factor, when the same patient has just ceased from a course of laborious attempts to rectify the defective spinal condition by an osteopath without any good results. But I can see no impossibility in the statement that vertebral and costal displacements may exert direct pressure on the spinal nerves as they emerge from the intervertebral foramina, or on the sympathetic ganglia which lie on the heads of the ribs. The pathology of herpes zoster is not clearly understood, and osteopathic literature teems with cases which have been cured by rectification of a misplaced rib. Head has stated that "this remarkable eruption is associated with disturbances of the peripheral nerves, usually an inflammation of the sensory ganglion or of the nerve," and it is conceivable that pressure of various kinds on the nerve or ganglion on the posterior root may have some influence in its causation. Osteopathic textbooks attach special significance to the sympathetic in the etiology of disease, and probably err as much in their emphasis of this portion of the nervous system as we do by so largely ignoring its influence. They have exalted to the dignity of laws two observations from the works of Hilton and Head respectively: (1) The muscles moving a joint, the skin over the joint, and the interior of the joint are all supplied by nerves from the same source; (2) when a painful stimulus is applied to a part of low sensibility in close central connexion with a part of much higher sensibility, the pain produced is felt in the part of higher sensibility rather than in the part of lower sensibility to which the stimulus was applied.

Their entire pathology circles around these two statements and the special factor of some displaced tissue, and in proportion as there is reality in the pressure on sensitive parts, in the same proportion is there relief afforded by its successful removal. With such a restricted and localized pathology the area of their therapeutic influence must be very circumscribed. But if this fact be recognized and appropriate constitutional treatment adopted, great benefits are likely to accrue from the admission of this mode of treatment into our therapeutical armamentarium.

I am much indebted to Mr. Billington for directing my attention to an article¹ on Paralytic Ileus as a Sequel of Fractured Ribs, by Mr. J. E. Adams. Mr. Adams quotes the following statement of Starling's: "Stimulation of the splanchnic causes complete relaxation of the lower part of the ileum with the rest of the small bowel, but it produces a strong contraction of the muscle fibres forming the ileocolic sphincter." He records two cases of fracture of the ribs in the neighbourhood of their angles—in one case the eighth and ninth ribs, and in the other the eighth, ninth, tenth, and eleventh ribs, being involved—in which the whole of the small intestine was paralysed and the ileocolic sphincter in a state of spasm. Now, as the great splanchnic nerve arises from the sixth to tenth thoracic ganglia, Mr. Adams attributed the paralytic condition of the bowel to irritation of the great splanchnic. Although the thoracic ganglia lie close to the heads of the ribs, he considered that some displacement of the proximal fragments of the ribs may have irritated the sympathetic chain either directly or through the rami communicantes connecting the sympathetic ganglia with the spinal nerves.

He is more inclined to believe in this explanation than in the other possibility, that at the time of the accident a severe blow was administered which caused inhibition of the muscular coats of the bowel.

REFERENCES.

¹ On a Case of Occipito-atloid Disease, *Glasgow Medical Journal*, 1890. ² *The Laws of Life and Health*, Alexander Bryce, p. 257. ³ *Ibid.*, p. 257. ⁴ *Ibid.*, p. 255. ⁵ *Annals of Surgery*, December, 1909.

UNDER the will of the late Miss Julia Woodward, of Clevedon, the University of Bristol receives a donation of £1,000, which is to be used for the foundation of a scholarship either in botany or in music. The cottage hospital at Clevedon is left £200.

Two neat booklets which have reached our hands contain descriptions of the exhibits at the Japan-British Exhibition, sent by the Wellcome Chemical and Physiological Research Laboratories respectively. Information as to the general lines on which the work is carried on is also given. At the end of each booklet are some pages in Japanese; a study of them leaves an impression of gratitude that so far not even the most advanced degree-granting body has hitherto included Japanese in its medical curriculum.

A Lecture

ON THE

INTERPRETATION OF X-RAY NEGATIVES.

DELIVERED BEFORE THE ST. PANCRAS AND ISLINGTON DIVISION OF THE BRITISH MEDICAL ASSOCIATION AT THE GREAT NORTHERN CENTRAL HOSPITAL.

BY

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INTERPRETATION OF X-RAY PHOTOGRAPHS.

THE *x-ray* negative should be examined, as it is more reliable than a print. It is impossible to reproduce in a print many details which are visible in a negative, and it is possible to have a print touched up so as to make it appear better than the original negative. If a negative is blurred so as to obscure the diagnosis, another should be made. With modern *x-ray* apparatus it is possible to get a sharp skiagraph of any part of the body. It is sometimes necessary to anaesthetize a child in order to make a skiagraph. It should be kept in mind that the *x-ray* negative is produced by a shadow cast on the film of the plate. If one knows the relative position of the *x-ray* tube, the patient, and the plate at the time when the radiograph was made, it is possible to tell on a negative the right side from the left. The radiographer usually places the film side of the plate next to the patient. Suppose one looks at the film side of a negative of the kidney region, and the patient says that the plate was placed on his back, then one can tell that the patient's right kidney is to one's left hand. If a print was made from this negative, the patient's right kidney would be to one's right hand. The information as to left or right side should be supplied by the radiographer, as in some cases it is impossible to tell which is which without his help. The negative should be lighted from behind by a light which passes through opal or ground glass. This light must be neither too strong nor too weak. Special boxes lighted by electric light are made for this purpose. This brings out more detail in the negative than can be seen by holding it up to the light at a window, or to a naked artificial light. By using a proper light one may be able to see details such as a shadowy obscure kidney stone which would be invisible by an unsuitable light. A box fitted with an opal glass window and lighted inside by electric lamps of variable candle power is the best for viewing negatives by.

By tilting the negative at an angle of about 60 degrees to the perpendicular a faint detail may be made more apparent. Sometimes faint details are better seen at a distance of 2 to 3 yards than near at hand. When possible, the right and left sides of the patient should be compared; they should be taken on the same plate at the same time. If this is not possible, an *x-ray* photograph of the normal should be compared with the one under examination. It is important to decide whether a negative is a good enough one from which to form a diagnosis. One must be on guard for distortion of the image from faulty technique, photograph blemishes, forgotten buttons, mercury ointment on the patient's skin, and many other details. If there is any doubt as to diagnosis, a second *x-ray* negative should be made, and in all important cases a second plate should be made after a few days, in order to corroborate the first.

EXAMINATION OF BONE.

In examining a bone the following points should be looked for:

1. Outline of the bone, for irregularities due to fracture, exostosis, detached tendons.
2. Periosteum, which is normally invisible, but may be visible when thickened or detached.
3. Cortex, which may be increased or decreased in thickness or density.
4. Medulla, which may be increased or decreased in thickness or density.

5. General or local atrophy from disease or disuse.
6. Changes in the trabecular structure.
7. Epiphyseal line.
8. Epiphysis.
9. Ossification.

Cartilage casts no greater shadow than muscle, therefore the cartilaginous ends of the bones do not appear in a radiograph. Calcified cartilage, as in the rib cartilages of old patients, throws a distinct shadow. Calcified arteries throw distinct shadows. Lines of separation between muscles, lobulation of fat in superficial fascia, and the depth of the skin can all be shown in suitable cases.

Any calculus which sinks in water can be shown to cast a shadow, but those which float in water cast little or no shadow. Biliary calculi do not cast shadows, and cannot be demonstrated by x rays. It is possible for a biliary calculus to be demonstrated by x rays, provided it is heavier than water; and, in exceptional cases, biliary calculi have been demonstrated by x rays. Secondary deposits in the liver cannot, as a rule, be shown on a plate, though secondary deposits in the lungs can be demonstrated. This is due to the great contrast between the dense secondary growth and the transparent lung tissue.

Flatus in the intestines, by making the body more transparent to the x rays, makes a very definite mark on the plate. Chips of glass in the hand can usually be seen on a plate, but thorns do not appear.

Green-stick fractures and impacted fractures may be seen on a plate when it is impossible to see them on the screen. In examining a skiagraph of the neck of the femur, the amount of rotation outwards of the foot must be considered. If the foot is rotated out, the neck of the femur appears short, and if the foot is kept quite straight the full length of the neck of the femur is shown. Dislocations are usually evident on a skiagraph, but some joints require stereoscopic views to show their condition. The elbow, wrist, and ankle, and in a few cases, the shoulder, may require stereoscopic views for a correct diagnosis of dislocation. Callus casts a shadow, and can be recognized during union of bones. It appears in a radiograph four weeks after a fracture. The difference between the shadow of pus and serum is so little that for practical purposes it does not exist.

Tumours cast very little or no shadow, unless they are very large, bony, or calcified. Brain tumours are hard to show by x rays, but they have been confirmed by this method. Early carcinoma in the stomach casts no pathognomonic shadow. A negative shows most detail when it is quite dry. When it is partly damp the damp part appears lighter than the dry part, and if this is not noticed it could give rise to a mistake in diagnosis. A damp circle in the region of the kidney appears like a stone when the rest of the plate is dry.

A normal radiograph of the bones of the knee and shoulder is frequently got when the patient has great pains in these regions, because it is the soft parts which are at fault, and it is often impossible to show sufficient detail in the soft parts to make a radiograph of value.

SCREEN EXAMINATION.

In order to make a thorough screen examination one must have been in the dark for at least ten minutes. By

that time the fatigue of the retina has passed off and the eye is prepared to see what it otherwise could not see. Students, and their teacher, often walk into the dark x ray room to see a patient with renal calculus, and while the radiographer is pointing out the stone and its position in the kidney someone remarks, "Where is the screen?" He cannot see the screen, while the x -ray worker, who has been in the dark for a long time, can see not only the screen but also the shadow of the kidney and the stone. Within ten minutes the student can see just as well.

A lead diaphragm is most essential to cut off all extraneous rays when making a screen examination. Without a diaphragm it may be impossible to see a needle in the hand, while with the diaphragm it may be quite easy.

The x -ray tube should be so fixed that it is easily moved about. It should be under the x -ray couch, and should be well protected so as not to let the x rays fall on the operator or on the spectators.

Screen examination of the head, except for foreign bodies, is of little value. A screen examination of the abdomen should show the pelvic bones and vertebrae, the outline of the kidneys and liver, flatus in the intestine, and metallic foreign bodies, and frequently a renal calculus when one is present. Soft tumours in the abdomen do not

appear unless they are very large. A screen examination may fail to show a fracture when a plate shows it clearly.

Examination of the chest should be by both screen and plate, as each has its sphere of usefulness.

The screen examination during removal of foreign bodies is sometimes a necessity, even after they have been carefully localized.

It is impossible to tell at what depth a foreign body lies from the examination of a single negative. The nearer a foreign body is to the plate during the time of exposure, the sharper will be its

outline. Thus, if two similar foreign bodies are represented in a negative, the one with the sharper outline is the one nearer to the plate. For exact localization, special methods must be used.

URINARY CALCULUS.

A patient with symptoms of urinary calculus should be radiographed so as to show both kidneys, both ureters in their entire extent, and the whole of the bladder. This is necessary, as symptoms pointing to stone on one side of the body may be due to a stone on the other side. Symptoms of stone in the bladder may be due to stone in the kidney and vice versa. A patient should be prepared for radiography by a vegetable laxative the night before. Calomel should not be used as it might cause a shadow. An enema should be given immediately before the radiograph is made. The patient should not have had a meal for twelve hours previous to the x -ray examination. Renal calculi can frequently be seen on the fluorescent screen, but there are some which can be radiographed which cannot be seen on the screen. A negative which shows the outline of the psoas muscle, the second last rib, and the lower pole of the kidney clearly, and which has been taken while the patient held his breath, is good enough for giving a negative or positive diagnosis as to stone. When the lower pole of the kidney is blurred it indicates that the patient has moved his kidney by breathing, and a small stone may be made invisible by this movement. If the negative

Aneurysm of transverse part of the arch of the aorta

does not show the outline of the psoas muscle it is possible to make a better one, and if the diagnosis is doubtful a better negative should be made. It may be impossible to get a satisfactory radiograph in the case of a very fat patient. The radiograph should be made while the patient holds his breath. Frequently the outline of only one kidney appears. This is usually the left kidney, and is due to distension of gas in the descending colon pressing on the kidney and thus outlining its edge. The outline of the lower poles of the kidneys can be made more evident by inflating the large intestine with air by a Higginson's syringe, but this method is not recommended for the purpose of showing renal calculi. A calculus of *oxalate of lime* casts the darkest shadow. *Cystine* stones come next in density, followed by *phosphate of lime*. *Mixed phosphate* stones cast still less shadow, and last in order come *uric acid* stones, which may cast no shadow at all. A stone of exactly the same density as the kidney may cast no shadow at all.

RENAL CALCULUS.

A negative showing stone in the kidney should conform to the following points:

Position.—The stone should be in the position of the kidney. It is possible to have two radiographs of a stone showing the stone in different positions. This is caused by the relative position of the x -ray tube, the stone, and the photographic plate. Thus when the shadow of a stone coincides with that of the last rib, it is possible by changing the position of the x -ray tube to project the shadow of the stone clear of the last rib. When a stone can be seen on the fluorescent screen, it will be seen to move freely with respiration. A range of motion of 1 to 1½ in. is usual.

The position of the kidney varies a great deal, but usually renal calculi lie to the inner side of a line drawn vertically upwards from the highest point of the iliac crest. Calculi in the kidney may appear above the level of the last rib and below the level of the crest of the ilium, though such extreme positions are rare.

Density.—The density of its shadow may vary from little more than that of the shadow of the psoas to that of the densest part of a lumbar vertebra.

There may be one or many. A single radiograph cannot decide the number of stones present, but it is possible to tell the number by stereoscopic radiographs. Several widely separated stones in the region of the kidney (especially at its periphery) may indicate hydronephrosis.

Fallacies which simulate stone in the kidney are:

Blemishes in the plate. These have usually sharper edges than a stone, and they are usually multiple, though not necessarily so. The radiograph of a stone always has less clearly defined edges than a blemish in the plate.

Calcified lymphatic glands. These are usually found lower down than the position of the kidney. They are rounded, and present a granular appearance, unlike the homogeneous appearance caused by a calculus. The granular appearance is seen in very good radiographs only. A small calcified gland casting a shadow in the position of the kidney could be mistaken for a calculus, and unless an indication of its nature was given by the presence of other calcified glands, a mistake might easily be made. Calcified glands most frequently cast a shadow about the brim of the pelvis and along the side of the spinal column.

Scybulous masses are frequently outside the position of the kidney.

Bismuth, which the patient may have swallowed.

Concretions or foreign bodies in the appendix. These usually lie outside the line of the kidney.

Atheroma of vessels and **myositis ossificans**. In such cases well marked signs would be probably found elsewhere.

Putty-like mass found in old tuberculous kidney. These may cast shadows indistinguishable from stone, or their shadow may be streaky and ill defined, and occupy nearly the whole kidney region. In this case the lowest part of the shadow may be the densest, as the heavy lime salts tend to gravitate.

Extraneous bodies, such as a pigmented mole on the skin, mercury or lead ointment, or other foreign body which may have got between the patient and the plate.

Combinations of any of the above fallacies and a true stone.

A shadow which looks like a stone but cannot be

confirmed by subsequent plates should not be considered as stone.

X rays have been used in the operating theatre at the time of operation in order to ascertain where a stone lies in the kidney before opening it. After the kidney has been delivered it is placed in the path of the x rays, and the surgeon looks at the shadow of the kidney on a fluorescent screen placed in a cryptoscope. He can thus locate exactly the position of the stone before opening the kidney. Once a stone has been seen on a plate there is a strong probability that it can be seen on the fluorescent screen, provided that

1. The patient is not too fat, and plenty of fluorescence can be seen on the screen.
2. The examiner has been in the dark for at least ten minutes, so as to remove the fatigue of the retina.
3. A diaphragm is used to stop off all x rays except over an area half the size of the kidney.

It can be made out more distinctly once it is located by making the patient breathe deeply, and then the stone and kidney will be seen to rise and fall at least 1½ in.

URETERIC CALCULUS.

A ureteric calculus is mainly distinguished by its position, shape, and size. The position of the ureter on an x -ray negative is indicated by a line drawn from the tip of the transverse process of the second lumbar vertebra downwards across the transverse processes of the third, fourth, and fifth lumbar vertebrae to the sacro-iliac synchondrosis and thence to the symphysis pubis nearly concentric with the pelvic brim at a distance of about 1 in. from the brim. Ureteric stones are frequently found where the ureter is narrowest, but may be found elsewhere. They may change their position from day to day not only downwards, but also upwards. Calcified glands are specially common in the position of the ureter as it lies over the sacro-iliac synchondrosis and are liable to be mistaken for ureteric stones. They are usually larger than ureteric stones.

Shape.—The shape of a ureteric stone is usually oval, or elongated. When a stone blocks the ureter there may be a deposit of crystals above the stone, and these cast a shadow, so that a streak is got on the plate. The long axis of a ureteric stone is usually directed towards the bladder. This is important for distinguishing ureteric stone in the pelvis from stone in the bladder. Stone in the bladder generally lies more transversely, while ureteric stone lies more in the direction of the ureter.

Size.—Small ureteric calculi do not usually demand operative treatment. A radiograph made later on may show that the stone has passed on. Stones in the ureter may, however, become encysted, and then they may grow as large as a vesical calculus.

Fallacies.—The same fallacies may be met with in connexion with ureteric stone as are found in cases of renal stone.

In doubtful cases radiographs should be made with a metallic bougie in the ureter in order to show the relative position of a doubtful stone to the ureter. The value of this method is increased by making stereoscopic negatives. Specially opaque x -ray bougies should be used. But even this method is not absolutely reliable, as a calcified gland has been found which surrounded the ureter, and cast a shadow indistinguishable from a ureteric stone.

In the position of the ureter in the pelvis there are frequently small shadows which closely resemble ureteric calculi. These are usually caused by phleboliths in the pelvic veins, and are comparatively common. They may be distinguished from ureteric calculi in some cases by:

1. Their relative position to the ureter when a bougie which is opaque to x rays is passed into the ureter. They are seen to be placed at a distance from the bougie.
2. They are frequently multiple and in a line. When this line does not correspond with that of the ureter it is in favour of a diagnosis of phleboliths.
3. Their shadow is clearer than that of a ureteric calculus.
4. They are often round, but may be oval.
5. They may cause no symptoms of stone.
6. Stereoscopically they may be shown to lie in several planes.

VESICAL CALCULUS.

Vesical stones usually cast oval shadows, and lie transversely. They are, as a rule, diagnosed without the help

of x rays, and the rays are used only as a confirmatory diagnosis. A radiograph of a vesical stone is only likely to be confused with one of a stone in the lower end of a dilated ureter. The vesical stone usually lies with its long axis more or less transverse, while the ureteric stone has its long axis more or less in the line of the ureter. Scybala masses may cast shadows like vesical calculi, but these scybala are usually indented, whereas vesical calculi are usually oval with no indentation. The bladder can be made very distinct in a radiogram if it is filled with air while being radiographed.

FRACTURES.

Screen examination shows a gross fracture, but certain fractures cannot be recognized by screen examination. The latter include green-stick fractures, cracks in bones with no displacement, small chips partly detached from the bone, and fractures of the phalanges caused by crushing. Wherever there is displacement of fragments the fracture can be seen on screen examination provided one fragment does not cover exactly the other fragment. Therefore a fracture should always be looked at in two planes. Since the introduction of x rays metal splints should be used as little as possible, as a fracture cannot be shown satisfactorily through a metal splint. All splints and bandages should be removed whenever it is possible, as they cast shadows. Plaster-of-Paris, iodoform, adhesive plaster, thick layers of cyanide gauze, lead lotion, mercury ointment, and rubber protective tissue cast fairly deep shadows, and should always be removed before screen examination. The screen examination of every fracture can be made most conveniently with the x -ray tube below the couch. A cryptoscope should be used as little as possible. When it is not possible to darken the room it is best to make the screen examination at night. A fracture which will make a useful limb often looks very bad on the screen; therefore never let the patient examine the screen. The fragments should lie side by side—not end to end—in a well set fracture.

Fractures are practically never set end to end unless operated on. When set end to end the fragments unite usually at an angle and not in a straight line. The method of union is shown by the radiographs.

The redundant bone is absorbed where it is not required, and new bone thrown out where it is required. Callus and old bone are moulded so that, though the fragments united side by side, the final result is a straight or very nearly straight bone. It is not necessary to set a fracture while watching the result on the fluorescent screen.

In some cases, even under anaesthetic, it is not possible to bring the fragments end to end. This is specially true of fracture of the lower end of the humerus, involving the elbow. Even when it is possible to bring the bones end to end it is not possible often to keep them so. Harm can be done by too much x -ray examination, and too many trials to get the bones into better position. A well united fracture shows the line of fracture for years after good union has taken place.

The illustration shows a case of aneurysm. The patient had worked in the x -ray department for a year, while suffering from a slight cough and huskiness. On examining his chest by x rays a large aneurysm was discovered, as shown in the photograph. He was put to bed for six months and the aneurysm has not increased.

[Dr. Pirie showed a number of x -ray negatives to illustrate some of the points to which he referred.]

THE ninth International Conference on Tuberculosis will be held at Brussels from October 5th to the 8th. The principal subjects proposed for discussion are: Hereditary tuberculous contagion; the predisposition to the disease; the protection of children against tuberculosis; tuberculosis and the school; the part of women in the campaign against tuberculosis. Reports on the progress of the fight against tuberculosis in different countries, and others by the committees or sanatoriums, the milk supply, solar radiation, international statistics, and international marks indicating the condition of the lungs, will be presented. A number of communications are promised. Among them is one by Dr. Nathan Raw on the general measures recommended by the International Conference to the Public Authorities for the prevention of the spread of tuberculosis in different countries. All inquiries relative to the congress should be addressed to the Secretariat, Avenue Van Volxem, 253, Forest-Brussels.

THE SPREAD OF CANCER AMONG THE DESCENDANTS OF THE LIBERATED AFRICANS OR CREOLES OF SIERRA LEONE.

By W. RENNER, M.D.,

MEDICAL OFFICER, FREETOWN, SIERRA LEONE.

I HAVE been rather struck within recent years by the increasing number of cases of cancer of various organs, especially of the breast, that have in the course of my practice come under my observation, and this particularly so among the descendants of the liberated Africans, commonly called creoles, who form the bulk and principal portion of the colony proper.

In consequence of this, I have been induced again to look into the returns of cases admitted into the Colonial Hospital, as well as into my private case-book, to see how far I would be justified in speaking of an increase of this disease among the creoles, its apparent rarity among the resident aborigines in the colony and in the hinterland of Sierra Leone, and how far this apparent increase is due to causes which may be traced to the influences of European civilization and the adoption of the European mode of living.

In pursuing the investigation of this subject, I would first consider the case of the resident aborigines in the colony and in the hinterland. From the fact that this disease is rarely seen or met with among the hundreds of female aborigines who are treated regularly every year in the Colonial Hospital, and that the medical officers of the protectorate districts, especially those who are stationed in large towns where there are established dispensaries at which the natives have been encouraged to attend for treatment, have in their official returns not shown the presence of new growths among their patients, we can safely assume that cancer as a disease is very rare among the aborigines. This is, however, only fairly, but not altogether, satisfactory, as there may be cases which are kept in the background by the people, and which, even when on his patrols in the district, the medical officer cannot get hold of. Therefore, in spite of the non-entry of cases of cancer in the official returns, I would rather not say that the aborigines are immune from the disease, but that the disease is rare among them.

With reference to the creoles in the colony proper, an examination of the records of hospital cases and those of medical practitioners would show that within the last forty years cancer as a disease has been spreading among them.

In 1900 I endeavoured, in a paper entitled "Prevalence of Malignant Disease among the Natives," which formed the appendix to the Colonial Hospital Medical Report, to tabulate cases of malignant new growths that were admitted into the hospital within the years 1870-1900—a period of thirty years. Out of 22,453 cases of all kinds treated in the hospital, only 20 cases of malignant disease were recorded. These cases were simply described as "malignant tumour," "carcinoma," "sarcoma," "malignant growth," but without any details being given as to the particular nature of the disease or of the organ or tissue invaded.

To illustrate my meaning fully I append an extract from the paper, showing in decades the number of cases treated and the number of malignant growths noticed at each period:

Period.	Total Number of Cases Treated.	Nature and Number of Malignant Growths Noted and Treated.
1870-1879... ..	6,509	Cancer of the breast 2 Sarcoma 1 Malignant disease of jaws ... 1 — 4
1880-1889... ..	5,334	Cancer of the breast 2 Cancer of the liver 2 Carcinoma 1 Malignant disease 1 — 6
1890-1899... ..	9,392	Malignant growths 2 Malignant tumour 1 Cancer of the liver 1 Epithelioma 1 — 5
Grand total		15