

This appears to me to have been a very remarkable injury, and one worthy of being placed on record. It was probably caused by a forcible bending backwards of the lumbar vertebræ, with splitting off of a fragment from the second lumbar, which nipped and imprisoned the bowel as it sprung back into position, the lower fragment being still firmly attached to the intervertebral disc.

I am much indebted to Dr. Lane, and Dr. Gray of the Melbourne Hospital, for notes of the case, and to Dr. Howard for permission to publish it.

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### RADIUM TREATMENT OF SUPERFICIAL LESIONS.

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The following notes are based on a series of over sixty cases of various kinds treated with radium during the last two years. They include rodent ulcers, epitheliomas (which form the majority), papillomas, keratoses, sarcoma, affections of the lips, pigmentations, lupus-erythematosus, psoriasis, nævi, and hypertrophic cicatrices.

In only three cases has the result been unsatisfactory, and in these cases the growth (carcinoma) was too extensive to be effectively treated. One was an inoperable carcinoma of the cheek in an old woman, another an epithelioma of the lip in an old woman who refused operation, and the third a recurrent carcinoma of the side of the head, involving the bone.

Many of the growths treated were in such a position that operative removal would have been difficult, and the resulting scar would have caused unsightly contractions, and interfered with the normal physiological working of the part, as, for instance, in Case 2, where a rodent ulcer involved the lower eyelid, and was obstructing the lachrymal duct entrance. On the other hand, the scar, if it can be so called, left after the growth has been removed by radium, causes no contraction, leaves the skin soft and supple, and cannot be noticed except on close inspection, when the skin is seen to be slightly thinner and paler than the normal. Case 3, where a rodent ulcer involved the free edge of the lower eyelid, is a good example also of the beautiful cosmetic result which would have been

impossible if part of the lid had been removed by operation, as would have been necessary, whereas now the mark left is practically invisible. Where the nose is attacked by epitheliomatous ulceration, too, it requires a very skilful plastic operation to cover the defect left after thorough removal, which necessitates sacrifice of a margin of healthy tissue; but, on the other hand, it is wonderful how an apparently deformed and mutilated nose regains its shape when the disease heals up under radium applications, as in Case 13. Unsightly pigmentations can be removed without producing marked scars, such as may follow other methods, if the applications are just sufficient to cause their removal, and no more. This is a great advantage in the case of young women, and requires great care and patience, as, in my experience, no two cases react quite alike, a reaction following, perhaps, in one case in half the time it will in another.

I have never yet seen telangiectases appear, even after strong reactions, as after X-ray dermatitis, though some writers warn against such an occurrence. When a reaction is produced, unlike that produced by the X-rays, it is not painful, though itching is often marked, and it may be tender to the touch; but if the spot is subject to friction of the clothes, an excoriation is easily produced, and may be persistent if the friction is continued. In one case of a mole on the shoulder, slight ulceration was caused by friction of the dress, and did not heal for about a month, even though a very mild application had been given. This puzzled me for a long time, till I recognised that the friction caused it, after seeing a similar case; so that where areas treated are liable to be rubbed, precaution should be taken against this.

Formerly, when my supply of radium was limited to one capsule of five milligrams, I used it in conjunction with X-rays, but latterly, since I have increased my supply, I have given up using rays when the surface to be treated is not extensive. The results are just as rapid with radium alone, more easily regulated, and the results are of more scientific value.

The radium I now use consists of the pure bromide of full activity. One specimen contains five milligrams in the original mica-covered capsule imported from Messrs. Watson and Sons,

London, and a second contains six milligrams obtained from the same firm, and spread out in celluloid varnish over an area of one square centimetre. This was done by Mr. Fred. Baker, of Watson and Sons, Melbourne, and though not spread very evenly, it gives excellent results. When applying these, I usually place a very thin layer of rubber between them and the skin.

Applications vary from ten minutes to one and a half hours, according to the tolerance of the skin and the amount of action desired.

When X-rays were used, the applications of radium were shorter in duration than when radium was used alone. The X-rays were applied only from five to ten minutes at a time with the bulb at 16 centimetres from the skin, and a current of one milliampère through a tube with an alternate spark of 4-10 centimetres, twice a week. As I mentioned before, whenever possible now I use the radium alone, and the results are as good, if not better.

So far only one recurrence in the scar has come to my knowledge, and that disappeared after a few applications. I attribute this to the patient leaving before the part had received sufficient treatment, and I think treatment should be carried on for a while after the desired result appears to have been obtained. In positions where a reaction is easily produced, even by very short applications, as, for instance, over the mucous membranes, it is advisable to interpose two or three layers of fine tinfoil, such as is found wrapped round cigarettes or sweets. This device allows of more prolonged applications being made without producing an erythema so easily, and does not seem to delay curative action. However, filtering off the softer rays in treatment of deeper growths is a different matter, and will not be dealt with in this article.

#### RODENT ULCER.

Under this heading I place only those typical cases with a pearly rolled edge; doubtful cases are classified as epithelioma. None of these cases were very extensive, nor had any involved the bone. All did very well, and only one recurred, which has been mentioned:—

(1) M. F., æt. 75, male. Small rodent of right cheek, the size of a threepence; present over twelve months. Completely disappeared after nine mild applications of radium and five short rayings. Scar supple, and not noticeable.

(2) M., male, æt. 70. Rodent ulcer of the inner half of lower eyelid, noticed two years ago. Now involving the inner canthus and obstructing the tear-duct. Breaking down in the centre. It cleared up under X-rays and radium, leaving a supple scar, not noticeable, and the tear-duct quite free again. He had a slight recurrence in the outer end of the scar, due to ceasing treatment before advisable. This, however, soon cleared up with a few strong doses of radium.

(3) C., male, æt. about 60. Small rodent ulcer on centre of lower lid, half an inch long placed vertically, and involving the free edge of the lid. Slight crusting present. Cleared up after about three hours' application of radium. Later on it reappeared beyond the area treated, and this also resolved with a few applications. There was no recurrence in the treated area, and the site does not show, except on close inspection, eight months later.

(4) Mrs. H., æt. about 50. Rodent of left cheek the size of a threepence, noticed two years ago; healing in the centre, and spreading at the edge. Healed up after two and a half hours of radium and four rayings.

(5) Mrs. E., æt. 40. Pearly rodent below the outer canthus of the right eye, irregular in shape, the size of a sixpence, and extending on to the lid. Present many years; crusted in the centre; cleared up after ten hours' radium applications.

(6) T. H., male, æt. 50. Small pearly rodent on the side of the nose close to the canthus of the eye. Cleared up after five hours' application of five milligrams pure radium and three hours of two milligrams of quarter strength.

(7) P. O'N., male, æt. 76. Oblong rodent ulcer of lower eyelid just below the inner canthus. Noticed two years ago. Length, one inch; breadth, one-third inch. Cleared up after ten hours' radium applications and six rayings.

(8) J. McK., male. Rodent ulcer below the lower eyelid one inch long, with raised pearly edges, and a deep fissure in its centre. Cleared up after nine and a quarter hours' radium applications and four rayings.

#### SUPERFICIAL EPITHELIOMAS.

The majority of these were of the flat variety, and nearly all the seat of chronic ulceration.

(9) Mrs. C., æt. 75. Growth on upper eyelid the size of a large pea, with slight ulceration on the apex. Present as a small wart for years, but has grown considerably in size the

last few months. Only mild applications were used, to avoid a severe reaction. It disappeared after about five hours' radium applications and a few very mild rayings. Six months later no trace left.

(10) S., æt. 65, male. Superficial ulcerated epithelioma of the side of nose at the junction of the tip with the ala. Half an inch long; present two years, and covered with a dry scab, under which it showed an irregular discharging surface. Complete disappearance after five half-hour radium applications and five rayings of ten minutes each. Two months later no scar noticeable except on close inspection.

(11) C. K., æt. 70, male. Circular raised epithelioma of scalp one inch across. Present three years; operation refused. Began as a pimple. Has been treated by a chemist and irritated with caustics. Cleared up after nine rayings and five radium applications. Supple scar quite sound six months later.

(12) R. U. N., male, æt. about 65. Very painful ulcerating recurrent epithelioma of the side of the head. Ear has been removed by operation. Bone implicated; too large to treat effectually with radium. Not improved by radium or rays. Pain not relieved.

(13) Mrs. R. J., æt. 65. Superficial ulcerated epithelioma over R. ala nasi; present two years, following a scratch. Growth extends inwards, almost blocking the nostril. Treated twice weekly with half an hour radium applications and eight-minute rayings. Six sittings caused complete disappearance and left the nostril quite free.

(14) Wm. R., æt. about 60. Inflamed nodular growth between eye and ala nasi. Present a year; base inflamed and thickened, and it contains sebaceous matter. Disappeared after two and a half hours' radium and three rayings. Three weeks later site not noticeable.

(15) Mrs. K., æt. 50. Small growth the size of a pea between eye and ala nasi, with a superficial serpiginous ulcer above it on an infiltrated base. Present two years. Ulcer disappeared after four and a half hours' radium and two rayings. Four months later only a slight trace of the papule, and ulcer quite soundly healed. Two more applications of radium caused papule to quite disappear.

(16) W., male, æt. 66 years. Small crateriform epithelioma over mastoid bone on inflamed base; present twelve months. Cleared up after six hours' radium and fourteen rayings. This small growth was very obstinate.

(17) McL., æt. 70. Raised circular, crusted epithelioma of pinna of ear one inch in diameter, causing the ear to stand out at right angles to the head. Painless, and present six weeks, beginning as a pimple. Patches of heratosis senilis scattered

over the face. Healed up rapidly under raying and radium. Five months later result was all that could be desired.

(18) Ed. C., male. Small, irritated, warty growth on neck. Present four years, and increasing in size. Has had an epithelioma of lip operated on some time ago. Growth disappeared after one hour's radium application and two mild rayings.

(19) Mrs. B., old woman, with a large, tender crusted papillomatous growth of upper edge of pinna of ear. Present nearly two years. Also superficial ulcer on tip of nose, which refuses to heal. Complete disappearance of growth after eight applications of radium and six rayings. Ulcer of nose quickly healed under radium.

(20) M. G., male, æt. 71. Crusted nodular growths, one below eye, one on cheek, and a third on the back of the neck. Healed up after three and a half hours' radium and five rayings of ten minutes.

(21) Mrs. L., æt. 72. Epithelioma of bridge of nose the size of a large pea on an inflamed base, ulcerating at top. Two years' duration. Disappeared after one and three-quarter hours' radium application, causing a smart reaction. Five months later scar quite sound.

(22) G., male, æt. 55. Small pea-sized epithelioma in nasolabial angle. Present two years. Crusted on top. Cleared up after six hours' application.

(23) Mrs. C., æt. 60. Very painful inflamed crateriform epithelioma above eyebrow; present some years, and getting worse. Several keratotic growths on face. Latter quickly responded to radium. Former was very resistant to treatment by rays and radium, but cleared up with strong doses of the latter.

(24) Mrs. N., æt. 65. Many small keratotic spots on face, and a large superficial ulcer on a slightly thickened base over the zygoma. All unaffected by ordinary treatment. Has had growth removed by rays two years ago. Present ulcer was not improved by strong rayings, but rapidly disappeared with radium applications, as did the keratoses.

(25) Mrs. B., æt. 65. Superficial ulcerated epithelioma of nose. Completely disappeared after six hours' application.

(26) Mrs. T., æt. 40. Crusted, tender, inflamed papilloma of ala nasi. Completely disappeared after seven and a half hours' application.

(27) M. R., male, æt. 50. Inflamed epitheliomatous ulcer of the side of the nose of two months' duration. Began as "a corn," which he picked. Healed firmly after five and a half hours' application.

(28) T. H., male, æt. 50. Nodular growth of temple previously removed with X-rays by a layman. Very severe doses

were given, causing loss of hair on the side of the head and scarring of the cheek and ear. This recurrence disappeared after eleven hours' application of radium.

(29) H., middle-aged man, with chronic superficial ulcer of the lower lip. Present two years, and never heals up for more than a day or two at a time. Radium applied short of producing a reaction for four hours altogether. Ulcer healed, and site appeared quite normal some months later.

(30) H., æt. 65. Small oval ulcer of lower lip, with raised edges and infiltrated base. Duration two months, and growing. Disappeared after five hours' application, with production of a mild reaction.

(31) E., middle-aged man. Has had a fissure of the lip two years. At present there is a painful fissure, with a very tender inflamed papillomatous epithelioma at its anterior end. Completely healed after six and three-quarter hours' application, with a mild reaction. Papilloma rapidly disappeared, and practically no scar left.

(32) Mrs. H., old woman, with an ulcerating epithelioma of the lower lip the size of a hazel nut, quite movable, and no glands felt. Objected to operation. After forty hours' application of radium through two layers of tinfoil, or quarter millimeter of aluminium, to prevent severe reaction, the growth receded, and almost healed. But a month later it started to grow rapidly, and she was induced to have it removed. This growth might have been cured if the patient had attended more regularly, or if larger quantities of radium had been available.

Many patients advanced in years presented those intractable patches of keratoses so common in the aged, often with ulceration, and these cases do very well under radium treatment. If untreated, these spots often become the seat of epitheliomas, several of the above having originated in this manner.

#### SARCOMA.

(33) One case was treated. A woman about 35 years of age, with a translucent active growth on the under surface of the upper lid, causing pressure on the eyeball. Twice removed by an oculist. Removal of the eye advised, but refused. Radium was applied after everting the lid, and also outside the lid, and the growth was practically cured, when a small nodule was seen between the eye and the lower lid in a spot inaccessible to treatment. Operation was still refused, and the patient was lost sight of. Microscopic examination of a fragment showed the original tumour to be an active sarcoma.

#### HYPERTROPHIC CICATRIX.

Three cases were treated, all with a most favourable result:—

(34) Miss B., a pretty girl, about 20 years old, with an unsightly red hypertrophic scar following excision of tuberculous glands. The scar flattened down, and the redness faded, after several mild reactions were produced with radium.

(35) H. P., a young man, with hypertrophic cicatrices following a very severe burn on the right arm and side. Large, firm bands of contracting scar tissue in the bend of the elbow and up the arm prevented extension of the arm. It was getting worse, and preventing him from following his occupation as a painter. After eight rayings and eight applications of radium along the bands they gradually became softer and flattened, and he was discharged, able to use the arm freely, and this improvement continued, and he is able to use the arm well now, twelve months after treatment.

(36) J. O., æt. 50. Hypertrophic cicatrix of neck two inches long surrounded by a patch of eczematization; very irritable. Scar flattened after an hour's application of radium and two rayings, and eczematous patch cleared up.

#### PSORIASIS.

(37) Small patches were very quickly removed with about twenty minutes' application, leaving brownish pigmentation, and have not recurred in twelve months. The pigmentation has cleared off, and the patches do not leave any mark.

#### PIGMENTATIONS.

(38) Mrs. B., elderly, presented a circular brownish yellow patch on the bridge of the nose the size of a threepence. It disappeared after a mild reaction was induced with radium.

(39) E. H., a baby four months old, had a large congenital superficial *café-au-lait* coloured patch of pigmentation on the left temple extending on to eyelids. This disappeared after doses sufficient to produce a lively reaction, leaving the skin normal looking.

#### WARTS.

These, as a rule, disappear without reaction after one application of sixty minutes. Very large ones may require two applications. No mark is left.

#### VASCULAR NÆVI.

These disfiguring blemishes offer a splendid field for radium treatment, receding rapidly, sometimes without a reaction being produced, and leaving the skin, maybe, a little paler over the site, but if care be taken not to overdo the treatment, the

result is all that could be desired. From my limited experience, I should say that the raised violet-coloured nævi recede more quickly than the flatter and brighter ones. If time is no object, they may be caused to disappear with only the production of a faint rosy reaction, and with no discomfort to the patient at all. If large doses be given, and sufficient reaction be produced to cause scab formation, there is liable to be left a pale atrophic condition of the skin, thus sacrificing a good cosmetic result for speed.

(40) Baby H., æt. four months. Bright red nævus over left frontal bone, slightly raised, and swells on crying a little. Developed after birth. Radium applied twice weekly, from ten minutes to half an hour at a time. Slight pink reaction showed occasionally, and was allowed to subside. After a total of five and three-quarter hours the nævus completely disappeared, and the site can only be detected on close inspection.

(41) Baby R., æt. seven months. Raised circular nævus in centre of forehead over site of anterior fontanelle. Diameter,  $\frac{3}{4}$ -inch. Bright red, swelling up and becoming dark when baby cries. Developed since birth. Though large doses of one hour twice a week were given latterly no definite reaction occurred, and the nævus steadily receded, and disappeared after eleven hours' total applications.

(42) Child, aged five years. Had a little elongated bright red nævus standing out from the face close to the nose, like a little horn on a red base. This case required careful treatment, as a reaction was easily produced. After eleven hours' total applications all redness disappeared, and a crust formed, on removing which a small single vessel, apparently in the centre of the papilla, bled a little. Treatment was then stopped.

(43) Baby P., æt. four months. Large, deep nævus of the back over the lower cervical and upper dorsal region measuring 4 by 3 centimetres, with the long axis transversely. The edges were deep purple, and the centre excoriated, and exuding serum freely. It appeared after birth, and has been increasing in size. It is raised up, causing a fluctuant tumour; also, there was a red flat, more or less superficial, nævus of the buttock, also developed since birth, and spreading. Two five milligram capsules were applied over the back and moved round from time to time, with tinfoil between the radium and skin in two or three layers to cut off the very soft rays.

Treatment was begun on October 5, and carried out with interruptions to allow of mild reactions passing off. On November 3, after ten-hour application of the ten milligrams, all ulceration had healed, and there was great improvement.

The patient was discharged on February 15 cured. The purple colour had given place to a more or less normal tint at the edges, and over the area which had been ulcerated it was firm, though thin, whitish, and atrophic looking. Fluctuation had gone, but there was left a thickness where the tumour had been which felt like fibrous tissue. The flat nævus on the leg had fourteen hours' treatment, and the rubbing of the napkin had caused a little erosion, but the nævus was practically gone. The mother had directions to return if there were any signs left at all, and so far I haven't seen her again.

#### LUPUS ERYTHEMATOSUS.

I have at present two cases under treatment, both of the chronic discoid type, and limited to the face, one being very extensive. The latter has been under treatment for over a month, and already great improvement is manifest. In the other case it is too early to give any opinion. In these cases the affected area reacts fairly quickly, and the scar left after treatment resembles the scarring where the disease disappears spontaneously, as it sometimes does in mild cases. In a disease so often aggravated by active measures, and always so rebellious, the improvement following radium treatment is all the more satisfactory, especially as X-ray treatment does not always benefit it, and is said in some cases to aggravate the condition.

The cases I have reported above are those met with in the ordinary course of practice, both private and hospital, and have not been selected ones.

With regard to instrumentation and dosage, much has been learned from the excellent articles in the *Revue de Médecine* by Drs. Louis Wickham and Degrais, the great pioneers of radiumtherapy.

With regard to the histo-pathology of the tissues treated by radium, and the explanation of the beautiful æsthetic results obtained. I cannot do better than quote from the *Revue de Médecine* the following:—

Histology of tissues remaining after treatment of vascular nævi by radium according to MM. Dominici and Barcat.

taken from the article written by Drs. Wickham and Degrais in the July number of the *Revue de Médecine*, 1908, pp. 632 and 633:—"After MM. Dominici and Barcat, the histological process of regression of nævi under the influence of radium occurs probably after the following manner:—The fibrous fascia and the elastic and connective tissue fibres of the blood-vessels are absorbed; at the same time the fixed cells of the inter-vascular connective tissue and the cells of the vascular coats return into an embryonic state. The embryonic connective tissue cells proliferate and remain connected together in a network or syncytium. The latter extends at the expense of the blood-vascular cavities, which gradually contract. The angiomatous tissue is thus replaced by a collection of embryonic connective tissue cells, between which the capillary blood-vessels spread, relatively narrowed and separated. The young connective tissue cells become disposed parallel to the surface of the skin, and reform adult connective tissue. They then secrete new connective tissue bundles and new elastic fibres, atrophying proportionately with the formation of these secondary elements. The connective tissue of new formation differs from cicatrized inflammatory tissue in several characteristics, namely—(1) By the addition of fixed cells, connective tissue bundles, and principal elastic trunks following a regular stratification. (2) By the absence of expansion of newly-formed connective tissue beyond its natural boundaries, and consequently above the level of the superficial cutaneous surface. (3) By the delicacy of the connective tissue bundles of new formation. The apparent conformation of the external integument is in agreement with this structure, since the skin remains smooth, flat, and supple in the area formerly occupied by the angioma. In short, the histological process in the cure of nævi consists essentially in modifications of evolution of the vascular connective tissue, ordered and regulated by the action of the Baquerel rays. These cause a new embryonic formation of the angioma, followed by a reorganisation of their elements, which become reunited into the form of fibrous tissue, which has a uniformly regular texture.

"This explanation is based on the researches which MM.

Dominici and Barcat have made in regard to the modifications caused by radium on normal skin and different pathological tissues (tuberculous, lymphosarcomas, sarcomas, epithelial cancers, &c.) In all the cases studied by the authors radium radiations determined similar transformations in healthy normal tissues. It is unlikely that nævi escape the law to which other tumours are subject."

Also, in an article read before the French Society for the Study of Cancer, reported in the *Revue de Médecine* of December, 1909, MM. Delbet and Herrenschmidt describe the action of radium on carcinoma tissue supported by histological examination before and after treatment. They emphasise the selective action of the rays on the cancer cells, but point out that if a dose insufficient to modify these cells be given it may merely stimulate the growth into greater activity, and emphasise the fact that the growth should receive evenly distributed doses over its entirety, and that the amount of radium used and the dose given should be sufficient to completely alter the constitution of the cancer cells. In small and superficial malignant growths I treated there was no danger of stimulating them, as sufficient dose was easily given, but in two of the cases that were beyond the power of my radium this stimulation was produced, and appeared to start beyond the range of the greatest activity of the rays where insufficient raying was received to alter the cells. This might have been overcome by longer and more frequent applications, but as both cases came from the country, and refused to remain in town, this was impossible.

With the large quantities of radium at their disposal, the physicians of the Radium Institute have already produced the most astonishing and satisfactory results on even large and inoperable malignant growths in many instances, and my excuse for reporting these cases is the uniform success I have had where I did not attempt too much, and by publishing my failures to point out the necessity of caution in trying to cure malignant growths that are not clearly within power of the radium one possesses, owing to the danger of stimulating them to more active growth.