A Clinical Lecture ON THE TREATMENT OF LACRYMAL OBSTRUCTION.

DELIVERED AT THE ROYAL LONDON OPHTHALMIC HOSPITAL,
MOORFIELDS.

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SYMPTOMS AND PATHOLOGY.

LACRYMAL obstruction—omitting those cases due to occlusion of the canaliculi, with which I do not propose to deal on this occasion—is caused by inflammation of the lacrymal sac and nasal duct. The inflammation generally spreads up the nasal duct from the nose, though in rare cases it may start in the conjunctival sac. It is astonishing that conjunctivitis so rarely gives rise to dacryocystitis, whilst, on the other hand, dacryocystitis invariably causes some conjunctivitis, often limited to the neighbouring part of the conjunctival sac. It is to be regretted that ophthalmic surgeons as a rule pay too little attention to the condition of the nose. Many intractable cases of conjunctivitis are associated with rhinitis. Chronic rhinitis, for example, is often present in angular or diplobacillary conjunctivitis, especially in children, and a diplobacillus in all respects similar to the Morax-Axenfeld diplobacillus, is found in the nasal discharge in these cases.

The primary result of spread of inflammation from the nose to the lacrymal sac by way of the nasal duct is swelling of the epithelium lining these structures and of the subepithelial tissues. The lacrymal sac and nasal duct are surrounded by a well-developed venous plexus, and inflammation is accompanied by engorgement of these veins. This engorgement, together with the swelling of the soft structures which form the lacrymal excretory apparatus, prevents the normal passage of fluid from the conjunctival sac into the nose. Like most other ducts in the body, the walls are in contact under normal conditions, unless fluid is passing. The swelling of the tissues leads to an active obliteration of the lumen instead of a passive falling together of the walls, so that more force is required to open it up than is supplied by the physiological mechanism, which has its chief anatomical basis in the fibres of the orbicularis palpebrarum surrounding the lacrymal sac. Fluid, therefore, accumulates in the sac, the walls are forced apart, and the sac is kept dilated. The stagnant fluid contains deleterious material which further irritates the walls. These themselves secrete more fluid than normal. The irritated mucous membrane reacts very much in the same manner as does the conjunctiva. We know that the conjunctiva contains unicellular mucous glands or goblet cells, and that these are enormously increased in number in chronic conjunctivitis. The same applies to the lacrymal sac, and this fact accounts for the excess of mucus which is poured out into the stagnant tears and conjunctival secretion. If the condition persists for a long period, or if, as is often the case, subacute exacerbations of inflammation occur, leucocytes are extruded into the fluid, which becomes muco-purulent. Dacryocystitis, thus developed, manifests itself therefore by dilatation of the lacrymal sac or mucocele. If the dilated sac is pressed upon by the finger the fluid is expelled. It may pass down into the nose, the external pressure being sufficient to overcome the obstruction in the nasal duct. More commonly it regurgitates into the conjunctival sac through the canaliculi, when its nature can be determined, whether mucous or muco-purulent.

The importance of the efficient treatment of lacrymal obstruction cannot be too forcibly insisted upon. A mucocele is a constant menace to the eye. It has been proved by bacteriological research that the mucus or muco-pus almost invariably contains pneumococci, to name only the most important of many varieties of pathogenic organisms. Pneumococci are not uncommon in the conjunctival sac, but they are usually of slight virulence. This is by no means the case

in dacryocystitis. Here they are frequently extremely virulent. Now, we know that one of the most dangerous forms of corneal ulcer, the *ulcus serpens* or hypopyon ulcer, is caused by virulent pneumococci. These ulcers, unless treated quickly and vigorously, rapidly lead to perforation of the cornea and loss of the eye. Moreover, pneumococci are a common cause of panophthalmitis if there is any route whereby they may obtain an entrance into the globe; hence the rule that a mucocele must be cured before any intraocular operation is performed. If these facts are taken into consideration we may well be astonished, not that hypopyon ulcer occasionally occurs in cases of chronic dacryocystitis, but that it occurs so relatively seldom. A less disastrous sequel of mucocele is an acute exacerbation of the dacryocystitis leading to the formation of a lacrymal abscess. This may, indeed, cure the disease by causing the complete obliteration of the lacrymal sac. Enough has been said to show the extreme importance of curing every case of mucocele as quickly and permanently as possible, and the dangers are such that radical measures are fully justified.

TREATMENT.

A few words must be said as to the line of treatment which has been employed universally up to the last few years, and is still employed by many surgeons. The lower punctum is dilated, and fluid is forced into the sac with a syringe. In some cases it passes into the nose, and the repetition of the syringing cures the condition. Usually, however, the fluid regurgitates into the conjunctival sac, and none passes into the nose. The nasal duct is then probed, either by small probes without slitting up the canaliculus, or with larger probes after the canaliculus has been slit up. What is the effect of passing a probe down an inflamed duct in this manner? No matter how skilfully the operation may be performed, it is almost inconceivable that grave damage will not be done. The swollen and softened epithelium is torn up and the subepithelial tissues are lacerated; very often the venules are torn, and more or less haemorrhage takes place. These abrasions are restored in the usual manner. New fibrous tissue is formed, which is at first elastic and resilient. But it is a universal characteristic of new-formed fibrous tissue that as it organizes it also contracts. Hence the necessity in cases treated in this manner to continue the use of probes and to use relatively large ones. Unfortunately for the patient the nasal duct is supplied, not only with a venous plexus, but also with a very well developed set of sensory nerves. Probing is therefore extremely painful, and the patient shirks the operation as soon as he has derived some benefit. The fibrous tissue, left to itself, gradually contracts, and a very slight inflammatory attack suffices to occlude the duct again. Dreading a repetition of the previous torture the evil day is put off as long as possible. Eventually the regurgitation of pus and the epiphora become an unbearable nuisance. Probing is now a much more serious business. There is a fibrous stricture which must be dilated. The fibrous tissue is now much more elastic in the proper sense of the term, that is, it has a much greater tendency to resist deformation and to regain its original form. The use of the larger probes has become imperative, with a corresponding increase in the amount of pain caused by the operation. And so the weary cycle goes on, epiphora and pus alternating with probes and pain. Or perhaps the surgeon himself gets tired and introduces a style, which usually means for the patient both pus and pain, or at least grave discomfort.

Fortunately a more rational method of treating these cases has been devised, and has been attended with great success. In the majority of cases, syringing, properly carried out, results in complete cure *if the case has never been treated with probes*. If it fails, extirpation of the lacrymal sac offers a really radical cure.

Syringing.

I have here a group of cases which are undergoing treatment by this method. About half of them are practically cured: fluid passes readily down into the nose. It will be found that in the remaining cases there is some good reason why the method has failed. Some have not yet been treated sufficiently long; others have been irregular in their attendance or have not come sufficiently

frequently; in others the disease is of long standing. None have been treated by probing, for it is a rule of my clinic that lacrymal probes are not to be used without special permission. Syringing is useless unless carried out thoroughly and perseveringly, and that involves the active co-operation of the patient. It is most successful in cases seen early—that is, of only a few weeks' duration—as shown by epiphora. The lower punctum is first dilated with a Nettleship's dilator. I use a Luer's all-glass syringe, fitted with a fine probe-pointed straight cannula. The syringe is filled with boracic lotion or saline. The cannula is introduced into the lacrymal sac, not into the nasal duct. Several syringefuls of fluid are passed in; probably none passes down into the nose. Syringing is repeated *every day*. In many cases the fluid will pass down the duct in a week or less, for the constant cleansing of the sac restores the normal condition of the epithelium and relieves the congestion. If fluid does not pass in a week a mild astringent should be used, for example, zinc sulphate, gr. j or ij to the ounce, and after several syringefuls have been introduced, a little protargol, 10 to 15 per cent., is passed into the sac and the excess squeezed out. When once a free passage of fluid into the nose has been obtained, syringing is repeated at constantly increasing intervals, otherwise the condition is liable to recur. Indeed, in some cases it is advisable to teach the patient to use the syringe himself.

This method is remarkably successful in cases which apply for treatment at an early stage of the complaint. It is unsuccessful if not carried out thoroughly. It is usually unsuccessful in cases which have previously been probed, in cases of long standing, owing to destruction or irremediable injury to the walls of the sac and duct, or to dilatation of the sac and atrophy of the embracing fibres of the orbicularis (atonic sacs). In all such cases excision of the lacrymal sac is indicated.

Excision of the Lacrymal Sac.

It might well be anticipated that excision of the lacrymal sac would lead to permanent epiphora. It does not. The great success of this operation depends upon the fact that under normal conditions the amount of tears secreted is only sufficient to moisten the conjunctiva, and is lost by evaporation from the surface of the globe. Under conditions of irritation, from cold winds, foreign bodies, etc., there is a reflex increased secretion, which is normally carried off by the sac and duct. Under such conditions only will there be epiphora after extirpation of the sac. The extreme degree of epiphora which occurs in the presence of a mucocele is due to the irritation of the conjunctiva by the regurgitation of stagnant mucus or muco-pus. As already mentioned, this sets up a conjunctivitis which is sometimes called lacrymal conjunctivitis, a name which has, however, also been applied to Parinaud's conjunctivitis, which is a totally different thing. It must be remembered that this conjunctivitis may be chronic if the dacryocystitis has lasted a long time. Some authors have said that in rare cases it is necessary to remove the lacrymal gland, or at least the inferior lacrymal gland, after extirpation of the sac in order to cure epiphora. Even if this were so the

operation is much less drastic than appears upon the surface. I have now done a considerable number of excisions of one or both lacrymal sacs and have not yet met with a case in which this was necessary. I believe that all such cases are due to operating on the gland too soon. Epiphora may persist and be troublesome for several weeks after extirpation of the sac if the dacryocystitis has been of long standing and the resulting conjunctivitis severe. Hence it is essential to treat this conjunctivitis very thoroughly before resorting to other measures. I have always found it yield in reasonable time. Of course it is essential that the sac shall in all cases be completely removed.

The difficulty of completely excising the lacrymal sac varies enormously in different cases. The causes are anatomical and pathological. The former are easily overcome, the latter less so. The anatomical fact which is often forgotten is that the fundus of the sac extends above the level of the internal palpebral ligament (Fig. 1). This part is very likely to be left if the ligament is not divided. Absolutely no harm results from its division.

The pathological factors which interfere with complete removal are more numerous and less easy to combat. First, it must be remembered that the nasal

duct is also diseased, and after the sac has been removed the upper end of the duct should be thoroughly curetted with a small sharp spoon. The easiest sac to remove is the atonic, greatly dilated sac; it can readily be dissected out entire. The most difficult are those in which suppuration has destroyed the walls and made them extremely friable; it may be impossible to remove these whole; they have to be dissected out piecemeal, and the wound must be carefully inspected to see that no mucous membrane remains. These are also the cases in which

bleeding is most troublesome, though the vicinity of the angular vein and of its many tributaries makes bleeding the bugbear of the operation even in the simplest cases. It can usually be overcome by properly applied pressure, assisted, if necessary, by the use of adrenalin. Axenfeld's retractors also tend greatly to diminish bleeding by keeping the veins well stretched.

The relations of important structures concerned in the operation and the position of the incision which I employ are shown in Fig. 2. The dotted circle shows the relation of the conjunctival sac. The following instruments are required: A small scalpel, dissecting forceps, two pairs of toothed (fixation) forceps, Müller's and Axen-

feld's retractors, small probe-pointed (tenotomy) scissors, small Volkmann's spoon, small periosteal elevator, curved needles, and skin sutures.

I always employ a general anaesthetic, but the operation can be performed under local anaesthesia. In the latter case it is well to add adrenalin to the cocaine or eucaine solution, which must be injected deeply in every direction around the sac. In easy cases local anaesthesia is doubtless quite sufficient, but it is seldom possible to be certain that any given case will prove easy, and failure completely to remove the sac is liable to bring odium upon the operation.

The lids are held stretched outwards by a finger

Fig. 1.—To show position of lacrymal sac and nasal duct.

Fig. 2.—Diagram to show incision and relations to conjunctiva and bones.

applied near the outer canthus. This throws the internal palpebral ligament into prominence. A curved incision is made, commencing just above the ligament, and extending downwards and slightly outwards to the inferior margin of the orbit and for a short distance along it. At the upper end the incision should lie about 5 millimetres internal to the inner canthus. If it be placed too far internally the angular vein will be opened and profuse haemorrhage will occur and prove very troublesome. The internal palpebral ligament is divided and the fibres of the orbicularis are dissected through until the sac is exposed. The dissection is carried backwards and inwards, and the finger is introduced into the wound to determine the position of the crest of the lacrymal bone, which forms an admirable guide to the exact position of the sac. The sac is then thoroughly separated from the bone on the inner side with the scalpel. There will probably be a considerable amount of bleeding. The retractors are now introduced—Müller's first and then Axenfeld's—in the manner indicated in Fig. 3. If the bleeding still continues after the venules have been put upon the stretch by the retractors, pressure must be applied. A small swab of cotton-wool is pushed into the wound, and kept firmly pressed back for one or two minutes. It is useless simply to dab up the blood; firm pressure must be applied for the time indicated, and in this case it generally proves quite effectual. Dipping the swabs in adrenalin, 1 in 1,000, previous to their introduction undoubtedly increases the haemostatic effect. The sac is now seized with fixation forceps and pulled forwards. The fundus and outer wall are dissected free with blunt-pointed scissors. Care must be taken not to dissect too far outwards, since the internal rectus may be injured, though I have never seen this mishap occur. The sac is pulled well forwards, and the posterior wall is dissected free in the same manner. The sac is now attached only by the duct. It is pulled well up, so as to drag up as much of the mucous lining of the duct as possible, and is removed by a snip of the scissors, applied as closely as possible to the bone. The wound is carefully inspected to see that all the mucous tissue is excised. The upper part of the nasal duct is then thoroughly scraped out with the sharp spoon. The wound is completely sutured. A small spherical pad is applied, and over this an ordinary pressure pad and bandage. Care should be taken to see that the lids are quite closed when the pad is applied.

The wound generally heals by first intention. It should not be pressed upon with the finger to see if there is any regurgitation during the first few days, as it is easily reopened. There is no objection to removing both lacrymal sacs at the same operation if both are affected. When the operation is satisfactorily performed there is no regurgitation on pressure over the scar. If after a week or two there is still some regurgitation, part of the mucous membrane has been left, and the operation must be repeated. Usually it is the fundus of the sac or the upper part of the nasal duct which has been left. The scar becomes quite unnoticeable, since it lies in the natural folds of the skin.

In all cases of cataract in which there is a mucocele the lacrymal sac should be excised as a preliminary to extraction. Only some weeks after this operation, when there is no trace of regurgitation, is it permissible to proceed with the extraction. A more difficult problem is the presence of mucocele in a case of acute glaucoma. Here immediate iridectomy is indicated, and admits of no delay. In these cases the sac must be completely isolated from the conjunctival sac. This is best effected by passing a ligature round each canaliculus and tying it firmly. Some surgeons cauterize the punctum, thus sealing it up with a cicatrix. Either procedure may be followed by the development of a lacrymal abscess, but in the meantime the iridectomy wound has probably healed, and in any

case the pus is evacuated through the skin and not into the conjunctival sac.

LACRYMAL OBSTRUCTION IN CHILDREN.

The remarks already made refer to adults. Mucocele is not uncommon in very young infants. It is usually extremely easily cured, for it is due to delay in the proper canalization of the nasal duct. The duct is developed as a solid cord of epithelium, the central cells degenerating and being cast off. Sometimes the cells accumulate in the lower end of the duct and block it at the orifice into the nose. These cases should be treated by a simple conjunctival lotion, the mother being directed to squeeze out the sac very frequently each day. This treatment often cures the complaint. If it does not succeed in a week or two, the baby should be put under an anaesthetic and the sac and duct syringed out. If the surgeon is quite confident of his ability to pass a probe properly, the punctum and canaliculus may be dilated with a Nettleship's dilator and a small probe passed *once* down the duct into the nose. It must not be forgotten that the duct is very short in young babies, and no force must be used. Above all, it must be remembered that permanent damage may be done to the walls of the duct if the utmost skill is not exercised. This is almost the only condition which I know of when probing is indicated.

There is a small group of cases of mucocele in children in which simple treatment proves ineffectual. In these the lacrymal sac must be extirpated. The operation is much more difficult in children, owing to the smallness of the parts. In my experience most of these cases are due to extensive disease of the sac and often of the surrounding structures. Some are probably caused by primary tubercle of the sac; more commonly there is caries or syphilitic disease of the neighbouring bones. Often the bone disease is extensive, and complete removal of the diseased parts involves opening up the ethmoidal sinuses or even the nasal cavity. I have been surprised at the favourable course of these cases, since one might well anticipate trouble from direct communication between the wound and the septal nasal cavities and sinuses.

Fig. 3.—Diagram to show use of retractors.

THE LACRYMAL SAC IN THE ECONOMY OF VISION.*

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Physiology of Lacrymation.

THE lacrymal apparatus comprises the lacrymal gland, the puncta lacrymalia, the canaliculi, the lacrymal sac, and the nasal duct. The tears, excreted by the gland at the upper and outer angle of the orbit, pass downwards and inwards over the eyeball, and are discharged, through the canaliculi and the lacrymo-nasal duct, into the nose. Ordinarily the gland secretes scarcely any more liquid than is lost by evaporation from the surface of the eyeball. Excessive secretion of tears results from psychical or reflex stimulation of the gland, the latter generally taking place through the terminal fibres of the fifth nerve in the conjunctiva, lacrymal sac, or nose.

The mechanism by which the tears are removed from the eye into the nose is somewhat complicated, and is still a contentious question. For the satisfactory removal of the tears the following conditions seem necessary:

1. The edges of the lids should be lubricated by the fatty secretion of the tarsal glands, which prevents the overflow of tears when their secretion is not excessive.
2. The edges of the lids, at any rate in the region of the puncta lacrymalia, must be closely applied to the eyeball, that is, there must be no paralysis or paresis of the orbicularis

* Read before the Birmingham Branch of the British Medical Association.