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Original Communications.

ON THE USE OF ROENTGEN RAYS IN MEDICINE AND SURGERY.*

BY

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In December, 1895, Professor Roentgen, of Wurzburg, first announced the discovery of certain rays which emanated from an excited Crookes tube enclosed in a cardboard box, from which box no light was visible, but some platino-cyanide of barium which he happened to have, gave out a fluorescence when brought in the vicinity of the box. On further investigation he found this fluorescence was due to certain rays emanating from the tube which penetrated the walls of the box in which it was enclosed, and when further examined he found that these rays could pass through certain materials whilst they would not pass through others, and that when platino-cyanide of barium was spread on a card and held up near the Crookes tube when excited, platino-cyanide became luminous. and that when any substances, some opaque, some transparent to these rays were interposed between the tube and the platino-cyanide, a shadow picture of the opaque bodies was seen. These Crookes tubes may be excited by either a static machine or a Rhumkorff coil.

There are any number of static machines; the old frictional machines in which the electricity was developed by friction of glass cylinders, or plates or ebonite plates, these have given place to the induction machines, which are all based on the old electrophorus, in which a plate of resin or sulphur, or both, in a tin dish was excited by rubbing with a cat's skin, and then placing a metallic plate on the plate of resin and then touching the upper surface. The metal plate became charged with

* Read before the Canadian Medical Association, September, 1902.

positive electricity which could be carried by an insulated handle to a leyden jar, and a charge could be put into the leyden jar. This process repeated *ad infinitum* would go on storing up a charge until at last the leyden jar contained a considerable charge. The various induction machines are made on this principle so that a constant supply of electricity is produced, and carried off to be made use of. One side of the plate is negative and the other positive. These machines which used to consist of but one pair of plates are now made up of large numbers and considerable sized plates up to six feet. Lord Blythwood, in Glasgow, has a machine of 120 plates, the largest in the world. Instead of being driven by hand they are driven by dynamos at from 300 to 400 revolutions per minute, so that practically any amount of electricity may be obtained from this source of high tension ready to illuminate one of these tubes. The charge in this tube can be regulated by the length of the spark gap in the circuit, the longer the spark gap is, the greater the amount of electricity passing through the tube at the time and the number of sparks are so numerous that the light from them becomes continuous and almost without a flicker.

An induction coil consists of a coil of copper wire wound around a central core of soft iron and consisting of comparatively few turns from 100 to 200 according to the size of the coil and requirements, called the primary. Outside this and carefully insulated from it, is wound a coil of exceedingly thin wire of many turns, some thousands, called the secondary coil, the primary and secondary together constituting the induction coil which is excited by a pulsating or interrupted current. At every pulsation or interruption a current of electricity passes through the primary and produces an induced current in the secondary, and the intensity of this current is regulated by the ratio of the number of turns of the secondary to primary. The terminals of the secondary are attached to the terminals of the Crooke's tube, and for every pulse of current in the primary a spark is passed between the terminals of the tube. These sparks are so numerous that they give the appearance in the tube of continuous light.

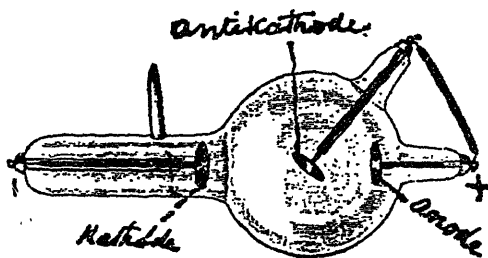
From either of these sources the electricity is obtained, and many are the arguments pro and con as to which is the better. If any of you are desirous of going into the apparatus for yourselves I shall be glad to give you all the information I can, but it is not necessary to enter into all these arguments at the present moment. Either source of electrical excitation will answer for the present consideration, and both are used and have their staunch friends.

The rays which are known as X-rays are not luminous themselves, in fact, are invisible. They penetrate through many substances such as

wood and its elements, metallic or otherwise, of low atomic weight, the elements of low atomic weight being pervious or transparent to these rays, whilst the heavier atomic weight elements are opaque, although in very thin layers they also are transparent.

	Hydrogen.. 1		
Non-metallic	Carbon.. 12	Non-metallic	
Transparent	Nitrogen... 14	Opaque	Iodine 127
	Oxygen.. 16 etc.		
	Lithium. 7		Mercury. 200
Metallic	Magnesium... 20	Metallic	Lead.
Transparent	Aluminum.. 27	Opaque	Silver.... 108
	Sodium.. 23		Gold.. 196
	Potassium. 39		Platinum... 196

Some of the salts of some of the heavier metals are capable of stopping these rays and converting them into light or luminous rays, notably tungstate of calcium or platinocyanide of barium, hence screens can be coated with such materials. Screens of these materials constitute the screens upon which our shadow pictures are produced. Any object placed between the Crooke's tube throws a shadow according to its opacity to the X-rays, thus the skin and flesh are more easily penetrated than the bones, and they in turn vary in opacity according to their density and so also do the other tissues of the body. And the soft parts as well as the bones differ in transparency inversely as their thickness.



CROOKE'S TUBE.

The rays emanate from the antikathode plate in the Crooke's tube from a point, as light from a candle, and they diverge from that point in straight lines in all directions in front of the antikathode, forming a hemisphere of rays diverging from a point, and to view an object without distortion it is necessary for the screen to be held in a plane which is normal to some of the radii of that luminous hemisphere. This can be judged of by moving the object slightly to right and left or up and down, and observing that point where the distortion is least, or altering the position of the screen or of the patient to obtain a good view. I have a narrow frame of hardwood placed on legs of convenient height to stand by and lean over, 18 inches wide and six feet long, with

a canvas strained tight on top. Under this I have my tube rigged up on a traveller, which enables it to be placed at any point from end to end or side to side of this couch, and its position can be raised up nearer or lowered from the canvas so that it can be placed with the platinum antikathode vertically under any part of the body. Then, in a room absolutely dark, the screen is placed over the body and any and every part can be examined and compared with the normal. Even the light from the tube should be screened off.

The normal amount of luminous appearance on the screen for the different parts of the body should be first ascertained and then on examination any aberration from normal can be recognized. A normal line or wire should be placed over the patient lying on the couch from head to foot and indicating the median line. A wire with two light weights attached answers well and should be placed carefully along the median line. A similar wire may be placed across the body at right angles to the previous one; a piece of ordinary flexible electric lamp cord answers the purpose and will throw a shadow on the screen.

The *head* it is difficult to see through, so as to show any tumour within the bone, but there may be a difference on the two sides, so that a fore and aft view will show a little increase of thickness or density of the two sides.

The *thorax*. The ribs are seen distinctly, both the back and front portions with the clavicles, scapulæ and shoulder joints. The lungs being inflated are very transparent, and the heart and vertebræ can be readily made out. The movement of the diaphragm is very clear and can readily be compared on the two sides to see if it be normal or reduced. The heart can be seen pulsating and the movements of both auricles and ventricles can be seen well. The roots of the lungs can generally be seen and, if a skiagraph be taken, the larger bronchial tubes can be made out and the great vessels and vertebræ.

Having determined in your own experience the normal condition it becomes easy to determine the abnormal. If there be any affection of the lungs the earliest symptom is decreased movement of the diaphragm on the affected side, increase in density from inflammatory deposits or adhesions.

In pneumonia there is generally some consolidation of the lung on the affected side clearly shown and even localized.

In pleurisy, if there is effusion it shows in a remarkable manner. On examining the patient in a sitting position the liquid assumes a surface level with the floor, and you see the chest completely dark with a perfectly straight line across; but if the patient be placed on the back the lung will float on to the side uppermost and will show more as a trans-

parent part in the dark background of the liquid. When the patient is sitting up, the level of the fluid may be disturbed by shaking and waves can be seen distinctly passing across the patient, and the pulsations of the heart can be counted by the waves on the surface of the liquid. Thus the condition of the lungs or heart can be easily made out and more especially when there is thickening of tissue or displacement.

In the *abdominal cavity* the viscera are so much more dense and the muscular walls back and front are so much more opaque, that it is much more difficult to make out the condition satisfactorily. Still something can be done. The upper surface of the liver shows and corresponds with the dome of the diaphragm. The stomach can generally be made out as a transparent portion in its proper place; this can often be more distinctly made out by giving a dose of carbonate of bismuth, which throws a shadow more or less the shape of the stomach so that movements thereof and of the intestines can be made out by these means. The kidneys can sometimes be made out but not always, and stones in the kidneys, ureters or bladder may be made out. This depends to a certain extent on the composition of the calculus; cystin is almost transparent, so is uric acid, but the phosphatic or mixed calculi will sometimes show their structure in layers of alternate transparent uric acid or opaque phosphate of lime.

In making a *fluoroscopic examination*, it is necessary to use a fluoroscope or a screen. I have already described the screen which must be used in a dark room, by dark meaning absolutely without light, the patient being placed upon the couch and the tube below. The screen is placed above the patient and a shadow of the body will be seen and by moving it about over the patient the different parts of the body will soon be recognized, taking care that the tube be moved also so as to have the antikathode parallel with the screen. Before attempting to see anything on the screen it is well to remain in the dark for a good ten or twenty minutes or more, so as to allow the retina to recover its activity and to rid itself of previous impressions. After a little practice it will soon be possible to make out the different organs and the medical man who wishes to become a good fluoroscopist must become familiar with the normal appearances in health.

The nearer the object is to the screen on which the shadow is thrown the sharper will the shadow be, and the further off from the screen the less distinct will be the shadow. Having examined the patient fluoroscopically, or whilst doing so, a piece of celluloid and a bit of tracing paper may be put over the screen, and with a pencil with a metallic point the different organs may be drawn on the thin tracing paper for future reference. If a picture is needed, a photographic plate with

the film side next the light is laid on the patient, with the film surface forming a plane normal to the radii of the light, and a sheet of thick lead laid on the back of the plate to protect the plate from the action of diffuse rays. The plate is developed and fixed as an ordinary photographic plate. The reading of what is seen on the plate must be accomplished with due regard to the picture of health. I have here a number of pictures which illustrate what may be done in this way.

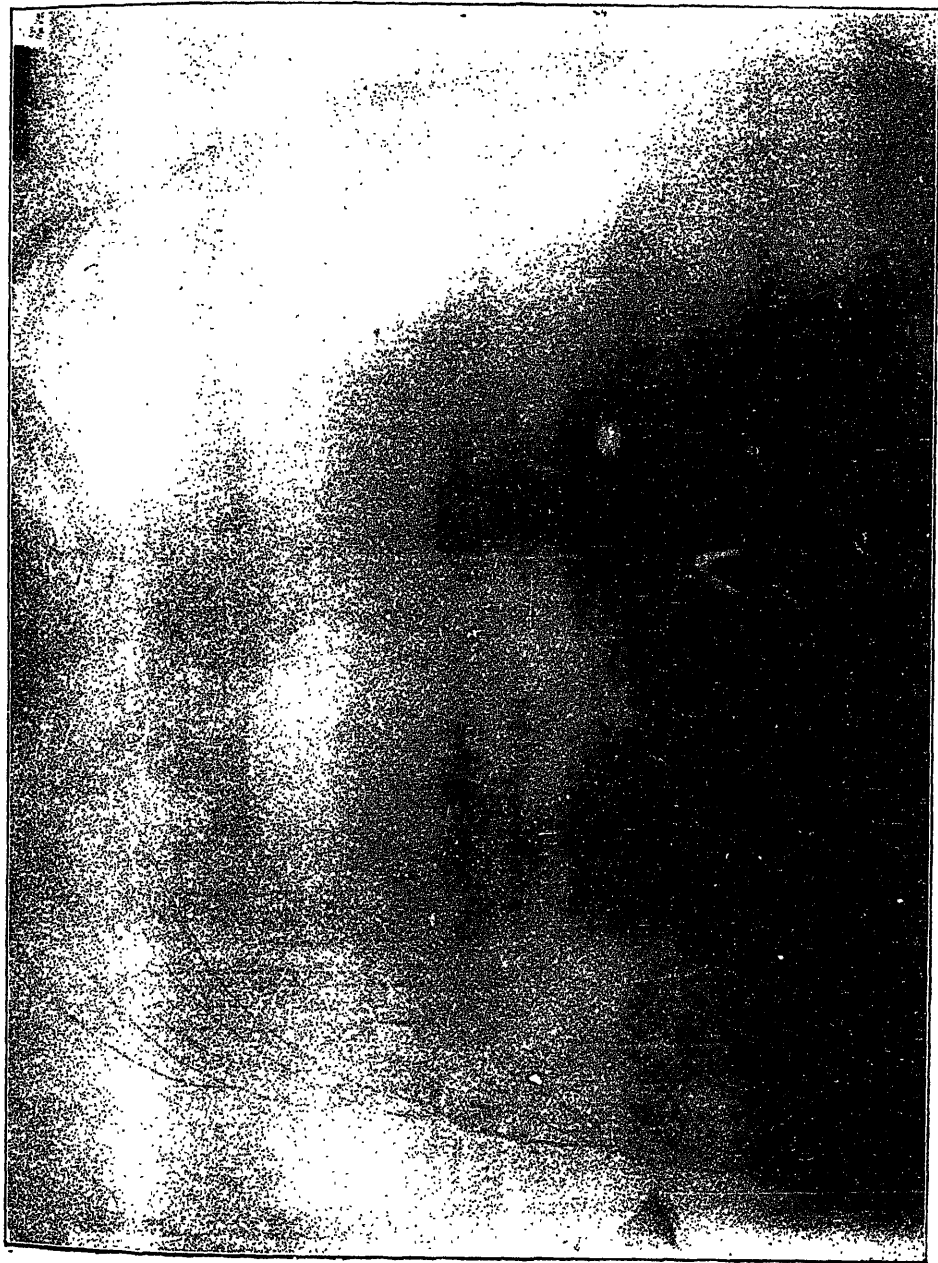
I have taken many of these pictures stereoscopically, and this may be done so as to have a large stereoscope to view them ; or they may be reduced in size so as to see them in a small hand stereoscope.

In *dentistry* the use of the X-rays has been carried to a remarkable point in showing the cavities in teeth, malpositions of the teeth, and abscesses of the socket. Beautiful photographs of teeth taken by Dr. Weston Price, of Cleveland, were shown, illustrating the advance in this direction.

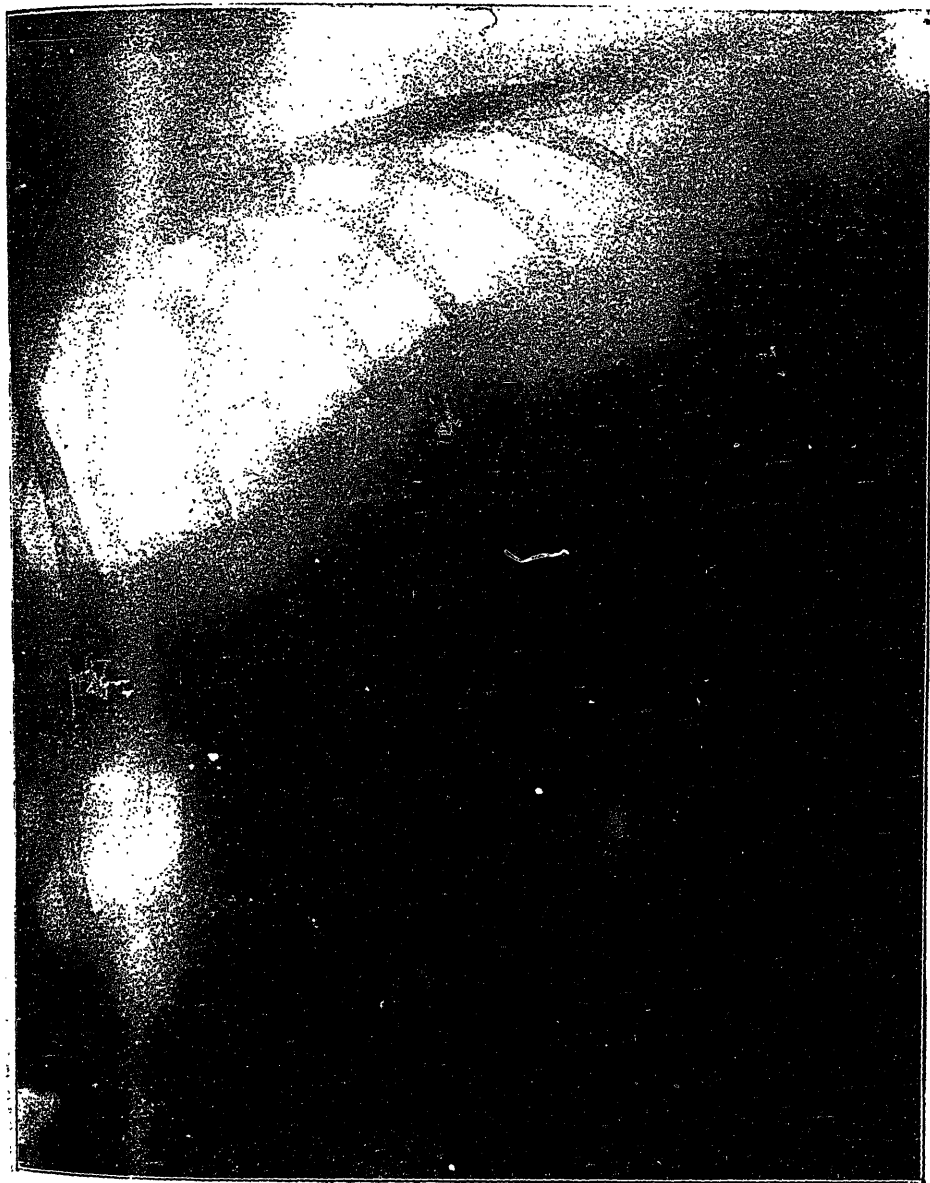
The use of the *X-rays in the treatment of disease* has been tested during the last few years and great advances have been made in this line, more particularly in cases of cancer, tubercular diseases of the skin and rodent ulcer.

In cases of cancer the most remarkable result is the immediate relief of pain. This has been the most prominent and immediate result, and if nothing more were gained than this it would be worth using; but in these cancerous growths and ulcerations there is generally a foul odour, and this also disappears as if by magic. Moreover after a few applications an improvement takes place in the appearance of the wound, and in a few days more, granulations spring up and the case commences to improve. It frequently happens that this improvement once begun goes on by itself and healing goes rapidly on without further application of the rays ; in other cases the treatment has to be re-applied. The hardened infiltrated tissues around the wound become softened and disappear, and if ulcerated, the ulcer, from being an ash coloured sore as it often is, with everted edges, with a blue colour and but little discharge and no vitality, with infiltrated tissues around, becomes level with the surrounding skin with a healthy discharge, free from odour, and with healthy granulations all over it.

Amongst cases that I have treated I may mention one case of *rodent ulcer* under the ear. Twice it had been removed, together with considerable of the surrounding diseased tissue, and on the third occasion the surgeon reported inability to operate further and suggested X-ray treatment. The pain was immediately relieved, and on the fourth night of treatment the patient was able to sleep on that



Dr. Hamilton's case lying down showing the bubble of air floating on front of chest.



Dr. Hamilton's case of Hydro-pneumothorax. three days after tapping.



Dr. Hamilton's case, three weeks after tapping.

side of his head, which he had not done for long previous. The ulcer soon began to heal and after two months and a half of treatment was almost closed over and the infiltrated tissue entirely gone away. At the end of three months treatment it was scabbed over and the man allowed to cross the Atlantic, returning a month later with the ulcer still closed over and no appearance of a recurrence.

A case of *tubercular lupus* of eight years' standing and now with three patches on the face, which had been frequently operated upon without improvement, was treated in the beginning of June, 1901. Eight treatments of X-rays were administered for five minutes every other day at a distance from the tube of 12 inches, with a current of 2 ampères at 110 volts through a Caldwell break. My absence in England then made a break in the treatment until October, but the patient continued to gain. The treatment was renewed every other day, as before, and gradually increased to five minutes every day, and finally to ten minutes every day. In January and February the treatment had to be stopped in consequence of an attack of measles. After the measles the case was seen to be much improved and after a lapse of nearly two months, treatment as before was again renewed, but the improvement did not seem to be so rapid as formerly, therefore a high frequency current was applied with improvement again. This was continued for a month and then it seemed to lose its power to improve the condition and recourse was had to the arc lamp of Lortet and Genaud's modification of Finzen's light, with the addition of adrenalin as a means of increasing the anæmic condition of the skin. Success followed this, and by the beginning of July the patient was sent away to the country returning well at the end of a month of country life.

A case of *Rodent Ulcer* of the nose near the tip and extending for one inch up towards the bridge of the nose, with a diameter from right to left of one and a quarter inches, a regular cauliflower appearance, and with everted blue edges, had been under treatment in the ordinary manner for six years with no success. The surface of the ulcer was exposed to X-rays at a distance of six inches, the rest of the face and the body being protected by lead sheet, for ten minutes every day, for eleven days, at the end of which time the healing process had been well established. The ulcer healed under antiseptic dressings in 21 days, but a small opening through into the nostril on one side is still left, and this, when the new tissue has had time to become sound, will probably be repaired by paring the edges and bringing them together.

Another case of *Rodent Ulcer* with a hardened and thick base of

some ten years' standing has been treated daily with high frequency currents for ten minutes each time, with the result of softening the hardened base, which was apparently adherent to the cheek bone, being situated to the left side of the nose and below the eye. This patient has not yielded so readily to treatment as others have but was making steady progress and by changing the treatment to X-rays is now quite well.



BEFORE TREATMENT.



AFTER TREATMENT.

In the treatment of *Tubercular Lupus* one case above reported has been cured so far. A very bad case involving the whole of both cheeks, the forehead in large measure and with numerous spots of raised coppery-brown patches of tuberculous skin about the arms and body, and with a duration of upwards of 28 years, was put under treatment by several methods. Two spots were treated by X-rays with a current of 110 volts, and 4 amperes to excite the coil at a distance of the tube of 12 inches. Two other spots were treated for ten minutes with high frequency current, and two more by Lortet and Genaud's modification of the Finsen light, with the arc lamp at 3 inches distance from the skin. In all these patches improvement is still going on, and while the patient is still under treatment and will be for some time, from present appearances it will progress to a cure.

The treatment of *Cancer* may be illustrated by the case of a lady of fifty years of age, who had her right breast removed for cancer. One year later the wound broke out again, when a second operation

was performed, and the wound healed up. Within two years she had a return of the ulceration and applied for a third operation with a large superficial ulceration of the cicatrix and surrounding skin. It was deemed impossible to deal with this surgically and she was advised X-ray treatment. This began on June 18th, when there was present an ulcerated area as big as two hands, and giving considerable pain, a hard cicatrix and considerable infiltrated tissue surrounding. The discharge had a foetid odour. On commencing the treatment, the pain and odour both stopped, and after 20 applications at a distance of 12 inches, the skin for three inches around seemed to be reddened, and therefore further treatment was stopped for the time. Healing went on all over the wound, and at present, there are only two small areas not quite healed, but both are closed with a scab, which is expected to fall off in a few days, showing the whole area healed. In this case there was slight reddening of the surface of the other breast, looking as if the disease had extended to the skin of the other side, but a few exposures to the rays seem to have stopped it.

Two other cases of *Cancer* in the breast in two young women, aged respectively 35 and 38 years, were treated. One had her breast removed two years previously and the cicatrix ulcerated immediately afterwards and now presents the appearance of an indolent ulcer with thickened edges, raised above the wound and surrounding skin, and purple in colour. Treatment has reduced the thickened edges until they are level with the surrounding skin and the ulcer is cicatrizing. The pain is gone. The other case is one that has not been operated upon and is of two years standing. A line along the lower border of the pectoralis major marks the position of the ulceration. The nipple is gone and the area over the heart is composed of hard thickened tissue with a dense yellow mass, looking like the core of a huge boil, in the centre. Applications of X-rays in the same manner and of the same strength as in the other cases has brought about the healing process. The hard tissue is disappearing and is becoming soft, and the edges of the wound are showing healthy granulations.

I have two cases wherein success did not attend the exhibition of X-rays. One was a man 56 years of age who had had cancer of the stomach, for which he had been operated upon 18 months ago, and came back for another operation. It was then found that the stomach itself and the mesenteric glands were affected to such an extent that no surgical interference was likely to be of any avail. He was therefore handed over to X-rays without any hope of improvement. A tube was allowed to act upon his stomach at ten inches distance ex-

cited by a current of 40 volts at 4 amperes. After twelve treatments he was unable, from weakness, to return and he died a few days afterwards.

A second case was a gentleman who had cancer of the glands of the intestine. He had been operated upon and the part removed, and he returned about eighteen months after and a second operation was performed, but nothing could be removed so the wound was closed but never healed, leaving a fistulous opening which connected with the transverse colon and allowed fœcal matter to escape. This patient was put under X-ray treatment and thought he felt better for it, so that he got an apparatus himself and went home treating himself daily with the assistance of some friend. One day, pushing the treatment too far, he exposed himself to the rays for 40 minutes, with the result of a burn of the skin of abdomen. This all healed ; but after a little over six months he succumbed.

The cases of rodent ulcer and tubercular disease of the skin show a very decided effect for the better in all cases, the wounds have healed up after a short series of exposures. Of course, how long they are going to remain healed, is a question time alone will answer. The cases of cancer of the breast, which I have seen, have been put into a healthy cicatrizing condition, one, I may say, is healed, the other two are still under treatment. I had a case of pyosalpinx, which it was thought would be benefitted by X-rays. Operation on the diseased ovaries was succeeded by peritonitis and death. At the post mortem there were found tuberculous masses in the lung, and there had been an attack of miliary tubercle, and all the patches of tubercle, the miliary tubercle, and the affected neighbouring glands were all encapsuled and proceeding to caseation, so that here it is clear that X-rays have a remarkable action on tuberculosis. We may therefore, I think, safely say that we may expect to find relief from the use of X-rays in tuberculosis, in cancer and in melanotic cancer. The reported cases of cure, that is, cure to date, have been cases of epithelioma, some cases of carcinoma, cases of rodent ulcer, and tubercular lupus.

I have mentioned high frequency and light in the treatment of one case of lupus with satisfactory results. The fact that X-rays, high frequency current, and light produce similar curative effects on the same case may enable us to find some explanation of the *modus operandi* of these agents. There is apparently something common to the three agents which produces the curative action, but in what manner these three agents act to produce the cure is a question we shall have to leave to a future time to answer.

Observations on the postmortem in the case of L. F. from report by Professor Adami, to whom I am indebted for the information.

Left lung free from adhesions, save for a few nodules between the lobes on palpation, many shotty nodules felt, some superficial as small white dots. On section, full of shotty tubercles, particularly numerous in the upper lobe. Two or three larger foci the size of dried peas, with central caseous substance and more fibroid periphery. Lung anæmic; no sign of recent inflammation. Bronchi pale, peribronchial glands caseous and calcareous.

Abdomen. In the mesenterics and over the peritoneal covering of the intestines were occasional small, whitish, fibroid masses, flattened and resembling fibroid tubercles. One of these on section had gritty calcareous contents. The intestine showed no tubercles on the mucous surface, save one doubtful or healing ulcer in the lower part of the ileum and, a few dubious erosions of the mucosa of the same area.

The interest of this case lies in the condition of the tubercles. Evidently according to the evidence this woman had for some time suffered from progressive tuberculosis, nor does the clinical history, with one exception, give evidence of any period of improved health and conditions, or indicate that we should here meet with an arrested process. Rather the onset of acute septic pelvic trouble as a complication might have been expected to lead to an augmentation of the tubercular process. Yet we find everywhere the tubercular process is arrested, the region where the arrest is least marked, being in that part of the peritoneal cavity, situated deeply beneath the ribs, the upper and posterior surface of the liver. The one exception referred to above was during the use of the X-rays, and here it is interesting to note that the upper part of the peritoneal cavity was the part least directly treated.

TEMPORARY LIGATION OF THE CANALICULI AS A MEANS
OF PREVENTING WOUND INFECTION IN OPERATIONS
ON THE EYE. *

BY

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In February last I exhibited before the Montreal Medico-Chirurgical Society a case of recent suppurative keratitis occurring in connection with dacryocystoblennorrhoea, in which the suppurative process had been promptly arrested by first ligating the canaliculi and then energetically disinfecting the corneal ulcer. In connection with this case I called attention to another in which I had operated for cataract, the eye having perished from acute suppuration coming on within 48 hours after the operation. In this case there was no positive evidence of disease of the tear sac, but the puncta lacrymalia presented a patulous, somewhat pouting, appearance. This seemed to point to the tear passages as the source of infection. It then occurred to me that this could be effectually obviated by ligating the canaliculi close to the puncta and so shutting off any possible supply of disease germs from the tear passages.

Prior to the operation, the usual precautions to make the eye as aseptic as possible were taken and in addition, just before operation on the second eye, I ligated the canaliculi and carefully cleansed the puncta external to the ligatures. This eye recovered from the cataract operation without a single unfavorable symptom, notwithstanding the fact that the patient had been for two months shut up in the hospital and had gone through the pain, worry and disappointment of a panophthalmitis. Before the operations the condition of the two eyes was to all appearance alike. It therefore seems probable that the first eye was lost through local infection from the tear passages and that a similar result in the second eye was prevented by shutting off the source of infection.

Since February I have only had one case suitable for the same pre-

* Read before the American Ophthalmological Society, New London, July, 1902.

caution and here the result has been equally satisfactory; unfortunately this case had been too much meddled with before coming to my hands to be typical of the class in which I consider ligation specially suitable. This patient, about 65 years of age, with mature cataract in the right eye, had long been affected with a copious secretion of yellow muco-pus from the right tear sac. Decrepit, slovenly and unclean, he did not at best appear particularly suitable for operation and much less so in the presence of a suppurating tear sac. He had been advised that the cataract should not be removed until the tear sac disease was cured and to this end the lower canaliculus had been slit and the tear sac treated by syringing and the use of lacrymal probes, apparently without benefit, at least there was when he came under my care still an abundant secretion from the sac, and a conspicuous chronic conjunctivitis. To have shut off the tear sac by ligation would obviously have been impracticable after the lower canaliculus had been opened, and as the usual treatment had already exhausted his patience, it was thought best to arrest the secretion from the tear sac by using a strong solution of zinc chloride. This caused intense reaction for a few days and was followed in a couple of weeks by complete closure of the artificial opening by way of the lower canaliculus, though fluid could be freely syringed through the upper canal into the nose, none escaping through the lower canal. The conjunctivitis was now practically cured. I, therefore, considered the condition of the eye suitable for the removal of the cataract, after having first taken the precaution of ligating the upper canaliculus.

The operation was followed by a rapid and uncomplicated recovery and the principle I am advocating, that of effectually shutting off the source of infection rather than depending on other tedious and doubtful means of procuring asepsis, was again vindicated.

Now as for the removal of cataract in the presence of a suppurating tear sac, I have failed to find in ophthalmic literature any other recommendation than that of treating the tear sac until cured before undertaking the cataract operation. This would be all very well if the cure could be effected within a reasonably short time, and if we could be certain that an absolute asepsis had been achieved. It is quite certain that many bitter disappointments have attended these supposed cures. Some go as far as to recommend treatment of the nasal cavities until they too are thoroughly disinfected before removing the cataract, but who can tell when this has been accomplished? Personally I have no faith whatever in the efficacy of such treatment. I do not believe that safety can be secured by any known means of restoring these parts to a state of health, except by absolute obliteration of the tear sac. On the other hand, the plan I propose does secure immediate and absolute

immunity, so far as infection from the tear sac and nasal passages is concerned.

In the words of descriptive anatomy "the canaliculi are dense and elastic in structure," hence they can be perfectly occluded by a fine ligature for some days at least without impairing their continuity. After removal of the ligatures, in one instance at the end of two weeks, there was no difficulty in passing a small probe through into the sac; in the other two cases the canals were opened after ten and seven days respectively. No doubt the ligature does cause a little swelling and reaction immediately around it for a few days, thus rather increasing the desired effect and securing perfect occlusion for the all important first few days.

Thus far I have used No. 2 iron-dyed silk with a fine curved needle, passing it around the canals just a little to the inner side of the punctura and tying about as firmly as the No. 2 silk will bear; a stronger silk might perhaps be made to cut through, but this I think cannot be made to have this undesirable effect, though it seems to serve the intended purpose perfectly.

It is of course proper to wash out the tear sac, and thoroughly cleanse the parts before applying the ligature. So far I have done this immediately before removing the cataract, but there might be cases in which it would be well to ligate a few days before, and treat the conjunctiva if inflamed, for some time prior to operation. As compared with treatment intended to cure chronic inflammation of the tear sac preparatory to operating for cataract, it will I think be conceded that ligation of the canaliculi is infinitely superior as a prophylactic measure; furthermore it is almost painless, easy and simple of performance, and not followed by the slightest inconvenience or annoyance to the patient. The secretions pent up in the tear sac do not perceptibly increase, and cause no inconvenience. There is, moreover, no loss of time, for the reason that the cataract can be removed either immediately or at most after a few days delay. This is an important consideration for persons living at a distance and perhaps unable to remain for any considerable length of time away from home.

But there is still a larger class of cases in which ligation should, and I have no doubt will, prove to be of great value—I refer now to all those numerous cases of corneal ulcers infected by secretions from the tear passages—everyone knows how disastrous they are apt to be and how impossible it has heretofore been to prevent reinfection of the ulcer from day to day. For this very reason an infinite number of eyes have perished in spite of all the most approved methods of treatment. Temporary ligation at once fulfils the most urgent indication and

should prevent further spreading of the ulcer from the moment the corneal lesion has been thoroughly disinfected. The one case reported in the *Montreal Medical Journal* of last March, is sufficient to illustrate a principle which awaits confirmation by the test of sufficient experience. If the idea is a new one and happens to meet with the approval of this Society, so much the better, but if their judgment of it should be adverse, there will be the satisfaction of knowing that condemnation comes from a thoroughly competent and impartial tribunal.

TUMOR OF THE OPTIC NERVE, WITH INTRA-CRANIAL COMPLICATIONS.

BY

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This case is one of the usual type of optic nerve tumors, but presents the unusual, though not unknown peculiarity of involvement of both optic nerves, and loss of vision of both eyes.

B. S., aged 14, was brought to me by her mother on Dec. 6th, 1901, with a history of failing vision of the right eye since the preceding June. Up to the latter part of Dec. 1900, had enjoyed excellent health and was considered up to the usual standard of development and intelligence as compared with her brothers and sisters. In December, 1900, she had an attack of measles, and according to her mother's statement, was never quite herself again, though she and several other members of the family recovered without definite complications. In the following June, first noticed some difficulty in seeing clearly with the right eye, and in July or August the eye had begun to be prominent, and was now quite blind. The proptosis has gradually increased up to the present time and is now very great, as shown by accompanying photographs. Claims to have been quite well with the left eye until about two weeks ago. Vision with this eye is now reduced to counting fingers at one foot distant. The visual field not determinable. Pupil wide and inactive. The optic nerve presents unmistakable optic neuritis, though the swelling of papilla is not very pronounced. Otherwise there is nothing to indicate disease within the left orbit.

To return now to the consideration of the conditions present in the right orbit, no tumor can be discovered by palpation (without an anæsthetic); the globe is displaced as nearly as can be estimated, about 6 millimeters forward and four millimeters upwards. It is rotated inward most of the time, occasionally there is a squint in the opposite direction, i.e., a rotation outwards, without corresponding position of the other eye. The movements are slightly restricted in all directions; the pupil wide and reactionless, except when the left eye makes an effort at near vision; then both pupils contract normally. The ophthalmoscope shows a typical choked disc without hæmorrhage or other changes in the retina; refraction at macula equals $2\frac{1}{2}$ D. At the surface of papilla about 10 D.

The early loss of vision with proptosis occurring about the same time, are common signs of optic nerve tumor; but there were in this case the additional early symptoms of a distinctly cerebral character, such as vertigo, ever since the spring of '91, and from about the same time purposeless vomiting, more particularly early in the morning. The child is slow of speech, and rather lacking in general intelligence; but there is neither motor nor sensory paralysis unless we count as such the loss of olfactory sense and the loss of vision as described above.

The patient complains of some soreness down the right side of the neck, and the head is drawn somewhat downward towards the right, apparently in consequence of spastic contraction of certain muscles in the neck. There is also absence of patellar reflex.

It was fairly evident that we had to do with a neoplasm, involving the right optic nerve, the optic chiasm and probably extending more or less widely within the cranial cavity.

In order to be quite certain as to the first part of this diagnosis, on the 11th of December the child was anesthetized, and I divided the internal rectus, and rotated the eye so far outward that I could see the condition of the optic nerve, which appeared enormously thickened and contorted, much as in the accompanying diagram; exploration with the finger also detected the larger mass extending to the apex of the orbit. I then reattached the rectus muscle, and waited several weeks, with the intention of removing the growth by Krönlein's method. This operation, done chiefly for the purpose of getting rid of the disfigurement and deformity produced by the presence of the growth in the orbit, I performed on the 9th of January. Recovery was uneventful. For some weeks there was still a considerable proptosis and great œdema of the ocular conjunctiva, all of which slowly subsided, leaving at the time of discharge, on Feb. 19th, an appearance indicated in the accompanying photograph.

Besides the swollen and curiously contorted optic nerve, there was a great mass of new growth, completely occupying the apex of orbit. When this had all been cleared away the optic foramen could be distinctly felt with roughened margins and very much wider than normal. For some two or three weeks the child appeared listless and dull after the operation, but before the date of discharge from the hospital there was much improvement in this respect, though still far from being bright or intelligent. There was also at this time an increasing papillitis of the left optic nerve and vision reduced to qualitative perception.

It is remarkable how many of the recorded cases of optic nerve

tumors have followed injuries about the head, or some constitutional febrile condition. This case belongs in the last mentioned group, and was attributed, by the parents at least, to the attack of measles already mentioned. This occurring as it did, some months before vision failed, a possible connection between the two cannot be denied, when we take into consideration the definite history of vision having failed gradually within six months, and allowing for the fact that the tumor must have been growing for quite a long time before the child would have noticed any loss of vision, this would in all probability bring the commencement of the trouble back to about the same period of time as the attack of measles.

In Dr. Byers' paper referred to in this report, his synopsis of 102 cases, shows one other case to have followed measles. This case is moreover somewhat rare, though not unique, as already stated, in the involvement of both optic nerves, and exemplifies the fact which Byers has pointed out, viz:—"The Frequent Co-Existence of an Inter-Cranial Growth with that of the Orbital Portion of the Optic Nerve," so that the former is not the result of extension from the orbit, but constitutes a part of the original neoplasm.

Dr. Byers has kindly furnished me with a pathological report of this case, which is herewith submitted.

PATHOLOGICAL REPORT.

After hardening for some time in Formalin, the tumor presented the appearance depicted in the accompanying sketch. Anteriorly the optic nerve was almost uniformly enlarged to a diameter of 5 or 6 mms., for a distance of about 2 cms., and then occurred a sudden marked increase in the size of the growth, which measured here about 15 mms., from before backwards and 30 mms., in height and breadth. The capsule of the tumor was formed by the nerve's dural sheath, which was present everywhere except on the posterior surface of the larger portion where separation had taken place. The anterior portion of the growth as depicted in the sketch was twisted one whole turn upon itself.

Section of the tumor showed the usual conditions—dural sheath externally separated from the paler nerve proper by the newly formed subdural tissue. In no part of the growth was there anything resembling a cystic condition. The course of the optic nerve proper throughout the tumor was quite eccentric, and this structure, apparently normal anteriorly, slightly increased in size towards the optic foramen near which, oval in shape, it measured 5 x 3 mms.

Microscopically the subdural overgrowth consisted of a loose mesh-

work of flowing connective tissue arranged in ill-defined bundles, which anastomosed freely with one another by means of delicate interlacing fibrils. There were numerous well-stained nuclei scattered throughout the field, but very few vessels. The picture was, in fact, identical with that of the first tumor removed by Dr. Buller and described and depicted in Vol. 1, No. 1 of the Royal Victoria Hospital Studies.

Absent from the sections were any marked signs of oedema or myxœdematous change, and dilation of the lymph spaces of the nerve so marked a feature in the case already mentioned and in the tumor presented to the Society by Dr. Buller in 1899, was barely, if at all, noticeable.

Staining with Pal-Wiegert showed complete degeneration of the nerve fibrils. The slight enlargement of the nerve proper towards the optic foramen was apparently due to an increase in the endoneurium of the individual bundles rather than to a hyperplasia of the inter-fascicular connective tissue.

The microscopical characters of this growth present only the picture of a simple hyperplasia of the fibrous elements of the subdural space, and to a slight extent of the individual fasciculi, especially toward the cerebral end of the nerve. The overgrowth corresponds in no way to any special type of tumor formation, and must be looked upon as a phase of that development of fibrous tissue in the abstract which we designate technically *fibromatosis*. It will be observed on examination how essentially the condition is one of simple overgrowth of the fibrous tissue elements and how little marked are the cellular and myxœdematous characters so commonly present in specimens of the condition mentioned.

It is worthy of note, also, that the microscopical examination showed that the maximum intensity of growth was toward the optic foramen, that the extirpation of this tumor was incomplete, and that the tumor must necessarily have formed only part of a large intracranial neoplasm which, judging from the clinical history, must have developed more or less simultaneously with that situated within the orbit.

A STUDY OF THE RETICULAR SUPPORTING NET-WORK IN MALIGNANT NEOPLASMS.

AS STAINED BY MALLORY'S METHOD.

BY

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Observations on the presence of several varieties of connective tissue in tumors have been recorded in well-known papers. Comparisons have been drawn between the distribution of the connective tissue in the sarcomata and carcinomata, but I believe that heretofore there has been no thorough comparative study of the finer supporting organization of all the types of malignant tumors—by which I mean, carcinomata, sarcomata and endotheliomata, which last type includes the peritheliomata.¹

That such a study would be generally interesting was a foregone conclusion, but there was a possibility that it might be very useful in assisting to make diagnoses of the more obscure growths by a fairly rapid method and also establish the relations between the various types of new growths.

Mallory's method was chosen because fresh tissue is not always to be had and because I had found that the use of digestion methods was unsatisfactory in fixed specimens. This method is, beside, a particularly brilliant method of staining, for, not only the supporting tissues, but, in well-fixed specimens, the cells are clearly and brightly stained, allowing a more careful study of the relation of framework and cellular elements.

In using the method I have made a slight modification which I think brings out the colors somewhat better than the original method. This deviation is simply in the use of a drop of aniline oil on the section just after the alcohol, but the method I will give in detail.

Sections are cut from tissue hardened in Zenker's fluid and imbedded, preferably, in paraffin. These are fixed on slides in the usual way and then the paraffin is dissolved off and the slide immersed in absolute alcohol, 95 per cent. alcohol, 70 per cent. alcohol, then in water. They are then stained in a 1/10th per cent. aqueous acid fuchsin solution for from 2 to 3 minutes, then washed in water; a few drops of a 1 per cent. solution of phospho-molybdic acid is then

dropped on the section and allowed to remain from 5 to 7 minutes. The slides are now carefully washed in water and the stain composed of aniline-blue 0.5 grams, orange G, 0.2 grams and oxalic acid 2 grams, with 100 cc. of water, is dropped on, to remain for about twenty minutes. The slides are then rinsed in water, hurriedly dehydrated with 95 per cent. alcohol and then a drop or two of aniline oil is allowed to remain on until the sections are clear, when it is removed by blotting and the sections are then cleared in xylol and mounted in balsam.

By this method the finest reticular processes can be seen clearly and distinctly, and their relation to the cells studied with any power of the microscope.

Before speaking of the structure of the tumors I think it will be well to recount the structure of the tissues in which the growths arise. In doing this I can let the paper of Dr. Adami on classification speak for me, in part, for in this communication the author reviews the genesis and structure of the body layers in an extremely clear manner.

Briefly then—at an early stage of the life of the embryo there are three layers of cells developed from the one original layer; these are, epiderm, hypoderm and mesoderm. But at a somewhat later time the mesoderm “from being a simple undifferentiated cell mass, which we may compare with the morula, certain of its cells growing outwards between the epiblast and hypoblast, become arranged into a definite layer to form or enclose the primitive body cavity. From this point onwards we can distinguish two structures of mesoblastic origin—the mesothelium, or lining-membrane portion of the mesoblast; and the mesenchyme or the mesoblastic pulp.” So, as Adami says, “during embryonic life one obtains a series of differentiations of the primitive cell layers leading to the production of two sets of tissues; one which we may term the *lining-membrane tissues*, the other, the *pulp tissues*” (p. 5). Both of these layers become developed widely, and highly differentiated, into organs and tissues, but “even in cases where there is the widest divergence from the original type of lining membrane, we find that this distinction still holds, that the parenchymatous cells form *layers or groups of cells into which the vessels do not penetrate, and in which there is an absence of stroma between the members of the cell groups*. While, contrariwise, regarding tissues originating from the embryonic pulp, we notice that in them the prominent characteristic is that there is an *intercellular ground substance either homogeneous or fibrilated, separating the specific cells of the tissues*” (p. 6).

It is because of such features as these that Adami speaks of tumors arising from the lining membranes of the body as lepidomata (lining membrane tumors) and hylomata (pulp tissue tumors).

The object of this paper will be to show how closely the tumors adhere to the types of tissue in which they originate—judged by the arrangement and distribution of their intercellular substance.

First of all—if, “after the embryonic period hylie tissues never take on lepidic characters,” we could expect to find among the tumors that none of those arising in connective tissue of any kind would present any of the features of a carcinoma.

Second, we might expect the reverse to be true if we confine ourselves to tumors arising in mature epithelium or hypothelium.



FIG. 1. Cancer of rectum. Metastasis in lymph gland.
Mallory's stain. Leitz, I-6.

Judging from the case reports of several writers we cannot expect the tumors arising in mesothelial tissues to possess such stable characters, and since the endothelium is a later development from a relatively undifferentiated tissue, we should expect this lining membrane to show no more permanent characters than those of the physiologically functional cells derived from mesothelium, and too, less stability than has the older hypoderm or epiderm. In view of such peculiarities of the tumors arising in these differentiated mesodermic tissues, Adami calls them the “transitional lepidomata.”

When we come to study the finer supporting tissues of the class of tumors which are more usefully—for the present purpose—called lepidomata, since this term excludes those growths which may originate in other than the true covering membranes, we are able to state definitely that the rule is for the absence of an intercellular fibrous tissue. This point White has made after a careful study of tumors, treating them by Mall's, Spalteholz', Van Gieson's, Weigert's and Mallory's methods. The text of his conclusion is as follows: “Carcinomata possess a stroma of white fibrous tissue outlining the cell spaces, but have no intercellular network” (p. 220).

Petersen (*Verh. d. deutsch. path. Gesell.*, 3 Tag., 1901, 61) has offered the same conclusions.

In order to be convinced and see for myself that this is true I have made Mallory preparations from a number of carcinomata of rectum, gall duct, stomach, metastases in lymph glands, in the adrenal and other organs, and have been able to reach the same conclusions, with the slight apparent variation due to the observation that in a rapidly infiltrating cancer, for instance of the stomach, when single cells are more or less isolated at the margin of the growth, the appearance may lead one to think that there is an intercellular reticulum. But if even the smaller aggregations of cells are studied it will be found that in no case is there a definite intercellular supporting network (Figs.

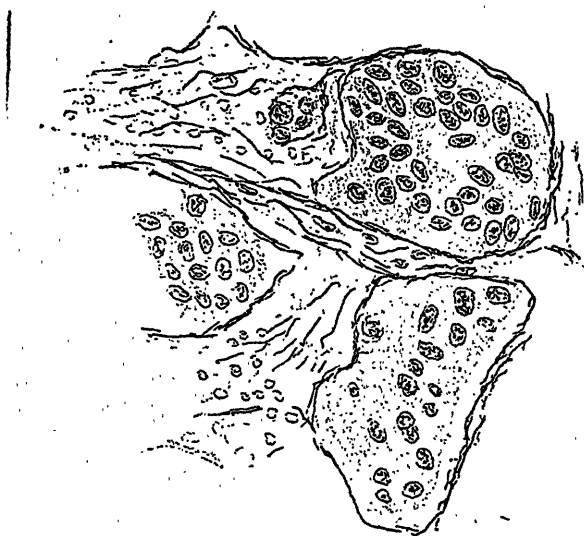


FIG. 2. Cancer of breast. Metastasis in lymph gland.
Mallory's stain. Leitz, I-6.

1 and 2). About the cell groups in carcinomata the fibrous tissue forms a perfectly definite boundary zone with no tendency for the fibrils to branch into the cell groups.

When we come to study the sarcomata (hylomata) in the same way, we see that in rapidly growing nodules, while the reticulum is not always invariably present in the centres, the surrounding fibrous tissue is not well defined and definite and that fibrils are dipping down into the cell masses, and also that between the cells in various parts of the nodules short intercellular fibres can be seen. In gradually growing nodules the intercellular tissue will be seen complete, justifying completely White's conclusion that "sarcomata present a

larger increase in the connective tissue and possess an exceedingly fine intercellular reticular network, very similar in structure to the reticulum present in normal glandular tissue."

Johnston also makes definite statements as follows: that there is a "reticulum present to a greater or less degree in every sarcoma," and that "the reticulum is entirely absent between the cells of carcinoma and endothelioma, a valuable differential point." The last part of this conclusion we will discuss presently.



FIG. 3. Endothelioma. Mallory's stain, Leitz, 1-6.

Polak comes to the same conclusion with reference to the sarcoma. I have been able to justify these conclusions after a study of several sarcoma, of stomach and mediastinal glands.

Now when we come to examine the structure of the endotheliomata (secondary or transitional lepidomata), we have to deal with a group of tumors that arise from cells differentiated from the middle germinal layer and from the mesothelium. Consequently they are embryogenetically more closely related to the sarcomata than to the

carcinomata (using the terms in their morphological sense). But with this origin and relationship they bear, nevertheless, in a great many instances, a very close morphological resemblance to the carcinomata.

As they are usually described, they form two more or less well-marked types, according to their origin in the lining endothelium of blood vessels, or in that surrounding the blood vessels, which is generally supposed to be the endothelium lining the perivascular lymph spaces.

For my study I have had a very large number of excellent specimens, about forty in all, and for the majority of these I am greatly indebted to Dr. Hektoen of the University of Chicago, and to Dr. Henry Christian of the Boston City Hospital. My method of preparing sections I have described.

So far I have been able to find no general difference in the distribution of the reticular meshwork in the endotheliomata and peritheliomata. The only difference occurs in the very cellular, well circumscribed, and in the infiltrating forms.

When the cells of the tumor growths are arranged in groups, more or less as in the carcinoma simplex, the general rule has been that these cell masses are surrounded by a well-marked fibrous tissue and with very rare intercellular fibres, but there is this difference from carcinomata, that *there is a tendency to the formation of an intercellular reticulum* which is, in some cases, only shown by filaments from the enveloping fibrous tissue dipping down into the cell masses, and in many cases branching and surrounding a few of the peripheral cells. In sections of the same tumors in which this is seen there may also be groups of cells in which the process has gone farther, and *between the majority of the cells in the group there is a definite intercellular meshwork*. This is apparently regardless of the endovascular or perivascular origin of the growth (Fig. 3.)

We see here very plainly evidence of the relationship between the endotheliomata and the sarcomata. This similarity is still more markedly shown in the infiltrating growths in which, while about the vessels the reticulum is scarce, the cells are separated by a well-marked reticulum which has all the appearance of that of a sarcoma.

I am convinced that this appearance is not due to the presence of the reticulum of the normal tissue into which the cells have penetrated, because the arrangement is too definite and general, and is entirely unlike the picture presented by the infiltrating carcinomata, when a few cells may be seen surrounded by the blue-stained fibrils. In cancers there are few examples in a specimen of a regular intercellular

formation, and these few examples would be no more than we might expect, simply as an artefact, due to the cutting through the end of a column of cells, the whole surrounded by a reticulum.

The conclusions that I have drawn are that the alveolar endotheliomata show, at the least, a partially-formed intercellular reticular network; at the most, an almost complete one; and that the infiltrating forms show a complete meshwork which corresponds to that of the sarcomata; that all endotheliomata of whatever origin show a tendency to a sarcomatous structure as regards the relation between cells and reticulum.

The application of this, in at least one way, is obvious. It represents most graphically the peculiarities of the derivation of the middle germ layer in its instability compared with the cells of the other layers, and brings out quite prominently the tendency of such relatively unstable tissue to revert to the simpler embryonic type, to lose its acquired functions and retain its hereditary one of simple growth, and in that growth to preserve all the peculiarities of the great group of connective tissues to which it really belongs.

This study shows also, I think, the value of the embryological basis of the classification of tumors.

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ON ANKYLOSTOMIASIS OR UNCINARIASIS.

A REVIEW.

BY

J. GEORGE ADAMI, M.D.

Asked to name the two lines of research along which, at the present time, pathologists in general are most actively engaged, one would unhesitatingly, for the first, mention the study of hæmolysins, agglutinins and other cell products along the lines of Ehrlich's now famous theory, and, for the other, would mention the study of the parasites infecting man. Many a young, well-trained pathologist has seized the opportunities afforded of late years to investigate the abundant diseases of tropical countries, whether as a member of some army medical staff, or holder of some government appointment, or as a member of one or other of the many commissions sent out from the different civilized countries to investigate the causation of some special disease.

It is needless to refer to the remarkable results obtained from the study of the mosquito as an infective agent. What has been accomplished in connection with malaria, filariasis, and yellow fever, is, or should be, familiar to all. But the interest in the minuter animal parasites, whether of the blood or of the intestinal canal is by no means confined to those conveyed by the mosquito. Not a month passes but some new and valuable observations are announced from one or other part of the world regarding the smaller parasites. It has struck me that it might be of interest to bring together certain of the recent observations regarding one of these smaller forms,* not, it is true, a new form, for it has been known for many years, but one which has within the last few months been noted for, I believe, the first time, causing very definite symptoms in a large number of individuals in the Old Country and, to come somewhat nearer home, as causing rather widespread disturbance in the Southern States. So far I do not know that it has ever been noted in Canada, but with the influx of Italian and other foreign labourers and with the increase in mining and engineer-

* Richard P. Strong—Circulars upon Tropical Diseases, No. 1, Chief Surgeon's Office, Manila, 1901.

Charles A. Bentley—On the Causal Relationship between Ground Itch or Panig-hao and the Larvæ of *Ankylostomum duodenale* from the Soil. *British Medical Journal*, Vol. I., p. 190.

Charles Wardell Stiles—The Significance of the Recent American Cases of Hook Worm Disease (*Uncinariasis* or *Ankylostomiasis*) in Man. Eighteenth Annual Report of the Bureau of Animal Industry, Washington, 1902, p. 183.

A. E. Boycott and J. S. Haldane—On the Outbreak of *Ankylostomiasis* in England. *Journal of Hygiene*, Vol. III., 1903, p. 96.

Looss—*Centralblatt für Bakteriologie*, 29, 1901, p. 735.

ing operations, it is not improbable that, if it does not already exist and set up disturbances in our midst, it may do so in the course of the next few years. I refer to the little intestinal worm which we used to know as *Anchylostomum duodenale* and the condition of *Anchylostomiasis*, which now we are instructed to speak of as an *Uncinaria* and as *Uncinariasis* respectively.

Before proceeding further it is, I think, but right to enter a protest against this change in nomenclature. There is a strong and, I admit, a perfect well-justified movement at the present time to establish a sound system of scientific nomenclature, more especially as regards the different species of animals and vegetable forms. According to the rules, as now accepted by biologists, the name first given to a species should stand, unless that same name has already been applied to some other species, and provided that it already conforms with certain other rules laid down. But the attempt to carry out these rules is, it must be confessed, causing not a little present confusion. This has been specially seen in connection with bacteriology, in which names have been originally given to various species without any regard to the strict rules of botanical nomenclature. The discoverers of and workers upon one or other form have named them in a haphazard way and frequently have used two adjectives to describe a single species. Such triomial appellations are absolutely against the rule. All the same it is a wrench not to be allowed to refer any longer to the *Bacillus colis communis*, *Bacillus lactis aërogenes*, *Staphylococcus pyogenes aureus*, *Bacillus aërogenes capsulatus*, and so on. It is difficult, for example, always to recognize the last of these under its new name, however well deserved, of *Bacillus Welchii*, to recognize, also, the old *Bacillus pyocyaneus* under its combined newer and older name of *Pseudomonas aëruginea*. But in such cases we must submit.

More than a century ago, in fact in the year 1879, Frolich discovered a minute worm in the intestines of the fox to which he gave the name of *Uncinaria*. His observations were quite forgotten when, in 1838 and 1843, Dubini of Milan, discovered and described a similar worm in the small intestines of man, and gave to it the name *Agchylostoma duodenale* (which is the unlatinized form of *Anchylostomum*) and although Dujardin in Paris rechristened this human worm, *Dochmius*, and Cobbold in England referred to it as a *Sclerostoma*, nevertheless for over half a century the name *Anchylostomum* has been that which has been generally accepted. And what is more, those who are not simply zoologists, the large army of medical men in all parts of the world, have known the worm by this name and have, further, employed the term *Anchylostomiasis* to designate a definite condition of disease produced by the same. Now come the zoologists and on the

grounds that they have established an international law that species should be named according to priority, they lay down that these names are to be changed, that *Uncinaria* was the name first bestowed upon worms belonging to this genus, and so force us to give up titles which are familiar, titles which we have utilized in connection with the nomenclature of disease. Let it be admitted that *Anchylostomum* is a mouthful and not a pleasing word, that, also, it is spelt variously (though it scarce becomes American scientists to growl on this account), it must nevertheless be confessed that we have the right to doubt whether zoologists are justified in rigorously demanding that others not zoologists subscribe to the law made by them for their own convenience. Where a species is obscure by all means let the zoologists change its name as much as they please, but where a given name has become familiar, has been in use for sixty years, and where workers of another science have used it and made combinations in connection with it to indicate certain phenomena or groups of phenomena, which concern them and do not concern the zoologist, then change of this kind is no longer permissible; the name has to be accepted as being already fixed: it is fitting, nay imperative, that the zoologists and species-makers respect our usage of the same, and modify their rule. In this particular instance, the need for establishing such exception to the rigid carrying out of the "law of priority" is rendered all the more obvious by the irritating announcement that, after all, the zoologists are not absolutely sure whether the hook worm of man and that of the fox and dog do belong to the same genus. Looss, for example, brings forward evidence that they do not, and Stiles admits that he is probably correct, so that after all, just when we are getting accustomed to the new term *Uncinaria*, we are told that it is incorrect and that the human hook-worm is to be regarded as of a different genus and by the law of priority we are to go back to the old name of *Anchylostomum*. Let zoologists make up their minds regarding species and genera before demanding of us that we change our terms. A plague on them !*

* While Dr. Stiles holds strongly for speaking of *Uncinariasis* instead of *Ankylostomiasis*, he questions whether it is not unadvisable to name diseases after the zoological names of the parasites. Here we cordially agree with him, but nevertheless would point out the difficulties. Suppose, for example, we were to speak of this as 'Tropical Chlorosis,' in many respects an excellent designation, for the majority of cases occur in the tropics and in sub-tropical regions, that name would not well include the cases developing among miners in more northerly countries. 'Hook Worm Disease' also suggests itself as most appropriate, but has this disadvantage that names of morbid conditions in the vernacular introduce complications when one comes to study the literature of other nations, and when those of other nationality come to study ours. It is best to select a name readily recognizable by all workers everywhere and the name compounded from that of the parasite lends itself most readily for this purpose.

The human hook worm is of minute form not much above half an inch in length, inhabiting the upper part of the small intestine and was first described, as already stated, by Dubini in Italy. Some few years later in the fifties, it was found to be very widespread in Egypt where Griesinger showed that the disease known as Egyptian Chlorosis is due to its presence; he, indeed, calculated that one-fourth of the inhabitants of Egypt harboured the worm and suffered from anæmia as a consequence. A few years later Wucherer showed that the anæmia common in Brazil is Anchylostomiasis and since then this same condition has been identified in very many other tropical and sub-tropical countries, both in the Old and New Worlds, one of the latest regions from which it has been announced being the Philippines.

But apart from the existence of hook worm disease generally diffused throughout the population in warm climates, it has been noted to occur affecting more limited masses of the population, in the Temperate Zone. Somewhat over twenty years ago, Perroncito showed that this worm was the cause of a very severe outbreak of anæmia among the workers in the St. Gothard Tunnel and since then in France, Germany, Belgium, etc., it has been found to cause a great deal of anæmia among brick workers and here and there among miners in connection with certain mines.

The recent work upon the subject to which I more particularly wish to call attention, is the recognition that the disease is extensively present in the Southern States and when so present is found to be due, not to one, but to two species of hook worm, the Old World species, evidently imported by bricklayers and others from the Old World as from tropical America, and an American species recently discovered by Stiles, which he has named the *Uncinaria americana*. Boycott and Haldane now announce also the existence of the disease in Great Britain affecting the miners in the celebrated tin mines at Dolcoath, in Cornwall, and their communication gives a particularly full and valuable study of the symptomatology and blood conditions in the disease.

Before, however, referring to these observations, it may be well to give a brief description of the worm and its mode of life. The worms, male and female, are to be found chiefly in the upper part of the small intestine of man, the male being about half an inch, the female three quarters of an inch long, both being thin and of even thickness, resembling a short piece of coarse thread, with a well formed hook or curvature at the anterior end of the body, brought about by the mouth being, not terminal, but slightly dragged to the ventral surface. The eggs are oval and some 52 x 32 mikrons in size and

when laid are already partly segmented. The newly discovered form, *U. americana*, differs in that the individuals, both male and female, are somewhat smaller, the teeth have a different arrangement, resembling more those of the *U. stenocephala* of the dog; the vulva in the female is situated in the front of the middle of the body, whereas, in the Old World form, it is nearer the posterior third of the body and the eggs are larger, being from 64 to 72 mikrons long by 36 to 40 broad. So far this new form has been found in Virginia, Texas, Porto Rico and Cuba.

The eggs laid by the female are discharged in the faeces of the patient and do not develop into adult worms in the intestine of their host, but for further growth must first pass out of the body. They develop best in unaltered faecal matter. Each egg develops a minute embryo with a more or less globular œsophageal bulb, differing from that of the adult. This embryo lives in water or in moist ground; in its growth it casts its skin four times, gradually assuming more and more the adult characters. Low temperature retards development, a point which explains how, in temperate zones, the worm persists and develops especially in deep mines and excavations, in places, that is, where the temperature is distinctly warm. After the second casting of the skin, the worms live best in water. Looss, indeed, succeeded in keeping them alive thus for thirty days. Now upon being swallowed, the further stages are carried out within their host, some fortnight apparently being required before they reach the adult form. Drinking contaminated water, or handling infected dirt, is evidently the means of carrying these worms into the alimentary canal of the second host.

Recently Looss has suggested that the larvæ may enter the body directly from the skin. He has found that the larvæ, being placed upon the skin, lead to its becoming reddened in a few hours and now, upon examination, they are found to have penetrated along the hair follicles and elsewhere, so as to lie within the tissues. It is possible, therefore, that once thus within the system, the young worms may find their way to the digestive tract and that cutaneous injection may be the common means of spread. In this association it is worthy of note that Boycott and Haldane call attention to the frequent "botches" and pruritus associated with the disease in Cornwall. They were, however, unable to discover the larvæ in the furuncles which they examined.

In this connection Bentley propounds the view that the Ground Itch or "Pani-ghao" of Assam and of the West Indies, otherwise known as "water-pox" or "sore feet of Coolies," an affection of the skin confined entirely to the lower extremities, is always associated

with the presence of larvæ of the *A. duodenale* in the soil of the affected areas and is, in fact, brought about by the infection of the skin by these larvæ. The condition develops in affected areas when the rainy season comes on. There is a primary erythema, followed by a vesicular eruption, which may become pustular or even may lead to obstinate ulceration and gangrene.

Patients affected with these worms show as their most characteristic symptom a marked anæmia, with extreme pallor, palpitations and hæmic murmurs and breathlessness upon exertion. There may be dull or colicky pains in the abdomen and, as the condition becomes worse, and enfeeblement more extreme, œdema is apt to show itself, more particularly in the lower extremities. There may be nausea, but little marked vomiting. The stools are apt to take on a curious brownish character, sometimes exhibiting definite blood.

It is this anæmia which more particularly has been studied by Boycott and Haldane and its cause would seem to be fairly clear. The hook worms are blood-suckers and what is more, do not remain in one place, but after having gained a meal at one spot, they attach themselves to another region of the mucosa and puncture it until they pass down to and drain some capillary. Not only, therefore, do they actively abstract blood, but blood is lost through minute hæmorrhages from the successive bites abandoned by them. Nor is this all. Each bite becomes a focus of possible infection and the seat of definite inflammatory change so that, as a result, the wall of the small intestine becomes thickened and thereby, also, nutrition is impoverished. In the third place, recent investigations are more and more leading to the conclusion that this and other intestinal worms secrete a definite if low form of poison.

We have probably, therefore, to deal with three factors in the production of this form of chlorosis; hæmorrhage, a low form of infection, and intoxication, all leading to pronounced changes in the blood. It has been usual of late to describe this anæmia as being somewhat similar to pernicious anæmia, but as Boycott and Haldane show, this view is incorrect, it is very rarely that the anæmia is so extreme as to merit this term. Their studies upon the blood show that the old name of Egyptian chlorosis was more nearly correct. The blood conditions more nearly approach those seen in well marked chlorosis than after simple hæmorrhage or in pernicious anæmia.

What goes by the name of anæmia may be produced either by diminution in the total hæmoglobin in the vascular system without a corresponding diminution in the total volume of the blood, or by an increase in the total volume in the blood without a corresponding

increase in the hæmoglobin. In a very remarkable paper published two years ago (Transactions of the Pathological Society of London, Vol. 51, page 311), Lorrain Smith showed that pernicious anæmia and anæmia from hæmorrhage are of the former, and chlorosis of the latter type. In chlorosis, that is, we are dealing with a form of hydræmia or of dilution of the blood. It is unnecessary here to go into the very ingenious method of Haldane and Lorrain Smith, based upon the absorption of CO, whereby the percentage of hæmoglobin is determined and, noting the amount of CO absorbed, the absolute amount of hæmoglobin in the blood calculated. It is but necessary to state that in employing this method, instead of discovering in Anchylostomiasis an anæmia such as would be expected to be obtained through simple loss of blood, there was discovered one closely resembling that seen in advanced cases of chlorosis. Thus taking the percentage of hæmoglobin and the cubic centimetres of blood per 100 grms. of body weight, respectively, the following figures came out:—

6 healthy young females (Lorrain Smith).....	93	per cent.	.92
6 cases of anæmia from hæmorrhage (Lorrain Smith)..	33	per cent.	.39
7 pernicious anæmia (Lorrain Smith).....	26.5	per cent.	.40
21 chlorosis (Lorrain Smith)	39.9	per cent.	.79
4 anchylostomiasis (B. & H.).....	45	per cent.	.735

These cases showed that the condition much more closely resembled what is seen in chlorosis than in the other conditions. It is true that poikilocytosis, normoblasts and megaloblasts have been described in some cases, but on the other hand, the colour index is nearly always very low and the megaloblasts are less numerous than the normoblasts, while the more pronounced the degree of anæmia, the less does it show the high colour index characteristic of the pernicious type.

The total leucocytes vary from 3,800 to 56,000 per ccm., the average of 16 definitely anæmic cases being 13,000, and it is noteworthy that where there is marked anæmia leucocytosis has generally, to a large extent passed away. There is a definite increase in the eosinophiles, but this also bears no precise relationship to the degree of anæmia as indicated by the hæmoglobin percentage, but, as was noted by T. R. Brown, in Baltimore, (in his case in Trichinosis in which he first called attention to the eosinophilia associated with the presence of gross parasites), it corresponds, in a general way, to the degree of leucocytosis which is present.

Those interested in this subject are referred to Boycott and Haldane's paper for a very full study of the conditions in the mine at Dolcoath, under which this form of anæmia became so frequent. Those mines have apparently been worked for tin ever since the time of the Phœnicians, but only within the last eight years has this

extensive anæmia shown itself in the workers. Evidently the disease has been introduced by Cornish miners who have returned from other countries, where their services are much in demand.

Similarly reference may be had to Dr. Stiles's very full article in the Eighteenth Annual Report of the Bureau of Animal Industry for a bibliography with abstracts of cases of the disease occurring in the United States. As will have been noted by many of our readers, the daily press both here and across the water has of late contained paragraphs concerning the discovery of a "microbe of laziness." This refers to another more recent article by Dr. Stiles, in which he ascribes the listlessness and distaste for work so characteristic of those inhabiting tropical and sub-tropical countries, to the prevalence of this disease. It is true that anchylostomiasis does bring about slowly a condition of bodily weakness and that this condition may continue for long years. Whether this is wholly coincident with the indolence of the negro and of the "poor whites" in the Southern States and of other inhabitants of the tropics elsewhere, may well be questioned.

I may here, in conclusion, epitomize the advice given in regard to the detection of the condition:—Simply take a small amount of fæces, preferably from near the surface, about the size of the head of a large pin, spread this out in a drop of water on an ordinary slide; cover with a cover-slip, examine under a moderately high power, look carefully, with not too strong illumination, for an elongate oval egg with thin shell and with contents either unsegmented or in the early stages of segmentation. In cases of infection with *U. americana*, the fully developed embryo may be found within the egg shell. Be cautious not to mistake for the egg of the *Uncinaria*, the eggs of *Ascaris lumbricoides* (which have a thick gelatinous, often mammilated covering and unsegmented protoplasm), or the eggs of the *Oxyuris vermicularis* (with a thin unsymmetrical shell, one side being almost straight, and containing an embryo), or the eggs of the whip worm (*Trichuris trichiura*, more commonly known to physicians as *Trichocephalus dispar*, possessing a smooth thick shell, apparently perforated at each pole and an unsegmented protoplasm). Before giving a negative opinion, it is wise to make from five to ten preparations or to follow the method of sedimenting the fæces.

Lastly as to the treatment. The two drugs most commonly used are thymol and male fern. The directions usually given for thymol treatment are:—2 grms. (31 grains) of thymol at eight A.M., ditto at ten A. M.; castor oil or magnesia at twelve noon; diet of milk and soup. If a week later the eggs are still present in the stools, the treatment should be repeated, it being borne in mind that some cases are very obstinate and demand a treatment extending over several weeks.

RETROSPECT OF CURRENT LITERATURE.

Medicine.

UNDER THE CHARGE OF JAMES STEWART.

On Anæmia Splenica.

OSLER, WILLIAM, M.D. "On Anæmia Splenica." *Am. Jour. of Med. Sc.*, Nov., 1902.

The writer, although admitting that the existence of anæmia splenica is still in a tentative stage, believes that as such a special malady exists of unknown etiology.

It may be defined as a chronic affection, probably an intoxication of unknown origin, characterized by a progressive enlargement of the spleen which cannot be correlated with any known cause, as malaria, leukæmia, syphilis, cirrhosis of the liver, etc. (primary splenomegaly); anæmia of a secondary or chlorotic type (leucopenia); a marked tendency to hæmorrhage, particularly from the stomach; and in many cases a terminal stage with cirrhosis of the liver, jaundice and ascites (Banti's Disease).

After analysing a series of cases the author discusses the symptomatology and pathology of the disease.

1. Anæmia Splenica is characterized by an extraordinary duration. In two cases the patients were known to have had the symptoms for twenty-five years. In the writer's 15 cases, in seven the duration was more than ten years, and in eleven it was over four years.

Very little inconvenience is often experienced, even with a spleen extending below the umbilicus. The majority of O's cases were active business men, whose chief inconvenience was the recurring hæmatemesis and the resulting tardy convalescence after the attacks.

2. Splenomegaly.—A large group of cases with splenomegaly and secondary anæmia exists which are usually easily distinguished from the condition under discussion. In these a cause is usually apparent—malaria, tuberculosis, rickets or syphilis—particularly in children, in whom any state of malnutrition, if protracted, may be associated with

enlargement of the spleen. The anæmia and splenomegaly usually yield to appropriate treatment; at all events there is not the remarkable chronicity. The spleen rarely reaches the colossal size seen in chronic splenic anæmia. The sequences so characteristic of splenic anæmia are not seen. Lastly, while the blood shows the features of a secondary anæmia, there is rarely the exaggerated chlorotic type, and leucocytosis is more common than leucopenia.

It is not always possible to assign individual cases to their proper places, but on the other hand, many of the cases in children conform to the definition of splenic anæmia as given above.

The special feature of the enlarged spleen is the size, which is unequalled in any other disease, except perhaps leukæmia. The average weight in twelve cases collected by Rolleston was 61 ounces. In Boviard's case the weight was twelve and half pounds.

3. Hæmatemesis is a remarkable feature of the disease. Eight of the writer's patients had attacks of vomiting of blood. In a large proportion of cases the hæmorrhages are due to conditions associated with splenic enlargement, and not with cirrhosis of the liver. The source of the blood may be a general diapedesis from the mucous membrane, the most careful search failing to reveal a bleeding point; a bleeding œsophageal varix may also be responsible for the hæmorrhage; Rolleston suggests that the tension exerted by the enlarged spleen on the gastro-splenic omentum may cause a kink and so induce congestion of the gastric veins.

Other hæmorrhages are less common; epistaxis, retinal hæmorrhages, bleeding gums, menorrhagia, and hæmaturia have been recorded.

4. Anæmia even in well defined cases may be slight. It is of the secondary or chlorotic type, the diminution in corpuscles being of a moderate grade. The hæmoglobin is markedly reduced as in chlorosis, and the white cells are usually diminished, except after a hæmorrhage when they are increased. In the extreme anæmia at the close of the disease there may be marked poikilocytosis, with nucleated blood corpuscles.

5. Pigmentation of the skin is rather common, usually a diffuse bronzing as in Addison's disease, but rarely so intense.

6. Hepatic features.—The majority of cases present no symptoms of hepatic derangement; in a few there may be ascites even with a normal liver; whilst in a third group the symptoms are such as to suggest cirrhosis, a fact first pointed out by Banti. The splenomegaly may exist for a long series of years without leading to cirrhosis. The enlargement, in adults at least, is not very marked. Ascites and hæmatemesis do not necessarily mean that the liver is involved.

Further observations are necessary before the relationship of the group of cases in children, particularly the family form of splenomegaly, can be assigned to their true position. Is the accompanying cirrhosis primary or secondary? What forms of hypertrophic cirrhosis occur in children? What are the relations of the family to the others? What is the state of the liver in the cases of primary splenomegaly, the conditions of the blood, the relations of the cases to hæmochromatosis and to Hanot's cirrhosis? These are some of the questions awaiting solution.

The morbid changes throw but little light on the process. It is probably a chronic toxic rather than an infective process, but of the nature and character of the poison we are ignorant.

Treatment.—Of nineteen cases collected by Harris and Herzog, in a study of the subject, fourteen out of nineteen recovered after splenectomy. Three of Osler's cases submitted to this procedure; one remained well three years after, and two succumbed from hæmorrhage after operation. Recurring hæmatemesis is the most important indication for the operation.

The Treatment of Pleurisy with Effusion.

DELAFIELD, FRANCIS, M.D. "The Treatment of Pleurisy with Effusion." *Am. Jour. of Med. Sc.*, Dec., 1902.

Delafield enters a strong plea for the early treatment of pleurisy with effusion by aspiration. He believes that aspiration should be performed not simply to remove fluid, but to cure pleurisy as a morbid process. He thinks that aspiration is *the* treatment for pleurisy, and should be performed as soon as the presence of fluid in the chest is made out.

Although the other methods of treatment are seldom followed by death, there is the objection of a long and tedious course. Two months is an ordinary duration and six months is not uncommon. Still further than this, the longer the pleurisy lasts, and the longer the lung is compressed the greater is the extent of pleuritic adhesions, and the greater the vulnerability to tubercular infection.

Two hundred hospital cases of pleurisy with effusion are tabulated to show the benefits of aspiration. Of these none of the patients died, none of them were injured by the operation, and in none of them was the chest infected.

In all of the patients the quantity of fluid in the chest was considerable and occupied the lower part of the pleural cavity.

The fluid taken from the chest was bloody in 25 cases, turbid in 18 cases and clear serum in the rest. The character of the fluid seemed to make no difference. Those with bloody or serous fluid did as well as those with clear serum.

Of the 200 cases, 182 left the hospital entirely cured; 6 left the hospital within ten days after the aspiration, and probably recovered; 6 left the hospital at periods of from seventeen to thirty-six days after the aspiration, the pleurisy was better, but the results were uncertain; 6 left the hospital at the end of from twenty-four to thirty-eight days, not at all improved.

Of the 182 cases which were cured, the length of time which elapsed from the beginning of the pleurisy to the day of aspiration, was as follows:—

7 months.....	1 case.
90 days.....	5 cases.
70 to 75 days.....	3 cases.
60 to 70 days.....	9 cases.
50 to 60 days.....	6 cases.
40 to 50 days.....	9 cases.
30 to 40 days.....	15 cases.
20 to 30 days.....	39 cases.
10 to 20 days.....	71 cases.
5 to 10 days.....	20 cases.
4 days.....	2 cases.
3 days.....	1 case.

It will be seen that in more than one half the cases the duration of the pleurisy before aspiration was between ten and thirty days.

In all of the cases the pleurisy was going on as an inflammation up to the time of the aspiration; the patients had not been at all improved either by nature or by the remedies taken.

That length of time which elapsed from the aspiration to the entire cure of the patient was as follows:—

Within one week.....	64 cases.
“ two weeks.....	138 cases.
“ three weeks.....	158 cases.
“ four weeks.....	169 cases.
“ six weeks.....	179 cases.

As to the number of aspirations: the operation was done once in 142 cases, twice in 45 cases, three times in 9 cases, and four times in 4 cases.

In private practice the results are better than in the hospital. In the fortunate cases, within twenty-four hours after one aspiration there is no more fluid and no more pleurisy. In a large number of cases the pleurisy is cured within a week, and none of them ought to be sick longer than two weeks.

Pathology.

UNDER THE CHARGE OF J. GEORGE ADAMI.

On the Relationship between Tropical and Amoebic Abscess of the Liver and Dysentery.

LEONARD ROGERS. Tropical or Amoebic Abscess of the Liver and its Relationship to Amoebic Dysentery. *British Medical Journal*, Sept. 20th, 1902.

The pathology of the large solitary abscess of the liver is still in a very confused state. Thus, as pointed out by Dr. Leonard Rogers in the introduction to his paper given at the Manchester meeting of the British Medical Association, in Allbutt's System of Medicine, Davidson, writing upon Suppurative Hepatitis, regards the condition as produced by ordinary pyogenic organisms acting on a liver predisposed to inflammatory change by life in the tropics, while Lafleur, writing on Amoebic Abscess of the Liver, holds that about half the cases of the disease are associated with amoebæ, which either themselves directly cause the pus formation, or act as carriers of the pyogenic organisms into the liver. It will be seen that even Lafleur, whose work with Councilman upon this subject has rendered him one of the leading authorities upon the subject, is far from being positive as to the relationship between the amoebæ and all cases of tropical abscess. He admits, it may be explained, the existence of a group of what he terms "idiopathic abscesses," causing like symptoms, but not associated with dysentery and not yielding amoebæ on examination.

Rogers, therefore, has done a valuable work in making a full study of this matter at Calcutta. He notes that the statement sometimes made that natives rarely suffer from the disease is totally erroneous as applied to India, and he is able to report a study of clinical and post mortem observations upon more than thirty cases. By a careful technique he has obtained results so constant that, at last, it would seem safe to draw conclusions regarding the ordinary form of solitary abscess of the liver, at least so far as it is met with in India. He had previously noted (what has been observed by others, though apparently not put to practical application) that while the thick pus of a liver abscess is often free from amoebæ yet, if a scraping of the wall be examined, they can be found with great ease. His procedure was to have ready two sterile test tubes and when the abscess was opened by one of his surgical colleagues, some of the free pus was

placed in the one, a small scraping from the wall of the abscess in the other. From this material, cultures and films were made and in it he searched for the amœbæ. The results were remarkably consistent.

In fourteen cases this double examination was made, in three others the scraping from the wall of the abscess was alone examined. In eight other cases pus only was obtained. In twelve of the seventeen cases in which thus a scraping was made from the wall of the abscess, the material was obtained at the time of operation and in all of these without exception, amœbæ were easily found, and that nearly always in the first slide examined. In four of the five cases in which the scrapings were obtained some days after the abscess had been opened, the amœbæ were readily found in an active condition; in the fifth, which was examined on the twelfth day after operation, when there was only a little thin discharge from the wound (quite different in character from the thick pus obtainable upon first opening the abscess), no amœbæ could be found. In other words, in sixteen out of seventeen cases in which scrapings were taken from the wall of the solitary abscess, the amœbæ were found. The only case in which they were not found is readily explainable.

Of the twenty-two examinations of the free pus from the abscess, the amœbæ were recognized in only four.

In twenty cases of liver abscess, in which the walls were examined for amœbæ post mortem, amœbæ again were always found, with one exception similar to that in the previous series, for it was a case of a liver abscess which had been opened fifteen days before death. Here, though the amœbæ were absent in the liver, they were found in chronic ulcers in the cæcum. With the exception of these two cases, which were not examined until ten to fourteen days after the abscesses were opened, Rogers has obtained a series of thirty-five consecutive cases in which he was able to demonstrate the relationship of the amœbæ to the disease process.

The next point to be considered, is whether the amœbæ, as such, cause the disturbances, or whether some pyogenic organism be present so constantly or so frequently as to explain wholly or in part, the development of the "tropical abscesses." In this connection Rogers found, out of twenty-four cases in which cultures were made from the pus, staphylococci were obtainable in only eight and in two of these only one or two colonies developed, so few that they might have been accidental contaminations. In one of these two no cocci could be seen in staining the pus. In one case a short oval bacillus was obtained. In the remaining fifteen the pus was sterile. In the pus from the post mortem cases staphylococci were found in eight

out of thirteen, together with streptococci in one. We thus have altogether thirty-seven cases yielding cocci in sixteen, and in these sixteen there were six in which the abscess had been opened previously and in which there was a possibility of infection from without. At the best, therefore, suppurative organisms were found in fewer than half the cases, and the obvious conclusion, is that the amœba is the only constantly found organism in tropical abscess of the liver. In this connection it should be recalled that the contents of these liver abscesses is not proper pus—is not, that is to say, a fluid containing pus corpuscles. It is a necrotic, granular debris in which singularly few cell bodies are to be made out.

It is next to be enquired what is the relationship between dysentery and liver abscess. We now know that in many parts of the world dysentery is associated with the presence, in the large intestine and its walls, of a bacillus first isolated by Shiga in Japan, since isolated by many other observers in the Philippines, the United States, Germany and elsewhere. Rogers notes that he has discovered the same in cases of catarrhal dysentery in Calcutta. He also notes that liver abscess is rare in the dysentery of temperate climes and in the epidemic dysentery of armies and of Indian gaols. There are, it is true, some divergences in the properties of the bacilli isolated by observers in different countries, but all of them have the property of agglutinating with the blood of patients suffering from the disease. Has the tropical abscess any definite connection with dysentery and, if there be such a connection, is it only with one particular form, the so-called 'amœbic dysentery' and, finally, does this particular form of dysentery differ from the dysentery set up by the Shiga bacillus clinically and histologically, so as to permit a clear distinction between the two?

Out of twenty-four cases of tropical abscess, upon which Rogers had full notes, in fourteen or 58.3 per cent. there was both a previous history of dysentery and lesions of the disease were found *post mortem*. In six more there was no history of previous dysentery, although this had been enquired for, but lesions of the disease were found *post mortem*. In three more there was a previous history of dysentery, but no lesions were found *post mortem*. (This recalls one of our Montreal cases in which, although we found the amœbæ in the liver *post mortem*, the colon was perfectly healthy). In only one case was there neither a history of dysentery nor lesions in the colon *post mortem*. Thus, in 95.83 per cent. of this series of cases of tropical abscess, there was either a history of previous dysentery, or the actual existence of lesions. Dr. Rogers confirms and enlarges upon this series, by a study of thirty-nine cases abstracted in the older *post mortem* records of the Calcutta Medical College Hospital. Here, out of 39 cases in which the notes

were sufficiently full, he obtained a total of 89.12 per cent. of either clinical or *post mortem* evidence of dysentery. The relationship between the two would, therefore, appear to be clear. Dysentery is constantly, or almost constantly a forerunner of tropical abscess of the liver.

Regarding now the type of dysentery, Rogers points out that this is distinct; so much so, that he and others were able to distinguish between it and ordinary epidemic dysentery seen in goals and elsewhere. The ulceration is characteristic; though the ulcers vary in size, the cæcum and ascending colon may be covered with raised yellowish white, sloughy, gelatinous material forming very extensive large ulcers and then the unaffected portions of the gut are bounded by the well marked raised borders of the ulcerated areas, a thin dark line of intense injection being seen at their boundaries, the normal tissue appearing to be depressed below the level of the diseased portions. This is just the opposite to the condition met with in the ordinary form of dysentery, in which the ulcers are depressed, the intervening mucosa raised. This Rogers regards as the most characteristic feature of the amœbic ulcer. In addition there may be, not these large ulcers, but a smaller form, and this is perhaps the commoner. These also tend to be in the form of raised patches, with a well defined margin, often showing a ring of congestion and with a pale yellow surface due to the gelatinous infiltration of the submucous coat. These ulcers may be very few in number, or may be scattered over the surface for the greater length of the large bowel. The unaffected mucous membrane, and this appears to be of some importance, seems in general to be quite healthy. Except in very chronic cases, there is no general thickening of the whole of the mucous membrane of the bowel, which is so characteristic of the ordinary catarrhal form of dysentery. Finally, Rogers notes some ulcers which may be so small as to appear simply as red dots, in the centre of which on close observation, a minute pale yellow, superficial ulceration can be detected, again surrounded by a red ring of congestion. Excavation of the ulcers, the yellow material sloughing out, is rare.

The distribution of the disease is of some importance. In all cases where more than a few ulcers are present, the cæcum is most markedly affected. The largest form of ulceration is commonly limited to the cæcum or to that and the ascending colon. Even the small ones do not, as a rule, affect the sigmoid flexure and rectum. Thus the distribution and the absence of thickening and of inflammation between the ulcers constitute, according to Rogers, the most characteristic features differentiating the amœbic from the ordinary catarrhal form of the disease. It is scarcely necessary to state that, as determining the nature, the amœbæ are easily found in the floors of the ulcers, the

yellow infiltrated material often showing numerous active amœbæ in every field of the microscope.

Coming at the present time, this paper seems to be of distinct importance. More especially among workers in India, there has been a tendency to doubt the existence of amœbic dysentery and, particularly during the last year, the attention paid to the bacillary form of the disease has caused no small confusion. But these observations of Rogers, showing as they do, how intimately the amœba is connected with the solitary abscess of the liver of the tropics, showing the intimate relationship between those tropical abscesses and dysentery and demonstrating as it does, that amœbic dysentery has special features sharply distinguishing it from the ordinary catarrhal disease, are of high value. We are pleased to find that they more than confirm the well-known work by our colleague Dr. Lafleur upon this subject.

Thus to sum up; these observations of Professor Rogers prove conclusively the following points:—

(1) The large solitary abscess of the liver seen in India, is always brought about by the presence of, or is associated with, *amœba dysentericæ*.

(2) That in more than 95 per cent. of such tropical abscesses, there is to be determined the existence or pre-existence of dysentery affecting the large bowel.

(3) That it is possible to distinguish sharply between the two different forms of dysentery, (a), epidemic catarrhal dysentery, which has associated with it the Shiga bacillus and (b) amœbic dysentery, the histological changes in the large bowel in these two conditions being quite distinct.

J. G. Adami.

Reviews and Notices of Books.

ATLAS & EPITOME OF OTOLOGY. By GUSTAV BRUHL, M.D., of Berlin, with Collaboration of ADAM POTITZER of Vienna. Authorized Translation from the German. Edited By S. MACC. SMITH, M.D. Clinical Professor of Otology, Jefferson Medical College, & 244 Colored Figures on 39 Lithographic Plates and 99 Text Illustrations. Philadelphia & London. W. B. Saunders Co., 1902.

This is another of those admirably illustrated clinical handbooks which those enterprising publishers have recently placed within reach of all who are interested and in a position to devote time and attention to the study of the recognized special branches of medicine and surgery.

The first part of this volume consists of superb colored illustrations with brief descriptions of each, thus constituting a very complete exposition of the normal and pathological anatomy of the auditory apparatus.

The second part consists of 277 pages of text, which includes a brief but thoroughly practical description of the normal anatomy and physiology of the ear, and a concise but most instructive account of all the diseases of that appendage from a clinician's standpoint, both as regards diagnosis and treatment. Malformations, tumors and general diseases associated with or tending to induce aural complications are also carefully considered. The work is an eminently practical one and should be in the library of everyone who aspires to the attainment of a working knowledge of otology.

BACTERIOLOGICAL TECHNIQUE. A Laboratory Guide for the Medical, Dental and Technical Student. By J. W. H. EYRE, M.D., F.R.S., Edin., Bacteriologist to Guy's Hospital etc. 8 vo., 375 pages with 170 illustrations. Philadelphia and London; W. B. SAUNDERS & Co., 1902. Cloth, \$2.50 net.

Of English bacteriologists, Dr. Eyre has most actively and most consistently advocated the establishment of standard methods for bacteriological research along lines similar to those laid down by the Committee of American Bacteriologists whose "procedures" are so well-known on this continent. He has, for now some years, been interested in the study of bacteriological methods, and this work gives

in very clear form, those methods which he has either elaborated himself or has found, by practical experience, to be the most satisfactory, more particularly for the general student. Indeed, as he remarks in his preface, the bulk of the matter is simply an elaboration of the typewritten notes distributed to his class in practical bacteriology. The work has not, by any means, come before us as a complete manual of bacteriology, but aims at giving clearly and accurately the details of technique, which too often are passed over in silence. So far as we have been able to follow the work, it fulfils admirably the purpose for which it is designed. It is essentially practical and, what is more, well up to date as regard methods of staining and preparation of media. Add to this it is well illustrated and clearly printed and should, we think, become a most popular laboratory handbook.

PRACTICAL DIETETICS—WITH SPECIAL REFERENCE TO DIET IN DISEASE. By W. GILMAN THOMPSON, M.D., Professor in the Cornell University, Medical College in New York City, &c., &c. Second Edition, enlarged and thoroughly revised. New York, D. Appleton & Co., 1902.

This is a large volume of 814 pages with complete index, cross references and table of contents, the latter so arranged as to show at a glance where any information on any part of the subjects discussed may be found. Such an arrangement makes the size of the work unobjectionable. The great importance of suitable diet under all conditions, both in health and disease, justifies the exhaustive manner in which the whole subject has been discussed by the author. The subject matter is divided into nine parts;—viz: Food and food preparations, stimulants, beverages, condiments, cooking—food preparation, the quality of food required, foods required for physical conditions, food digestions—conditions which especially affect digestion, the general relation of food to special diseases, diseases which are caused by dietetic errors, administration of food to the sick, diet in disease, rations dietarics. There is also an appendix containing receipts for invalid food and beverages, suitable for fevers and convalescence from acute illnesses.

So little is taught in medical schools on the subject of dietetics, it may be said this important part of the physician's education must be acquired after he leaves college. This book will be of great value to every medical man who desires to practice his profession on sound rational principles, and to leave nothing undone which may contribute to his success, and we cordially recommend it as a standard work which should be accessible to every medical practitioner.

NOTHNAGEL'S PRACTICE. DISEASES OF THE BRONCHI, LUNGS AND PLEURA. PROF. FRIEDRICH A. HOFFMANN, PROF. O. ROSENBACK and DR. E. AUFRECHT. Edited with Editions by JOHN H. MUESER, M.D. Authorized Translation from the German, under the Editorial Supervision of ALFRED STENGEL. W. B. Saunders & Co., Philadelphia. Canadian Agents, J. A. Carveth & Co., Toronto.

This important volume is opened by an exhaustive article on the Bronchi, by Hoffmann of Leipzig. After dealing with the anatomy, malformations and injuries of the bronchi, the bulk of the article is devoted to foreign bodies and to bronchitis.

An attempt has been made to classify bronchitis on an etiological basis, and Marfan's division into specific and non-specific forms is regarded as the most satisfactory, although obviously limited by a very imperfect bacteriological knowledge of the subject. Owing to this impossibility of a scientific classification of the subject, the various causes of the disease are discussed seriatim, followed by the general symptomatology and the varieties of the disease. The Editor regards a streptococcus infection as an indication of a severe type of the disease, marked by longer duration, greater fever and prostration, prolonged course, and of localization of rales and presumably of lesion.

Capillary bronchitis is considered under the heading of bronchitis, although the Editor adds a note stating his belief that this form of the disease is really a catarrhal pneumonia—a belief very generally accepted on this continent.

Although the drug treatment of bronchitis is fully described, the author has evidently very little faith in their efficacy. He leans strongly to the employment of hydropathic methods as the best and most effective means of dealing with this malady, influencing favorably every phase of the disease. Inhalations are regarded as next in value to hydro-therapeutic measures. These sections are well worth careful perusal, even if they do not meet with general acceptance.

A comprehensive article on asthma, emphysema and atelectasis are also contributed by Hoffmann.

The subject of inflammation of the lungs is dealt with by Aufrecht of Magdeburg-Altstadt.

The treatment of the subject is full and scholarly. It is illustrated by temperature charts and numerous tables, which are of the greatest value and interest for reference.

Whilst supporting the use of moderate doses of alcohol in debilitated subjects, the author is strongly opposed to the use of this remedy as

a routine measure and in large doses, believing that it frequently converts excitation in prostration. He is emphatic in the value of quinine, and strongly recommends its use in severe cases after the fifth or sixth day. About seven and a half grains of the hydrochlorate of quinine, dissolved in half an ounce of water is administered hypodermically three times daily, and is said to produce a marked amelioration in the general condition. The mortality, as shown by a table, also seems to indicate a marked lessening of the mortality.

The other forms of pneumonia, cancer, thrombosis, embolism, abscess, and gangrene are also treated by Aufrecht.

Rosenbach of Breslau deals with tumors of the pleura and pneumothorax. We cannot too highly express our appreciation of this work. The difficult and laborious task of translation has been performed in a satisfactory manner, and the additions of the editor materially enhance the value of the book.

CELLULAR TOXINS OR THE CHEMICAL FACTORS IN THE CAUSATION OF DISEASE. By VICTOR C. VAUGHAN, M.D., L.L.D., Professor of Hygiene and Physiological Chemistry, and Director of the Hygienic Laboratory in the University of Michigan, and FREDERICK G. NOVY, M.D., Sc. D., Junior Professor of Physiological Chemistry in the University of Michigan. Fourth edition revised and enlarged, 8vo., pages 487, LEA BROS. & Co., Philadelphia.

That this well-known book by Professors Vaughan and Novy fills a want, is evidenced by the fact that it has now reached its fourth edition. It contains a mass of material bearing upon the chemical substances related to the production of disease, which is not easily to be found in any other work in our language. It is interesting to observe how, in each edition, the stress laid upon different groups of substances is changed. In the first edition, if we remember aright, the ptomaines obtained the fullest treatment. In the last edition more stress was laid down upon bodies of the nature of nucleins. In the present edition there are important chapters on such subjects as the Specific Precipitins, the Lysins and the Agglutinins, with a statement of all the recent and remarkable observations upon bacteriolysis, hæmolytic and cytolysis, while naturally Erlich's theory of immunity is discussed at considerable length. The last chapter, short but suggestive, is also new, that upon the autogenous diseases, that is to say, upon diseases brought about by the agency of the metabolic products of the animal body.

The subjects treated in this work, are many of them singularly complicated, nor have we by any means reached an ultimate and fixed

state in our knowledge regarding them. The work cannot be regarded in any way as an ordinary textbook; its style, indeed, is not that fitted for beginners; but is of distinct value for the advanced students. From its nature we think that perhaps the authors have made a mistake in not retaining the references which were present in the previous editions. They give, it is true, references to newer work described by them and, as they point out, the student will find the references to earlier work given in the earlier editions. This, however, necessitates the student possessing those earlier editions, at least the last.

DISEASES OF THE PANCREAS AND THEIR SURGICAL TREATMENT. By A. W. MAYO ROBSON, F.R.C.S. Eng., Senior Surgeon, Leeds General Infirmary; Emeritus Professor of Surgery, Yorkshire College, Victoria University, England; and B. G. A. MOYNIHAN, M.S., (Lond.), F.R.C.S. Eng., Assistant Surgeon Leeds General Infirmary; Consulting Surgeon to the Skipton and to the Mirfield Memorial Hospitals. Octavo Volume, 293 Pages, Illustrated. W. B. SAUNDERS & Co., 1902. Canadian Agents, J. A. CARVETH & Co., Toronto. Price, \$3.00.

It is only within a comparatively short time that the diseases of the pancreas have been studied and a still shorter time since they have been treated surgically. Mr. Mayo Robson's name has been long associated with advanced surgical work, in connection with the pancreas and liver and the influence of gall-stones in the production of diseases of the pancreas has been frequently insisted on by him. He was the first to seriously advocate drainage of the gall-bladder for chronic pancreatitis, in fact, Mr. Mayo Robson has been identified for some time with the surgery of this region and we welcome any work on the subject of diseases of the pancreas and their surgical treatment, for which he and his fellow worker Mr. Moynihan are responsible.

It is stated that the work has a twofold object, *viz.*, to record and to review the work done in the past and to indicate as far as possible the scope and trend of future research. The work first describes the anatomy of the pancreas, the experimental work on this organ and pancreatic diabetes, quoting at length from the work of Opie of Johns Hopkins Hospital on the subject. Injuries of the pancreas are next described and then the various forms of pancreatitis, in the acute form early exploratory operation being recommended. Pancreatic calculus has a chapter devoted to it. Cysts are next described and their frequent relation to the impacted calculus mentioned. A chapter on new growths of the pancreas completes the work.

It is a work that all surgeons and many physicians will read with

pleasure and profit. It is well printed and well illustrated and free from typographical errors.

SAUNDERS MEDICAL HAND-ATLASES. ATLAS AND EPITOME OF TRAUMATIC FRACTURES AND DISLOCATIONS. By Professor DR. H. HELFERICH, Professor of Surgery at the Royal University, Greifswald, Prussia. Authorized Translation from the German, edited by JOSEPH C. BLOODGOOD, M.D., Associate in Surgery, Johns Hopkins University, Fifth Edition Revised and Enlarged, W. B. SAUNDERS & Co., 1902. Canadian Agents, J. A. CARVETH & Co., Toronto. Price, \$3.00.

This volume, which is one of the series of Saunders' Medical Hand-Atlases, maintains the high standard which has characterized the other works in this series. The plates, the majority of which are beautifully coloured, present, as no words could, the conditions found in the various fractures and dislocations. The characteristic deformity exhibited by the patient, is shown in each case and the companion illustration shows the condition present on dissection. The great aid afforded by this means for a clear understanding of the nature and cause of the deformity may be readily appreciated. Brief notes are added to the illustrations calling attention to their salient points. The value of the work is increased by a concise description of the etiology, symptomatology, prognosis and treatment of the injuries dealt with. The sections on treatment while brief are adequate and enhance the value of the work as a whole. It can be strongly recommended to the medical student and the general practitioner, as well as to the surgeon.

Correspondence.

AMERICAN MEDICAL TEMPERANCE ASSOCIATION.

To the Editors of the MONTREAL MEDICAL JOURNAL.

Dear sirs:—Three times during the last half century medical manifestos have been issued giving the opinion of physicians on alcohol. The first was issued in 1839, and was signed by 86 persons. The second in 1847, and was signed by 2,000 physicians, and the third appeared in 1871, with the signatures of over 4,000 physicians, including the names of many leading physicians in all parts of the world. A fourth declaration of opinions is now being circulated for signatures, and reads as follows:—

The following statement has been agreed upon by the Council of the British Medical Temperance Association, the American Medical Temperance Association, the Society of Medical Abstiners in Germany, and leading physicians in England and on the continent. The purpose of this is to have a general agreement of opinions of all prominent physicians in civilized countries concerning the dangers from alcohol, and in this way give support to the efforts made to check and prevent the evils from this source.

In view of the terrible evils which have resulted from the consumption of alcohol, evils which in many parts of the world are rapidly increasing, we, members of the medical profession, feel it to be our duty, as being in some sense the guardians of the public health, to speak plainly of the nature of alcohol, and of the injury to the individual and the danger to the community which arise from the prevalent use of intoxicating liquors as beverages.

We think it ought to be known that:—

1. Experiments have demonstrated that even a small quantity of alcoholic liquor, either immediately or after a short time, prevents perfect mental action, and interferes with the function of the cells and tissues of the body, impairing self-control by producing progressive paralysis of the judgment and of the will, and having other markedly injurious effects. Hence alcohol must be regarded as a poison, and ought not be classed among foods.

2. Observation establishes the fact that a moderate use of alcoholic

liquors, continued over a number of years produces a gradual deterioration of the tissues of the body, and hastens the changes which old age brings, thus increasing the average liability to disease (especially to infectious disease), and shortening the duration of life.

3. Total abstainers, other conditions being similar, can perform more work, possess greater powers of endurance, have on the average less sickness, and recover more quickly than non-abstainers, especially from infectious diseases, while they altogether escape diseases specially caused by alcohol.

4. All the bodily functions of man, as of every other animal, are best performed in the absence of alcohol, and any supposed experience to the contrary is founded on delusion, a result of the action of alcohol on the nerve centres.

5. Further, alcohol tends to produce in the offspring of drinkers an unstable nervous system, lowering them mentally, morally, and physically. Thus deterioration of the race threatens us, and this is likely to be greatly accelerated by the alarming increase of drinking among women, who have hitherto been little addicted to this vice. Since the mothers of the coming generation are thus involved the importance and danger of this increase cannot be exaggerated.

Seeing, then, that the common use of alcoholic beverages is always and everywhere followed, sooner or later, by moral, physical and social results of a most serious and threatening character, and that it is the cause, direct or indirect, of a very large proportion of the poverty, suffering, vice, crime, lunacy, disease and death, not only in the case of those who take such beverages, but in the case of others who are unavoidably associated with them, we feel warranted, nay, compelled to urge the general adoption of total abstinence from all intoxicating liquors as beverages as the surest, simplest and quickest method of removing the evils which necessarily result from their use. Such a course is not only universally safe, but is also natural.

We believe that such an era of health, happiness and prosperity would be inaugurated thereby that many of the social problems of the present age would be solved.

This declaration has already received the signatures of over 1,000 physicians in all parts of the country. I have been appointed chairman to present this manifesto to American physicians for their endorsement. I should be very glad to receive the name, title and address of any physician who is willing to aid by his signature to correct public sentiment and assist in the prevention of one of the great evils of the age. This is purely a scientific effort, for the purpose of having a general consensus of opinion of the leading physicians

of the world, and it is assumed that American physicians are equally enthusiastic and prompt to lend their signatures to this statement as in the wine-drinking countries of Europe. A postal card with address and title is earnestly solicited from every medical man who would like to be represented in this great movement for a clearer comprehension of the subject. Address,

T. D. CROTHERS,

Hartford, Conn.

Secretary, American Medical Temperance Association.

T H E

Montreal Medical Journal.

A Monthly Record of the Progress of Medical and Surgical Science.

EDITED BY

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No. 3.

ON THE HOSPITALS FOR INFECTIOUS DISEASES IN MONTREAL.

All truly interested in the well-being of our community must have experienced a feeling of profound relief when at last, after three years wretched obstruction, the City Council finally ratified a scheme for the provisions of infectious hospitals. Plan after plan had been proposed only to be defeated; the Council refused to build a common hospital for the accommodation of all cases occurring in Montreal—at one time it refused to do anything at all in the matter—then it declared itself willing to agree to the establishment of a double hospital, one for the French-speaking members of this community, another for the English, but when it came to providing a site for the same, the opposition was such that the scheme had to be withdrawn. Finally, the heads of the general hospitals, French and English, in the city, came forward and offered to provide hospital accommodation for the members of the two communities, and the plans proposed by them have been accepted.

Theoretically this is a step in the wrong direction. It is a duty of those elected as representatives of the community to build and maintain

a hospital for the care of infectious cases and that duty has been recognized all over the civilized world. The City Council is bound to provide for the safety of the community in order that the community as a whole may be protected from infection and the health of the people kept at as high a standard as possible and these duties should not be delegated to any one else. The city has no right either to demand or to expect that others should take up this work. All the same the arrangement that has been determined upon is, from many points of view, greatly superior to the establishment of a hospital governed by the City Council. Had the city undertaken this work we may be sure that, in the mere building and equipment, much of the public money would have gone astray, with the result that the building and equipment would not have been of the first order. Every contract, once the hospital was open, for coal, drugs, food and other necessaries, would have been determined, not by considerations of the welfare of the patients but by political considerations and the pecuniary advantage to be gained by certain aldermen; nursing and medical attendance would have been cut down to the lowest possible amount to the detriment of the patients in the hospital. As it is, we may feel assured that both of the hospitals will be built in accordance with the most modern ideas of what is necessary for the treatment of those suffering from exanthematous diseases. There will be no waste of money and no boodling; nursing and medical attendance will be of the first order and, not least, the wards will also be open for teaching purposes. The outer world does not understand that the presence of medical students in the wards of a hospital is a distinct advantage to that hospital. They regard that presence as often harmful to the patients. As a matter of fact it may be laid down with confidence that nothing conduces more to the thorough and scientific treatment of patients than does the attendance of medical students: the teaching of the same demands of the attending staff that the cases are thoroughly studied. It prevents slipshod methods. It is those hospitals in all parts of the world, that are thus thrown open to medical students, in which the patients receive the best attendance and in which the highest standard of efficiency is attained. The two infectious hospitals will now be directed and managed by those who have no personal interest in making money out of them. The medical attendants, resident and consulting, will be the best that can be selected, the nurses probably will be those who have already undergone some years training in the general hospitals of the city, and now undertake a course of training and study in the infectious hospital in order to complete their knowledge of what, in private practice, will be for them some of the most frequent and important cases with which they have to deal.

From what has already been said during the course of the agitation over these hospitals, the private practitioners of the city are assured of the privilege of sending their patients to the hospitals and of attending upon them personally when they so desire, while provision will be made for well-equipped private wards. The hospitals, in short will be in competent hands and, for the health of the city this in itself is a matter of the first importance, since now, instead of a householder fearing to send his child to the hospital, everyone will be only too glad to utilize the hospital in order to prevent the many evils which attend the isolation and quarantining of private houses ; the sending away of the patients will thus in itself materially reduce the chances of infection of others in the household.

We still have to learn how the money is to be raised to build the English and French hospitals respectively. We still have to learn also where the West End Hospital is to be situated. We have, however, such confidence in those who have carried the matter through to the present situation that we have no fear that these matters will not be determined in a manner that is thoroughly satisfactory.

One word more deserves most assuredly to be said. To Alderman Ames, the Chairman of the Health Committee of the Council, our citizens of all races and creeds owe a heavy debt of thanks. Without his steady perseverance throughout all these years we should still be in the position of having no proper scheme before us. He has borne the brunt and heat of the fray and if the present scheme is not that which he, during last year, has so urgently pushed forward, our thanks are none the less owing to him. We can well understand his contention that the city should undertake this matter, and cordially agree with him that the site upon Fletcher's Field was the ideal site for this purpose. Yet taking everything into consideration, we believe that, for the good of the community and for practical purposes, this final arrangement is the best; but believing this, we realize all that he has done to bring about a solution of the difficulty.

Proceedings of the McGill Medical Society of Undergraduates.

POTTS' DISEASE—SYMPTOMS AND DIAGNOSIS.

BY

D. A. McKECHNIE, '03.

The signs and symptoms of Potts' Disease or as it is sometimes called tuberculous caries of the spine, vary with the stage of the inflammatory process and its situation, but for practical purposes the following are the most important symptoms to recognize and the ones most constantly present: pain, rigidity, deformity, abscess and paralysis.

In a study of 84 cases, H. P. Wolley, of Chicago, found that family history was of little value in the diagnosis, and that the two sexes were about equally affected. Rigidity was present in every one of the 84 cases and kyphosis or backward curvature of the spine in 76. In 31 cases the deformity was in the dorsal region, in 21 in the dorso-lumbar, in 19 in the lumbar, and in 5 in the cervical, thus leaving 8 cases without deformity.

Pain was almost invariably present and generally felt at some point distant from the seat of the disease. 15 cases developed psoas abscess, 5 developed lumbar and 3 developed cervical.

Only 3 gave evidence of paraplegia.

The clinical picture of the disease may be briefly outlined as follows: The child will early complain of pain, and generally in the parts of the body supplied with sensation, by the nerves issuing from the diseased area of the spinal canal. The pain will be increased on movement, especially upon jumping or on flexing or rotating the spine. After a time the child is unable to stand upright unsupported and shows a tendency to lean the body forward or to support it by resting the hands on the knees. If asked to pick up anything, he does not bend his back but reaches the ground by bending the knees and holding the back straight. Later a prominence of one or more vertebrae appears, and if the disease is not arrested by proper treatment, deformity will continue, the patient will become stunted in his growth (and dwarfed) and the typical hump or round back is produced, which lasts for life.

In other cases the disease will go on to the formation of abscess,

which if not properly drained and the strictest antiseptic precautions taken, may lead to a long-continued suppuration, death eventually resulting.

To consider the symptoms in more detail:—

Pain—This is an almost constant factor, although in the early stages of the disease, it may not be especially prominent. It is of two main types—the local and the referred.

Local pain is felt over the spines of those vertebrae which are diseased. It can be elicited by pressure or percussion over the spines or perhaps more effectually by pressing upon the transverse processes and so causing rotation of the vertebral bodies. Movements of the spine will likewise cause local pain and the same result can be brought about by a sharp blow on the head or nates, thus causing a jarring of the vertebral column.

Referred pain is felt in the parts supplied with sensation by the nerves issuing from the diseased portion of the spinal column, and hence differs in situation according to the region of the vertebrae affected.

If the lumbar region is the site of the disease, the nerves being pressed upon and irritated as they issue from the inter-vertebral foramina, of this area, will produce pain which is referred down the legs.

If the dorso-lumbar region is affected, the pain may follow the last dorsal nerve, and be felt in the lower part of the abdomen or in the gluteal region. From the lower dorsal region pain is often referred to the epigastrium and a child may complain of stomach ache from such a cause. From the upper dorsal and lower cervical areas, pain extends down the arms, whilst if the upper cervical region be diseased, the pain is felt along the course of the cutaneous muscles of the cervical nerves.

Rigidity.—If anything this is a more constant symptom in spinal caries, than pain. In the early stages of the disease, it is the result of involuntary muscular spasm, the object being to fix and immobilize the spine, that less pain may be produced.

This is the symptom which is made more apparent on asking the patient to pick up something from the floor, to do which, he gradually lets himself down with a perfectly rigid back and comes into a sitting or squatting posture. The body is raised in a similar manner by resting the hands upon the thighs. When told to move about he walks as though on ice, sliding and shuffling along so as to avoid the jar of successive steps. When standing it is noticed he fixes the upper part of the column by the aid of the trapezii and other muscles whose action at the same time raises the shoulders and throws the arms out from the sides. It is also often noticed that there is an "involuntary

transference" of the weight of the parts above the diseased area, to the hips, the patient placing his hands upon the hips and keeping the muscles of the arm tense.

Deformity.—Osseous ankylosis is present in almost all cases of Pott's Disease, although it is possible for recovery to take place without it, when the condition is recognized early and treated accordingly.

After the disease has continued for a time, the processes of one or more vertebræ may be noticed to distinctly project beyond the general line of the column, but it should be remembered that caries of the bodies of the vertebræ may take place to a considerable extent with little or no angular curvature being apparent.

The extent and character of the deformity depends principally upon the number of vertebræ affected and their region. A true angular deformity may result when only two bones are involved, the body of the upper vertebræ being welded to that of the lower so as to produce a wedge-like mass.

In the lumbar region there is usually little or no displacement, the disease being limited to the centres of the bones, so that the sides escape and preserve the integrity of the spinal column. When a large number of vertebræ are affected, as is common in the dorsal region, the curvature is never angular, but the whole section of spine becomes deflexed and kyphetic in type. Owing to the length of the spines of the dorsal vertebræ, the projection in this region is more pronounced, while in the cervical region there is rarely much deformity owing to the small size of the vertebræ and deep position of their spinous process. Secondary changes in the shape of the thorax accompanying the more advanced cases of caries in the dorsal region, viz., the sternum becomes more convex anteriorly in order to compensate for the diminished vertical measurement of the thorax, and the ribs become so crowded together that the intercostal spaces are almost obliterated.

All those changes tend to stunt the growth of and dwarf the person, so that in time he constitutes the typical hunchback.

Abscess.—This is the most serious symptom in spinal caries and it commonly makes its appearance as the disease progresses, although in some cases it occurs before any other signs are apparent, except pain, and always before there is any deformity. However, it must not be supposed that abscess is present in all cases. In children especially we often meet with great spinal deformity, without having any suppuration, but in adults it is very rare to see angular curvature without abscess formation.

When pus forms, the situation of the abscess depends mainly upon the part of the spine affected, as when the cervical vertebræ are-

diseased, the abscess pushes forward behind the pharynx and often by its size causing some difficulty in swallowing and breathing. Left to itself it may burst and discharge into the pharynx, or it may travel downwards behind the œsophagus into the posterior mediastinum, or more commonly the pus finds its way into the posterior triangle at the side of the neck, being guided thither by the prevertebral fascia.

When the dorsal spine is affected the abscess may again take different directions, most frequently it passes backwards between the vertebral ends of the ribs to form a dorsal abscess 3 or 4 inches from the spines, or it may extend between the ribs and parietal pleura along the course of the intercostal vessels, coming to the surface at the point where the lateral cutaneous nerves are given off; not uncommonly it works its way downward passing under the internal arcuate ligament of the diaphragm, thus entering the psoas sheath and giving rise to a psoas abscess in the groin.

When the lumbar spine is diseased, either a lumbar or psoas abscess may result. The first gives rise to a fluctuating swelling situated between the last rib and crest of ilium. The psoas abscess is formed as stated above, by the pus entering the sheath of the psoas muscle in which it travels downwards. At the brim of the pelvis, it usually burrows outwards forming a large fluctuating tumor in the iliac fossa. As the accumulation increases it passes on beneath Poupart's ligament behind and external to the femoral vessels, finally pointing near the internal saphenous opening in the neighborhood of the lesser trochanter.

Occasionally the pus finds its way down into the pelvis instead of passing under Poupart's ligament and in other rare cases the abscess has extended down the leg and been evacuated at the side of the tendo Achillis.

Hence it is of importance to know the different courses an abscess may take and how it may point even at some distance from the actual seat of disease.

Paraplegia.—This is fortunately not a common symptom or result, it only occurring in the worst cases or in those where proper treatment has been neglected. It is said to occur in about 7 per cent. of cases.

Narrowing of the spinal canal sufficient to cause compression of the cord, rarely occurs as the direct result of angular curvature. When symptoms of paralysis appear, it is found these are due, in the majority of cases to the accumulation of inflammatory products, granulation tissue, caseous material or pus between the bone and dura mater.

In rare cases the pressure is caused by a chronic abscess pushing back the common ligament against the cord, but more commonly than this, the ligament itself is invaded by tuberculous, granulation tissue finally perforating and directly exposing an area of the cord.

The signs of paraplegia can be divided into those arising from pressure on the roots of the nerves and those due to pressure on the cord itself.

The production of peripheral pain, as a result of compression and irritation of the nerve roots has already been referred to, but it may be noted that this frequently is accompanied by hyperæsthesia of the skin, and later, when the conducting power of the nerves is impaired, by anæsthesia.

When considering the symptoms arising from pressure upon the cord, it should be remembered that motor phenomena will be more evident than sensory, since the sensory tract lies towards the centre of the cord and is consequently more protected from injury. At first there is slight dragging of the toes in walking, and weakness of the bladder and rectum sphincters, with exaggeration of the reflexes, (the latter sign being an important one from a diagnostic point of view).

Later on the paralysis becomes more complete, secondary contractions and rigidity occur and the reflexes diminish.

However, the course of paraplegia is on the whole favorable, and recovery takes place in the majority of cases.

Diagnosis.—The diagnosis of Potts' disease is always more difficult in the early stage before angular curvature has taken place, and when it might be mistaken for intercostal neuralgia, rheumatism, hysteria or renal disease.

A thorough and complete examination of the patient is of great importance and strongly emphasized by all writers—he should be stripped of his clothing and inspection first carried out, carefully noting whether any special attitude is assumed, whether any rigidity present or deflexion of spine. He should be made to bend backwards and forwards and to both sides and the occurrence of spasm in any of the muscles of the trunk noted. It is well to examine the spine from in front as well as from behind, and pain on pressure over the transverse processes and rigidity of the back are the symptoms on which most stress is laid. Marked tenderness on pressure along the entire length of the spine without the occurrence of muscular spasm or deformity, is a pretty sure indication of the so-called "hysterical" spine, as opposed to tuberculosis.

If muscular spasm be found on any manipulation of the spine, or pain on bending or from pressure on the head, together with referred pains to the anterior part of the body and the patient showing an elevation in temperature of from $\frac{1}{2}$ to 1 degree, the chances are almost certain that you have to deal with an inflammation of the spine, even though no deformity is apparent.

In the later stage of caries and when angular curvature is present, it

may have to be diagnosed from the kyphotic or backward curve of rickets. But in the latter condition we find that the curve will more or less completely disappear on holding the child up by the arms or on extending it face downwards across one's knees. There are, moreover, the associated signs of rickets present, and an absence of these pointing to tubercle. The diagnosis between abscess resulting from spinal caries and that due to any other cause may give some trouble. We may have a psoas abscess descending in the sheath of the muscle and presenting under Poupart's ligament when no disease of the vertebrae exists. In some of these cases of "sample abscess," the diagnosis from abscess dependent upon vertebral disease may be practically impossible, for occasionally the presence of an abscess is the only symptom of spinal disease.

The more important conditions (apart from Potts' disease) in which we may have abscess or swellings simulating that dependent on caries of the spine, are the following:—

- (1) Disease of the kidney with accompanying suppuration in the surrounding areolar tissue, producing a perinephritic abscess.
- (2) Inflammation of the appendix or cæcum—right side only.
- (3) Disease of the iliac bone or a cellulitis in the tissues under the fascia iliaca, producing an iliac abscess.
- (4) Hip-joint disease.
- (5) An empyema perforating the pleura and passing down behind the diaphragm.
- (6) Femoral hernia.

These various conditions are apt to confuse, but with care can be readily diagnosed from the abscess of Potts' disease. If the collection be perinephritic, there will likely have been previous or there are, co-existing signs of renal disease while a spinal lesion may be absent.

The character of the pus in an abscess following appendicitis, or inflammation of the cæcum, is distinctive in its very offensive odor, due to presence of colon bacilli. The previous history in such a case will also differ considerably from that of spinal caries.

An iliac abscess and especially when it finds its way into the sheath of the psoas, may be difficult to diagnose. It can then be only distinguished by its generally being more limited in extent than the ilio-psoas abscess and by the absence of symptoms of spinal disease.

Hip-joint disease is readily recognized by the limitation of movements at the hip, presence of pain in the joint, and by the abscess not extending upwards along the course of the psoas muscle.

In those cases when an empyema has found its way down and presented in the groin, an examination of the chest will point out the nature of the affection.

From femoral hernia, a psoas abscess may be distinguished by the fluctuating character of the swelling and which may be felt above and below Poupart's ligament by its being external to or below the femoral vessels and by the absence of any gurgling. Other symptoms of spinal caries will as a rule, also be present.

In conclusion, will cite two interesting cases, one of which was reported in the *British Medical Journal*, 1900, and the other in the *Lancet* of 1881 (bearing on this subject)

W. S., age 18, schoolboy, was admitted to Westminster hospital, London, May 24th, and died June 8th.

He was a pale strumous boy. Parents both dead. Had five healthy brothers alive. He enjoyed good health until two months previous to admission to hospital. He then complained of sore throat and was treated for quinsy. At the same time he had a so-called attack of pleurisy.

Two weeks before admission an abscess swelling came on the left side of his neck, extending for four inches from occipital spine to left ear. Another abscess burst into his pharynx at about the same time, and a probe introduced through the mouth came down on exposed bone. He was able to walk to the hospital when he was at once placed in an absolute recumbent position, and there maintained with head supported by sand bags. Was ordered a generous diet and a tonic of cod liver oil and syrup of iron phosphates. No improvement beyond freedom from pain resulted, and he died June 8th.

The post mortem examination showed the viscera generally to be healthy, but the upper three cervical vertebræ were diseased and distinctly eroded. A large abscess sac enveloped these articulations, spreading forward to the pharynx and laterally and behind towards the left ear.

It was a very typical case of cervical caries with active joint mischief going on, but the only distortion was a stiff neck mistaken for quinsy.

The other case reported by Dr. James Allan in the *Lancet* for June, 1881, shows that pus or abscess formation does not always come to the surface and show itself.

Henry C., age 55, admitted to hospital September 3rd. Four years before, he fell from a considerable height on his back. For the last two years he has had pain and weakness in the lumbar region. On examination, the last dorsal spines were found to be slightly prominent and there was pain on pressure or movement, with some rigidity of the spine. He frequently complained of pain in the area supplied by the lateral branch of the last dorsal nerve. Was no paralysis or difficulty with bowels or bladder. He died rather suddenly of pneumonia, May 30th.

The post mortem examination showed that the 12th dorsal and 1st lumbar vertebræ were diseased. A large portion of both bodies being broken down and the space so formed occupied by thick pus, which had also burrowed along each side of the spine in the psoas muscles, getting as far as the 3rd lumbar vertebræ. The right lung was in a state of red hepatization and caseous nodules were present in the apices of both lungs.

Hence the importance of an early and correct diagnosis in Potts' disease, since much may be done in the way of checking its course by anticipation, but nothing in the way of cure after delay.

POTT'S DISEASE OR CARIES OF THE SPINE.

BY

R. H. ELLIS, B.A., '03.

We do not always judge of the importance of an incident by the frequency with which we are brought into contact with it, and in this connection I have but to mention our dusky Italian friend with his street organ, who seems to grow, as it were, under our very windows when study is the necessity of the hour, or the man on the corner, on whom fortune seems ne'er to smile, save through the coppers which we fling into his cap.

Neither on the other hand, can we draw conclusions as to the importance of an event which but rarely transpires in our midst. The assassination of a President or the crowning of a King will at once occur to our minds to bear out this statement. And yet, among the disorders which afflict mankind, there are diseases which, from their ever recurring frequency and prevalence, no less than from their influence on a people or nation, demand the closest attention and study, which we can give.

You will doubtless remember that some two weeks ago, while attending a clinic to the 3rd and 4th years at the Royal Victoria Hospital, the great subject of tuberculosis in one of its most prevalent forms was brought before us. A week later, the subject was again tuberculosis, and there will doubtless arise in the experience of each one of us many score of cases such as we saw on these two occasions.

To-night we are dealing with the same disease, though in yet another of its manifestations.

One of the most common forms of tuberculous disease, and one especially met with in surgical experience, manifests itself in the changes which bones and joints undergo when invaded by the tubercle bacillus; and while we are speaking, with particular reference to the vertebral column, yet the process in the various bones of the body is very similar.

In mentioning Pott's disease, the mental picture is at once presented of an individual with bent back and great deformity. In fact tuberculosis of the spine and angular curvature are, with the majority, synonymous terms. Though the two are very frequently associated, yet the one does not necessarily imply the other. Were our knowledge sufficiently complete to enable us to make an early diagnosis, the deformity would not be so common. And when we remember that only a moderate length of time is necessary, after the first appearance of rational signs, to bring on a modification, (bulging or flattening

according to the region) of the normal spinal contour, we are the more readily impressed with the importance of this knowledge. But I am encroaching on the territory of another.

Since the great discovery of Koch in 1882, our knowledge of the pathology of the disease has taken a wonderful stride forward. From that year also dates the inauguration of a new surgical treatment. Records of the disease and descriptions of the clinical forms found in joints, go back as far as Hippocrates, but it was to Wiseman in 1676, that we are indebted for our first accurate clinical history. Under the name of "white swelling," (tumor albus) he included a number of chronic joint diseases, which constitute even at the present time, the most frequent form of tuberculous inflammations of the joints, and which we are accustomed to call by the same name. He was also convinced that the disease is materially dependent on scrofula. Other investigations followed and of these R. Brown Chester, in 1766, and Benjamin Bell, in 1779, deserve special mention. In 1844, Bonnet furnished positive anatomical proof that "a large number of so-called white swellings were due to tuberculosis of the synovial membranes."

Since then experimentation on animals has thoroughly demonstrated the tuberculous nature of the so-called "scrofulous bone and joint disease"; and yet it is remarkable that in all cases of experiment (as is also true of the disease in men) the number of bacilli is exceedingly small.

My share in the subject for this evening consists in discussing the etiology and pathology of tuberculosis of the spine.

The causes of tuberculosis of the spine are much the same as those of the affection elsewhere, *viz*:—it affects an individual predisposed to the development of tuberculosis, either by some inherited tendency, or by impairment of the general health, as from some previous illness or exposure to defective sanitary conditions.

In many cases a predisposition to the disease is certainly manifest, and in such individuals the tissues and fluids of the body furnish a more favorable soil for the growth of the bacillus. One set of statistics shows that of 162 cases, 34 per cent. were children of distinctly tuberculous parents and again, records show, that in 250 cases of tuberculous bone disease 97 had parents or grandparents who were tuberculous. This, curiously, is again about 34 per cent.

In regard to the age at which the disease is most frequently met we have very clear evidence. Of 375 cases recorded, 226 were under five years of age when the disease began, while 77 were under two years. In 4 cases the disease could be referred to the first six or

seven months of life. 8 cases occurred after the patient had reached the age of 40, and but one was over 50. This last occurred in the cervical region in a man 72 years of age.

Whether the proneness of early childhood to this disease be the result of the greater softness of the osseous structures at that period I will leave for others to decide.

Sex exerts a not unessential influence on the frequency of the disease. Thus of 412 cases in which the sex was recorded, 235 were males and 177 females, or a ratio of 9 to 7. This bears out Dr. Sayre's assertion "that it occurs more frequently among boys than girls." This preponderance is probably due to a greater exposure to accidents.

In the vast majority of cases, tuberculosis of the joints and bones follows slight contusions or sprains. Pott's disease usually occurs after a fall or sprain and in a susceptible individual. This bruise to the soft spongy tissue of one of the vertebræ is followed by a laceration of the delicate vessels, and a consequent effusion of blood into the cancelli of the bone. The circulation of the part is impaired and nutrition is interfered with. This for a time disables the tissues and so the resistance on their part to bacteria and their poisons is greatly lessened. In an individual predisposed to tuberculosis, the seeds of the disease may be imprisoned in the system, the first manifestations occurring in other structures, notably the lymphatic glands and the lungs. The original focus of disease is, however, frequently small and may remain quiescent while the lesion in the bones advances. The disease of the bones may be due to direct extension through the mucous membranes or to hematogenous infection.

The bacilli are carried by the blood to the injured area and as Krause holds, pass out of the ruptured end of the capillary into the clot, which forms a favorable soil for its growth. The light forms of injury are more frequently followed by tuberculosis than more severe accidents, and so at one time, amputations were very common in France after sprains, while it was very rare to find the disease following fracture.

A study of the comparative frequency of this disease in the several regions of the spinal column brings up a few interesting points with respect to trauma. The results are based on the fact that the apex of spinal projection corresponds very closely with the centre of disintegration, and this conclusion is reached from an inspection of dried specimens and from the post mortem table. Of 300 cases recorded where a diagnosis of the individual vertebræ involved has been made, we find that there were three centres of maximum liability to the disease, one was at the 6-7 cervical vertebræ, one extending from the 8th dorsal vertebræ as a centre a short distance up and down, and a

third at the 1-2 lumbar. The curve represented by these figures is a continuously progressive one, gradually rising to its maximum and descending to its minimum. For, if it were very irregular, rising and sinking very suddenly between adjacent vertebræ, it would suggest the suspicion that the method of diagnosis was too defective to be depended on.

We see from this that certain regions are peculiarly liable to the disease, while others rarely suffer from the tuberculous changes. The question now arises, can we assign any reason why the vertebræ at the extremities should possess a greater immunity than those of the dorsal or dorso-lumbar regions.

Assuming traumatism to be the important exciting factor, we can probably explain this liability from the mechanics of the spinal column. We are all well acquainted with the curves of the various regions and can easily see how the dorsal convexity, corresponding to the 7th, 8th and 9th vertebræ would be the most vulnerable part of the spinal column, either from a blow from behind or from a fall on the back. Moreover, this region suffers from a want of that protection seen in the cervical and lumbar, where the muscles with the occiput above, and the iliac crests below, would save these parts considerably from violence, while the upper dorsal region is protected by the scapulæ and their connected mass of muscle.

With respect to the lower region which is affected about equally with the dorsal, we find two explanations which we may put forth. As we descend the superincumbent mass adds increased weight, and we may say that it would exert considerable pressure, especially in jumping or a fall on the limbs and ischia. Our second reason is found in the fact that between the lowest dorsal and the upper lumbar vertebræ, we have the most enarthroidal joint in the column, which constitutes a great natural hinge between the upper and lower parts of the body. On this point, in almost every form of heavy work as carrying, lifting and in wrenches of all sorts, the strain is felt, and must considerably predispose to its predilection for the entrance of the tubercle bacillus. From the above facts we can readily see how the average liability of the cervical, dorsal and lumbar regions is in the ratio of 1-5 and 5.

In rare instances the transverse and spinous processes may be the seat of the disease.

With these few ideas in regard to the etiology of the subject under discussion, we will turn our attention to its pathology.

The disease begins in bones as tuberculous osteitis, and in the vertebral column the bodies are first attacked. Here, as in other bones, we have the first signs of the disease in that part where we have the greatest growth; that is in the region of the periosteum, or rarely

in the intervertebral substance, the latter when found being usually in children. Thus it is that in many cases it exists as a tuberculous periostitis.

The inflammation here, as in soft parts, is characterized by increased vascularity, the blood vessels in the Haversian canals becoming dilated and thus giving the bone a red and injected appearance. Exudation and escape of leucocytes soon result, and proliferation of connective tissue cells then follows, causing congestion of the interval between the blood vessels and the body wall of the Haversian canal. The earthly salts are loosened from their connection with the animal matter and the bone lamellæ and trabeculæ are softened, eaten into as it were, and absorbed by the pressure of the inflammatory material, which here as elsewhere assumes the form of a lowly-organized small cell-exudation. This is granulation tissue. The bone is eaten out in a crescentic manner, and large cells (osteoclasts) containing many nuclei, are found in immediate contact with the bone. These osteoclasts it is believed (though the process is unknown) take an important part in the absorption of the osseous structure, and we soon have the spaces of the cancellous bone still more widely dilated until the affected portion is completely replaced by granulation tissue. Under appropriate treatment ossification may occur, and recovery may then ensue without deformity of the spine. This favorable termination is especially apt to occur where periosteal proliferations of bone develop in the anterior common ligament and form bridge-shaped spans, which bind the vertebræ firmly together and produce ankylosis of the corresponding portion of the spine. More frequently, however, the inflammatory material undergoes caseation, may break down into pus, with very extensive destruction of bone and the formation of spinal abscesses. Large portions of cancellous tissue may die "en masse" forming cheesy sequestræ, which may keep up the morbid process for years.

Complications frequently arise from these collections of pus, though in some instances they give considerable aid in diagnosis. I have but to mention the cold abscess which later takes the form of the psoas, iliac, retro-pharyngeal and as we heard at our last meeting, sub-diaphragmatic abscesses. In some cases the pus burrows into the vertebral canal, thus setting up meningitis, and as a result of pressure, a subsequent paraplegia.

As before mentioned, the most favorable seat for the initial stage of the disease, is just beneath the anterior common ligament on the anterior surface of the bone. At this point absorption is greatest, as the vessels which pass more or less vertically into the vertebral bodies become surrounded by a characteristic mantle of granulations. The spinal column macerated at this stage, exhibits on its anterior

surface, irregularly dilated, vascular openings which when situated close together, form irregular, shallow, plate-shaped defects. The spine looks as if worm-eaten. If the autopsy is made at this time and the anterior common ligament is removed, we find the tubercular granulations on its internal (posterior) surface in the shape of small red nodules, which have been torn out of the bone. The bodies of the vertebræ exhibit the corresponding openings.

The sub-periosteal tuberculous deposit early extends to the adjacent bone, and thence to the neighbouring vertebræ, either along the under surface of the anterior common ligament, or through the intervertebral discs, which are disintegrated by the process. When it spreads along the anterior common ligament the disease may be very extensive, body after body being eroded and the discs suffering even more than the bodies. In such a case the deformity produced is not strictly angular, but rather of a general kyphotic nature. Occasionally the disease starts in many foci simultaneously, so that the bodies of several vertebræ become pitted and carious without producing general destruction. In other cases the process is limited to the bodies and intervertebral discs of two adjacent vertebræ, the periosteum being but little affected. This variety is perhaps most common in the lumbar regions where the bodies are large and permit of limiting zones of sclerosed tissue, by which the further progress of the disease may be arrested. When as in rare instances the centre of the bone is attacked, suppuration is a less frequent result.

By the growth of granulation tissue the bodies of the vertebræ are rendered incapable of sustaining the accustomed pressure. They are also much weakened by the rarefying osteitis which often precedes the spread of the tubercular infection. The formation of the pre-vertebral abscesses aid in the destruction. Finally, partly through the pressure above and partly by the dragging of the abdominal muscles, acting mainly on the anterior border, the upper portion of the spine thus undermined, according to the laws of construction of arches, falls forward forming an angle with the lower portion at the seat of the disease.

When the disease and deformity occur in the dorsal region, the normal lumbar and cervical curves will be increased owing to the patient's efforts to maintain the upright position. The angular projection is thus thrown backward and the well-known humpback is produced.

When the disease occurs in the lower lumbar region, there is no means of restoring the balance; and the patient is compelled to stand or walk with the body inclining forward, and in severe cases nearly at right angles to the pelvis.

With a brief consideration of the methods adopted by nature to

produce fixidity and rigidity of the diseased spine during life, we have done. This is brought about through the combination of three processes, *viz*:—

(a) Loss of elastic discs.

(b) Ankylosis.

(c) Reflex spastic contractions of the spinal muscles.

In regard to the first, we are dealing with a substance lacking vessels, its nutrition being effected in great part by the vessels of the bone, and which cannot, therefore, undergo the vascular and granulative changes seen in inflammation. It is eroded by the proliferating granulations from the surrounding structures and gradually gives place to tissue of a non-elastic character. Or this same result may be brought about by another process. The cartilage in many cases is bathed on all sides by a more or less pus-like fluid. Thus acted on, it begins to soften or degenerate, its consistence diminishes, its elasticity, which is of such physiological importance, is lost more and more, until the intervertebral substance is destroyed. New bony formations now spring up and we come to our second factor—ankylosis.

This is a result of the granulation tissue springing from the bony surfaces on either side. The two layers of granulation tissue unite, and after, as a rule, passing through the fibrous stage undergo ossification. This leaves the patient with a stiff joint.

But the third factor cannot be overlooked, though it also plays an important part in producing the deformity. Great influence attaches to the reflex contractures of the muscles, resulting from irritation about the joint, and the development of these contractures is especially favored by the position the patient voluntarily assumes. These pure-contractures soon pass into complete fixation, through changes in the muscles and connective tissue.

In the muscles the changes in this stage (nutritive changes) depend upon certain degenerations and upon absorption of their contractile substance. As a result of disuse, fatty metamorphosis occurs, and the contractile substance is finally destroyed. The inflammation conveyed from the diseased area also influences the atrophic processes, the normal elasticity of the muscles is lost and they are converted into unyielding bands. They often assume a tendinous structure, and the contracture becomes retraction. The shortened muscles then yield only to great violence or not at all.

And now like our ministerial friend of the Wesleyan College, I have finished my "lastly" and will give place to the rest of the programme, trusting that after this evening, the majority of you will cry, (in regard to Pott's disease as I erstwhile would have done) with the poor man of Scripture; that "Whereas once I was blind, now I see."

COMPLICATIONS OF GONORRHOEA.

BY

S C. NORRIS, '03.

Before the discovery of the gonococcus by Neisser in 1879, and its successful cultivation 9 years later by Bumm, very little was known about the complicating conditions of gonorrhœa. A few of the more common ones, such as the rheumatic and cardiac were referred to as "associated conditions," but the intimate relation between the two was only surmised. Since then, with improved methods of staining and cultivation, the specific organism has been demonstrated in many organs of the body as the existing cause of these not unusual complications, but all has not yet been learned and there still remains much room for research work.

The term gonorrhœa, in a strict sense, means a specific anterior urethritis and any variation or extension from this will be considered as a complication. These may arise anywhere in the course of the disease and do not seem to have much relationship to the severity of the attack, but to some extent on the treatment employed and general condition of the system, they are possibilities even in the mildest attack, but when once established are difficult to deal with and get rid of.

Konig states that once the organisms have gained access to the system, they may be found in every tissue in the body, this has so far not been entirely proven and until this has been accomplished, we can only theorise as to the causation of some of the conditions. As yet, there have been very few cases where the gonococci have been demonstrated in the nervous system and the associated nervous conditions are supposed to be due to the action of the gonotoxine. This theory will probably be overthrown in a few years and the gonococci shown to be the exciting cause, though probably the toxine also has something to do with the ultimate result. That the toxine is capable of producing inflammation, is probably proved by the iritis produced in the systemic infection.

No doubt some of the complications are due to a mixed infection, but pure cultures of gonococci have been obtained in sufficient cases to prove that it can produce most of the diseased conditions without the association of any other organism.

The question of the mode of entrance into the blood stream naturally arises. In the first stage of the inflammation, the gonococci are superficial, but later they are found in the deeper structures, where they

are taken up by the white cells and carried to the lymph channels and thus get into the blood current.

We will consider the complications under the following headings:—

- (1) Local.
- (2) Those due to direct transmission.
- (3) Those due to direct extension.
- (4) Systemic infections.

(1) Local:—

When the infecting agent gets into the deeper layers and follicles, folliculitis results and when the openings are blocked we get perifolliculitis. This may point internally or externally, if the latter, it is not often followed by a fistula, though sometimes this may occur. Stricture is one of the later effects and generally does not appear before the end of the first year, after an acute attack, most frequently situated in the bulbo membranous portion or anterior $2\frac{1}{2}$ inches.

The development of a stricture depends on the thickening and induration of the wall, due to the continuance or frequent recurrence of the discharge. The painful condition chordee, is due to involvement of the spongy portion and blockage of the lymph spaces.

(2) Those due to direct transmission:—

Gonorrhœal proctitis is said to be rare. It is generally due to an unnatural gratification of the sexual impulse, or to the discharge escaping from the infected vulva and infecting the parts about the anus, especially in patients with hæmorrhoids or prolapse of the rectum, where the parts are brought into direct contact with the infecting material. It gives rise to few symptoms, except when excoriations and fissures are present, when pain and tenesmus develop. Fistulæ and ischiorectal abscess may occur.

Dr. Barr says, that in 191 cases examined, 67, or 35 per cent. had gonorrhœa of rectum established by microscopical examination. Conjunctivitis occurs from infection by fingers or towels, sponges, etc. It generally runs a very severe course and unless very carefully treated, may result in ulcerative keratitis, which may perforate and involve the iris. Anterior synechia, staphyloma and other sequelæ may result and serious damage is common. Ophthalmia neonatorum is one of the most terrible results of gonorrhœa.

In an address on ophthalmology to the Indian Congress in '94, Dr. Mackenzie stated that in Bengal alone there were blind beggars, 40 per cent. of whom had lost their sight through this affection, and according to Fuchs, there are 30,000 persons in the blind asylums of Europe from this cause. Infection occurs in the genital canal during birth or after birth by infected towels or sponges. It is generally

more acute and runs a more rapid course with more serious consequences than the conjunctivitis of the adult.

A few cases of acute rhinitis with profuse discharge have been recorded, but the condition is very rare.

(3) Those due to direct extension:—

When from want of cleanliness the mucous membrane of the glans becomes involved, we have the condition of balanitis, which may go on to vesicle formation and ulceration, and in healing leave a scar not unlike that of a chancre. Further invasion of the mucous membrane on inner side of prepuce giving us balanoposthitis, usually causes phimosis and if retracted over the glans, para-phimosis.

When the glans is involved, we generally get a lymphangitis along the dorsum of the penis, which may extend and involve the glands in the groin, which enlarge, but rarely suppurate.

In the urethra, extension backwards may be aided by passing instruments, or by improper or incomplete irrigation and the posterior urethritis thus set up, is in itself a complication and one which gives a great deal of trouble in the treatment.

From the urethra the ducts and glands of Cowper may become infected, giving on account of their anatomical position a very painful condition.

Next in line of involvement comes the prostate and here we have what seems to be the latest seat of the disease. In the recurring form of gonorrhoea the discharge can be seen oozing from the prostatic ducts, some claim that gonococci cannot be found in this and that it is a secondary infection, but there does not seem to be any reason why gonococci cannot remain latent in the prostate and when the vitality of the mucous membrane is lowered take on increased virulence. The prostatitis may end in abscess formation from the joining of several follicles and this may point in any direction, leading to periprostatic abscess, fistulæ and cellulitis, or if the condition is more chronic fibrosis may result and cause more or less trouble. A small portion of the neck of the bladder is commonly found involved with the prostate (prostatocystitis).

From the prostate the infection may spread in two directions:—

1st. Through ejaculatory ducts.

2nd. Invasion of the bladder.

The question of invasion of the ducts is debated, according to Baumgarten's experiment the infection does not pass backwards along the ducts, but reaches the epididymus by the lymphatics or vessels.

The seminal vesicles, however, frequently become involved. Some claim that this is common and frequently mistaken for prostatitis.

Epididymitis, one of the most frequent complications occurs generally in those cases improperly treated or not treated at all, but is also determined by violent exertion, trauma or venereal excess. It may occur on both sides, but the left seems to be most frequently affected, some say because of its position causing a tendency to local congestion. Whether sterility follows a double epididymitis or not is as yet undecided, cases have been reported on both sides. Some cases of epididymus orchitis are followed by atrophy of the testicle. With the epididymitis a hydrocele sometimes occurs from direct infection or pressure. Invasion of the bladder is generally said to be the result of a mixed infection, but pure gonococcal cystitis has been demonstrated. Young says that albuminous urine is necessary for its development. From the bladder the infection may spread to the kidney by three routes:—

1st. Ureters.

2nd. Lymphatics.

3rd. Blood vessels.

If with a cystitis, we have some obstruction to the outflow of urine as prostatitis or stricture, then we have the two etiological factors necessary to produce changes in the ureters and kidneys, *viz.*, pyelitis, pyonephrosis and pyelonephritis. Morris says, pyelonephritis when secondary to disease of the bladder is too often unrecognized and Stimson says it may exist for months without giving rise to any symptoms that attract attention. Some cases have been reported without any previous cystitis, the infection extending from the urethra under the mucous membrane of the bladder by the lymphatics.

(4). Systemic infection:—

We cannot say that gonorrhœa is distinctly a local disease, because of the numerous and varied conditions produced from the general infection of the system in so many cases. The cause for this may be in the infection itself, or in the system of the individual, but no doubt are greatly aided by harsh measures towards the local condition. Ward says that constitutional symptoms may be produced by the absorption of the gonotoxin, and considering some of the effects this may be the case, but the gonococci also reach and circulate in the blood stream and have been obtained in pure culture from it during life in several cases.

Several fatal cases of septicæmia have been reported, in which no lesions could be found in any organs and no other cause could be found for the condition. The post mortems were incomplete in most of the cases. The general opinion seems to be that the nervous conditions associated with gonorrhœa are due to the action of the gonotoxin. Stimson reports a case of meningitis, in which gonococci were

found and Furbinger, both by lumbar punctures and post mortem examination found diplococci corresponding in all details to Neisser's gonococcus.

Gowers, Leyden and several others have published cases of myelitis, apparently closely associated with gonorrhœa.

Engel-Reimers has reported cases of polyneuritis and Fournier has described gonorrhœal sciatica.

Tambourer has reported a case of double hemiplegia following phlebitis in the course of a gonorrhœa and Pitres also mentions two similar cases.

Dr. Bruns reported a case of right sided hemiplegia with motor aphasia in a young woman suffering from gonorrhœal parametritis, salpingitis and peri-oöphoritis.

Gonorrhœal iritis is probably due to the action of the gonotoxin, it generally occurs in the later stages of the disease and in connection with gonorrhœal rheumatism, but may be present alone as the only evidence of the attack.

In respiratory system.

In '94, Mazza obtained gonococci in pure culture from a pleuritic effusion and now pleurisy is generally recognized as one of the complications.

Bordone-Uffrediezzi reports a case of a young girl assaulted by an individual with gonorrhœa with the development in a few days of a polyarthritis and later a double pleurisy and also symptoms of endo and pericarditis, examination of pleural exudate showed organisms not to be distinguished from gonococci and confirmed afterwards by cultures.

Pneumonia has also been mentioned, but as yet no definite proof has been obtained.

In the circulatory system the complications have been well established and are now generally accepted.

Gonococci have been found in the heart in many pure cultures by many French observers and in the last few years by Thayer and Blumer. They demonstrated the gonococci in the blood during life and on the heart valves, post mortem. Since then Leuhartz inoculated a previously healthy urethra with vegetations from aortic valve and set up a purulent discharge. Thayer and Lazar in reporting a later case concluded among other things:—

(a) Endocarditis may be transient with few apparent results, chronic, or rapidly fatal with symptoms of acute ulcerative endocarditis.

(b) It is commonly due to direct action of the gonococcus, but may be the result of a mixed infection.

In the cases thus far reported the left heart has been most affected, and aortic valve more than the mitral, though any of them may be involved. Pericarditis is rare, though some cases have been reported.

Myocardial changes, such as necroses, embolism and abscesses are common in gonorrhœal septicæmia, though they are generally secondary to endocarditis.

Councilman reports one case in which myocardial abscesses existed without endocarditis.

No marked changes in the arterial system have so far been described, but slight alterations and thromboses in retinal veins have been ascribed to gonorrhœa in men free from syphilis, or other probable causes for vascular disease. Many cases of phlebitis in lower extremities have been reported.

The most frequent complications are no doubt the rheumatic, which may occur at most any stage, but ordinarily after the 3rd week, when the discharge is subacute and also may follow ophthalmia neonatorum.

It may manifest itself in any of these ways:—

1. Arthralgia.
2. Synovitis.
3. Arthritis.

In the first, we have simply temporary fugitive pains in or about the joints with no signs of inflammation.

When the synovial membrane is attacked, the effusion is intra-articular and resembles that of a traumatic synovitis.

In the arthritis the periarticular structures chiefly are involved, with serous or sero-purulent effusion in the tendon sheath, producing much swelling and redness, the ligaments are softened and displacement may occur.

Suppuration may take place, with extensive destruction of all tissues involved, Osier calls this the most destructive and disabling of all complications of gonorrhœa. It may be mono or poly articular, in one series three or more joints were involved more than 175 times and one joint only 56 times.

In Dr. Stewart's series, the knees were most often involved, then the ankles, small joints of feet, wrists and small joints of hand.

Endocarditis is not very often associated with the rheumatic condition.

Perichondritis, especially of the costal cartilages is not uncommon and inflammation of the tendons especially tendo achilles is often seen. Flat foot is commonly produced by softening and relaxation of the ligamentous structures in the sole.

Abscesses about the tarsus and peroneal tendons have been reported by Almqvist.

Professor Eichorst reported a case of myositis with a swollen area $3\frac{1}{4} \times 3\frac{1}{2}$ inches. There was no temperature and the condition was present for months. He said that in every case so far observed, the femoral region was involved and that the swelling was due to the gonococcus and not the streptococcus.

We find many cases of cutaneous lesions reported generally in septicæmic conditions, but whether due to gonococcus or its toxine is yet to be proven. Thayer and Lazrier report petechiæ present in one case with ulcerative endocarditis.

A case of purpura of lower limbs afterwards developed into a general condition with myalgia and arthralgia, in which examination showed the presence of the coccus and staphylococcus alba. In another case the skin lesion appeared as a painful red indurated blotch, with a round crater-like ulceration in the centre with sharply defined edges and penetrating the entire thickness of the skin with a sanious discharge. These craters varied in size and numbered 15 in all. On excising a suppurating right testicle, cutting a stricture and treating an infected focus behind this, improvement began at once in the arthralgia and skin lesions.

Phillips in '99, reported a case of chronic gonorrhœa, with an acute exacerbation, purpura rheumatica, macular lesions, irregular and circular in outline, varying in size, deep bluish red in color, not fading on pressure and situated over anterior and inner aspect of the legs and thighs and also over left ankle and wrist. About 12 days later purpura urticous appeared on the lower extremities, bright red in color, not changing on pressure, no itching and normal temperature. There was no previous history of rheumatism, but along with the preceding symptoms several joints were swollen and painful.

Cases of parotitis have been reported, one in which a right-sided adenitis was followed by an orchitis and suppurative parotitis of same side in quick succession. In explanation, the reporter stated that since parotitis often follows a primary lesion in the abdomen or pelvis without any symptoms of pyæmia, and the testicles being in origin and connections an abdominal organ, should be considered under the head of abdominal and pelvic lesions.

The consideration of this subject would not be complete without special reference to the disease and its dire consequences in women. Infection commonly takes place in the urethra, as the pavement epithelium and presence of lactic acid bacteria give the vagina a relative immunity. If the cervix is infected either directly or secondarily to the urethra, we are apt to get a rapid spreading through the whole genital tract, vulvitis, vaginitis, endocervicitis, endometritis,

salpingitis and generally a localized peritonitis and peri-oöphoritis. Several cases have been reported of acute diffuse peritonitis and pure cultures of the coccus obtained, but I was not able to find any record of a pure gonococcal peritonitis in the male.

The result in women of chronic gonorrhœa only too often is invalidism and sterility. In the more acute cases it is also either directly or indirectly a factor in puerperal sepsis and accountable for a larger percentage of complications and fatalities than is generally supposed.

In conclusion allow me to read the opinions of a few gynæcologists on the subject:—

Montgomery says,—in women, gonorrhœa is much more dangerous than syphilis, for when infection once occurs, the entire genito-urinary tract may become involved and the individual subsequently suffers from chronic inflammation of the uterus, suppuration of the tubes, inflammation of peritoneum and ovaries as well as cystitis, ureteritis, and all the affections of the kidneys. She not only loses her power of reproduction, but develops inflammatory conditions, which, if they do not cause a fatal termination, produce such destructive changes in the pelvic organs as to necessitate their removal in order to prolong life or render it endurable.

Dr. Holmes.—There is no disease that affects women, that should engage the serious and thoughtful consideration of the physician more than gonorrhœa, that deadliest of all enemies to female health.

Sir Lawson Tait.—In early life I heard an eminent surgeon say that if he were doomed to have venereal disease, he would rather have syphilis than gonorrhœa. I marvelled and disbelieved, but now I know that if he included women in his thoughts, he spoke truly.

Where syphilis kills tens, gonorrhœa kills thousands and it would take the sufferings of one hundred cases of syphilis to make up for the long weary years of agony in one case of gonorrhœal pyosalpinx.

VALSALVA.

BY

S. O. MCMURTRY.

The Italian anatomist, physician and surgeon, Antonio Marie Valsalva, was born at Imola, 1666, and died at Bologna, 1723. Born of a noble family he received a liberal instruction in classical and in polite literature.

As a boy, he, as the French say "turned a curious eye" to the structure of the bodies of birds and other small animals, and as soon as his school days were over entered into the study of anatomy at the University of Bologna, a city near to his birth place of some 50,000 inhabitants. Anatomy in his day was on a fairly firm footing, owing to the splendid results of the labours of Fallopius, Vesalius and others, one hundred years before. But not satisfied with book knowledge of the subject, and wishing to see with his own eyes all that was most hidden in the human body, Valsalva dissected many subjects. Led by his teacher, the earnest Malpighi, he rose to such proficiency that in ten years after graduating, when Malpighi stepped down from office, he was appointed in his place as Professor of Anatomy in the University. This post he filled with great satisfaction, and during his office a host of clever doctors were graduated, including the great Morgagni.

Medicine and surgery claimed his attention, for he applied himself to every aspect of his chosen profession. Appointed in charge of the Hospital for Incurables, he showed enterprise by reviving the practice of ligaturing vessels which, in spite of its advantages, had given place to cauterizing. He treated with remarkable success diseases of the ear and simplified several surgical instruments. In his day surgery had been given a stimulating impulse by the increased knowledge of anatomy and also by discoveries attending upon the treatment of gunshot wounds following the invention of gunpowder. Histology was in its infancy, owing to the but recent invention of the magnifying glass and of the microscope. Valsalva applied himself with great vigour to the study of the ear, its minutest muscles and nerves. His fame spread beyond his native country, the Royal Society of London admitted himself and his teacher Malpighi as members of their order.

A work by Morgagni has done most to preserve the memory of Valsalva. This is a commentary and criticism of the "Works of A. M. Valsalva on Dissertations on Anatomy and Descriptions of the Structure, Function and Diseases of the Human Ear." He tells us of Valsalva's description of the chief ligaments of the colon, of the sinuses of the aorta, of the muscles of the eye, etc., of his work on the ear, that he had devoted over sixteen years to its study, dissecting over one thousand heads.