END-TO-SIDE ANASTOMOSIS FOR OBSTRUCTION OF THE NASO-LACRIMAL DUCT*

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IN all the operations commonly performed for obstruction of the naso-lacrimal duct, the side of the sac, and not the end, is used for the anastomosis (Fig. 1). The medial wall of the sac is incised vertically over the greater part of its extent to provide the anterior and posterior flaps. This radically alters the anatomy and destroys any chance of pumping action by the orbicularis. The upper end of the sac, in which lie the opening of the common canaliculus and the mucous folds which guard it, is laid open and left in close proximity to the raw upper edge of the bony opening. Gaps are left above and below the anastomosis unlined by mucous membrane, extensive removal of bone is necessary in the course of which ethmoid cells may be entered, and the anterior and posterior suture lines are liable to adhere—all features which favour obstruction of the anastomosis by granulation and fibrous tissue. These operations are mostly modifications of the flap technique introduced by Dupuy-Dutemps and Bourguet (1921); they work well on the whole, but failures still occur in some 5 to 10 per cent. of cases and imperfect results in a larger number, which must be attributed, at least in part, to the defects of the method.

The end of the naso-lacrimal duct normally opens into the side of the nose (Fig. 2). It therefore seems logical, when the duct is obstructed, to excise the obstruction (Fig. 3) and to join the proximal cut end once more to the side of the nose making an accurate anastomosis with a circular hole in the mucosa (Fig. 4). In this way the only change produced is that the duct opens into the nose somewhat higher than before. The anatomy of the upper part of the sac is unaffected, there are no gaps unlined by mucous membrane, the bony hole is small, leaving the ethmoidal cells untouched, and the suture lines cannot adhere because the opening is circular. Such a procedure may be called end-to-side anastomosis.

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FIG. 1.—Side-to-side anastomosis.

FIG. 2.—Left lacrimal passages and nose. Coronal section.

FIG. 3.—Common site of obstruction.

FIG. 4.—End-to-side anastomosis.

Technique

The method was worked out on the cadaver and has been applied with success to living subjects.

Approach to the Fossa.—The preliminary steps are much the same as those commonly used in the Dupuy-Dutemps operation. The incision is placed a little lower than usual so as to expose mainly the lower part of the fossa and upper end of the duct. The periosteum is incised just in front of the anterior lacrimal crest,

and the periosteal sheet is swept laterally taking the sac with it and exposing the fossa up to the posterior crest (Fig. 5).

FIG. 5.—Approach to lacrimal fossa.

Exposure and Section of the Duct.—It is at this point that the dissection begins to differ from that used in standard operations.

The lower part of the sac and upper part of the nasolacrimal duct are exposed by removing the anterior wall of the bony canal with the sphenoidal punch (Fig. 6). The sac and duct are freed from the bone all round, the duct is cut transversely with scissors as low down as possible, and both sac and duct are mobilized so that the cut end can be turned up (Fig. 7).

FIG. 6.—Exposure of naso-lacrimal duct.

FIG. 7.—Cut end of duct.

The cut end is now trimmed so as to leave a free opening into the lower end of the sac some 5 mm. in diameter, conserving as much of the sac as possible and adjusting the plane of section so as to facilitate the anastomosis (Fig. 3).

This step in the operation is influenced by the position of the obstruction. In the majority of cases this lies at the junction of sac and duct, so that the narrow collapsed duct and fibrous "hour-glass" stricture are easily seen when the anterior wall of the bony canal is removed. The duct is cut below the stricture and its position and nature can be verified by trying to pass a probe into the sac from below and by syringing through the canaliculi, when the sac will be distended but little or no fluid will emerge from the cut end. This stricture must be excised sufficiently widely to leave a free opening, while at the same time conserving enough of the sac to complete the anastomosis by the end-to-side method. In

some cases, however, the obstruction is situated lower down and then the duct is seen to be dilated, filling the bony canal, and little different in width from the sac. A probe passes easily through the cut end into the sac and fluid emerges freely from it on syringing. In these cases no excision is needed and a greater length of sac and duct is available for the anastomosis.

Patency of the Upper Lacrimal Passages.—Syringing with the cannula just within the canaliculus should produce a free flow of fluid from the cut end of the sac. If it does not do so, an obstruction must be present in the upper end of the sac or in the sinus of Maier and conversion to the side-to-side operation is necessary.

Bony Opening.—It will now be possible to estimate where the cut end of the sac can most conveniently be joined to the nose. At this point, which usually lies somewhat below and just behind the middle of the anterior lacrimal crest, a circular hole in the bone is made with the Arruga hand trephine, revealing the nasal mucosa (Fig. 8). The opening is placed so low down and so far forward that ethmoid cells are not encountered. It does not usually need enlarging, though a trifle more bone may be removed with the sphenoidal punch if this is thought to be necessary. Provided that the mucosa is not pressed against the bone by nasal packs, it should rarely, if ever, be injured.

FIG. 8.—Bony opening.

FIG. 9.—Mucosal opening.

Mucosal Opening (Fig. 9).—A circular hole is punched in the centre of the circle of nasal mucosa using a 5-mm. corneal graft trephine with a spatula in the nose as backing. It may be necessary to complete the removal of the centre piece with curved spring scissors. The anterior end of the middle turbinate may be seen in the opening but does not interfere with drainage.

Completing the Anastomosis.—The cut end of the sac is now sewn to the circular hole in the nasal mucosa with four or more sutures, using Kalt's silk on a 5-mm. Barraquer needle and placing the posterior suture first. A fine rubber catheter may be passed from the nose into the sac to act as a conformer where it will

remain by virtue of its own elasticity if the free end is strapped to the face (Fig. 10). This precaution was, however, omitted in two cases without affecting the result. The completed anastomosis is shown in Fig. 11.

FIG. 10.—Catheter passing through nostril and hole in nasal mucosa into sac.

FIG. 11.—Completed anastomosis.

Closing the Wound.—The deeper layers are drawn together by two buried catgut sutures so as to replace the orbicularis and periosteum as nearly as possible in their original position. The skin is closed by a single continuous subcuticular stitch.

Post-operative Management.—This does not differ from that followed in standard operations. The patient is instructed not to blow his nose for at least a week. When a tube is used it is allowed to stay in for a week or until it falls out accidentally. Systemic penicillin is administered prophylactically for 3 days after the operation. No other precautions are necessary and the patient should be up and about as soon as the basal sedation has worn off.

Results

The method has been used in twelve cases of obstructed naso-lacrimal duct, in eleven of which it has been successful. Nine of the patients operated on had a simple mucocoele of the lacrimal sac and three were cases of subsiding acute or sub-acute dacryocystitis. The results are summarized in the Table (overleaf), and the details of the successful cases are described below.

Syringing.—Fluid passed freely to the nose on syringing in all cases at some stage after the operation. As soon as it was evident that the anastomosis was draining and the fluorescein test was positive no further syringings were done.

Fluorescein Tests.—Ten cases were tested by putting 2 drops of fluorescein into the conjunctival sac. The test was regarded as positive when the fluid

TABLE
RESULTS IN TWELVE CASES

Case No.	Sex	Age (yrs)	Pre-operative Condition	Follow-up to Last Visit (mths)	Epiphora		Fluorescein Test	Syringing	Remarks	
					Subjective					Objective
					In-doors	Out-doors				
1	F	63	Dacryocystitis	9	-	-	-	+	Patent	Artificial eye
2	F	72	Dacryocystitis	16	-	-	-	+	Patent	
3	M	76	Mucocoele	6	-	±	-	+	Patent	
4	F	52	Mucocoele	6	-	±	-	+	Patent	Everted punctum
5	F	43	Mucocoele	1	-	-	-	+	Patent	
6	M	46	Mucocoele	10	-	-	-	+	Patent	
7	F	59	Mucocoele	18	-	-	-	+	Patent	
8	F	64	Mucocoele	17	-	±	-	-	Patent	
9	F	52	Dacryocystitis	4	-	±	+	-	Blocked	
10	F	74	Mucocoele	12	-	-	-	+	Patent	
11	F	68	Mucocoele	2	-	-	-	+	Patent	
12	F	78	Mucocoele	4	-	-	-	Not done	Patent	

was seen to have drained away, after a few minutes, and the patient's handkerchief showed a yellow stain on blowing the nose. Nine of these patients gave a positive result. In the tenth case the fluid drained away but no staining of the handkerchief could be demonstrated although the patient was symptom-free and the anastomosis was freely patent on syringing. The case which was not tested in this way was quite symptom-free and the anastomosis also was patent on syringing.

Epiphora.—Both subjective and objective epiphora were absent in all cases indoors. In no case did any troublesome degree of epiphora occur out-of-doors, but three patients, in response to questioning, mentioned slight occasional watering in cold winds. In two of these, one of whom had an artificial eye on the affected side, the fluorescein test was positive. In the third there was a minor degree of ectropion of the punctum, and the anastomosis was freely patent on gentle syringing although the fluorescein test was negative.

The unsuccessful case was that of a woman aged 52 (Case 9), who had suffered repeated attacks of acute dacryocystitis during the preceding year, one of which was subsiding at the time of operation. A block developed post-operatively at the upper end of the sac, although the anastomosis seemed to be patent beyond it and no further acute attacks have occurred in a follow-up period of 5 months. It would probably have been wiser in this case to have done a side-to-side anastomosis in order to provide the freest possible drainage.

The Table shows that eight of these cases have been observed for 6 months or more and four of them for over a year.

Discussion

The theoretical advantages of the end-to-side method have already been enumerated, but its value will be judged by results and all that can be said about these first few cases is that they justify further trial.

Certain points require special discussion.

Selection of Cases.—End-to-side anastomosis is useless unless the upper lacrimal passages are freely patent. Naturally every indication on this point should be collected beforehand, including those derived from syringing and dacryocystography, but the final decision must be taken during the operation. If fluid does not flow freely from the cut end of the sac on syringing gently with the point of the cannula just within the punctum, then a side-to-side anastomosis should be done and the obstruction cleared from inside under direct vision.

Conversion to Side-to-Side Operation.—In a given case two considerations may lead the surgeon to abandon the end-to-side method. If there is evidence of obstruction in the upper lacrimal passages or if the stricture is placed so high that it is not possible to conserve enough of the sac for the anastomosis, it will be necessary to change to the side-to-side method. This can be done with ease at any time before the nasal mucosa is incised. One blade of a pair of blunt-ended scissors is introduced into the sac from below through the cut end and the medial wall is opened so as to provide flaps of suitable size. This method of entering the sac is, in fact, more satisfactory than the usual one of incising it from outside. The sac is opened neatly in one movement without risk of damaging the mucosa, and there is no doubt whether the lumen has been reached. There is much to be said for employing this approach whatever type of anastomosis is planned.

Anaesthesia.—Bleeding tends to be less in this than in standard operations because less bone is removed. Also, because the wound in the nasal mucosa is small and well occluded by the anastomosis, there is less tendency for blood to go down the throat. General anaesthesia with intubation is unnecessary, and indeed contraindicated, because it increases bleeding. Intramuscular injection of Largactil, Phenergan, and Pethidine combined with local injections and nasal spray have proved even more satisfactory for this than for standard operations (Burn and Hopkin, 1955).

Operative Hazards.—In removing the anterior wall of the bony canal, care must be taken to avoid damaging the origin of the inferior oblique muscle and the mucoperiosteum of the maxillary antrum. Provided these possibilities are kept in mind there is little or no danger.

Historical Note

After the technique had been worked out and applied with success, search was made in the literature for references to similar operations.

One account was found of an end-to-side anastomosis of this type (Juge, 1955), but no mention is made of numbers or results.

The principle of using the end instead of the side of the sac to form a fresh passage into the nose has been incorporated in a number of transplantation operations in which the cut end is drawn into the nose through a hole in the bone and mucosa, and held there by a suture emerging from the nostril. Such an operation was first performed by Speciale-Cirincione (1913) in two cases, in Italy, and more successfully and in larger numbers by Forsmark (1911) in Sweden. Stock (1934) in Germany, Burch (1920), Stokes (1938), and Gifford (1944) in America, and MacMillan (1932) in Canada, have advocated similar methods. The results were not, on the whole, so good as those achieved at the same period by side-to-side methods, and this must be attributed mainly to the absence of an accurate anastomosis so that the implanted end was left to collapse and seal off.

The logical consequence of Forsmark's work would have been the development of such an anastomosis, but at that time anaesthetic methods, needles, and suture materials were not such as to make fine plastic procedures easy. The more rough and ready side-to-side techniques introduced by rhinologists like Toti and Moscher were achieving good results and the attention of ophthalmic surgeons became concentrated upon them until, with the introduction of anterior and posterior muco-mucous flaps by Dupuy-Dutemps and Bourguet (1921), the results became so good that they have held the field ever since. Nevertheless, now that modern instruments and anaesthetic methods have made accurate end-to-side anastomosis relatively easy, it is perhaps worth considering whether the standard methods cannot be improved upon in this way.

Summary

A method of treating obstruction of the nasolacrimal duct by anastomosing the cut end of the sac to a circular hole in the nasal mucosa is described. Twelve cases have been treated, of which eleven have proved successful.

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