

# Comparable anatomical and functional success to younger patients in endoscopic dacryocystorhinostomy patients of older age

Erol Erkan<sup>1</sup>, Sercan Çıkrıkçı<sup>2</sup>, Fatih Ağdaş<sup>2</sup>

<sup>1</sup> Department of Ophthalmology, Yozgat City Hospital, Yozgat, Turkey

<sup>2</sup> Department of Otorhinolaryngology, Yozgat City Hospital, Yozgat, Turkey

## ORCID ID of the author(s)

EE: 0000-0001-8395-1765  
SC: 0000-0002-3327-3959  
FA: 0000-0001-5150-5250

## Corresponding Author

Erol Erkan  
Karatepe Mh Dr Sadık Ahmet Cd. No:3/9  
Merkez, Yozgat, Turkey  
E-mail: erolerkan@gmail.com

## Ethics Committee Approval

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All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

## Conflict of Interest

No conflict of interest was declared by the authors.

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## Abstract

**Background/Aim:** Endoscopic dacryocystorhinostomy (EDCR) has many advantages over the external method, with comparable anatomical and functional success rates. Delayed wound healing is reported to be associated with older age in previous studies. In this study, we aimed to assess the effect of age on the functional and anatomic success of our EDCR results.

**Methods:** A total of 55 patients with nasolacrimal duct obstruction (NLDO) were included in this retrospective cohort study. Patients were managed with either EDCR alone or EDCR combined with nasal septoplasty in our hospital. The patients were divided into two groups as Group 1 (20-54 years old) and Group 2 (55-77 years old) according to age.

**Results:** The mean ages of the patients in Groups 1 and 2 were 38.53 (9.55) years and 66.24 (6.36) years, respectively ( $P<0.001$ ). EDCR was performed on 30 nasolacrimal ducts in Group 1 and 38 nasolacrimal ducts in Group 2. Forty-one cases (60.3%) were managed only with EDCR, and 27 (39.7%) patients underwent septoplasty surgery in addition to EDCR due to septum deviation. There was no significant difference between the groups in terms of anatomical and functional success ( $P=0.239$  and  $P=0.233$ ).

**Conclusion:** Our results showed that comparable anatomical and surgical success rates are possible in NLDO in older patients compared with younger patients. This result may encourage surgeons with question marks about the success of the EDCR in older age NLDO patients.

**Keywords:** Endoscopic dacryocystorhinostomy, Age, Epiphora, Nasolacrimal duct obstruction

## Introduction

Recent advancements in the endoscopy systems, endoscopic intranasal imaging, and intervention capabilities make it possible to perform various open procedures with the endoscopic methods. Endoscopic dacryocystorhinostomy (EDCR) was first introduced in 1989 by McDonogh and Meiring [1] and became popular in nasolacrimal duct obstruction (NLDO) today. Indications for EDCR include primary and secondary (acquired) NLDO (trauma, nasal or sinus inflammation, surgery, neoplasm), functional outflow obstruction, and history of dacryocystitis.

In patients with nasolacrimal duct obstruction, when compared with external surgery, EDCR appears to be favorable in many ways, such as the absence of an external incision scar, shorter operative time, lower intraoperative bleeding, and rapid postoperative recovery of the orbicularis oculi muscle [2, 3].

Working with multiple instruments in a narrow surgical field requires experience. Synechia formation between the ostium and middle turbinate, orbital perforation risk, narrow surgical field due to possible nasal septum deviation, granuloma formation in the ostium, expensive equipment, and small rhinostomy are disadvantages of the endonasal method [4-7].

In this retrospective study, we evaluated our EDCR results in patients with epiphora and nasolacrimal duct obstruction. Our primary objective was to assess the effect of age on the functional and anatomic success of our EDCR operations.

## Materials and methods

Patients with a complaint of epiphora who presented to the Yozgat City Hospital otorhinolaryngology outpatient clinic between June 2017 and June 2019 were included in this study. These patients were evaluated by endoscopic nasal examination, dacryoscintigraphy, and paranasal sinus computed tomography (PNCT), and nasolacrimal lavage was performed by an ophthalmologist. Patients with ocular surface disease, appositional lid abnormalities, poor pump function, and neurogenic lacrimal hypersecretory disorders were excluded from the study. Surgical treatment was planned for patients with an obstruction in nasolacrimal lavage and lacrimal sac or a distal obstruction in dacryoscintigraphy.

Nasal endoscopy and anterior rhinoscopy were performed to evaluate the nasal cavity and identify additional nasal pathologies (nasal septum deviation, location of deviation, sinusitis, polyp, anatomical variations, anomalies, etc.). Patients were planned for a combined operation of EDCR + septoplasty if the anterior and middle parts of the nasal septum obscured the view of the surgical field on the side of the planned EDCR.

The anatomical and functional success of the performed surgery was evaluated according to the examination findings after 6 months. We used the criteria described by Olver in this evaluation [8].

Olver [8] suggested that lacrimal surgeons should consider 3 criteria for evaluating success in DCR surgery, either external or endonasal. These criteria include:

1. Evaluate the results at least 6 months after surgery and at least 3 months after tube removal.

2. Evaluate subjective success based on the patient's symptoms.

3. Anatomic success should be based on (i) patency in syringing and (ii) the presence of a functioning rhinostomy.

The latter is evaluated using the functional endoscopic dye test, which is positive when 2% fluorescein instilled in the conjunctival fornix is seen emerging from the rhinostomy a few seconds later [8].

The minimum follow-up period after surgery was 6 months. Silicone tubes were removed at the 3<sup>rd</sup> postoperative month.

All patients were informed about the procedures and possible complications were explained. Informed consent forms were obtained from the patients.

The study protocol was approved by Yozgat Bozok University Clinical Research Ethics Committee on 28 May 2020 with the decision number 2017-KAEK-189\_2020.05.28\_06 and adhered to the principles of the Helsinki Declaration.

### Surgical technique

All patients were operated under general anesthesia with the endotracheal tube out of the way of the endoscope and instruments. During the procedure, a 0-degree rigid endoscope, metal probe, punctum dilators, small forceps, 3.0 mm straight diamond burr, sickle knife, and silicone stent were used. In case of significant ipsilateral septal deviation, septoplasty was performed before EDCR with an incision contralateral to the septum deviation. A mixture of 0.0125mg/ml epinephrine and 20mg/ml lidocaine hydrochloride was diluted with saline and injected into the middle turbinate, middle turbinate adhesion, and lateral nasal wall towards the maxillary line using a dental syringe. A square incision with an edge length of 1 cm was made on the mucosa in front of the middle turbinate attachment with a sickle knife. Using the elevator, the mucosa was elevated and removed with the periosteum. Bone tissue was exposed and made visible using a diamond burr. The lacrimal canaliculus was enlarged with a punctum dilator from the lower punctum, which was first advanced vertically, then rotated horizontally and advanced until the dilator met lacrimal bone, the hard stop. The punctum dilator was again rotated vertically into the lacrimal sac. The back-and-forth movement of the dilator was visualized as tenting of the sac with an endoscope. An incision was made on the medial wall of the lacrimal sac, which was removed with forceps. After the punctum dilator was withdrawn, the silicone stent was advanced through the lower punctum into the lacrimal sac until the metal tip of the silicon stent was visualized out of the window opened in the lacrimal sac wall. Then, the silicone stent was advanced from the upper punctum and the same procedures were repeated as per the lower punctum. The metal tips of the silicone stents were cut and the two ends of the silicone tube were tied with 10 knots and secured. The operation was ended after hemostasis was achieved.

All patients were given oral amoxicillin and clavulanate combination for 5 days postoperatively. In case of penicillin allergy, clarithromycin was administered. Patients were given nasal irrigation solution or nasal spray and called for control on the 10<sup>th</sup> postoperative day. Silicone stents were removed after 3 months and followed for at least 6 months. The success rates of

the surgical procedure were evaluated at the 6<sup>th</sup> postoperative month.

**Statistical analysis**

Demographic features, postoperative complications, and surgical success rates at the sixth month were analyzed. SPSS (Statistical Package for Social Science, Worldwide Headquarters SPSS Inc.) package program (version 22.0) was used for statistical analysis. Continuous data were expressed as mean (standard deviation), and categorical data, as numbers and percentages. Chi-square test, Fisher's exact test, and Student's t-test were used for intergroup analysis. A *P*-value <0.05 with a 95% confidence interval was considered statistically significant.

**Results**

A total of 68 EDCR surgeries, 42 unilateral and 13 bilateral, were performed on 55 patients. All patients had epiphora. Five patients had a history of dacryocystitis. Fifty-one (75%) patients were female and 17 (25%) were male. A total of 68 EDCR surgeries were performed in 13 patients bilaterally (19.1%) and 42 patients (80.9%) unilaterally. The demographic characteristics of all patients are shown in Table 1.

Table 1: Demographic Data of Patients

	Value
Age, years, mean (SD)	54.01 (15.9) (20-77)
Gender, n (%)	
Female	51 (75%)
Male	17 (25%)
Surgical Side, n (%)	
Right	35 (51.5%)
Left	33 (48.5%)
Bilateral	13 (19.1%)
Medical History, n (%)	
Hypertension	21 (30.9%)
Diabetes Mellitus	6 (8.8%)
Anticoagulant/Antiplatelet Use	8 (11.8%)
Lacrimal History (n)	
Epiphora	68
Dacryocystitis	5
Punctum Injury	1

SD: Standard deviation

The mean age of the patients was 54.01 (range: 20-77) years. Since studies investigating the effect of age on EDCR results are limited, patients were divided into two groups according to age, as Group 1 (20-54 years old) and Group 2 (55-77 years old). There were 30 patients in Group 1 and 38 patients in Group 2. The mean age of Groups 1 and 2 were 38.5 (range 20-54) years and 66.2 (range 55-77) years, respectively. The two groups were similar in terms of gender and surgical side (*P*=0.163 and *P*=0.489 respectively). Forty-one cases (60.3%) were managed with EDCR alone, and septoplasty was performed in 27 (39.7%) cases additionally due to septum deviation. The postoperative complications were noted. The minimum follow-up period was 6 months. Tubes were removed at the 3<sup>rd</sup> postoperative month. Anatomical and functional success were evaluated according to the criteria described by Olver et al. (8). The overall anatomical and functional success rates were 92.7% (63 cases) and 89.7% (61 cases), respectively; while anatomical and functional failure rates were 7.3% (5 cases) and 10.3% (7 cases), respectively. In Group 1, anatomical success was achieved in 20 patients (96.7%), and functional success, in 28 cases (93.3%). There were anatomical and functional failures in 1 (3.3%) and 2 (6.7%) cases, respectively. In Group 2, anatomical and functional success were achieved in 34 cases (89.5%) and 33 cases (86.8%), respectively. In this group, there were anatomical and functional failures in 4 (10.5%) and 2

(6.7%) cases, respectively. There was no significant difference between the groups in terms of anatomical (*P*=0.239) and functional success (*P*=0.233) (Table 2 and 3).

Table 2: Surgical Data of Patients

	Patient number (n)	Percent (%)
Type of Surgery		
EDCR	41	60.3
EDCR+Septoplasty	27	39.7
Functional Outcome		
Successful	61	89.7
Unsuccessful	7	10.3
Anatomic Outcome		
Successful	63	92.7
Unsuccessful	5	7.3
Complication		
Periorbital Swelling	3	4.4
Synechia	4	5.9
Fistula	1	1.5

EDCR: Endoscopic dacryocystorhinostomy

Table 3: Demographic and Surgical Data of Age Groups

	Group 1 (20-54 years)	Group 2 (55-77 years)	<i>P</i> -value
EDCR Procedures (n)	30	38	
Age (years, mean (SD))	38.53 (9.55)	66.24 (6.36)	<0.000
Gender (n)			0.163
Female	25	26	
Man	5	12	
Surgical Side (n)			0.489
Right	14	11	
Left	16	17	
Medical History (n)			
Hypertension	5	16	0.040
Diabetes Mellitus	0	6	0.031
Anticoagulant/Antiplatelet Use	0	8	0.007
Functional Outcome			0.233
Successful	28	33	
Unsuccessful	2	5	
Anatomic Outcome			0.239
Successful	29	34	
Unsuccessful	1	4	

*P*<0.05 statistically significant

There were no major complications during and after the surgery. During follow-up, 3 patients had periorbital swelling, 4 patients had nasal synechia and 1 patient had fistula to the skin (Table 2).

There was a statistically significant increase in hypertension, diabetes mellitus, and anticoagulant/antiplatelet drug use with age (*P*=0.040, *P*=0.031, and *P*=0.007, respectively) (Table 3).

**Discussion**

EDCR is the treatment of choice in NLDO. Due to rapid advancements in endoscopic surgical instruments, comparable success rates with the external method, and other favorable features, EDCR gained popularity over the years. Anatomical success rates in EDCR range from 84 to 95% [9-13]. In our study, our anatomical success rate was 92.7% similar to the literature. Various factors that might influence the success of EDCR are largely investigated [9, 13, 14]. However, the effect of age on EDCR outcomes remains to be clarified and not much data is available.

After an anatomically successful EDCR, some patients still complain about tearing. This is called "functional failure" by experienced lacrimal surgeons [15]. The functional failure rates are reported to vary between 1.7% and 4.7% in primary EDCR and between 5% and 12% in revision EDCR [10, 11, 14]. In the retrospective analysis of 61 failed EDCR procedures performed by Baek et al., functional failure was seen in 15% of patients [12]. In this study, age and history of diabetes mellitus were significantly related to functional failure. This functional failure in elderly patients may also be associated with age-related

changes in the eyelid [9]. In our study, the functional failure rate was 10.3%, similar to the literature.

Shams et al. evaluated 65 patients (69% transnasal) with anatomical success but functional failure in a multicenter study. All cases had recurrent or permanent and symptomatic epiphora with a Munk score of 2 to 4. These patients were not resistant to lacrimal irrigation and/or had no positive endoscopic dye test results [15]. In these patients, successful treatment can be achieved with surgical methods such as eyelid tightening procedures, tightening of eyelid laxity, repeat silicone stent intubation, Lester-Jones tube, endoscopic corticosteroid application, and punctoplasty [12, 15].

Manometric measurements of lacrimal sac pressure can offer quantitative and objective information about the failure but include insertion of a catheter into the lacrimal sac which may alter the physiologic course of tear outflow [16]. According to Kamel et al. [16], positive pressure was detected in cases with epiphora and in patients with failed DCR. They also reported that the endoscopic approach is superior to external DCR in terms of manometric measurements. They concluded that the suction power of the pump mechanism is more effective after endoscopic DCR than external DCR. Detorakis et al. [17] stated that lacrimal manometry might not be an ideal indicator of physiologic outflow due to the interventional nature of the method and evaluated successful DCR patients using MRI. They found that lacrimal pump function was better preserved in endonasal DCR than external DCR.

Studies showing the effect of age on EDCR results in patients with primary nasolacrimal duct obstruction are limited. Age may affect the functional outcome by increasing comorbid problems and compromising wound healing. It should be emphasized to the lacrimal surgeon that careful preoperative examination of the eyelid, punctum, and conjunctiva before EDCR, especially in elderly patients, is imperative [9]. In a study by Cohen et al. [18], 10-year results of patients who underwent primary EDCR were examined. They concluded that advanced age, smoking, postoperative epiphora, and male gender were associated with long-term failure. Patients should be informed that the rate of failure is higher in this group of patients [18].

Zenke et al. [19] and Dolmetsch et al. [20] stated that there was no significant relationship between age and EDCR success, but included all primary, congenital, and revision EDCR patients in their studies. Jae et al. [21] analyzed the effect of age on 441 EDCR patients. They did not find any significant difference between the groups in terms of anatomical success but reported that functional success was significantly lower in the older group. Mak et al. [22] evaluated the prognostic factors of 83 patients who underwent primary EDCR. In this study, he suggested that young patients had a higher failure rate, and this may be related to a higher degree of fibrosis. The unsuccessful group in this study included a total of 5 patients, which may be interpreted as an insufficient number of subjects.

Kim et al. [23] compared the success rates of only silicone tube intubation with the combination of conjunctival resection and silicone tube intubation in patients with nasolacrimal duct obstruction. It was concluded that performing resection for the relaxed plica semilunares increases the success of silicone tube intubation. They interpreted the reduction of tear

meniscus height and area as the success of the resection procedure. According to this study, it may be beneficial to correct the eyelid and conjunctival problems in combination with EDCR to increase anatomical and functional success in the treatment of epiphora in elderly patients.

The reported rate of concomitant EDCR and septoplasty ranges from 11.9 to 57% [11, 24-31]. Per the literature, 39.7% of our cases were managed with a combined procedure. Koval et al. [25] postulated that as an adjunctive procedure performed to facilitate the main procedure, septoplasty does not affect EDCR results. However, some articles are reporting that sinonasal anomalies might influence the surgical results of EDCR [26, 30].

Miyake et al. [32] investigated the quality of life using Sino-Nasal Outcomes Test (SNOT)-22. They reported well tolerance of EDCR and after 30-90 days of surgery, nasal symptoms associated with quality of life did not show any decline. The concomitant performance of septoplasty in the setting of asymptomatic septal deviation did not confer any benefit in terms of symptoms of nasal obstruction.

The strength of this study is that all patients had the same surgery for NLDO treatment, and two experienced surgeons took part in the operation at the same time. Also, we excluded patients with lid abnormalities, which increase the homogeneity of our patient group in terms of epiphora etiology. None of our patients underwent surgery for the eyelid and conjunctiva.

Our results show that EDCR is an effective and reliable procedure without major complications or an incision scar that will cause cosmetic problems on the face. EDCR increases patient's quality of life in the treatment of NLDO. A careful nasal examination is imperative in NLDO. Septoplasty should be performed before EDCR in patients with septal deviation and NLDO. Our results indicate that age does not affect EDCR results in terms of anatomical and functional success.

### Limitations

The relatively small size of our patient group can be a limitation to our study.

### Conclusion

Our results indicate that age does not affect EDCR results in terms of anatomical and functional success. We can propose that surgeons with doubts of success in older NLDO patients can perform EDCR either alone or combined with septoplasty with similar success rates to those of younger NLDO patients. Future studies with a larger group of patients might better establish the exact relationship between age and EDCR results.

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