

BETA RADIATION IN OPHTHALMOLOGY*

A. D. RUEDEMANN, M.D., and OTTO GLASSER, Ph.D.

For the past five years, beta radiation from radium has been used at Cleveland Clinic in treatment of corneal scars and lid lesions.

Beta rays had previously been advocated by Moore in treatment of tuberculosis of the eye.¹ Since tissue reaction in ocular tuberculosis is a low-grade, inflammatory process, we analyzed the use of beta radiation as a possible treatment of corneal scars and lid lesions in which a low-grade inflammation is also present.

Most patients with corneal scars are dismissed with the final statement that nothing further can be done. For patients whose vision is limited to light perception or moving shadows, an increase to recognition of large objects or those as high as 1/60 is extremely welcome. Slight improvement frequently marks the difference between complete dependency and self-sufficiency.

At present only two types of radiation, x-rays and gamma rays of radium, are used to any extent upon the eye. Both must be carefully handled to protect the lens and retina. They are successfully used in treatment of ocular conditions requiring deep penetration: carcinoma, sarcoma, and deep orbital pathologic processes.

Beta rays which we employ require an amount of radon in this form of therapy which is both considerable and expensive. Furthermore, such amounts of radon are not always easily obtainable.

Although beta rays as used in our treatments are of high intensity they are easily absorbed and penetrate only superficial layers of tissue; therefore it is safe to use them for lesions of the cornea and adjacent areas.

In preparing our beta ray applicator we seal radon in a small glass sphere (see illustration, R) approximately 4 mm. in diameter with a wall 0.1 mm. in thickness, which absorbs the alpha rays. This glass sphere is inserted into a thin metal capsule with open end (B2, B3). This capsule is then inserted into an open-ended brass holder (B1, B4), the wall of which is 2 mm. thick. Only a small glass window thus separates the tissue from the beta rays. Ninety-seven per cent of the emanating rays consist of beta rays: gamma rays make up the other 3 per cent, the alpha rays being absorbed in the glass. The handle (A) 35 cm. long, is held at one end with the open window at the other end of the holder placed against the area to be treated. Standard precautions are taken against undesirable radiation reaching the operator.

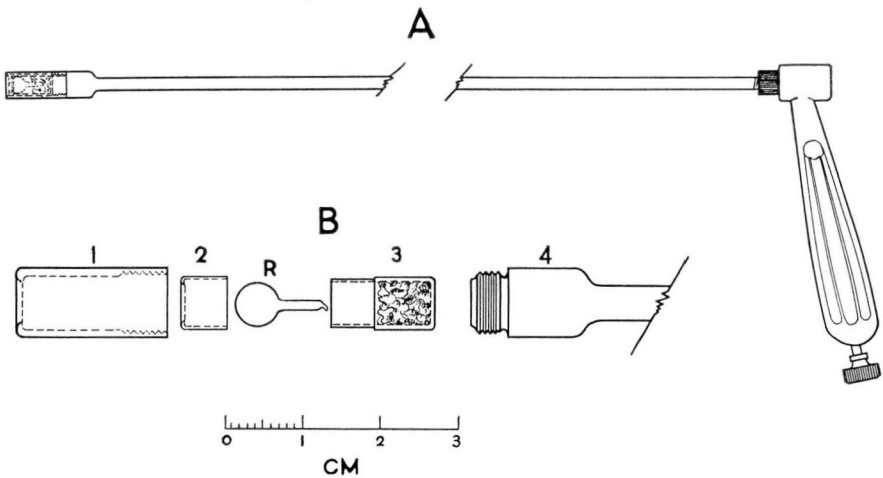
* Presented at the Annual Meeting of the Michigan State Medical Society at Grand Rapids, September 27, 1944.

BETA RADIATION

The gamma-ray strength of the radon bulb usually used is 200 millicuries. With this bulb the average dose applied is 5000 mg. Treatment time is therefore $5000/200$ or 25 seconds.

Approximately fourteen to twenty-one days after treatment maximum reaction is observed. A four-week interval between treatments is advocated to permit the reaction to subside.

In treatment of palpebral conjunctival lesions, two-tongue blades are fastened end to end with a short overlap to hold the everted lid. A long applicator is used to raise the fold in the upper cul-de-sac.



In lesions of the ocular conjunctiva and the cornea, the surface is anesthetized with 0.5 per cent pontocaine and a speculum introduced before the beta radiation therapy. Patients are treated in a sitting position. A spotlight is used for illumination. A head loupe helps maintain proper corneal position, especially for minute corneal nebulae. Thus, no assistants are near the open end of the applicator. It is important that assistants avoid exposure to the rays, especially if many treatments are given. A lid speculum is necessary in treatment of corneal lesions because most patients cannot or will not hold their eyes still longer than five seconds, and immobility of the eye is necessary.

The first treatment was given in December, 1941, and treatments have been given every four weeks since that time, making a total of 725 treatments to over 100 patients, the average number of treatments being seven per patient.

Overgrowths of the lids are of minor importance from a visual aspect but of major importance from a cosmetic standpoint. Treatment of these

lesions by beta radiation has been satisfactory. The marginal areas have been left free without notching and without recurrences.

Beta rays have been used in the treatment of early tuberculosis by Gifford,² and we have used it in small basal cell epitheliomata in a total of 10 cases. This group with involvement of lashes and lid margin has long been neglected because we feared notching, and the patient feared operation. With beta rays only a few lashes are lost, and two treatments are usually sufficient. Incidentally, we have treated several basal cell epitheliomata of the face with equal success.

Lesions on the palpebral surface of the lid have also responded well to treatment. Vernal catarrh is treated by a variety of procedure. Treatment with beta radium was tried in a series of cases. After instillation of 0.5 per cent pontocaine, the field is freed of moisture and then held everted with a double-length tongue blade for the application. This procedure affords prompt relief. This condition, a polypoid degeneration of the membrane, requires more than one application in severe cases and, as in one case at Cleveland Clinic, may even require replacement of the membrane. In several lymphogenous overgrowths of the lid margin with involvement of one corneal margin, a satisfactory result was obtained. In all, about 15 patients were treated, and those who followed local and general therapy were definitely benefited. All have had complete investigation for allergic problems, and the general routine for their relief has been followed.

Under allergy treatment alone, follicles or polyps will not disappear even with a rigid routine. A change in the epithelium from large pavement blocks to a thin nonirritating membrane in which reversal cannot take place is the best that can be expected or anticipated.

Lymph overgrowths on the ocular conjunctiva usually disappear completely under beta radiation. We used radium needles with reasonable success in the past, but duration of treatment was much longer, and the results were not good when a lesion extended above the superior margin of the upper lid into the upper cul-de-sac.

Two patients with severe keratoconjunctivitis were given one application over the entire corneal area, and both responded well to therapy. After using beta radiation in treatment of a patient for severe conjunctivitis of obscure origin with the clinical appearance of an acute blennorrhea of the inclusion type, the beefy membrane and large follicles disappeared. This had been an old chronic condition with repeated exacerbations.

This report would be unduly prolonged if each case were described. Suffice it to say we have been impressed by the satisfactory results obtained in treating our allergic cases.

A similar group with ocular tuberculosis as that reported by Moore¹ gave comparable results. We have had a large number of these patients, and in all but two the lesions were on the cornea. Superficial scarring or superficial involvement, such as production of a nebula or at most a macula, gave the best results with almost complete disappearance of the scar or lesion. Treatment of corneal macula or corneal leukoma was moderately successful. Here again, general measures, such as heliotherapy, high vitamin intake, regulation of habits, and occupational therapy, were also used. In our experience, the cases treated with beta radiation had a shortened period of involvement and were followed by better results.

Corneal scarring from various causes fell into three pathologic groups: corneal nebula, macula, or leukoma. The duration of the lesion played a part in the result of treatment. Depth of involvement was most important. Superficial lesions responded promptly and satisfactorily. With most corneal nebulae, the vision was definitely improved.

Maculae became less dense and smaller after beta radiation, and leukomas were improved by contraction of the area and thinning of the margins, although where there was little or no effect on the main lesion, gamma rays were used. The patient is benefited if the scar can be reduced, especially when it encroaches on the pupillary space.

Acute interstitial keratitis due to syphilis has shown improvement with beta radiation as an adjunct to systemic therapy. Four such cases have been treated. The earlier treatment is instituted, the better the result. Keratitis due to vitamin deficiency or trauma is also benefited.

Many patients have been treated for symblepharon, pseudo-ptyerygium, and recurring pterygium. These conditions present similar corneal problems: superficial overgrowth, deep infiltration, and frequently presence of a deep blood supply, which is marginal in origin but passes through the deep substantia propria. Treatment is directed to closure of the deep vascularization. This cannot be accomplished by surgery alone, but surgery with radium therapy approximately one week later has produced good results.

Several complete keratoplasties supplemented by beta radiation treatment were attempted with questionable success. We believe it is possible to enlarge a clear zone in the cornea, but we do not believe new corneal tissue can be produced. This is true of most corneal transplants. If the entire cornea is scarred, the transplant will not remain clear. Beta radiation, however, may help to maintain clarity in some patients.

We have also treated intractable blepharitis marginalis, distichiasis, herpes, and postsurgical scarring with varying results, mostly encouraging.

CONCLUSION

1. Beta radiation proved beneficial to many patients, because even slight improvement lessened their dependency and enhanced their usefulness.

2. Beta radiation offers another method in the treatment of corneal scars and certain lid lesions, especially if applied early and in conjunction with other therapy. We believe that gamma radiation of the most dense scars can be used in conjunction with beta radiation treatment.

3. Cost, lack of availability, and persistency of the scar detract from the value of beta radiation.

REFERENCES

1. Moore, J. E.: Personal communication to author, (A.D.R.).
2. Gifford, S. R.: Personal communication to author, (A.D.R.).

TREATMENT OF CARCINOMA OF THE PROSTATE

CHARLES C. HIGGINS, M.D.

With the introduction of estrogen therapy and orchiectomy as supplemental measures in the treatment of cancer of the prostate, new concepts were made available for combating this disease.

Sufficient time has now elapsed to warrant evaluation of the various types of treatment. Opinions of other surgeons and a personal experience with 100 cases forms the basis for such an evaluation.

In 1941 Huggins demonstrated the effect of certain hormones upon carcinoma of the prostate.¹ With the advent of this knowledge a new era in the treatment of this disease has been entered.

Various treatments have been recommended: orchiectomy, administration of estrogen substances, and irradiation of the testes. Interesting observations have been made regarding such treatment. Alleviation of pain, pronounced regression of the primary neoplasm, and disappearance of metastasis have occurred in many patients. Some, however, do not respond to treatment satisfactorily; relief of symptoms is transitory, and in a few little benefit is obtained.

Randall in 1942 reported a series of 5 cases in which castration had been performed for carcinoma of the prostate in 1934.² Transurethral