

THE TREATMENT OF TUBERCULOUS GLANDS BY X RAYS.

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IT has been observed that great differences exist among different tissues in their susceptibility to X rays. X rays seem to exert a selective action on different cells. The cell most affected by X rays is the one which is actively growing. Cells may be classified in order of their susceptibility to X rays as follows: (1) Lymphocytes; (2) the mother cells of the spermatozoa; (3) the cells at the roots of the hairs of the scalp and beard; (4) cells forming the sweat-glands; (5) cells around the roots of the nails; (6) giant cells; (7) the actively growing cells of carcinomatous growths; (8) the endothelial lining of bloodvessels; and (9) gland-cells near the surface, as the thyroid and lymphatic glands. Other more slowly growing cells are less affected, such as the upper layers of the epidermis, and those entering into the composition of cartilage and bone. The depth from the surface is also of great importance. For this reason, the actively growing cells of the human ovary are little affected by X rays, whereas those of the testes are very readily influenced. The active rays are absorbed by the tissues to such an extent that those at a depth of about 3 centimetres only receive about a quarter of the original rays.

Physico-Physiological Considerations.

As lymphatic glands lie near the surface, they are in a position to receive a therapeutic dose of X rays. The success with which tuberculous glands may be treated by X rays is now well established. The *rationale* of this treatment is based on the foregoing considerations, and may be briefly summarized. The formation of the giant cell has lately been studied by Podwyssotzki and Pirone¹ by experiments on rabbits. By a method of irritation applied by means of cold, they observed that the nuclei of certain cells underwent direct division, which went on with remarkable rapidity, and in twelve to twenty-four hours many cells were filled with a mass of nuclei set close together. Thus protoplasmic areas were formed containing several dozen nuclei. Thus giant cells were artificially produced. The formation of a giant cell

¹ Podwyssotzki and Pirone: *Archives des Sciences Biologique*, vol. xii., p. 214. St. Petersburg, 1906.

means, therefore, the rapid growth of a cell. Such a cell is very susceptible to the action of X rays, and is easily killed by X rays. Now, the giant cell seems to be generally associated with or contains tubercle bacilli. It often becomes a lodging-place for these bacilli, just as a gall-nut becomes a lodging for the larva inside. In both cases the host provides a protection to an unwelcome guest. If, then, the giant cell is killed by the action of X rays, the bacilli are naked, and the leucocytes attack and destroy them. Thus the X rays cause the removal of tubercle bacilli from the lymphatic gland, not by killing the tubercle bacilli, but by destroying their protective ramparts, and thus allowing their enemy—the leucocyte—to attack and prevail.

In a small dose the X rays are a stimulant, in a large dose an irritant, and if still increased they cause complete destruction of living cells. It is thus very important to administer the proper dose of X rays to effect a cure of tuberculous glands. Too small a dose will stimulate the giant cells to multiply. A larger dose will kill them, and at the same time stimulate the leucocytes to greater activity. A still greater dose will kill the leucocytes. Fortunately, there is a simple indication of the dose required. It is the fine lanugo hair on the side of the face and neck. I have noticed, especially in the treatment of tuberculous glands in the neck by means of X rays, that the downy hair over the side of the face becomes much longer on the side which receives the rays. This is due to the fact that the dose of X rays is stimulating and not detrimental to the cells at the roots of the hairs, and in the same way the leucocytes are stimulated and not killed. The same dose stimulates the leucocytes and kills the still more active cells which are forming the giant cells. It is a good guide to give a dose of X rays for tuberculous glands so that the downy hairs do not fall out, but grow longer. Cures, however, occur also when the downy hairs fall out. We know the dose of X rays which makes hair on the scalp fall out. The same dose on the lanugo hairs will not make them fall out, because the cells at the roots of those lanugo hairs are not so actively growing as those at the roots of the hairs of the scalp. In fact, one might say that the cells at the roots of lanugo hairs are growing only as fast as those of the deep Malpighian layer. Therefore, to destroy the cells at the roots of lanugo hairs, one would also destroy those of the Malpighian layer. For this reason it is difficult to epilate the hairs from a lady's upper lip.

Method of Application.

The technique for treatment of tuberculous glands in the neck which I have found most useful is the following: Use a medium tube. Give each week a third of the dose of X rays which will produce epilation on the scalp. Thus in three weeks a dose of X rays will be given which, if it had been applied to the scalp in one sitting, would have produced

epilation. This dose I have measured by means of my water electrometer. Use no filter for the skin over the glands, and the skin gradually grows red. This continuous hyperæmia probably does good, and is really a local Bier's treatment. The redness later on gives place to a dirty brown appearance, and when this stage is reached (in about six weeks) the glands will be seen to have grown smaller. The first sign of improvement is the differentiation of individual glands. Treatment must be continued from three to six months, until the glands no longer project on the surface. They remain for several months longer as hard small nodules, which may persist for a year, but give no further trouble, and gradually disappear altogether. The following clinical records of cases which I have recently treated by the application of X rays illustrate the advantages of this method.

CASE I.—Miss T., twenty-five, came to me for X-ray treatment on September 15, 1906, with a mass of tuberculous glands on the right side of the neck, which had been growing for about nine months. Two of the glands seemed about the size of pigeon's eggs. Treatment was continued about once a week till January 28, 1907, and she was then considered cured. The glands no longer showed on the surface, but remained beneath the skin as hard small nodules. Seen in July, 1907, the result remained perfect, as also it was in December, 1907, when no enlarged gland nor hard nodule could be felt.

CASE II.—A. N., aged twelve, tuberculous glands for nine months; began X-ray treatment on February 6, 1907.

His photograph is reproduced as he appeared on February 28. There was a large mass of tuberculous glands on the right side of the neck. Mr. Carson sent the case for X-ray treatment. Treatment was continued once a week till the mass completely disappeared, as shown by the photograph taken on September 1. A slight dermatitis, produced by a large dose of X rays, can be noticed in the illustrations. I consider a slight dermatitis does no harm during the treatment, and certainly has hastened the cure in three cases. I do not now, however, aim at producing a dermatitis.

CASE III.—H. E., aged ten. One tuberculous gland, size of a pigeon's egg, on left side of neck, of one year's duration. His condition on December 2, 1906, is shown in photograph. X-ray treatment was begun on December 2, 1906, and continued once weekly until March 21, 1907, when the condition was cured. The gland no longer showed on the surface, but could still be felt as a hard small nodule under the skin. The photograph brings out another point. The boy had decided adenoids before the treatment, and after treatment the adenoids disappeared. The photographs are characteristic.

CASE IV.—W. R., aged four, had a large mass of tuberculous glands of six months' duration, as shown by the photograph taken May 23,

1907. Mr. Carson sent me this case for X-ray treatment. Treatment was continued once a week. The neck became a dirty brown colour,

CASE II.



February 28, 1907.



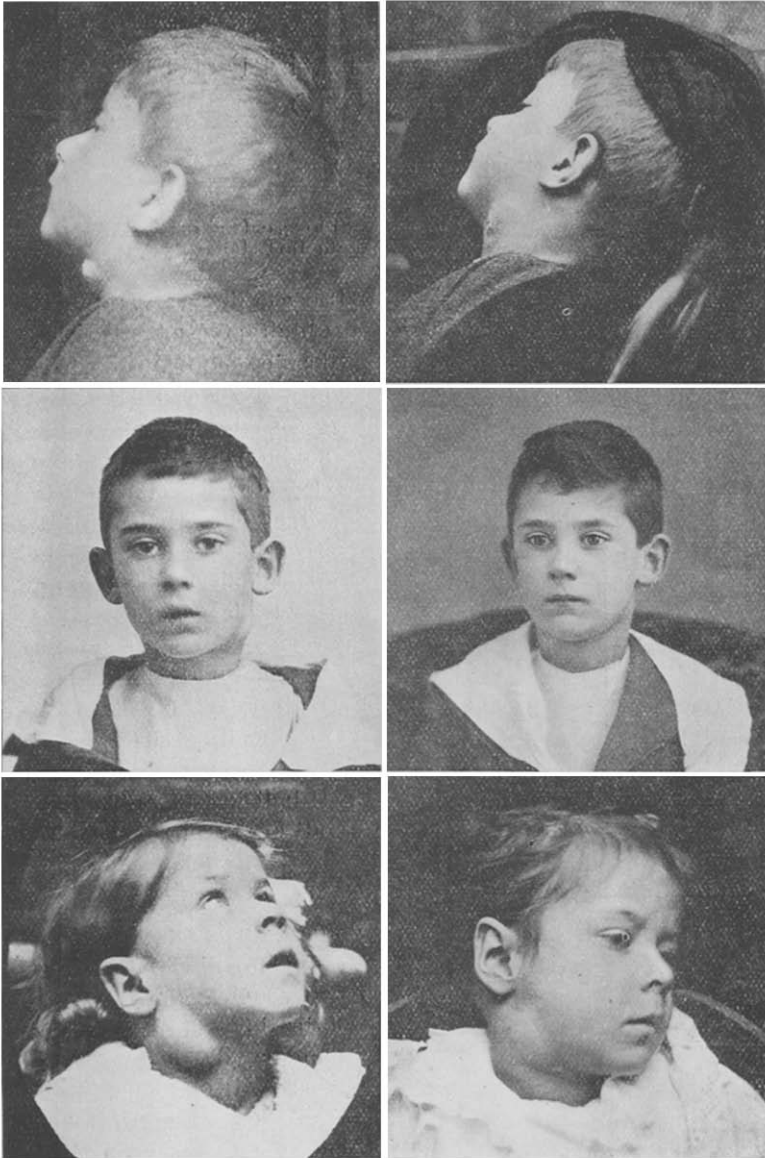
June 1, 1907.



September 1, 1907.

TUBERCULOUS DISEASE OF THE CERVICAL GLANDS IN A BOY OF TWELVE YEARS TREATED BY X RAYS.

and has been thus maintained during the treatment. Downy hairs did not fall out, except over the apex or the swelling. The condi-



CASE V.—September 19, 1907.
 „ III.—December 2, 1906.
 „ IV.—May 23, 1907.

CASE V.—December 9, 1907.
 „ III.—March 21, 1907.
 „ IV.—November 4, 1907.

TUBERCULOUS DISEASE OF THE CERVICAL GLANDS IN CHILDREN OF AGES
 FROM FOUR TO TEN YEARS AND TREATED WITH X RAYS.

tion on November 4 is shown in the second photograph. The glands are going down, but still are visible on the surface. The patient has had about five months' treatment to produce this result. She had no treatment during August. Another three months should complete the cure in this case.

On two occasions during the last year I have noticed a gland come to the surface and point during the first month of treatment, and after continuing on the point of breaking for six weeks, gradually go away without opening. In no case have I seen a solid gland break down and suppurate during X-ray treatment.

CASE V.—H. P. presented himself on September 19, 1907, with a suppurating gland pointing as shown in the illustration. X-ray treatment was carried on from September 19, 1907, till November 1, and then the abscess began to grow smaller, less tense, and showed every sign that it was going away without opening. It kept on shrinking till November 11, when it burst while the patient was at school. A dressing had to be kept on for a week, but after that time was discontinued, as there was no discharge. The second illustration shows the condition on December 9, 1907.

Conclusions.

Tuberculous glands in the neck can certainly, in my opinion, be cured by X rays. The best time for beginning the treatment is when the glands are growing larger. A broken-down gland can be made to disappear without incision, provided treatment is begun before it has begun to point. No bad effects are produced. Hitherto I have met with no failures, but treatment must be continued for at least three to six months.