

Some practical aspects of conjunctival bacteriology / [Freeland Fergus].

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SOME PRACTICAL ASPECTS OF CONJUNCTIVAL BACTERIOLOGY.

I DESIRE to say something as to the necessity and utility of daily bacteriological work in the modern eye clinic. The science of pathology and the science of therapeutics are sisters. The problem to be solved is the treatment of disease. The object of pathology is to explain the origin of disease, and the ideal object of rational therapeutics is to apply the teachings of pathology to its cure or to its alleviation. In all its departments medicine is in many respects more of an art than a science, and probably to a large extent must remain so; but, unquestionably, recent pathological advances have done a great deal to illumine the work of the practitioner, and to bring his efforts more into line with the biological sciences.

Thanks to the pathologists, we now have clearer ideas as to the nature of the many forms of inflammation of the conjunctiva, which in days gone by were all classed together as catarrhal ophthalmia, and were for the most part put down to exposure to cold, or to other indefinite causes. Some considerable number of years ago it came under my notice that a number of persons, who all lived in the same tenement in High Street, Glasgow, were suffering from acute catarrhal conjunctivitis.

I investigated the matter at the time, and found that no fewer than forty persons were thus affected in this one tenement. It seemed to me, then, that we here had to deal with something which was epidemic, and to some extent analogous to one of the specific fevers. Some time later I read a very interesting paper by Dr. Weeks, which seemed to afford a complete explanation of such occurrences. In that paper he described his bacillus and the contagious catarrh to which it gives rise.

Many changes have taken place since then, and thanks to the labours of several distinguished pathologists we now know a considerable amount about the bacteriology of the conjunctiva. Indeed, attempts have even been made to form a bacteriological classification of conjunctival diseases. No doubt the picture is not complete, for the micro-organism to which granular ophthalmia is due has not been discovered,

nor has it as yet been determined what is the condition in phlyctenular conjunctivitis; much work, however, which is of great practical importance has already been done.

There are few conjunctival sacs which appear to outward observation to be normal in which micro-organisms are not found. It is only occasionally on taking a scraping from the conjunctival sac and putting it on a culture medium in an incubator, that no growth occurs. Some of the micro-organisms which are thus found are in no sense pathogenic—for example, the bacillus xerosis. On the other hand, most of them are, under suitable circumstances, capable of doing harm. These latter may be divided into two definite groups. The members of one group do not appear to be capable of doing mischief so long as there is no want of continuity in the protecting epithelium. Amongst these must be included staphylococcus albus and aureus, streptococcus, possibly also pneumococcus, and various forms of bacilli. Amongst these I personally have observed the bacillus pyocyaneus. The members of the other group seem never to be present without setting up inflammation. Typical examples of these are found in Weeks's bacillus and in the gonococcus. Probably Morax's diplobacillus is seldom present without causing a conjunctivitis, although, as a rule, not of a severe type.

Bacteriology should be in daily use in every eye clinic; first, because it is an important aid to diagnosis; secondly, because it is a guide in determining the safety of any operation; thirdly, because it materially influences our views of treatment.

1. As already stated, the classification of conjunctival inflammations becomes more and more a bacteriological one. By no other process can we absolutely determine in the early stages whether a given case of inflammation of the conjunctiva is due to the gonococcus, to Morax's diplobacillus, or to Weeks's bacillus. Nor is this differential diagnosis an altogether unimportant matter. Take, for example, a case in which a patient comes with an acute conjunctivitis. You make a cover-glass preparation and stain it with methylene blue, and find small diplococci, for the most part enclosed in the cellular elements of the discharge. If, in addition to this, you find that these micro-organisms decolour by Gram's method, there is the strongest proof that you are dealing with a case of acute purulent ophthalmia of gonorrhoeal origin, and therefore with a patient who will require all skill and attention if a favourable determination of his malady is to be obtained. In the early stages ordinary clinical observation entirely fails to differentiate between these various forms of acute ophthalmia. It can only be done by bacteriological observation, and hence the importance that it should be resorted to at the earliest possible moment. In a case similar to the supposed one just described, it would be the duty of a surgeon immediately to shut out the healthy eye from all risk of contagion by the application of some such apparatus as Buller's shield.

2. In the next place, I wish specially to make some remarks as to the necessity of bacteriological investigations of the conjunctiva prior to operative procedure. This is an aspect of the subject of the importance of which I have long been aware. Some cases were published by me in 1897, and for several years prior to that date I had investigations made on this subject. Even as a student one was struck with the fact that many of the operations on the eyeball which seemed to have been per-

formed with the greatest skill and dexterity by several surgeons gave unsatisfactory results. Many of them were followed by irido-cyclitis, and not a few by acute suppuration. Unquestionably the introduction of so-called antiseptic treatment eliminated a great number of these, but still left many disappointing cases. Patients after operation continued to have acute catarrhal conditions, sometimes severe iritis, and sometimes even suppuration. Nothing can be more distressing to a surgeon who has used every care than to find a case operated on with proper precautions going wrong. I have no doubt whatever that disaster can often be prevented by a thorough bacteriological investigation before attempting to operate, yet, odd to say, so far as I have perused the ordinary textbooks, there is not one of them which mentions anything of the kind. We are given abundance of directions as to how to prepare patients, what sort of diet they are to have, what medicine is to be given them the night before. Full and explicit directions are sometimes given, even as to the special form of knife to be used, as if that in the hands of a good operator were a matter of much importance; and yet none of the textbooks with which I am acquainted advise the operator to look carefully before he leaps, and to make bacteriological investigations before operating on any eye. I therefore think that this practice, the adoption of which I urged many years ago, has not yet found favour. It may be stated as a general rule that no operation should be performed until such investigations have been made by a reliable observer.

The only exception to this rule which I remember at present is in cases of glaucoma. Many of these cases do not admit of the possibility of delay and the risk of an infection must be run.

Let me illustrate my meaning by a few concrete examples, and, in the first place, let me take some cases in which bacteriological investigation showed the presence of streptococcus. In my own experience I have known this parasite to cause the loss of three eyes after cataract extractions. About the year 1896, a patient was sent to me from the South of Ayrshire. One eye had already undergone the operation of cataract extraction, but the result had been an intense suppuration with the destruction of the eyeball. She was sent to me to see if I would undertake the other eye. The first step was to have the conjunctival fluid from both eyes examined, and at once there came a report that the fluid on each side contained streptococcus. That was to my mind an ample and full explanation of this melancholy occurrence. With a good deal of difficulty the streptococcus was got rid of in the remaining eye, which was then operated upon, and good vision obtained.

The second case of failure due to streptococcus was in my own clinic. I had a suspicion in this case that the lachrymal sac and the conjunctiva were not altogether healthy. When the patient was admitted to the ward there was a certain amount of discharge. She was kept for a considerable time under what I believed in those days to be suitable treatment, till the house-surgeon informed me that the eyelids were perfectly free from all discharge, and the lens was then extracted. In that case there was a severe suppuration, and in the discharge streptococci were found.

The third case which I wish to mention in this connexion has been seen by me quite recently, and is very instructive. A senile cataract in the right eye was extracted by a

surgeon residing in another town. The night after the operation she was seized with violent pain in the eye, which ultimately became an atrophic stump, either from acute suppuration or from irido-cyclitis. She happened to be admitted under my care at the Eye Infirmary to have the other eye done, and, following my usual plan, thorough investigations were made.

It was then discovered that there was plenty of streptococcus in the conjunctival fluid of the remaining eye. That afforded an ample explanation of the disaster to the first eye, and gave warning as to the treatment of the second. Had an operation been at once performed there is every probability that the second eye would also have been lost. A period of a fortnight passed before the condition of the conjunctiva warranted an operation. This was done in the usual manner by combined extraction, a large conjunctival flap being cut. For the first ten days the patient was absolutely free of all pain, and the wound healed rapidly and well. At the end of that time, however, she complained one night of a good deal of pain, and on examining her next day I found the lids somewhat swollen and all the other evidences of an acute catarrhal conjunctivitis present. On making cover-glass preparations it was observed that streptococci were abundant in the discharge. It was a streptococcic conjunctivitis—a reinfection of the conjunctiva, probably from the nasal cavities. Fortunately the wound was firmly united, and the eye was beyond risk so far as vision was concerned.

Take another example out of many which I could give: At present there are in the hospital 3 children who are all affected with very similar injuries. In each there has been a penetrating wound of the cornea followed by traumatic cataract. One of these eyes is as quiet and free from irritation as in the most healthy condition. In this case there are no micro-organisms in the conjunctival fluid, or only those which are perfectly innocuous. Both of the others are extremely irritable, and in each there is an acute catarrhal condition of the conjunctiva. In the discharge from one of these cases pneumococci are abundant. In that of the other there are numerous micro-organisms which at present are undergoing the process of being identified.*

It will not do in instances such as these to say that the difference depends upon a different amount of swelling of the lens. A swollen lens will not *per se* determine any external irritation. Such a lens, if not properly treated, may and very likely will give rise to a traumatic glaucoma, but it will not give rise to a catarrhal condition of the conjunctiva or to an iritis. Again and again I have needled lenses both for congenital cataract and for high myopia so as to nearly fill the anterior chamber with lens débris, but I have never seen apart from micro-organic life any acute condition. Cases such as have been described might be almost indefinitely multiplied, but these instances must suffice for the present. To sum up this part of the subject: No operation which involves the opening of the ball should be undertaken if bacteriological investigations reveal the presence of staphylococcus aureus, streptococcus, pneumococcus, or any other

* The eye which had the pneumococci subsequently developed a hypopyon with irido-cyclitis, and had to be enucleated. The other made an excellent recovery, and in this respect it is interesting to note that the micro-organism turned out to be the staphylococcus albus.

well-defined pathogenic micro-organism. As regards staphylococcus albus, my experience shows that it will not cause a suppuration or an iritis or an irido-cyclitis, but at the same time if present in any considerable quantity it will almost invariably give a form of conjunctivitis, which, however, is of no importance as regards the ultimate success of the operation.

If the conjunctival secretion gives no growth on culture media, then the conjunctiva will, with an exception to be presently mentioned, maintain an almost normal whiteness during the process of recovery. The exception referred to is when the patient is the subject of gout or of chronic rheumatism. I think that sometimes such patients are difficult to heal, and that we may in them have iritis of a modified type without any micro-organisms which have as yet been identified. This, however, just opens up the question as to what is the etiology of these diseases.

3. Bacteriological investigations are of use as regards treatment. Pathological research, however important and interesting from a biological point of view, cannot be regarded by the practitioner as an end in itself. Whatever it may have of intrinsic value to the man of pure science, to any one who is studying disease with a view to its cure or amelioration it is only a means to an end, and that end is rational treatment.

In the first place, it is to be observed that the newer views of etiology of conjunctival diseases have caused their treatment to be regarded from two separate aspects. On the one hand, there is the actual treatment of the case, and on the other the prevention of the spread of contagion. In other words, prophylaxis is here, as in the department of public health, a matter of the first importance.

A contagious ophthalmia, such as that caused by Weeks's bacillus or by the gonococcus, must run its natural length, just as a case of small-pox or of scarlet fever does. I am not sure that anything will cut it short. No doubt treatment may to some extent modify its virulence, or, at any rate, give the patient some degree of comfort, but I feel inclined to deny totally that any form of treatment will at once stop the progress of the disease. For example, I have never, either in my own or in any other clinic—and I have carefully watched a good number of patients in other clinics—seen any remedy cut short a case of purulent conjunctivitis.

It invariably runs its usual course for some weeks in which a contest seems to be waged between the virulence of the infective material and the resisting powers of the tissues. Let me again quote from my own personal experience a case which is typical of many others which I could give. A patient came under my care for the purpose of having a cataractous lens removed. I found on investigation that he had undoubtedly staphylococcus aureus in his conjunctiva. The question came to be how this parasite was to be got rid of. He was prescribed a lotion of 1 to 8,000 of mercuric bichloride and was sent home to use it for three weeks. At the end of that time he returned with the parasite as abundant as ever. The lotion had effected nothing. He was then put to bed and pledgets of cotton-wool well soaked with 1 to 8,000 of mercuric bichloride were kept on the eyelids tolerably constantly, and that for a period of ten days, at the end of which time the parasite was still found in considerable quantities. The next attempt that was made to get rid of it was by using strong

silver nitrate solutions such as were then employed for purulent conjunctivitis. I speak of a period of ten years ago, before protargol had come into use. The result of the nitrate of silver treatment was most disappointing. At the end of a week the conjunctiva had become much inflamed and the parasite was as abundant as ever. It seemed to me that the only thing which I had effected by the nitrate of silver treatment was the destruction of the projecting epithelium of the conjunctiva, and hence the acute conjunctivitis. As a last resource I visited the patient twice or thrice daily and thoroughly mopped out the whole conjunctival sac with sterilized cotton-wool moistened with a little sterilized water. What the so-called remedies had not done this line of treatment did in a few days. It removed the parasite and rendered the conjunctiva safe for operation purposes. That is only one example out of very many that could be given. That there is no substance which we can apply to the conjunctiva in a strength sufficient to be germicidal without destroying the membrane can scarcely be gainsaid. A lotion, if properly used, may largely effect the mechanical removal of septic organisms, but proof is altogether wanting that it will destroy them.

What proof exists is entirely contrary to the view that anything we have, so far as the human conjunctiva is concerned, can be, in the strict sense of the word, an antiseptic. I even go the length of expressing a doubt as to whether lotions or drops have any inhibitory influence on the development of the micro-organisms in the conjunctival sac. To begin with, I do not think the applications are sufficiently long in the sac to be of much service. Put a few drops of a solution of argyrol on the conjunctiva, immediately there is a copious secretion of tears, which practically prevent it having any contact with the conjunctival structure. I am given to understand that many eminent surgeons in the treatment of gonorrhoea have entirely abandoned as useless the old so-called astringent injections. I am not at all sure that caustic solutions are of any more use when applied to the conjunctiva than they are when applied to the urethra, and I think it may fairly be argued that their power of destroying the conjunctival epithelium makes their application of very doubtful utility in the treatment of conjunctivitis.

If this view be adopted it makes the question of the method in which the lotion is to be applied a matter of primary importance, while the actual contents of the lotion is an affair of comparatively little moment. Till a few years ago the all-important thing was considered to be the ingredients of the lotion. Nothing could better illustrate that view of the case than the directions drawn up by so eminent a man as the late Dr. Mackenzie for the use of his well-known lotion. To his mind it mattered greatly that the eye was bathed with a solution of a mercuric salt. He did not find it at all incompatible with his ideas of prescribing to order the patient to bathe his eyes with a mixture of the lotion and the discharge removed from the conjunctiva at previous washings. Some surgeons will still tell you that excellent results are obtained by the use of lotions containing such substances as boroglyceride, boracic acid, and so on. To that our reply is that excellent results are also obtained by the use of sterilized water. The presence of such inert substances as those just mentioned cannot be imagined to exert any influence.

Before passing from this part of the subject, it is only right to mention that my colleague, Dr. McMillan, than whom I know of no more cautious or accurate observer, tells me that in cases of blenorrhoea of the lachrymal sac much good is often done by filling the sac with a solution of argyrol. There exists, however, a great difference between the lachrymal sac and the conjunctival sac, and it is, that in the former the solution of the salt remains in contact with the membrane lining the sac for a considerable period, whereas in the conjunctival sac contact is maintained only for a few seconds. This leads me to remark that where we have an old standing blenorrhoea of the sac which does not yield readily to treatment it should be removed. Certainly this ought to be done where there is blenorrhoea of the sac prior to a cataract operation.

Five years ago I saw a patient from Paisley to whom a surgeon very justifiably refused operation because there was an old-standing dacryo-cystitis and the other eye was only in the incipient stage. It occurred to me that the extraction might easily and safely be performed if, as a preliminary operation, the lachrymal sac was removed. I accordingly excised it, and subsequently operated on the cataract successfully. Since that time, in common with many other surgeons, I have removed the lachrymal sac for suppuration. It is not a very difficult operation, and I think it may be rendered still easier by previously filling the sac either with paraffin or with soft wax.

As regards prophylaxis of acute conjunctivitis, it concerns in the first place the patient's other eye, if it be not affected by the morbid process. As already remarked, in such a serious form of conjunctivitis as that due to gonococcus, if one eye is not involved it must be at once put beyond the reach of contagion by being hermetically sealed, either by such an apparatus as Buller's shield or by a carefully adjusted bandage. Care must be taken in every case of conjunctivitis, whatever its nature, that the friends and attendants of the patient are not infected. The methods by which this can be done are now so well known and, I hope, so generally practised, that there is no need to insist upon them here.

I shall just refer very briefly to one other point, and it is that the teachings of modern bacteriology give us important indications as to when an eye should be bandaged, or rather as to when it should not be bandaged. Formerly it was the custom to apply a compress and bandage in the treatment of almost every case of corneal ulceration. The bandage was supposed to do good first by keeping the eye at rest, secondly by excluding cold, and thirdly by giving the ulcerated surface a certain amount of support. It is obvious on the slightest consideration that a bandage applied only to one eye will not keep it at rest, for, notwithstanding its application, the eyeball will move freely along with its fellow; all that the bandage does in this respect is to subject the eye in its movement to a greater amount of friction. A bandage may or may not keep out cold; I have never tested the difference of temperature between the skin under such a bandage and the same part of the skin without it, but one thing it certainly does is to retain any septic secretions, and consequently it simply foments the organ with its own septic discharges. I admit that sometimes a bandage is of use in preventing an ulcer from becoming ectatic, but apart from this limited use

bandages seem to me to be quite inadmissible in the treatment of corneal ulceration. In most instances they are productive of harm. If the eye must be protected, then let it be by a shade or by a pair of smoked glasses. If dark glasses are to be used for the purpose of diminishing the amount of light which enters the eye, they should be of London smoked glass and not blue. These latter allow the actinic rays to pass freely, and hence, if it be desired to keep the chemically strong rays out of the eye, it is a mistake to tint the glass with blue or purple. At the same time, cobalt-blue glass, or the more recent amethyst glass, while allowing the light of short wave length to pass, will largely exclude the heating portions of the spectrum. London smoked glass diminishes both sets of rays.

It would therefore seem that the former practice of fomenting eyes should be discarded; presumably nothing more aids the development of micro-organisms than a moist heat, and I have seen corneal ulcers made very much worse by the applications of fomentations. So far as my own practice is concerned, I employ them only for two purposes, one of which is to promote suppuration in the early stages of panophthalmitis, and the other to relieve the pain of rheumatic iritis.