and the large mononuclears and large lymphocytes, have all markedly diminished. The number of nucleated red corpuscles is also diminished.

Her general condition is greatly improved. She is feeling well and comfortable, and her appetite is better than she can ever recollect it. Her abdominal girth is now only 38½ in., and the discomfort of the large protuberant spleen is to a great degree ameliorated. She has put on weight, and appears more cheerful than for months past, and is taking steps to resume her professional duties as a music teacher.

CONCLUSIONS.

In drawing general conclusions from these four cases we must exclude, I think, Case II, in which the conditions of the problem were complicated by the fact of the tuberculous infection, which, as is well recognized, has the effect of producing marked changes in the clinical aspect of cases of leucocythaemia, particularly noticeable in the shrinkage in the size of the spleen and diminution of leucocytes, so that the improvement in these two respects in Case II cannot be wholly attributed to the effects of the x rays.

In the other three cases there has been marked improvement, which we cannot but attribute to the effect of the rays, little as we can at the moment explain the rationale of their therapeutic effects. In each case the spleen has diminished in size, and there has been improvement in the character of the blood, the degrees of improvement differing in the three cases. It is noteworthy that the case in which the spleen has diminished most in size, and the characters of the blood have been most favourably influenced, has been kept absolutely free from arsenical treatment, so that it cannot be urged that the effects produced are the result of concurrent therapeutic measures.

The improvement in the condition of the blood has run on parallel lines in each case. The percentage of haemoglobin and the number of red corpuscles have gone up as the result of treatment, and the leucocytes have fallen in number. There has been diminution in the percentage of those varieties of leucocytes increase in which especially characterizes the disease—namely, the myelocytes, basophiles, large lymphocytes, and eosinophiles, with at the same time a rise in the percentage of the polymorphonuclear neutrophils, and further improvement in the type of the blood has been shown by diminution in the number of nucleated red corpuscles.

But even more marked and of far greater importance than changes in the blood or the spleen has been the improvement in the patients' general condition of health, as indicated by improved colour, increase of weight, diminution or disappearance of pain, improvement of appetite, and general subjective sense of well-being and the ability to resume their daily occupations.

But though we may accept as a fact this temporary improvement, it is too soon to assert that permanent benefit has been conferred. Most of the cases recorded, so great has been their interest, have been rushed into print whilst the treatment has been incomplete, or before sufficient time has been allowed to elapse to judge of the likelihood of recurrence. Senn's case, which was apparently completely cured, came back under treatment about a year later with what is described as a slight relapse. But what can be safely asserted is that as the result of this method of treatment great amelioration in the patient's condition can in many cases be secured, and even if eventual cure be not obtained, many months, or perhaps even years, of comfortable existence may be given.

It is hardly necessary to say much about previous accounts of the use of the x rays for the treatment of this disease since Ledingham¹ and McKerron, in reporting a case which had been under their care, and which had improved under treatment, supply a very full bibliography on the subject. In their case, a boy of 11 years, the leucocytes came down from 220,000 per c.mm. to 23,000 as the result of six weeks' treatment, though the qualitative changes in the leucocytes were still those characteristic of splenomedullary leucocythaemia. There was, however, as in the above-recorded cases, a steady improvement in the ratio of the polynuclears to the myelocytes. In some of the cases to which Ledingham and McKerron refer all the abnormal cells appear to have vanished from the blood, notably in Senn's case² and in Bryant³ and Crane's first case, in which at the end of treatment the varieties of leucocytes were said to be in the proportions of those in normal blood. But in the majority of the cases in which complete detailed blood examinations have been recorded—and these are the minority—there has only been the fall of leucocytes without the disappearance of the

abnormal cells from the blood, although in each case, as in those which I record above, there has been distinct diminution in the myelocyte percentage, and a corresponding rise in the polynuclear percentage, that is to say the essentially leukaemic character of the blood has shown a tendency to disappear, but not entirely. And associated with this amelioration in the character of the blood there has been more or less diminution in the spleen and improvement in the patients' general condition. Only in exceptional cases did the condition remain unimproved or the patient get worse and die in spite of treatment.

Brown (E. J.)⁴ records a case in which, as in Senn's case, the blood lost completely its leucocythaemic character, the number and varieties of leucocytes becoming practically those of normal blood, with return of the red corpuscles to their normal number and disappearance of nucleated forms. Aubertin⁵ and Beaujard describe, with full haematological particulars, a case of splenomedullary leucocythaemia which, on the other hand, whilst improving under treatment, still retained the characters of leucocytes typical of the actively-developed disease.

REFERENCES.

¹ *Lancet*, 1905, i, p. 71. ² *Medical Record*, August 22nd, 1903. ³ *Medical Record*, April 9th, 1904. ⁴ *Medicine*, 1904, vol. x, p. 521. ⁵ *La Presse Médical*, August 20th, 1904.

THE TREATMENT OF RINGWORM OF THE SCALP BY THE X RAYS.

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THE x-ray treatment of ringworm of the scalp may now be said to be established as a valuable addition to our methods of dealing with this most intractable affection. Ever since the therapeutic possibilities of the x rays were recognized, occasional cases have been thus treated, but until comparatively recently in a more or less half-hearted manner, partly owing to imperfect technique and partly as the result of a certain degree of timidity on the part of the operator, in case the treatment should be followed by dermatitis and the production of a cicatricial alopecia.

We are indebted to Sabouraud and Noiré of Paris for the introduction of a technique which has given brilliant results in their hands, and by which these dangers have been obviated. At the Ringworm Schools connected with the Hôpital St. Louis of Paris this treatment has been almost exclusively adopted during the last year, and Sabouraud has reported a large number of cases successfully treated by the rays, with no untoward after-effects since the introduction of his improved technique.

During the last six months we have been employing this treatment, both at Charing Cross Hospital and at the Victoria Hospital for Children, where Mr. Cassels Smith, house-surgeon, kindly gave the exposures, and about 60 cases have been so treated, with encouraging results, but not with the absolute success which we anticipate when the technique has been still further improved. They were all cases of small-spored ringworm of the scalp in children, and by means of the x rays the time occupied in the treatment of the case is being considerably reduced from that taken by the previous methods we employed—namely, depilation by the inflammatory reaction set up by an irritant ointment or pigment containing carbolic acid, tar, or croton oil. But not only has the time under treatment been lessened, but the discomfort, and even pain, associated with the inflammatory treatment has been obviated. In none of these cases has a serious dermatitis resulted from the rays. As this is a somewhat new form of treatment, a few notes on the technique and our experience of it may prove of interest.

TECHNIQUE.

A brief description of the apparatus in use and the technique we employ at the hospital will serve to indicate the mode of procedure. As far as possible we have followed the method of Sabouraud and Noiré, but differences in our x-ray apparatus from that employed by Sabouraud necessitated certain variations in the detail of procedure. For a description of Sabouraud's technique the reader is referred to an article by him in *La Presse Méd.*, December 28th, 1904, and *Ann. de Derm. et de Syph.*, July, 1904.

Apparatus.

The electrical current for the therapeutic x-ray apparatus is obtained from a main continuous current of 100 volts. The interrupter employed is a "dipper" mercury break, and we have a 10-inch spark coil. The x-ray tubes in use are regulating tubes of the Müller pattern. A d'Arsonval milliampere meter is inserted in the secondary circuit between the coil and the tube. The tube is fixed on a metal stand, and is protected by a lead-glass shield with an opening, to the rim of which lead-glass cylinders of different diameters are fitted.

The Measurement of the Dosage and the Time of Exposure.

This is a matter of the utmost importance both with regard to the success of the treatment and the safety of the patient. With our apparatus we have not been able to measure the dosage to our complete satisfaction yet, though we have succeeded in estimating that requisite to produce a defluvium of the hair after a single exposure, without causing more than a transient erythema. The quantity of the rays are roughly determined by means of the milliamperè metre in the secondary circuit, the current in which is kept constantly at half a milliamperè by an operator, who increases or diminishes the resistance in the primary circuit and the break as may be required by differences in the tension of the tube. The tension on the tube has also been roughly estimated by interposing a constant sparking gap of about 4 in., and when-

Fig. 1.—M. T. Photograph taken on January 26th, after the defluvium of the hair.

Fig. 2.—M. T. Photograph taken on April 10th, after the hair had regrown.

ever this is sparked across the tube is softened slightly by the regulator.

The length of time of the exposure and dosage is ascertained by means of Sabouraud and Noire's radiometer X, and we are largely indebted to that instrument for the constancy of our results. It consists of pastilles of platino-barium cyanide like greenish-yellow wafers. On exposure to the x rays the pastille gradually assumes a yellowish-brown tint. It has been estimated that the dosage of x rays and the time taken in producing a certain standard tint of fawn in the pastille, when placed at a distance of 7.5 cm. from the anode, is sufficient to cause a depilation of an area of the scalp exposed at a distance of 15 cm. from the anode. The time varied slightly from day to day, according to the state of the atmosphere (other things being equal), for, when the air is dry, a shorter exposure is necessary than when it is humid. Sabouraud exposes a pastille each morning to give him the exposure-time for that day, and also another during each exposure with our apparatus, which differs chiefly from that in use at the Ecole Lailler in that there they employ large static machines to generate their electric current. We have estimated that, with a maximum spark gap of 4 in., a current of $\frac{1}{2}$ milliamperè in the secondary circuit and a dry day, the average exposure-time (that is, the time taken to produce the fawn tint on the radiometer X) is about 15 minutes.

THE PRINCIPLE OF THE TREATMENT.

The value of the x rays in the treatment of ringworm of the scalp depends solely on their power of causing a depilation of the area exposed to them, and, if their dosage be not excessive, of doing so, without destroying the hair-papillae, and so preventing regrowth of the hair. The x rays do not kill the ringworm fungus, nor do they seem to impair its growth in doses sufficient to cause the hair to fall out. In several instances we have grown cultures of the fungus on maltose-agar from hairs which have fallen out or been

loosened by the rays about a fortnight after an exposure, and in one case after the hairs had been exposed several times to the rays. This experience accords with that of other observers, and is an important factor in the management of the case, for not only is the ringworm apt to spread if unchecked after the exposure to the rays, but also, when the defluvium commences, the diseased hairs as they fall out are a source of danger, and may infect new areas in the scalp.

PROCEDURE.

The child's scalp is first cropped short—not shaved, but clipped close by scissors or by patent clippers such as barbers use for clipping the hair of the neck. If the scalp be very scurfy or if any impetiginous crusts are present it is first treated with a mild antiseptic ointment such as sulph. precip. gr. x, acid. salicyl. gr. v. vaseline ad $\frac{3}{4}$ j, which is rubbed in daily after washing. The scalp is then carefully examined and the areas of ringworm marked out about a quarter of an inch beyond their margins by a blue pencil. The scalp is now ready to be exposed to the rays. The patient is placed either on a chair with a head rest or on a couch. A lead glass cylinder of suitable diameter to the area to be exposed is fitted to the protecting shield. The length of the cylinder is such that with the scalp apposed to the end of it the anode of the tube shall be 6 inches away. The various diseased areas are then exposed serialim. If the ringworm be widely dissemi-

Fig. 3.—G. S. Photograph taken on January 26th, nine days after the exposure. Hair clipped short.

Fig. 4.—G. S. Photograph taken on March 3rd. Defluvium complete in exposed areas.

nated over the scalp it may be advisable to expose the whole of the scalp. This we did at first by exposing the scalp in three sections—namely, posterior and two lateral, and as each section was being exposed the remainder of the scalp was protected by lead sheeting, the lead-glass shield and cylinder being dispensed with, and the operator standing behind a lead screen. This procedure required to be done carefully to avoid either leaving the border between the two areas unexposed, or allowing the areas to overlap, and so having a portion of the scalp exposed twice, and running the risk of a burn. The exposures were given with the diseased area at a distance of 6 inches from the anode of the tube, the length of the exposure having been previously determined by the radiometer. This method of causing a complete defluvium did not prove satisfactory, as partially exposed areas were apt to be left. We are now adopting the more tedious but more reliable method of Sabouraud, namely, using the protecting shield and cylinders for every exposure. The procedure is as follows: The largest cylinder, which has a diameter of 9 cm., is fitted to the shield, and the scalp apposed to it. A brown band is then painted round outside of the cylinder with tincture of iodine to mark the exposed area, and the exposure is given; then by moving the cylinder another circular area is similarly treated, and so on till the whole of the scalp has been exposed with the exception of the irregular figures painted with iodine between the circular patches. The patches are then covered with exactly-fitting circular discs of lead foil, which are held in position by elastic bands, and the irregular unexposed areas subjected to the rays. By this procedure about twelve exposures are necessary to include the whole of the scalp. The result, however, is more satisfactory than by attempting to expose larger areas than that which can be done by the 9 cm. cylinder, for only the central portion of an area larger than that is properly exposed, while the periphery is done insufficiently.

For at least three weeks after the exposures the scalp must be thoroughly treated with mild parasitocides to check the spreading of the disease. Every evening one or other of the following ointments is rubbed in all over the scalp:—Oleate of copper, gr. xx to the ounce; hydrarg.-ammonia, gr. xii, and salicylic acid, gr. x to the ounce; or Sabouraud's ointment of oil of cade 2 parts, to lanoline 5 parts. Every morning the scalp is washed with soft soap and warm water, and after drying, an iodine spirit liniment consisting of fresh tincture of iodine 1 part, and 60 per cent. alcohol 9 parts (Sabouraud). The patient is instructed to wear a small linen cap constantly, with a paper lining which is renewed every time the scalp is washed or ointment is rubbed in.

About the fourteenth day after the exposure the hair begins to fall out, and the defluvium is complete in about a week. This may take place without any perceptible inflammatory reaction, but usually a slight transient erythema supervenes about a week after the exposure and dies down with the defluvium. In only one of our cases did a marked erythema occur, which lasted for three weeks. The patient was a timid child who could not be persuaded to lie still, and in moving her head about had shifted the protecting lead sheeting on the scalp, and permitted a small triangular area to be subjected to two consecutive exposures of sixteen minutes each. Fortunately, this erythema has now subsided, and the hairs have begun to grow over the patch.

If the hairs have not fallen out by the twenty-first day a second exposure is given, but we rarely find this to be necessary since we adopted the dosage prescribed by Sabouraud. It occasionally does happen, however, that, owing perhaps to an idiosyncrasy on the part of the patient and a usually great power of resisting the action of the rays, a second exposure has to be given.

After the defluvium has taken place, the scalp is carefully examined to see that no stumps are left either in the parts of it which have not been exposed, or where the hairs have fallen out. We find that the healthy hairs are caused to fall out more readily by the rays than the diseased hairs, and a few stumps may be left as small specks over the otherwise bald areas. These short stumps usually come out later. If any stumps have been detected in the unexposed hair at the border of the patch, it is best to needle each one with croton oil by Aldersmith's method, but this procedure should not be necessary if the diseased areas be carefully mapped out before exposure, and reinfection from the falling-out stumps be prevented.

New hairs begin to appear about six weeks after the hair is shed, and the regrowth is complete in about five months. The slowness of the regrowth is an advantage rather than otherwise, for it allows time for all the diseased hairs to be eradicated before new hairs grow in.

GENERAL REMARKS.

Some experience in the treatment of ringworm by the commonly-employed methods has led one to share the belief of a number of other observers that if ringworm of the scalp is to be cured it is necessary to do more than rub in a parasiticide ointment, for however strong the parasiticide may be, it cannot penetrate sufficiently deeply into the follicle to destroy the fungus in the root of the hair. Depilation has to be resorted to, after setting up an inflammatory reaction by various irritants, such as croton oil, tar, or carbolic acid. By this means, judiciously employed, it is possible to cure a severe case in about a year or eighteen months, so that an expert would be unable to find a ringworm stump. In the *x* rays we have an ideal and painless depilating agent, and by means of them, combined with the local parasiticide treatment described above, an average case can be cured in about a third of that time.

It is a treatment, however, which is by no means easy; first there are the difficulties of the technique, second there is the all-important local treatment with the parasiticide remedies, and, third, there is the care which is requisite to avoid mishaps. Without a thorough knowledge of the disease and the ability to recognize diseased stumps this method is liable to be just as disappointing as any of the others, beside submitting the patient to a certain amount of risk.

The immediate dangers of the treatment I have already referred to, and with care they can, as a rule, be avoided, but with regard to the ultimate dangers, if there be any, sufficient time has not yet elapsed to disclose them. It has been suggested that the exposure of the scalp to the rays might have some harmful effect on the underlying brain. Certainly in an infant or a child under 3 years of age, where the scalp is thin

and the fontanelles have not closed, one would be timid about submitting the scalp to the *x* rays, but with regard to older children no misfortune of that nature has, as far as we are aware, been recorded. Another possibility has been put forward—namely, that the new hair which grows in afterwards may not be so healthy as the hair which has been shed, and might at some remote period fall out and result in alopecia. This is simply a conjecture, however, which though possible does not seem probable, and has as yet, so far as my experience goes, no evidence to support it.

GENERAL PERITONITIS DUE TO PERFORATIVE APPENDICITIS.

ILLUSTRATED BY CASES TREATED BY ABDOMINAL SECTION, WITH REMARKS ON THE QUESTION OF EARLY OPERATION.

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THE following cases of general peritonitis, which came under my care within ten days of each other, present points of interest in diagnosis and treatment that make the reporting of them almost a matter of duty.

They demonstrate plainly not only the importance of the early recognition and treatment of general peritonitis, but that if it be discovered and operated on within twenty-four hours of the onset, before the blood has become loaded with toxins, the outlook is far from hopeless.

Both cases also demonstrate how impossible it may be at times to diagnose appendicitis if the ordinary symptoms are relied on, for in one case the whole of the pain was at first on the left side of the abdomen and later became general, while in the other it was generalized from the onset. In neither case did the usual tender spot afford an indication, and the general distension of the abdomen and universal rigidity of the abdominal muscles simply enabled a diagnosis of general peritonitis to be made, though the history of a previous attack of pain in the caecal region in one case suggested the possibility of the peritonitis being due to perforative appendicitis. Case 1 was seen with Dr. William Blake, of West Wickham, who kindly furnished the data for the notes.

CASE I.

Mrs. H., aged 70, an otherwise healthy patient, was seen in October, 1904, for some pain in the right lower abdomen, which was followed by diarrhoea for several days. She was seen in consultation with an eminent physician, who thought the pain hepatic, though Dr. Blake suspected the appendix to be at fault.

In December, she resumed bicycling and continued to take exercise freely up to Wednesday, January 4th, 1905, when she attempted to lift her machine over a fence.

On Thursday, the 5th, she had some abdominal pain, for which Dr. Blake saw her at noon; the pain was not definitely over the caecum, but rather at the umbilicus and above and below it. At 5 p.m. a $\frac{1}{4}$ gr. morphine injection was given, but at midnight the pain returned, and during the night she vomited three times. At 8 a.m. the pain was so severe that the morphine had to be repeated. There was then noticed some rigidity of the abdominal muscles, which was rather more marked on the right side.

When I saw her with Dr. Blake at 3.30 p.m. the patient looked pinched and very ill. The vomiting was continuing; the pulse was 110, and the temperature 100° F. The abdomen was distended. It was tender all over, and the muscles were rigid, especially in the caecal region. On flicking the abdomen with the finger a fluid thrill could be felt in both flanks and across the hypogastric region. No flatus had passed by rectum and the bowels had not been moved for two days, thus raising the question of acute intestinal obstruction.

At 4.15 p.m. the abdomen was opened by a vertical incision through the right rectus sheath, when a quantity of offensive thin sero-pus escaped, the peritoneum was dusky red and both the large and small intestine were distended and of the same colour; there was no lymph barrier, and on passing the fingers to the lower end of the caecum a gangrenous and perforated appendix was at once felt and brought to the surface. The mesentery of the appendix was black and had to be ligatured beyond the gangrenous margin, which was cut away.

The root of the appendix was gripped by pressure forceps, crushed and ligatured close to the caecum, and then amputated, the stump being buried by a pursestring suture of catgut. A portion of gangrenous omentum was removed and the abdomen was thoroughly flushed with hot normal saline solution poured from a pitcher into a glass funnel held about 3 ft. above the patient, the rubber tube connected with the funnel being passed first into the pelvis and then into the right and left lumbar pouches. The lavage was discontinued when the fluid returned absolutely clear. A rubber tube with a gauze strip in it was inserted into Douglas's pouch and brought out of the wound, which was then closed layer by layer with iodized catgut. Dr. Blake wrote to say that he removed the pelvic tube on the second day and inserted a