RADIOTHERAPEUTIC OBSERVATIONS.*

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The employment of the mysterious x -rays for the treatment of various skin diseases has ceased to be the monopoly of a few privileged promoters and is gradually becoming almost indispensable in the work of the up-to-date dermatologist. Much has been learned in this new field of practical medicine. More remains to be accomplished before the new agent can be handled with scientific accuracy. At the present moment there is still a deplorable diversity of opinion concerning some vital points in the theory and practice of radiotherapy. The controversy as to the real active principle emanating from the Crookes' tube is apparently still unsettled. Freund and Kienboeck may be mentioned as important representatives of the two opposing factions. The former, after persistently attributing the bulk of the x -ray effects to peculiar electric discharges or waves from the tube, seems of late to somewhat recede from his position. Kienboeck, who regards the Roentgen rays as the efficient element, has a host of followers, among whom I am willing to be counted. It seems to me that comparisons with the well-known effects of the Finsen light therapy, and even with those of continued exposure to ordinary strong sunlight, make it more than plausible that the clinical manifestations following x -ray exposure can be explained without giving to the electric shocks coming from the tube more than a coincidental rôle. With all deference to certain experts in electricity I can therefore take little stock in their attempts to establish those clinical results on the basis of electrolytic action.

TECHNIC.

The whole question here alluded to has more than merely theoretic value. Inseparably coupled with it is the selection of the proper tube for our work, whether a hard or a soft one. Whoever is after the display of electric action will take a hard tube. He can get an abundance of electric waves out of it with a scarcity of rays. Accordingly, the desired irritative or resolvent effects on the skin will be slow in making their appearance. On the other hand, the soft tube emits hardly a spark when in contact with our hand, but gives a light rich in Roentgen rays. Its clinical effects are prompt and energetic. These are established facts and admit of no discussion. Furthermore, it is generally admitted that the rays of a hard tube have a penetrating action and may easily cause far-reaching destruction, while the rays of the soft tube are absorbed by the upper layers of the skin.

Much of the success in x -ray work depends on the proper apparatus. The static machines are hardly fit for dermatologic purposes. A good induction coil only is to be considered. In my own equipment, which has given perfect satisfaction, the direct street current is utilized, allowing a maximum of 150 volts. It is conducted into a wall plate containing volt meter and amperere meter, rheostat and speed regulator, allowing up to 2,400 interruptions to the minute. From the wall plate the current is directed through a motor and into a rotary mercury-petroleum interruptor, and from there to the coil, which is capable of a 12-inch spark. The latter is so constructed that of the three parallel spirals constituting the primary spool, one only, two or all three may be energized through a special system of

switches. In this way all gradations from the softest, barely noticeable light to a rich green one can be generated. Without resorting to the rheostat the voltage varies accordingly from about 65 to 85, while the amperage recorded shows in inverse proportion from 4 to $1\frac{1}{2}$. I purposely mention these figures as very different from other authors; for instance, Schiff and Freund, who advocate a current of 12 volts with an amperage of $1\frac{1}{2}$ to 2. The fact of the matter is that while proper registrations of the intensity of the current are of interest, reference to them is of value only when the identical apparatus is used by another. The essential element in determining the energy with which we work is the character of the light irrespective of either voltage or amperage. There are some special photometric devices designed to ascertain the strength of the light, but they are little used and of minor value for practical work. To the beginner the frequent use of the fluoroscope will be of inestimable service, and Kienboeck's directions in this regard, and his sketches illustrating the shadow of the hand from tubes of varying degrees of vacuity were much appreciated by me. Gradually one learns to judge the condition of the tube by mere inspection and by the aid of the ear. The intensity of the light is, however, only one of the factors constituting the desired dosage. The distance of the tube from the radiated surface and the time of exposure are of equal if not more importance. The often-heard advice to use only the "softest light" must therefore be taken *cum grano salis*. If I place my tube with its strongest possible light at a proper distance, say 40 centimeters, I can use it safely for what might be called a mild exposure.

As to the tube itself, I would strongly recommend the use of self-regulating tubes after the pattern of the Müller tube. While much more expensive than the ordinary cheaper ones they have a great endurance and I have repeatedly used them for more than one hundred strong exposures without exhausting them. Two principal methods of employing the rays may be mentioned. The one first advocated by Schiff and Freund, and followed by Pusey, is to use a soft light in short sittings in frequent, even daily, intervals until a reaction sets in. This is surely a safe method though rather slow in many cases, and as for out-of-town patients, who come for an occasional treatment only, quite impracticable. The other plan, according to Kienboeck, is to give what he calls a normal exposure, i. e., the use of a powerful light for a period of about twenty minutes in a single sitting, after which an interval is allowed and the reaction is waited for. One such normal exposure will often be sufficient to produce the dehiscence of hair from the radiated area. This method requires a good deal of experience. I have followed it repeatedly and have never had any serious consequences. I have more often, however, taken the middle ground and have used ten-minute exposures at intervals of a day or two to the number of from five to eight, when usually a decided reaction would take place. The proper method to be followed will depend to a large measure on the nature of the case and other circumstances, as I may mention later on. Whoever is making extensive use of the Roentgen rays is bound to have, sooner or later, some unpleasant experience with the much-dreaded x -ray burns. This is due to the well-known observation that the effect of the radiations is cumulative and that the reaction, even after powerful exposures, requires eight to ten days to become at all noticeable and will then

* Read before the American Dermatological Association, at Boston, Sept. 19, 1902.

gradually reach its climax within the following week or two. Unfamiliarity with this important fact may lead the beginner to persist in continued strong exposures up to a point when damage can not be undone. The three or four cases in which I produced a powerful reaction, consisting in acute dermatitis with oozing, crusting, etc., yielded readily to simple treatment within a week and caused little anxiety to either patients or myself, and left no permanent injury. I have never caused any sort of ulceration or sloughing. This may be explained from the fact that the light from the soft tube, which I have employed exclusively, has a rather superficial effect and does not penetrate into deeper tissues. Yet I feel that in the future even temporary dermatitis will easily be avoided by me, and my remarks may serve to keep others from similar accidents, for the ideal way of using x-rays in the majority of cases is surely to produce our results with the least irritation. In this connection a word about individual idiosyncrasy may not be amiss. Kienboeck believes that there is no such thing. Still the time required to produce a reaction surely varies in different patients, and particularly is there a notable difference in the resistance in various tissues. Pathologic cell aggregations, for instance lupus nodules, will be influenced much more readily than normal skin.

The protection of such parts as are not to be exposed to the rays is an important point in the technic. I have used for this purpose thick sheet lead, which is easily molded and cut into any desired shape, and had them lined with flannel. I would particularly warn against the careless exposure of the lips, which are most susceptible to irritation by the rays. In treating the face I always cover the eyes and the hair of the head.

During the six months, from March 1 to September 1, I have subjected 81 patients to radiographic treatment as follows: Lupus vulgaris, 1; lupus erythematosus, 1; scrofuloderma (tuberculosis of the shoulder joint), 1; hypertrichosis, 11; syccosis, 4; acne (all forms), 34; epithelioma, 9; psoriasis, 3; lichen planus hypertrophicus, 2; dermatitis staphylogenes, 1; eczema, 4; keratosis palmaris, 3; clavus, 1; pruritus, 1; hyperidrosis nasi, 2; non-dermatologic affections, 3.

I shall in the following very briefly and summarily report my observations in these cases:

LUPUS VULGARIS.

To the many cases of successful treatment of this affection by x-rays recorded in literature I am able to add one more, a typical instance of this disease.

CASE 1.—My patient, about 50 years old, has been affected by lupus of the face since his early childhood, and has ever since been under treatment of a more or less radical character. I have myself had him under my care for the past eight years with little more than temporary benefit, having employed the well-recognized former modes of treatment, as cauterizations, curetting, dissection of the nodules, galvano-cautery and the like. The affection consisted in multiple, dry, deep-seated gelatinous nodules, isolated or forming small patches and practically covering the whole of the right cheek, extending over the bridge of the nose and encircling the lower eyelid, which as a result of surgical interference, undertaken in early childhood and consisting in an unsuccessful transplantation of skin has ever since been entirely everted. From the beginning of March to the end of July I made use of x-ray exposures in this case, starting at first on a small patch the size of a dollar. Seven ten-minute sittings during a period of about ten days caused a distinct superficial irritation, which developed promptly into a shallow eroded surface showing small depressions in the place of the former nodules. With nosophen dressings the patch healed up within about a week, giving a

smooth, slightly reddened scar. In this manner the principal locations of the trouble were gone over successively. During the latter part of the treatment the whole area, as far as possible, was subjected *in toto* to mild ray exposures, and the interesting observation could be made that an irritation would appear only where lupus tissue was still present, while the previously treated areas exhibited no sign of further irritation.

While I am not prepared to pass final judgment about the outcome in this case, I am able to say that the result of the treatment so far was in every way highly satisfactory and far superior to any other method known to me, except, perhaps, that of Finsen. The perfect painlessness of the treatment and the smoothness of the scars are particularly noteworthy.

LUPUS ERYTHEMATOSUS.

A patient who is still under my care had a very characteristic and inveterate case of this affection.

CASE 2.—A woman, 56 years old, who had a lupus covering almost the whole of the face, with isolated patches behind the ears, was treated by me with x-rays during the two months, July and August. Three treatments a week for ten minutes with a strong light, at a distance of about 15 cm., were given to one side of the face only, while the other was treated with resorcin lotion. After four weeks the improvement on the radiated side was very marked, the color of the patches becoming very pale, and the desquamation being markedly diminished. A period of rest was allowed for this side, while the other half of the face was then likewise exposed with similarly good results.

SCROFULODERMA.

CASE 3.—A young man, 23 years old, came to me April 15 with two large ulcers on the left upper arm, showing all the familiar characteristics of scrofuloderma. They distinctly connected with a tuberculous focus in or about the shoulder joint, and copious masses of thin, yellowish pus were discharged with each dressing from those ulcers. The patient was emaciated and had temperatures from 101 to 102. Radiations were given 3 to 4 times a week with a powerful light, at a distance of about 10 cm., over the whole region of the shoulder and including the ulcerated surfaces. After only six exposures the discharge of pus became very scanty, and disappeared almost entirely within the next three weeks. At the end of five weeks' treatment the ulcers were healed up, with the exception of a small area the size of about a pea, when the patient desired to be temporarily dismissed in order to go to his distant home. I have quite recently seen him again, and found him in every way much improved; the pain in the shoulder joint almost entirely gone, the mobility much improved, the weight of the patient increased by twenty-three pounds, absolutely no temperature, and the former ulcerations entirely healed up. There was, however, a small new abscess formation on the posterior part of the shoulder, on account of which the radiations were resumed.

HYPERTRICHOSIS.

I have often heard the remark from colleagues engaged in this line of work that they consider the treatment of hypertrichosis by Roentgen rays as a very delicate and uncertain affair. One of them, in answer to my direct question, once mentioned that he had given over seventy exposures to a woman thus afflicted. My own experience in the eleven cases thus treated have made me rather optimistic concerning what can be accomplished here. I have invariably made use of what has been before referred to as normal exposures, and have found that three to five such exposures, given at intervals of a week or two, will produce complete epilation. As several of my patients were living out of town and could come for a treatment only at long intervals, this method was the only one to be selected. The reaction consisted, as a rule, in marked pigmentation and temporary erythema which yielded gradually.

My patients have all been instructed that the epilation following one series of treatments is not to be considered as permanent, but that radiations should be resumed at intervals of, at first, two months, and later on longer periods without waiting for a return of the hair.

Whoever has had much experience in the electrolytic destruction of superfluous hairs will be bound to consider this new method a veritable boon to both operator and patient. One lady, with a very extensive growth all over the chin and somewhat on the cheeks, and who had formerly received many electrolytic sittings at my hands, remarked to me, after her third *x*-ray treatment, when all the hair from the radiated surface had fallen out, that she would never under any circumstances again submit to the electric needle.

As regards the final effect on the skin, I have been unable in my cases to verify Ehrmann's observation of an atrophy of the skin following this treatment.

SYCOSIS.

Of the four cases of sycosis which I have treated, two were very severe and inveterate. In one case it had affected the whole chin for a period of two years; in the other the lip had been the seat of the trouble for more than four years. The cases were both of the coccogenic variety and showed multiple follicular miliary abscesses. The treatment required was seven exposures for the one and eight for the other. The exposures were given at a close distance for ten minutes daily. The result of the treatment surpassed my most sanguine expectations. After two or three radiations pustules ceased to form. The reaction produced was very moderate. Defluvium commenced about two weeks after the beginning of the treatment and with it all inflammatory phenomena disappeared completely. The skin looked entirely normal, except slightly pigmented and reddened. These cases have since remained under my continued observation. About two months after epilation had become complete new hair began to show and has since grown out all over the affected areas. In spite of this there is so far no sign of relapse. Absolutely no other treatment had been given in these cases.

ACNE.

The thirty-four cases mentioned above comprise several varieties and all degrees of severity of acne. Five of them were instances of acne rosacea; one belonged to the type of acne necroticans; four cases were indurated and pustular acne of the back and shoulders. The bulk of them were, of course, of the ordinary type of acne of the face, many of them of the very severest and most rebellious nature. It would entirely surpass the intention of this communication to go into details of all these cases. I would only remark in general that their management differed considerably from that employed in the previously named affections, in that the exposures were rather mild in character, the distance of the tube, according to its light, being from 20 to 40 cm.

My plan in these cases is usually to start in with three treatments a week for from two to three weeks. After this exposures are given twice weekly only for a time, and later on about once a week. A beneficial action can usually be noticed during the second week, when few new pustules are noted and the comedones seem to shrink and dry up. The accompanying seborrhea oleosa of the face is very promptly influenced. Some of the severest cases which I have ever treated were cured in from four to six weeks and have so far remained well.

If I think of the many years of hard and persistent work which I have formerly given these cases in the

way of local treatment, consisting in the opening of abscesses, the removal of comedones, curetting, caustic applications and the like, with but fair results, and compare with that my present management of these cases and its almost uniformly excellent therapeutic effects, I can only regret that Roentgen's wonderful discovery was not made twenty-five years ago.

I am not prepared to draw final conclusions from my observations as to the etiologic nature of acne, but my long-held belief, that constitutional causes are foremost in its production, has now become considerably modified.

EPITHELIOMA.

From all appearances the use of *x*-rays for the eradication of epithelioma means a remarkable progress in this department of surgery. My own observations in nine cases of this kind are certainly such as to make me rather enthusiastic in this respect. My cases were all of the superficial variety. As to location, three were situated on the side of the nose, one on the lower lip, one on the lower eyelid, one near the tip of the tongue, one on the glans penis, one on the back of the hand and one on the forehead. Three of them were relapsing forms and had been previously treated by me by curetting and cauterization. In these latter cases the diagnosis had been established previously by microscopic examination. In the others this additional help to the diagnosis was considered undesirable, as a removal of tissue would be contrary to the conservative plan of radiotherapy. The treatments were given with a strong light, the distance of the tube being from 5 to 10 cm., the sittings being ten minutes, repeated at daily intervals for a time, and then only every two to three days. The case of epithelioma of the lower lip was demonstrated before my class at the Northwestern University before the beginning of the treatment, and afterwards when cured. It required ten treatments during a period of four weeks. The one on the tongue yielded to twelve exposures given during three weeks. In only one case was there produced a reaction amounting to severe dermatitis. In most of them the exposures were interrupted at the first sign of a slight irritation and further results waited for. In all of them, I am happy to record, at least for the time being, a recovery.

A comparison of this method with all others known, both by surgical means and by caustics, must necessarily establish a vast superiority of radiotherapy, not only as regards its absolute painlessness, but also as regards the condition of the scars. Whether the results attained in my own cases and in the many reported by Pusey and others will prove permanent, remains to be seen; but to my mind the elective and deep-reaching action of the rays seems more radical than any surgical interference possibly could be.

PSORIASIS.

The three cases of this affection were selected with regard to special location of the disease. They were cases in which a few regions only were invaded by particularly stubborn manifestations; in one of them the knees only, in another the arm, showed a large infiltrated scaly patch; in a third the lower limbs were exposed to the rays. Exposures were made with a mild light at a distance of from 15 to 20 cm., in order to take in the whole affected area. Results were noticeable after from eight to ten exposures, and were on the whole satisfactory. In one of them the benefit has lasted for more than four months. We know from other observations recorded in literature that beneficial results by *x*-rays in

psoriasis are, however, not to be considered as permanent.

LICHEN PLANUS.

Similar results were obtained in two cases of lichen planus hypertrophicus located over the tibial region. One such patch, which had obstinately resisted various plans of treatment, even as energetic as thorough curetting, disappeared in an almost marvelous way after four strong exposures, given at intervals of five days each, and left the skin in a perfectly normal condition.

ECZEMA AND PRURITUS.

I have made use of x -rays only for isolated, chronic infiltrated patches of eczema, and my results seem to me very encouraging. One case of pruritus genitalis was much benefited by three mild exposures.

KERATOSIS PALMARIS.

I am sure that most dermatologists will agree with me concerning the great difficulty of successfully treating this condition. My own experience, at least, has always been very disappointing. The three cases of this affection which I submitted to radiotherapy were inveterate forms and covered in one instance the palmar surface of both hands, including the fingers, and in the other two circumscribed patches of the size of a dollar on each palm. The effect of the rays in these cases was, to say the least, surprising. One case seemed perfectly restored after five strong exposures.

CLAVUS.

CASE 4.—About the middle of July I was visited by a young gentleman, 23 years old, who complained that for the past two years his life had been made perfectly miserable by the presence of numerous soft corns on the soles of his feet. The affection was symmetrical and consisted in upward of sixty soft corns distributed over the plantar surfaces of all the toes and the adjacent regions of the sole. While a single corn may be a trivial affection, a trouble like this one surely deserves the earnest attention of the dermatologist. I learned from my patient that all sorts of treatments, including excision, keratolytic ointments, special pads, etc., had been tried in vain, and I therefore resorted at once, as an experiment, to the use of x -ray exposures. I gave twelve daily exposures with a strong light, at a distance of 10 cm., for ten minutes each. No visible reaction resulted, but the treatments had to be discontinued as I left for my vacation. Three weeks later, when I returned, my patient exhibited his feet to me, and to my great delight he was absolutely and perfectly free from all his corns and has remained so to this day.

HYPERIDROSIS NASI.

Two cases of this kind were subjected to radiotherapy, with the expectation that the rays would assist in limiting the excessive oiliness in analogy to their action in acne. Ten mild radiations were given in one of these cases at intervals of from three to four days, and the result as regards the size of the follicles and the secretion was satisfactory.

DERMATITIS STAPHYLOGENES.

CASE 5.—This was a remarkable case of an inflammatory affection, covering the back of the right hand, consisting of an eruption of multiple pustules, weeping and the other signs of an acute dermatitis. This condition seemed to me to be secondary to previous energetic treatment by the home physician, Dr. Sauerhering, Wausau, Wis., consisting in electrocautery for a trouble, the nature of which I could only guess, but in regard to which I had microscopic findings by Professor Zeit of Northwestern University, who declared that there was nothing malignant present, at any rate no tuberculosis. As the condition had rebelliously resisted continued treatment in various ways before, I decided to employ x -ray exposures. These were given with a strong light at a distance of about

10 cm. for ten successive days, when there was a decided erythema surrounding the affected patch. The pustules, however, had ceased making their appearance after the first few treatments, and the oozing had become considerably lessened. The patient was very anxious to leave for his home, but reported to me two weeks later that his hand was perfectly cured.

Of non-dermatologic affections I have used the rays in two cases of acute epididymitis, but was unable to say whether they helped the progress of the cases very much. In a case of hip-joint disease, in which I was asked to administer the rays, the effect in alleviating pain was very noticeable.

CONCLUSION.

Were I to attempt an explanation of the beneficial action of the x -rays in all these cases I would surely side with those who deny any particular effect on microorganisms, but who, basing their opinion on microscopic evidence, as does Scholtz, attribute to the rays a special affinity for pathologic cell formations, which, under the influence of the rays, undergo metabolic changes and even entire disintegration.

In conclusion, I can only say that my experience with radiotherapy so far has made me an ardent advocate of it, and I believe that until it is replaced by something still more marvelous it will constitute one of the most effective weapons in our fight against a large class of dermatologic affections.

THE PROGNOSTIC VALUE OF TUBERCLE BACILLI IN SPUTUM.

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The sputum of each patient at the Adirondack Cottage Sanitarium is carefully examined every six weeks. In this paper the results of these observations carried out at the sanitarium during the last two years have been made use of to determine the possible prognostic value of quantitative and qualitative changes in the tubercle bacilli occurring in the sputum of phthisis. Before giving the results of the observations it might be well to recall briefly a few facts which, though thoroughly familiar, are of sufficient importance to review at this time.

Pulmonary tuberculosis has no characteristic form of sputum. It may vary in quantity from almost nothing to even 1,000 c.c. in twenty-four hours. The absence of sputum is no better sign of the absence of pulmonary tuberculosis than is the absence of cough. An abundant, mucoid, more or less frothy sputum, which often contains no tubercle bacilli, at times marks the onset of miliary tuberculosis on a chronic or less acute form of the disease. In fibroid tuberculosis of the lungs there may be little or no expectoration and no tubercle bacilli may be found for long periods.

The character of the sputum macroscopically is no absolute criterion of the presence or absence of the tubercle bacilli. Tubercle bacilli may occur in watery mucoid sputum, as well as in the usual mucopurulent variety. Tubercle bacilli may occur by millions in one part of a specimen and be absent from another. The bearing of this fact on the number of the bacilli in a specimen is readily seen.

The staining properties of the tubercle bacillus depend on its resistance to decolorization. As some hold that many of the tubercle bacilli in a preparation are not stained when it is ready for examination, the great value of sufficiently overstaining is easily seen. Carbol fuch-