

# Modified Conjunctivodacryocystorhinostomy for Upper Lacrimal System Obstruction

Robert M. Schwarcz, MD; Seongmu Lee, MD; Robert A. Goldberg, MD; Guy J. Ben Simon, MD

**Objective:** To describe a modified technique for conjunctivodacryocystorhinostomy (CDCR) and to compare this technique with the standard transcaruncular placement of the glass tube.

**Methods:** Patients with upper lacrimal system obstruction underwent CDCR at the Jules Stein Eye Institute during a 3-year period. Thirteen patients underwent modified CDCR leaving the caruncle intact, while 7 patients underwent Jones glass tubes placement through a caruncular incision (conventional CDCR). Data regarding ocular and tearing history were recorded and analyzed. Success rates, defined as complete improvement in tearing, were compared between patients who underwent standard CDCR and those who underwent modified CDCR. Main outcome measures included symptom relief, patients' tolerance of the Jones tube, and surgical complications.

**Results:** Nineteen patients (12 men and 7 women; mean age, 66 years) underwent 20 CDCR surgical procedures

with Jones tube placement. Previous lacrimal history included malignancy of the ocular adnexa, trauma, chemotherapy, and previous failed dacryocystorhinostomy. Success was found in 13 surgical cases (65%) and partial improvement was found in 4, giving a qualified success rate of 85%. Patients who underwent modified CDCR were more likely to undergo a successful surgery compared with patients who underwent conventional CDCR, with 11 (85%) of 13 cases achieving complete improvement vs 2 (29%) of 7 cases in the conventional CDCR group ( $P = .03$ , Fisher exact test). Complications included 1 case of migration and loss of the Jones tube.

**Conclusion:** Modified CDCR results in partial or complete resolution of tearing in nearly 92% of cases, allowing for an improved outcome both functionally and cosmetically compared with conventional CDCR.

*Arch Facial Plast Surg.* 2007;9:96-100

**C**ONJUNCTIVODACRYOCYSTORHINOSTOMY (CDCR) with Jones tube placement is generally performed to bypass the lacrimal canaliculi and sac, providing a direct route for tears to enter the nasal cavity in cases of upper system blockage. In 1962, Lester Jones<sup>1</sup> first described this procedure for nonreconstructable lacrimal canicular obstruction. A glass Pyrex tube is inserted into the new communication created, and between the actions of the tear pump and the capillary pull of the tube, tears are drained into the nasal cavity without the aid of the nasolacrimal system.<sup>1-3</sup>

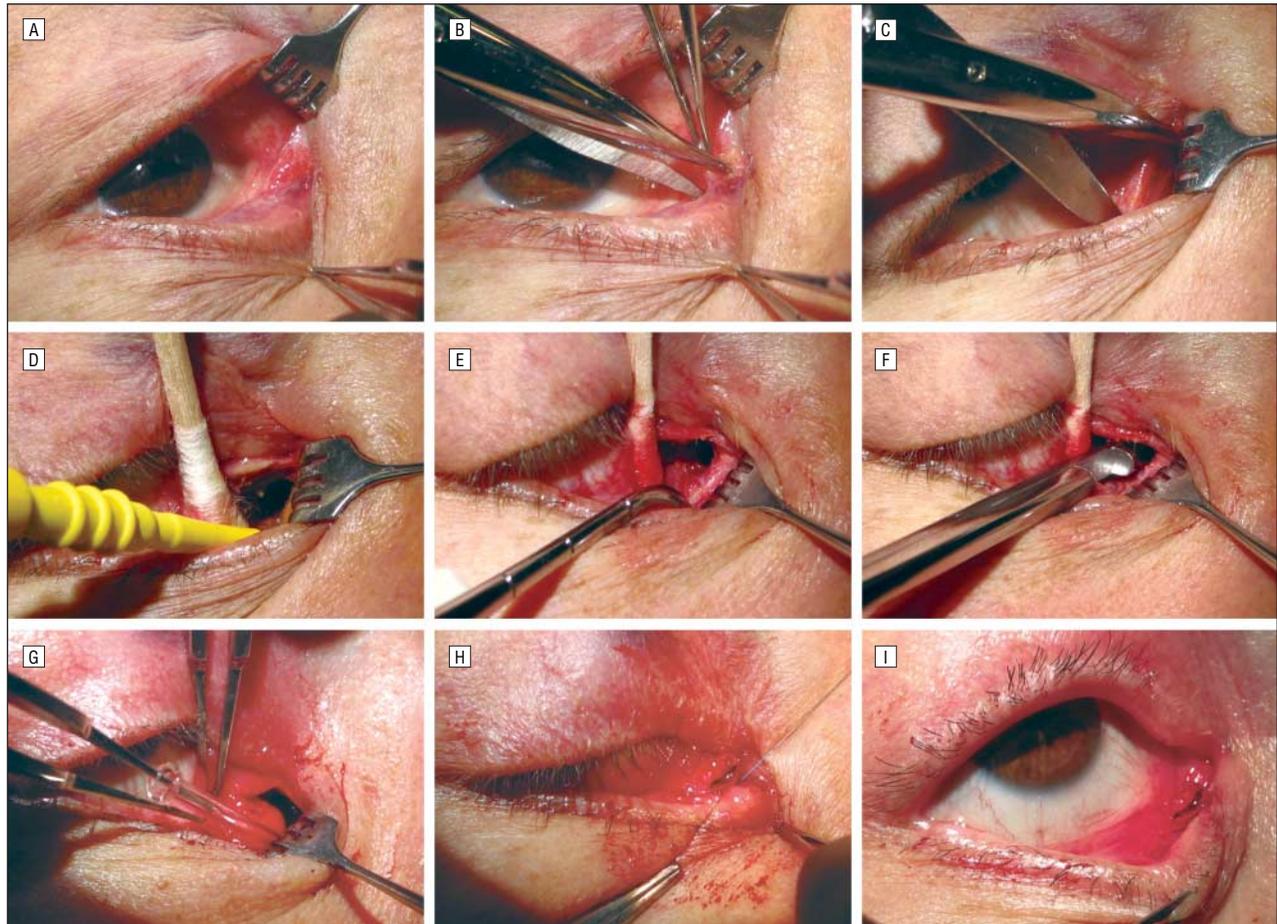
The standard external CDCR approach as described by Jones<sup>2</sup> used an external skin incision to create the bony osteotomy, then after being introduced by a large bore needle, the Pyrex tube was

passed through the medial canthal angle. Several years ago, Trotter and Meyer<sup>4</sup> described an endoscopic approach to this surgery that allows the placement of this bypass tract without the need for a skin incision. We describe a technique that involves no skin incision and no endoscope and a more anatomical placement of the Pyrex tube.

## METHODS

Data regarding all patients diagnosed as having upper lacrimal system obstruction in the ophthalmic plastic service at the Jules Stein Eye Institute, Los Angeles, Calif, between January 2002 to December 2004, who underwent conjunctivodacryocystorhinostomy (CDCR), were recorded and analyzed (retrospective medical chart review). All patients with tearing secondary to upper canicular obstruction who underwent CDCR were included. Complete success was defined as

**Author Affiliations:** Jules Stein Eye Institute and Department of Ophthalmology, David Geffen School of Medicine at UCLA, Los Angeles, Calif (Drs Schwarcz, Lee, and Goldberg); and Goldschleger Eye Institute, Sheba Medical Center, Tel Hashomer, Israel (Dr Ben Simon).



**Figure 1.** Modified conjunctivodacryocystorhinostomy for upper lacrimal system obstruction. Visualization of the inferomedial fornix (A) and blunt dissection to periosteum (B and C). The periosteum is incised with a monopolar cautery (D) and elevated using a Freer elevator down to the level of the lacrimal and maxillary bone junction (E). With the aid of a Kerrison rongeur, a bony osteotomy large enough to create a passage for the glass tube, which is inserted at a 45° angle, is performed (F). Once secured in the inferomedial fornix (G), the neck of the Pyrex tube is sutured to the adjacent conjunctiva by incorporating it in a purse string closure using a 6-0 polypropylene suture (Prolene; Ethicon Inc, Somerville, NJ) (H). Final position of the tube is at a 45° angle or more vertically, with the mouth resting in the inferomedial forniceal gutter (I).

complete improvement in tearing. Success was considered only with good position of the Jones tube in the nose and no patient discomfort associated with postoperative care. The study was approved by the local institutional review board. Informed consent was obtained prior to surgery.

Statistical analysis was performed using the paired samples *t* test to evaluate preinjection and postinjection data such as visual acuity. The  $\chi^2$  and Fisher exact nonparametric tests were used to evaluate outcome and to compare success rates between the 2 techniques. Statistical analysis was carried out with Microsoft Excel XP (Microsoft Corporation, Redmond, Wash) and SPSS software (SPSS Inc, Chicago, Ill).

## SURGICAL TECHNIQUE

### FORNIX-BASED TRANSCONJUNCTIVAL CDCR

Under monitored anesthesia care, patients are preoperatively given nasal packing soaked with 4% cocaine, which is carefully placed under the middle turbinate. The packing is removed, and the middle turbinate, inferior conjunctival fornix, and medial canthal angle are all infiltrated with 2% lidocaine with 1:100 000 epinephrine.

The surgical assistant exposes the area of the inferomedial conjunctival fornix inferolateral to the caruncle with a lacrimal rake and 0.5-mm Castroviejo forceps (**Figure 1A**). With the aid of Stevens tenotomy scissors, blunt dissection is carried down to the level of the periosteum overlying the lacrimal and maxillary bone junction (Figure 1B and C). The periosteum is incised with a monopolar cautery and elevated anteriorly with a freer elevator (Figure 1D and E). The exposed bone is then infractured with the tip of the freer elevator, and a Kerrison rongeur is used to create a bony osteotomy large enough to create a passage for the glass tube, which is inserted at a 45° angle. Included in this dissection is the underlying nasal mucosa (Figure 1F). A Bowman probe is placed through the conjunctival opening and viewed intranasally to estimate the proper length of the tube needed. Under direct visualization with the aid of a nasal speculum or endoscope, the tube is placed through the conjunctival incision into the anterior nasal cavity in an inferomedial vector, with reconstruction of the nasal septum or middle turbinate when necessary. Once secured in the inferomedial fornix, the neck of the Pyrex tube is sutured to the adjacent conjunctiva by incorpo-

**Table. Demographics of 19 Patients Who Underwent Conjunctivodacryocystorhinostomy (CDCR) at the Jules Stein Eye Institute During a 3-Year Period**

Feature	Value
Sex, No. of patients (%)	
Male	12 (63)
Female	7 (37)
Age, mean ± SD (range), y	66 ± 16 (35-87)
Ocular/lacrimal history, No. of cases (%)	
Tumor excision	6 (30)
Chemotherapy	4 (20)
Failed DCR	4 (20)
Trauma	3 (15)
Other/missing	3 (15)
Surgery, No. of cases (%)	
Conventional CDCR	7 (35)
Modified CDCR	13 (65)
Tube length, mean ± SD (range), mm	18 ± 1.6 (16-22)
Tube diameter, mean ± SD (range), mm	3.8 ± 0.3 (3-4)
Suture placement, No. of cases (%)	8 (38)
Outcome, No. of cases (%)	
Complete improvement	13 (65)
Partial improvement	4 (20)
No improvement	3 (15)
Follow-up, mean ± SD (range), mo	19 ± 28 (1-96)

Abbreviation: DCR, dacryocystorhinostomy.

rating it in a purse string closure (Figure 1G and H). The final position of the tube is placed at a 45° angle or more vertically, with the mouth resting in the inferomedial fornix and the tip extending 2 to 5 mm into the nasal cavity (Figure 1I).

### CANTHAL-BASED CDCR

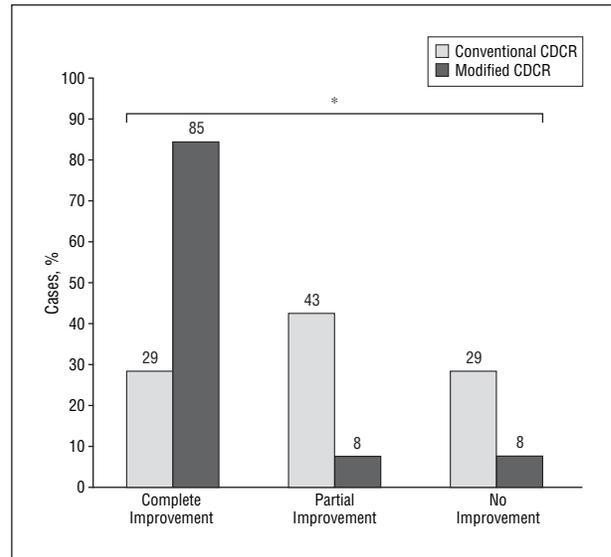
Conventional CDCR is performed in a similar fashion but with the Jones tube placed through the caruncle using a Hendersen trephine and placing the tube at a 30° angle or more horizontally.

## RESULTS

Nineteen patients (12 men and 7 women; mean age, 66 years) underwent 20 CDCR surgical procedures with Jones tube placement. Thirteen patients (65%) underwent modified CDCR leaving the caruncle intact, while 7 patients (35%) underwent conventional CDCR. Demographics of the study population and surgical outcome are summarized in the **Table**.

Lacrimal history included malignancy of the ocular adnexa, trauma, chemotherapy, and previous failed dacryocystorhinostomy (Table). The mean tube length for the modified approach was 18 mm, with a mean diameter of 3.8 mm. The tube was sutured in 9 cases (45%) using polypropylene (6 patients) or polyglactin 910 (Vicryl; Ethicon, Inc, Piscataway, NJ) sutures (2 patients).

The surgical outcome was favorable in most cases, with 13 patients (65%) reporting complete improvement in tearing and 4 patients (20%) reporting partial improve-



**Figure 2.** Outcome of conjunctivodacryocystorhinostomy (CDCR) surgical procedures performed at the Jules Stein Eye Institute in January 2002 to December 2004. Thirteen cases underwent modified CDCR leaving the caruncle intact and placement of the tube in a medial incision. Seven cases underwent conventional CDCR with placement of the glass tube through a caruncle trephination. Complete success was defined as complete improvement in tearing, while partial success was defined as partial improvement. Patients who underwent modified CDCR had an overall better outcome compared with patients who underwent conventional CDCR. \* $P < .05$  (Fisher exact test)

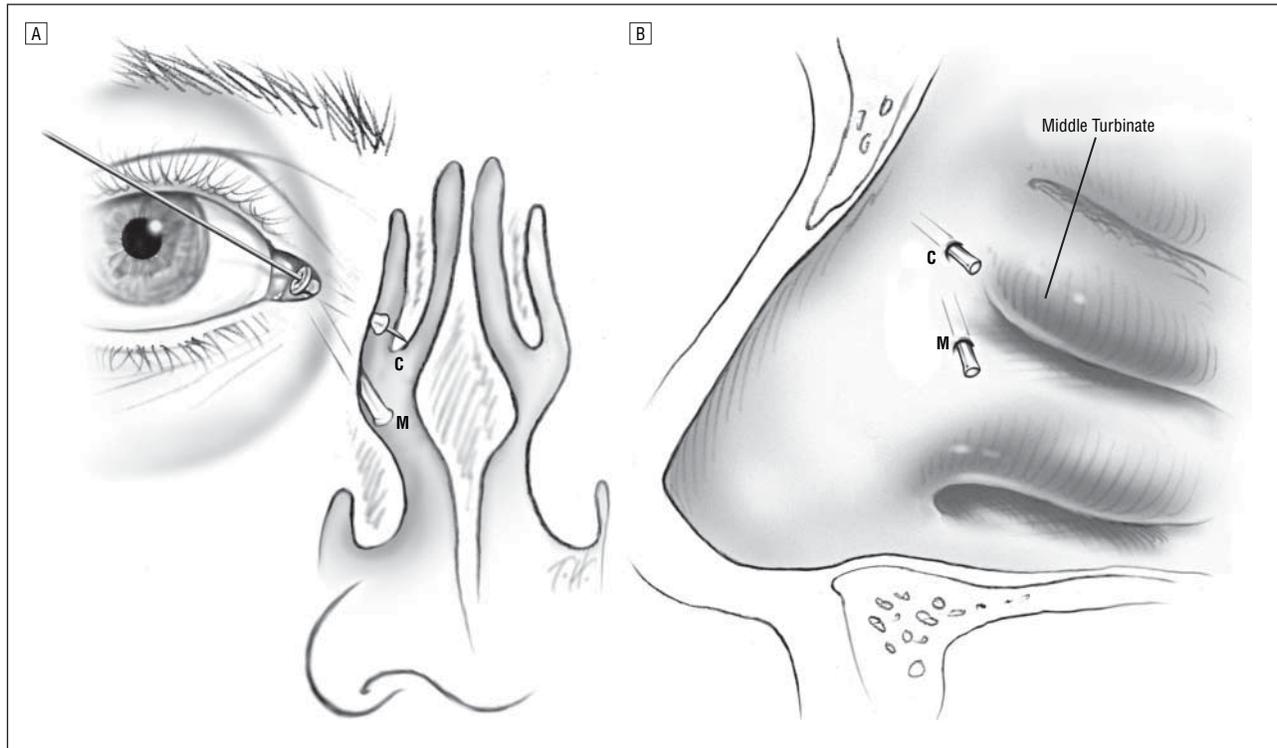
ment, giving a qualified success rate of 85%. Patients who underwent fornix-based CDCR had a higher success rate compared with patients who underwent canthal-based CDCR. Of the 13 patients in the modified CDCR group, 11 (85%) reported complete improvement in tearing and 1 (8%) reported partial improvement in tearing. Of the 7 cases in the conventional CDCR group, the corresponding values were 2 (29%) and 3 (43%) for complete and partial success, respectively. This difference was statistically significant ( $P = .04$ , Fisher exact test) (**Figure 2**).

Visual acuity did not change after surgery (delta log-MAR [logarithm of the minimum angle of resolution] visual acuity of 0.025;  $P = .40$ , 1-sample  $t$  test).

Complications included 1 case of tube migration and scarring of the fistula tract. The patient did not undergo additional surgical procedures. One patient who underwent conventional CDCR also underwent successful surgery revision and placement of the tube medial to the caruncle (modified CDCR). Of the 3 failed cases, 2 involved operations on patients with histories of nasopharyngeal carcinoma. Of note, these 2 patients underwent extensive surgery including ethmoidectomy, septectomy, and radiation prior to CDCR; these 2 patients underwent canthal-based CDCR. In the third failed case, inappropriate position of the tube with globe irritation was noted, but the patient did not undergo additional revision.

## COMMENT

Lacrimal canalicular bypass tract surgery, first described by Lester Jones,<sup>1</sup> is indicated for epiphora secondary to obstruction at the level of the canaliculi.<sup>5</sup> Lim et al<sup>6</sup> recently reported a patient dissatisfaction rate of



**Figure 3.** A, Tube position in gutter; B, displays tube position as placed intranasally. C indicates the conventional tube position; M, the modified technique with the tube more vertically placed.

30%, with persistence of overflow tearing while patients were recumbent and patient dissatisfaction with aesthetic outcome. They also reported complications of tube malposition, obstruction, and extrusion.<sup>6</sup>

The literature provides several variations modifying the Jones tube as originally described for canalicular obstruction. In some surgical variations, a skin incision is used, but we have not found a cutaneous incision necessary to achieve adequate osteotomy and tube placement.

We describe a modified technique for placement of the Jones tube in a more anatomic position. Placing the tube in the inferomedial conjunctival fornix positioned vertically, rather than the standard canthal-based transcaruncular route positioned horizontally (**Figure 3**), places the mouth of the tube directly in the lacrimal lake. A more inferomedial placed and directed Jones tube allows for better cosmesis, hiding the mouth of the tube under cover of the medial eyelid. The vertical position of the tube often allows more room to position the tip in the nasal cavity, provides a longer soft tissue passage for stability (Figure 3) (whether or not frosted or shaped tubes are used for better fixation), and may allow better drainage action by gravity on the fluid within the tube lumen. The mouth of the tube is generally better hidden cosmetically, as opposed to its visible status in the place of the caruncle.

Abel and Meyer<sup>7</sup> reported cases of refractory conjunctival inflammation in cases without carunclectomies. Liu<sup>8</sup> described a conjunctival incision for Jones tube placement allowing for no skin incision or endoscopy, as we describe, but he performs a carunclectomy and places the tube in a less inferior vector.

The nuances of Jones tube positioning and placement are unlikely to dramatically affect the outcome, and our results emphasize the relatively good outcome of both techniques. Although this study was limited by its retrospective nature and relatively small number of patients, we noted a statistically significant improvement in success rate in patients with a fornix-based tube, supporting our anecdotal impression. A prospective randomized study would obviously better define the outcomes of various Jones tube techniques. Lacking that type of data, the surgeon should consider the different anatomic options for Jones tube placement in light of his or her own experience and the patient's individual anatomy. We suggest that vertical orientation of the tube, with the mouth in the medial fornix, is an appropriately considered option that may have potential advantages.

**Accepted for Publication:** November 9, 2006.

**Correspondence:** Robert M. Schwarcz, MD, Jules Stein Eye Institute, 100 Stein Plaza, Los Angeles, CA 90095 (rschwarcz@gmail.com).

**Author Contributions:** Study concept and design: Schwarcz and Goldberg. Acquisition of data: Lee. Analysis and interpretation of data: Ben Simon. Drafting of the manuscript: Schwarcz and Lee. Critical revision of the manuscript for important intellectual content: Schwarcz, Goldberg, and Ben Simon. Statistical analysis: Ben Simon. Administrative, technical, and material support: Schwarcz and Lee.

**Financial Disclosure:** None reported.

## REFERENCES

1. Jones LT. The cure of epiphora due to canalicular disorders, trauma and surgical failures on the lacrimal passages. *Trans Am Acad Ophthalmol Otolaryngol.* 1962; 66:506-524.
2. Jones LT. Conjunctivodacryocystorhinostomy. *Am J Ophthalmol.* 1965;59:773-783.
3. Steinsapir KD, Glatt HJ, Putterman AM. A 16-year study of conjunctival dacryocystorhinostomy. *Am J Ophthalmol.* 1990;109:387-393.
4. Trotter WL, Meyer DR. Endoscopic conjunctivodacryocystorhinostomy with Jones tube placement. *Ophthalmology.* 2000;107:1206-1209.
5. Rose GE, Welham RA. Jones' lacrimal canalicular bypass tubes: twenty-five years' experience. *Eye.* 1991;5:13-19.
6. Lim C, Martin P, Bengier R, Kourt G, Ghabrial R. Lacrimal canalicular bypass surgery with the Lester Jones tube. *Am J Ophthalmol.* 2004;137:101-108.
7. Abel AD, Meyer DR. Refractory medial conjunctival inflammation associated with Jones tubes. *Ophthal Plast Reconstr Surg.* 2003;19:309-312.
8. Liu D. Conjunctival incision for primary conjunctivodacryocystorhinostomy with Jones tubes. *Am J Ophthalmol.* 2000;129:244-245.

## Announcement

### Identifiable Patient Photographs

**P**lease do not send masked photographs of patients.

Until the late 1980s, placing black bars over the eyes of patients was accepted as a way to mask the identities of patients in photographs when consent to publish their photographs was not or could not be obtained. However, bars across eyes do not always mask identities and should not be used. . . .

Therefore, when photographs of faces or identifiable body parts or detailed case descriptions are included in a manuscript, authors should obtain written permission from the identifiable subject (or a legally authorized representative) to publish the photograph or case description, and send a copy of the permission to the journal.<sup>1</sup>

Authors may obtain the Patient Consent Form from [www.archfacial.com](http://www.archfacial.com). The patient should be offered the opportunity to see the manuscript before submission. When the manuscript is submitted electronically, send the patient consent by fax to the editorial office: (206) 386-3553.

1. Iverson C, Flanagan A, Fontanarosa PB, et al. *American Medical Association Manual of Style.* 9th ed. Baltimore, Md: Lippincott Williams & Wilkins; 1998:141-142.