Chapter 98 – Dacryocystorhinostomy

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External dacryocystorhinostomy (DCR) was first described by Toti in the early 20th century.[1] The technique is applicable to patients complaining of tearing and demonstrating obstruction of the lacrimal outflow system. The procedure consists of creating a fistula for egress of tears directly from the lacrimal sac into the nose and bypassing the nasolacrimal duct (Figs. 98-1 and 98-2). Description of endonasal DCR took place even before report of external DCR.[2]

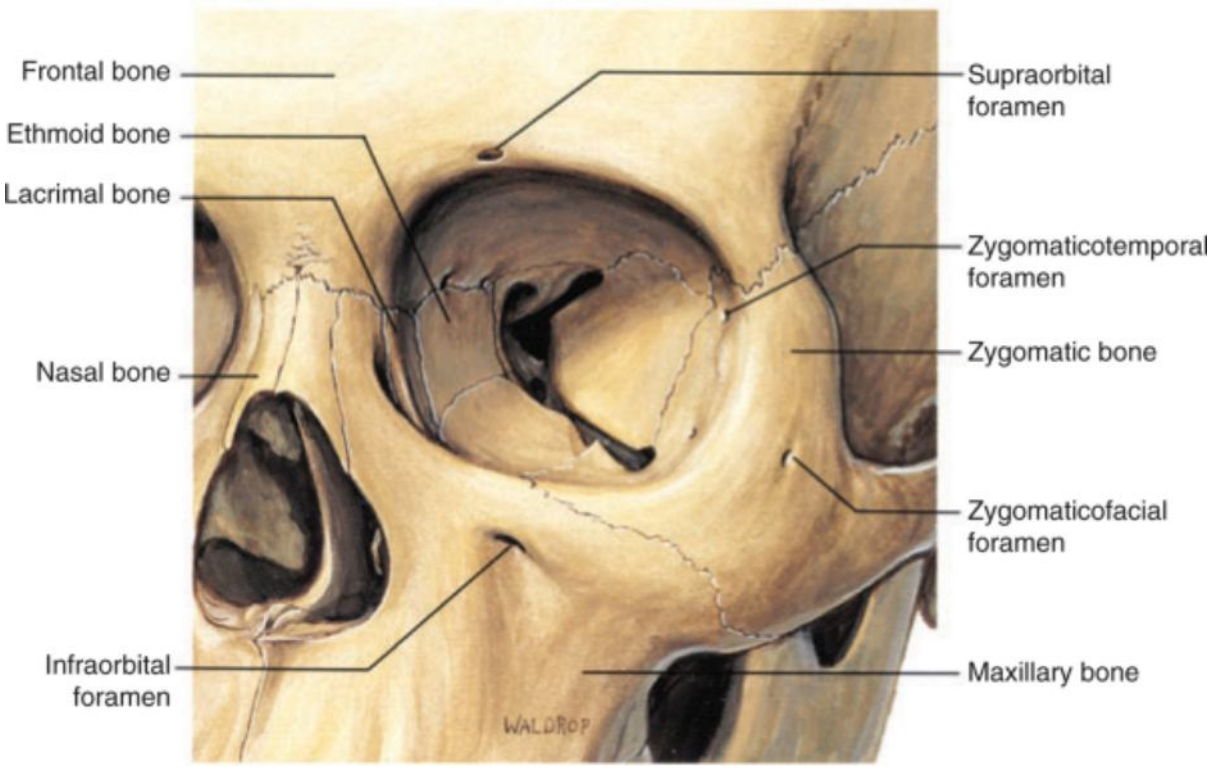

Figure 98-1 Orbital bones, frontal view.
(From Dutton JJ: Atlas of Clinical and Surgical Orbital Anatomy. Philadelphia, WB Saunders, 1994.)

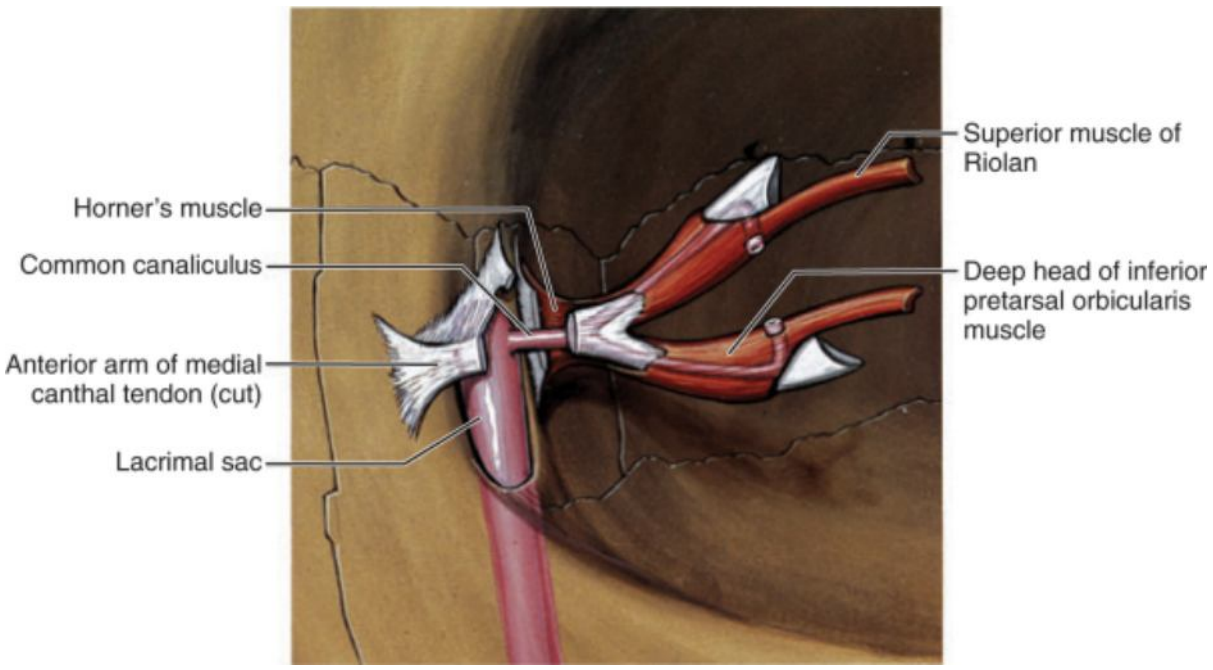

Figure 98-2 Lacrimal drainage system, superficial anatomy.
(From Dutton JJ: Atlas of Clinical and Surgical Orbital Anatomy. Philadelphia, WB Saunders, 1994.)

PATIENT SELECTION

Patients may complain of tearing for one of three reasons: hypersecretion of tears, impaired drainage of tears, or a combination of both. Primary hypersecretion of tears is uncommon, but secondary hypersecretion is a frequent cause of tearing. It may be due to a variety of ocular surface disorders, some as benign in nature as seasonal allergy. Associated symptoms and signs will help in making these diagnoses, and their proper treatment should proceed before surgical repair. For example, a patient with itching may have hypersecretion because of seasonal allergy and may be treated with antihistamine drops. Reflex hypersecretion in patients with ocular surface dryness (as in those with Graves' disease) must be addressed by referral to an ophthalmologist. Abnormal eyelid position can cause reflex tearing by rubbing of lashes against the cornea or by desiccation of the cornea as a result of inadequate blinking or closure. Patients' complaints will assist in making the diagnosis inasmuch as those with surface disorders causing reflex hypersecretion will complain of burning and a foreign body sensation. Fluorescein drops instilled into the conjunctival cul-de-sac will highlight defects in the corneal epithelium when viewed with a cobalt blue filter on a penlight in patients with dry eye.

Impaired drainage of tears can occur at any level of the lacrimal outflow system. In newborns and infants, the most common site of obstruction is distally at the valve of Hasner, where canalization is often incomplete at the time of birth. In most patients, congenital nasolacrimal duct obstruction will resolve by the age of 6 to 12 months, so probing of the lacrimal system should be delayed until the end of the first year of life. Probing of the lacrimal system is most often curative at this age.[3]

In adults, tearing secondary to insufficient lacrimal drainage is common and may be due to functional or physical obstruction. Functional obstruction includes poor function of the medial canthal lacrimal pump, usually secondary to eyelid malposition or aberrant anatomy. Physical obstruction may occur at the level of the punctum, canaliculus, common canaliculus, lacrimal sac, or nasolacrimal duct. The latter two account for about 74% of lacrimal outflow obstructions[4] and are treated with greater than 90% success by external DCR surgery.[5]

Patients may have acute dacryocystitis and complain of tearing, discharge, swelling, and pain over the lacrimal sac. Some cases proceed to periorbital cellulitis before diagnosis, so a high index of suspicion in this setting must be maintained. Pressure over the sac produces purulent reflux from the punctum, which is often quite painful for the patient. Probing or irrigation at this time is useless and may complicate the situation. About two thirds of acute infections grow gram-positive organisms in culture, and about 7% are anaerobic.[6] Treatment of acute infection consists of at least 3 weeks of oral antibiotic, antibiotic-steroid drops, and warm compresses. An abscess in the area necessitates prompt percutaneous drainage, often possible in the office under local anesthesia. The sac may then be irrigated with antibiotic solution. Occasionally, poor response to oral therapy will necessitate intravenous antibiotic treatment and prompt surgery.

Endonasal DCR has enjoyed renewed interest since the 1980s but is less preferred because of lagging success

rates and expense. Recent reports suggest that the technique is becoming more successful.[7]

Successful DCR requires a functional upper outflow system. Treatment of upper system (punctum, canaliculus, and common canaliculus) obstruction must be undertaken either separately or in the setting of surgical DCR. Punctal stenosis may be treated by various punctoplasty techniques. Canalicular stenosis may be treated with silicon intubation, generally only in the setting of incomplete obstruction. Common canalicular stenosis may sometimes be treated in the setting of DCR by silicon intubation. If intractable upper system obstruction is present, primary conjunctivodacryocystorhinostomy with placement of a Jones tube is necessary.

In 8% to 14% of DCR surgeries, dacryoliths composed of precipitated organic material will be found.[8,9] Affected patients may complain of intermittent tearing and pain and demonstrate distended, tender lacrimal sacs but minimal or no inflammation. Alternatively, the dacryolith may mimic complete obstruction and occasionally cause acute dacryocystitis.

In the presence of any suspicion of a mass in the lacrimal system, external DCR with biopsy is mandatory. The symptom of bloody tears is particularly worrisome for tumor. If intraoperative frozen sections are available, it may be possible to complete the DCR if the sections are benign. If malignancy is found, however, dacryocystectomy with appropriate margins should be performed and creation of an ostium into the nose avoided.

PREOPERATIVE EVALUATION

Most patients referred to an otolaryngologist with complaints of tearing will already have been evaluated by an ophthalmologist and treated for ocular surface disorders causing hypersecretion. If not, ophthalmologic workup should proceed before any consideration of lacrimal surgery for correction of tearing.

Complete endonasal examination, with particular attention paid to the distal end of the nasolacrimal duct beneath the inferior turbinate, should be performed in the office. Occasionally, physical obstruction of the ostium is visible and readily treated. Significant rhinitis should also be treated before surgical correction because it also rarely causes functional obstruction. Note of any septal defects or deviation is important, particularly if an endonasal approach is selected.

Dilatation and irrigation of the lacrimal system in the office can be used to localize the outflow blockage. Probing of the lacrimal system, however, has no place in adult patients. This procedure is rarely if ever curative and will cause significant patient discomfort. In addition, there is a risk of trauma to the delicate mucosa-lined canalicular system, which is a considerably more difficult problem to treat than nasolacrimal duct obstruction. Quick, easy passage of saline into the nasopharynx after topical anesthesia and gentle injection into the canaliculus may call into question the diagnosis of lacrimal obstruction. However, this will often occur in the setting of a dacryolith because the liquid will drain around the object. It is also sometimes possible to open the nasolacrimal duct with forceful injection, but resistance will be palpable and indicates that the system is probably functionally obstructed. The physician should note the speed and volume of flow, in addition to the presence of resistance or frank reflux of fluid. Reflux in the presence of resistance to flow indicates obstruction. If reflux occurs from the canaliculus being injected or if resistance to easy passage of a 22-gauge or smaller cannula is felt, canalicular obstruction is present. Reflux of fluid from the opposite lid suggests obstruction distal to the common canaliculus, and DCR is likely to be curative.

Computed tomography of the orbits and sinuses may be ordered in some situations to evaluate sinus and nasal anatomy and whenever a mass is suspected. It is particularly helpful in the setting of previous facial trauma.

A complete medical history is necessary, with particular attention directed to bleeding/clotting disorders and hypertension-related pathology. If the patient will be under general anesthesia, evaluation by the primary physician is frequently necessary.

SURGICAL APPROACHES

External DCR is performed under local anesthesia with sedation or under general anesthesia. Our preference is general anesthesia because control of the airway in the presence of nasopharyngeal blood is desirable. Before sterile preparation and draping, a local anesthetic with epinephrine is injected transcutaneously over the anterior lacrimal crest and intranasally just anterior to the middle turbinate. The patient may be administered nasal decongestant before anesthesia, or cottonoids soaked in decongestant may be placed.

A no. 15 scalpel blade is used to create an approximately 1.5-cm skin incision over the anterior lacrimal crest by cutting in one stroke down to periosteum (Fig. 98-3). A Cottle or similar instrument is used to elevate the periosteum over the maxillary bone. Elevation proceeds posteriorly and superiorly and includes the lacrimal sac fused to the periosteum (Fig. 98-4).

Figure 98-3 Anterior lacrimal crest. The incision will be hidden in the lower eyelid crease.

Figure 98-4 Lacrimal sac elevated from the fossa (medial).

A small dehiscence of bone is often encountered at the junction of the maxillary and lacrimal bones and is useful for insertion of a Kerrison punch to begin bone removal. If this dehiscence is not present, the bone may often be cut with a small osteotome. Only rarely is it necessary to drill to gain access to the nose, although drilling is more frequent in patients with duct obstruction in the setting of inflammatory diseases such as sarcoid or Wegener's granulomatosis. If the anterior lacrimal crest obstructs visualization, it may be partially resected with the bone punch.

A wide area of bone removal facilitates working in the nose (Fig. 98-5). The patient's upper punctum is gently dilated, and a 0 or 00 Bowman or similar probe is inserted. The probe is immediately turned medially, and gentle lateral traction is placed on the lid to straighten the canaliculus. When the probe is in the sac, it is rotated up over the medial aspect of the brow and visualized through the wound to be distending the sac. The sac is opened over the probe, and the incision is extended as completely superiorly and inferiorly as possible (Fig. 98-6). The sac may be incised with an angled crescent blade, an angled needle-tipped cautery, or a radiofrequency dissector. Extension of the incision in the sac anteriorly at its upper and lower limits is helpful for inspection of the interior of the sac. Any foreign bodies should be removed, and a low threshold for biopsy should be maintained. The probe is removed from the lacrimal punctum.

Figure 98-5 Lacrimal sac reflected and bone partially removed from the fossa.

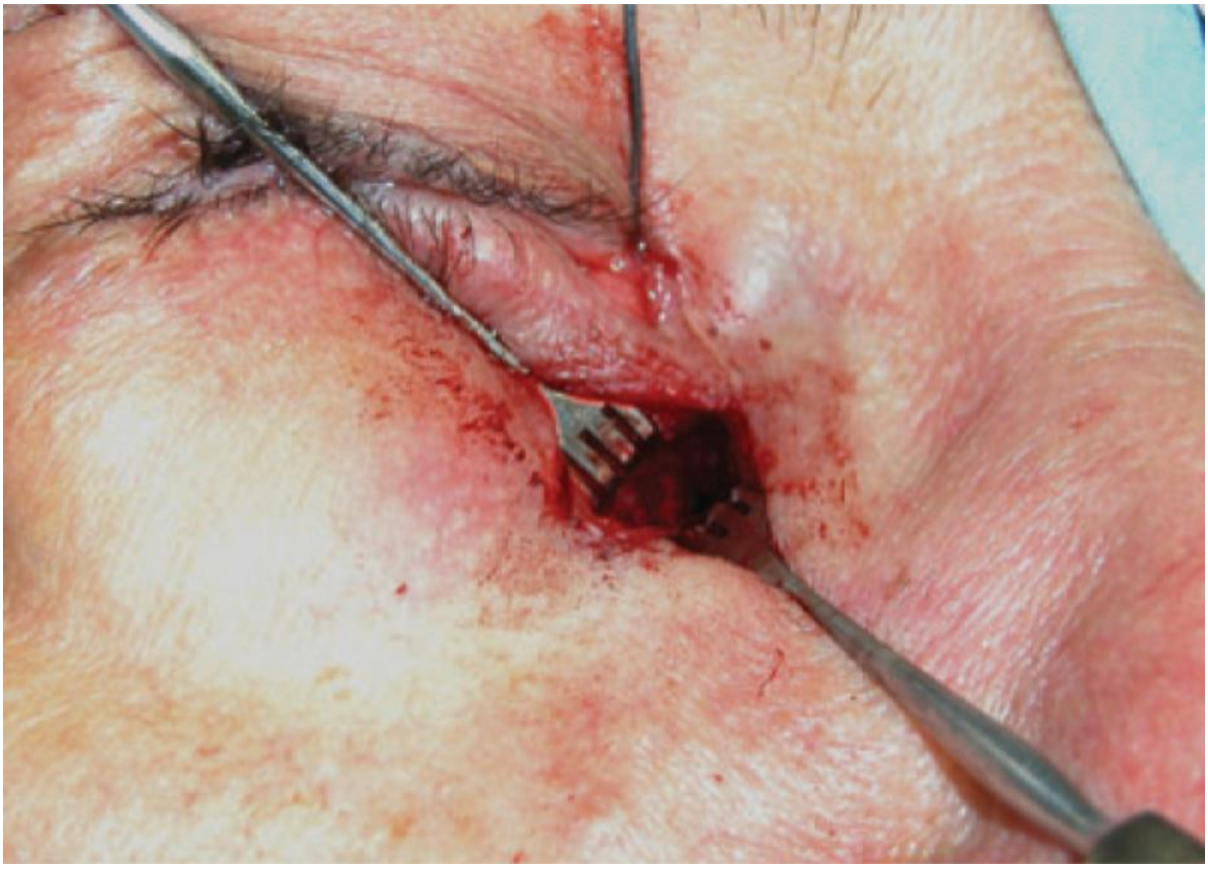

Figure 98-6 Probe in the lacrimal punctum emerging in the wound from the opened lacrimal sac.

The nasal packing is now removed. An oval or round opening into the nasal mucosa is created with a needle-tipped cutting/cautery device. One probe of a silicon intubation system (such as a Guibor tube) is passed through the upper canaliculus, into the sac, and through the fistula and retrieved in the nose with the appropriate device (such as a grooved director). The second probe is passed through the lower canaliculus and retrieved in the same manner. Both tubes are then elevated from the lacrimal sac with a small blunt hook, and 6-0 silk suture is tied around both at about the level of the skin incision (Fig. 98-7). It should be tied in a single square knot to facilitate later removal via thepunctum. The hook should then be used to check tension of the tubes at the medial canthal angle: the loop should prolapse no farther than the medial limbus (Fig. 98-8). The ends of the suture are trimmed to 3 mm.

Figure 98-7 Silicon stents emerging from wound are tied together with suture (to rest in the area of the sac).

Figure 98-8 Silicon stents should be loose enough to prolapse only as far as the medial limbus.

Approximately 4 cm of a 12F red rubber straight catheter is cut. One end may be beveled with drape scissors if desired. It is passed, beveled end first, over both wire probes, into the naris, and up into the wound. The catheter is retrieved in the wound with sturdy forceps, such as Adson's. Double-armed 4-0 chromic gut suture is passed across the lumen of the tube approximately 4 mm from its end while taking care to not cut the silicone stents with the needle (Fig. 98-9). The tube is retracted into the nose, and both ends of the suture are passed through the anterior wall of the lacrimal sac. The tube is pulled up into the sac, the sutures are tied in a series of six to eight overhand knots, and the ends are cut (Fig. 98-10).

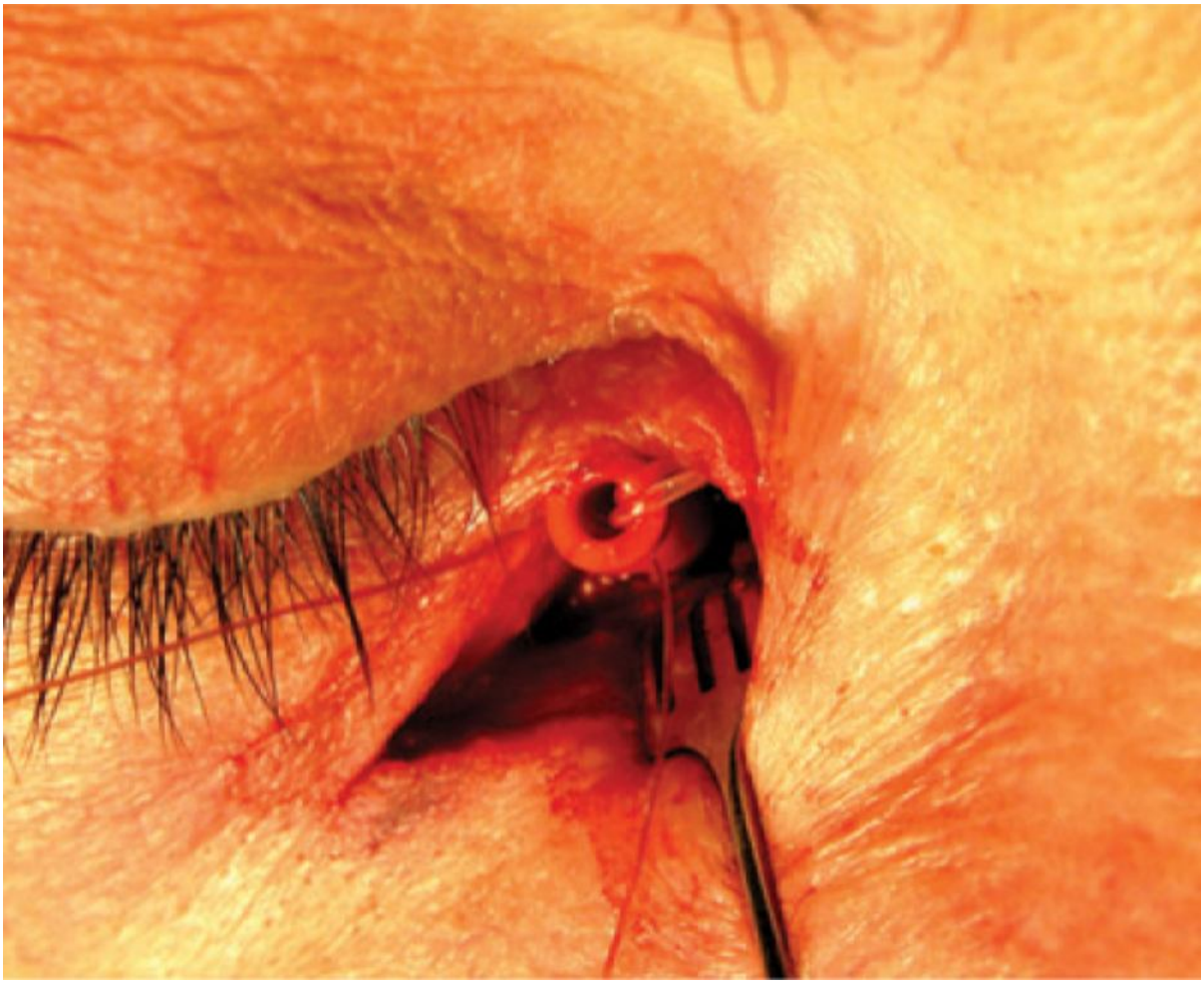

Figure 98-9 Rubber catheter around the silicone stents and gut suture passed across the lumen (for fixation into the sac remnant).

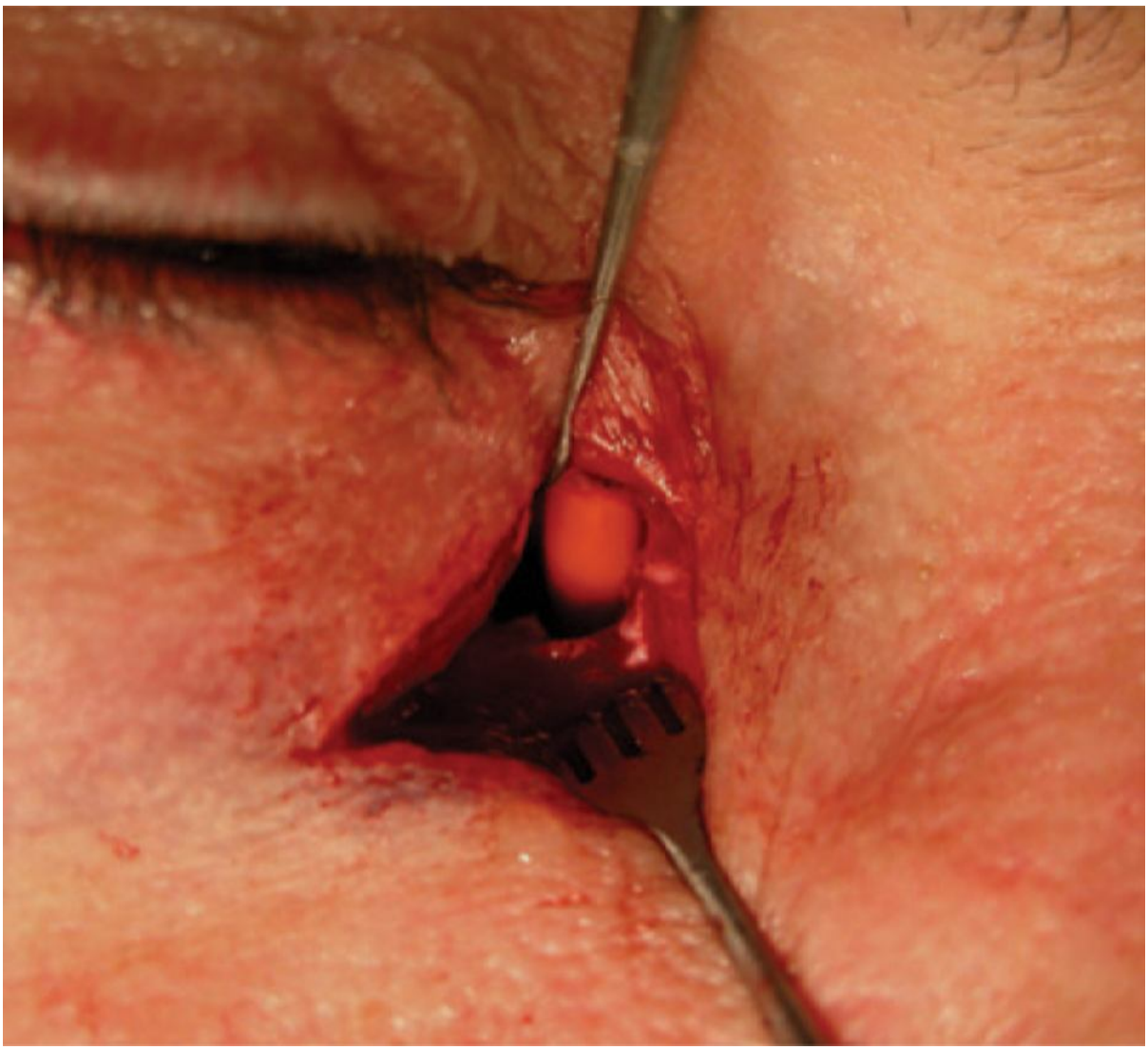

Figure 98-10 Rubber catheter sewn into the anterior of the sac remnant and tied to rest in a fistula.

The lacrimal sac area is now irrigated with an antibiotic solution. The three tubes are cut approximately 1 cm proximal to the naris, and a 5-0 nylon loose stitch is fashioned to secure the catheter to the nasal mucosa. The ends are cut short and rotated into the lumen of the tube so that they do not irritate the patient. Skin is closed with running 8-0 nylon suture or interrupted 7-0 chromic suture, and antibiotic-steroid ointment is applied (Fig. 98-11). This may be followed by a pressure bandage if significant hematoma is expected.

Figure 98-11 The closed incision will be hidden in the lower eyelid crease.

POSTOPERATIVE MANAGEMENT

Patients are discharged from surgery on a regimen of oral antibiotic, topical antibiotic-steroid drops, and nasal steroid spray. Topical antibiotic-steroid ointment is applied to the stitches until they are removed in 5 to 7 days. Patients are instructed to not blow or pick their noses for 3 weeks. The first three medications are maintained until removal of the red rubber catheter 3 weeks postoperatively, at which time the drops are tapered from four times a day to twice a day and then discontinued 1 week later, and the oral antibiotic is discontinued. The nasal steroid is continued until removal of the silicon stents, 2 months postoperatively.

The patient is seen in the office 1 week postoperatively for removal of the skin sutures. Two weeks after this visit (3 weeks after surgery) the nylon stitch in the naris is cut and the catheter is withdrawn from the nostril in the office. The chromic gut suture holding the proximal end will have dissolved by this time. Two months postoperatively, the silicon tubes are removed either from the naris after cutting at the medial canthal angle or from the punctum by rotating the tube until the silk suture emerges from one punctum, cutting between them, and pulling the end with three lengths of tubing from the punctum (Table 98-1).

Table 98-1 -- POSTOPERATIVE MANAGEMENT SCHEDULE AFTER DACRYOCYSTORHINOSTOMY

One week postoperatively	Remove skin sutures	Discontinue ointment
Three weeks postoperatively	Remove rubber catheter	Discontinue oral antibiotic Taper antibiotic-steroid drops

Two months postoperatively	Remove silicone stent	

PEARLS

- A functional upper lacrimal drainage system must be present for dacryocystorhinostomy to be effective.
- The rubber catheter stent must be sewn securely up into the body of the lacrimal sac.
- Gentle handling of the puncta and canaliculi is essential to avoid injury.
- Any suspicion of a mass in the lacrimal sac area must be approached externally.

PITFALLS

- Too much tension on the silicone stent (placing the silk suture too deep) will cause erosion of the lacrimal puncta.
- Failure to put lateral traction on the eyelid (i.e., straightening the canaliculus) while passing a lacrimal probe will cause damage to the canalicular mucosa.
- Using an unfamiliar absorbable suture (i.e., one that will not predictably break down at 2 to 3 weeks) may cause difficulty in removal of the rubber stent.