Endoscopic Endonasal Assistance with Jones Lacrimal Bypass Tubes

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Patients with epiphora from severe canicular disease or lacrimal pump malfunction are often managed by a conjunctivodacryocystorhinostomy (CDCR) with placement of a Jones bypass tube. Surgical failure can be due to tube malposition, blockage, migration, or loss. The proximal end of the tube is easily monitored by biomicroscopic examination. The distal end has, until recently, been more difficult to observe since it is concealed in the nose, and good illumination and magnification are required to see it. We review the indications for lacrimal bypass tubes, the difficulties that may be encountered and show how endonasal endoscopy assists in tube positioning and postoperative management.

BACKGROUND

Conjunctivodacryocystorhinostomy (CDCR) with the insertion of a Jones bypass tube\(^1\)^\(^2\) is the procedure of choice for creating a lacrimal drainage tract between the conjunctiva and nasal space for patients with epiphora from extensive canicular obstruction or lacrimal pump malfunction (facial palsy).\(^3\)\(^6\) In general, if less than 8 mm functioning canaliculus remains, an artificial lacrimal bypass system is required. Canicular obstruction from herpes simplex infection and trauma to the medial canthal account for almost half of cases operated\(^6\)\(^8\) (Table 1).

Early CDCR techniques with conjunctivorhinostomy relied on the patency of a mucosal lined tract between the conjunctival sac and nasal mucosa, usually derived from nasal or buccal mucosa,\(^9\) or a vein graft. The results of CDCR without a permanent prosthetic tube were limited because of frequent soft tissue adhesion. Lacrimal bypass tubes were introduced, initially made of polyethylene, which frequently became blocked by tissue ingrowth and debris.\(^10\) Glass bypass tubes were found to be more reliable\(^2\) and have remained the material of choice. A standard glass bypass tube has an internal diameter of approximately 2 mm, external diameter between 3 and 4 mm, and a length of 12 to 18 mm. It can be funnel-shaped, straight, or curved and features a top flange or cuff that helps maintain medial canthal placement.\(^3\)\(^7\)

Attempts have been made to use silicone or rubber material\(^11\) and to modify the shape of the tube with varying success.\(^12\)

Jones tubes require accurate placement, either primary (at the same time as dacryocystorhinostomy) or secondary (after dacryocystorhinostomy). The tube should be directed from the anterior caruncle or lower lid medial to the punctum, 30° to 45° inferomedially into the nose. The length of the tube must be accurately assessed since too short a tube will bury in proximally and too long a tube may extrude proximally or abut on the septum distally, and fail.

Following successful placement of a Jones tube the patient and ophthalmologist embark on a long course of after care involving close cooperation and active management. Tube displacement is the most common problem encountered after surgery—almost 44% of patients need replacement of the prosthesis within 10 years for spontaneous loss and within five years for all other causes.\(^6\) Other problems were related to either to the proximal or distal end of the tube and can result in

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pain or loss of function\textsuperscript{13,14} (Table 2). The proximal end of the Jones tube is seen macroscopically or on biomicroscopy. The distal end is less easily accessible without endonasal endoscopic assistance and hence distal problems are often overlooked because of inadequate examination of the nasal space and distal end of the tube.\textsuperscript{15} This has led many surgeons to avoid performing CDCR or has led the patients to give up when the tube is lost or blocked, causing them to remain with a permanent watering eye.\textsuperscript{16} Some patients with a functioning CDCR and bypass tube are dissatisfied by the number of intermittent problems and aftercare.\textsuperscript{17}

**ENDONASAL ENDOSCOPY OF LACRIMAL PATIENTS**

Nasal endoscopy has been shown to be useful in the preoperative evaluation of all lacrimal patients,\textsuperscript{16} during endonasal endoscopic dacryocystorhinostomy with\textsuperscript{18} or without\textsuperscript{19} the use of laser, and postoperatively for monitoring the surgical ostium function\textsuperscript{20} and evaluating the causes of dacryocystorhinostomy failure.\textsuperscript{21}

With the use of endonasal endoscopy the management of patients requiring Jones tubes is changing and becoming easier. Endoscopy is routinely performed before, during, and after surgery to assist with tube placement and aftercare.

The Hopkins rigid nasal endoscope is used by lacrimal surgeons, as well as other fields such as urology, general laparoscopic surgery, ears, nose, and throat specialists, and is available in a general hospital setting.\textsuperscript{22} The endoscope may be placed on a light handle (similar to ophthalmoscopy) or attached to a fibre optic light source. Optionally a video monitor and VCR can supplement the instrumentation for teaching purposes. The 2.7 mm or 4 mm diameter endoscope with a 0° or 30° view angle provides an illuminated and magnified view of the nasal space. Nasal endoscopic examination is easily performed in an office setting, and the majority of patients require no topical anaesthetic. Nasal mucosal decongestion is achieved with guttae phenylephrine 10% (Muro Pharmaceutical, Tewksbury, MA) moistened cotton buds placed in the nasal space. This will shrink the nasal mucosa and will increase the available space and patient comfort during the manipulation of the endoscope.

In the operating theatre, no additional preparation is required besides the standard cocaine nasal packing and infiltrative anaesthesia used for lacrimal surgery.

**ENDONASAL ENDOSCOPIC MANAGEMENT OF JONES BYPASS TUBES**

**Preoperative evaluation**

Preoperative visualization of the nasal anatomy and pathology can assist in the early identification of potential problems and correct planning of surgery. Unidentified endonasal anatomical factors could lead to drainage failure from occlusion of the distal end of the prosthesis.\textsuperscript{15} For instance, a significantly deviated septum with a narrow nasal space provides poor access to the middle turbinate and little space for the distal end of the tube. Identifying the narrowed nasal space early enables a planned submucous resection (SMR) by a rhinological colleague before, or at the same time as, Jones tube placement. This is particu-
larly important for trauma cases where there is frequent septal and canalicular trauma.

Normal anatomical variations such as a prominent concha bullosa or paradoxically curved middle turbinate are potential difficulties for tube positioning which, if identified preoperatively, will aid in planning surgery.

Nasal pathology such as synechiae from previous lacrimal surgery or the finding of nasal polyps can also be addressed.

**Jones tube placement**

Nasal endoscopy in CDCR provides direct magnified monitoring during surgery. In primary placement, a standard external dacrystorhinostomy (DCR) with a large rhinostomy is performed where the nasal space is visualized both directly and endoscopically. Alternatively, a primary or secondary endonasal DCR with or without laser assistance is performed, which gives a tighter ostium and may provide greater tube stability.

Endonasal endoscopy enables simultaneous correction of nasal problems, such as performing a limited middle turbinectomy for anteriorly placed concha bullosa, division of previous surgical adhesions or polypectomy. The position and angle of the distal end of the bypass tube can be evaluated in relation to the surrounding endonasal structures and the appropriate length of prosthesis chosen so that the distal end remains free and unobstructed (Figure 1). Focusing on the numerous problems related to nasal anatomy has lead some centers to use the expertise of a rhinological colleague routinely during surgical placement.

**Postoperative management**

Traditionally the ophthalmologist manages patients with Jones tubes after surgery. The need for nasal examination and identification of problems relating to the distal end of the bypass tube is well recognized. Both the tube position and its function can be affected by endonasal complications after surgery. Routine postoperative endonasal endoscopic evaluation can help identify these problems early, monitor function, and assist intervention.

Previously, routine postoperative care involved inspection of the palpebral collar and cleaning of the
tube lumen by probing and syringing with a simple lacrimal cannula without a clear view of the distal end. Many recommended the prosthesis be cleaned every 8 to 12 months even if this necessitates the removal of the tube and the use of local or infiltrative anaesthesia. Endonasal complications were rarely identified and an attempt to inspect the nasal cavity by means of nasal speculum and direct visualization was often unsuccessful. Endoscopic examination offers a direct easy access to the nasal cavity and distal end of the glass tube, which virtually abolishes the need to remove the tube for cleaning.

We recommend that the tube position and function should be examined endonasally within a week after surgery when nasal mucosal oedema has subsided. Examinations should occur at regular intervals until the tube is well stabilized. A reliable protocol is to examine the tube at 2- to 3-month intervals up to 6 months, then at increasingly longer intervals. The tube normally rocks with blinking (Figure 2) and may lightly touch the septum if there is a narrow nasal space. Intermittent tube septal touch can help stabilize the tube position. There is a risk of the tube sinking in and becoming embedded in the septum or displacing and becoming embedded in the lateral nasal wall if the surrounding tissue is not tight around the tube. Adjustment of the tube position or replacement (rare) with a different length tube can easily be performed under direct endoscopic visualization before the tube has become surrounded by fibrous scar tissue.

Tear flow through the tube is by a combination of lacrimal pump function (eyelids), respiratory changes in pressure, gravity, and capillary flow. Early obstruction by blood or mucous can be seen endonasally and cleared by the patient holding the nose and alternately sniffing and blowing to alter the pressure within the tube, or by gentle saline irrigation or probing the obstruction under direct view. Normal function is tested by observing fluorescein stained tears draining passively from the conjunctival fornix via the tube to the nasal space (Figure 3). This functional endoscopic dye test (FEDT) is similar to the Jones endoscopic dye test, viewed without a blue filter. We routinely perform an endoscopic sniff test to observe fluctuations of tear movement and even air bubbles in the tube lumen. It is important to teach the patient how to do a sniff test daily to help keep the tube patent and to let the patient know if the tube is becoming obstructed.

Other postoperative problems include granuloma formation, mucosal overgrowth, or mucosal adhesions, which can be identified endonasally and treated under direct observation as a minimally invasive office procedure. Granuloma can be snared using Blakesley forceps using only topical anaesthesia and decongestant, taking care not to crush the glass tube. Mucosal overgrowth covering the distal end of the tube can be cauterized using a silver nitrate stick (Figure 4) in a similar fashion to that described for treating tissue overgrowth at the proximal end.
NONENDOSCOPIC ENDONASAL EXAMINATION

Nonendoscopic visualization of the nasal space and distal end of the tube can be difficult, misleading, and sometimes impossible because of anatomical variations or abnormalities. Methods include transmitted light from the proximal (medial canthal) end of the tube to illuminate the intranasal space, with or without a nasal speculum to expand the anterior nasal space. Even computerized tomography scanning to establish the position of the distal end of the tube has been used.

Rigid nasal endoscopy has the advantage of minimal access, and excellent illumination and magnification, not shared by the above techniques. Until recently the nasal space and its influence on the outcome of every form of lacrimal surgery has been underestimated by ophthalmologists.

SUMMARY

Rigid nasal endoscopy is a reliable technique that can be used to assist in the preoperative nasal evaluation, operative tube positioning, and management after surgery. Postoperative function can be evaluated by using a passive dye test (FEDT) viewed directly, and minor interventions carried out without the need to remove the tube or do excessive probing. Endonasal endoscopy facilitates the maintenance of tube function with minimal manipulation and patient discomfort, and is fast and efficient. Its use should help improve tube retention and function. A detailed study over a number of years is necessary to provide convincing evidence for improving clinical standards.

Lester T Jones wrote:

The postoperative care of such a patient (having a glass bypass tube) should be in the hands of a physician who is willing to look into the nose, as inspection of the length and position of glass tube is most important.

Endoscopic endonasal assistance helps the ophthalmologist to fulfill his criteria.
REFERENCES


