

Original Article

Transconjunctival dacryocystorhinostomy Long term results



Pelin Kaynak, MD^{a,*}; Can Ozturker, MD^a; Gamze Karabulut, MD^a; Burcu Çelik, MD^b; Omer Faruk Yılmaz, MD^b; Ahmet Demirok, MD^{b,c}

Abstract

Purpose: To evaluate the outcomes of transconjunctival dacryocystorhinostomy (TRC-DCR) surgery in patients with epiphora due to primary acquired nasolacrimal duct obstruction (PANDO) at second year follow-up.

Methods: In this retrospective, interventional study, 33 eyes of 29 patients, with epiphora due to PANDO, are included. Lower eyelid conjunctiva is incised at vestibulum inferomedially to access the lacrimal sac and nasal mucosa. Bone is perforated with burr and rongeurs and saccal and nasal flaps are anastomosed. Conjunctival wound edges are apposed and left unsutured. Intraoperative difficulties, surgical time and complications are noted. Average follow-up time was 2 years. Anatomical success was defined as patent lacrimal passages upon irrigation and functional success was defined as relief of epiphora.

Results: In nineteen (57.6%) eyes the surgeries were completed with the anterior and the posterior flaps sutured. In eight eyes (24.2%) only anterior flaps could be sutured. In 6 eyes (18.2%), the surgical procedure was converted to external dacryocystorhinostomy since the nasal mucosa could not be exposed adequately via transconjunctival route. The mean surgical time was 65.1 min. One patient had a millimeter long lower eyelid margin laceration in one eye (3.7%) intraoperatively due to traction for visualization of the operative site.

Epiphora resolved in 25 of 27 eyes (92.5%) in whom TRC-DCR could be completed. Epiphora and failure to irrigation were noted in two eyes (7.4%) at the postoperative 4th and 8th months, respectively and required reoperation. No complications occurred, except granuloma formation at the conjunctival incision site in three eyes (11.1%).

Epiphora resolved in all the six eyes of patients who underwent an external DCR (100%).

Conclusion: Transconjunctival dacryocystorhinostomy is a scarless dacryocystorhinostomy technique which is performed without endoscope and/or laser assistance, with 92.5% success rate comparable to external DCR at the second year follow-up without major complications.

Keywords: Primary nasolacrimal duct obstruction, Conjunctival dacryocystorhinostomy, External dacryocystorhinostomy, Endoscopic dacryocystorhinostomy, Laser assisted dacryocystorhinostomy

© 2013 Production and hosting by Elsevier B.V. on behalf of Saudi Ophthalmological Society, King Saud University.
<http://dx.doi.org/10.1016/j.sjopt.2013.12.001>

Introduction

Epiphora due to primary acquired nasolacrimal duct obstruction (PANDO) is usually treated via external dacryocystorhinostomy first described by Toti in 1904 where access

to the sac and nasal cavity is via a skin incision.¹ Dupuy-Dutemps and Bourget, later described a dacryocystorhinostomy (DCR) technique where mucosal anastomosis, with suturing of the nasal and saccal flaps, was done.² External DCR is still performed in a similar way with minor alterations.^{3–8} The suc-

Received 2 December 2013; accepted 2 December 2013; available online 12 December 2013.

^a Ophthalmic Plastic and Reconstructive Surgery Department, Istanbul Beyoglu Eye Research and Training Hospital, Galata, 34349 Istanbul, Turkey

^b Ophthalmology Department, Istanbul Beyoglu Eye Research and Training Hospital, Galata, 34349 Istanbul, Turkey

^c Medeniyet University, Faculty of Medicine, Ophthalmology Department, 34730 Istanbul, Turkey

* Corresponding author. Address: Kayali Bayir sok. 5/1, Kandilli, 34688 Istanbul, Turkey. Tel.: +90 532 3668738; fax: +90 212 2916245.
e-mail address: pkaynak@gmail.com (P. Kaynak).



Peer review under responsibility of Saudi Ophthalmological Society, King Saud University



Production and hosting by Elsevier

Access this article online:
www.saudiophthaljournal.com
www.sciencedirect.com

cess rate of external DCR has been reported as high as 90%.⁵⁻⁹ However, external DCR leaves a scar in the medial canthal area.

Endonasal techniques with or without use of lasers and endocanalicular techniques with lasers have high success rates reported between 60% and 100%, which are comparable to the success rates of external DCR.¹⁰⁻¹⁹ Endoscopic procedures avoid the facial scar but they necessitate additional surgical equipment and visualization systems.²⁰⁻²³

Adenis et al. described the retrocaruncular approach to perform DCR to avoid facial scar with 82% success rate, in 2003.²⁴ Simpler surgical methods and easy-to insert stents are reported for high success scarless DCRs.²⁵⁻²⁷

Authors of this study (Kaynak-Hekimhan and Yilmaz) have described the transconjunctival DCR (TRC-DCR) technique 2 years ago.²⁸ In this study, second year results of TRC-DCR are investigated.

Materials and methods

The study confirms to the tenets of the Declaration of Helsinki and received institutional ethics committee approval. In this retrospective, noncomparative, interventional study, 33 eyes of 29 patients (22 females, 7 males) between the age of 21 and 58 years (mean age – 43 years), with epiphora due to PANDO, diagnosed by lacrimal system irrigation and dacryocystography, were included. The exclusion criteria were history of previous lacrimal surgery and/or a filling defect in dacryocystogram, other ocular pathologies that may cause epiphora such as canalicular obstruction, canaliculitis, eyelid abnormalities, ocular surface disorders and dry eyes. Informed consent was obtained from all patients. All surgeries were performed by the same surgeon (PK) under hypotensive general anesthesia.²⁸

Surgical technique

Nasal decongestion followed by local infiltration of the conjunctival incision site and medial canthal area was done. Cornea was protected. Lower eyelid was retracted gently away from the eyeball. Inferomedial vestibular conjunctiva was incised 2–3 cm. with Westcott scissors, starting from a point 4–5 mm below the caruncle. Medial fat pad and inferior oblique muscle were laterally retracted and anterior lacrimal crest was exposed. Periosteum was incised. Frontal process of maxilla and lacrimal bone were removed with drill and/or rongeurs, around the suture in the lacrimal fossa to create a rhinostomy site not smaller than 8 × 8mm. Nasal and saccal mucosal "H" shaped incisions were performed as in external DCR. The nasal and saccal posterior flaps were anastomosed. When posterior flaps are lacerated and apposition was impossible the remnants of posterior flaps were excised. Anterior nasal and saccal flaps were sutured and bicanalicular silicone intubation was done in all cases. Periosteum was closed repairing the lacrimal diaphragm and suspending the anterior mucosal wall of the anastomosis. Medial conjunctiva was approximated and left unsutured.

The surgeon converted the surgery to conventional external DCR with the skin approach, whenever an adequate size bony ostium could not be created or if there was insufficient exposure of the nasal mucosa to complete the DCR via

transconjunctival route. The duration of surgery, difficulties and complications encountered were recorded.

The eye was patched over a sterile dressing for 4 h post-operatively. The eyes were opened early on surgery day to check for hemorrhage. Ice compresses were applied in the first 24 h. Topical and systemic antibiotics for 7 days, nasal and ocular steroids and nasal saline spray were continued for 3 weeks after surgery.

Patient follow-ups were scheduled on the 1st day, 1st week and 1st month, 3rd month, and then every 3 months until 1st year and every 6 months thereafter. In each visit, the symptoms of epiphora and infection were questioned, the incision site was examined and the patency of the new rhinostomy was assessed by irrigation. The silicone tubes were removed at the 1st month visit. The patients who were lost to follow-up were questioned through phone calls.

The patency of the new drainage ostium to irrigation and complete cessation of epiphora were the criteria for success. Diminished epiphora with patency to irrigation was noted as partial success and epiphora similar to preoperative period with or without patency to irrigation was noted as failure. Post-operative complications were also noted.

Results

Table 1 summarizes the surgical results including late results, complications of transconjunctival and external DCRs and duration of surgeries of each patient.

Transconjunctival DCRs were completed successfully in a total of 27 eyes out of 33 eyes (82.7%), with the formation of both the anterior and posterior flaps in 19 (57.6%) eyes and with only anterior flaps in 8 eyes (24.2%). 6 (18.2%) eyes were converted to external DCR because adequate ostium could not be created to reach nasal mucosa in all and additionally due to fat prolapse in 4 eyes of these eyes. Ethmoidal cells were entered in 2 eyes.

During transconjunctival DCRs, intraoperative complications, such as significant hemorrhage or inferior oblique muscle injury, were not encountered. In one eye (3.7%), a 2 mm vertical lower eyelid laceration occurred because of severe traction for exposure, which was repaired at the end of surgery and healed without leaving a sequel.

Average duration of surgery was 65.15 min ranging between 45 and 125 min. The first 15 cases were operated in a mean duration of 79.3 ± 21 mins while the second group of our last 18 cases was operated in a mean duration of 57.1 ± 10 min. The difference between surgical times between early and late cases was calculated by using the Mann Whitney U test on SPSS 16.0 version and the difference was found to be statistically significant with a *p* value <0.001. The duration of surgery was compared in the two groups of patients who were below (*n* = 9) and over (*n* = 11) 35 years of age. The younger group had a mean 56.1 min surgical time whereas it was 61.1 min in the older age group. No statistically significant difference was found (*p* = 0.159) between these groups.

Ecchymosis that lasted more than 10 days was seen in 12/27 (44.4%) and 3/6 (50%) eyes which underwent transconjunctival DCR and external DCR, respectively. Granulomas of 3 × 3 mm size, at the conjunctival incision sites were noted in 2 eyes (7.4%) several months following surgery, and were removed under local anesthesia in minor surgical settings.

Table 1. Results of transconjunctival DCRs (trcjDCR) and external DCRs (extDCR).

No	Sex	Age	OD/ OS	Type of surgery completed ^b	Flaps anastomosed	Follow-up (months)	Difficulty	Lacrimal patency	Epiphora	Complication(s)	Duration (mins)
1	F	44	OD	TrcjDCR	Anterior	54	-	+	-	Echimosi	105
2	F	49	OS	TrcjDCR	Posterior & anterior	46	-	+	+/- ^c	None	115
3	F	54	OD	extDCR	Posterior & anterior	42	Orbital fat prolapse	+	-	None	65
4	M	35	OD	extDCR	Posterior & anterior	25	Nasal mucosa not well exposed	+	-	ECHIMOSIS	125
5	F	44	OD	trcjDCR	Posterior & anterior	31	-	+	-	None	70
6	F	44	OS	extDCR	Posterior & anterior	32	Ethmoidal aircells entered	+	-	Echimosi	60
7	F	40	OD	trcjDCR	Anterior	24	-	+	-	Echimosi &granuloma	100
8	F	49	OD	extDCR	Posterior & anterior	25	Orbital fat prolapse	+	+/- ^c	None	70
9	F	49	OS	extDCR	Posterior & anterior	24	Orbital fat prolapse	+	-	Echimosi	65
10	M	39	OD	trcjDCR	Anterior	28	-	+	-	None	65
11	F	53	OS	trcjDCR	Posterior & anterior	26	-	+	-	Granuloma	75
12	M	52	OD	trcjDCR	Anterior	22	Ethmoidal aircells entered	+	-	Echimosi	70
13	F	21	OD	trcjDCR	Anterior	27	-	+	-	None	60
14	F	46	OD	trcjDCR	Posterior & anterior	25	-	+	-	None	75
15	F	33	OS	trcjDCR	Posterior & anterior	23	-	+	-	Perop eyelid laceration ^a	70
16	F	30	OD	trcjDCR	Posterior & anterior	29	-	+	-	None	60
17	M	51	OD	trcjDCR	Posterior & anterior	27	-	+	-	Echimosi	65
18	M	51	OS	extDCR	Posterior & anterior	18	Orbital fat prolapse	+	-	None	75
19	F	36	OD	trcjDCR	Posterior & anterior	17	-	+	-	None	55
20	F	44	OD	trcjDCR	Anterior	21	-	-	+	Echimosi	65
21	F	39	OS	trcjDCR	Anterior	18	-	+	-	None	50
22	F	30	OD	trcjDCR	Posterior & anterior	22	-	+	-	None	60
23	F	26	OS	trcjDCR	Posterior & anterior	21	-	+	-	None	55
24	F	35	OD	trcjDCR	Posterior & anterior	17	-	+	-	None	50
25	F	53	OS	trcjDCR	Posterior & anterior	16	-	+	-	Echimosi	55
26	F	47	OD	trcjDCR	Posterior & anterior	13	-	+	-	Echimosi	55
27	F	47	OS	trcjDCR	Posterior & anterior	14	-	+	-	Echimosi	45
28	F	33	OD	trcjDCR	Posterior & anterior	11	-	+	-	Echimosi	50
29	M	56	OD	trcjDCR	Anterior	12	-	-	+	Granuloma	85
30	F	54	OS	trcjDCR	Posterior & anterior	10	-	+	-	Echimosi	60
31	F	28	OD	trcjDCR	Posterior & anterior	9	-	+	-	Echimosi	45
32	F	45	OS	trcjDCR	Posterior & anterior	7	-	+	-	Echimosi	50
33	M	52	OS	trcjDCR	Posterior & anterior	8	-	+	-	None	50
22 7	F M	43 yrs				24.1 months	92.5%	88.8%			65.1 min

^a 2 mm vertical lower eyelid laceration occurred during surgery due to retraction repaired during surgery and healed without sequelum.

^b All surgeries started as transconjunctival DCR (trcjDCR), however the surgeon converted to conventional DCR (extDCR) with the skin approach when there was difficulty to reach and create an adequate rhinostomy. This column denotes the type of surgery the surgeon completed DCRs.

^c Epiphora diminished significantly but continued occasionally, which can be considered functional failure. Patients did not ask or need revision surgery.

There were no visible scars in any of the 27 patients operated with the transconjunctival approach. Follow up time ranged between 7 and 54 with an average of 24.1 months.

Epiphora resolved completely in 25 of 27 eyes (92.6%) who had successful transconjunctival DCRs and rhinostomies were patent to irrigation during the entire follow-up time. Epiphora diminished, however it continued on-and-off in the early postoperative follow-up in 2 eyes (7.4%), and failure to irrigation was noted at 4th and 8th months postoperatively and required reoperation. One patient had partial success with occasional epiphora (3.7%).

In six eyes, in which the DCRs were completed via the cutaneous approach, patency to irrigation was positive during the whole follow-up period. Epiphora relieved completely in five eyes and continued but decreased significantly in one eye, as reported by the patient, and it was patent to irrigation. The patient did not require revision surgery.

Discussion

The Transconjunctival DCR technique,²⁸ used as the surgical DCR technique in this study, can be performed with conventional external DCR instruments. Additional instrumentation was not needed in any of the surgeries in contrast to the endonasal techniques.^{11–19}

The Transconjunctival DCR technique enables approximation and suturing of mucosal flaps, similar to external DCR, consistent with the general principle of margin-to-margin anastomosis of saccal and nasal flaps to form a smooth epithelium lined tract.

Although Becker reported 92.5% success in patients who underwent external DCRs without flaps,⁷ general surgical principles advocate the endothelium lined smooth tract for healing with primary intention, the long term patency of the anastomosis and the drainage of tears. Also, there are published materials in the ophthalmic literature, that by flap formation techniques, the success increases beyond 90%.²³

We designed the 8 × 8 mm rhinostomy site below the medial canthal ligament in order to avoid a visible scar and hide it in the lower eyelid. This site was a little lower than the suggested rhinostomy site for a successfully draining external DCR.⁷ Sutured flaps may also, explain the high success rate in this surgical series, where rhinostomies were relatively small and inferiorly located.

Low technical success rate of 81.8% is the major disadvantage of the transconjunctival DCR technique. It is occasionally difficult to reach the nasal mucosa and suture the flaps in the deep surgical plains, yet the incidence of converting to cutaneous approach external DCR to complete surgery (technical failure), decreases from 38.5% (first 13 eyes) to 8% (last 12 eyes) in the second half of the patient group in our early report of the technique among 25 PANDO patients in 2011.²⁸ We had only one patient that we needed to switch to external DCR after the 25th patient that we operated. For a more objective evaluation of the learning curve we had compared the recorded surgical duration of surgeries and found a statistically significant difference between the first 15 and the last 18 patients' surgical times displaying a decrease of surgical time as the surgeon gets used to the technique.

Another problem encountered while performing transconjunctival DCR was orbital fat prolapse, which is considered to

be one of the important reasons for DCR failure according to Welham et al.^{7–28} In our series, fat prolapse to the lacrimal fossa area made visualization and manipulation of bony and soft tissues difficult in 4 cases. We also found that there is a possibility to pull and rip the fat tissue accidentally which may end up in a retroseptal hemorrhage, in addition to the probable increase of failure rate. Hence care needs to be taken in such situations, the fat should be retracted from the site and the periosteum closed meticulously after rhinostomy and flap suturing to prevent incarceration fat tissue at the rhinostomy site. The fat prolapse did not decrease the success rates of our consequent external DCRs. We did not record any late failures after the 8th month. We also noted that the fat prolapse did not result in any late fibrosis at the ostium.

Anteriorly located ethmoidal air cells located between the lacrimal sac and the nasal cavity may be confusing when performing a dacryocystorhinostomy (DCR). Talks and Hopkinson reported that the ostium was opened via the standard lacrimal fissure in only 46% of DCRs.²⁹ Ethmoidal cells were entered in 2 patients (7.4%) in our series. Although ethmoidal sinus entrance might be a handicap in finding the appropriate rhinostomy site in transconjunctival DCR, it did not mandate an external DCR in our experience.

Transcaruncular DCR by Adenis and coauthors had a similar approach as our technique.²⁴ Both surgical techniques avoid facial scarring, minimize trauma to the medial canthal tendon-Horner's muscle complex and allow suturing of mucosal flaps. Adenis et al.²⁴ used the retrocaruncular approach which is adjacent to the globe and the incision which was reported to heal without scarring in their series with 82% success rate. However they created the rhinostomy posterior to the medial canthal ligament, while in our study, the medial canthal ligament makes the superior border of the rhinostomy. More inferior localization of rhinostomy did not decrease the success rate in our series. The higher success in the current study can be explained by the inclusion criteria of only PANDO cases whereas Adenis et al. had various etiologic factors such as dry eye, orbital fracture and sinus surgery trauma.

The higher success in our series may also suggest more secure handling of tissues for rhinostomy and flap formation at a relatively further surgical site from the eyeball in contrast to the close anatomic relations of the medial canthal tendon, caruncle and the globe in the retrocaruncular technique. Less surgical trauma of tissues around the medial canthal ligament which contributes to the pump mechanism may be another factor of higher success.

One patient in the current study had a vertical 2 mm full thickness eyelid laceration, due to excessive traction for better visualization of the surgical site. The laceration was repaired on site and it healed without a remarkable scarring. No other laceration was recorded. Avoiding exertion of too much force for traction of the lower eyelid for surgical site exposure prevents such complications.

We compared the surgical times of patients below and over 35 year of age in the last 21 cases in order to comment on the negative contributions of the tightness of the lower eyelid in this technique. We found no statistical significance in between durations of surgery in younger and older patient groups. We also did not see any late functional epiphora that might be suggestive of iatrogenic eyelid laxity.

In conclusion, the transconjunctival dacryocystorhinostomy with conventional DCR instruments is a useful technique in treating patients with epiphora due to PANDO, with success rates as high as 92.5% in the second year, comparable to external and endoscopic DCR techniques.

Conflict of interest

The authors declared that there is no conflict of interest.

References

1. Toti A. Nuovo metodo conservatore di cura radicale delle suporazioni croniche del sacco lacrimale. *Clin Mod Firenze* 1904;**10**:385–9.
2. Dupuy-Dutemps L, Bourguet J. Procédé plastique de dacryocystorhinostomie et ses resultats. *Ann Ocul J* 1921;**158**:241–61.
3. Pico G. A modified technique of external dacryocystorhinostomy. *Am J Ophthalmol* 1971;**72**:679–89.
4. Ali MJ, Joshi DS, Naik MN, et al. Clinical profile and management outcome of acute dacryocystitis: two decades of experience in a tertiary eye care center. *Semin Ophthalmol* 2013 [Epub].
5. Warren JF, Seiff SR, Kavanagh MC. Long term results of external dacryocystorhinostomy. *Ophthalmic Surg Lasers Imaging* 2005;**36**:446–50.
6. Welham RAN, Henderson PH. Results of dacryocystorhinostomy analysis of causes for failure. *Trans Ophthalmol Soc UK* 1973;**93**:601–9.
7. Becker BB. Dacryocystorhinostomy without flaps. *Ophthalmic Surg* 1988;**19**:419–27.
8. Walland MJ, Rose GE. Factors affecting the success rate of open lacrimal surgery. *Br J Ophthalmol* 1994;**78**:888–91.
9. Fayers T, Laverde T, Tay E, et al. Lacrimal surgery success after external dacryocystorhinostomy: functional and anatomical results using strict outcome criteria. *Ophthal Plast Reconstr Surg* 2009;**25**:472–5.
10. Caldwell GW. Two new operations for obstruction of the nasal duct with preservation of the canaliculi, and an incidental description of a new lachrymal probe. *NY Med J* 1893;**57**:581.
11. Steadman MG. Transnasal dacryocystorhinostomy. *Otolaryngol Clin North Am* 1985;**18**:107–11.
12. McDonogh M, Meiring JH. Endoscopic transnasal dacryocystorhinostomy. *J Laryngol Otol* 1989;**103**:585–7.
13. Lester SE, Robson AK, Bearn M. Endoscopic 'cold steel' versus laser dacryocystorhinostomy: completing the audit cycle. *J Laryngol Otol* 2008;**122**:924–7.
14. Hartikainen J, Jukka A, Matti V, et al. Prospective randomised comparison of endonasal endoscopic dacryocystorhinostomy and external dacryocystorhinostomy. *Laryngoscope* 1988;**108**:1861–6.
15. Bakri SJ, Carney AS, Downes RN, et al. Endonasal laser-assisted dacryocystorhinostomy. *Hosp Med* 1998;**59**:210–5.
16. Massaro BM, Gonnering RS, Harris GJ. Endonasal laser dacryocystorhinostomy. A new approach to nasolacrimal duct obstruction. *Arch Ophthalmol* 1990;**108**:1172–6.
17. Woog JJ, Kennedy RH, Custer PL, et al. Endonasal dacryocystorhinostomy: a report by the American Academy of Ophthalmology. *Ophthalmology* 2001;**108**:2369–77.
18. Watkins LM, Janfaza P, Rubin PA. The evolution of endonasal dacryocystorhinostomy. *Surv Ophthalmol* 2003;**48**:73–84.
19. Kaynak P, Ozturker C, Yazgan S, et al. Transcanalicular diode laser assisted dacryocystorhinostomy in primary acquired nasolacrimal duct obstruction: 2-year-follow up. *Ophthal Plast Reconstr Surg* 2013 [Epub].
20. Javate RM, Campornanes BS, Nelson D. The endoscope and the radiofrequency unit in DCR surgery. *Ophthalmic Plast Reconstr Surg* 1995;**11**:54–8.
21. Fayet B, Racy E. Endonasal dacryocystorhinostomy (DCR) with protected drill. *J Fr Ophthalmol* 2000;**23**:321–6.
22. Henson RD, Cruz HL, Henson RG, et al. Post operative application of mitomycin-C in endocanalicular laser dacryocystorhinostomy. *Ophthal Plast Reconstr Surg* 2012;**28**:192–5.
23. Tsirbas A, Wormald PJ. Endonasal dacryocystorhinostomy with mucosal flaps. *Am J Ophthalmol* 2003;**135**:76–83.
24. Adenis JP, Robert PY. Retrocaruncular approach to the medial orbit for dacryocystorhinostomy. *Graefes Arch Clin Exp Ophthalmol* 2003;**41**:725–9.
25. Drnovšek-Olup B, Beltram M. Transcanalicular diode laser-assisted dacryocystorhinostomy. *Indian J Ophthalmol* 2010;**58**:213–7.
26. Ibrahim HA, Noble JL, Batterbury M, et al. Endoscopic-guided trephination dacryocystorhinostomy: technique and pilot trial. *Ophthalmology* 2001;**108**:2337–45.
27. Goldberg RA, Samimi DB, Tsirbas A, et al. The hydrogel lacrimal stent for dacryocystorhinostomy: preliminary experience. *Ophthal Plast Reconstr Surg* 2008;**24**:85–9.
28. Kaynak-Hekimhan P, Yilmaz ÖF. Transconjunctival dacryocystorhinostomy: scarless surgery without endoscope and laser assistance. *Ophthal Plast Reconstr Surg* 2011;**27**:206–10.
29. Welham RAN, Wulc AE. Management of unsuccessful lacrimal surgery. *Br J Ophthalmol* 1987;**71**:152–7.