Volume : 3 | Issue : 10 | October 2014 • ISSN No 2277 - 8179

Research Paper

Comparison of external and endoscopic Dacryocystorhinostomy in primary nasolacrimal duct obstruction

Medicine

KEYWORDS : Dacryocystorhinostomy, External, Endoscopic, Complication, Success rate

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ABSTRACT

Introduction: Epiphora is an annoying symptom, embarrassing the patient both socially and functionally, two widely acceptable treatment modalities of epiphora due to nasolacrimal duct obstruction (NLDO) are external and endoscopic dacryocyctorhinostomy (DCR). Purpose of this study is comparison of complications and success rate of these two methods in patients with NLDO.

Material and methods: Retrospective study of patients who underwent surgical endoscopic and external DCR and comparison of their success rate and postoperative complications from 2012-2013 with 6 months follow up in otolaryngology department of shahid sadughi hospital in yazd.

Results: A total of 105 patients underwent surgeries for NLDO (52 patients in endoscopic and 53 patients in external group). Min age was 49 years and 62.4% of subjects were female. There was not any significant difference in success rate between two groups (endoscopic 92.3% versus external 86.7%, P value=0.35). Epistaxis and nasal discharge occured just in endoscopic DCR [epistaxis 7(13.5%) and nasal discharge 8 (15.3%)]. Some complications occured exclusively in external DCR group such as: Unacceptable scar 15 (28.4%), wound dehiscence 5(9.4%), transient lagophtalmus 2(3.7%), transient orbicularis hypototony 1(1.8%). Failure rate in functional subgroup was higher. In endoscopic DCR group in anatomic obstruction special complications (epistaxis and nasal discharge) were higher than functional subgroup (P<0.05).

Conclusion: In this study, the success rates of endoscopic and external DCR were similar. Endoscopic DCR did not produce a scar, had fewer unacceptable complications, and allows the simultaneous correction of intranasal pathology. It also resulted in higher patient satisfaction and less operative time. Endoscopic DCR as a minimally invasive method can be a successful substitute for classic external DCR.

Introduction

The obstruction of the nasolacrimal duct, which causes epiphora, is a common problem and results in significant individual and social distress for the patient. There are two principal categories of lacrimal obstruction, i.e., anatomic and functional. Anatomic obstructions are more common than functional obstructions, with the approximate rates being 70 and 30%, respectively. Anatomic obstruction is complete blockage between the lacrimal sac and the nasal cavity. Functional obstructions are caused by narrowing within the lacrimal system or a failure of the pumping mechanism.

Nasolacrimal duct obstruction (NLDO) has different causes, such as idiopathic, iatrogenic, congenital, traumatic, lithiasis, and infection. Suspicion of obstruction may be confirmed by syringing, Jones test, and dacryocystorhinography (DCG).

The condition can be relieved by undergoing an operation known as a dacryocystorhinostomy (DCR), which connects the lacrimal sac and the nasal cavity. The lacrimal sac mucosa is connected to the nasal mucosa above the level of the mechanical obstruction at the nasolacrimal duct. This can be achieved either through an incision on the lateral side of the nose (external DCR) or by operating inside the nose (endonasal DCR) (1).

External DCR was first described by Addeo Toti in 1904. An alternative pathway of DCR by the intranasal route was described by Caldwell as early as 1893. The approach failed to gain popularity due to poor access to the nasal cavity. With the advent of the nasal endoscope and functional endoscopic sinus surgery in the early 1990s, there was renewed interest in endonasal DCR, and McDonogh and Meiring described endoscopic intranasal DCR in 1989 (2, 3). The reported success rates of both procedures range from 63 to 97% (4-6).

The wide range of success is likely due to surgical variability, patient demographics, and lack of standardized outcome measures in the medical literature (7).

Each procedure has its own potential advantages and disadvantages. There is conflict in the literature about the success rate, duration time, cost effectiveness, and complications. The present study was conducted with the aim of comparing the results, advantages, disadvantages, and complications of external and endonasal endoscopic DCR.

Material and Method:

We performed a retrospective, comparative, non-randomized review of the medical records of patients who had undergone surgical endoscopic and external DCR at the Shahid Sadoughi Hospital from 2012 to 2013. Diagnoses of nasolacrimal duct obstruction were based on the patients' symptoms and probing and irrigation of the lacrimal system. Scintilligraphy was performed as a physiological test to distinguish the functional group from anatomical obstruction group. The Ethics Committtee at Shahid Sadoughi University approved the design of the study, which included 120 cases. After excluding 15 patients because of some exclusion criteria, a total of 105 patients underwent surgeries for NLDO, with 52 patients undergoing the endoscopic approach, and 53 patients in the external group. They are included in Table 1. All surgeries were performed by two of the authors (Musavi and Sarafraz), and all external and endoscopic DCR operations were conducted under general anaesthesia. All patients were followed for a minimum of six months. Success was defined as improvement in tearing, i.e., patients did not report additional postoperative episodes of tearing.

The data were analyzed using the Statistical Package for Social Sciences (SPSS) software (version 18 for Windows). The data were given as means, standard deviations, and number (percent-

Volume : 3 | Issue : 10 | October 2014 • ISSN No 2277 - 8179

age). The chi-squared test was performed for statistical analyses. A P < 0.05 was considered to be significant.

Table1. Selection criteria for cases with NLDO

Inclusion	Exclusion
-Epiphora -Evidence of obstruction on probing or irrigation	History of facial trauma Age less than 30 or more than 60 History of belpharities Eye lid malformation (Entropion, Ectropion) Canaliculus obstruction Previous DCR to same eye Congenital NLDO

Surgical technique

Endoscopic endonasal DCR

Endoscopic endonasal DCR was performed under general anesthesia. After vasoconstriction of the nasal cavity, the tip of the middle turbinate and the mucosa surrounding the lacrimal sac were infiltrated with lidocaine as a local anesthetic agent. A surgical incision was made at the anterior superior to the insertion of the middle turbinate. The posterior mucosal flap was elevated off the maxillary bone, and an incision was made until the sac was exposed. Metallic lacrimal probes were passed medially through both canaliculi to the lacrimal sac lumen. Then, a silicone tube was positioned and tied.

External

External DCR was performed under general anesthesia. A straight incision was made medially to the angular vein at the level of the medial canthal ligament. For adequate exposure of the anterior lacrimal crest, the wound was opened with traction sutures. An osteotomy was done, and the lacrimal sac was marsopialized to the nasal cavity. Probing ensured that the site of obstruction was localized, and, then, the flaps were sutured with 6/0 vicryl sutures. A silicon tube was inserted and tied. The wound was closed, and the skin was sutured using fine sutures for cosmetic effect. The tubes were kept in place for 2-3 months before removal.

Data were recorded as follows:

1. Surgical time (in minutes from local anesthesia administration to removal of drapes).

2. Symptomatic relief (1–4; 1 = no improvement; 2 = marginal improvement; 3 = considerable improvement; 4 = complete resolution of epiphora symptoms).

3. Success rate in external and endoscopic DCR

4. Post-operative complications

5. Duration of Follow-up

6. Patient satisfaction (1 = extremely dissatisfied to 10 = extremely satisfied).

7. Complications in functional and anatomical subgroups

Results:

A total of 105 patients underwent surgeries for NLDO (52 patients in endoscopic and 53 patients in the external group). The minimum age was 49, and 62.4% of the subjects were female. Average duration of follow up was six months. Symptomatic relief and patients' satisfaction were higher than in the endoscopic group (P < 0.05) (Table 2).

	External DCR	Endoscopic DCR
Surgical time (Min)	65	49
Symptomatic relief (Score out of 4	2.49	3.43
Patients' Satisfaction (Out of 10)	8.2	9.2
Duration of follow up (Months)	6	6

Table2. Summary of the results

There was no significant difference in the success rate between the two groups (endoscopic 92.3% versus external 86.7%) (P value = 0.35). Epistaxis and nasal discharge occurred just in endoscopic DCR (epistaxis 7 (13.5%) and nasal discharge8 (15.3%). Some complications occurred exclusively in the external DCR group, including unacceptable scar (15 patients, 28.4%), wound dehiscence (five patients, 9.4%), transient lagophtalmus (two patients 3.7%), transient orbicularis hypototony (1patient, 1.8%) (Tables 3 and 4). One patient in the endoscopic DCR group had a mass in the nasal cavity, and the biopsy results indicated that it was adenocarcinoma.

Table3. External and endoscopic complications

	Male (37.6%)	Female (62.4%)	Total (105)
Age range	30-57 (43.5)	35-60 (47.5)	30-60 (45)
Epistaxis	4	3	7 (13.5%)
Scar	11	4	15 (28.4%)
Infection	0	0	0
Wound Dehiscence	2	3	5 (9.4%)
Lagophtalmos	2	0	2 (3.7%)
Orbicularis hypotonia	0	1	1 (1.8%)
Subcutaneous emphysema	0	0	0
Tube extrusion	0	0	0
Nasal Discharge	4	4	8 (15.3%)

Table4. Special complications of each group

Complications	Endoscopic DCR	External DCR
Unacceptable Scar	-	15(28.4%)
Wound dehiscence	-	5(9.4%)
Transient lagophtalmos	-	2(3.7%)
Orbicularis hypotonia	-	1(1.8%)
Nasal discharge	8(15.3%)	-
Epistaxis	7(13.5%)	-

The failure rate was higher in the functional subgroup. In the endoscopic DCR group, special anatomical obstruction complications (epistaxis and nasal discharge) were higher than in the functional subgroup (P < 0.05) (Table 5).

Table5. Failure rate and complications in the functional and anatomical subgroups

	External DCR		Endoscopic DCR	
Obstruction Type	Functional	Anatomic	Functional	Anatomic
Failure rate	10%	3.3%	6%	1.7% (P<0.05)
Epistaxis	0%	0%	1%	12.5% (P<0.05)
Scar	13.4%	15%	0	0
Wound dehiscence	5.2%	4.2%	0	0
Lagophtalmos	1.7%	2%	0	0
Orbicularis hypotony	1.8%	0	0	0
Nasal discharge	0	0	3%	12.3% (P<0.05)

Discussion

Obstruction of the nasolacrimal duct can be approached either externally by transcutaneous excision or by the endonasal

approach. Many comparative studies have been performed in relation to these two approaches. For a century, the external approach was the gold standard approach (8). Despite a general belief that external DCR is more successful than endonasal DCR, a 2001 report by the American Academy of Ophthalmology concluded that it was difficult to draw a definitive conclusion about the relative efficacies of the endonasal and external DCR approaches because of deficiencies in the reported literature (9, 10). Also it is difficult to compare success rates between the two approaches due to the wide range of success in different studies (70-90%). The wide range reflects the fact that few studies have standard outcome measures, with some studies defining success as patency to irrigation and others considering the resolution of symptoms (11). Our study included both objective patency results and subjective measurements of patients' symptoms.

Various interventional cohort studies have studied the success rate between these two approaches. A retrospective cohort study comparing the success rates of endonasal (86 cases) and external (90 cases) DCR surgeries found statistically significant success rates with endonasal DCR (84% versus 70%, P = 0.03) at the follow-up period of seven months (9). In Cokkeser et al.'s study, the results were comparable between external and endonasal DCR (90% versus 88%) (12). Dolman et al. also found both procedures to have essentially equivalent success rates (90% versus 89%) (13). However, Ibrahim et al., in a retrospective comparative cohort study, found a higher success rate with external DCR than endonasal DCR (82% versus 58%) (14). In our study, there was no significant difference in success rate between the two groups (endoscopic 92.3% versus external 86.7%, P value = 0.35).

The most important advantage of the endoscopic approach is the preservation of the physiological pump system. The minimal loss of blood during surgery makes a blood transfusion unnecessary in the post-operative period (8). Also, patients do not have a facial scar in the post-operative period, providing the desired cosmetic effect (7). A comparatively shorter time is required for the operation than for the external DCR. In our study, 49 minutes were required in the endoscopic group, whereas 65 minutes were required for those in the external group. Additional advantages of the endoscopic approach are early ambulation and a shorter stay in the hospital (8). The endoscopic approach allows the diagnosis and management of associated conditions, including septal deviation, sinus disease, hypertophic conca, and even dacryocystitis (despite a general belief that these conditions are contraindications for the endoscopic surgery) (16-19).

Endoscopic DCR allows direct inspection of the lacrimal sac for any underlying pathology, and intranasal biopsies of suspicious mucosa can be taken for further assessment (7). In our study, one patient in the endoscopic DCR group had a mass in the nasal cavity that was recognized by endoscope, and the result of the biopsy was that the mass was adenocarcinoma.

In our study, patients' satisfaction and quality of life in the endoscopic group were better than in the external group, with scores of 9.2 and 8.2, respectively. The latter may be higher due to the shorter surgery time; lack of an external incision and scar formation; quicker return to work; and no removal of sutures.

Complications of endoscopic endonasal DCR have a low probability, but they can include re-stenosis of the opening, bleeding from the nasal cavity, orbital injury, corneal abrasion and canaliculi erosion (20-22).

The medical literature indicates that serious complications are rare. Of the 226 patients who underwent endoscopic endonasal DCR in the Sonkhya retrospective case series, only two patients had complications of orbital fat prolapse and lamina papyracea damage. Neither patient had any sequelae from this complication (19). In our study, we didn't have any serious complications, such as any kind of orbital damage in the endoscopic group.

In the endoscopic group, 13.5% of the patients experienced mild, post-operative epistaxis, and this was relatively higher than it was in a study conducted by Karim et al. (23), who reported one case (1%), and a study conducted by Droos, in which 2.8% of the patients had post-operative DCR bleeding (24). However, in our patients, bleeding stopped spontaneously or by conservative treatment.

Lacrimal sump syndrome and associated recurrent infections can occur in the endoscopic approach if the lower portion of the bone surrounding the sac is removed inadequately. This can be avoided by using the marsupialization technique, as we did in our surgeries. Tsirbas and Wormald used a similar technique in endoscopic DCR to fully expose the lacrimal sac and marsupialize it into the lateral nasal wall. They achieved high, long-term success rates at 89% with this approach (25-27).

External DCR was first described by Toti in 1904 (28), and it was the gold standard approach for a century. It has some potential complications, such as retro-bulbar orbital hemorrhage (29), incision necrosis (30), cutaneous scarring (31), infection of the wound (32, 33), granuloma formation, corneal abrasion, cerebrospinal fluid leak, retained stenting material, secondary hemorrhage, diffuse Cervicofacial subcutaneous emphysema and pneumomediastinum, rhinolith formation, meningitis, pneumocephalus, retained gauze, orbital emphysema, lagophthalmos, and orbicularis oculi weakness (34-42).

The most unacceptable complication is hypertophic scar formation. In Droos' study, hypertrophic scar occurred in 22.2% of the patients, which was comparable to the results of a study conducted by Devoto et al. (43), which showed 15 of 34 patients (44%) could not see their incision site (grade 0), 16 of 34 (47%) graded it as minimally visible, 3 of 34 patients (9%) graded it as moderately visible, and no patient graded it as very visible. Another study conducted by Sharma et al (31) showed that 61 of 296 patients (20.6%) felt that their scars were visible. In our study, 15 patients (28.4%) had a visible scar at the end of follow up (after six months). Infection of the wound has been observed in many surgeries. In Droos' study, the frequency of this complication was 8.3% (three cases), which was slightly higher than that found by Besharati (5.3%) (44).We had no patients whose wounds became infected. This outcome may be due to the topical antibiotic that we administered for one week after surgery.

Lagophthalmos first was reported as a complication of DCR in 1994 by Fayet et al. (42) Transient lagophtalmos occurred in our study in two patients (3.7%), and it resolved gradually over a period of two weeks. Droos reported that 22.2% of his patients had this complication.

The two main advantages of external DCR that make it popular in some centers are the predictability of success and the direct visualization of the anatomy. These goals were achieved with training and increased experience in the endoscopic procedure provided by short-course education. Onerci stratified the success rate according to the experience of the surgeon and found high success rates of up to 94% with experienced surgeons, whereas inexperienced surgeons had success rates of only 58% (45).

In contradistinction from most studies, we studied the failure rates in the functional and endoscopic subgroups, and we also assessed complications in relation to these subgroups. The failure rate in the functional subgroup was higher in both groups. In the endoscopic DCR group in anatomic obstruction special complications (epistaxis and nasal discharge) were higher than

in the functional subgroup ($P < 0.05$). The latter may be due to higher manipulation to localize and eliminate anatomical obstructions in comparison with functional obstructions. However, additional studies should be conducted in the future to clarify the reasons for these findings.

Conclusion:

In this study, the success rates of endoscopic and external DCR were similar. Endoscopic DCR did not produce a scar, had fewer unacceptable complications, and allows the simultaneous correction of intranasal pathology. It also resulted in higher patient satisfaction and less operative time. Endoscopic DCR as a minimally invasive method can be a successful substitute for classic external DCR.

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