SOME POINTS CONCERNING TRACHOMA.

BY

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It is hardly necessary to lay stress upon the importance of trachoma when addressing medical men who are practising or who are about to practise in the tropics. As you are well aware, the disease is one of the great causes of blindness and loss of efficiency in the Near and Far East.

Trachoma is associated with bad housing conditions, dirt, and general insanitary surroundings. When dust and glare, which lower the resistance of the conjunctiva to infection, are added to these conditions, then a state of affairs highly favourable to the spread of the disease is produced. The zenanas of the poorer class Mohammedans form never-failing reservoirs of infection from which the disease can spread, first to other members of the family, and then to those outside the family circle. The henna pot, which contains a pigment for beautifying the eyes, and which is shared, in a communistic fashion, by the ladies and children of the family, is a fruitful source of infection.

Flies may occasionally be responsible for the spread of the disease, but many authorities now consider them to be an unimportant factor in the dissemination of infection.

Trachoma is common in the Eastern parts of Europe where insanitary conditions prevail, but, fortunately, it is now rare in England, though this country, in common with other parts of Western Europe, was flooded by a wave of infection in the beginning of last century on the return of the soldiers who fought in the Napoleonic wars. The backwash of this wave is yet apparent in Ireland, the less progressive districts of which country are still infected. In England the disease is now chiefly seen amongst immigrants from Eastern Europe.

Trachoma (*τράχως* = rough) is a specific and infectious inflammation of the conjunctiva, of a chronic type, and is characterised by the

formation in the membrane of follicles and papillæ which end in cicatrisation. The disease is frequently called granular ophthalmia, an unfortunate term, since it lays emphasis upon the occurrence of follicles and papillæ which are merely the reaction of the conjunctiva to any form of chronic irritation, and are in no way pathognomonic of trachoma.

Before proceeding further, I propose to recall to your memory certain facts concerning the structure of the conjunctiva. The conjunctival membrane, which has a close relationship to the skin, is continuous with the skin at the margins of the lids. It sweeps backwards over the tarsal plates, to which it is intimately attached, and, forming a very lax fold, or fornix, above the convex border of the tarsus, passes on to the anterior surface of the globe and gives a loose covering to the front portion of the scleral tunic. The conjunctiva is represented on the surface of the cornea by the corneal epithelium.

There are thus three separate parts of the conjunctival membrane: (1) The tarsal or palpebral; (2) the fornical or transitional; (3) the bulbar. The tarsal and fornical parts of the conjunctiva are covered by laminated cylindrical epithelium and there is a considerable development of low papillæ in the former. As these papillæ are covered by epithelium, they do not become evident on the surface until inflammation causes them to hypertrophy. At the junction of the tarsal and fornical portions of the conjunctiva these papillæ become higher and the epithelium dips between them, so that the discrete structures may give a velvety appearance to the membrane. This appearance is very marked in the presence of inflammation, but it may also be found in some cases of simple hyperæmia caused by an error of refraction. A delicate reticulum of adenoid tissue appears in the deeper layer of the conjunctiva at an early age, and is best marked in the transitional portion of the membrane. This tissue may show follicular aggregations even in the healthy membrane, but such formations are much more evident if any chronic source of irritation is present.

Pathology of trachoma.—A section of a trachomatous conjunctiva shows a general round-cell infiltration of its deeper layer with a varying degree of vascular engorgement. Pseudo-papillæ, formed by folding of the swollen membrane, are found, especially in the transitional part of the conjunctiva; tubular depressions, lined by epithelium, are also seen, and cysts may be caused by the occlusion of their orifices or of the

mouths of the interpapillary crevices and by the subsequent accumulation of epithelial debris. The epithelium is thickened and is infiltrated by leucocytes, and actual downgrowths of epithelial cells may occur into follicles which have ruptured.

The follicle is the characteristic and striking histological feature of trachoma; it is composed of a central group of large connective tissue cells having rounded or oval, pale nuclei, and of a peripheral group of small and deeply staining lymphocytes; the centre of the follicle appears to be paler than the periphery for this reason. The central cells may be mononuclear leucocytes, or may be connective tissue cells, and often appear to be epithelioid, and their cytoplasm may contain cell inclusions of various kinds. Other forms of leucocytes may also be found in this zone. The peripheral cells are enclosed in a stroma which is continuous with the connective tissue of the surrounding conjunctiva, but it is a disputed point as to how far this stroma extends into the interior of the follicle. The follicles are surrounded by a vascular network from which capillaries pass inwards, but these do not appear to reach the centre of the follicle. The existence of a capsule, in the early stages of the follicle, has been disputed, but a capsule undoubtedly forms in the later stages and takes its part in bringing about cicatrisation. It has been stated that the capsule begins to form on the deeper surface of the follicle, and that it is best developed in that part. The follicle ends in cicatrisation, which is generally preceded by a degeneration and softening of its contents. The softened contents may, occasionally, be discharged on the surface, the covering epithelium having become thinned and broken through; but an ingrowth of fibrous tissue, followed by absorption, is the more common termination.

Infiltration of the tarsus by round cells, which is best seen along the course of the vessels, is found at an early stage, and this is followed by distortion and, in some cases, by a partial atrophy of the tarsal plate. The tarsal glands undergo degenerative changes, and the formation of cystic spaces in them is fairly common.

Pannus is seen as a cellular infiltration of the superficial layers of the cornea, accompanied by a rich formation of young blood-vessels. The infiltration, in the early stages, is usually quite superficial and lies between the epithelium and Bowman's membrane, but in the later stages the *substantia propria* is involved, and Bowman's membrane may

be destroyed in advanced cases. . Nodular aggregations of lymphocytes may be found which resemble the young follicles seen in the conjunctiva, but typical follicles rarely occur except upon the limbus.

No specific organism has yet been discovered to be the cause of trachoma. PROWAZEK and HALBERSTAEDTER have described groups of corpuscles in the epithelial cells which they considered might be the cause of the disease. Similar appearances have, however, been found in other conditions, and even in the apparently normal conjunctiva. HEYMAN has found identical forms in cases of blenorrhœa, and GREEF states that "the conclusion that everything, in which trachoma bodies can be found, is trachoma, can no longer be sustained."

Symptoms and Signs of Trachoma.—The disease may be divided into three stages:—(1) An early or florid stage, which is chiefly characterised by the formation of follicles and papillæ; (2) a middle or early cicatricial stage, in which traces of fibrous tissue can be distinguished by the unaided eye as it forms in and amongst the trachoma follicles; (3) a late stage, in which the tarsus and cornea show marked changes, due to the disease, and in which the cicatricial changes in the conjunctiva are very advanced. It is scarcely necessary to mention that no sharp line can be drawn between these different stages, which gradually merge into one another; the forms of the disease may also be considerably modified by the occurrence of secondary infections.

First Stage.—The appearance of small papillary elevations, accompanied by a few irregularly placed follicles, is usually the earliest sign of trachoma. These signs are often said to make their first appearance in the lower fornix, but, at a very early stage, they are best seen at the convex upper edge of the superior tarsus, and, indeed, this portion of the conjunctiva bears the brunt of the attack during the greater part of the disease. Follicles increase in number and are seen on the tarsal conjunctiva as small, raised, yellowish, and irregularly placed spots. Their growth in this region is limited by the intimate connection that exists between the membrane and the tarsus, but they reach a much greater size in the transitional conjunctiva, where their growth is less restrained, and here they are of varying sizes and are pale and translucent, resembling sago grains or frog-spawn. Considerable swelling of the transitional conjunctiva accompanies the formation of the follicles, and small folds and creases of this part of the membrane are formed and lead

to the appearance of coarse papillæ. The papillæ, which normally exist in the tarsal conjunctiva, undergo hypertrophy as a result of the irritation, and, by doing so, often hide the follicles. The proportion of follicles to papillæ varies in different cases and sometimes one predominates and sometimes the other, so that a "papillary" form and a "follicular" form of trachoma have been described; it must be remembered, however, that the follicle is the essential feature of this stage, and that, though it may not be immediately apparent, it is never absent. The occurrence of a secondary infection will favour a papillary outgrowth and so cause a papillary type of the disease.

It is necessary to evert the fornix thoroughly in order to examine the transitional conjunctiva properly; this may be effected by many different means, of which eversion of the lid by a small button-hook is very effective, but *by far the most satisfactory method is to balloon the conjunctiva by injecting a syringe of normal saline beneath it*; any changes in the membrane can then be accurately observed as it lies stretched and fully exposed. This method has the further advantage, as will be pointed out later, that it allows remedies to be thoroughly applied to the diseased area and is otherwise beneficial. The occurrence of follicles in the fornix is usually limited by a fairly regular line that lies just anterior to the junction between the transitional and the bulbar conjunctiva.

Ptoxis can be nearly always observed at this period, even in the early stages; this drooping of the lid is most probably due to a loss of function of the levator palpebræ owing to its insertion having become involved in the inflammation. *Pannus*, or vascularisation of the cornea accompanied by some opacity, due to subepithelial infiltration, may or may not be present in this stage, but, if the cornea is carefully examined, it will usually be possible to detect a slight swelling of the upper part of the limbus associated with the presence of some fine vascular twigs, which branch on to the neighbouring corneal tissue.

Middle Stage.—All the signs become more accentuated in the middle stage of the disease. Ptoxis is obvious and pannus becomes more marked, and often involves the whole of the upper half of the cornea. If the transitional conjunctiva is ballooned by an injection, delicate lines of fibrous tissue can be seen running through it, so that it appears as if a fine grey net had been pressed into the membrane and had been

incorporated with it. A line of fibrous tissue may also be observed to run horizontally about 3 mm. above the free edge of the lid in the *sulcus subtarsalis*, at the point where the *rami perforantes* pass from the inferior tarsal arch of vessels to the conjunctiva through the tarsal plate. This line becomes broader and deeper, and is known as *Arlt's line*. The internal margin of the lid, which normally has a sharp and well-defined edge, becomes rounded, and a soft granulation tissue often forms upon it. When the follicle formation is in excess, the follicles on the tarsus sometimes become aggregated into an almost homogeneous, firm, gelatinous mass, which is of pale yellow colour; a considerable thickening of the lid may be produced in this way; the surface epithelium becomes thickened at the same time, and the whole syndrome forms the condition which is known as *Stellwag's gelatinous trachoma*. Cysts may also form in the conjunctiva as the result of the retention of cell products in the crevices between the papillæ and of the accumulation of glandular secretion. Signs of the previous existence of trachoma can often be observed, even if the disease has been cured in the early part of its middle stage. The tarsal conjunctiva will, in that case, be seen to have a faint lilac tinge, which is quite characteristic, and some contraction of the fornix will usually be apparent. In the later part of the middle stage the shrinking of the fornix is much more striking, and it may be possible to recognise definite strands of fibrous tissue in the conjunctiva.

Third Stage.—The changes in the third stage are due to shrinking of the new-formed fibrous tissue and to degenerative changes in the tarsal plate. The tarsus becomes rather sharply bent, so that an angle, whose apex looks forwards, is formed in the lower part of the plate. The tarsus is also reduced in size, and may, in some cases, be merely represented by a small rod-shaped mass of tissue, which contains fat, cheesy matter, and fibrous tissue. These alterations are due both to the degeneration of the tarsal plate and to the traction of the shrinking conjunctiva upon its deep surface. The bending of the tarsus leads to an entropion, so that the lashes turn inwards, and a trichiasis, or rubbing of the cilia on the cornea, adds to the corneal irritation and pannus. Shrinking of the conjunctiva leads to a diminution in size of the transitional fold, and much of the anterior layer of this fold is drawn down to form a covering for the upper part of the tarsal area of the lid. The conjunctival surface of the tarsus shows white branching strands of scar

tissue, and between these strands may be seen small spots of granulating tissue which represent the remains of hypertrophied papillæ. The lid margin has a sinuous outline, described by HERBERT, the portion near the outer canthus being at a lower level than the central and inner parts. The size of the palpebral aperture is also often lessened. Pannus is very marked in this stage and corneal ulceration may occur; the corneal troubles are much aggravated by any trichiasis which may be present. In very severe cases, where the cicatricial changes and shrinking of the fornix have led to an excessive atrophy of the conjunctiva, changes occur in the surface epithelium, the uppermost layer of cells undergoing keratosis with a general deposition of keratohyalin, so that the membrane becomes epidermoid in character. Under such circumstances the eye becomes dry and no tears adhere to the surface of the diseased conjunctiva. This condition of *xerophthalmia* is not limited to the conjunctiva, but affects the surface of the cornea, and, by causing its opacity, leads to blindness.

Diagnosis of Trachoma.—It must be admitted that the diagnosis of trachoma, before the cicatricial stages have set in, is a problem of considerable difficulty, and even a surgeon of considerable experience will frequently find himself unable to decide whether a conjunctival disease is truly trachomatous or not. These difficulties are not so pronounced, of course, in the later stages, when cicatricial changes have occurred. The reason is that follicle and papillary formation are the natural reaction of the conjunctival membrane to many different varieties of irritation, infective and otherwise. The follicle formation which results from the excessive use of atropine in susceptible persons is an example of one of these, and I have known cases of irritation from this cause to be diagnosed as trachoma. This difficulty of diagnosis must necessarily continue as long as we are unable to identify the causative organism of the disease. Three signs are of value as an aid to diagnosis in the early stages of the disease; these are (1) the presence of ptosis, (2) the early occurrence of pannus in the upper part of the cornea, (3) the situation of the trachoma follicles. Ptosis, of some degree, is seldom or never absent, and the patient acquires a peculiar sleepy appearance owing to the drooping of the upper lid. Pannus appears in that part of the cornea which is in constant contact with the rough and infected membrane, and is first seen at the upper part of the limbus, but the

vascularised area of infiltration soon encroaches upon the upper part of the cornea; this area is generally limited by a fairly well-defined and regular horizontal margin below, which, in the early stages of the disease, does not ordinarily reach lower than the level of the upper border of the undilated pupil. Vascularisation, which commences in parts of the cornea other than its upper half, is unlikely to be due to trachoma.

The follicles, in trachoma, are best marked along the upper, or convex margin, of the superior tarsus, and from here they spread upwards to the fold of the fornix, and downwards on to the conjunctiva which covers the tarsus. They may be seen to a much less extent in the lower fornix and the conjunctiva of the lower lid, and, in some cases, they may even be found upon the plica semilunaris. The follicles are of varying size and are rather irregularly placed, whilst some may be masked by the development of papillæ.

The conditions which are most difficult to distinguish from the earlier stages of trachoma are (1) Follicular conjunctivitis, (2) spring catarrh, (3) a chronic form of purulent ophthalmia.

Follicular conjunctivitis is the disease that presents the greatest difficulty in diagnosis, since it also is characterised by the appearance of follicles, which, however, differ from those of trachoma in that they do not undergo cicatricial changes. Follicular conjunctivitis is not usually accompanied by ptosis, and, unless the conjunctiva is irritated by caustic applications or by secondary infections, shows little tendency to papillary formation or to pannus. The follicles are regular in size and in shape, and are as marked in the conjunctiva of the lower lid as in that of the upper; indeed they may be often rather more so. Follicular conjunctivitis is usually a condition of childhood, and is often associated with an excessive development of adenoid tissue in the naso-pharynx, in the cervical lymphatics, and in other parts of the body. A hyperæmia, induced by an uncorrected error of refraction, or by a mild secondary infection, will sometimes increase the follicular growth and cause the formation of papillæ and so render the diagnosis especially difficult. In cases of difficulty it is advisable to use mild lotions, to correct the refraction, and to watch the course of the case; if the disease shows no signs of progress, it is not true trachoma.

Spring catarrh is characterised by a papillary formation in the conjunctiva of the tarsus and in the transitional conjunctiva. The

Fig. I.

Section under low magnification showing tarsus, tarsal conjunctiva, and transitional conjunctiva in the early part of the second stage of trachoma. Trachomatous follicles and interfollicular depressions are seen in the transitional conjunctiva.

To accompany Col. Kirkpatrick's Paper (Face p. 42).

Fig. II.

Trachoma follicle showing peripheral zone of small, deeply-staining cells and central area of large cells. Young blood-vessels seen in periphery, and early capsule formation.

Fig. III.

Trachoma follicle, central zone. Note variety of cells.

Fig. IV.

Later part of First Stage.

Fig. V.

Later part of Second Stage.
Aul's line is well marked.
Note the presence of soft granulation tissue on margin of the lid.

Fig. VI.

Third Stage--Ptosis and the bulging forward of the tarsus seen in right eye. Herbert's sinuous lid margin seen in left eye.

papillæ are discrete and firm, with flattened tops, and, unless inflamed, are pale and pink with a peculiar bluish tinge. The colour is sometimes compared to that of ham. The papillæ are thus quite different in appearance to the softer and readily bleeding papillæ found in trachoma. The conjunctival discharge contains a considerable number of eosinophile leucocytes, and the disease is usually accompanied by an eosinophilia. An absence of follicle formation is a further point of differentiation between the diseases. A spring catarrh, associated with a secondary infection, may present considerable difficulties in diagnosis from trachoma; in such cases a careful examination should be made of the discharge for the presence of eosinophiles. Little difficulty will be experienced in forming a diagnosis if the characteristic corneal changes of spring catarrh are present. Trachoma and spring catarrh are sometimes combined, and such cases will be difficult to diagnose and to treat correctly.

High papillæ, which are soft and bleed readily, and which are accompanied by some irregular follicles, are sometimes found in cases of *purulent ophthalmia*, the acute stage of which has passed off. The papillæ, in cases of this sort, are usually larger than those found in trachoma and a thin, greenish-yellow discharge may be seen to trickle from the spaces between them. An examination of the discharge will show the presence of the causative organism, which is usually the gonococcus. Pannus is absent in these cases, but there may be a vascularisation of the corneal edges, which is not confined to the upper part of the cornea. An inflammation of this character will yield to suitable treatment more readily than trachoma will; the disappearance of the papillæ, after a short course of treatment by eyebaths of magnesium sulphate lotion, aided by the use of copper sulphate, will show the nature of the disease. It should be remembered that trachoma is sometimes complicated by the onset of an attack of gonorrheal ophthalmia; this is said to occur very frequently in Egypt.

The hyperæmia and other conjunctival changes, produced by *an uncorrected error of refraction, is the condition which is most often confused with trachoma by those who are unfamiliar with eye diseases.* Such a refraction error frequently causes a hyperæmia of the conjunctiva and the eyelids, and an increased glandular activity follows the excessive supply of nutriment. This is shown, not only by watering of the eye, but also by the collection of secretion along the edges of the lids, and,

occasionally by the formation of so-called Meibomian cysts or chalazia. The redundant secretion affords a medium in which micro-organisms can grow and multiply, and its presence lowers the resistance of the conjunctiva to infection, so that inflammations of the membrane are common in such cases. Small papillæ and follicles may be found in the transitional conjunctiva, and, as previously stated, if these are irritated by the application of caustic drugs, the hyperæmia is increased and a condition closely resembling true trachoma may be produced. The result of treatment will usually show the nature of the case. Patients who have a seborrhœic tendency and who suffer from an error of refraction, appear to be specially liable to this condition, and the use of resorcin (in 1 per cent. eyedrops), in addition to the correction of the refraction error, is often valuable in such cases.

The Treatment of Trachoma may be considered with reference to the stage of the disease and with reference to whether it should be medicinal or operative.

Treatment should be directed towards promoting the disappearance of the follicles without, at the same time, causing the formation of an excessive amount of fibrous tissue. Nature will, in course of time, effect the first object, but she does so by a cicatrisation that leads to very undesirable complications and sequelæ.

The first essential is that the patient should be placed under good sanitary and hygienic conditions, so that he may be kept in as good a state of general health as possible, and that he may cease to be a source of danger to others. Good food, fresh air, general cleanliness, and suitable tonics fulfil the first requirement. The provision of separate basins and towels for the patient, the observance of proper precautions regarding the cleansing of the eyes by attendants, and the right disposal of cloths soiled by conjunctival discharge, will, under ordinary circumstances, satisfy the second. Should the disease appear amongst members of a community, such as those living in schools or barracks, infected persons should be segregated and placed in special companies or taught in separate classes. The mistake made at the beginning of last century, when infected soldiers were discharged to their homes, and thus allowed to disseminate the disease broadcast, should be avoided, and these patients should not be allowed to return to their families until they are free from infection.

For the treatment of the first stage of the disease, nitrate of silver solution and copper sulphate, or blue-stone, are probably the two drugs which are most in favour as medicinal applications. Silver nitrate is used in various strengths, from 5 grains to the ounce of distilled water to 60 grains to the ounce, but a solution of 10 grains to the ounce will usually be found to be the most satisfactory; the stronger solutions are too irritant and are likely to cause too great a formation of fibrous tissue, whilst the weaker ones are insufficient to cause a proper reaction and to promote absorption. A mop, made by twisting a little cotton-wool on to the end of a small stick (for example a match), is dipped into the solution and then applied to the affected area, the excess being washed off by a stream of saline solution after a pause of about twenty seconds. This may be applied daily or three times in a week according to circumstances. The application is followed by the formation on the surface of the conjunctiva of a bluish-grey film, composed of necrotic epithelium; this is shed in the course of a few hours. Patients occasionally complain that they notice haloes around lights after treatment by silver nitrate; this symptom arises from the effect of the drug upon the corneal epithelium, changes in which cause a dispersion of light. The appearance is only a temporary one, but patients may be alarmed by its occurrence, since a similar symptom is common in glaucoma.

Sulphate of copper should be applied in the form of a stick, or of a crystal which has a perfectly smooth surface. The retrotarsal fold is thoroughly exposed and the crystal, or stick, is lightly rubbed over any prominences which are seen on the surface of the conjunctiva; the conjunctival sac is then thoroughly irrigated with saline solution. The use of copper sulphate is specially indicated in cases where papillary formation is a marked feature. Strong solutions of perchloride of mercury (1 in 100 or 1 in 500) have been recommended by some surgeons; these are rubbed into the affected area with a mop, the pressure of which at the same time forces out the contents of the follicles. Some advocate the application of boracic acid powder in the same manner, and this has the advantage that it causes little irritation. HERBERT recommends intensive irrigation with 1 in 3000 perchloride of mercury solution. Whatever drug be favoured, it is essential to apply it to that part of the conjunctiva which is diseased, and the fornix must be thoroughly everted for this purpose. *A subconjunctival injection of fluid, which balloons out the*

fornix, will be found to be a most efficient method of ensuring a complete exposure of the membrane. The upper lid is everted and the point of the needle is entered at the outer angle of the upper margin of the tarsus, and a syringe of normal saline solution is injected. If 4 minims of a 4 per cent. solution of cocaine, or similar substance, and 4 minims of adrenalin are added to the saline, any subsequent manipulation of the conjunctiva will be rendered painless. A subconjunctival injection has further great advantages, since (1) it stretches the membrane and so tends to lessen the contraction caused by cicatrisation, and (2) it promotes the absorption of inflammatory products by a lymphagogic action. Puncture of the follicles by a needle or by the point of a galvanocautery has been recommended by some surgeons of experience, but the expression of their contents is probably the most efficient method of dealing with the follicles at this stage. Expression is carried out by means of a forceps, between the blades of which the diseased membrane is squeezed. The blades of some of such forceps are furnished with rollers in order to facilitate expression of the follicles. A preliminary ballooning of the fornix by the subconjunctival injection of an anæsthetic fluid is advantageous in all these methods of treatment.

The application of carbon-dioxide snow and exposure to X-rays have been recommended in the treatment of trachoma, but these measures have not proved entirely satisfactory in my experience.

It must be borne in mind that trachoma is an obstinate disease, and that, even if detected in the first stage, it will require treatment for some months, if all danger of relapse is to be avoided. If the disease fails to respond to treatment, or if the patient is unable to afford the time necessary for a thorough cure, it may be advisable to undertake a more radical measure and to excise the transitional portion of the conjunctiva.

Such an excision is a simple proceeding; the lid is everted and the fornix ballooned; a slightly curved, horizontal incision is made beneath the follicle-bearing area, and its extremities are then joined by a similar incision passing along the upper margin of the tarsus. These incisions should be quite superficial and should merely divide the conjunctiva. The elliptical area, thus isolated, is then easily lifted from the subjacent tissue by the knife or scissors; the cut edges of the membrane may be slightly undermined and then united by three or four sutures, but this is not really essential, as healing takes place rapidly. This little operation is followed by very little trouble or discomfort.

A trachomatous conjunctiva, owing to its impaired power of resistance, is very subject to the occurrence of secondary infections, and these should be carefully watched for and appropriately treated when recognised. Inflammation due to the Morax-Axenfeld bacillus is one of the most common of such infections, and this will usually readily yield to treatment by sulphate of zinc drops. Koch-Weeks infections are best treated by silver nitrate, and eyebaths of a saturated solution of magnesium sulphate will be found useful in the case of infection by the gonococcus. The latter form of treatment is also of great value in inflammations due to streptococcal infection.

The treatment of the second stage of the disease is conducted on the same lines as that of the first stage, but, owing to the presence of the newly-formed fibrous tissue, medicinal treatment is unlikely to be as effective in this case, and operative measures are more likely to be required. Copper sulphate is usually more efficacious than silver nitrate at this stage, but the course of treatment will probably be much shortened if more radical treatment is adopted. Colonel HENRY SMITH recommends the employment of subconjunctival injections of cyanide of mercury, and ABADIE has recently reported excellent results from deep and multiple punctures of the tissues at the upper margin of the tarsus by a galvanocautery; the punctures are repeated until a regular trough is formed in the tissues. It will be found, however, that the *combined excision of the fornix and tarsus*, as described by HEISRATH, will probably prove the most satisfactory form of operation. This operation can be very easily carried out if attention is paid to the following steps:—

After ballooning the fornix by the injection of a local anæsthetic combined with adrenalin, a suture is passed through the thickness of the lid at the central point of its margin; this suture serves as a landmark, and assists to control the lid. The upper lid is everted, and the retro-tarsal fold is seized by a fixation forceps and thoroughly exposed; a fixation forceps, provided with a catch, is applied to the outer part of the fold (the inner part in the case of the left eye) and allowed to hang free, in such a manner that full eversion is obtained (Fig. VII). The inner part of the fold (or the outer in the case of the left eye) is next grasped by a forceps held in the left hand, and the tissue is stretched between the two pairs of forceps. A horizontal incision is made through the conjunctiva, just below the follicle-bearing area, along the whole length of the lid

(Fig. VII, 3). A sharp knife is required for this purpose, and care must be exercised to keep the plane of the blade at right angles to the surface of the membrane. The conjunctiva, which forms the lower edge of the wound, is then thrown down towards the globe, so as to form a loose fringe of membrane (Fig. VIII, 5). The fornical conjunctiva is next peeled upwards off the underlying tissues as far as its attachment to the tarsus. This dissection is made more by pushing movements of the blade of the knife than by actual cutting, and it is usually only necessary to divide a few strands of tissue by the knife edge. The extremities of the wound are next joined by a second incision which passes close to the border of the lid (Fig. VII, 4); the centre of this incision is deepened until the tissues which underly the tarsus are exposed (Fig. VIII); the incision in the tarsus is then completed by seizing the lower margin of the wound, already made, in a forceps, and by extending the cut laterally through the entire thickness of the tarsal plate. The tarsal plate is next dissected off the tissues beneath as far as its upper margin, so that it only remains in position along a narrow horizontal line; the tarsus and the attached apron of transitional conjunctiva are now held up by a forceps, between the blades of which both structures are grasped, and the remaining attachment is divided by a few strokes of the knife or by a few snips of the scissors. A fairly extensive, elliptical, bare area is left by the removal of the tissue (Fig. IX, 4). The fringe of conjunctiva, which remains continuous with the bulbar part of the membrane, is raised, and a suture is passed through its margin, at a point which would be intersected by a perpendicular line let fall on to the extremity of the horizontal diameter of the cornea; the needle is again passed through the cut edge of the tarsus at a point $6\frac{1}{2}$ mm. to one side of the suture marking the central point of the lid margin (Fig. IX, 5). A second suture is passed at corresponding points at the other side of the wound, and, when these are tied, the operation is completed. It is very important not to injure the deeper tissues when stripping off the conjunctiva and the tarsus, and to place correctly the sutures, which unite the edges of the wound. Bleeding may be troublesome occasionally, but is seldom likely to be so if adrenalin is injected with the local anæsthetic. The operation is followed by some reaction, which lasts for about thirty-six hours and then passes off quickly. The sutures may be removed on the third or fourth day, and painting with silver nitrate may be commenced at the end of the first week.

The treatment of the third stage of trachoma is chiefly concerned in the treatment of complications caused by the contraction of the fibrous tissue and by the distortion of the tarsus. The depth of the fornix is greatly diminished, partly because the membrane is shrunken, and partly because it is drawn down over the remains of the tarsus by the contracting fibrous tissue in that region, and there will therefore be less difficulty in applying drugs to its surface. Small, raised, granulating spots, which bleed easily, may be seen amongst the fibrous tissue, and the application of copper sulphate to these is beneficial. The chief indication is, however, to treat any complication, such as trichiasis, that may be present, and to recognise and to remedy any of the secondary infections that are so commonly found at this stage of the disease. The operation of excision of both fornix and tarsus is not advisable, since so little of the transitional conjunctiva remains, but much benefit may be derived from the excision of the tarsus, the diseased tissue of which often appears to serve as a reservoir of infection.

Pannus is best treated by attention to the disease of the conjunctiva, and an improvement of the corneal condition will quickly follow an improvement in the state of that membrane. A peritomy will sometimes be of advantage in helping to clear up a very vascular pannus, and a sub-conjunctival injection of cyanide of mercury will often hasten the disappearance of opacities. The slightly faceted, chronic ulceration, that so often persists after the conjunctiva has been practically cured, may be much benefited by the use of Scarlet R applied once or twice daily as a 2 per cent. solution in olive oil. I have also found this application to be very valuable in early cases of xerophthalmia. Dionine is often of use in promoting the absorption of opacities due to pannus. A very marked improvement in pannus nearly always follows the combined excision of tarsus and fornix. The state of the lachrymal apparatus should be carefully investigated and watched, as an infection of the canaliculi may occasionally cause a persistent corneal irritation. Jequirity is highly recommended by some surgeons for the treatment of pannus. The instillation of the drug induces a severe inflammation of the conjunctiva, and this often leads to the shrinking of the vessels which have invaded the cornea. The conjunctiva is painted every day with an infusion made from crushed jequirity seeds; the infusion is used in a 5 per cent. solution. The application is stopped when a sufficient reaction has been produced.

It is advisable for the patient to use eyedrops of $\frac{1}{2}$ per cent. solution of copper sulphate or of a 7 per cent. solution of tannic acid in glycerine for some weeks after discharge from hospital; a yellow oxide of mercury ointment should be applied at bedtime.

In conclusion, I would like to suggest that, even in apparently typical cases of trachoma, we may not be dealing with a single disease entity, and that the causes of the conjunctival changes, characteristic of trachoma, may widely vary in different cases.

Fig. VII.

1. Fixation forceps, with catch, holding retro-tarsal fold everted.
2. Suture marking central point of lid
3. First incision, made through the transitional conjunctiva, just below the follicle-bearing area
4. Incision through tarsal conjunctiva; this is made to divide the tarsal plate in the middle portion.

Fig. VIII.

1. Forceps gripping the edge of the divided tarsal plate.
2. Cut edge of tarsal plate.
3. Suture marking point in lid which lies over the centre of the cornea.
4. Detached fringe of transitional conjunctiva.
5. Detached fringe of bulbar conjunctiva.
6. Tissues, which underly the tarsal plate, exposed by throwing the divided portion of the tarsus downwards.
7. The incision through the tarsal conjunctiva.

Fig. IX.

1. Suture marking the point in the lid which lies over the centre of the cornea.
2. The cut edge of the tarsal plate.
3. The cut edge of the fringe of bulbar conjunctiva.
4. Deep tissues, exposed by the removal of the tarsus and transitional conjunctiva.
- 5 and 6. The sutures, by which the fringe of bulbar conjunctiva is united to the cut edge of the tarsus. These are passed through the edge of the bulbar conjunctiva just to the outer side of a point which would be intersected by a perpendicular line let fall on to the extremity of the horizontal diameter of the cornea. They are passed through the cut edge of the tarsus at a point $6\frac{1}{2}$ mm. to one side of the suture No. 1.

DISCUSSION.

Colonel R. H. ELLIOT : Colonel KIRKPATRICK said that he had nothing new to tell us. If that is the case, he has certainly put before us a number of old things in a new way. One of the most important parts of his paper is his reference to the large number of conditions which, certainly in my time, we put down to trachoma. Many of the cases which we confidently called trachoma in the old days were not true trachoma. Trachoma is a word for a congeries of diseases, and not a single disease. That is a line along which some important work can be done. I should like to refer to the extraordinary importance of this question of trachoma. I am without the slightest fear of overstating the case when I say that trachoma in India, and I understand also in Persia, Afghanistan, and China as well, is responsible for more blindness than any other two factors put together. Even if you put ophthalmia neonatorum and cataract together, I do not believe that they are responsible for such a big loss of sight in Eastern countries as trachoma alone. But trachoma is, if treated properly from the first, invariably a curable disease. I have had trachoma myself, and have been completely cured of it and can speak of it from the patient's side. If a case of trachoma is treated properly from the start, blindness need never result, and yet trachoma is responsible for more blindness than anything else. It is of great importance that Governments should be awake to their responsibilities in regard to trachoma and other eye diseases. Governments—in India, for instance—have never been anything like awake enough to these diseases and to the possibility of cutting off trachoma at its earliest stages. There are two other points I would like to commend to your attention. One is Colonel KIRKPATRICK's suggestion of the magnesium sulphate treatment. I have had very little opportunity of trying it myself, but I have met with a number of young men who have seen Colonel KIRKPATRICK use it in Madras, and who have come back enthusiastic about its advantages. The other thing I can speak of with more emphasis, viz., the procedure of ballooning the conjunctiva. I believe that this is an extraordinarily valuable manœuvre, both from the point of view of diagnosis and of treatment.

Lieut.-Colonel S. P. JAMES : In view of what Colonel ELLIOT has said about the responsibility of Governments, and the fact that trachoma in its very early stages can be treated and cured successfully, may I ask

Colonel KIRKPATRICK whether he considers that trachoma should be made compulsorily notifiable in England? That is a question we are frequently asked in the public health service.

Colonel H. KIRKPATRICK: In reply to Colonel JAMES, I am afraid my experience in England is very limited. I used to meet with a good deal of trachoma more years ago than I care to number, when I was a house surgeon in Dublin. I certainly think, however, that it ought to be notifiable. It is an infectious disease and a dangerous one, and consequently it ought to be notifiable.

Lieut.-Colonel JAMES: The difficulty is diagnosis.

Colonel KIRKPATRICK: Typical trachoma certainly should be notifiable.

Colonel ELLIOT: I should like to support Colonel KIRKPATRICK in this matter. It would be much better to have notification, even if a number of the cases turned out not to be trachoma, than to let cases of trachoma be unnotified and go far and wide. After every big war we have had numbers of cases of trachoma in this country, and, in fact, far over Europe.