously or as the result of instrumentation and lead to quite a serious haemorrhage. It is noteworthy fact that bleeding is more often associated with the nonmalignant enlargement of the prostate.

Whenever there is a quantity of residual urine, the bladder is more or less constantly under tension. This tension is transmitted back to the ureter and the pelvis and these dilate though the latter never so markedly as to deserve the name of hydronephrosis. These changes are bilateral. The back pressure causes interstitial nephritis and leads to deficient function of the kidneys. Deficient kindey function leads to accumulation of waste products in the blood and this to uraemia and finally to death.

We see thus, that a prostatic suffers first from a burning sensation during micturition with nocturnal frequency; next he develops hesitation and frequency and acquires a residual urine; next he gets attacks of retention, with a distended bladder in between and finally uraemia and death.

When a patient presents himself with the earlier of these signs or symptoms it is our business to find out whether he is suffering from an enlarged prostate.

This we do by questioning him regarding the history particularly along the lines a prostatic follows.

Next we do a physical examination. This examination consists mainly in finding out two things. (1) Is there enlargement of the prostate? (2) Is there residual urine?

It is always most convenient to find out about the residual urine first because unless the bladder is empty it is difficult to define the upper edge of the prostate. We determine the presence and quantity of residual urine by passing a catheter just after the patient has passed urine. Before the catheter is passed it is always necessary to examine the hypogastrium by palpation and percussion. If it is found that there is still a distended bladder after micturition it is best to withhold the catheter till the patient is admitted to a hospital or nursing home because it is never safe to rapidly and completely empty the distended bladder in a prostatic. The sudden relief of tension is often followed by hæmorrhage from the kidney and sometimes by anuria and uraemia. Such a bladder should be gradually emptied by tying in a catheter and allowing it to drip at the rate of two drops a second. The bleeding is from the kidney and not from the bladder. Recently, I had a case of a ureteral

stone impacted at the lower end. The ureter was dilated to the size of the small bowel. After the operation there was bleeding for some days. The wound in the ureter had been stitched up and there could have been no other source of bleeding but the kidney.

Having determined that there is no appreciable distention of the bladder, the catheter may be passed. It must be realised that there is more than the usual risk of infection of the bladder in prostatics because of the residual urine. Special precautions should be taken. The anterior urethra should be washed out with potassium permanganate solution 1: 2000. A stiffish rubber catheter, boiled for at least five minutes and well lubricated should be used. The rubber catheter is mentioned first because it can be sterilised with ease. I have found a mixture of liquid paraffin and vaseline of the consistency of thick honey to be the best lubricant. If this catheter does not pass, a boilable coude gumelastic catheter should be used. If this does not pass easily a Harricon stillette should be used after giving it the proper curve to stiffen the catheter. If this does not succeed the catheter may be assisted with a finger in the rectum. If this even fails, which is rare, a metal catheter should be used, assisted as before by a finger in the rectum. Usually the rubber catheter passes easily in the type of case we have mentioned, but all the manœuvres mentioned are necessary in some cases of retention.

Having passed the catheter the residual urine if any is withdrawn and measured. The catheter is then withdrawn after instilling 10 c.c.m. of a 10 per cent. argyrol or an aqueous solution of acriflavine.

A rectal examination is next made. This is best done in the dorsal position. The finger should be well lubricated and the anus well smeared with vaseline. The finger should be more glided in than pushed in. The direction of the anal canal should be remembered. It is, as you know, directed from below upwards and forwards. The prostate should be felt. Its size, shape, consistency and mobility should be determined. For determining the mobility a bimanual examination is necessary. The upper limit should also be defined.

The usual type of enlarged prostate feels smooth and elastic and is moveable.

A hard nodule in the prostate may be either a prostatic calculus or malignancy. The latter is fixed. The former can be seen with x-rays.

A chronic prostatitis is usually hardish all over and is tender. There is a history of infection and there are threads in the urine.

A tuberculous prostate is nodular and usually associated with thickened vesicles and there is often epididymitis. The micturition is painful and T. B. are found in the urine.

There is one lesion which simulates enlarged prostate and that is a nervous lesion. In all cases of suspected enlarged prostate a Rhomberg test should always be done and the knee jerks tested. A cystoscopy presents a typical picture in these cases, the trabeculæ being delicate and long whereas in an enlarged prostate they are coarse and short.

I do not do a cystoscopy in every case. It is an unnecessary instrumentation. In cases where the enlargement does not explain all the symptoms and in cases where there is pus in the urine, I always do it.

Having made sure that the patient is suffering from an enlarged prostate the next thing to determine is what to do about it. Enlarged prostate is a progressive disease but its rate of progress varies tremendously. In some, matters come to a head within a few years and in others the history may extend over twenty years or more. In some, mild symptoms like hesitation and a little frequency go on for years; in others the first symptom is either hæmorrhage or retention. Practically all the cases that have come to me have come either during an attack of retention or after one or more attacks of retention.

Our main keynote is the removal of the mechanical obstruction to the flow of urine. The one and only certain method of removal of this mechanical obstruction is to remove the enlargement in the prostate. All other means are palliative.

We will consider the latter first. As one of the manifestations is the inability of the bladder to completely empty itself, drugs like strychnine, ergot etc. with a stimulant action on muscle were used without any effect. Cathartics and warm enemata were used with the idea of diminishing congestion with only a mild temporary benefit. Belladonna and atropine were also tried without effect. Massage of the prostate by the squeezing out of the secretion in the dilated prostatic alveoli gave only a very temporary relief. Vasectomy or a Steinach's operation was tried. These by increasing the testicular hormone certainly caused improvement for a short time.

When testovirone was isolated and later synthetised, it was tried in case of enlarged prostate. There is no doubt that such administration slows down the progress of the disease and staves off retention in the earlier type of case. Once retention has been established it does not prevent further attacks. There is evidently something more necessary than just the testovirone to have a more profound and permanent effect on the diseased prostate. The dose of the testovirone must be large, twenty-five mgm. twice a week to obtain even the effect mentioned above.

Sclerosing solutions have been injected into the prostate with the only result that the removal has been rendered more difficult. Diathermy and other high frequency currents have been tried also

without any success except the most fleeting relief and that probably due to slight reduction in congestion.

It must not be forgotten that even though the enlargement of the prostate is progressive yet the aggravation of its symptoms is due to attacks of congestion When these attacks of congestion pass off the patient feels a comparative relief. If any medicine or particular form of treatment has been adopted during the attack that treatment gets undeserved credit and we must guard against that.

Deep x-rays and radium certainly have an effect on the enlargement leading to its shrinking but never to its original size. If correct doses have been adopted there is a relief in the symptoms which may last from six months to a year. By the end of that time the prostate has usually enlarged to its original size, if not more, and the symptoms are reproduced. A further course again causes amelioration but not to the degree obtained on the first occasion. Of the two, I prefer the x-rays and I have had patients who were unfit for operation having treatment with x-rays for three or four years. It certainly helped to prolong their lives.

The obstruction produced by the prostate was attempted to be sidetracked, before a proper operative procedure was developed, by means of what was called "catheter life". Rubber or gumelastic catheters were passed once, twice or three times a day. Moreover the patient was taught how to catheterise himself. If we look at the statistics of those days we find that the entering into the catheter life was the most dangerous period. As many as 50 per cent. were dead within the first six months and those who survived this period carried on for many years. When I was a house-surgeon at St. Peter's Hospital, London. I remember a prostatic who had been using the catheter for six years. He used to carry the rubber catheter in a glass tube and his urine was perfectly clear! The great danger of catheterisation is sepsis and once sepsis is introduced the life of the patient is made miserable, what with the markedly increased frequency and the pain and straining at the end of micturition. Apart from this, infection spreads up to the kidney leading to a typical surgical kidney with fever and rigors. All these hasten the end. We must, therefore, be extremely careful whenever we order or do an instrumentation in a prostatic. It is my invariable rule to order a urinary antiseptic straight away and to wash out the bladder after the catheterisation with potassium permanganate 1 : 2000. After the washing has been completed and that is only when the permanganate returns unaltered in colour either argyrol 10 per cent or 1 per cent aqueous solution of acriflavine 10 c.c. is instilled and the catheter withdrawn. I do not recommend catheter life.

The question finally comes to operation. As previously stated the only certain cure is the removal of the enlargement in the

prostate. This, however, cannot be done indiscriminately. Otherwise the mortality may be appalling.

First and foremost we have to study the general condition of the patient. His nutrition, colour, tongue have to be seen. A dry brown tongue is an absolute contra-indication to immediate operation. We must ask about the appetite, vomiting, constipation, headache and sleep. If these are favourable we can take it that there are no clinical manifestations of uræmia.

We should examine the blood in a routine way for colour index and for clotting time. If the colour index is low suitable medicines or injections should be prescribed or if matters are urgent or the index or R. B. C. count very low, a blood transfusion may be given. The clotting time is important as I once nearly lost a case by bleeding for lack of this precaution.

The kidney function should next be tested. The best way is by the urea clearance test. But if the means for this are not available the ordinary urea concentration or urine dilution test may do. The kidney function may also be tested colorimetrically using phenol red.

If the kidneys show 50 per cent or more function we may go ahead straight away, if between 40 and 50 per cent a two stage operation is indicated whereas, if below 40 per cent some preliminary drainage is necessary.

Amongst the drainage measures are a tied-in catheter or a decompression through a small supra-pubic incision. In all cases of retention or marked distention the bladder must first be emptied by dripping with a tied-in catheter. The decompression operation is a simple procedure and may be carried out at a pinch through a large trocar and canula though the special Kidd's trocar is very useful. In cases with a dry tongue such preliminary drainage is always necessary.

With attention to the bowels and free diuresis by ingestion of large quantities of fluid combined with drainage it is wonderful how rapidly some cases improve. I demand from my patients one hundred ozs. of urine in twenty-four hours. Some of them produce as much as 150 ozs.

Suprapubic cystotomy may be done as a preliminary in the second class of cases or as a permanent measure.

In doing a suprapubic any stones present are removed. In a prostatic, vesical calculus is more silent because it gets the protection of the postprostatic pouch. Sometimes one comes across hundreds of seed calculi. Any diverticula should be explored at the same time. These are usually associated with pus in the urine and their presence has usually been discovered during the cystoscopy. If the patient can stand it the diverticulum should be dealt with now. Any how it should be always be dealt with before the prostatectomy otherwise it leads to septic infection and often to a persistent

suprapubic fistula. I do not fix the bladder to the abdominal wall except in cases where a permanent fistula is intended. The cave of Retzius is always drained by a gauze-strip. Use a rubber tube at least ¾ " in internal diameter. The lower end should not press on the trigone In those cases where a permanent fistula is intended the drainage tube may be smaller, and is replaced by a self-retaining catheter within 10-14 days according to the progress of the case. After transference to the bed I use a simple suction apparatus to keep the patient dry.

The prostatectomy may be primary or secondary ; primary only when the patient's condition guarantees it ; secondary when the patient's kidney function has improved as a result of preliminary cystotomy. I always use the suprapubic method. I start enucleation on the vesical aspect close to the internal meatus. I do not attempt to peel off ihe urethra. I should think that it will always slough. After removal of the prostate I see that the eyes of the catheter are in the prostatic cavity and then irrigate with fluid at 115° F. If that is not enough to check the bleeding I irrigate with 1 : 4000 silver nitrate. If bleeding still continues I either pack with gauze round the catheter or use a Pilcher bag. Tilting the foot end of the bed up helps The patient is irrigated with H_2O_2, one volume morning and evening. The ¾" tube is removed on the fourth or fifth day and a smaller one put in ; this is changed on the eighth day and a quarter inch tube is put in ; this is finally removed on the fourteenth-eighteenth day when the wound is allowed to heal. If not healed by the twenty-fifth day I tie in a catheter taking care to see that it drains well. It is very rarely that the suprapubic sinus needs scraping or cauterising. The patient is allowed up on the twenty-first day.

The mortality of secondary prostatectomy is about 8 per cent while that of primary is about 5 per cent. In all doubtful cases I do the two stage operation.

Late complications are narrowed internal meatus of which I had one case. I used to start enucleation at the internal meatus in those days. Since starting on the vesical side I have no further trouble of this kind.

Difficult fistulæ is another trouble. The patient should be allowed up ; this helps to clese these fistulæ. I had a case which troubled me for four months but ultimately healed after scraping and suture, together with a tied-in catheter.

In secondary cases the interval between cystotomy and prostatectomy should not be more than 2-3 weeks. After that period there is a lot of fibrous tissue formed and the finger cannot get at the prostate so easily. In all such cases the old scar should be excised and the peritoneum defined and dissected up. In one case where I did not take this precaution the peritoneum was torn during

prostatectomy. Fortunately nothing more serious than a localised peritonitis followed.

Of all the prostatectomies the toughest is the enucleation of a fibrous prostate. I remember once after struggling for an hour and a half I produced a miniature prostate 1"×¾". I now use the Maccarthy's transurethral resectome for these cases with most satisfactory results. In the ordinary prostate I found it not so useful. Spouting vessels obscure the field and on all the occasions that I have tried it, I have had to give up before anything approaching complete resection could be done.

Ladies and Gentlemen, I thank you for having given me a patient hearing and I do hope that those of you who are general practitioners will have realised that nothing short of removal cures an enlarged prostate and that if done early the risks are small and the convalescence short.

INDIAN MEDICAL COUNCIL AND ITS UTILITY.

By Dr. S. C. ANAND, M.B.B.S., I.M.S.
Retd. Editor 'Medical Comrade.'

Of the numerous indignities that a subserviant nation has to suffer in the various spheres of human activity, the one that India was required to brook in 1933 was the foisting on her a legislation which brought into being a hitherto unwanted and now provenly futile body known as the Indian Medical Council. While in the political arena the behests of the Whitehall must be complied with, in the field of medical legislation no less glorious a part was played by the General Medical Council of Great Britain and Ireland. It started active agitation in 1930 by refusing recognition to medical graduates from India, on grounds of inadequate clinical training and want of acceptable standard of medical education. This resulted in an enquiry by Col. Needham a retired officer of the Indian Medical Service who, as could only be expected, recommended as an essential prerequisite for recognition, the establishment of a central authority which could regulate medical education under the aegies of the General Medical Council. In the interests of the young and ambitious aspirants for higher medical education, the only alternative for the Indian legislator was to place on the Statute Book an enactment now known as the Indian Medical Council Act of 1933. Under this Act a Council was established with the dual function of establishing a uniform minimum standard of higher medical education for the various British Indian Provinces and of negotiating

reciprocal relations with foreign countries. This august body has not up to date been given the powers of maintaining an All India Register, the one important function which similar institutions all over the world are required to perform, nor has it succeeded in eliciting General Medical Council's recognition for the qualifications granted by all the British Indian Universities, nor does its authority extend over the one third of this country, namely, Indian States. To add to it, the bulk of the medical profession—the Licentiates—are outside the jurisdiction of the Council, though thanks to the efforts of Mr. Kazmi, a bill for their inclusion is on the anvil of the legislature.

While central registration is yet a far cry, reciprocity with foreign countries in the midst of a world war is also a pious wish. Raising the standard of medical education to a higher uniform level by converting the existing schools into colleges or giving effect to the Council's recommendations having financial implications, is no less up hill a task in the present circumstances, when all the revenues both central and provincial must, of necessity, be tapped for the war effort. These beneficient activities have naturally to take their turn after world conditions have returned to normality.

So much about the functions. One would naturally like to know about its finances. With no income of its own, the Council is solely dependent on annual grants by the Government of India. The administration of these funds is the concern of the Council subject to the general financial control of the donor. Huge sums doled out from the centre are sometimes spent, at others misspent. A detailed check on the Council's activities, not being either desirable or possible, it sometimes indulges in luxuries which one can illafford in these times. To mention only one of the several instances, the appointment of a retired officer as Secretary of the Council on a lavish four figure salary in 1937 and the recent decision to extend his tenure for another two years on the maximum of the scale, despite the physical disability which the advancing age naturally imposes on every living being, is a phenomena not easy for the sensible layman to comprehend. A body set up regulate and improve medical standards should behave in such an unmedical fashion as to retain in its employ an over superannuated Secretary, is something not easy to explain. It must have been for none other than medical reasons that the maximum age of 55 years should have been fixed for retirement from Government service. Even persons with specialised knowledge and valuable experience such as the Judges of the High Court are not allowed to stay on beyond 60 for the simple reason that age does tell on the mind and the body after a certain stage. It is curious, therefore, that a body consisting entirely of experts in the various branches of medicine, should have thought it fit to ive such a long rope of service to one who has

even surpassed the maximum age limit fixed for the judges and should both in fairness to himself and the Council have long ago been ordered to complete rest under sound medical advice, yielding place to a much cheaper, but decidedly a more energetic and ambitious young man who would naturally be more qualified and better equipped both physically and mentally for secretariat work. Should the suspension of such a dormant body be considered outside the domain of practical politics, the Government and the Council should as well consider the possibility of having a part time Secretary till at least the duration of war. It is no less the concern of the Government as that of the taxpayer himself to see that public money is not thrown in such a wasteful channel when it is so badly required for strengthening the National War Front in so many directions.

Extracts.

THE MANAGEMENT OF PUERPERAL SEPSIS.

BY W. E. STUDDIFORD.

Prophylactic Measures. There are two sources of infections.

1. *Exogenous.* Organisms responsible for this type are:
   - The B. hemolytic Streptococcus
   - The Staphylococcus
   - The colon bacillus
   - The pneumococcus
   - The gas bacillus
   - The typhoid bacillus

B. hemolytic streptococcus and more rarely the pneumococcus have their source almost always in the nasopharynx of the patient or attendent or in a septic focus some where in the vicinity of the patient. Most of the other organisms have their source in the intestinal tract. B. hemolytic streptococcus are not found normally in the vagina. Transmission to the genital tract may take place by direct inoculation of the fingers of the patient or fingers of the attendants or by transfer by means of air and dust from a septic focus. Following are the principal measures employed to prevent infections by the B. hemolytic streptococcus and primary pneumococcal infections:

(1) Doctors and nurses caring for patients during labor delivery and the postpartum period are required to mask both nose and mouth.

(2) Vaginal examinations are carried out with the same careful preparation of the patient and examiner as is used in the actual

delivery of the patient. Strict precautions against direct or indirect vulval contamination are employod in rectal examinations.

(3) Nurses and doctors suffering from acute upper respiratory infections or from evidence of subacute or chronic nasopharyngeal foci are excluded from the active care of patients until such infections have cleared up and, negative cultures for hemolytic streptococci have been obtained.

(4) Patients are warned against touching the vulva during labor. This is designed to prevent transmission of hemolytic streptococci from carriers.

The colon and gas bacillus infections. The colon bacillus is transmitted to the genital tract (*i*) by a complicating infection of the urinary tract, (*ii*) by fecal contamination of the genital tract during labor and delivery. Treatment with sulfanilamide group of drugs will cure urinary infections. The prevention of fecal contamination depends on the maintenance of an empty rectum during labor and a careful technic during delivery. These latter precautions are equally important in the prevention of gas bacillus infections.

2. *Endogenous infections.* The prevention of endogenous infection is much more difficult.

Anaerobic streptococcus infection is the chief cause of endogenous infections. This organism is present in the vaginal tract of a large percentage of normal women before delivery. Infections with this organism follow most often a prolonged exhausting labor. Early decision during labor as to the method of delivery to prevent prolonged exhausting labor is necessary to prevent the infections. Another method of prevention of endogenous infections consists in the attempt to sterilize the vaginal tract during labor by means of antiseptic agents. But this is a controversial point.

Prophylactic use of salfanilamide may prove useful in certain cases.

Treatment. Procedures like hysterectomy, ligation of thrombosed veins and drainage of general peritonitis have been abandoned.

Surgical intervention of retained placental fragments may be required.

Medical therapy. General treatment consists of rest in bed, fresh air, sunlight and ample diet. Serious cases may require glucose and saline infusions or blood transfusions.

Chemotherapy. The type of infecting organism should be discovered by laboratory tests. The most successful results of chemotherapy are seen in B-haemolytic streptococcal infections. Sulfanilamide is the most satisfactory drug for this type of infection.

Sulfapyridine is useful in gonococcal and pneumococcal infections.

Sulfathiazole appears to be better for staphylococcal infections.

(*Medical Clinics of North America.*)

INTRAVENOUS SERUM IN THE TREATMENT OF PERIPHERAL VASCULAR DISEASE.

BY GRAHAM W. WAYWARD, M.D., M.R.C.P.

Physician, E.M.S.; Chief Assistant to the Medical Professorial Unit, St. Bartholomew's Hospital, London.

One of the chief aims in the treatment of peripheral vascular disease is to aid the development of an adequate collateral circulation in the affected limb. Good results have been obtained with passive vascular exercise, alternating suction and compression or intermittent venous occlusion.

It has also been claimed that procedures which increase the blood volume stimulate the formation of a collateral circulation.

It has been observed that the blood volume in patients with thrombo-angitis obliterans was decreased. Koga gave saline solution intravenously and reported striking improvement in 13 patients, with an increase in the peripheral circulation and dimunition in both rest pain and pain on exercise. Intravenous injection of 300 c. cm. of 2 to 5 per cent. saline made the legs warmer and the trophic changes to clear up. The injections were given quickly—300 c. cm. in 10 minutes three times at first and later at weekly intervals.

The effects of intravenous saline on the peripheral circulation are presumably mechanical, produced by the immediate increase in blood volume. But this increase is a transient one, lasting several hours only, and it seemed probable, therefore, that if the blood volume could be increased for a longer period of time the effect on the peripheral circulation would be greater. For this reason the effect of increasing the blood volume by giving human serum intravenously were studied.

Pooled liquid serum having a protein content of 7 per cent. was used. The amount transferred each time was 800 c. cm. and the rate varied between 5 to 15 c. cm. a minute.

Effect on the circulation:

1. Changes in the blood volume. After an initial increase equal to the amount of serum injected, the blood volume gradually returns to normal over a period of from 2 to 3 days.

2. Changes in the general circulation. If the transfusion is given slowly there is usually no change in blood pressure, the pulse rate shows a transient increase of from 8 to 16 a minute and there is no increase in venous pressure.

3. There is increase in oscillometric readings.

4. Changes in skin temperature. Most of the patients with peripheral vascular disease and cold limbs have shown clinical increase in warmth lasting for several days.

5. Reflex response to reflex vasodilatation. There was a progressive increase in the response after each transfusion except in

those whose blood vessels were incapable of dilating because of organic disease.

Clinical Results:

1. Effects on the warmth of the skin. An increase in warmth of those limbs with impaired supply has been a striking result of serum transfusion.

2. Rest pain. All were relieved of rest pain.

3. Intermittent claudication. Some cases improved considerably.

4. Raynaud's syndrome. This also improved.

5. Ulcers associated with gangrene. Pre-gangrenous colour changes in the skin were definitely improved. In some gangrenous cases tips separated rapidly and the fingers healed rapidly. Non-healing ulcers healed quickly.

(*B. M. J.*)

TREATMENT OF SQUINT IN CHILDREN.

BY CHARLES TAIT, M.B., B.S., D.O.M.S.

Consulting Ophthalmic Surgeon, Sivernake Hospital; Heather-wood Hospital; Occulist to Bucks Education Committee.

The treatment of squint in children is of paramount importance. Apart from aesthetic reasons, this is necessary for the preservation of good vision in the squinting eye. The vision in a squinting eye is generally much below that of the fixing eye and if no adequate steps be taken to treat this condition, the vision in this eye will undergo progressive deterioration and it will become amblyopic even though the appearance of the squint may partially or completely disappear as adult life is reached. Amblyopia once established becomes permanent.

This paper is solely confined to concomitant squint. In concomitant the visual axes, although abnormally directed, retain their normal relation to each other in all movement of the eyes. Such concomitant squints may be convergent, divergent or alternating. The common age incidence of squint is between the ages of 1½ to 5 years. The reason is that any binocular sense is undeveloped during the first few months of life.

Causation of squint.

Donders stated that "convergent squint almost always depends upon hypermetropia" and that "divergent strabismus is usually the result of myopia". Thus when a near object is viewed, the two eyes are focused upon it, and there is a definite relationship between the

degree of convergence of the two eyes and the accommodation required to obtain clear vision. If, however, there exists an undue degree of hypermetropia, the normal relationship is disturbed, and the excessive amount of accommodation demanded for clear vision initiates an over convergence or squint. This theory does not explain all cases.

Worth taught that the essential cause of squint was a defect in the fusion faculty. "In the presence of this fundamental cause the eyes are in a state of unstable equilibrium, ready to squint inwards or outwards on slight provocation".

Diagnosis. Before treatment it is necessary to diagnose that a real squint is present and to determine to what category the squint belongs. Epicanthus on first examination closely simulates squint. In this condition the normal appearance of the inner canthi are obscured by semilunar folds of redundant skin, so that the eyes do not appear to be centrally placed but to be turning in.

Treatment. It is folly to suppose that a child is either too young to have anything done or that he will grow out of the condition. There is usually no difficulty in inducing a child of 18 months to wear glasses. Quite young babies may develop an intermittent squint which is associated with digestive or teething troubles, but if this persists or shows a tendency to increase examination of the eyes should not be delayed.

1. Correction of error of refraction. Error of refraction must be determined by retinoscopy with the eyes fully under the influence of a mydriatic such as atropine. The childs' accomodation must be completely paralysed by the mydriatic. Ointment of atropine (base) 1% should be employed and introduced into the lower fornix of each eye on three occasions daily, 3 days before the examination. In children of 12 years and over satisfactory cyclopegia can be produced by a solution of homatropine 1% and cocaine 2% over a period of 30 to 45 minutes immediately preceding the examination. Full correction under atropine should be ordered for constant wear. The parent must see that glasses are worn continuously all day and every day and maintained in good adjustment. In very young children spectacle frames of the "tie on" variety may be advised.

The child should be re-examined at the end of the three months and any alteration in the degree of the angle of the squint noted.

As soon as the child is old enough, an attempt should be made to determine the vision in each eye. The vision in squinting will be found to be below that of the other eye. This must be improved at the expense of the fixing eye by means of occlusion.

2. Occlusion. By this device the child is prevented from seeing with his good eye, and is therefore compelled to depend upon his amblyopic eye for all sight.

Occlusion must act efficiently . In cases where there is considerable difference between the vision of the two eyes it is essential that the fixing eye be covered continuously till the vision of the squinting eye has so improved that its degree of acuity compares favourably with that of the fixing eye. Defective occlusion and late treatment give poor prognosis. One should not wait for occulsion to be adopted till the child is of such an age that the vision can be recorded. If the degree of squint is considerable or there is a marked difference between the refraction of the two eyes the fixing eye should be occluded after the child has been wearing correcting glasses for a few month whatever the age.

Exercises. Once the vision in the squinting eye has been sufficiently developed various forms of orthoptic exercises may well be employed to stimulate the binnocular functions of the eyes, together with the more complex faculties of stereoscopic vision and depth perception. This is best done by Worths' amblyoscope.

Operation. Early operation is required in those cases in which a high degree of squint is present which is but little influenced by the use of glasses and those in which an alternating squint is present. Other circumstances being equal, it is better to delay operation until the child has reached his tenth birth day. Operation aims at lengthening or shortening the opposing muscles.

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MEDICO-SURGICAL SUGGESTIONS

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URINARY INFECTIONS IN CHILDHOOD

EDWARD WILLIAM WHITE, M.D., F.A.C.S. AND CHARLES A. MURRAY, M.D.
Chicago.

Urological complications attending childhood infections present an interesting study for the pediatrician and the urological surgeon and it is difficult to comprehend why literature of this important subject is so meager. Pediatric urology is not a distinct speciality. On the contrary, it ranks as an important phase of general urology, and more thought and more intelligent study should be given to it. Lamentable is the situation, that as urologists we have too long considered the so-called medical kidney as a thing apart from the scope of our endeavor. It is logical to assume that in order to thoroughly and successfully attack renal disease, one should strive to secure a thorough understanding of the acute and inflammatory kidney disease so commonly witnessed in childhood.

A complete urological survey is definitely indicated in the majority of cases of urinary infection in infancy and early childhood. These patients from conception to adult life are subject to the same pathological changes seen in later life with but few reservations. Among children, renal anomalies, renal tumors, acute infections, obstructive uropathies and a host of pathologic entities are daily recorded.

It is granted that the ordinary case of pyelitis, scarlatinal nephritis or pneumonic nephritis will terminate favorably if properly managed, however, it is still very important if the disease persists, to have a dependable understanding of any associated urological pathology which may be present.

Urinary Infections — Urinary infection results from bacterial invasion and is accompanied by a great variety of inflammatory changes. In the urine bacteria are regularly present and pus cells generally found. Not infrequently symptoms are wanting or may be extremely severe, localized in the urogenital system, or referred to other organs or regions. Although it has been adequately

demonstrated by urological investigations that urethro-vesicle infection exists without renal involvement, in most instances the predominant lesion is assumed to be in the kidney unless otherwise designated. It is commonly known that in many instances major uropathy begins in infancy or early adult life, hence the study of urinary infections in the young is worthy of grave consideration. Especially is this true when the disease neither resolves spontaneously nor responds readily to appropriate measures. Acute urinary infection in adult life may often be a recurrence of a low grade persistant process from childhood. Pyelonephritis of one year duration invariably becomes chronic and regardless of a lack of symptoms or clinical findings, it is constantly present to a greater or lesser degree. The so-called pyelitis of pregnancy could reasonably be of this category. All have witnessed instances of young girls dismissed from the hospital after attacks of acute pyelonephritis, who on re-examination months or years later have shown pathogenic bacteria in the urine. Many of the foregoing cases were doubtless examined prior to our present day knowledge of urinary tract pathology. Regardless of our present knowledge concerning urological conditions in childhood, these observations can be repeatedly confirmed. The recognition and adequate treatment of accessory causes of persistent urinary infection in childhood is essential for proper management of these cases.

Modern urological advances and refinements in the diagnosis of advanced or chronic structural changes in pediatric cases have clearly demonstrated that with but few exceptions, children may fall heir to every urological disease known to exist in adults. Because the important problem of urologic disease in infants and children is seemingly without end, and modern knowledge concerning it so disseminate, what may appear as undue emphasis on detail of discussion is here given for clarity and to impress firmly on our minds that not a few cases diagnosed as chronic cystitis or chronic pyelonephritis or persistent pyuria are in reality cases of renal anomalies, renal tumor, renal tuberculosis or calculus disease. As a rule, correct urologic diagnosis in chronic urinary infection is not attended by major difficulties, although the therapeutic phase may be extensive. Usually acute urinary infections properly recognized are self-limited and disappear clinically in from two or four weeks, irrespective of treatment.

General Consideration of Acute Urinary Infection in Children: Non-Tuberculous — In reviewing the literature, and from our own personal experience, we note that in most instances, acute urinary infections in children are commonly classified as pyelitis. Rayer in 1837 coined the term, and at that time differentiated quite clearly between infection of the renal pelvis and of the parenchyma. He further stressed a fact which is only too frequently forgotten, that

inflammation of the pelvis ultimately involves the parenchyma, and vice versa. If the literature is a criterion, comparatively slight attention was accorded Rayer's publications, until forty years later (1876) when Huttenbrenner emphasized their importance and gave an adequate clinical description of the disease. Echerich, two decades later (1895), reviewed the available data on pyelitis and pyelonephritis and stressed the high incidence of urinary infection in infants and children. The term colicystitis was used at this time, obviously considering the lesion a vesical one, possibly due to the predominance of the colon bacilli. While the foregoing citations have in a measure been substantiated by urological studies, yet it is generally conceded that infection of the renal parenchyma is the dominant lesion. Helmholz in recent years has confirmed this through extensive experimental research, as have also the pathological investigations and instrumental explorations of modern urologists.

Incidence — Acute urinary infection in childhood is most prevalent during the early years of life and due to its habit of complicating other disease processes, particularly in the naso-pharyngeal or intestinal tract, it could reasonably be considered the most frequent bacterial disease in children under two years of age. It is a well-known fact among pediatricians that most mild urinary infections go unrecognised, and only the most virulent attract clinical attention. Fromm, in a series of two hundred and twenty-five cases, reported urinary infection in 4.4 per cent. under the age of two years. In no succeeding years of childhood is acute urinary disease so prevalent, and only after the fourth decade is the incidence approached.

Etiology — The etiology of urinary disease in childhood is indeed a broad and important field, and as we know all to well, has an extensive literature. Although acute urinary diseases are directly produced by some bacterial invasion, there is a multitude of predisposing factors and accessory items of interest, namely; age, sex, heredity, seasonal causes, structural ureteral or renal changes, toxic trauma, etc., all of which have a definite bearing on diagnosis and management.

Mechanical Process: An Important Factor in Etiology — Urinary stasis plus obstruction seems to be the most potent predisposing factor in the production and promotion of urinary infection. An unimpeded flow of urine greatly inhibits the possibility of bacterial lodgement and hence inhibits the development of urinary infection of sufficient severity to attract clinical recognition. As a corollary, the maintenance of a free renal output is the most important single factor in the management of acute or chronic urinary infection. As Uon Lichtenburg so aptly expressed it. "The initial effect of urinary obstruction is urinary stasis or urinary constipation." The

pathologic processes active in the presence of stasis produce various degrees of renal congestion, hyperemia or engorgement. The congestion may result from a small or scarcely demonstrable residuum. The endothelial cells of the renal capillary bed exhibit marked phagocytic activity. However, the necessary function is perceptibly lessened by urinary back pressure, and furthermore the resistance of the renal cells is diminished. With an organ so debilitated, colon bacilli or other invading organisms rush in for the kill and usually become established. It appears to be axiomatic, therefore, that urinary stasis predisposed to infection, always perpetuates an established one, and there is slight hope for cure unless urostasis is eliminated.

Stasis may result from various urogenital obstructions, neuromuscular inertia, congenital malformations, embryologic rests or renal mobility. Each should be considered in the routine of urological analysis.

Toxic Trauma — Bacterial invasion through the medium of toxemia and trauma renders the renal epithelium more susceptible to devitalization and hence a fertile area for bacterial development.

Toxic injury to the renal structure demands greater consideration than traumatic injury, not only because of its higher incidence, but because of the possibility of bilaterality. The toxemia may be local or general as often noted in furunculous dermatosis or a part of a general septicemia. The resistance of the renal cells is overcome by the toxins elaborated by the invading organisms and severe renal infection ensues. General or systemic toxemia commonly exists in acute infections, such as, typhoid, scarlet fever, diphtheria, endocarditis, pneumonia, gastro-enteritis, measles, and chemical poisoning. The pathology depends on the severity of the invasion; simple congestion when mild, and cloudy swelling when the process is severe. The clinical manifestations of the toxic effects upon the sound kidney are often prominent in advanced unilateral disease, especially pyonephrosis. Toxic injury of the otherwise healthy mate frequently causes the appearance of a heavy cloud of albumin and showers of casts. Following elimination of the toxic process, as by surgical removal, the opposite kidney generally returns to normal.

Bacteriology — The subject of bacteriology in urinary infection, while extremely important, is too often neglected by urologists. But bacteriology has a specific place in urology if treatment is to be successful, particularly as concerns the use of our newer drugs. The medical profession in general, through intensive study, has made tremendous advances in bacteriological identification, classification and cultural characterization. What was formerly a meager understanding is today a definite science and its correct application to specific disease is noteworthy. For brevity, I believe classification

based on the gram stain characterization of organisms and for the diagnosis of the ordinary bacterial infection is entirely satisfactory for the average medical man.

Of the gram negative bacteria B. coli communis is most often found. In the adult it is said to cause about seventy-five per cent. of urinary infections. Other gram negative bacilli which cannot be distinguished from B. coli by gram stain are Aerobacter aerogenes and Pseudomonas and Proteus genera. The gonococcus, while being gram negative, is fortunately not very prevalent in children. The question of gonococcal infection of the kidney has been one of special interest to the urologist. A number of case reports are to be found in the literature, but considerable doubt seems to exist as to the correctness of the diagnosis in many instances. The greater significance of gonococcal infection in young children is in infection of the lower urinary tract and particularly significant in gonorrheal vaginitis.

Of the gram positive bacteria, staphylococcus is of the highest incidence, with streptococcus next. In contrast studies by various workers in an attempt to find the relative incidence of specific bacteria in renal and vesical infection, it has been quite definitely established that B. coli and staphylococci are more generally active in vesical infection; whereas, in renal disease the B. coli shows a lower incidence and there is a greatly increased incidence of staphylococcus, proteus, B. pyocyaneous and bacteria of the paratyphoid group.

It is generally understood and confirmed by personal experience, that among the various bacteria causing urinary infection in childhood, the members of the staphylococcus group are possibly as prevalent as B. coli. The relations of the staphylococcal invasion to the ultimate bacteriological picture is as yet an unsolved problem. As has been previously stated, staphylococci are predominant in vesical infection. In renal complications the staphylococcus, being usually hematogenous, is conceded by many to initiate the destructive renal process by lowering resistance and preparing the way for secondary invasion.

Assaults on the renal intergrity by the streptococci have been frequently cited. However, in actual practice they are encountered infinitely less than B. coli or staphylococci. In most statistical reports the incidence is below fifteen per cent. These lesions are characteristically cortical and chiefly glomerular and are diffusely scattered microscopic or macroscopic abscess formations. These metastatic lesions are infrequently found in interstitial tissue. Many other gram positive organisms are noted, but because of their comparative rarity, need not be discussed here.

Pathways of Renal Infection—In a brief and casual consideration of the important phase of pediatric urology, all interested in

urological research are thoroughly aware of the controversy still existing with regard to the pathways of renal infection. It is usually very difficult to determine the exact route of bacterial invasion of the kidney. However, in many cases it is clearly suggested by a careful analysis of the clinical history together with the symptomatology and urological findings. One should ever be on the alert in treating resistant cases of pyuria in childhood and insist on a complete cystoscopic and pyelographic study. Lower urinary tract pathology or other accessory conditions which would otherwise pass unnoticed can thereby be definitely discovered or ruled out.

The path of renal disease in infancy and early childhood is in most instances hematogenous or blood-born, secondary to the acute exanthemata, and of varying degrees of severity. The usuae pathologic renal picture is one of nephritis, acute glomerular, tulular or hemorrhagic.

Nephritis of one type or another ranks high among the cause of death. Age is not an important factor and although infants are less often attacked than older children, congenital or fetal nephritis has been reported. Between ten and twenty years of age the incidence seem rather high.

Pathology of the Kidneys in the Acute Infectious Desiases of Childhood—The simple degenerative change called cloudy swelling is the most common pathologic change in the kidneys during the course of acute infectious diseases in children. It is caused directly by the circulating toxins. The microscopic picture of the swollen, granular cytoplasm of the epithelial cells of the renal tubules is too well known to deserve more than passing mention. Clinically, aebumin and casts are found in the urine, but the process usually resolves completely when the infection subsides, leaving no trace of altered structure or function.

If the infection is more severe, cloudy swelling progress to hydropic degeneration, and even to fatty degeneration of the tubular epithelium. Even such severe damage to the renal parenchyma usually resolves to normal, when the acute infection subsides. This is probably difficult to understand until it is remembered that the epithelium of the renal tubules is capable of extensive regeneration, even when badly damaged. This is ture in adults as well as in children.

This is not so, however, with the glomeruli of the kidneys. When the latter are damaged we are justified in speaking of a "nephritis." In the vast majority of cases of acute infections the renal glomeruli fortunately escape injury, often in spite of severe toxemia. When such injury does develop, it does so, not as a direct result of the bacteria themselves, nor as a dirbct result of their toxins, but glomerular nephritis probably develops because the glomeruli become *sensitized* to the circulating toxin.

Large quantities of bacterial toxins filter through glomerular capillaries and Bowman's capsule without injurying these structures to a significant degree. In some individuals they become the site of a reactive process; and acute, subacute or chronic nephritis supervenes No bacteria are ever found in these lesions, yet the epithelium of Bowman's capsule or the endothelium of the glomerular capillaries (or both) become much swollen and may proliferate. In recent years, since the problem of hyperergic and allergic inflammation has been studied, it has become clear that in such individuals these vulnerable structures, constantly bombarded by toxin, become sensitized to it, finally rebel and react strongly and wildly, often to their detriment.

If the reaction is chiefly exudative, then an acute nephritis supervenes The hyperergic reaction may take the form of a marked increase in permeability of the capillaries, such as is seen in urticaria, etc., and red blood cells may actually exude through the capillary walls, resulting in hematuria. A marked swelling of the epithelium of Bowman's capsule or of the glomerular endothelium may occur, increasing from a normal thickness of less than half a micron to 8 to 10 (or more) microns, presenting a semi-permeable membrane 15 to 20 times thicker than normal. This naturally decreases filtration, resulting in oliguria Often the two mechanisms are combined. These acute hyperergic processes usually resolve to normal in the great majority of cases, a fact often observed clinically.

If the hyperergic reaction persists, instead of a cellular proliferation, subacute or chronic nephritis supervenes These conditions, unfortunately, often result in permanent damage to the kidneys. Proliferation of the epithelial cells of Bowman's capsule or of the capillary endothelial cells results in the formation of crescent-shaped masses of cells which fill and block Bowman's space, interfering mechanically with renal function. Filtration pressure must therefore increase, and hypertension may develop. Such cell masses do not absorb or resolve, and usually interfere permanently with the function of those glomeruli effected. As the cell masses become organized by fibrous scar tissue, the glomeruli become completely functionless. Furthermore, those individuals whose glomeruli become sensitized, may in later life have a flare-up with recurrent attacks of subacute nephritis whenever a bacterial toxin from some source filters through them. The described mechanisms probably explain the progressive, recurrent picture of chronic glomerular nephritis which follows acute infectious diseases.

If acute infectious diseases are complicated by suppurative foci, such as post-scarlatinal mastoiditis or post-pneumonic suppurative arthritis, then pyemic emboli may land in the kidneys and produce multiple cortical abscesses. Such abscesses may rupture the capsule

and produce a peri-nephritic abscess, which would require surgical drainage.

Another pathologic change that is being observed recently with alarming frequency is the precipitation of sulfanilamide crystals in the renal tubules, leading to the formation of sulfanilamide stones in the pelvis. This can often be obviated by adequate therapeutic management.

Syphilitic nephritis of nurslings, renal affections in congenital lues, the kidney complications following nasal, oral and mastoid surgery offer interesting and important subjects for presentation. Although at the onset, all, from the standpoint of renal pathology, present nephritic changes, the etiology and symptomatology are vastly different and each may require quite different management.

In the foregoing no attempt has been made to discuss specific disease entities. It is to be hoped that the problems briefly presented will constitute incentives for more intelligent and thoughtful evaluation of urinary symptoms in infants and children.

(*Illinois Medical Journal, Feb 1912.*)

CHRONIC ARTHRITIS*

WITH SPECIAL REFERENCE TO ETIOLOGY AND MANAGEMENT

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This paper will be limited to a discussion of the chronic non-specific affections of the joints. Such conditions as gout, gonorrhea, neurologic arthropathies, or direct invasion of the joints with the tubercle bacillus or with pyogenic micro-organisms will not be considered. Chronic arthritis is one of our most common diseases, affecting more than three million of our population, and one million, or a third of these, are bedridden, helpless, suffering cripples. Can anything be done to lessen the incidence of this crippling disease or to decrease the suffering of those already afflicted? This question will be considered presently by giving a brief history of a few selected cases.

My impressions of the arthritis problem, especially of etiology and management, are based solely on clinical evidence. After all, is not chronic arthritis, like rheumatic fever, a constitutional disease with joint manifestations? Is it not a problem for the general practitioner who first sees these cases when the disease is early, deformitis are minimal, and excellent results are possible?

*Presented before the Wyoming State Medical Society, Sheridan, Aug. 13, 1940.

CLASSIFICATION.

Chronic arthritis is usually divided into two main types, atrophic and hypertrophic. Other names used for the atrophic are rheumatoid, proliferative and infectious, and for the hypertrophic, non-infectious or osteoarthritis. Although both types frequently coexist and many cases can not be differentiated etiologically or pathologically, discussions will be simplified by accepting this concept of the joint changes.

ETIOLOGICAL FACTORS.

The intelligent management of arthritis, as in any disease, depends upon the recognition and removal, if possible, of all known or probable casual factors. In chronic arthritis as in rheumatic fever, no definite *specific* agent has been identified; but in both acute rheumatism and chronic rheumatism (diseases closely allied), clinical studies show that there are certain predisposing etiological factors which, in the patient's interest, should not be ignored.

In considering the etiology of chronic arthritis, no definite distinction will be made between the two main types. Although certain contributing factors, such as age, weight, trauma and heredity, may influence the pathological changes in the joints, these factors do not justify, in my opinion, the contention of some writers that atrophic and hypertrophic arthritis are always two independent diseases and wholly unrelated etiologically.

For many years I have been a firm believer in a bacterial toxic agent as the most important basic casual factor in all rheumatic diseases, acute or chronic. This idea was obtained from the excellent papers by Billings and Rosenow published in 1912 and 1914. These eminent investigators, by combined clinical and bacteriological studies, showed that an area of tissue, *without pain or tenderness*, may harbor and give off to the blood stream pathogenic bacteria or *their products* that may produce disease in remote parts of the body.

This discovery was not only revolutionary, but epoch making—revolutionary because the profession had scarcely grasped the teaching of Pasteur and Lister that *acute* inflammation was caused by living micro-organisms; and epoch making because it showed that pathogenic bacteria may live, multiply and throw off their products in areas of tissue giving no symptoms of acute inflammation. This doctrine of chronic infections, first promulgated by Billings, is the basis of the infectious theory of arthritis. If the theory of chronic infections is wrong, then the term "infectious arthritis" should be discarded.

Let us consider briefly how chronic infections may be related to joint disease. Laboratory and bacteriological proof is lacking. The evidence is largely clinical, partly immunological, and also involves questions in bacterial allergy. There is no bacteremia and there is no evidence that the joints are invaded by micro-organisms. Fluid aspirated from such joints is as sterile as in cases of serum sickness.

Since organisms are found neither in the blood nor in the joints, the question may be asked: What is the connection between chronic infections and arthritis? According to William Boyd "The culprit is not the germ but bacterial products." This view seems to be a plausible explanation and can not easily be disproved. Boyd further states that the real "culprit is a toxic agent, probably the result of an interaction between the toxins of bacteria and the tissue cells." This toxic agent is referred to by some writers as "allergen." The views expressed by Boyd are supported by the studies of a number of immunologists and also by clinical observation.

What is the clinical evidence?

1. Absence of any significant advance in the study or management of arthritis before the concept of focal infection was introduced.

2. The frequency of a history of past or existing infections.

3. A history or actual evidence of concurrent diseases known to be due to chronic infections, such as glomerular nephritis and iritis.

4. The occasional relief of symptoms immediately following of removal of chronic infections.

5. Widespread acceptance of the infectious theory by the general practitioner and by the laity.

6. Increasing recognition of the infectious theory by the authorities on arthritis. In a review of all the English literature on arthritis in 1936, the reviewer stated: "On the basis of the literature under review, the pendulums could hardly swing farther away from the subject of foci of infection and keep it alive." The same reviewer in a review just published of the articles of 1938, cited fifty-two publications on infections as casual factors.

Specialists seem to be letting up in their fanatical derision of the infectious theory. In 1938, Hench' closed an address on rheumatic arthritis as follows: "In practice I regard the factor of infection as of great importance. Experience with large numbers of patients has given me the distinct clinical impression that a program of treatment based on approval of the microbic theory is superior to those programs which ignore the factor of infection or relegate it to a place of minor importance. Therefore, as a practicing clinician, I have committed myself, with reservations, to the microbic theory."

To discover and properly evaluate foci of chronic infections, as well as the contributory factors in both types of arthritis, presents one of the most difficult diagnostic problems in medicine. I firmly believe in the clinical approach. A careful history will usually give more information than all the laboratory tests combined A clinical investigation conducted in the proper way often gives a clue to some causal factor, especially a chronic or latent infection. What can be said of a few of the most common atria?

1. Tonsils. Much has been said about "wholesale removal of innocent tonsils." I know of no one who contends that a normal tonsil will cause arthritis, but who can make a 100 per cent diagnosis whether a tonsil is or is not diseased? This is particularly true in patients with imbedded tonsils or a tonsillar stub following incomplete removal. If tonsillar infection is related in any way to acute rheumatism, it should be safe to assume an etiological relationship in chronic rheumatism.

In a study of 48,000 school children, Kaiser showed that the incidence of rheumatic heart disease was 37 per cent higher in children with tonsils than in children whose tonsils had been removed. This, of course, is the experience of at least 80 per cent of the general practitioners. These figures show one way to lessen the incidence of rheumatic heart disease.

The importance of removing infected tonsils is common knowledge among general practitioners. The best paper I ever heard on the relation between infected tonsils and systemic disease was the recent one of Dr. Earl Whedon. His careful study of 1,510 tonsillectomized children personally observed over a period of thirty-four years is real clinical investigation and is the kind of research advocated by James MacKenzie nearly half a century ago.

2. Teeth. Infection in and around the teeth is the most common focus in adults. Should the evaluation of the significance of oral sepsis be left to the dentist who does not have an opportunity to observe the systemic effects of infections? Who would be responsible if an area of infection in the mouth, pronounced innocent by a dentist, should cause arthritis or even death from bacterial endocarditis or some other form of visceral disease? The physician, of course. A non-vital tooth may be much less important than gingivitis or a pyorrhea pocket in a patient who has worn braces to straighten the teeth or who gives a history of salivation or of repeated attacks of trench mouth.

Willcox of London, writing in Hill and Ellman's new book on rheumatic diseases, states that in 95 per cent of his cases of oral sepsis the infection is gingivitis, pyorrhea pockets or alveolar abscesses. Our experience is similar since we find pyorrhea and gingivitis fifteen times as often as we find apical abscesses.

3. Other foci frequently overlooked, occurring in the order named, are paranasal sinuses, female pelvic organs, gallbladder, prostate, rectum, and toe nails.

The importance of chronic infections in different organs will be illustrated in the case histories.

It is a common belief among the laity that rheumatism is due to an infection somewhere in the body, and the frequency with which patients give a history of relief of rheumatic conditions following the removal of infections is surprising. For instance, a

woman of 46 from Oklahoma consulted us recently because of obesity and menopausal symptoms. She stated that for one and a half years, in 1931 and 1932, she was in bed or in an invalid chair because of a generalized arthritis. All her teeth were extracted without relief. Finally, her gallbladder full of stones was removed. At the end of the month, she was no better. She then took up Christian Science and five weeks later was free from pain and stiffness, and has had no recurrence. She d es not believe in the infectious theory of arthritis!

MANAGEMENT OF ARTHRITIS.

The incidence of this crippling disease may be markedly lessened by the combination of a co-operative patient and an interested doctor giving attention to a few of the probable etiological factors. Cures may be hoped for, if at all, only in the early cases No plan of management can be expected to restore to normal a joint that is extensively altered by disease.

An attempt should be made to combat the outstanding features first. The chief symptom for which patients seek relief is pain. That the relief of pain is urgently indicated is not, in my opinion, adequately stressed. I have known patients to become definitely psychotic from constant, agonizing pain that interfered with sleep and rest. It is pain that causes muscle spasm and the resulting arthritis deformans. That ankylosis, subluxations, and alteration of all the joint structures may result from long continued splinting of the joints by spastic muscles due to pain, is easily understood. Complete immobilization for only a few months of certain normal joints, such as the wrist, may produce ankylosis. Relaxation of spastic muscles, either spontaneously or following massage, will occur only when pain is controlled. Most of the patients we see have tried, without results, heat, alternating temperature baths, and various physiotherapy procedures for relief of pain and muscle spasm. Some writers have even recommended dilaudid, which is an opium derivative and similar in its action and habit forming properties to heroin.

The chief features of the management we have used for arthritis for a number of years are: first, salicylates; second, removal of focal infections.

1. Salicylates. I am convinced that the action of the salicylates is something more than just analgesic. The results following their use clearly indicate a definite action on the joint structures. In rheumatic fever, the action of sodium salicylate can be considered almost specific. When properly administered (large doses) in acute rheumatism, all symptoms such as fever, pain and swelling and redness of the joints disappear in thirty-six to sixty hours in 90 per cent of cases. According to Swift the action of the salicylates in rheumatic fever " is dependent upon depressing the irritative properties of the etiological agent and desensitizing the joint structures,

thereby lessening exudation and inflammatory reaction. There is no evidence that the production of immune bodies is increased." All of this, of course, is in reference to rheumatic fever, but does not the majority opinion favor the view of a similarity between rheumatic fever and proliferative arthritis, the differences being due to age and reaction of the invaded tissues?

Comparatively few writers in this country even mention the use of salicylates in chronic arthritis, and then only in homeopathic doses. Results with sodium salicylate can be obtained only with massive doses, 125 to 250 grains or more daily. Lack of results usually can be attributed to inadequate dosage and improper administration. As in the use of digitalis, an effort should be made to determine not only the optimum but also the maintenance dose. We begin by giving 90 to 125 grains the first day, 20 per cent less the second day, and then the drug is discontinued always for two days. When resumed on the fifth day, the amount given is increased over the original dosage about 20 per cent depending upon the age and weight of the patient. During the " rest days, aspirin is given, 40 to 60 grains daily. When the dosage of sodium salicylate is properly and gradually increased, patients usually develop a tolerance for the drug so that after two or three weeks, the average patient is able to take 150 to 250 grains a day for two days out of four; this may be kept up for months. Sodium bicarbonate should be given grain for grain with each dose of sodium salicylate or aspirin. When patients complain too much of gastric irritation, sodium salicylate may be given by the rectum; but in recent years, since using the drug in wax coated tablets and following the method of administration as outlined, complaints of gastric irritation are seldom heard.

Toxic effects? Impairment of hearing and tinnitus are always signs of the physiological action of the drug and can be used as a gauge to dosage. Hematuria has not been seen except when massive daily doses are given without interruption.

We do not contend that sodium salicylate is a specific for arthritis and striking effects should not be expected in the presence of a highly active etiological agent. However, pain may be completely relieved, thereby decreasing muscle spasm and contractures. Exudation in and around the joints is also lessened. If the exudate contains the " glue from which connective tissue is formed "." then fibrous ankylosis may be prevented.

With the symptomatic relief thus obtained, patients are able to sleep and eat, gain weight become encouraged and begin to doubt the statement that " nothing can be done for arthritis."

2. Removal of Foci of Infection. In four out of five of the modern textbooks of medicine, the removal of foci is either the first or second therapeutic procedure recommended in rheumatoid or infectious arthritis. Many general practitioners with whom I talk do not know that the removal of foci is a controversial subject.

It needs to be emphasized that removal of foci is largely a preventive measure. To expect a cure of advanced cases of arthritis or even relief of all cases, is a viewpoint that is just as wrong as statements to the effect that removal never does any good. It is all a question of percentage. That early removal of infectious foci will prevent a sufficiently large percentage of cases of arthritis and the removal after the disease has developed will favorably influence a definite percentage is enough in my opinion, to justify this comparatively simple precedure.

Foci may be in a number of regions of the body, and the removal of an obvious focus but leaving one or more other foci will do no good as the history of the woman from Oklahoma illustrates. Although we have had experience for a number of years in looking patients over in a search for foci of infection, even though none is found, we never record that none exists.

In the treatment of arthritis, I firmly believe in the complete eradication of all positive or strongly suspicious foci, provided this can be done without too much radical surgery, I do not agree with such statements that in the treatment of arthritis, foci of infection should be removed merely because of their detrimental effect on general health. This is evading the etiological issue. If infections are not directly related etiologically to the arthritis, then they should not be removed.

3. Rest The decision of how long a joint should be kept at rest will depend on two things—pain and time. An inflamed joint should not be used. On the other hand, complete immobilization of a joint for months by splints, muscle spasm or otherwise, is harmful. With bedrest and the judicious use of sodium salicylate for a few weeks, pain and soreness usually subside so that gentle passive and active motion may be instituted.

4. Weight Reduction and Relief of Trauma. Probably more important than a history of a severe injury to a joint is daily minor trauma, especially of the hips or knees, due to walking, in patients who are overweight. Nothing is so important in the management of these cases as weight reduction and in some instances the wearing of a brace. We have seen a few patients, incapacitated from the changes of hypertrophic arthritis of the hip, become entirely symptom-free in a few months by putting the hip joint at rest with the use of crutches either with or without a brace The same thing will happen with arthritis of the knee joint. Also, in cases of hypertrophic arthritis of the spine, we have frequently seen complete symptomatic relief by avoiding stooping, lifting and motoring, by the wearing of a brace, and by taking sodium salicylate.

5. Psychotherapy. Next to pain relief with sodium salicylate, there is nothing more important for the suffering arthritic than hope. Without a hopeful attitude, even after the pain is relieved

with sodium salicylate, the crippled arthritic can hardly be expected to indulge very energetically in active exercise.

In a clinic on arthritis that I attended recently, a number of patients being demonstrated were all told the same thing *i.e.*, that *the cause* of arthritis was not known and there is no treatment for it. It was then explained to the patient that since arthritis never kills, they would have to adjust their lives to an incurable, progressive, painful disease. Is it any wonder that so many arthritics go to cultists?

(*Rocky Mountain Medical Journal, Sep. 1941.*)

Extracts.

LEUCODERMA.

BY D. PANJA, M.B.. (CAL.)

Leucoderma is neither contagious, infectious nor hereditary. It is an acquired loss of pigment in the skin which manifests itself by the occurrence of ivory—white patches. Etiology is unknown. But some intestinal infection is present.

The lesions give rise to no subjective symptoms but, the whitened patches are hypersensitive to heat and light. General health is not affected. The affection may remain stationary for years and is generally slowly progressive in its course but in rare cases the patches may disappear spontaneously. Diagnosis is easy but may be confused with partial albinism which is congenital and the patient has always a blue 'iris.' Melano—leucoderma may also resemble leucoderma but affects the palms of the hands and the soles of the feet and is a late manifestation of syphilis.

General Treatment. Any infection of the bowel bacillary, helmenthic or amoebic should be treated. Irregular action of the bowels should be corrected. Liq. Hydrargyri Perchloride (B.P.) is given in half to one drachm dose twice daily after meals for three to four weeks and is repeated after an interval of 1 to 2 weeks. The treatment is to be continued for 3 to 6 months or longer.

Spices and food causing intestinal fermentation should be avoided. Germinating gram, beans and peas which yield a good supply of tyrosin, a precursor of melanin are given in plenty.

Local Treatment. Rub gently the oil of boachi (Psoraba Corylifolia) on the lesion twice a day for 5 to 10 minutes each time in order to cause stimulation of pigment cells. If the oil produces redness and vesication, it should be stopped and a soothing lotion such as calamine lotion should be applied on the patches several times each day until the redness and vesication subsides. When the

skin is normal, apply the oil again but diluted with olive oil 1 in 2 or 1 in 3 according to tolerance of the skin.

The diluted oil should be used by children or on tender parts such as the muco-cutaneous juction of the lips, eyelids etc.

Injection method. The patch is carefully cleared with alcohol and the oil is injected intradermally with an ordinary hypodermic syringe fitted with a fine needle. The amount of oil in each injection is a single drop. Larger patches are injected at a distance of 1 c. m. or a little more apart. In two or three weeks formation of pigment can be noticed. When the deposition of pigment ceases another course of injections may be given in the intermediate white patches until the whole area is normally pigment once more. The injections are painful and some time a small focal ulcer may result.

(*Indian Medical Gazette.*)

TREATMENT OF BACILLARY DYSENTERY WITH M. & B. 693.

BY G. J. BELL, M.B. (LOND.) D.P.M.

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An epidemic of dysentery occurred recently at this colony which houses mental defectives of all grades. The number of patients affected was 16. Bacteriological investigations carried out by Dr. J. T. Duncan revealed that in this one epidemic there were two types of dysenteric infection. Bacillus dysenteriæ Flexner being isolated from the stools of about two-thirds of the cases, and B. dysenteriæ Sonne from the others. In the patients infected with B. dysenteriæ Flexner the symptoms tended to be much more severe; they exibited pyrexia up to 104 F., frequent passage of stools consisting of blood and mucus or pure blood, and severe tenesmus. The same group only had severe diarrhœa with much mucus and only an occasional trace of blood.

The opportunity was taken of treating the condition with M. & B. 693. This was given in doses of 0·5. g. four-hourly by mouth, and the average total amount received by each patient was 5 g. On this dosage and method of administration no symptoms of intolerance such as nausea or vomiting were shown by any of the patients. The result obtained was very satisfactory. In all cases treated the symptoms cleared up in 36 to 72 hours. The effect on the pyrexia was immediate and temperatures returned to normal within 24 to 48 hours. After the passing of blood and mucus had ceased there was a period of constipation varying from 2 to 4 days before normal

stools appeared. In the treated cases there was little variation in the clinical picture. The following is an example:

An epileptic imbecile aged 27. First symptoms of illness March 5, 1941. Passed frequent loose motions containing blood and mucus. Rise of temperature to 103 F. Pulse-rate 72 to 100. Respirations 18 to 20. Complained of tenesmus. M. & B. 693 one tablet 4-hourly given. On the 6th passed only one loose motion containing blood and mucus. No complaint of tenesmus. Highest temp. 101·8 F. On the 7th much improved. Had one loose motion containing mucus only. Highest temp. 99 F. On the 8th no further symptoms. Received 10 g. M. & B. 693 altogether. B. dysenteriæ Flexner present in stools.

The first two cases in this series did not receive treatment by M. & B. 693, and though they were obviously inadequate in number for purposes of comparison, the course of the disease in them did differ greatly from that in the treated cases. One made a good recovery after exhibiting typical dysenteric symptoms for nearly two weeks. The other (a low-grade epileptic imbecile) died after an illness lasting five days.

Of the 14 patients who received chemotherapy, specimens of bowel material were taken for examination before treatment was begun from the first 8. All gave positive results, 5 being found to be infected with B. dysenteriæ Flexner and the remainder with B. dysenteriæ Sonne. In the subsequent 6 cases treatment was instituted immediately symptoms appeared. Specimens for examination were taken at varying periods afterwards, but only in one instance when this was done within 24 hours was a positive result obtained, B. dysenteriæ Flexner being found. All patients in this group exhibited typical dysenteric symptoms similar to those shown by the earlier cases.

Dysentery bacilli were never found in any specimens taken for examination later than 36 hours after the beginning of treatment with M. & B. 693. Repeated examinations in all cases treated have so far been entirely negative. The specimens for examination were taken by means of rectal swabs. In 2 patients there was a recurrence of symptoms of mild degree 5 days and 14 days respectively after the cessation of symptoms, but it could not be confirmed bacteriologically that these were either relapses or reinfections. They were treated as before, with disappearance of symptoms within 24 hours.

(*Lancet*)

TREATMENT OF TUBERCULOUS GLANDS OF THE NECK IN CHILDREN.

BY JAMES C. GILLIES, M.B., F.R.C.S.E.,
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IN most cases the first glands to become enlarged are those of the upper deep cervical group.

If the glands in the lower part of the neck become enlarged without enlargement of the upper glands, then the route of infection is from below, and it will be found that there are tuberculous glands in the mediastinum or the abdomen. The recognition of this by Grey Turner was a big step since it explained the failure of local treatment in this type of case. This Condition occurs mostly in older children and in adults; its treatment is general and will not be further discussed. It is mentioned here now, and the importance of it being recognised is emphasized.

Management of the case. It is important firstly to get a full history of the previous health of the child, and the exact site of onset of the glandular enlargement. The family history too is important. Then examine the child carefully throughout, particularly the teeth, tonsils, eyes and ears. X-ray of the chest is advisable. Examine the axillæ and groins for other glandular enlargement; this may provent you making a wrong diagnosis Any focus of disease, particularly bad teeth, or infected tonsils and adenoids, must be dealt with. Tonsils should de quiescent at the time of removal; remember always that there is danger of causing secondary infection in the tuberculous glands.

General treatment. If the disease is in its early stages, general treatment may abort it. Open air treatment and rest are important. Where the onset is fairly acute the child should be kept in bed for a minimum period of three weeks, and movements of the neck restricted by a thick collar of cotton wool or a jury mast. Town children should be sent to the country or the seaside. Cod-liver oil and syrup ferri iodi are useful. Good food and plenty should be given, particularly eggs, butter and meat. Natural sun-light or ultra-violet rays applied generally are helpful; local ultra-violet rays are not.

With the eradication of bad teeth and tonsils, and general treatment as above, the glands may subside; the general health at least should be much improved. The patient will require observation over a long period owing to the faculty of the tubercle bacillus of lying dormant only to resume activity at the first opportunity. While even a small lump is palpable, the condition is not cured, although conservative measures may be continued.

Local treatment. If at the end of three months treatment there is a chronic mass in the upper neck, or if at any time there is a sudden increase in size, indicating massive caseation, the operation

must be undertaken for the removal of the upper deep cervical glands.

The operation is not a serious one from the patient's viewpoint, although surgically it may be difficult. The amount of glandular enlargement is always greater than it appears from the outside. The aim should be to remove all the upper deep cervical glands. The incision is made in the line of the neck creases, and should be adequate in length. The tonsillar gland, particularly if it is caseous, is usually adherent in front to the large common facial vein and behind to the internal jugular. It is necessary to remove the glands along the internal jugular from the level of the omo-hyoid upwards. The anterior triangle is crossed obliquely at its apex by the spinal accessory nerve which is often embedded in glands. If it is necessary to continue the dissection into the lower part of the neck, a second transverse incision is made. Vertical incisions are not allowed. Careful approximation of the skin edges with Michel's clips will give an inconspicuous scar. Following operation, a further period of general treatment is advisable.

If the case presents itself with an abscess, operation is not precluded. One can go through the abscess, cleaning out the cavity with spirit, and, after carefully enlarging the hole in the deep fascia, proceed with the dissection. It is perhaps better to incise and empty a large abscess at a preliminary operation, leaving the dissection to a date a week or so later.

Old sinuses, where most of the caseous matter appears to have extruded itself, may be induced to heal by gentle curettage. Where a palpable mass is present beneath the sinus, operation should be planned to excise the sinus, and the mass of glands causing it.

Aspiration of abscesses is a difficult and unsatisfactory procedure which cannot be maintained for any time without sinuses developing. Aspiration is useful for clinching a doubful diagnosis or to prevent breaking down of the skin for a short period until operation cannot be performed.

The use of the sharp spoon on caseous glands gives dramatic successes in some hands and leaves a very small scar. It is, however, an uncertain procedure, and not without danger. Success has been claimed for treatment with radium and X-rays, without convincing substantiation up till now. Such treatments are liable to increase the difficulty of operation when the cases ultimately come to the surgeon.

More recently, treatment has been attempted by injections into the glands. This method requires further trial before it can be recommended.

(*Medical Press and Circular.*)

DIABETES MELLITUS AND SYPHILIS

BY L. TILLMAN McDANIEL, AND HERBERT H. MARKS AND ELLIOTT P. JOSLIN

New England Deaconess Hosp.

A careful study of 258 patients with diabetes and syphilis was made by the authors. Every case had met rigid criteria for diagnosis. Before diabetes may be assumed to be the result of a syphilitic infection, it must appear subsequent to the infection. Adequate antisyphilitic treatment should result in a fairly prompt improvement in the diabetes and the syphilis, whereas antidiabetic treatment alone should be ineffective.

A review of cases presented in the literature as instances of diabetes due to syphilis showed that practically all of them fail to satisfy the foregoing criteria. The chief factors in the causation of diabetes (heredity, overweight and age at onset) are the same for the diabetics with syphilis as for the diabetics without syphilis. Evidence against the relationship of the two diseases is the marked difference between the sexes in the duration of syphilis before the onset of diabetes. A diabetic with syphilis may be given antisyphilitic treatment with the same consideration given to any other patient. To be sure that antisyphilitic treatment has improved or cured diabetes, a case must be followed for years and checked with glucose tolerance tests. No such cure was observed in the 258 cases. The patient with syphilis and diabetes does not appear to have any type of diabetes different from that of the usual patient of the same age. The authors have been unable to recognize the characteristics of such a clinical entity as "syphilitic diabetes."

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