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Endoscopic Conjunctivodacryocystorhinostomy

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Preoperative Evaluation

The evaluation of a patient with complaints of epiphora involves investigating causes of excess lacrimation as well as lacrimal outflow obstruction. There are many causes of excess lacrimation. Dry eyes are one of the most common but entropion, trichiasis, and any other cause of ocular irritation are frequently seen. Mild punctal ectropion can cause significant epiphora. Idiopathic hypersecretion, although a diagnosis of exclusion, is an important consideration.

A basic secretor test, a careful slit lamp examination with and without corneal staining, and an evaluation of the conjunctiva for signs of inflammation, symblepharon, or infection are performed. An evaluation of eyelid position should include a search for entropion, ectropion, trichiasis, and eyelid notching. When idiopathic hypersecretion is suspected, a Schirmer 1 test is indicated.

Evaluation of the outflow pathway involves probing and irrigation. Traditional Jones 1 and Jones 2 testing is rarely performed. A 23-gauge lacrimal irrigating needle is used to probe the upper and lower canaliculi. Stenosis or blockage of the canaliculi is noted. Irrigation of the system is attempted through the lacrimal sac. The ease of irrigation into the nasopharynx and the amount of reflux of irrigant back to the eyes are noted. Significant blockage of a canaliculus is an indication for an endoscopic conjunctivodacryocystorhinostomy (CDCR).

A dye retention test is occasionally used. In patients with no or limited outflow obstruction (as demonstrated with probing and irrigation), this test can help make the diagnosis of lacrimal pump failure. It can also be helpful in cases of partial canalicular stenosis. The test is most useful with unilateral epiphora where the side in question can be compared with the normal side. A drop of fluorescein is placed in both eyes. The patient is asked to not wipe his or her eyes. The amount of fluorescein remaining in the tear meniscus is observed after 2 minutes. When a normal outflow tract is present, only a trace amount of fluorescein is present in a normally small tear meniscus. A significant increase in the amount of fluorescein present and in the size of

the tear meniscus indicates an outflow obstruction or lacrimal pump failure.

When considering whether to perform endoscopic CDCR, evaluation of the caruncle and medial canthus is important. There must be an appropriate place for the proximal end of the tube to rest. A previously placed medial tarsorrhaphy or other abnormality of the eyelids secondary to trauma or resection of tissue can require correction before the placement of the tube.

Nasal endoscopy can be performed to evaluate the amount of room between the septum and lateral nasal wall and the presence or absence of intranasal tumors. Intranasal tumors can cause an outflow obstruction and need to be evaluated and treated when appropriate. Benign intranasal tumors can impinge on the distal end of the tube after surgery. A deviated nasal septum can make endoscopic surgery difficult or impossible. Visualization of the operative site just anterior to the middle turbinate is decreased and a constant blockage of the endoscope tip by blood can occur. Additionally, the distal end of the tube must rest between the septum and the lateral nasal wall. If insufficient space is available, a septoplasty needs to be performed before endoscopic CDCR.

Gladstone-Putterman Modified Jones Tube

The original Jones tube is susceptible to internal or external migration and to ejection with nose blowing, sneezing, or coughing. To alleviate these problems, an additional flange can be added to the Jones tube. This internal flange is 4 mm distal to the external flange. It acts similar to an arrowhead, locking the tube in position (Figure 15.1). This modi-

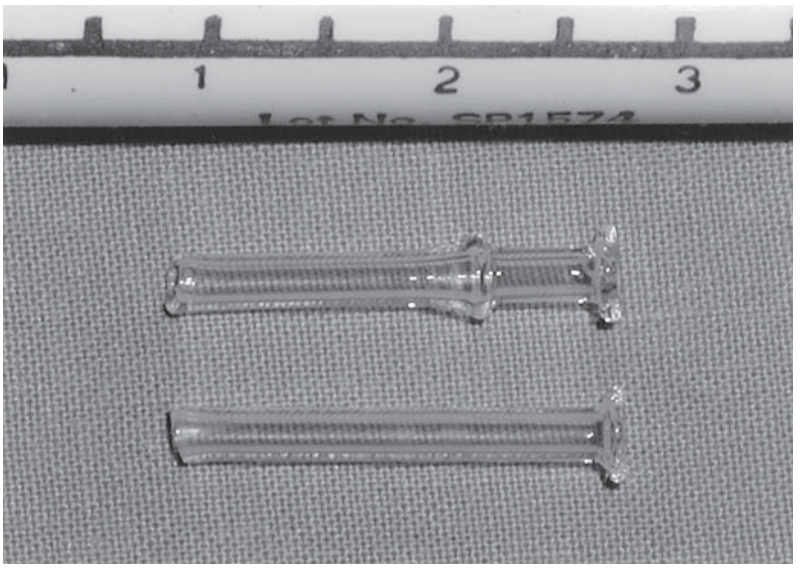

FIGURE 15.1. Comparison of Gladstone-Putterman tube (above) and Jones tube (below).

fied tube, known as the Gladstone-Putterman tube, is inserted in a similar manner as the original Jones tube.

Indications for Endoscopic Conjunctivodacryocystorhinostomy

The most common indication for endoscopic CDCR is canalicular blockage. This blockage may be secondary to trauma, previous surgery, or systemic chemotherapeutic agents such as 5-fluorouracil or Taxotere. A unicanalicular or bicanalicular blockage can cause epiphora, as can a significant common canalicular stenosis.

When canalicular stenosis is present, Silastic intubation can be attempted. If this fails to eliminate the epiphora, then an endoscopic CDCR is indicated. With canalicular blockage, a dacryocystorhinostomy will not be effective because the tears cannot progress to the lacrimal sac. A complete bypass of the lacrimal outflow tract is necessary.

Lacrimal pump failure frequently occurs after Bell's palsy and other causes of facial paralysis, which are common after removal of acoustic neuromas and squamous cell carcinomas. A normal probing and irrigation of the lacrimal system can be performed, but a dye retention test may be quite abnormal with a great deal of dye remaining in the enlarged tear meniscus. Some degree of lagophthalmos, ectropion, and corneal staining may be present. It is important to exclude these as causes of the epiphora before proceeding with endoscopic CDCR. In normal patients, the lower eyelid punctum moves medially with each blink. This is seen most easily if the upper lid is held open and the patient is asked to blink. The absence of this movement can be an indication that an old facial paralysis is not completely resolved and that a lacrimal pump failure may be present.

The final indication for endoscopic CDCR is a patient with idiopathic hypersecretion. This diagnosis of exclusion is made when the outflow tract is normal and there are no identifiable factors causing increased lacrimal gland secretion. Results from the Schirmer 1 test will be much higher than normal. Referral for an external disease consultation should be considered before proceeding with surgery. In these cases, the modified Jones tube provides an additional and larger outflow tract to accommodate the increased tear production.

Advantages of Endoscopic Technique

Endoscopic CDCR offers a number of advantages over external CDCR. These advantages include absence of scarring, absence of ecchymosis and edema, less surgical manipulation of medial canthal tissues, and better visualization of the modified Jones tube and adjacent structures once the tube has been placed. Because no external incision is made, no external scar is present. Because there is minimal external tissue manipulation, it is rare to have ecchymosis or medial canthal edema.

With endoscopic technique, no medial canthal skin incision is used and no dissection of deeper tissue is performed. This lack of tissue manipulation is important in the healing process. A properly placed modified Jones tube is more likely to stay in the proper position. With the external technique, there is a greater chance of the tube shifting its position as the tissues heal. This change can lead to malposition of the proximal end of the tube. Additionally, the angle of the tube can be altered. It is important that the tube maintain an approximately 45° downward angle. If this angle decreases as tissues heal, a decrease in tear drainage can occur.

Once the modified Jones tube is placed, endoscopic intranasal inspection of the distal end of the tube is performed. This process allows an accurate assessment of two potential problems. Tube length is evaluated. A tube that is too short does not protrude far enough from the lateral nasal wall and is at risk for being covered by mucosa. A tube that is too long will touch the nasal septum and can be painful and can lead to external tube extrusion or poor tear drainage. Either of these problems is easily correctable at the time of surgery if recognized.

The relationship of the distal end of the tube to the middle turbinate is evaluated endoscopically. The middle turbinate is often infractured at the onset of surgery to provide easier access to the uncinate process. Postoperatively, the turbinate will often assume its preoperative position. This can bring the turbinate into apposition with the distal end of the modified Jones tube. If the surgeon believes that the shift will result in blockage of the tube, a partial turbinectomy can be performed at that time.

Surgical Technique

Thirty minutes before the procedure, the patient is asked to blow the nose and is then given two sprays of 0.05% oxymetazoline in the nasal cavity ipsilateral to the planned procedure. This process is repeated in 5 minutes. The majority of cases are performed under monitored intravenous sedation and local anesthesia, although some patients require general anesthesia. The nasal cavity is packed with 18 inches of 1/2-inch plain gauze soaked in 4% cocaine solution. The packing is removed after 5 minutes.

Under direct visualization with a 0° rigid endoscope, local injection of 2% lidocaine with 1:100,000 epinephrine mixed 50:50 with bupivacaine 0.75% with 1:200,000 epinephrine is administered to the submucosa of the anterior middle turbinate, uncinate process, and area anterior and superior to the uncinate process. The nasal cavity is repacked, carefully filling the space between the middle turbinate and the lateral nasal wall with 4% cocaine-soaked gauze for another 5 minutes. This regimen of packing is necessary to obtain adequate hemostasis. The face is draped in an appropriate manner, but a sterile field is not required.

Under endoscopic visualization, the middle turbinate and its relationship to the lateral nasal wall are inspected (Figure 15.2). If the

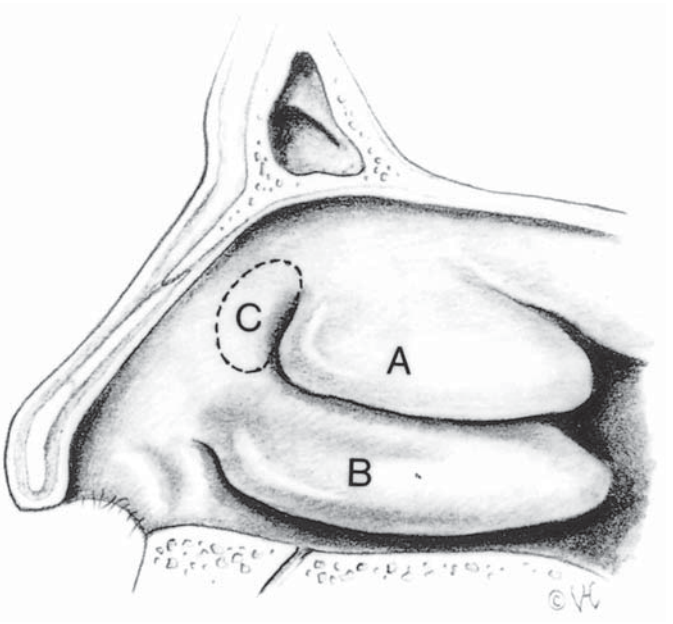

FIGURE 15.2. Normal nasal anatomy. **(A)** Middle turbinate. **(B)** Inferior turbinate. **(C)** Bone and mucosa overlying lacrimal fossa.

turbinate is obstructing the view of the uncinate process, or if the turbinate may obstruct the osteotomy site postoperatively, it may be gently infractured with a blunt periosteal elevator. The same instrument may be used to make an incision at the border of the bony lateral nasal wall and the uncinate process. The uncinate is the first protrusion of the lateral nasal wall encountered under the middle turbinate.

The mucosa overlying the lacrimal fossa is cauterized with monopolar cautery set in the coagulation mode (Figure 15.3). This area extends approximately 10 mm anterior to the uncinate process and from the level of the root of the middle turbinate superiorly and 10 mm inferiorly. The mucosa is scraped from the underlying bone with a periosteal elevator, and removed with Blakesley forceps. Thorough removal of the mucosa is important to prevent bleeding during the next step of the procedure. A medium-size Kerrison bone rongeur creates an osteotomy to correspond to the area from which the mucosa was removed. The rongeur is placed onto the bony edge that was exposed after removal of the uncinate process. Further bone removal proceeds superiorly and anteriorly. Usually four or five bites are needed to obtain an adequate osteotomy. At this point, the lacrimal sac can be identified.

A track for the glass tube is now created. No excision of caruncle is performed because this promotes inward migration of the modified Jones tube. A 12-gauge shielded intravenous catheter (Angiocath, BD, Franklin Lakes, NJ) is bent approximately 30° at its midpoint. A smaller 14-gauge catheter can also be used, but the passage of the Jones tube will be more difficult. Bending the catheter is intended to keep the distal end of the tube relatively anterior in the nose. The Angiocath enters the middle of the caruncle (Figure 15.4). The shaft of the Angio-

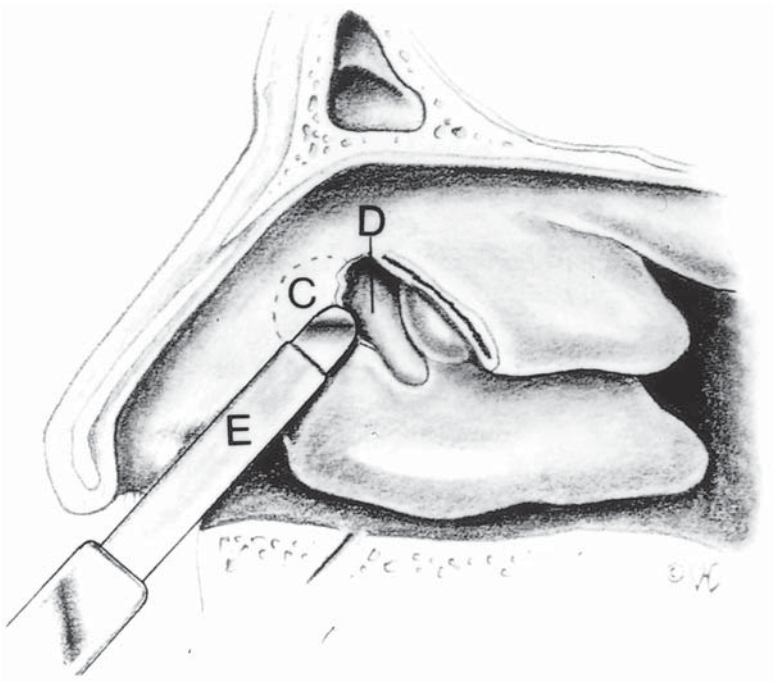

FIGURE 15.3. Guarded monopolar cautery **(E)** applied to nasal mucosa **(C)** and lacrimal fossa bone **(D)**.

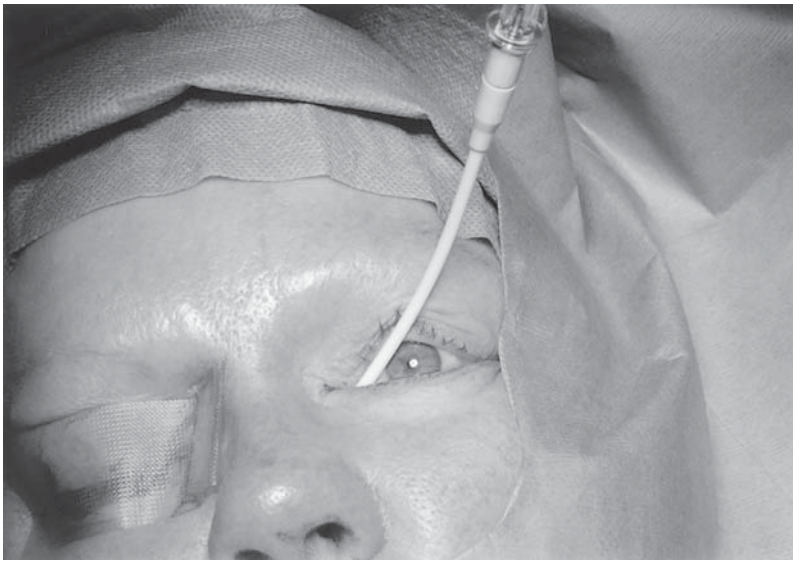

FIGURE 15.4. A 12-gauge shielded intravenous catheter (Angiocath) is bent approximately 30° at its midpoint and advanced through the middle of the caruncle at a 45° angle. The catheter can be visualized entering the nasal cavity with an endoscope.

cath is kept close to the eye as the catheter is advanced in a medial and inferior direction. A downward angle of 45° is attempted. The needle is visualized with the endoscope as it enters the nasal cavity. It can be redirected if necessary so it exits through the osteotomy. The metal needle is removed, leaving only the plastic sheath in position.

A 9-inch-long piece of 20-gauge wire is passed through the plastic sheath and the sheath is removed, leaving only the wire in position (Figure 15.5). The wire acts as a guide for the glass tube placement. A 4×19 mm tube is placed over the wire and pushed into proper position (Figure 15.6). When the extra flange encounters the medial canthal tissue, increased resistance will be felt. Both of the surgeon's thumbnails are placed on the proximal end of the tube and used to push it firmly into position. The internal flange will lock the tube in position.

The length and position of the tube are checked with the endoscope. The tube ideally sits halfway between the lateral nasal wall and the nasal septum. If the position is not appropriate, the proximal end of the tube is grasped and the tube removed, leaving the guide wire in place. A longer or shorter tube is inserted. Once an acceptable tube is placed, the guide wire is removed. A 6-0 double-armed silk or polyglactin suture is wrapped twice around the proximal end of the tube. Both needles are brought from the medial side of the tube through the skin. The needles are passed through a small piece of sterile rubber

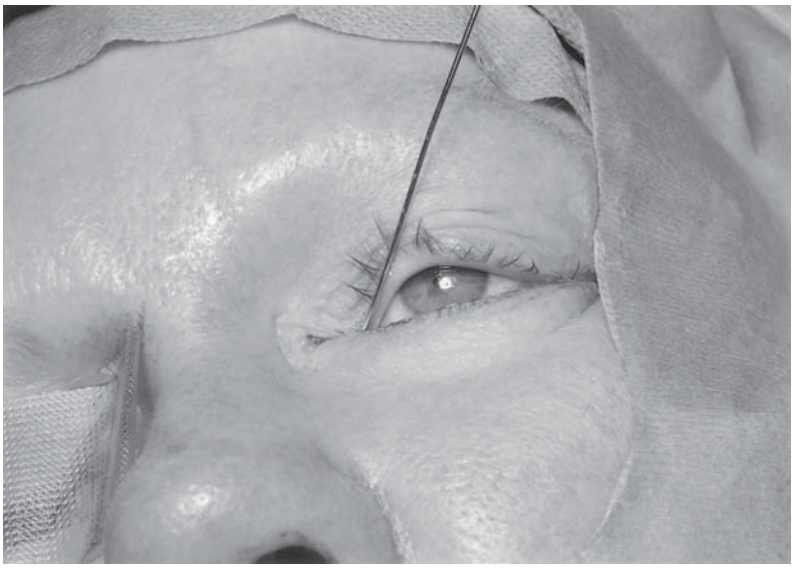

FIGURE 15.5. A 9-inch-long piece of 20-gauge wire is passed through the plastic sheath and the sheath is removed, leaving only the wire in position. The wire acts as a guide for the glass tube placement.

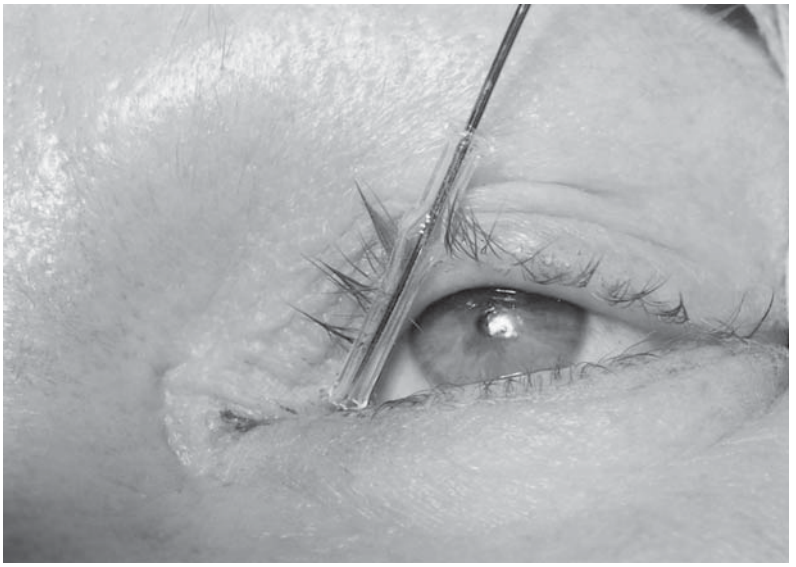

FIGURE 15.6. A Gladstone-Putterman 4 × 19 mm tube is placed over the wire before it is pushed into proper position.

band and are tied with mild tightness. This rubber band bolster and suture are removed after 1 week.

Special Surgical Considerations

After placement of the modified Jones tube, the distal end of the tube must be inspected endoscopically and its relationship to the middle turbinate appraised. If the distal end of the modified Jones tube becomes occluded by the middle turbinate, the change could result in external tube displacement or poor drainage of tears. To reduce the chance of this complication, a partial middle turbinectomy is performed. An additional injection of the local anesthetic mixture is given directly into the turbinate. A small curved hemostat is applied to the turbinate at the inferior border of the area to be removed. The curve of the hemostat is reversed and the instrument applied to the superior border. Care is exercised to avoid crushing the Jones tube. Ideally, the tips of the crushed areas will meet. Right and left angled endoscopic turbinate scissors are used to incise the tissue along the crushed areas. Blakesley forceps are used to gently twist the piece of turbinate and remove it.

An important part of the preoperative evaluation is the intranasal endoscopic examination. If a significant septal deviation is present, it will make endoscopic surgery difficult and allow insufficient room for the modified Jones tube. In these situations, a septoplasty should be performed before the endoscopic CDCR. This procedure can be performed at the time of the endoscopic CDCR but the septum medializes

better if the tissue is allowed to contract for a month before proceeding with the endoscopic CDCR. Techniques for performing a septoplasty are beyond the scope of this chapter.

Postoperative Care

For at least several months after surgery, it is important that the patient put a finger over the tube in the medial canthal area during sneezing, nose-blowing, or coughing. This precaution will help prevent external displacement of the tube. Once the medial canthal tissue has contracted around the tube and the extra flange, there is less chance of external displacement. At a minimum, patients should be reminded to tightly close their eyes whenever they perform the above maneuvers. Nose-blowing is discouraged for the first postoperative week because this may cause intranasal bleeding. After 1 week, a nasal saline rinse is used as much as desired to help cleanse the nasal cavity.

Postoperative Evaluation and Management of Complications

One of the most important aspects of postoperative evaluation is the patient's subjective evaluation of how much his or her epiphora has improved. This subjective evaluation is what patients consider when determining their satisfaction with the procedure.

An objective evaluation of tube function has been devised. The drainage is classified as Class I through IV. Several drops of water are place in the medial canthal area with the head tipped backward. In Class I drainage, the water drains spontaneously. In Class II drainage, the water drains with exaggerated nasal respiration. Class III drainage is present when the water will not drain with respiration but the tube can be irrigated. Class IV drainage is present when no irrigation is possible through the tube.

When Class I or II drainage is present, the patient has a significant improvement in his or her epiphora and is typically satisfied. Class III and IV drainage problems need to be investigated and corrected, otherwise epiphora will continue. Poor drainage can be attributed to many factors including displacement of the tube in an anterior or posterior direction, displacement in an internal or external direction, and blockage of the tube either externally or internally.

A tube whose proximal end is anteriorly displaced is not in position to allow entry of tears into the tube. This tube must be removed and replaced in a more posterior position. It is necessary to utilize the 12-gauge Angiocath and enter the caruncular tissue more posterior than the original placement. Removing the modified Jones tube can be difficult because the medial canthal tissues contract and hold the tube in position. Tying a 2-0 silk suture around the neck of the tube allows the tube to be pulled out of position without the risk of breaking it. Occasionally, it is necessary to use Westcott scissors to cut down to the area of the extra flange to free the tube.

A posteriorly placed tube can irritate the eye or can become blocked at its proximal end by conjunctiva. Removal of the tube and placement more anteriorly will typically be curative.

An internally migrated tube is seen more frequently when a portion of the caruncle is removed. It can occasionally occur without caruncular removal. Usually, the tube can be palpated with forceps through the overlying tissue. Westcott scissors are used to cut down to the proximal end of the tube and a 2-0 silk suture is tied around the proximal flange. This suture is used to pull the tube free. If extensive tissue manipulation is necessary to remove the tube, the canthal tissues should be allowed to heal before implanting another tube. Otherwise, another internal migration is likely.

An external displacement of the tube places the proximal end of the tube in a position where tears cannot enter. The tube may also irritate the eye. Simple manual pressure on the proximal end of the tube may force it back into position, allowing the distal flange to lock in position in the medial canthal tissue. If simple manual pressure is not adequate, endoscopic examination of the distal end of the tube is indicated. A tube that is too long can abut the nasal septum. This tube must be removed and one several millimeters shorter placed. A tube that is too short may not be seen intranasally and should be replaced by a tube of appropriate length. The physician should also consider idiopathic hypersecretion as a diagnosis of exclusion.

A normally placed tube may have its proximal end occluded by redundant conjunctiva. An injection of the tissue with a depo steroid may be curative. If not, excision of the excess tissue can be easily performed.

Blockage of the distal end of the tube can be caused by the lateral nasal wall, the nasal septum, or the middle turbinate. The treatment of these problems has been previously covered.

Occasionally, a perfectly placed and functioning tube may cause irritation of the medial canthal tissues. Topical steroid drops may resolve this condition. If not, an injection of a depo steroid can be used.