

NOTE UPON A FORM OF ACUTE INFLAMMATION OF THE CONJUNCTIVA ASSOCIATED WITH PUS COCCI.

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IN children one now and then observes an acute inflammation of the conjunctiva along with a pustular eruption of the face or scalp, especially when in the form of eczema impetiginoides.¹ It is thought that in these cases the conjunctiva has been inoculated by the contents of the pustules upon the skin, which are known to include staphylococci. The transference of contagious particles is brought about, as a rule, by the fingers of the patient, although in other instances purulent matter may run directly into the eye. I have examined bacteriologically several cases of this kind, and in all have succeeded in finding pyococci in the secretion from the inflamed conjunctiva. I am therefore inclined to think that the organisms named may, with fair probability, be looked upon as causing the conjunctivitis. The following case is so typical of the entire series that it may serve to illustrate certain points with regard to diagnosis and treatment.

A female child, two years of age, was brought to the ophthalmic department of the North-Eastern Hospital for Children on Sept. 15th, 1897. The history was that a fortnight before "some yellow humory heads" came out on the skin below the eyelids, especially on the left side of the face. Upon inquiry it was found that an elder sister had lately recovered from a similar eruption affecting the chin and mouth, probably impetiginous in nature. The patient's left eye had been inflamed for seven days. With the exception of measles six months before coming under notice she had suffered no illness of any moment, and her eyes had been well in the interval. On examining the inflamed eye a considerable collection of yellowish-white discharge was seen in the lacus lacrymalis and the conjunctival sinuses. The lids were glossy and swollen, but not in the least tense; the eyeball was reddened; upon the upper and lower palpebral conjunctiva was a thin, greyish membrane, which could be readily detached, leaving the underlying tissues red and thick, with a slight tendency to bleed in a few scattered points. The cornea was bright and clear. The preauricular gland was not enlarged. The temperature of the patient was not raised; constitutional symptoms appeared to be absent. A few scabs were noticed upon the skin below the left lower eyelid. No discharge was present from the genitalia; there was no affection, as swelling or pain, of the joints. There was a negative history of sore-throat both as regards the child herself and those about her.

The diagnosis seemed to lie between an acute inflammation of the conjunctiva due to (1) Klebs-Löffler bacilli; (2) gonococci; (3) Weeks's bacilli; (4) Fraenkel's pneumococci; or (5) pyococci. From a clinical standpoint diphtheritis appeared to be excluded, since the eyelids could be separated without difficulty, the false membrane was easily detachable, the cornea was intact, the preauricular gland was not involved, there were no diphtheritic patches about the skin of the face, and constitutional symptoms were absent. Against purulent ophthalmia due to gonococci were the negative facts that the lids were not tense, that the secretion was not pus-like, that chemosis was not present, and, lastly, that discharge from the vulva or vagina was not present, as is apt to be the case among little girls. The unilateral character of the inflammation, although rather suggestive of pneumococcus infection, could not be regarded as telling much in any direction. Diagnosis, therefore, appeared to be narrowed down to an inflammation produced by Weeks's bacilli of catarrhal ophthalmia, by pneumococci, or by pus-organisms. The probability was that the micro-parasites last-named lay at the root of the mischief.

In order to determine this point a cover-glass preparation was made by lightly smearing a morsel of detached membrane over a glass slip, which was then stained in the usual way. The specimen, when examined with a one-twelfth oil immersion lens, showed merely a few scattered diplococci

and cocci, lying upon and between the multinucleated and other cells contained in the preparation. These were found to retain their colour when treated according to Gram's method. This simple experiment was enough to yield valuable practical results, for in the first place it showed that diphtheria bacilli and Weeks's bacilli were absent; and secondly, that the organisms contained in the specimen must be either ordinary pus cocci or pneumococci, inasmuch as gonococci, as is well known, are decolourised by the alcohol employed in Gram's method. With a view to further identifying the organism or organisms known to be present two sloped agar-agar tubes were smeared with a morsel of membrane detached from the conjunctiva, and then placed in the incubator at 37.5° C. Two days later each tube showed more or less discrete colonies of two kinds: (1) circular discs of orange hue from 1 to 3 mm. in diameter; and (2) discs looking not unlike dabs of white oil paint from 0.25 to 2 mm. in diameter. From each kind of colony cover-glass preparations were made, some being stained with weak carbolic-fuchsin and others by Gram's method. The colonies in all instances were found to consist of clustered cocci. Accordingly, the presumption was that one was dealing with the staphylococcus pyogenes aureus and albus—that is to say, with the organisms commonly found in eyes, boils, carbuncles, and many other of the circumscribed suppurations. As a further proof, some of the water that had condensed in the original agar tubes was distributed in the usual way through three tubes of liquefied peptone-gelatin (10 per cent.), the contents of which were then poured into a similar number of flat-bottomed flasks like those used for the cultivation of bacteria in water. Colonies made their appearance within two days as minute masses visible to the naked eye. After five days' growth some of the colonies were observed to be white and others yellow in colour, while all the superficial ones lay, as it were, in little pits upon the gelatin plate. Later, the medium became liquefied more appreciably around individual colonies, which were found microscopically to respond to the well-known morphological and staining reactions of staphylococcus pyogenes albus and aureus.

As to treatment, a solution of silver nitrate, containing ten grains to the ounce, was applied to the everted conjunctiva of the inflamed eye every other day, and a wash of perchloride of mercury (1 to 5000) used frequently. After ten applications of the silver there was scarcely any discharge from the conjunctiva, which was free from membrane, smooth, and but little swollen. The remedy was therefore discontinued. Upon Oct. 13th the palpebral conjunctiva showed no obvious signs of disease, although some blepharitis, such as often follows an acute inflammation of the conjunctiva, was present. This was treated in the usual way, and the patient was discharged cured on Oct. 27th.

As already stated, the above is typical of several cases in which I have found the two organisms named. This constant association of particular bacteria with a particular clinical type of conjunctivitis tends to indicate that the latter is caused by the former. In further support of this view the fact may be mentioned that upon two occasions I have seen an acute inflammation of the conjunctiva associated with otorrhoea, pus-organisms being present in the discharge both from the ear and from the eye.

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ON THE FLAGELLATED FORM OF THE MALARIAL PARASITE.

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MUCH attention has of late been devoted to the flagellated forms of the malarial organism, and many theories as to its significance have been put forward, none of which have met with general credence. These—the theories of Laveran, Danilewsky, Mannaberg, Manson, Sakharoff, and the Italian school—are too well known to require repetition here. My own observations on these forms as seen in the blood of crows, which are very generally infected with the halteridium of Labbé, have led me to quite different conclusions, and are briefly as follows.

Frequently in slides of the blood of infected crows there appear, after standing from twenty to thirty minutes, elongated motile forms such as were described by Danilewsky as vermiculi in his "Parasitologie Comparée du Sang"; and

¹ Vide Dr. George Carpenter's paper on Pus Inoculations and Certain Eye Affections in Children, Archives of Pediatrics, vol. xi., 1894, p. 452.

in order to trace their origin it is necessary to observe closely the changes in the other forms seen in the same blood. Only the mature forms of the organism are seen to undergo any changes in the fresh slide of blood, the half-grown and younger forms remaining unchanged for a long time. The mature forms become rounded off, and are extruded from the corpuscle, which remains as a shadow lying in the plasma.

Both in the fresh and in the stained specimens of blood there can be seen differences which sharply distinguish two forms of the organisms. The forms are identical in outline, but the protoplasm of one is granular and opaque as compared with the clear hyaline protoplasm of the other. This distinction is well brought out in the stained specimen, in which the hyaline form remains almost entirely unstained, while the other takes on a well-marked blue stain with methylene blue. Of these it can be determined that the hyaline forms alone become flagellated.

These two forms, then, become extruded alike from the corpuscle and lie free in the plasma, but generally only a very short time elapses before the hyaline forms become flagellated, according to the process so often and so accurately described by workers on malaria. The granular forms lie quiet beside the nuclei and shadows of the red blood corpuscles which lately contained them, but are soon seen to be approached by the flagella which, having torn themselves away from the hyaline organism from whose protoplasm they were formed, struggle about among the corpuscles. These flagella, which so concentrate their protoplasm as to form a head, swarm about the granular spheres, and one of them plunges its head into the sphere and finally wriggles its whole body into that organism. Immediately on the entrance of this flagellum it seems to become impossible that another should enter, for they may be watched circling about, vainly beating their heads against the organism. The flagellum which has entered continues its activity for a few moments and the pigment of the organism is violently churned up. Soon it becomes quiet again, and remains so for from fifteen to twenty minutes, when a conical process begins to appear at one side of the organism, the pigment collecting mainly to the opposite side. This process grows larger and the pigment becomes more and more condensed until finally we have a fusiform organism with a small spherical appendage crowded with pigment at one end. The other end is hyaline, and the pigment granules which are not crowded into the small appendage are distributed superficially over the posterior part of the body. This spindle-shaped organism moves forward with a gliding motion, sometimes turning at the same time on its long axis, sometimes going through amœboid contortions. Red corpuscles lying in its path are either punctured by the hyaline anterior end, so that the hæmoglobin is allowed to escape into the plasma, or passed over and dragged along by the adhering posterior extremity.

In an intense infection a great destruction of corpuscles occurs; thus in a fresh slide after standing some time even leucocytes may fall victims to the destructive force of these organisms which have been seen to dash through them, scattering the granules into the plasma. As to the ultimate fate and true significance of these forms nothing definite can as yet be stated. In the slide they keep in motion for a long time but finally quiet down and disintegrate. The idea suggests itself from their great power of penetration that they may be the resistant forms that escape from the body during life into the external world. The whole process described above seems to be a sexual process analogous to the sexual process seen in the lower animals and plants which occurs under unfavourable conditions and results in the formation of a resistant "spore."

Recently I have examined the blood of a woman suffering from an infection with the æstivo-autumnal type of organism in which a great number of crescents were to be seen. These in the freshly-made slide of blood with very few exceptions retained their crescentic shape for only a few minutes (this activity in the change of form varies greatly in specimens of blood from different patients). They soon drew themselves up, thus straightening out the curve of the crescent while shortening themselves into the well-known ovoid form. After the lapse of from ten to twenty minutes most of them were quite round and extracorporeal, the "bib" lying beside them as a delicate circle or "shadow of the red corpuscle." After from twenty to twenty-five minutes certain of the spherical forms became flagellated; others, and especially those in which the pigment formed a definite ring and was not diffused throughout the organisms, remained

quiet and did not become flagellated. The flagella broke from the flagellated forms and struggled about among the corpuscles, finally approaching the quiet spherical forms. One of them entered, agitating the pigment greatly, sometimes spinning the ring about; the rest were unable to enter, but swarmed about, beating their heads against the wall of the organism. This occurred after from thirty-five to forty-five minutes. After the entrance of the flagellum the organism again became quiet and rather swollen; but although in the two instances in which this process was traced the fertilised form was watched for a long time no form analogous to the vermiculus was seen.

Note by Professor WILLIAM OSLER—These observations of Dr. MacCallum are of very great interest and importance, and illustrate another step in our still scanty knowledge of the life-history of the malarial parasite. During the past two years Dr. MacCallum and Dr. Eugene Opie have been studying the hæmatozoa of birds, particularly with a view of ascertaining points in the life-history which might be suggestive in the study of the hæmatozoa of malaria. Their paper will appear in an early number of the *Journal of Experimental Medicine*.

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CONTRIBUTION TO THE SURGICAL ANATOMY OF THE TYMPANIC ANTRUM.

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THOSE who have frequent occasion to open the tympanic antrum must constantly be forcibly reminded of its irregular position, especially as affects its relationship to the lateral sinus; those with the tympanum itself and also the facial nerve being fairly constant and only affected by the size of the antrum, whether that size be the result of disease or not. The results of careful measurements of twenty-eight temporal bones not affected with disease has enabled me to form a series of sketches, each typical of a certain number of sections. This number, whilst sufficiently large to give a fair approximate idea of the relationship of the sinus and antrum, is far too small to enable one to assume with any degree of certainty that it is correct.

The sections are cut horizontally, passing through the suprameatal fossa, which lies immediately above and behind the suprameatal spine, and is probably the best guide and landmark for the antrum which we possess. Each section has been carefully traced, these tracings compared by being superimposed. In this way the groups were formed, and a typical section was drawn for each group. In the figures an asterisk marks the position of the suprameatal fossa. These original groups are six in number, and may advantageously be further reduced into three main divisions—viz., (1) Those in which the groove for the sinus lateralis must be opened and the sinus exposed during the mastoid operation; (2) those cases in which the antrum is operated on—the probabilities are that the sinus will be exposed, yet it may escape; and (3) consists of those cases in which the sinus will not come into view during the operation. The bones used were all from adult skulls, children's and young adults' and diseased bones not being used. Group 1 is illustrated by Fig. 1, which shows the result of two sections; Group 2 is illustrated by Fig. 2, which shows the result of two sections; and Group 3 is illustrated by Fig. 3 (nine sections), Fig. 4 (six sections), Fig. 5 (seven sections), and Fig. 6 (two sections).

From these figures one would expect to expose the sinus about once in six operations, and by reference to my case-book I find that my own give a proportion or ratio of one in six. Besides these types certain exceptional varieties occur, notably those in which as a result of long standing chronic suppurative otitis media the antrum is almost or entirely obliterated. In such cases the usual advice in text-books is not to pursue our researches to a greater depth than 15 mm.¹ This advice is certainly based on careful anatomical measurements, but apart from the difficulty of such measurements

¹ Politzer's Diseases of the Ear, English edition, 1884, p. 513.