Double Stent Intubations in Difficult Post-Traumatic Dacryocystorhinostomy

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ABSTRACT
Nasolacrimal obstruction following mid-facial trauma can be a difficult challenge for the lacrimal surgeon. After the initial bony repair with wires, or screws and plates, the reconstruction of the lacrimal drainage pathway can be accomplished best after at least 3 months. We describe methods of sac stent and canaliculcstent intubation that can be used as a double stent intubation technique for severely traumatized patients.

Nasolacrimal obstruction following mid-facial trauma often presents the most difficult challenge to the lacrimal surgeon. Initial bone repair of the face following mid-facial trauma consists of wires or screws and plates to reunite the fractures, and reconstruction of the mid-face using bone grafts or cartilage grafts. Reconstruction of the lacrimal drainage pathways is accomplished more satisfactorily after edema of the initial plastic repair resolves, usually at least 3 months after the original injury.

Whereas we do not routinely use stent intubation of any form in a routine dacryocystorhinostomy (DCR), the post-traumatic case, with damage to the lacrimal sac, nasal mucosa, and/or intervening bone, usually requires a stent to separate the sutured flaps. A “sac stent” separates the anterior and posterior nasal mucosa-lacrimal sac flaps, but does nothing for the canaliculi. A “canaliculcstent” allows for clearance of the common canaliculus within the lacrimal sac and the newly-created opening, but may not allow for adequate separation of the anterior and posterior nasal mucosa-lacrimal sac flaps. A “double stent” achieves both goals, and is extremely useful in difficult post-traumatic dacryocystorhinostomy.

METHODS AND MATERIALS
We investigated a series of 67 post-traumatic DCRs (Figure 1). Three cases with primary canaliculcstent or common canaliculcstent obstruction were excluded; only those patients with lacrimal sac-duct obstructions were included. Stents were used in all post-traumatic DCRs. “Sac stents” were used in 35 cases, “canaliculcstents” in 25 cases, and “double stents” in seven cases.

A sac stent is a modification of the Iliff technique. A 14 or no. 16 green Silastic French catheter is placed within the fundus of the sac. A 4-0 nylon suture is placed through a free separate piece of silicone, which acts as a bolster on the skin superior to the lacrimal sac and passes through the fundus of the sac to hold the tube in place (Figure 2). The catheter has a hole for draining any blood. The tube is cut short to lie within the external nares (Figure 3). It is left in place for 3 weeks, and then removed by cutting the bolster from the skin and pulling the tube out the nose.

A canaliculcstent consists of silastic canaliculcstent tubing of .94 mm outer diameter, which is placed...
FIGURE 1: Patient with severe mid-facial trauma 3 months after initial reconstruction with double intubation, canicular and sac stent. Skin bolsters for sac stent are seen near each medial canthus.

FIGURE 2: Close-up of patient in Figure 1 showing canicular tubing looped between superior and inferior puncta, plus skin bolster for sac stent superior placement.

FIGURE 3A: Patient with double intubation showing large foley catheter and two small silastic tubing ends exiting from external nares.

FIGURE 3B: Same patient with tubing ends trimmed to reside inside nare.

through each canaliculus and looped at the inner canthus (Figure 2). A silastic sleeve, 2.4 mm outer diameter, is placed around the two smaller ends simultaneously, adjusting it at the level of the common internal punctum under direct visualization to secure it in place (Figures 4A & B). The two free ends are encircled within the external nares with a 4-0 silk suture at the inferior end of the tubes (Figure 5).
tube is removed after 2 to 3 months by cutting the loop at the inner canthus and pulling the tube out the nose.

**DCR Technique.** The anatomy is assessed preoperatively by dacryocystography. At surgery, the sac is exposed. Difficulty in exposing the post-traumatic sac often is facilitated by placing fluorescein-tinged sodium hyaluronate (Healon) into the sac before incising it. The Healon may distend the sac so that the lumen may be identified, and the fluorescein tints the free edges of the sac flaps a green color. All of the intervening and impacted bone between the lacrimal sac and the nasal mucosa must be removed. Wires and plates may be removed without altering the bony structure if surgery is performed at least 3 months after the initial trauma. Posterior flaps of nasal mucosa and lacrimal sac are sutured using three interrupted absorbable sutures. Similarly, the anterior flaps are sutured using three or four interrupted absorbable sutures.

**Indications for Intubations.** Because a damaged sac and/or nasal mucosa is involved in most cases of trauma, a sac stent is used to separate the anterior and posterior nasal mucosal-lacrimal sac flaps as far as possible. The largest catheter possible should be used, providing there is no pressure on the mucosa.

When it is not possible to clear the common internal punctum (common canalicular exit into the sac) of bone or tissue by at least 5 mm in all directions, a canalicular stent is used to prevent closure of the common canaliculus.

When both of the above situations exist, both tubes are used. It is easier to insert the canalicular tube first, followed by the sac stent.

**RESULTS**

Of the six patients with a double intubation all have functionally patent systems. One patient had a bilateral double intubation. Follow-up has been from 1 month to 3 years.

The only complication was a small slit of one lower canaliculus, but this did not interfere with drainage.
DISCUSSION

Mid-facial trauma with fractures of the naso-orbital-ethmoid complex may cause naso-lacrimal obstruction. Relief of resulting epiphora is best achieved by assessment and treatment after resolution of edema following both the trauma and the initial plastics repair. Because of the alteration of naso-lacrimal and nasal anatomy due to fractures, bone and cartilage grafts plus wires, plates, and screws, DCR often is very difficult. For successful surgery, two main criteria must be satisfied: 1) a large bony and soft tissue opening must be achieved, lined with mucosa; and 2) the common canaliculus on entering the lacrimal sac must be free of surrounding tissue. The former is achieved with a large sac stent tube, the latter with a canalicular tube. A "double intubation" achieves both purposes.

For the best chance of postoperative success, flaps should be sutured so that an epithelial-lined channel may be achieved.

The silastic canalicular tube alone cannot adequately separate the nasal mucosal-lacrimal sac flaps. Also, the sac tube cannot keep the common canaliculus free of surrounding tissue. In most cases of trauma, only one form of tube is necessary.

Small et al mentioned simultaneous use of a sac stent (sponge) and canalicular stent in "difficult" cases, but did not specify the exact situations or obstruction locations where this technique would be useful.8

Our modification of the canalicular stent minimizes movement of the tube and facilitates removal.8 This modified sac stent obviates suturing of any foreign material to the sac or inner tissues, gives a smooth surface, and also is easy to remove.

The "double stent" technique helps in the lacrimal rehabilitation of those patients having suffered severe mid-facial trauma and subsequent extensive reconstruction.

REFERENCES