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An Epidemic of Follicular Conjunctivitis in a Liverpool School.

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The following communication describes an epidemic occurrence of follicular conjunctivitis in a Liverpool school. One of us (Dr Loewenthal), who is the medical officer to the school, examined one of the pupil-teachers for some internal complaint, and accidentally found a luxuriant growth of follicles in his conjunctivæ. This suggested an examination of the school, which could only be preliminary and fragmentary owing to the holidays beginning just then. From this preliminary examination, however, it was clear that we had to deal with an epidemic of follicular conjunctivitis; and this was confirmed when a more complete examination of the school was instituted after the holidays. It was then found that out of 720 children, 420 were affected (= 60 p.c.).

Before going into statistical details, it will be well to give an account of the salient points of the disease.

As the most characteristic feature we find, in conjunction with more or less *slight* inflammatory symptoms, the occurrence of small roundish nodules, rising hemispherically out of the surface of the conjunctiva. These nodules are globular or oval, pink or yellow or greyish, or of any transition tint between these three colours, translucent, almost jelly-like in appearance, varying in size from a millet seed to a small pea. Their surface is smooth and shining, and they are ranged in two, three, or four parallel rows, especially in the lower conjunctival sac, lying so that the long axis of the oval nodules is parallel to the

conjunctival fornix. These nodules, or follicles as we will call them henceforth, are generally found first in the outer half of the lower conjunctival sac. There also they reach their greatest size at an early date. They are smaller towards the tarsal portion of the conjunctiva. In the upper lid, as a rule, they are not so big as in the lower conjunctival sac, nor do they attain any size on the surface of the upper lid, but there we not infrequently notice small round white spots, level with the surface of the mucous membrane, and very easily seen when the latter is hyperæmic. The prominence of the follicles is often masked by serous infiltration of the conjunctiva.

The development of the follicles may be slow or quick, with all possible shades of transition, the duration of the disease ranging from a few weeks to several years.

With regard to the course and progress of the disease, we must distinguish between the acute and the chronic form.

Acute follicular conjunctivitis often sets in with severe irritation, hyperæmia, and a serous infiltration of the conjunctival fornix. The ocular conjunctiva, too, is often hyperæmic in this form. The secretion is at first thin and clear, then it becomes charged with mucous flakes, until it reaches a more homogeneous muco-purulent appearance. The follicles are found towards the end of the first week, first on the conjunctiva of the lower lid, then spreading towards its free margin. Later on, the conjunctival fornix of the upper lid is affected, but there the spread generally stops, and, as already mentioned, leaves the tarsal portion of the upper lid free.

In the acute form, the follicles are not always very prominent; at first, the serous infiltration of the surrounding conjunctival tissue veils their existence to a great extent. When the hyperæmia diminishes, however, and the disease enters into the chronic stage, the follicles become more manifest. When the lower lid is everted, a sausage-like ridge, studded with these nodules, at once attracts attention. The hyperæmia disappears first in the ocular conjunctiva. Very often, however, a pericorneal injection sets in, followed by a swelling of the

corneo-sclerotic margin. Sometimes the pericorneal injection is circumscribed, and only occupies one or two small parts of the corneal circumference. This is of bad omen, as it is almost always followed immediately by the development of a marginal keratitis at the locality of the hyperæmia.

Towards this stage we find very often the tarsal conjunctiva, especially that of the upper lid, of a red, velvety appearance, being in the state of so-called papillary conjunctivitis.

Very often the chronic stage of follicular conjunctivitis does not develop out of the acute stage, but begins as such. In that case both inflammation and secretion may be very insignificant. The hyperæmia may be confined to the conjunctival fold; the tarsal conjunctiva shows no abnormal injection, nor does the pericorneal region, except temporarily, through irritation, either mechanical, as from dust and smoke, or functional, as from strong light or continued exertion.

In the chronic form the follicles are mostly found in the lower conjunctival fold; the upper fold may be free. This state of affairs may remain for years if not attended to.

It may be mentioned that in none of our cases did we find the pre-auricular gland enlarged. It is noteworthy that other authors have laid great stress on the enlargement of the adjoining lymphatic glands in both follicular and granular conjunctivitis. The pre-auricular gland is the first to be enlarged; in some cases even the cervical glands have been found swollen.

The disturbances of function and the discomfort may be very annoying. The chronic form, on the other hand, is generally characterised by comparative ease and absence of discomfort, in some instances very remarkably so, and quite out of proportion to the great development and enlargement of follicles.

Etiologically it is undoubted that the secretion of the follicular conjunctivitis is more infectious than that of simple catarrh. Whether the secretion owes its infectiousness to some specific pathogenic micro-organisms must be considered quite an open question. Recently the pneumococcus has been made responsible for the follicular development; but there are many

bacteria and cocci found in the normal conjunctiva—sometimes present and sometimes not—and equally so in various conjunctival affections, so that this question has not been satisfactorily solved thus far.

The prognosis is good, both for the acute and the chronic forms. The follicles, when and if they disappear, do not leave any visible trace of their previous existence behind; no scar of any sort is produced, and the conjunctiva re-assumes its normal appearance and function. It must, however, be noted that the complication of marginal keratitis may lead to unpleasant consequences.

Differential Diagnosis.—The disease might be mistaken for two other forms of conjunctivitis.

(*a*) Vernal Catarrah.—This name is very unhappily chosen, as it is neither vernal nor hardly a catarrh; it designates a rather plentiful development of small, closely-packed, yellowish, half-transparent follicles principally on the ocular conjunctiva in the two triangular spaces of the sclerotic that are exposed when the lids are open.

(*b*) Follicular conjunctivitis is more readily mistaken for granular conjunctivitis or trachoma, with which in some stages it certainly has some resemblance.

Let us consider first the differences in the development and subsequent changes of the newly-formed nodules—the follicles and granulations.

First, as regards colour. In both cases the granules are reddish-yellowish grey, but in trachoma the redness is much more pronounced.

A difference in form and arrangement is, however, more easily recognised. The base of the follicles has generally a diameter which exceeds their height, the granulations are often more polypoid in form, their height exceeding the width of their attachment. The follicles are often oval, and arranged in one or more rows, the granulations are round in shape and show no tendency to group themselves in rows. Both are generally located in the fornix, but the follicles tend almost

to run together, while the granulations of trachoma tend to remain discrete.

The granulations are found on the tarsal surface of the lids, especially of the lower lid, and approach much nearer to the free margin of the lid than is the case with the follicles.

If the ocular conjunctiva is implicated, which is the exception rather than the rule, the granulations are generally found in the upper, the follicles in the lower, half of the eye.

With regard to the development of the conjunctival papillæ. They are generally very conspicuous on the upper lid in acute follicular conjunctivitis at the time when the acute stage passes into the chronic stage, while in acute trachoma the papillæ are well developed from the very beginning of the disease.

In those cases of chronic follicular conjunctivitis in which an acute stage has never been noticeable, the swelling of the papillæ is very rare indeed. The follicles seem to spring from an otherwise normal, or perhaps slightly congested, conjunctiva. In chronic granular conjunctivitis there is generally a marked though not extreme development and swelling of the papillæ present.

Histologically the two kinds of tumours show a marked difference. The granulations of trachoma are prominences covered by the conjunctival epithelium. The prominence shows in its deeper portion a direct continuity with the stroma of the conjunctiva, and is not separated from the latter by a capsule. The follicle in the disease we are considering, however, has a sort of capsule, which separates it from the surrounding stroma. This capsule-like covering is probably merely a thickening of the surrounding tissue.

The follicles show more or less the same structure at all times; in the granulations, however, we find at one time the cellular elements preponderating, while at another they are rare and appear to be replaced by fibrous tissue arranged in bands. Chronologically the latter stage succeeds the former; the longer the trachoma lasts, the greater is the preponderance of the fibrous elements. The fibrous tissue then gradually

produces a cicatrisation of the conjunctiva by shrinking of its newly-formed fibrous elements. This is the most important difference between follicle and granulation. The follicle disappears without leaving any trace behind, the granulation leads to a cicatrix.

The difference between a granulation and a hypertrophic papilla is easily seen in a microscopic section. The granulation, which originates in the deeper parts of the mucous membrane, lifts the epithelium with all its folds, by developing hemispherically with a broadish base it pushes the upper layers of the conjunctiva before it, together with any epithelial folds that happen to be there. In the hypertrophic papilla the increase takes place within the epithelial covering, and though there is an increase in width, the principal increase is in the height of the papilla, and the epithelial folds reach down to their original level and are not pushed upwards.

Moreover, the locality of the papillæ is exclusively the posterior part of the tarsal conjunctiva down to the fornix —a zone about 4 mm. wide—whereas granulations are found up to the free palpebral margin on the one hand, and on the ocular conjunctiva up to the cornea on the other, in places where no papillæ exist.

Clinically follicular conjunctivitis need not be accompanied by any great discomfort, which may, in fact, be completely absent in the chronic stage. In trachoma, however, irritation is never quite absent. And whereas in follicular conjunctivitis, the conjunctiva returns to its normal state with the healing of the process, the prognosis of trachoma is invariably unfavourable owing to more or less extensive cicatrisation with its disastrous consequences for conjunctiva, tarsus, cilia, and cornea.

The treatment has to be directed not only to the existing condition, but also to its causes.

The congestion, irritability, and excessive secretion dependent on the conjunctivitis call for physiological rest and the application of cold and astringents. The infectiousness demands a

careful avoidance of any possibility of carrying over secretion from one eye to the other, as for instance by using the same drop-bottle for a number of patients.

Further, a careful and regularly repeated washing of the floor of the schoolrooms and removal of dust are required, and in extreme cases it may be advisable to isolate the patients.

Statistics.—In trying to ascertain how many of the children were affected, we were obliged to take into account cases in which only two or three enlarged follicles were found in the lower lid. An examination of the conjunctiva of the upper lid could only be made in the severer cases for various reasons. We distinguished, for convenience sake, three different classes, according to the degree of the affection. The first class comprises all the slight forms in which only a few well-developed follicles were visible. Of this class we found out of a total of 720 children 353 cases, or 50 p.c. of all children attending school. In the second class, we reckoned all those whose conjunctiva was studded with a large number of follicles, sufficient to give to the conjunctiva a mottled appearance even when seen from a distance, yet not so fully studded as not to leave a noticeable area of free conjunctiva around most of the follicles. There were a few instances in which the separation from the first class was difficult and somewhat arbitrary. Belonging to this class we found 61 children, or 9 p.c. In the third and most advanced class we included those in which the follicles become contiguous. They are often very large, resembling small tumours. Only 13 cases were found to belong to this class (= 2 p.c.).

As regards the sexes, of the 300 girls of the upper forms, 197 were found affected (= 66 p.c.), of which 171 (= 57 p.c.) belong to the first class, 22 (= 7·3 p.c.) to the second, and 4 (= 1·3 p.c.) to the third. Of 297 boys of the upper forms, 159 (= 53 p.c.) were affected; of these, 127 belonged to the first class (= 42 p.c.), 23 (= 7·7 p.c.) to the second, and 9 (= 3 p.c.) to the third class. The majority of the slight

cases are, therefore, found amongst the girls, the cases of medium severity are nearly equally distributed, whilst there is a relative as well as absolute preponderance of the worst cases amongst the boys. We cannot offer any explanation why more girls are affected than boys, and it is possible that local causes are responsible for this fact. The prevalence of the severer cases amongst the boys, however, may possibly be accounted for by the greater exposure to dust and mechanical irritation in playing and romping about in the schoolrooms. As regards the influence of age we found no difference; of 130 children in the infants' school, 72 (= 56 p.c.) were affected, with 15 medium and only one advanced case.

Concerning the microscopic specimens exhibited, they consist of the squeezed-out contents of follicles and sections of a few of the largest follicles. The swollen and newly-formed follicles show a fair increase of leucocytes in the tissue surrounding them. The fibrous capsule itself is relatively poor in leucocytes. In our specimens the follicles are completely filled with leucocytes, so that nothing can be seen of the irregular large cubical cells of other authors.

Regarding the epithelium we find goblet cells most plentiful, some with more than one nucleus in their cavity—evidently leucocytes that have entered.

We have not found any bacillus or coccus, nor any diplococcus in specimens prepared from squeezed-out follicular contents, and stained with an alcoholic solution of methylene blue.