Original Articles.

TUBERCULOUS SCLERITIS, A COMMONLY UNRECOGNIZED FORM OF TUBERCULOSIS.*

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THE etiology of scleritis has always been one of the obscure subjects in ophthalmology. At the present time, perhaps the view in regard to it most generally held is that the disease is dependent upon a rheumatic diathesis. This belief has come about not on account of any positive evidence in support of it, but probably on account of the tendency in the past to assign this cause to any disease of obscure nature. It has been recognized that scleritis in rare instances may be due to syphilis, and that it may occur in tuberculous individuals, where, however, it has not been regarded as in itself a tuberculous process. It has also been recognized that tuberculosis of the sclera may rarely occur, although it has not been thought that the condition was related to scleritis in its typical form. The few anatomical and bacteriological examinations that have been made in cases of scleritis have not seemed, heretofore, to throw any light on the etiology of the disease. Recently, in connection with the use of tuberculin, I have made some observations in a series of cases that have convinced me that scleritis is almost always a tuberculous process, that tuberculous scleritis presents certain distinctive features and that in cases in which the proper treatment can be carried out recovery may be confidently expected.

Although a considerable number of cases have now been reported in which tuberculin has been successfully used in the diagnosis and treatment of other forms of ocular tuberculosis,¹ especially tuberculosis of the iris, cornea, and conjunctiva, its use in cases of scleritis seems to have been almost entirely neglected. In fact, I have been able to find the report of only two cases of scleritis in which both a general and local reaction were obtained. In one of these cases, that of Wagner,² the inflammation entirely subsided within six weeks under treatment with tuberculin. The other case was reported by Czermak in the discussion of v. Hippel's paper on the treatment of ocular tuberculosis with tuberculin.³ In the same discussion Sattler stated that he had treated two cases of episcleritis with tuberculin T.R., presumably with good results. Von Hippel³ has himself reported two cases of scleritis in which highly satisfactory results followed injections of tuberculin T.R., but he did not state that a tuberculin reaction was obtained in either.

The cases in which my observations were made were only thirteen in number, but their significance is increased by the fact that they

were unselected cases of scleritis, and included all those that came under my charge during my services in the out-patient clinics of the Infirmary and Carney Hospital during the past year. In one of the cases the diagnosis was made and treatment with tuberculin carried out by Dr. G. S. Derby,⁴ working independently, before the patient came under my care. The cases were all tested with subcutaneous injections of Koch's old tuberculin, and with the exception of two cases were all admitted to the hospital for this purpose. A positive general reaction was obtained in all cases, and a local reaction in the eye in nine cases. Where the reaction was at all doubtful, the injection was always repeated with a larger dose.

The control temperatures, which in every case were taken during the twenty-four hours preceding the tests, were always within normal limits. The method finally adopted was to give an initial dose of 1 mg., then if necessary 1 mg., and finally 10 mg., at intervals of forty-eight hours. The maximum dose of 10 mg. was necessary in only four cases, but in two others it was used to obtain a local reaction. The lowest febrile reaction obtained was 100.3° in three cases. The highest was 105° in one case, the next highest 104° in two cases. In the other cases the reaction varied between 101° and 103°. The shortest time that elapsed before the height of the reaction was reached was nine hours (105°), the longest, forty-eight hours, and the average time twenty-two hours.

As just stated a local reaction was observed in 9 cases. In only one of these was the reaction slight and possibly open to doubt. In this case it followed an injection of 1 mg. and was accompanied by a febrile reaction of 100.7°. Forty-eight hours later a second injection of 10 mg. was given which produced marked constitutional symptoms and a temperature of 105°, during the continuance of which the eye not only showed no reaction but became decidedly less inflamed and remained so. The local reaction in the other cases consisted in an increased chemosis and congestion of the affected region, and where keratitis was present, sometimes in an increase in the corneal infiltration. Except in one recent case, the local reaction quickly subsided leaving the eye more or less improved.

All of the patients were females, which is in accordance with the established fact that scleritis is more common in this sex. The youngest was aged eleven years, the oldest, forty-six years, and the average age was twenty-six years. During the time I saw them the scleritis was active in one eye only, but in three cases there were corneal opacities in the other eye, which, judging by their appearance and by the statements of the patients, were due to a previous inflammation of the same nature. With the exception of one case the patients were well nourished and apparently in good health, aside from the ocular trouble. Two of the patients stated that they had formerly

⁴ Dr. Derby informs me that more recently he has also obtained a local and general reaction in another case of scleritis.

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¹ For a review of the literature on the use of tuberculin in the eye, see paper by W. E. Gamble and E. V. L. Brown, Jour. Am. Med. Assn., Oct., 1905.

² Wagner: Münch. med. Wochenschr., 1891, No. 15, p. 266, No. 16, p. 286.

³ v. Hippel: Bericht. d. Versamm. d. Ophthal. Gesell. zu Heidelberg, 1905, p. 136, and Arch. für Ophth., 1904, lix, i, p. 1.

suffered from "rheumatism," possibly tuberculous arthritis. A thorough physical examination was made in each case, but evidences of tuberculosis in the lungs or elsewhere were made out in only three cases. One of these was a child eleven years of age, who showed enlarged cervical glands and some signs of pulmonary involvement, but no tubercle bacilli in the sputum.⁵ The second case, aged twenty-eight, gave evidences of an old process, probably healed, at the apex of the right lung, while the third case, aged thirty-nine, showed slight signs of incipient tuberculosis at the apices of both lungs. In the latter case there was no definite reaction to tuberculin in the eye, and during the general reaction the patient complained of severe pains in the mediastinum. There was a definite family history of tuberculosis in only two cases. One of these was the child just referred to, whose twin sister and both of whose parents had died of pulmonary tuberculosis. In the other case the father died of Addison's disease at the age of sixty years, while a brother, who had suffered from Pott's disease in early childhood, was attacked by scleritis at the age of fifteen years, which involved first one and then the other eye.

The cases were all such as are commonly met with, and conformed to the classical description of anterior scleritis. In two of the cases the inflammation was apparently more superficial than in the others and would have come under the arbitrary classification of episcleritis. All of the cases showed more or less definite nodules and thus presented what is sometimes distinguished as the nodular form of scleritis. During the subsidence of the affection, however, after the nodules had disappeared, the diffuse form was often simulated, so that it is probable that there is no real distinction between the two forms. The nodules of scleritis seldom merit the name, since they most often appear simply as elevated areas in the sclera. They usually reach a considerable size and are situated at some distance from the cornea, most often, perhaps, where the anterior perforating vessels enter the globe. In addition to these larger well-known elevations, I have frequently noticed the occurrence of much smaller nodules which are situated beneath the conjunctiva and form the centers of small congested areas. At some period of the disease they were observed in all except three of the cases here reported. They vary from less than one to several millimeters in size. The smaller ones are almost perfectly translucent, the larger are apt to be more or less opaque and yellowish in color. They usually occur in the vicinity of one of the larger elevations, sometimes immediately upon it, but are not necessarily confined to this situation. Sometimes they occur near the limbus, where they may be mistaken for phlyctenules, but I have never seen them exactly on the limbus.

⁵ I am indebted to Dr. F. T. Lord for the clinical notes on this case. The patient was referred by him from the Channing Home to the Infirmary, on account of a local reaction in the eye following an injection of tuberculin. In most of the other cases the general physical examination was made in the Out-Patient Department of the Massachusetts General Hospital. Two cases were kindly examined for me by Dr. J. H. Pratt, and three cases by Dr. W. Tileston.

Frequently they border on a small blood vessel. When an attempt is made to excise one of them, a small white spot is left behind in the sclera.

No doubt these small nodules have also been noted by others. Vossius⁶ almost certainly refers to them, and Fuchs in his textbook probably also refers to them when he speaks of small hard nodules which disappear without disintegrating. So far as I can ascertain, however, attention has not hitherto been called to what I believe is their chief peculiarity, namely, their tendency to appear and disappear within a very short time, within less than a week, for instance. The histological examinations which I made of these nodules, in four cases, showed that the essential lesion was a focal proliferation of epithelioid cells, among which an occasional giant cell occurred, surrounded by an infiltration of lymphoid and plasma cells. (Figs. 1 and 2.) The vessels in the neighborhood showed perivascular infiltration with chronic inflammatory cells and the sub-epithelial tissue showed a similar infiltration in a greater or less degree. Caseation was entirely absent. Numerous sections, specially stained for the purpose, were unsuccessfully examined for tubercle bacilli. This result was not unexpected, since it is notoriously difficult to find the bacilli even in very active lesions. With the exception of the absence of caseation, these nodules thus had the structure of small tubercles. This being the case it was difficult to understand how they could disappear so quickly. An explanation was apparently found in the fact that the sub-epithelial tissue above the focal area was markedly edematous, so that it must have been the localized edema to which the appearance of the nodules as seen by the naked eye was mainly due. The color of the nodules, however, was probably dependent upon the amount of infiltration with lymphoid cells. No doubt, therefore, the sudden appearance or disappearance of these nodules is not due to changes in the size of the areas of epithelioid cells, but to the state of activity of the tubercle bacilli within the latter. When the resistance of the patient is low, the bacilli take on renewed activity and a localized edema results which again subsides when the resistance rises. Six times I have seen this phenomenon occur as a part, apparently, of a tuberculin reaction. On account of the foregoing considerations, therefore, I now regard the occurrence of one of these small nodules in a case of scleritis as alone sufficiently conclusive evidence of the tuberculous nature of the process.

In all except two cases interstitial keratitis was present at the time the patients came under my observation, and in three cases there was a sluggish iritis that had led to posterior synechiae. The keratitis, at least when in an active stage, seemed always characteristic. It consisted of a deep infiltration of the cornea, usually but not always extending out from the sclera on the affected side, which showed one or more punctate areas of greater density. Sometimes a punctate area was observed first in the clear cornea and

⁶ Vossius: *Ophth. klin.*, iv, 1900.

was afterwards surrounded by a hazy zone which increased or decreased apparently in accordance with the severity of the process. The variation in the density of the diffuse infiltration was always more apparent than in that of the punctate areas. Although I have had no opportunity to examine one of the focal areas in the cornea microscopically, it seems safe to assume that they correspond in nature to those in the sclera, that is to say, they are small tuberculous foci which become quiescent or active according to the resistance of the patients. Another characteristic feature of the corneal opacities was their slight tendency to become vascularized. New vessels were slow to make their way into the cornea, and the vascularization was always insignificant when compared to the density of the opacity or to the amount of inflammatory reaction. This was in accord with the tuberculous nature of the process since tuberculous lesions in general show a comparatively slight tendency toward vascularization. The new vessels, however, were apt to be large, although few in number. The scleritis often cleared up more rapidly than the keratitis, or at least appeared to do so, so that the eye sometimes showed simply a marked corneal infiltration with a slight circumcorneal injection. Such a condition, seen for the first time, might easily be mistaken for primary keratitis. In none of my cases has the corneal opacity entirely disappeared, but the extent to which it has cleared in some of them is remarkable and in all it has decreased in density. A considerable residual opacity, however, is of course to be expected in all the cases of long standing.

In the treatment of these cases one of the chief difficulties encountered was the lack of adequate facilities in either hospital for giving the patients a sufficient supply of fresh air. Only one case showed continuous improvement while in the hospital wards. This was an advanced case treated with ascending doses of old tuberculin, in which the inflammation entirely subsided within two months. The other ward cases did so poorly as regards both their general and ocular condition that they were soon discharged to be treated as out-patients. Three cases were unable to carry out the treatment advised and were lost sight of. One patient in whose case, however, the scleritis was not in a very active stage when first seen, recovered in three months after carrying out in a very imperfect manner the fresh air treatment at her home. In four cases, owing to the more favorable conditions under which the patients lived it was possible to adopt more desirable measures. The patients were directed to give up work, including household duties of any kind, and for the first two or three weeks to rest and take as much nourishment as possible. At night they slept in rooms with the windows open and during the day reclined in couches or hammocks in the open air, taking care to be well protected from exposure to cold. Later, when the ocular condition improved, a certain amount of exercise was permitted. Each patient kept a record of her temperature and weight and any

other details of importance. Twice weekly the patients visited the clinic where they received injections of Koch's old tuberculin. Each at first received a dose considerably below that to which she had reacted, and this was slowly increased so long as the eye did not react or the injection was not followed by a rise in temperature. The highest dose reached was 10mg. in one case. Under this treatment all four of the patients steadily gained in body weight and the ocular inflammation in each case entirely subsided within six weeks to two months.⁷ The remaining four cases have not yet been under treatment sufficiently long for the beneficial effects to have become clearly manifest.

At least three of the patients several times showed exacerbations during the menstrual periods, which is usual, I believe, also, in other forms of tuberculosis. This no doubt explains why scleritis is sometimes attributed to menstrual disturbances. Possibly it explains also why scleritis is more common among females, since the lowering of the resistance during menstruation no doubt increases the likelihood of metastases. No local treatment was employed in any of the cases other than the use of atropine as a collyrium to prevent iritic adhesions and to make the eye more comfortable.

As already stated, signs of systemic tuberculosis were made out in only three of the cases. Nevertheless, it seems improbable that scleritis was not always secondary to a larger focus elsewhere in the body, for instance, in the bronchial lymph glands or bones. Otherwise it is difficult to explain the extreme chronicity of the process and the slight tendency toward breaking down of the tissues. This is readily explained on the assumption of the existence of a lesion or lesions elsewhere, which, in calling forth protective elements into the blood, inhibits the activity of the local process. This, of course, should not be taken to mean that a systemic infection always suffices to protect the eye, because there are cases of ocular tuberculosis, rare, it is true, such as tuberculous iritis, which usually go on to complete destruction of the eye. Additional, although perhaps not conclusive, evidence that the scleritis was not the sole focus in these cases, is also furnished, by the results of the tuberculin injections, for the general reaction following them always seemed out of proportion to the local reaction, and in four cases no local reaction could be detected. Especially suggestive was the case in which with a febrile reaction of 105° there was no local reaction, although previously the latter had been obtained with a smaller dose. It is noteworthy, too, that the general physical examination in this case was entirely negative.

It is possible, if not highly probable, that these belong to the class of cases in which healed tuberculous lesions are found at autopsy without having been suspected during life. Certainly, the well-known frequency of such cases could easily account for the total number of scleritis

⁷ One of the patients discontinued the treatment against advice and one month later had a recurrence of the inflammation.

cases. On the other hand, it is evident that an inflammatory lesion of no greater intensity, even though more extensive than that which in the form of scleritis would produce irreparable damage to sight, might perfectly well occur in the internal organs without giving rise to any definite symptoms.

The explanation of the origin and character of the lesions of scleritis just suggested is also supported by the recent experimental work of Stock⁸ on endogenous tuberculosis of the eyes. By injecting tubercle bacilli into the ear veins of rabbits, Stock invariably obtained small foci in the choroid, iris, or ciliary body. Instead of increasing rapidly in size and finally destroying the eye, as happens when bacilli are introduced directly into the anterior chamber, it was found that these lesions as a rule underwent spontaneous healing. Moreover, it was found on histological examination that at first the foci consisted only of round cells; that later central areas of epithelioid cells appeared within them and that, except in one instance, caseation never occurred. In sections of these lesions Stock was unable to demonstrate tubercle bacilli, although he did not doubt their presence. It will be seen, therefore, these foci were identical in structure with the small nodules of scleritis examined by me. They also corresponded in general character to the lesions that have previously been described in enucleated eyes affected with scleritis, notably those described by Uthof⁹ and Schirmer.¹⁰

Stock attributed the mild character of the lesions obtained by him largely to the fact that the bacilli were confined to the blood vessels and thus exerted less toxic action on the tissues. It seems to me, however, that this explanation is untenable for the reason that in general miliary tuberculosis the lesions, which are also due to blood metastases, are not as a rule of this character. A more probable explanation, I think, is that just given to explain the lesions in scleritis, namely, that the bacilli in the lesions are rendered relatively inactive owing to the resistance developed in the individual. In the case of intravenous inoculations this resistance would be developed early due to the great multiplicity of the lesions throughout the body, so that a large proportion of the latter would be checked in their incipency. It is true that Stock found in the internal organs of all his animals, tubercles showing typical caseation, but he does not state that the organs were examined microscopically, or whether or not lesions similar to those in the eyes were also found. It is fair to assume, therefore, that the latter were present in the internal organs, and perhaps in as great relative number as in the eyes.

From still another standpoint the observations of Stock are suggestive in relation to the origin of scleritis. Stock found that the foci in the anterior part of the uveal tract were much more likely to persist than those occurring posteriorly. More important still, he found that

a comparatively large focus could exist in the ciliary body without giving rise to any of the clinical signs considered characteristic of cyclitis. Although a few observers have held a contrary opinion, it has hitherto generally been supposed that when cyclitis and iritis occur with scleritis, as not infrequently happens, it is due to the inflammatory process having spread from the sclera to the ciliary body. The findings of Stock, however, strongly suggest that the reverse is the case, and that scleritis always starts from a focus in the uveal tract, although the uveitis may not manifest itself clinically until the process has become well advanced. In a more recent communication¹¹ based upon some additional experiments, Stock has himself brought forward this view as to the origin of scleritis. In these later experiments he found in some cases that the sclera became involved in such a way as to produce a condition not unlike that seen in the scleritis of man. Should this view prove correct, it would explain satisfactorily why the nodules of scleritis are most apt to occur in the neighborhood of the anterior perforating vessels, since the latter offer convenient paths for the spread of the process. It would also explain the occurrence of certain cases of interstitial keratitis in which scleritis is apparently absent, for it is conceivable that bacilli might be carried into the cornea from a focus in the ciliary body without lodging also in the sclera. Possibly it would explain also certain cases of so-called serous iritis.

As already stated, Stock was unable to find tubercle bacilli in the sections of the ocular lesions of his animals. In the more recent communication just referred to, however, he describes an experiment which seems beyond question to demonstrate their presence. From the iris of an animal in which the lesions were apparently completely healed, he removed a piece of tissue and introduced it into the anterior chamber of a healthy rabbit. In the latter it gave rise to the typical caseating form of tuberculosis. This experiment illustrates also the fact that tubercle bacilli may remain dormant in lesions which are apparently healed.

If the above conception of the cases under consideration is correct, scleritis may be regarded as a favorable sign so far as prognosis in regard to the systemic tuberculosis is concerned. Moreover, it may be regarded as a disease amenable to treatment, a conclusion that is borne out by the actual results obtained in my cases. While it is probable that the rigorous treatment required in advanced general tuberculosis is not, as a rule, absolutely necessary in cases of tuberculous scleritis, it is obviously the most desirable treatment. It would seem also that there is no class of cases in which the use of tuberculin is more strongly indicated, for it is evident that the resistance of these patients towards the disease must be exceedingly great, and that the added stimulus supplied by tuberculin might be all that would be required to render this resistance

⁸ Klin. Monatsb. für Augenheilk., Beilageheft, p. 17, 1903.

⁹ Arch. für Ophth., xlix, 3, 1900.

¹⁰ Ibid., xli, 4, 1895.

¹¹ Stock: Bericht d. Versamm. d. Ophth. Gesell. zu Heidelberg, 1905, p. 297.

completely effective. While a noticeable improvement almost always followed a local reaction to tuberculin in my cases, it would probably be unsafe to produce such a reaction repeatedly, owing to the possible danger of creating new foci not only in the sclera and cornea but in the internal organs as well. I have therefore endeavored always to regulate the doses used in treatment so as to avoid not only a rise in temperature, but also the slightest reaction in the eye. It would seem that the eye itself should be the best possible indicator of the resistance of the patient, superior even to the opsonic index of Wright, since it presents a focus in plain view in which slight variations in the intensity of the process are readily apparent.

As is well-known, one of the chief characteristics of scleritis is its tendency to recur after the inflammation has apparently completely subsided. This is probably analogous to the flaring up of an old tuberculous focus in the lungs, and, as in the latter case, is probably not due to fresh metastases, but to renewed activity of tubercle bacilli which have remained dormant. For this reason it is evident that treatment should not be altogether abandoned even after all signs of scleritis have disappeared.

Thus far I have been so well satisfied with the results obtained with the old tuberculin that I have not considered it advisable to use the new tuberculin (tubercle bacillus emulsion). I have felt some hesitancy in using the latter also on account of the supposed danger of introducing live virulent bacilli into the patients. The difficulty of obtaining a uniform dosage is another objection to its use. However, I should not hesitate to try it in a case that was not responding well to the old tuberculin.

In conclusion, I wish to express my obligations to Drs. H. H. Haskell, A. Quackenboss, Myles Standish, H. B. Chandler and F. M. Spalding, for turning over to me some of the cases in which these observations were made.

STUDIES IN PSYCHOPATHOLOGY.

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I. RECURRENT PSYCHOMOTOR STATES.

UNDER recurrent psychomotor states I include insistent ideas, imperative concepts, persistent or periodically appearing emotional states, irresistible impulses, as well as the psychomotor attacks of an apparently epileptic character which may be designated as "psychic epilepsy." All those various states are found in many a symptom-complex of the insanities, but they are still more often met with in the functional mental and nervous diseases, — in functional psychosis. In fact, in many forms of hysteria, in many types of neurasthenia, or of the more fashionable "psycho-

asthenia," recurrent psychomotor states constitute the main and often the only symptoms of the malady.

The recurrent psychomotor states, with their great wealth of symptoms, appear almost mysterious in their onset and origin; they flash lightning-like on the patient's mind, get possession of it, then disappear, only to reappear on some other favorable occasion. Others persist in consciousness, with but slight remissions, and keep the patient in a continuous agony. The patients are aware of the absurdity of the ideas and impulses, but they are powerless to resist them. They regard such onsets somewhat in the same way as the epileptics regard their attacks, which set on against will and consciousness, and which are not subject to control. I do not mean by it to indicate that all those psychic attacks are of an epileptic origin, but I only wish to point out the fact that there is some analogy between recurrent psychomotor states and epilepsy, inasmuch as both of them come on as sudden, uncontrollable attacks.

It is true that in some cases we can drive the analogy more closely, because in some of the forms of recurrent psychomotor states we observe somewhat similar symptoms. We find the presence of a distinct aura, sensory in character, a sense of oppression, and sometimes a profound disturbance of consciousness during the attack, the patient occasionally being insensible to external stimuli. In some cases we even find a dazed state of consciousness, headache, and a condition of extreme fatigue after the attack is over. This resemblance, however, is but a superficial one. Recurrent psychomotor states differ widely from epilepsy. I have pointed this out in my previous works¹ and shall show it in this paper by an analysis of cases selected from a number of others of the same type. Many writers are deceived by this superficial resemblance and regard such attacks as "larval epilepsy," "as psychic equivalent of epilepsy." Such a view is entirely unjustified by a close scientific analysis of the facts. The most that can be done is to draw an analogy between the attacks of insistent states and the attacks of epilepsy, but we must bear in mind that analogy is not a safe method, as one may find himself reasoning on the same lines with the Esquimaux, who regards glass as a kind of ice.

Now it can be shown by rigid analysis of the cases of recurrent psychomotor states that they have nothing to do with epilepsy, although they may be associated with it, and that a study of the cases of recurrent psychomotor states reveals the fact of the presence of subconscious activities which become manifested as insistent ideas, uncontrollable emotions, irresistible impulses and various psychomotor states closely simulating epileptic attacks. It is from this standpoint that we may designate such simulating attacks as psychic epilepsy, not because they are psychic attacks, "equivalents" of real epilepsy, but they are pseudo-epileptic attacks of a purely psychic

¹ Psychopathological Researches; Multiple Personality.