

Comparison of success between external and endonasal dacryocystorhinostomy in primary acquired nasolacrimal duct obstruction in Turkish cohort

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ABSTRACT

OBJECTIVE: To evaluate the results and recurrence rates of external and endonasal dacryocystorhinostomy (DCR) surgery in patients with primary acquired nasolacrimal duct obstruction (PANDO) in Turkish Cohort.

METHODS: Medical records were reviewed in all patients who underwent surgery for PANDO between January 2010 and September 2014 in a tertiary university hospital retrospectively. The patients were followed up on the first day, first month, third month and sixth month postoperatively. Lacrimal drainage system and recurrence rates were recorded.

RESULTS: This study was conducted in 81 patients, 27 of whom were men (33.3%) and 54 were women (66.7%). The mean follow-up time was 30.13±16.42 months (range 6–62 months). The mean age was 50.51±12.47 years (range 16 to 77 years). External DCR was used in 44 (66.7%) of the cases and endonasal DCR was used in 37 (45.7%) of the cases. Surgical results of DCR were divided into three groups based on the integrity and openness of the lacrimal drainage pathway in all PANDO patients. Operation success rates of these data revealed that 45 (55.6%) cases were recorded as successful, 20 (24.7%) of the cases were accepted as partially successful and 16 (19.8%) of the cases were deemed as unsuccessful. Based on these data, surgical success rates were found in 38 (86.4%) patients in external DCR and 27 (73%) patients in endonasal DCR. Surgical failure rates were six (13.6%) in external DCR and 10 (27%) in endonasal DCR. There was no statistically significant difference between success rates and recurrences in both groups ($p>0.05$).

CONCLUSION: Endoscopic DCR produced simple, minimally invasive and preferable results compared to external DCR in the Turkish population. Although the success of external DCR is higher and the recurrence is lower than endoscopic DCR, with the outcomes of this study, endoscopic DCR can be tried as the first choice to protect the patient from major surgery and anesthesia in PANDO.

Keywords: Endoscopic endonasal DCR; external DCR; primary acquired nasolacrimal duct obstruction.

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Dacryocystorhinostomy (DCR) is the standard procedure for primary acquired nasolacrimal duct obstruction (PANDO) for many years. DCR provides an alternative way to drain the lacrimal sac along the nasal cavity for

tear and bypass the nasolacrimal duct. This process can be performed either using endoscopic or external approach.

The external DCR technique was firstly introduced in 1904 [1] and was subsequently regenerated [2] by

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the suturing of the nasal and lacrimal mucosal flaps to form nasolacrimal fistula. Several studies have reported the success rate of external DCR between 85% and 95% [3–8]. The endonasal DCR technique was described in 1893 by Caldwell [9] and after modified by West [10]. The literature involves several studies that estimated success rates ranging from 63% to 90% [11–13].

Our study aimed to evaluate the outcomes of external versus endonasal DCR in a large cohort of the Turkish population in a tertiary research hospital. We evaluated success rates and recurrence rates of external and endonasal DCR for the treatment of nasolacrimal duct obstruction.

MATERIALS AND METHODS

Medical records were reviewed in all patients who underwent surgery for PANDO between January 2010 and September 2014 in a tertiary university hospital retrospectively. This study was conducted according to the Declaration of Helsinki and was approved by a local ethical committee. A diagnosis of the PANDO was made from ophthalmic examination and/or radiological findings. PANDO was evaluated using on nasolacrimal probing and confirmed in dacryocystography. All patients had symptoms of epiphora. The preoperative examinations included slit-lamp, fluorescein dye disappearance test (Jones test), lacrimal irrigation and probing of the canaliculi. Surgical choice of external or endoscopic endonasal DCR was made randomly. However, patients' preferred choice was considered. Patients were applied to the Department of Ophthalmology and were evaluated jointly by the ophthalmologist and otolaryngologist. Preoperative endoscopic evaluation was carried out for possible coincidental nasal pathologies. Endonasal DCR was performed by an experienced otolaryngologist, as well as external DCR was performed by an ophthalmologist.

Patients were followed up regularly at postoperative first day, first month, third month and sixth month. The preoperative dacryocystographic evaluation was applied to all cases and cases with sac anomaly. Patients with an intrasaccular stone, tumor and canalicular obstruction or patients with a history of previous DCR surgery were excluded from this study. All cases with PANDO confirmed dacryocystography using lipiodol (Fig. 1). It was seen that all patients whose lacrimal sac were uniformly filled and their integrity was not impaired. The obstruction was localized in all patients after the sac at the nasolacrimal duct level.

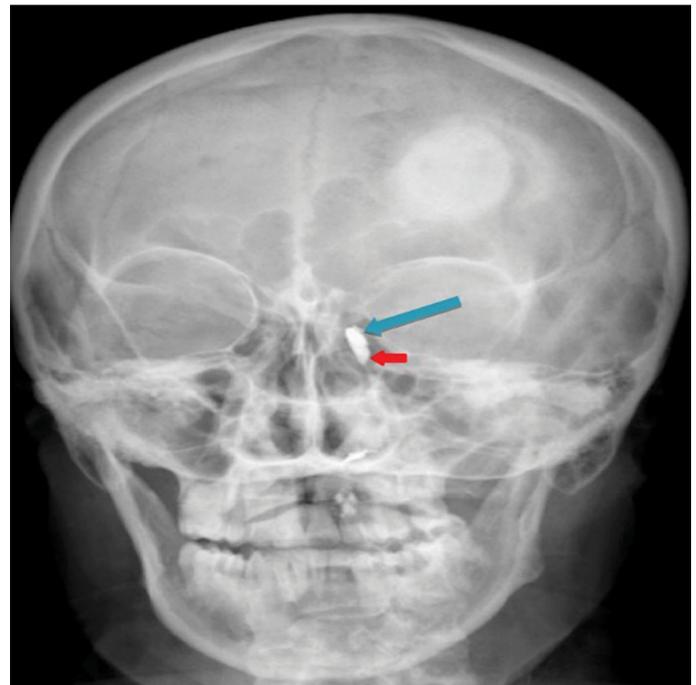


FIGURE 1. Obstruction on dacryocystography. Red arrow shows obstruction of the left nasolacrimal canaliculus. Blue arrow shows staining of lipiodol due to obstruction.

We categorized success into three parts: complete success, partial success, and failure. Full success was determined as a complete absence of tearing in normal conditions, lack of infection, and clearance in the lacrimal route during syringe irrigation. Partial success was defined as a tearing symptom that improved comparing with the preoperative condition. Fluorescein dye disappearance test was negative but resolved with partial or complete irrigation through the ostium. Failure was diagnosed as an anatomically obstructed ostium and persistent tearing.

Statistical Analysis

For the statistical analysis, SPSS (Statistical Package for Social Sciences) for Windows 22.0 program was used. Data were stated using descriptive analysis (mean, standard deviation) and comparisons of success and failure rates were made using Chi-square test and Likelihood ratio test were also used to compare the qualitative data. $P < 0.05$ was considered as statistically significant.

Surgical Technic

Endoscopic DCR procedure

Intravenous propofol and remyfentanil hydrochloride were administered during general anesthesia. Drug abuse

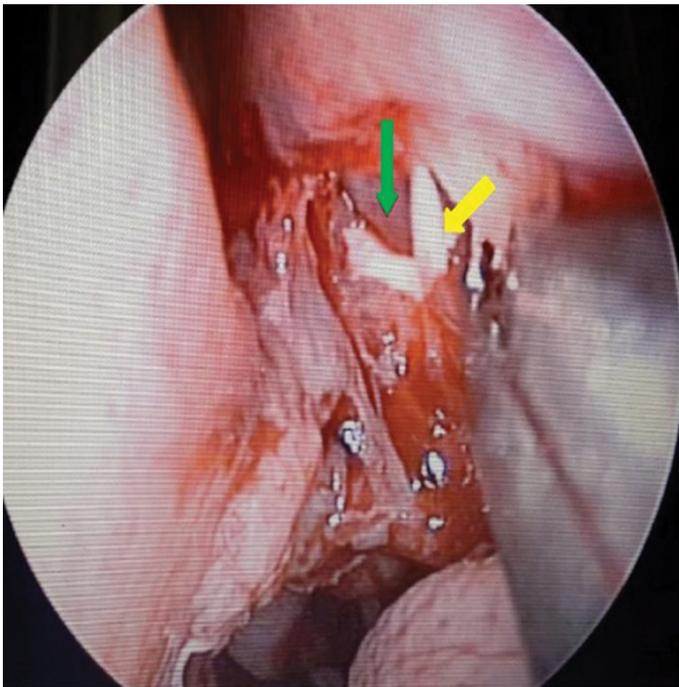


FIGURE 2. Reach the lacrimal sac with Kerrison rongeur. The green arrow shows lacrimal sac and yellow one is bone window.

(e.g., cocaine) was questioned in all patients concerning anesthesia. The nasal mucosa was decongested with cotton pledgets soaked in a solution of 4 mL of normal saline solution, 2 mL of 4% cocaine, and 1 mL of 1:1000 adrenaline. The trauma to the nasal mucosa was avoided because of the possible consequence of visual disturbance due to bleeding. Local infiltrating anesthesia to the nasal mucosa before endoscopic DCR included decongesting the nasal mucosa with local vasoconstrictors. Hemostasis was provided visualizing the lateral nasal wall with the endoscope. A vertical mucosal incision was made on the superior part of the middle and lower concha. After the initial incision, the mucosa was removed from the bone. The medial aspect of the maxillary part of the lacrimal fossa was taken anterior to the posterior or the anterior-posterior. After the bone was removed, the lacrimal sac appeared (Fig. 2). The lacrimal probe was entered through the canal and was pushed medially towards the occluded sac. The redness of the probe on the medial sac wall was seen endonasal and a form of an incision to which created anterior and posterior flaps (Fig. 3). After passing through the sac, canalicular silicone stenting was performed.

External DCR procedure

The skin incision was made externally. After reaching the

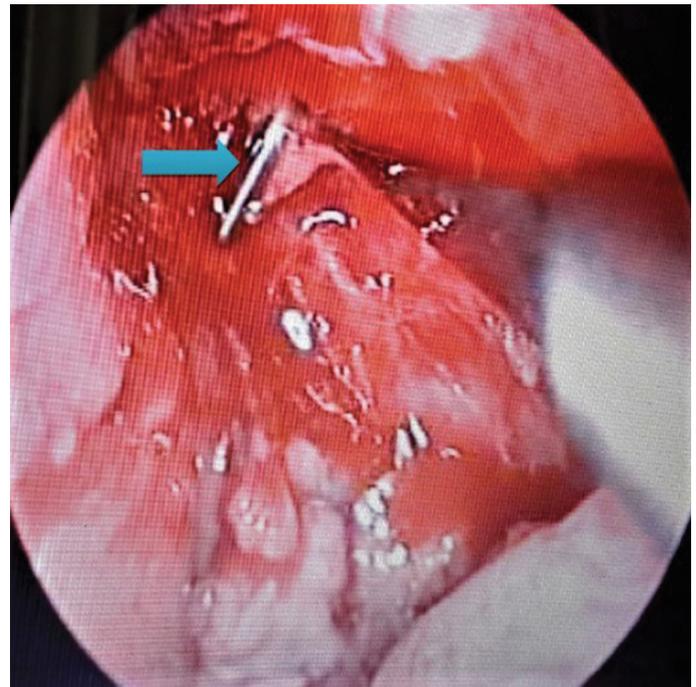


FIGURE 3. Blue arrow shows the tip of the silicone tube.

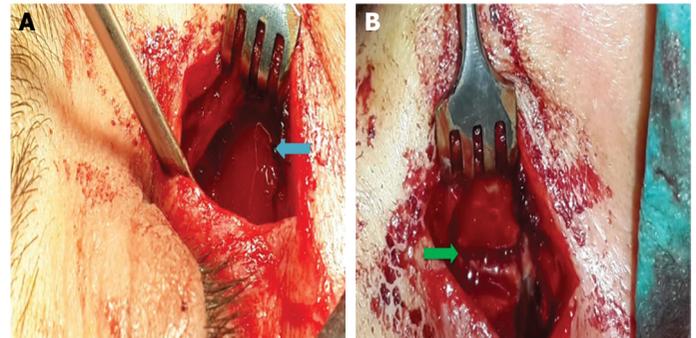


FIGURE 4. (A) Blue arrow shows bone window was created from the perforation site. **(B)** Green arrow shows H-shaped mucosal flap.

periosteum with blunt dissection, an incision was made until the inner canthal ligament was removed to reveal the lacrimal sac.

A periosteal elevator was used to dissect the periosteum over the lacrimal crest. Subsequently, the lacrimal sac was removed from the lacrimal fossa. The lacrimal bone was perforated from the anterior part with a periosteal elevator. The bone window was created with Kerrison rongeur from the perforation site (Fig. 4A). The bone window was enlarged from the top to the lacrimal fossa, to the nasomaxillary sidewall in front of the inner bulge tendon. On average, 16 mm to 14 mm sized smooth-edged bone windows were created. After reciprocal suturing of the ante-

TABLE 1. Demographic characteristics and the distribution of the study population

	%
Sex	
Male	33.3
Female	66.7
Surgery procedure	
External DCR	54.3
Endonasal DCR	45.7
Side	
Right	51.9
Left	48.1
Recurrence	
No	79.0
Yes	21.0
Lavage	
Open	80.2
Close	19.8
Jones	
Negative	42.0
Positive	58.0
Epiphora	
No	63.0
Yes	37.0
Success	
No success	19.8
Partial success	24.7
Full success	55.6

DCR: Dacryocystorhinostomy.

rior and posterior flaps of the H-shaped lacrimal sac and nasal mucosa (Fig. 4B), the silicone tube advanced from the upper and lower punctum was passed through into the nasal cavity to prevent canalicular and ostial occlusion.

RESULTS

This study was conducted in 81 patients, 27 of them were men (33.3%), and 54 were women (66.7%). Mean follow-up time was 30.13 ± 16.42 months (range 6-62 months). The mean age was 50.51 ± 12.47 years (range 16 to 77 years). External DCR was used in 44 (66.7%) of the cases, and endonasal DCR was used in 37 (45.7%) of the cases. The operation side recorded and 42 (51.9%) were right, and 39 (48.1%) were left side. There was no recurrence of 64 (79%) cases after the operation, 65(80.2%) of the cases had lavage clearance, 47 cases

TABLE 2. Comparison of the achievement status by categorical characteristics

	Success			p ^{1,2}
	Failure %	Partial %	Full %	
Sex				
Male	50.0	30.0	28.9	0.287
Female	50.0	70.0	71.1	
Surgical procedure				
External DCR	37.5	65.0	55.6	0.250
Endonasal DCR	62.5	35.0	44.4	
Side				
Right	68.8	50.0	46.7	0.310
Left	31.2	50.0	53.3	
Recurrence				
No	0.0	95.0	100.0	0.000¹
Yes	100.0	5.0	0.0	0.000²

DCR: Dacryocystorhinostomy; p1: Chi-square test p value; p2: Likelihood ratio p value.

(58%) had positive fluorescein dye disappearance test, 51 cases (63%) had no epiphora. Operation success rates of these data revealed that 45 (55.6%) cases were recorded as successful, 20 (24.7%) of the cases were accepted as partially successful and 16 (19.8%) of the cases were deemed as unsuccessful. Based on these data, operative success rates were found in 38 (86.4%) patients in external DCR and 27 (73%) patients in endonasal DCR. Surgical failure rates were six (13.6%) in external DCR and 10 (27%) in endonasal DCR.

Demographic characteristics, distribution of the cases and postoperative outcomes are summarized in Table 1 and Table 2.

Comparison of operation success with gender, operation type with operation success and operation success with operation side were all found to be statistically insignificant between two surgical setup groups ($p > 0.05$).

DISCUSSION

Epiphora is the most frequent symptom of PANDO, which causes vision impairment and eyelid irritation problems [14–17]. DCR is the main treatment of an option for epiphora in patients with obstruction distal to the common canaliculus [18–20].

In our study, surgical success was concluded to these data; 45 (55.6%) were successful, 20 (24.7%) partially successful and 16 (19.8%) unsuccessful. 86.4% and 73% of the patients who underwent external and endonasal DCR, respectively were successful in present study. Partial success was observed in 29.5% of external DCR and 18.9% of endonasal DCR. It is possible that the protection of the lateral lacrimal sac wall and its attachments to the medial canthal tendon and orbicularis oculi muscle simplify the lacrimal pump to function more effectively than after external DCR, which disrupts these structures.

Several studies reported that external DCR has a higher success rate than endoscopic DCR; thus, the consensus has been accepted that endoscopic DCR has lower success rates compared with external DCR [21–23]. We also found similar results in present study.

Dolman reported that full success was observed in 90.2% of external DCR patients and 89.9% of endonasal DCR patients. Partial success was shown in 2.0% of external DCR and 4.0% of endonasal DCR in patients with PANDO. Failure of surgery was seen in 7.8% of external DCR and 7.0% of endonasal DCRs. Therefore, no statistically significant difference was found in outcomes between each procedure [24]. If we compared our results with Dolman's study, our findings were concluded that high partial success rate was seen in current study cohort. It will be related to the different anatomical structures in the Turkish population or may be because we sutured the lower and upper ends of the H-shaped mucosal flap separately. On the other hand, these results may also arise from partial damage to the medial canthal ligament or due to the use of silicone tubes in all cases in current study. This does not prove its superiority to endoscopic DCR.

According to the royal college of ophthalmologists, achievement of the surgery was defined as the absence of tearing at least three months after an operation. Therefore, we used these guidelines for patients with at least six months' follow-up time postoperatively [25].

Both in external DCR [26] and endonasal DCR [27], the main reason for the failure of the surgery was the fibrosis of intranasal ostium. In the current study, one of 37 endonasal DCRs (3%) had a closure of the ostium two months after surgery. There was no recurrence in the external DCR group due to ostium closure. It will depend on H-shaped mucosal flap and removal of wide bone ostium in external DCR.

The limitation of our study was related to its retrospective design. On the other hand, there were some advantages of our study. One of them was investigated in a large subset of the Turkish population. The partial success rate was different from similar studies [24]. It can depend on surgical procedure or anatomical variations in the Turkish population. The advantage of endoscopic surgery was that it heals with no scar and protect the lacrimal pump system, on contrary of external DCR.

In conclusion, endonasal DCR is a procedure that has recently gained popularity by ophthalmologists due to its minimal invasive nature, high patient satisfaction, and high success rates. Although the success of external DCR is higher and the recurrence is lower than endoscopic DCR, with the outcomes of this study, endoscopic DCR can be tried as the first choice to protect the patient from major surgery and anesthesia in PANDO in the Turkish population. We believe that this study may be a guide for treatment options in Turkish patients with PANDO.

Ethics Committee Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Umraniye Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 19.11.2015, number: 111).

Informed Consent: Informed consent was obtained before every surgical procedure from all individual participants included in this study.

Conflict of Interest: No conflict of interest was declared by the authors.

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Authorship Contributions: Concept – GK; Design – GK, BK; Supervision – ARCC, EE, IP; Fundings – BK; Materials – BK; Data collection and/or processing – BK; Analysis and/or interpretation – BK; Literature review – BK, GK; Writing – BK; Critical review – ARCC.

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