Original article

Outcomes of external dacryocystorhinostomy and endoscopic endonasal dacryocystorhinostomy in the management of nasolacrimal duct obstruction

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Abstract

Introduction: Dacryocystorhinostomy (DCR) is the treatment of choice for nasolacrimal duct obstruction. Although external DCR is regarded as the gold standard, endoscopic DCR is evolving as an equally-effective alternative. **Objectives** To compare the success rate of treating nasolacrimal duct obstruction by endoscopic endonasal method compared to the conventional DCR surgery. **Materials and methods** This prospective, comparative, non-randomised study was conducted in 2009 - 2010. Thirty consecutive patients undergoing endoscopic endonasal DCR (Group 1) and 30 consecutive patients undergoing external DCR (Group 2) between July 2009 and September 2010 at the oculoplasty unit of the Tilganga institute of ophthalmology were included in this study. A patent lacrimal passage on syringing and symptomatic improvement at six months after surgery was defined as a successful outcome. The intraoperative and postoperative complications were also compared. **Results** Our study included 31 eyes of 30 patients in Group 1 and 34 eyes of 30 patients in Group 2. The success rate for endoscopic endonasal dacryocystorhinostomy was 90.3 % (95 % confidence interval 80 - 100) and external dacryocystorhinostomy was 94.1 % (95 % confidence interval 80 - 100). The difference of surgical success among the two methods was not statistically significant (p = 0.7). The rate of intra-operative and post-operative complications was similar in the two methods (p = 0.5). **Conclusion:** The short term outcomes and complication rates of endoscopic endonasal dacryocystorhinostomy and external dacryocystorhinostomy were similar.

Keywords: Nasolacrimal duct, external dacryocystorhinostomy, endoscopic endonasal dacyrocystorhionostomy

Introduction

Nasolacriamal duct obstruction, being one of the commonest causes of epiphora, occurs mostly at the junction of the lacrimal sac and nasolacrimal duct and the treatment of choice for this problem is dacryocystorhinostomy. Although there are different surgical techniques, all create an anastomosis between the lacrimal sac and the nasal cavity through a bony ostium. The difference in techniques is whether one utilizes transcutaneous or intranasal approach (Yanoff et al, 2009). External DCR was originally described in 1904 by the Italian surgeon Addeo Toti. His technique was later modified by Dupuy-Dutemps in 1921 by the addition of suturing of mucosal flaps, thus forming an epithelium lined fistula (Mahmood

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et al, 2001). The endonasal approach, although introduced in early 19th century, it is less popular due to poor access of the operating area through the nasal cavity. However, with the advent of the nasal endoscope since 1986 and the use of endolaser, many ophthalmologist, plastic surgeons in collaboration with rhinologist have taken up this approach (Benger et al, 1993; Sprekelson et al, 1996).

Different studies done worldwide show different results regarding the success rates of the two procedures. While some studies have shown external DCR as the gold standard, many others have established comparable or greater success rates with endoscopic endonasal DCR (Woog JJ et al, 2001). We here present the comparison of the success rates of treating nasolacrimal duct obstruction by the endoscopic endonasal method and the conventional DCR surgery in a tertiary eye hospital of Nepal.

Materials and methods

This was an interventional, prospective, comparative, non-randomized study carried out at the Tilganga Institute of Ophthalmology, Kathmandu, Nepal, from July 2009 to September 2010. A total of 60 patients (65 eyes) participated in the study. Thirty consecutive patients (31 eyes) underwent endoscopic endonasal DCR and 30 consecutive patients (34 eyes) underwent external DCR. All patients were asked for a detailed history regarding their complaints, onset and duration. Past history, treatment history was taken and a general physical examination was done. A complete ophthalmic examination, which included the following, was carried out : inspection, palapation of the lacrimal sac, slit-lamp examination, syringing and probing. Patients of age 15 years and above diagnosed with NLD obstruction were included in the study. Those patients with failed DCR, NLD obstruction following trauma, punctal anomalies, canalicular obstruction and with nasal pathology were excluded from the study. All patients meeting the inclusion criteria were informed of both the surgical procedures and their advantages and limitations. The patients were also informed about the study and its objectives. An informed written consent was taken from the patients before undergoing the surgery of their choice. Ethical clearance was obtained from the institutional review board of the TIO. All the surgeries were performed on a routine basis by a single oculoplastic surgeon, strictly following the standard techniques described below.

The external DCR was done under local anesthesia. A vertical incision parallel to the nasal bridge was given just medial to the site of the angular vessels with a 15 number surgical blade. The orbicularis oculi muscle beneath the skin was bluntly dissected. The medial canthal attachment was mechanically detached and the periosteum was separated from the bone medially and laterally to the anterior lacrimal crest with the periosteum elevator. The suture running between the frontal process of the maxilla and the lacrimal bone was infractured using the periosteum elevator and a wide 15 x 15 mm bony defect was created with the help of a Kerrison bone punch. An H-shaped incision was made at the postero-inferior part of the lacrimal sac, with a long anterior flap and a short posterior flap. Similarly, another H-shaped incision was made at the nasal mucosa with a short posterior flap and a long anterior flap. The posterior flaps of both the lacrimal sac and the nasal mucosa were excised. The anterior flap of the lacrimal sac was sutured with the anterior flap of the nasal mucosa with vicryl 6-0 in an interrupted fashion. The orbicularis was closed with vicryl 6-0 and an interrupted skin suture was given with vicryl 6-0.

The endonasal DCR was done under general anesthesia. A bowman probe was inserted through the upper punctum and the common canaliculus into the lacrimal sac and was pricked through the lacrimal bone bringing it out from

the sac through the mucosa of the lateral wall of the nasal cavity anterior to the middle turbinate. A local anesthetic infiltration was given around the insertion of middle turbinate. A C- shaped nasal flap was created and elevated. The flap was nibbed out with Takahashi ethmoid forceps for exposing the frontal process of the lacrimal bone. The frontal process of maxillary bone and thin lacrimal bone was removed to a create bony osteum of about 10 mm x 10 mm with a Kerrison rongeur of size 2 mm and 3 mm respectively. The lateral wall of the lacrimal sac was opened with a sickle blade and nasal micro-scissors. The lacrimal osteum was enlarged with cupped forceps. A Silicon tube was intubated from the upper and lower puncta and fixed onto the nasal mucosa near the nostril with a 5-0 prolene. A gel foam pack was applied to the lacrimal sac osteum. One ml of 40 mg triamcinolone acetonide was injected to the gel foam. All the above procedures were carried out under endoscopic visualization.

A follow-up of the patients was done on the first postoperative day, one-week, one month, three months and six months of surgery. Intraoperative and postoperative complications, if any, were noted. Postoperatively, a combination of a topical steroid and antibiotic eye drops were prescribed four times a day for two weeks along with nasal decongestant drops thrice a day for one week. Oral antibiotics were given to all patients for seven days. The suture in external DCR patients was removed at one week. Silicone tube in the endoscopic endonasal DCR patients was removed at three months.

At every follow-up, patency of the lacrimal passage on syringing and the symptomatic improvement was assessed. If watering was the same as before, we interpreted it as still watering. If there was watering, but was less than before, we interpreted it as minimal watering. If there was no more watering, we marked it as no watering. The results of syringing were interpreted as patent if there was no resistance to the flow of the fluid through the sac to the nasopharynx, partially patent when some fluid regurgitated through the upper punctum and some passed into the nasopharynx and non-patent when whole of the fluid regurgitated through the opposite punctum and no fluid passed into the nasopharynx. The success was defined by both symptomatic improvement (no watering) and patent lacrimal passage on syringing at six months after surgery.

Statistical analysis

The data was analyzed and computed using the SPSS 16 program. The fisher's exact test was applied and a p-value of ≤ 0.05 was considered statistically significant.

Results

A total of 65 eyes from 60 patients were studied. Thirty patients (31 eyes) underwent endoscopic endonasal DCR and 30 patients (34 eyes) underwent external DCR.

Table 1: Symptomatic improvement after six months of surgery

Symptom	Group A, after 6 months		Group B, after 6 months	
	No.	%	No.	%
Still watering	2	6.4	0	0
Minimal watering	1	3.2	2	5.8
No watering	28	90.3	32	94.1
Total	31	100	34	100

Group A - Patients undergoing endoscopic endonasal DCR;
Group B - Patients undergoing external DCR

This table shows results of the symptomatic improvement on follow-up visits.

On asking the patients about their complaints, 28 (90.3 %) in Group A and 32 (94.1 %) cases in Group B had no watering at the six-month follow up.

Table 2: Syringing after six months of surgery

Syringing	Group A, after 6 months		Group B, after 6 months	
	No	%	No	%
Patent	28	90.3	32	94.12
Non-patent	1	3.2	2	5.88
Partially- patent	2	6.4	0	0
Total	31	100	34	100

This table shows the results of syringing on follow-up visits.

On syringing, a patent lacrimal passage was noted in 28 (90.3 %) cases in group A and in 32 (94.1 %) cases in group B at the six-month follow-up.

Success was defined by both a patent lacrimal passage on syringing and a symptomatic improvement (no watering) at six months after surgery.

Table 3: Surgical outcomes

			Surgical outcomes		Total
			Success	Failure	
Grouping	Group A	Count	28	3	31
		% within group	90.3 %	9.7 %	100.0 %
		% within results	46.7 %	60.0 %	47.7 %
	Group B	Count	32	2	34
		% within group	94.1 %	5.9 %	100.0 %
		% within results	53.3 %	40.0 %	52.3 %
Total	Count		60	5	65
	% within group		92.3 %	7.7 %	100.0 %
	% within results		100.0 %	100.0 %	100.0 %

The overall success rate at six months after surgery for external dacryocystorhinostomy was 94.1 % and that of endoscopic endonasal dacryocystorhinostomy was 90.3 % with a p-value of 0.663 which is statistically not significant (p-value > 0.05). Fisher's exact test was applied. Overall success rate was 92.3 %.

Table 4: Types of intraoperative complications

Intraoperative complication	Group A		Group B	
	No.	%	No.	%
Bleeding	2	6.45	2	5.88
Mucosal tear	0	0.00	1	2.94
Others	0	0.00	0	0.00
Total complications	2	6.45	3	8.82
Total no. of cases	31	100	34	100

This table shows that intraoperative bleeding from the operative site occurred in 2 (6.45 %) cases undergoing endoscopic endonasal DCR and in 2 (5.88 %) cases undergoing external DCR. Mucosal tear occurred in 1 (2.94 %) case with external DCR.

Table 5: Types of postoperative complications

Postoperative complication	Group A		Group B	
	No.	%	No.	%
Haemorrhage	1	3.23	2	5.88
Bruises	0	0.00	2	5.88
Infection	1	3.23	0	0
Wound infection (in ext. DCR)	0	0.00	1	2.94
Wound gap	0	0.00	1	2.94
Cheese wiring	2	6.45	0	0.00
Hypertrophic scar	0	0.00	0	0
Others	0	0.00	0	0.00
Total complications	4	12.90	6	17.64
Total no. of cases	31	100	34	100

Postoperative haemorrhage occurred in 1 (3.23 %) case with endoscopic endonasal DCR and in 2 (5.88 %) cases with external DCR. Other postoperative complications in endoscopic endonasal DCR were infection in the form of dacryocystitis in 1 (3.23 %) case and cheese wiring in 2 (6.45 %) cases and the complication that had occurred after external DCR were bruises in 2 (5.88 %) cases, wound infection in 1 (2.94 %) case and wound gap in 1 (2.94 %) case.

Table 6: Total complications in both groups

			Complications (Eyes)		Total
			Present	Absent	
Grouping	Group A	Count	6	25	31
		% within group	19.4 %	80.6 %	100 %
		% within results	40 %	50.0%	47.7%
	Group B	Count	9	25	34
		% within group	26.5 %	73.5 %	100.0 %
		% within results	60 %	50.0 %	52.3 %
Total	Count		15	50	65
	% within group		23.1 %	76.9 %	100.0 %
	% within results		100.0 %	100.0 %	100.0 %

The total number of complications (intraoperative and postoperative) that occurred in Group A was 6 (19.4 %) and that in Group B is 9 (26.5 %). The overall complications that occurred was 15 (23.1 %) and the difference in complications between the two groups was not statistically significant (p-value = 0.496, p > 0.05). Pearson chi-square test was used.

Discussion

Epiphora, an overflow of tears from the eye due to imperfect drainage through the lacrimal passage, is a common annoying symptom, embarrassing the patient both socially and functionally. Although NLD obstruction is not a serious condition, symptoms like epiphora or repeated infections are quite annoying and cosmetically distressing. Medical treatment including antibiotic therapy may address the symptoms of this problem but definitive management of this problem generally consists of a surgical procedure (Woog et al, 2001). Different surgical procedures have been attempted to relieve the obstruction of the nasolacrimal duct, each with a different success rate and different complications. These procedures include standard external DCR, endoscopic endonasal DCR, endoscopic endonasal Laser DCR, non-endoscopic endonasal DCR and dacryocystoplasty.

This study which compared the success rate of endoscopic endonasal DCR and external DCR showed that the success rate of external dacryocystorhinostomy is 94.1 % and that of endoscopic endonasal dacryocystorhinostomy is 90.3 % at six months after surgery. The overall success rate is 92.3 % and the difference in the success rate between the two groups is statistically insignificant (p-value = 0.663; Fisher's exact test was used).

The success rate obtained from our study is similar to those of some other published comparative studies. Tsirbas et. al in their study reported an anatomic patency of 93.5% in mechanical endonasal DCR group compared to 95.8 % in the external DCR group (Tsirbas et al, 2004). Cokkeser et al reported success rates of external and endoscopic hammer-chisel DCR to be 89.8 % and 88.2 %, respectively (Cokkeser et al, 2000).

In a retrospective study done in Nepal by Sharma BR at the Lumbini Eye Institute, the authors concluded that in the external DCR group 90.5 % of the patients had surgical success and in the non-endoscopic endonasal DCR group 88.5 % patients had a successful outcome, with an overall success rate of 89.4 % (Sharma et al, 2008). These results are similar to those of our study though the non-endoscopic technique was used in that study.

Most authors feels that external DCR is technically easier, with an unimpaired view of the surgical area and well-defined landmarks allowing the creation of a wide bony window and the use of mucosal flaps to obtain an epithelialized DCR tract but advances of

endoscopic endonasal DCR include absence of skin incision with possible related complications preservation of the pump mechanism of the orbicularis oculi muscle and less bleeding (Goldberg, 2004; Dolman, 2003). The ability to address nasal or paranasal sinus abnormality at the same time, limitation of injury to the tissue at the osteotomy site, and faster rehabilitation were also noted in the endoscopic endonasal approach (Nussbaumer, 2004). It may be performed during acute dacryocystitis, where the external access is not indicated (Lee et al, 2001). So, endoscopic dacryocystorhinostomy has become more popular over the last decade.

Serious complications due to lacrimal surgery are extremely rare, but there are several minor complications. Intraoperative complications include haemorrhage, damage or trauma to nasal mucosal flaps or loss of nasal mucosal flaps, cerebrospinal fluid leak and damage to orbital structures. Postoperative complications include haemorrhage, infection, epiphora or tearing and wound related complications like wound infection, wound gap, wound necrosis, hypertrophic scar and other related complications. While comparing the complications in the two groups, some authors showed a low complication rate of endoscopic DCR as compared to external DCR (Sinha et al, 2008).

In the present study, there were no major intraoperative and postoperative complications. Regarding minor complications, a total of 2 (6.45 %) intraoperative complications and 4 (12.9 %) postoperative complications occurred in the endoscopic endonasal DCR and a total of 3 (8.82 %) intraoperative complications and 6 (29.41 %) postoperative complications occurred in the external DCR. The overall complications that occurred were 15 (23.1 %) and the difference in complications between the two groups was not statistically significant (p value = 0.496, $p > 0.05$). Pearson chi-square test was used. Intraoperative bleeding from the operative site occurred in 2 (6.45 %) cases undergoing endoscopic endonasal DCR and in 2 (5.88 %) cases undergoing external DCR. Mucosal tear was seen in 1 (2.94 %) case with external DCR. Postoperative haemorrhage occurred in 1 (3.23 %) case with endoscopic endonasal DCR and 2 (5.88%) cases with external DCR. Other complications that occurred after endoscopic endonasal DCR were infection in 1 (3.23 %) case and cheese wiring in 2 (6.45 %) cases and the complications that had occurred after external DCR were bruises in 2 (5.88 %) cases, wound infection in 1 (2.94 %) case and wound gap in 1 (2.94 %) case. Most of the post operative complications after external DCR were wound-related.

Infection is rare after lacrimal surgery; but in this study, 1 case developed infection after endoscopic endonasal DCR. It was manifested as dacryocystitis. Infection was controlled after treatment but the symptoms of watering persisted.

Cheese wiring of the puncta may occur if the stenting is too tight. In this study, 2 cases with endoscopic endonasal DCR developed cheese wiring and the tube was removed earlier in these cases. Sharma BR in his study found silastic tube cut through or “cheese wiring” of the canaliculi as the most common late postoperative complication (24 patients, 7.9 %) (Sharma et al, 2008).

Other complications that occurred in this study were wound related, i.e. bruises, wound infection and wound gap. These complications were found only in the cases of external DCR. The absence of an external wound and its related complications is one of the advantages of endoscopic endonasal DCR (Simon, 2005; Dolman, 2003).

In our study, a silicone tube was placed only in cases of endoscopic endonasal DCR and not in external DCR cases.

According to some authors a silicone tube will prevent the failure of DCR (Huwitz, 1986), while according to others, this procedure

is contraindicated on account of the high occurrence of granulomatous inflammation and DCR stenosis with low success rates and complications like punctal erosion and slitting of canaliculi (Sham, 2000). Some have described no differences in the success rate using the stent system (Saiju et al). So, whether to keep the stent or not is still debatable. However, it is believed that routine use of stents is beneficial, especially in cases of endoscopic DCR, as it helps to maintain the patency of the internal ostium and keep the flaps of the lacrimal sac from sealing together (Massegur et al 2004). The main limitation of this study is the small sample size. So, a randomized control trial with adequate sample size with a long follow up is recommended.

Conclusion

Endoscopic endonasal DCR seems to be equally good to the conventional external DCR to achieve success after six months. The rates of intra-operative and post-operative complications were also similar in the two methods, though the wound-related complications were only for external DCR. So, we recommend that the advantages and limitations of both the procedures should be carefully discussed with the patients for their optimum satisfaction before one of the two methods is chosen. The main limitation of this study is the small sample size. So, a randomized control trial with adequate sample size with a long follow up is recommended.

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