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THE INTRA-NASAL TREATMENT OF LACHRYMAL DISEASE.

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THE treatment of lachrymal affections has ever formed one of the most unsatisfactory chapters in medicine. Situated as the tear passage is on the frontier line of two special regions, while the rhinologist could afford to ignore and did ignore it, the ophthalmologist had perforce to give it his attention, and it has been not inaptly called the step-child of ophthalmology. Though the conception of attacking lachrymal trouble by draining the passage into the nose is a very old one, having been known to the ancient Greeks and Egyptians, yet practically nothing had ever been done to carry it out. During the last twenty years the unsatisfactory state of the question prompted efforts to solve the problem. While ophthalmologists fell back upon an old method, viz. excision of the sac, it was only when a proposal to combine it with intra-nasal opening for drainage was made that the interest of rhinologists was really awakened. They began to attack the question from the nasal side. An increased knowledge of lachrymal disease and its mode of origin made more clear to them the nature of the problem, and so great has the recent advance been, that it may be said that its solution is well in view.

ANATOMY.

The lachrymal apparatus concerned with the removal of the

tears consists of the canaliculi, upper and lower, the lachrymal or tear sac, the lachrymal or tear duct and its outlet. Both canaliculi generally unite and open into the tear sac. This sac lies in the lachrymal fossa or groove (Figs. 1 and 2), the anterior half of which is formed by the ascending process of the superior maxilla with the crista lachrymalis anterior, the posterior half by the lachrymal bone with the crista posterior. These two halves are of unequal thickness, the former being thick compact bone, the latter usually thin

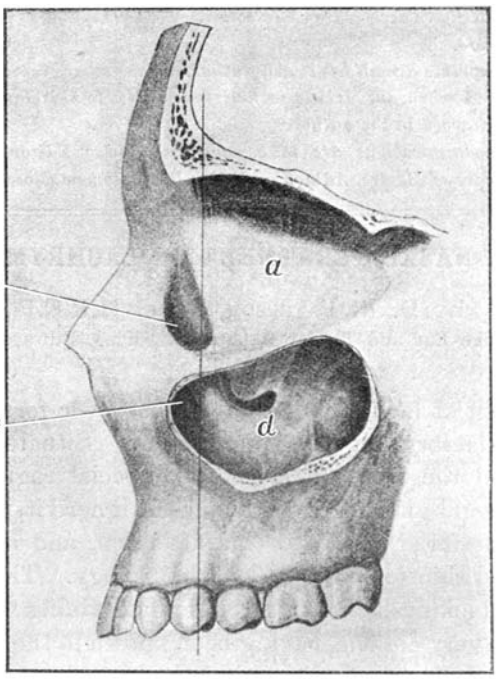

FIG. 1.—Sections showing relations of lachrymal fossa and naso-lachrymal duct (after Fein). *a*. Orbit. *b*. Lachrymal fossa or groove. *c*. Bulging of lachrymal duct. *d*. Antrum.

and sieve-like. The groove lodges the tear sac, which intimately blends with its thin periosteum. On its inner aspect the groove is covered by mucous membrane of the middle nasal fossa and is accessible from that side. On its outer aspect the tear sac has no bony covering and is in relation to the structures about the inner canthus; hence it is possible to compress it from the outside—a point of practical importance in the intra-nasal operation. The sac passes below into the membranous tear duct, which is sheltered in the naso-lachrymal canal and terminates in an outlet in the inferior

meatus. The bony outlet is found on the roof of the meatus at its highest point, about the junction of the anterior two fourths of the line of insertion of the turbinate. The bony and membranous outlets do not always correspond. If they do, the opening is wide with a clearly defined edge; usually, however, the membranous canal stretches beyond the bony, running under the mucosa to open lower down, often in a slit, but sometimes ending blindly with a lateral slit as the outlet. This disposition renders it liable to blocking by certain conditions of the nasal mucous tract and by pressure from growths, etc., in the nasal cavity.

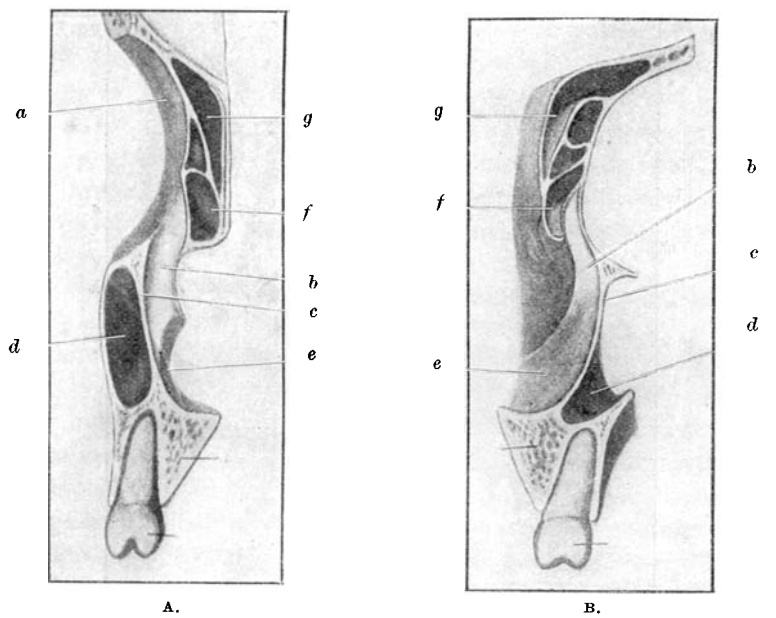

FIG. 2.—Frontal section of preparation in Fig. 1 through plane of perpendicular line. A. Anterior segment. B. Posterior segment (after Fein). *a*. Orbit. *b*. Lachrymal fossa or groove. *c*. Bulging of lachrymal duct. *d*. Antrum. *e*. Inferior meatus. *f*. Ethmoidal cell. *g*. Frontal sinus.

The passage from the top of the sac to the outlet comes into close relation with the nasal cavity. Its bony framework formed by the lachrymal, superior maxilla and inferior turbinate bones may be readily made out. The anterior half of the lachrymal groove formed by the thick ascending process of the upper jaw may be identified as a prominence—torus lachrymalis—in front of the anterior end of the insertion of the middle turbinate, and is a valuable guide to operation. Ethmoid cells, such as the frontal and anterior ethmoidal, may abut on the median aspect of the lachrymal

fossa (Fig. 2*f*), the thin bony wall which separates the two cavities often showing dehiscences which readily allow of the passage of disease from cells to sac. The infundibulum of the frontal sinus occasionally comes so far down as to lie close to the sac, whilst the maxillary antrum has a relation to the tear duct. But it is the close proximity of the ethmoid to the tear sac which explains the frequency of the connection between lachrymal and nasal disease. In addition we have close communication between the venous and

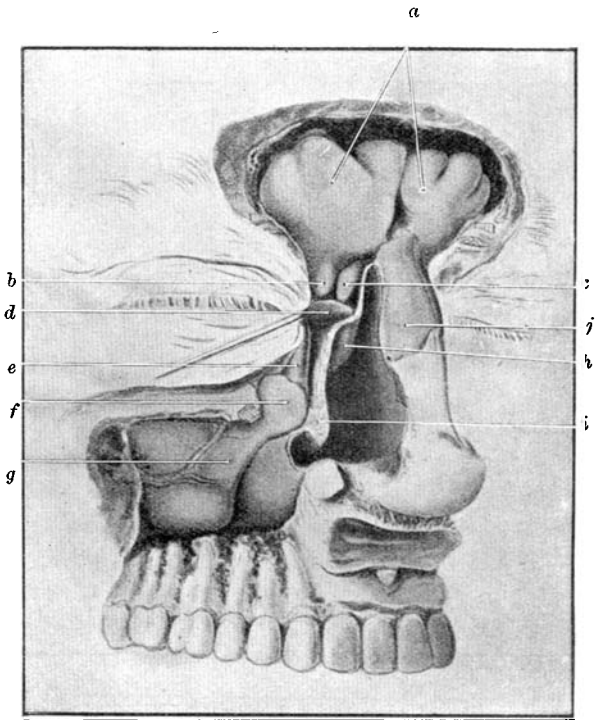

FIG. 3.—Dissection showing parts about lachrymal sac and duct (after Killian). *a*. Frontal sinuses. *b*. Infundibulum of frontal sinus. *c* and *d*. Ethmoidal cells. *e*. Naso-lachrymal duct. *f*. Prelachrymal recess of antrum. *g*. Antrum. *h*. Middle turbinate. *i*. Inferior turbinate. *j*. Nasal bone.

lymph tracts of the two regions. Fig. 3 shows the infundibulum coming close to the sac and an ethmoidal cell overlapping it.

LACHRYMAL AFFECTIONS AND NASAL DISEASE.

Affections of the tear passages from nasal causes range from simple epiphora to severe phlegmonous dacryocystitis. The nasal conditions producing them may be grouped together mainly under three heads:

(1) *Those Interfering by Pressure on the Outlet of the Duct.*—In this group, which has long been recognised by rhinologists, are conditions which impede either by their size or structure the outflow of tears into the nose. The removal of hypertrophied turbinates, polypi, cysts, deviations and spurs in the septum often relieves epiphora. On the other hand, as the membranous tear duct frequently runs under the mucosa and opens at some distance from the bony outlet, it may be affected in its course by circumscribed changes in the mucous membrane leading to hindrance of the outflow.

(2) *Inflammatory Affections of the Nose which extend by Continuity or by Contiguity to the Lachrymal Passage.*—Atrophic rhinitis may lead to purulent affection of the sac, chiefly by direct extension through the duct. Ethmoidal disease is a frequent cause of dacryocystitis from direct extension through the lachrymal bone to the sac. It is important to note that the ethmoidal disease may not always be obvious. It may be latent, as in two of my own cases, where it was only at the operation that suppuration of ethmoidal cells overlapping the bony wall of the sac revealed the cause of the dacryocystitis.

(3) *Specific Processes Spreading from the Nose up the Duct, e. g. Tubercle and Lupus.*

Kuhnt says—"Of by far the greatest practical importance are the evil results to the eye which follow the spread of inflammatory nasal conditions to the lachrymal passages and thence to the conjunctiva and cornea. The number of eyes lost in this way largely out-number, in my experience, all other forms of blindness from nasal disease." According to his statistics founded on experience in private practice the affections of the tear passages are in 93·7 per cent. of the cases of nasal origin. Brückner agrees with the view that in lachrymal disease there is nearly always some trouble in the nose as the causal condition. Rhese further confirms this, and sums up his views—"In my experience, disease of the anterior ethmoidal cells plays a prominent part in the genesis of tear-sac suppuration. I have operated on thirty such cases with excellent result, and it is the same in many cases of stenosis and epiphora."

Whatever the cause of the obstruction may be it leads to stagnation of secretion in the duct and sac, sometimes to great distension of the latter, and upon this may be grafted infections of various kinds. In lesser degree disease of an ethmoid cell contiguous to the sac may produce merely swelling of the mucosa of the latter and narrow its lumen where it passes into the duct. Consequently any operative procedure to be of service must deal

with the sac above this point, and it is a recognition of the fact that this is the most frequent site of stenosis which has led to the recent advance in intra-nasal treatment.

Treatment of Lachrymal Affections.

The methods of dealing with lachrymal affections may be divided into external and internal.

The external methods have been employed chiefly by ophthalmologists and most of them have but little interest for rhinologists. Slitting the canaliculus and passing Bowman's probes is a procedure much in use. "Dilatation by probing is the ordinary and best treatment for all strictures" (Nettleship). On this point some remarks of Kuhnt may be quoted: "A superficial examination of a large number of skulls will show that the lachrymal duct is only exceptionally straight; usually it curves somewhat backwards laterally or forwards. If a rigid probe, such as Bowman's, is introduced, it must necessarily here and there displace or lacerate the hyperæmic and swollen mucosa. Traumatism results, and the subsequent reactionary inflammation increases the swelling already existing." Laying in a permanent style or probe had considerable vogue at one time. A late colleague of mine thought highly of it and treated a considerable number of cases in this way. Its success, however, was not always due to its maintaining the natural passage. Through the kindness of my colleagues, Mr. F. Cresswell and Mr. Russell Thomas, under whose care they afterwards came, I have had the opportunity lately of examining two of those cases where the method acted efficiently for six or seven years in removing the epiphora (Fig. 4). The style had in both passed through the lachrymal bone into the middle meatus and lay not in the duct but in the nasal cavity, thus establishing a communication between the sac and the nose as in intra-nasal dacryocystotomy. Goethe, in *Wahrheit und Dichtung*, describes an operation at which he was present when a student at Strassburg and which was performed on his friend, the celebrated Herder, for a lachrymal affection—the laying in of a horse-hair drain through the tear passage. He speaks of it as "eine schmerzliche, höchst verdriessliche und sunichere Operation (a painful, very irritating and uncertain procedure)," and it did not turn out a success. A modification of the method is still made use of.

In more severe cases extirpation of the sac by means of excision is practised by ophthalmologists; but even then "watering of the eye" has remained in a good many of the cases.

The external procedure of most interest and which marked an important advance is that devised by Toti, an Italian rhinologist, in 1904, to which he has given the name dacryocystorhinostomy. It is carried out by a curved incision around the inner canthus through the soft parts, detaching the periosteum from the lachrymal fossa and displacing it forwards and outwards with the enclosed tear sac. A wide communication with the nasal cavity is then made through the bony wall. The posterior wall of the sac is

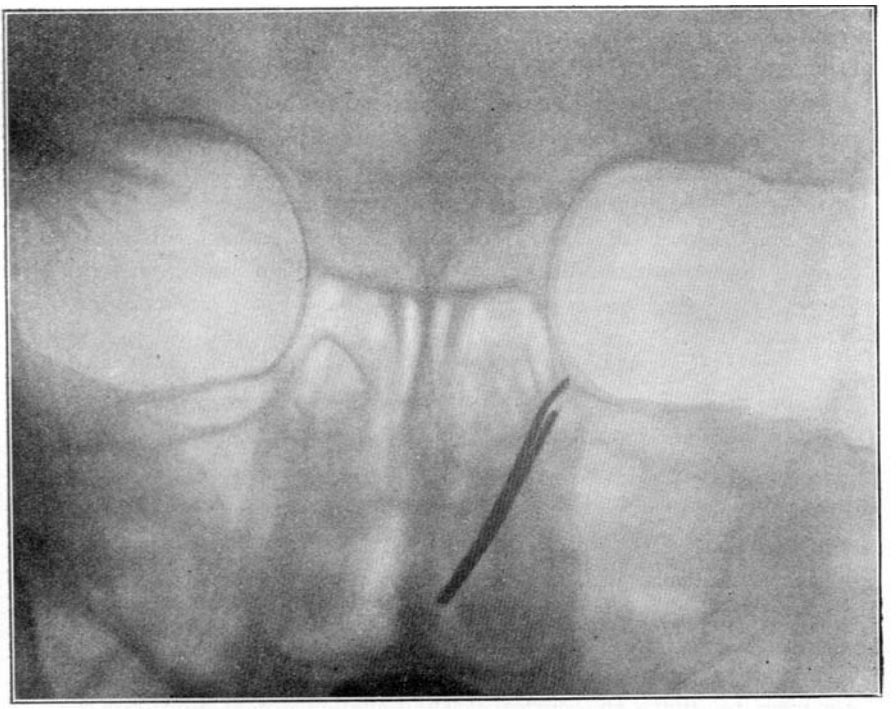

FIG. 4.—Skiagram of style which had been passed through the sac wall into the middle meatus and lay in the nasal cavity. It relieved epiphora for some years.

excised and part of the nasal mucous membrane resected. The parts are then replaced. It is essentially an establishment of nasal drainage by external operation, and there is no doubt that it has had considerable influence in pointing the way to recent advances. In Toti's hands the results have been good, but the technique is somewhat difficult, especially where the ethmoid requires to be resected, and ophthalmologists who have given it a fair trial have achieved but moderate success. My colleague, Mr. Leighton Davies, has done it in ten cases with a successful result in seven, and

thinks well of it. It involves a good deal of disturbance of the relations of the sac, and is very difficult to carry out where there is external phlegmon. It fails to touch the intra-nasal disease which is often the cause of the trouble, and the nasal part of the operation may be difficult to carry out owing to the disposition of the parts. It leaves an external scar. It is to efforts to overcome its disadvantages that we owe the intra-nasal method.

Intra-nasal treatment.—It is this form of treatment which concerns rhinologists more directly. It had long been a matter of common experience to note a "watering eye" disappear after the removal from the nasal cavity of some object which pressed on the outlet of the duct, such as polypi, hypertrophies, spurs, cysts, etc.

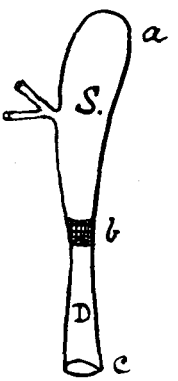

FIG. 5.—Diagram of lachrymal system to illustrate principle of operation. S. Sac. D. Duct. *a. b.* Inner wall of sac which is excised in operation. *b.* Common seat of stenosis. *c.* Outlet in nose.

Again, attempts had been made from time to time by retrograde probing to dilate the outlet of the naso-lachrymal duct, but they met with very little lasting result. The most fruitful procedures were those which aimed at opening the lachrymal duct and sac. For a long time those efforts were restricted to the duct where it is accessible from the inferior meatus. Caldwell, in 1893, in one case removed part of the lower turbinate and opened the duct and established drainage. Passow in 1901 carried out a more extensive operation. Removing part of the lower turbinate, he laid bare the whole membranous canal up to the tear sac, which he then slit open. He published three cases, but the procedure does not seem to have been generally adopted. J. M. West in 1910 cut a window in the naso-lachrymal duct just above the inferior turbinate, and published seven cases of which five were

cured. My own experience of this operation in two cases showed there was difficulty in preventing the window from closing.

The greatest advance was made about eighteen months ago, when West and Polyak, independently of each other, laid open the tear sac by making a window in the bony wall and established drainage by excising part of the sac wall. This operation, which has been called intra-nasal dacryocystotomy, is based on the view that the usual seat of dacryostenosis is at the outlet of the sac into the duct, and that any measure directed to the relief of it and its results must go above that point and attack the sac itself (Fig. 5). The seat of election has changed therefore from the duct, *b*, *c*, to the sac wall, *a*, *b*. It may be noted that Nature herself sometimes adopts this route for the tear outflow. Geddes records a congenital anomaly in which on one side the passage passed from a normally situated lachrymal sac downwards and inwards and terminated in the middle meatus. The naso-lachrymal duct on that side was represented by a fibrous cord in a normal bone canal which passed down to the roof of the inferior meatus.

Intra-Nasal Dacryocystotomy.

The operation may be carried out under local anæsthesia induced by applying cocaine and adrenalin to the region around and in front of the anterior end of the middle turbinate. Some idea of the position of the sac on its nasal side may be obtained by laying a probe outside on the cheek with its point over the inner canthus, measuring its distance from the nasal entrance and taking this for the inside measurement. As a rule the site of the sac is just in front of the anterior point of attachment of the middle turbinate (Fig. 6). Its prominence, forming the torus lachrymalis, is often visible. The turbinate, however, may come further forward and overlap it and part of this may require to be resected before coming down on the sac wall. The operation as carried out by West is begun by turning down a quadrilateral flap of mucous membrane, *a*, *b*, *c*, *d*, in front of the prominence over the sac for the purpose of obtaining more room to work. This flap is made by incisions down to the bone on three sides by means of a long slender knife, the anterior corresponding to the apertura pyriformis, the posterior immediately in front of the torus, the superior joining the upper extremities of both. The flap is now turned down and left attached by its base below; in a wide nostril it is usually unnecessary. Just behind it over the torus the mucous membrane is removed exposing the bony wall of the sac (s). By means of a long hollow chisel slightly

curved back (Fig. 7 *c*) the anterior half of the fossa lachrymalis formed by the thick ascending process of the superior maxilla is chiselled away, the thinner lachrymal bone behind being removed by a slender bone forceps or fine conchotome. The sac wall being fully exposed, it is possible by pressure on the sac externally over the inner canthus to make it bulge internally, and a probe touching the wall of the sac internally may be controlled from the outside in the same manner. The inner sac wall is now seized with a fine-toothed forceps (Fig. 8), pulled inwards, and part of it excised by a long, thin, straight bistoury. By this

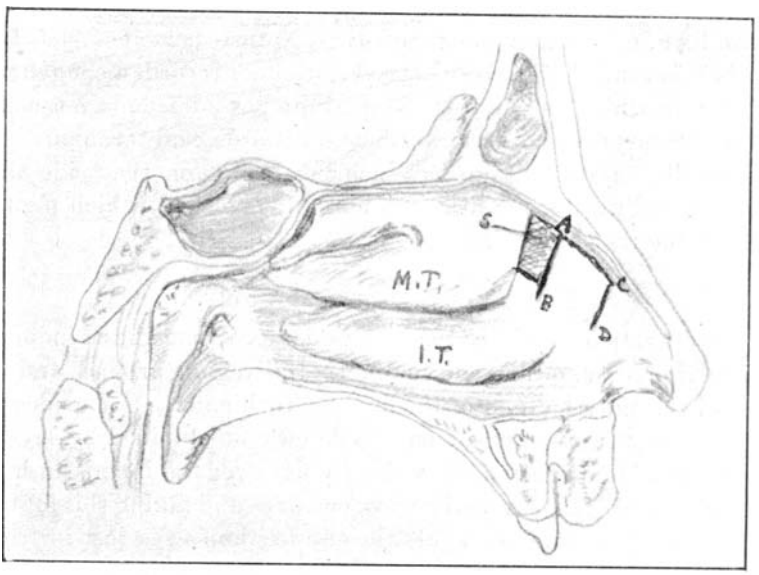

FIG. 6.—Operation as done by West. A, B, C, D. Mucous flap which is temporarily turned down. S. Sac exposed by removal of mucous membrane and bone. M.T. Middle turbinate. I.T. Lower turbinate.

means a large window is established and the contents of the sac flow out. A bent probe will now determine the relations of the sac, and by means of a fine-pointed lachrymal syringe inserted through the punctum, its cavity may be washed out. The mucous flap is now released, replaced in position and retained there by a little packing. Polyak's procedure differs but little from this. He dispenses with a flap, and after removing the mucosa he makes a transverse cut at the point where the sac joins the duct, inserts a curved probe to determine how far the sac extends, and if all the bony wall has been removed the sac wall is excised by means of a suitable conchotome. He avoids slitting the canaliculus and passing

a style into the duct. Where the parts are easily accessible West makes the bony window a little larger than the opening in the mucosa, and folds the latter over the edge of the bone so as to prevent the formation of granulation. In some cases the anterior end of the middle turbinate may come far forward and overlap the sac and has to be removed as a preliminary. Not infrequently a frontal or ethmoidal cell covers the sac and has to be opened up and removed. What looks like a prominent sac wall and promises an

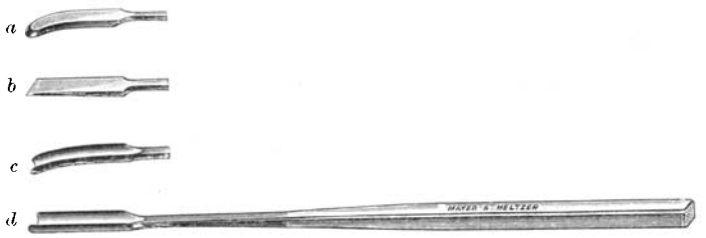

FIG. 7.—*a*. Elevator for muco-periosteal flap. *b, c, d*. Chisels of different shape.

FIG. 8.—Fine-toothed forceps. *a*. For right side. *b*. For left side.

easy operation often turns out to be such a cell. Breaking into it, however, does not complicate matters as a rule; on the contrary it may enable one to get at the thin wall of the lachrymal bone and remove it more easily. Bleeding may prove disturbing for a time when part of the turbinate has to be cut away, and it is not desirable to remove more bone than is necessary on that account. By this operation only the tear sac is opened; the duct remains untouched, as it is above that part of the canal where the stenosis generally lies. The after-treatment is very simple, being confined to syringing through the canaliculus with warm lotion.

The advantages of this operation according to West are: (1) The

physiological function of the tear passage is re-established, so that not only suppuration of the sac and phlegmon rapidly subside and fistulæ close up, but the tears can flow into the nose as formerly; (2) probes and styles are avoided; (3) the tear glands are preserved; (4) external incision and curetting with the resulting scar are avoided.

It is indicated in all troubles which are produced by dacryostenosis, viz. dacryocystitis, blennorrhœa, fistula, phlegmon and epiphora. It is contra-indicated in very young children, very old people, and generally where the nasal entrance is contracted by cicatricial tissue.

Available statistics afford reasonable ground for anticipating a good future for the operation. West has performed it in 130 cases,[1] including cases of epiphora, dacryocystitis, dilatation of the sac, blennorrhœa, phlegmon and fistula. In 90 per cent. spontaneous lachrymal flow was established. Polyak performed it in forty-two cases with immediate success in thirty-five. With the establishment of nasal drainage infective agents disappear out of the conjunctival sac, and in a case operated upon by West, Silex was able to perform a cataract operation without untoward result.

From my own experience the operation is not difficult to carry out. It is perhaps most troublesome in a nasal cavity which is splayed in its anterior part, that is, where the ascending process of the superior maxilla is, as it were, rotated on its long axis so that its posterior surface lies more laterally, a condition which makes it more difficult to get at the lachrymal fossa and necessitates the greater use of the chisel with consequent oozing. In several of my cases deflection of the septum in its upper part interfered with the working space, and a limited submucous resection was done to give the necessary room. On the other hand, on the concave side of the septum the operation was done without resorting to a preliminary flap. In one case the deflected septum came into such close apposition with the turbinate that it was impossible to do anything until part of the septum was resected. Such a case illustrates a difficulty in draining the sac by Toti's method as the proximity of the parts would inevitably lead to adhesions and closure of the opening. Where there is curving in of the apertura pyriformis contracting the nasal entrance a portion of the bone can be resected to give more room.

These additional procedures, though they may prolong the operation, complicate it but very little. They are part of the routine of a rhinologist and are easily carried out.

[1] This number now exceeds 200.

The relief given by the operation is immediate, and in striking contrast to the long-drawn-out treatment by style and probe. For epiphora due to hypersecretion or disturbance of the innervation of the lachrymal glands, as in Graves's disease, facial palsy, etc., or produced by an affection of the puncta or of the canaliculi the operation can have no value. But in all cases of dacryostenosis it is suitable where an operative procedure is indicated, and there is reason to hope it may become the normal method for the treatment of a large group of lachrymal affections.

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NOTE ON THE HISTOLOGY OF ENUCLEATED TONSILS.

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EXAMINATION of tonsils removed by guillotine (*i. e.* partial removal), by *écraseur* and enucleation respectively, present very striking differences in structure, which cannot be accounted for by age, variation, or by morbid changes.

The most prominent feature in enucleated specimens is the large amount of skeletal muscle which is seen in its attached area or bed (Fig. 1). This is not seen in tonsils removed by guillotine, and only slightly in *écraseur* specimens. Such occurrence of muscle-fibres is limited to a small but variable area, and it is so constant that it must be accepted as a normal condition which has to be seriously considered in tonsil removal.

A brief review of the tonsil's attachment will explain the presence of these fibres and their significance.

The faucial tonsil rests in a somewhat irregular pocket formed by the upward union of the faucial pillars as they invest the supra-tonsillar fossa. Below, it is separated from the lingual tonsil by a space containing a variable number of mucous glands. The anterior or palato-glossal pillar is a representative of the second branchial arch and contains a vestigial artery, but no muscle.

The posterior pillar is often less clearly defined and formed