Tuberculosis of the conjunctiva / by J.W.H. Eyre.

TUBERCULOSIS OF THE CONJUNCTIVA.

With the Author's Compts

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By

J. W. H. EYRE, M.S., M.D.,

BACTERIOLOGIST TO CHARING CROSS HOSPITAL AND LECTURER ON BACTERIOLOGY IN THE MEDICAL SCHOOL; OPHTHALMIC SURGEON TO ST. MARY'S CHILDREN'S HOSPITAL; LATE SENIOR OPHTHALMIC ASSISTANT TO GUY'S HOSPITAL.

(*With Plates IX. and X. of Vol. XL., German Edition.*)

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THE records of authenticated cases of tuberculosis of the conjunctiva are so few, and the total number of cases is stated to be so small, that additions thereto can hardly fail to be of interest.

Early observers, in blissful ignorance alike of the specific *causa causans* of tuberculosis and the pleomorphism of its resulting lesions, published but few cases of this nature; but since Koch's work on the tubercle bacillus, which among other points indicated the assistance the clinician might gain from the result of inoculation experiments in suitable animals, the list has expanded considerably — the great majority of the cases, however, being recorded by our German confrères.

The rarity of primary tuberculosis of the conjunctiva is now being less insisted upon, and I venture to assert that as more attention is directed to this condition, it will be found to occur fairly frequently.

In 1881 Hirschberg stated that the relative frequency of cases of tuberculosis of the conjunctiva to the total number of new cases was 1 : 6000. This, it must be remembered, was before the time that bacteriology was able to render any material aid to ophthalmology. A few years later (in 1885), when the extent — and limitations — of this aid was still only imperfectly realized, Mules put the ratio at 1 : 30,000.

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From my own experience, both sets of figures would appear to err in making the condition a rarer one than is actually the case, for in 1897 I recorded 8 cases out of a total of 25,000 new patients.[1] To them I now propose to add 3, making a collection of 11 met with during the course of six years and out of a total number of 31,000 new cases (and I am quite prepared to believe that there have been one or two more that have escaped detection among the remaining 30,989), these figures giving us a ratio of about 1 : 2700. Moreover, as these figures reach a point where the "error of averages" tends to become a negligible quantity, the condition will probably be found to be even commoner than this ratio would indicate.

In view of these data, the scanty space devoted to this subject by most authors appears to me to be totally inadequate. For example, in the third volume of Norris and Oliver's *System*, tuberculosis of the conjunctiva is dismissed in about a page and a half, and mention is made of one only of the many well defined phases assumed by the disease.

Now Sattler, in 1891, carefully described no less than four groups of cases differentiated by broad clinical and macroscopical features. These he suggested might form the basis of a practical classification — a classification recapitulated below, with slight modifications; and opposite to each group I have placed a short note of its microscopical peculiarities.

GROUP I.

CLINICAL APPEARANCES.	MICROSCOPICAL APPEARANCES.
Characterized by the presence of one or more small miliary ulcers, which usually caseate, and may or may not coalesce; these generally attack the palpebral in preference to the bulbar conjunctiva.	Scrapings from these ulcers used to prepare cover-glass films and suitably stained, say by the Ziehl-Neelsen method, generally show numerous small groups or bunches of bacilli indistinguishable morphologically in their tinctorial reactions from the tubercle bacillus.

[1] Eyre, "Tuberculosis of the Conjunctiva," *Trans. of the Ophthalmological Soc. U. K.*, vol. xvii., 1897.

GROUP II.

Characterized by the presence of grayish or yellowish subconjunctival nodules, varying in size, but rarely larger than a hemp seed—resembling somewhat the sago granules of acute trachoma when gray; or the tubercles met with in the lungs of acute miliary tuberculosis when yellow is the prevailing tint. (I am satisfied in my own mind that this group is but the initial stage of the next, and that these small tubercles, increasing in size by a proliferation of the small round-celled exudation which encircles the giant-cell systems, absorb their conjunctival covering; the continued action of the central irritant is responded to by a like activity of the cell elements, and as growth tends to take place along the lines of least resistance, the fungating granulations of the IIId Group are the inevitable result.)

Sections of the small miliary tubercles show well-defined giant-cell systems (Fig. 1); and scattered here and there, without any definite arrangement or relationship to these giant cells, small groups of tubercle bacilli, seldom numbering more than ten or a dozen individuals, can usually be demonstrated.

GROUP III.

Characterized by the presence of florid hypertrophied papillæ and rounded flattened outgrowths of granulation tissue, sometimes

Sections of the hypertrophied papillæ and flattened granulations as a rule show nothing but masses of small round cells with occasional

derived from the tarsal conjunctiva, but usually springing. from the fornices (resembling in many respects the velvety granulations met with in tuberculous arthritis), and associated with œdema and thickening of the lids.

large polygonal cells, but no definite giant-cell systems (Fig. 2). Tubercle bacilli are usually scattered but very sparsely throughout the tissue, and it generally happens that they are missed. In any case one must be prepared to examine scores of sections, and even then have to record a negative result.

GROUP IV.

Characterized by the presence of numerous pedunculated "cockscomb" excrescences in the fornices, of a jelly-like consistence, and often showing more or less extensive superficial ulceration.

Sections of the jelly-like masses occurring in this group consist, like the granulations of Group III, of masses of small round cells, but show in addition a large proportion of newly formed blood-vessels of the embryonic type (Fig. 3). As in Group III, it is difficult to demonstrate the tubercle bacillus in the sections.

GROUP V.

Characterized by the presence of a distinctly pedunculated tumor (very rarely, more than one may be present) having the macroscopical appearances of a papilloma or fibroma of the tarsal conjunctiva.

Sections of the tumor generally show a stroma of fairly dense connective tissue, enclosing a mass of round cells, with here and there giant-cell systems (Fig. 4); and in these systems, or in close proximity thereto, may be found tubercle bacilli, either isolated or in small bunches of five to ten individuals.

Hence it will be seen that a microscopical examination of the diseased tissue often affords but little help in diagnosis, and in such a case one must resort to an inoculation experiment for further assistance.

The animals usually selected for the purpose are the rabbit or the guinea-pig, and the seat of inoculation is either the subcutaneous tissue of the groin in the case of the latter animal; or the anterior chamber of the eye in the former.

Of the two animals the guinea-pig is generally conceded to be the more susceptible to the tubercle bacillus, dying of general tuberculosis some six, eight, or ten weeks after inoculation. On the other hand, if tuberculous material be introduced into the anterior chamber of a rabbit's eye, an iritis which is almost pathognomonic follows in from fourteen days to a month (see Fig. 7). The wide time limits, like those quoted in the case of the guinea-pig for death from general tuberculosis, depend upon two factors, the one, the virulence of the B. tuberculosis, the other the number of organisms introduced. In this connection I may mention the experiments of Wyssokowitsch, who (using tuberculosis sputum) found that the fewer organisms inoculated into a guinea-pig the longer the course of the disease before it was terminated by death; and also that if too few (less than 150) tubercle bacilli were inoculated into the rabbit, tuberculosis was not set up.

Now as the course and progress of a case of tuberculosis of the conjunctiva usually points to a strain of the tubercle bacillus of low virulence, and as one knows from microscopical examinations of material from such cases the bacilli are none too numerous, it follows that as large a piece as possible of the diseased conjunctiva should be used for inoculation purposes.

With these few preliminary remarks I will pass to the description of the three new cases.

Case 1.—Susan C——, aged seven, first came under observation Oct. 19, 1898, suffering from inflammation of the right eye.

History.—Father died a few weeks back of phthisis. Mother alive and well.

The grandmother states that the child has always been delicate

and ailing; that during the last six weeks the right upper eyelid has "drooped," the outer part of the lid has been swollen, and a little mattery discharge comes from the eye.

On Examination. General.—Patient is a fair, delicate looking child, not over-well nourished. Some bronchitis is present, but there is no evidence of tubercle of the lungs.

Local.—Right eye. There is a distinct thickening of the right upper eyelid, limited to its outer half, together with some ptosis which considerably decreases the size of the palpebral fissure; there is no pain or tenderness.

The right preauricular gland is swollen and hard, and shows as a distinct lump in front of the ear. The skin is not implicated and the gland is freely movable over the deeper structures. It is neither painful nor tender to the touch.

On everting the upper lid, the outer half of the conjunctival surface is seen to be much injected and of a livid hue. It is thickened and elevated from the presence of a small conjunctival nodule lying transversely to the direction of the Meibomian glands.

Scattered throughout this portion of the lid and contrasting with it in a striking manner are numerous yellow "pin's-point" specks.

The bulbar conjunctiva is unaffected; the cornea is normal. Left eye normal.

TREATMENT AND PROGRESS.

Oct. 19, 1898.—Ordered to bathe the eye with a simple boracic lotion, thrice daily. Ext. malti ferrati, ʒ i, ter die exhibited.

Oct. 27th.—The diffuse hyperæmia of the ocular aspect of the upper lid has given place to a localized circular patch about 4 *mm* in diameter, situated at the junction of the middle and outer thirds.

The preauricular gland appears to have increased in size, and the skin over it is somewhat reddened.

Nov. 2d.—Most of the yellowish points in the diseased conjunctiva have increased in size but even now do not attain a diameter of a millimetre. Ulceration of the conjunctiva has commenced in three separate spots—one in the centre of the injected area and the other two towards the lower part of its periphery.

Nov. 9th.—The three minute ulcers noted Nov. 2d have now coalesced and form a small circular ulcer, some 3 *mm* in diameter,

surrounded by a narrow hyperæmic zone. The edges of the ulcer are slightly everted and undermined, and the base shows numerous minute bright yellow dots, and readily exudes a sanious fluid when touched with a probe.

The preauricular gland is now tender to the touch.

Nov. 22d.—The patient was admitted into the St. Mary's Children's Hospital.

Nov. 23d.—A. C. E. was administered, and the ulcerating area and the tissue immediately surrounding it was thoroughly scraped with a small sharp spoon—at one spot at the centre almost the entire thickness of the tarsal cartilage being removed. The lid was then turned down, and a cold boracic compress applied for a few hours.

Nov. 27th.—The patient was discharged. The operation wound has practically granulated up, and looks well. Ordered to bathe the eye with lot. hydrarg. perchlor. (1 in 4000), three or four times a day.

Nov. 30th.—The site of the ulcer is slightly depressed, but otherwise appears normal.

The preauricular gland is less in size and no longer tender.

Dec. 14th.—The palpebral conjunctiva appears perfectly normal.

The preauricular gland of the right side is no longer to be seen or felt.

May 30th.—Eye remains normal.

BACTERIOLOGICAL EXAMINATION.

1. A coverslip film preparation was made from a portion of the scrapings from the ulcer. This, stained by the Ziehl-Neelsen method, exhibited numerous bacilli, morphologically identical with the tubercle bacillus, of fairly large size and having a moniliform appearance.

2. The remainder of the scrapings were introduced into the subcutaneous tissue of the groin of a young guinea-pig weighing 220 grammes. Five weeks later (Dec. 30th) the guinea-pig was dead; *post-mortem*, tubercle bacilli were found in a focus of suppuration at the seat of inoculation, and in the enlarged inguinal glands. Numerous small tubercles were also present in the omentum.

CASE 2.—Benjamin Y——, aged eighteen, clerk. First came under observation November 25, 1898, and was admitted to Guy's

Hospital two days later as suffering from tuberculosis of the conjunctiva.

History.—The family history is good. None of patient's relatives or friends suffer from consumption. Patient works eight to ten hours per diem in a small, badly ventilated office; one of his fellow-clerks suffers from a "winter cough."

Three weeks ago patient noticed that his right upper eyelid was swollen, and that he was unable to open the right eye to the same extent as the left; also that the sight of the left eye was failing.

Condition on Admission: General.—Patient is a tall, thin lad, far from robust-looking. Heart and other organs normal. No evidence of tubercle in the lungs.

Local.—Right eye. The upper lid is swollen and œdematous, pitting slightly on pressure, and the subciliary sulcus is obliterated. The cutaneous surface is of a dusky red color. The palpebral fissure, owing to the patient's inability to raise the lid, is distinctly reduced in size as compared with that of the other side.

The right preauricular gland is enlarged, hard, and firm; not adherent to the skin of the face, and freely movable over the deep structures; neither painful nor tender on pressure. One of the submaxillary glands, of the same side—that at the angle of the jaw—is also much enlarged.

On everting the upper lid, the conjunctiva is seen to be thickened and hyperæmic, and studded with numerous enlarged follicles of a purplish hue. The anterior edge of the retrotarsal fold shows numerous "warty-" looking masses of granulation tissue of fair size, the largest, situated about the middle, being about 5 *mm* in diameter. The granulations in this neighborhood are roughly circular in shape, with constricted bases and expanded, flattened summits—mushroom-shaped. The conjunctiva lining the upper fornix appears to be unaffected, beyond perhaps some slight engorgement of the vessels passing down on to the globe (Fig. 5).

The bulbar conjunctiva is practically normal, cornea unaffected. Vision = $\frac{6}{6}$. No hypermetropia.

Left eye { Tissues normal. Vision = $\frac{6}{36}$ $\bar{c}$ $\frac{+4 \text{ D sph.}}{+1.5 \text{ D cyl. ax. } 125^\circ} = \frac{6}{12}$ pt.

TREATMENT AND PROGRESS.

Nov. 27, 1898.—Immediately on admission, sol. cocainæ hydrochlor., 4 per cent., was instilled, and some of the prominent

granulations snipped off with curved scissors for microscopical examination. The eye was ordered to be bathed frequently with lot. acidi borici, and malt extract administered internally.

Dec. 1st.—A general anæsthetic was administered (A. C. E.). The right upper eyelid was everted and the retrotarsal fold excised in one piece, together with the narrow strip of conjunctiva covering the upper border of the tarsal cartilage which forms its anterior edge. No sutures were inserted; the lid was simply turned back and the eye closed by means of a pad and bandage.

Dec. 3d.—The pad and bandage were removed and a small eye-shade substituted. Patient had no pain though he complained of a feeling of stiffness when trying to move the lid or eye. Ordered to bathe the eye three times a day with lot. hydrarg. perchlor. (1 in 5000).

Dec. 7th.—Patient was discharged. The site of operation was marked only by a linear scar. There appeared to be no loss of mobility of the globe.

The preauricular gland was less in size and not so hard.

Dec. 20th.—Two small fleshy granulations have made their appearance, one at the middle and the other at the outer extremity of the scar.

Dec. 30th.—The granulations above mentioned, having increased in size, were removed to-day, under cocaine, by means of curved scissors, and the site of attachment of each scraped with a sharp spoon.

The preauricular gland could no longer be made out.

The submaxillary gland has also undergone resolution.

January, 1899.—No further trouble was experienced.

April, 1899.—Patient appears quite normal in respect to the affected eye.

BACTERIOLOGICAL EXAMINATION.

1. The small piece of granulation tissue removed on Nov. 27th was divided into two portions. (a) The one was fixed in a saturated solution of corrosive sublimate, hardened in alcohol, embedded in paraffin, and cut in serial sections in a plane vertical to the bulk of the granulation. Some twenty of these serial sections were mounted on each of twelve slides and stained for tubercle bacilli. On one slide a small bunch of perhaps ten bacilli was found; two or three isolated bacilli were all that were seen in the remainder of the

slides. On staining with borax carmine and picronigrosin, the tissue was found to consist for the most part of masses of small round cells and developing blood-vessels, with an occasional giant cell, and a few definite tubercle systems.

2. The remainder of the tissue was introduced into the subcutaneous tissue of the groin of a 300-gramme guinea-pig. On Jan. 10, 1899 (six weeks after inoculation), the animal was found to be dead. It weighed barely 100 grammes, and *post-mortem* presented a typical picture of general tuberculosis.

3. A piece of granulation tissue removed on Dec. 1st (practically half of one of the largest "mushroom" granulations, and about equivalent to a two-millimetre cube) was thoroughly washed in several changes of sterile broth. A. C. E. was administered to a large rabbit (weighing some 2000 grammes), and after flushing out the conjunctival sac with sterile salt solution for some five minutes, a linear incision was made in the upper part of the periphery of the right cornea with a triangular keratome, and the iris incised whilst in the act of withdrawing the knife. The diseased tissue was now introduced through the corneal wound and allowed to rest over the wound in the iris. The conjunctival sac was again thoroughly washed out. Two days later the lips of the corneal incision had united, there was practically no conjunctival injection, and the anterior chamber had reformed. A certain amount of exudation had taken place from the wounded iris, binding the piece of granulation tissue, which was now quite white, firmly down to that membrane. During the following week absorption of the foreign mass proceeded apace. On the ninth day after inoculation, however, a marked circumcorneal zone of injection was present, the iris was muddy and inactive, and the fundus reflex was dull. The mass of tissue in the anterior chamber was pinkish in color and new vessels could be made out on its anterior surface. Two days later the animal was killed with $CHCl_3$, the affected eye excised, frozen, and bisected vertically in its antero-posterior axis so that the section passed through the centre of the foreign tissue. One half was mounted in gelatin, the other prepared for

microscopical examination. *Post-mortem*,—a caseous gland was found in the right side of the neck which contained a few tubercle bacilli.

Microscopical examination of the sections prepared from the rabbit's eye showed that the adventitious tissue had become blended with the anterior surface of the iris. The central portion formed a roughly circular nucleus of dense fibrous tissue whilst the entire periphery was infiltrated with small round cells; and here and there the formation of elementary "giant-cell systems" could be observed. The search for tubercle bacilli gave a negative result. It would therefore appear that owing to a mistaken idea as to the severity of the condition of the eye, the animal was killed too early.

Case 3.[1]—Percy L——, aged fourteen. First came under observation on Feb. 3, 1899. Patient was then in one of the general surgical wards of Guy's Hospital, having been sent in for treatment of suppurating glands of the left side of the face and neck. A fortnight later he was transferred to the eye wards for (?) tuberculosis of the conjunctiva.

History.—The family history is good. Both parents alive and healthy; ditto brothers and sisters. No history of phthisis. Three months ago patient noticed a small swelling in front of the left ear; one month later another appeared just below the angle of the jaw on the same side. (A little before the first appeared patient says that his right eye was noticed to be swollen, but this quickly passed off.) Patient was taken to the family doctor, who opened the tumor in front of the ear, and let out some "thick yellow stuff." As the wound thus made did not close, but continued to discharge, and the second swelling "burst," patient was sent up to the hospital.

TREATMENT AND PROGRESS.

Feb. 3, 1899.—A. C. E. was administered and the cavity caused by the suppurating preauricular gland thoroughly scraped, the infiltrated skin around the opening excised, and the wound closed by continuous horsehair sutures. The gland below the jaw was

[1] I am indebted to Dr. Brailey for permission to report this case in its entirety.—J. E.

dissected out and this wound similarly closed. Both were dressed with carbolic gauze.

Feb. 6th.—Wounds dressed; incisions are healing although there is some discharge from each. The left eye was examined and granular conjunctivitis—trachoma—diagnosed.

Feb. 9th.—Wound below jaw healed but that in front of the ear still discharging. All stitches removed. (The preceding notes were abstracted from the Surgical Clerk's Report.)

Feb. 16th.—Patient transferred to the eye wards.

Condition on Admission: General.—Patient is a pale, weakly looking lad, although fairly well nourished. No evidence of tubercle in the lungs or elsewhere.

Local.—Left eye. Both lids pallid—slightly thickened but not œdematous.

On drawing down the lower lid, many small yellow nodules are seen scattered over the palpebral conjunctiva and a few grayish ones, chiefly to the outer side, and especially aggregated towards the outer canthus. Whilst the yellowish dots are precisely similar to these seen in acute miliary tuberculosis of the lung, the gray ones more nearly resemble the discrete granules of an early trachoma.

On everting the upper lid, numerous small red "mushroom" or "button" granulations, slightly constricted at their bases, are noticed arranged in a line over the upper edge of the tarsal cartilage. The largest of these is perhaps 4 or 5 *mm* in its longest diameter. Towards the outer angle may be noticed several of the yellowish tubercles, similar to those in the conjunctiva of the lower lid (Fig. 6). The vessels of the bulbar conjunctiva are but slightly injected. Cornea normal. The situation of the preauricular gland is marked by a small circular sinus, some 8 *mm* in diameter, which is suppurating profusely.

Feb. 17th.—Under cocaine, two contiguous yellow nodules were removed from the conjunctiva of the lower lid, for bacteriological examination.

Feb. 24th.—A. C. E. was administered. The lids were everted and all the prominent nodules and granulations removed by the aid of curved scissors. Next, their bases and the surrounding portions of the conjunctiva were thoroughly scraped with a sharp spoon, the lids replaced, and the eye bandaged for a few hours.

March 3d.—Two small granulations have sprung up at the outer part of the conjunctival surface of the upper lid. These were completely removed under cocaine.

Patient discharged.

March 8th.—The inner surface of each lid appears to be invested by normal conjunctiva—a good example of the vitality of this membrane, and its remarkable powers of regeneration even after the destruction of large areas.

The preauricular sinus has completely healed.

May, 1899.—Patient remains perfectly well.

BACTERIOLOGICAL EXAMINATION.

1. The scrapings and granulations removed by the operation on Feb. 24th were carefully preserved, thoroughly washed in warm sterile broth, then fixed in corrosive solution, hardened in alcohol, and embedded in paraffin in one mass. Sections were cut and mounted serially, and stained for tubercle bacilli, but although I examined considerably over a score of slides, each having 4–8 serial sections mounted thereon, I was unable to satisfy myself as to the presence of the tubercle bacillus. Stained with borax carmine and picronigrosin, the small nodules had each the structure of a typical miliary tubercle, with central giant cells.

2. A rabbit weighing 1270 grammes was anæsthetized by means of A. C. E., and incision made with a triangular keratome in the upper corneal margin of the right eye; next a small triangular piece of iris was excised, midway between the free and attached margins.

The tubercles removed from the conjunctiva (Feb. 17th) were introduced through the corneal incision, and, with a fine pair of forceps, passed through the wound in the iris into the chamber existing behind the base of the iris, and between it and the anterior surface of the lens, and pushed a little to the temporal side of the orifice so that it should not fall forwards into the anterior chamber of the eye. The entire operation was conducted with strict regard to asepsis, and was completed within thirty minutes of the removal of the tissue from the patient's conjunctiva, the nodules being placed during the preliminary steps in a capsule containing sterile broth at the temperature of the body.

Two days later the eye is noted as quite quiet, the corneal incision closed, and the orifice in the iris occluded by lymph.

The position of the piece of (?) tuberculous conjunctiva is indicated by a slight bulging forwards of the iris, to the nasal side of the patch of lymph.

During the next month but little change took place locally, although the animal steadily declined in weight until by the 5th of April (just over six weeks from the time of inoculation) it had lost 195 grammes. On this day also the iris was first noticed to be muddy and injected, and three minute yellow spots were detected on the pupillary margin of the iris.

On April 11th, the cornea is uniformly hazy, and in consequence the fundus reflex is dull. The whole iris is puckered up into ridges and furrows, radiating from the pupil. The three minute tubercles noted five days ago have increased to nearly double their previous size, and in addition, a large nodular mass occupies the nasal half of the posterior surface of the iris, and shows yellow through that organ (Fig. 7).

April 13th.—The animal to-day weighed but 1000 grammes. It was killed with $CHCl_3$, the right eye excised, bisected horizontally through its antero-posterior axis, the section passing through the large yellow mass; one half was mounted in gelatin, the other prepared for microscopical sections.

Post-mortem.—The emaciation, the glandular enlargement, the presence of tubercle bacilli in the glands of the neck and axilla (which were all that were examined microscopically), and the caseous nodules in the spleen made up an absolutely typical picture of general tuberculosis.

Microscopical examination of the sections prepared from the rabbit's eye showed that each of the small yellowish dots noted during life had the structure of a typical tubercle with its central giant cell or cells surrounded by zones of epithelioid and lymphoid cells; tubercle bacilli could also be detected in and near the giant cells.

The large yellow mass which formed an integral portion of the base of the iris was also tuberculous in character, and showed signs of commencing caseation at its centre. Infiltration of the ciliary body by small round cells was in active progress, and tubercle bacilli were plentiful throughout the entire mass.

CONCLUSIONS.

1. Cases of primary tuberculosis of the conjunctiva occur in the proportion of at least 1 : 2700; probably more frequently.

2. Primary tuberculosis of the conjunctiva is usually unilateral.

3. It occurs either as a caseating ulcer, or as an inflammatory new formation of the granuloma type—if as the latter it belongs to one or other of four clinically distinct groups.

4. It is extremely chronic, and exhibits no tendency to undergo spontaneous cure.

5. It does not usually tend to implicate the cornea until quite late in the disease, and the iris later still.

6. The preauricular gland of the same side as the affected eye is infected early, and then the next glands in the series, viz., those below the angle of the jaw.

7. If untreated, the conjunctival lesion will probably serve as the primary focus from which the bacillus tuberculosis will become disseminated to distant organs.

8. Removal should be thorough, and should be undertaken as early as possible. Under such circumstances, like other localized tuberculous lesions, a permanent cure may be confidently expected.

9. With regard to the microscopy of the disease, in the case of the ulcer, tubercle bacilli can generally be demonstrated by suitable means in the "scrapings"; but where the lesion is of the nature of a granuloma, it is rather the exception than the rule to detect the organisms in sections of the tissues, but in such cases the experimental inoculation of a portion of the diseased tissue into the anterior chamber of a rabbit's eye or the subcutaneous tissue of a guinea-pig will rarely fail to prove a positive result (so far in my hands this method of diagnosis has never failed).

Plate I.

FIG. 1.—Section of conjunctival tubercle (Group II.), with central giant cells—$\frac{1}{8}$ in. objective, and 8 ocular.

FIG. 2.—Section of granulation tissue outgrowths (Group III.),

showing small round cells and few polygonal cells—$\frac{1}{4}$ in. objective, and 6 ocular.

Fig. 3.—Section of gelatinous "cockscomb" excrescences (Group IV.), showing small round cells, and numerous embryonic type blood-vessels—$\frac{1}{4}$ in. objective, and 4 ocular.

Fig. 4.—Section of conjunctival tumor (Group V.), showing the small cells in fibrous stroma; also giant-cell systems towards the free edge—$\frac{1}{4}$ in. objective, and 6 ocular.

Plate II.

Fig. 5.—Tuberculosis of the conjunctiva, Group III. (See Case 2, Benjamin Y——.)

Fig. 6.—Tuberculosis of the conjunctiva, Groups II. and III. (See Case 3, Percy L——.) Note the unusual combination of the miliary tubercles of Group II. in the lower lid, with the fungating granulations so characteristic of Group III. in the upper.

Fig. 7.—Tuberculous iritis in the rabbit—resulting from the inoculation of a portion of the diseased conjunctiva from Case 3.

I am indebted to the facile brush of my friend, Dr. T. G. Stevens, of Guy's Hospital, for the faithful, and at the same time artistic, representations of the clinical appearances contained in these last three figures.

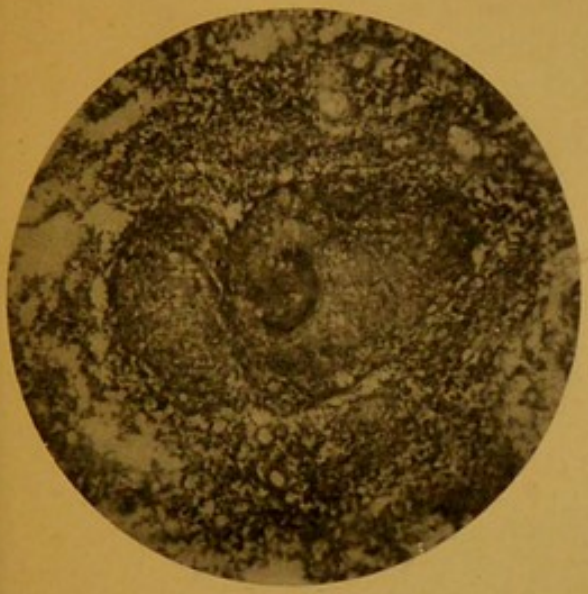

Fig. 1.

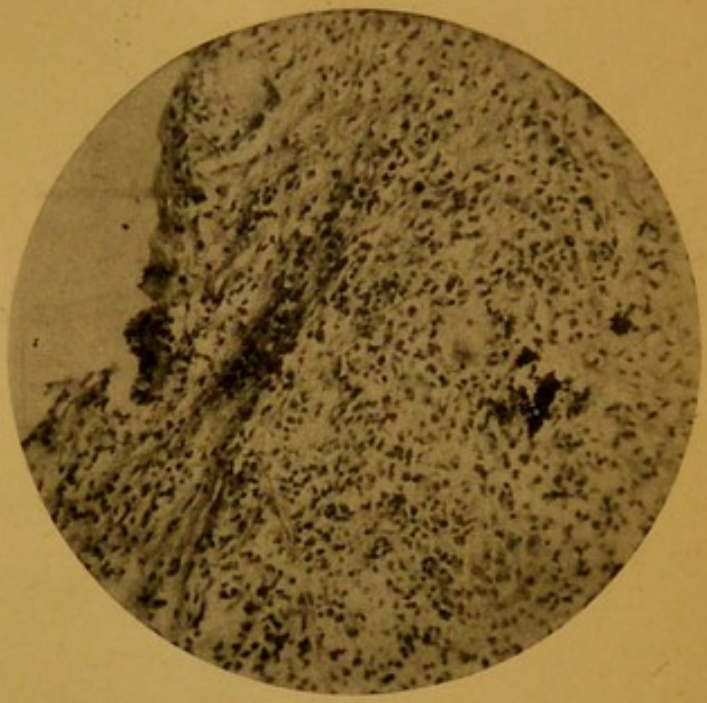

Fig. 2.

Fig. 3.

Fig. 4.

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Fig. 5.

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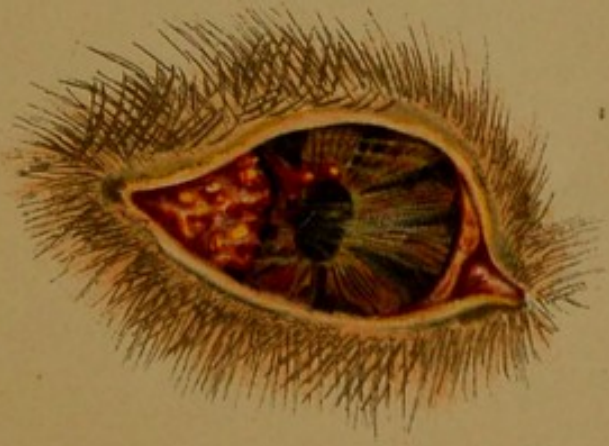

Fig. 7.

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