

# External Versus Endoscopic Dacryocystorhinostomy Regarding Complications and Outcomes-A Comparative Retrospective Study

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## Abstract

**Aim:** To compare external dacryocystorhinostomy (DCR) and endoscopic approaches in terms of success rate and complications.

**Methods:** In this randomized, interventional, comparative study, ninety-four patients (108 surgeries) participated in this study, 58 cases of endoscopic dacryocystorhinostomy and 50 cases of conventional external dacryocystorhinostomy were performed between December 2013 and December 2016 in the Ophthalmology department and in association with the Otorhinolaryngology department in "Diwaniya" teaching hospital in Iraq. All the patients had detailed general medical and ocular history, and they also underwent ocular and ENT examinations to exclude any nasal pathology. The level of blockage was diagnosed by lacrimal syringing and probing. Surgery was done under general anesthesia using a hypotensive technique in all patients, and the surgical outcomes and both intra and post-operative complications were analyzed.

**Results:** Ninety-four patients (32 males and 62 females; mean age, 56 years) underwent 108 dacryocystorhinostomy surgeries for acquired Nasolacrimal duct obstruction. The success rate associated with the endoscopic procedure was higher than that associated with the external approach [53 (91.4%) versus 41 (82.0%)]]; however, the difference was not statistically significant ( $p=0.148$ ). Moreover, the success rate was even better following revision in both surgical procedures [55 (94.8%) versus 42 (84.0%)] and was much better with endoscopic type and showing a nearly significant value ( $P=0.064$ ). The odds ratio and 95 % confidence interval were 3.49 and (0.87-13.97), respectively, which seems to demonstrate that endoscopic surgery is associated with approximately 3.5 times better successful rate in comparison with open surgery. The patients that wished to perform surgical intervention for the other eye were associated significantly more with the endoscopic procedure compared with the open procedure [54 (93.1%) vs. 40 (69.0%), respectively, ( $P=0.043$ ), OR=3.38, 95% CI (0.99-11.54)]

**Conclusion:** The endoscopic approach offered a better operation success rate for acquired Nasolacrimal duct obstruction compared with an external approach.

**Keywords:** Nasolacrimal duct obstruction; External dacryocystorhinostomy; Endoscopic dacryocystorhinostomy.

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## Introduction

Primary acquired nasolacrimal duct obstruction (NLDO) is a common cause of watery eye in the adults, and it is more common in females [1-2].

Secondary acquired lacrimal drainage obstruction can result from many causes like infectious, inflammatory, neoplastic, traumatic or mechanical causes as well as bacteria, viruses, fungi and parasites. Inflammation can occur due to endogenous sources (e.g., Wegener's granulomatosis), exogenous sources (e.g., radiation or systemic chemotherapy) or may be due to cancer-like primary growth or secondary or metastatic spreading [2].

Trauma can also cause obstruction and can be iatrogenic or accidental. Mechanical lacrimal drainage obstruction can be caused by the presence of lacrimal sac foreign bodies, like dacryoliths or casts

[2]. Dacryocystorhinostomy (DCR) is the therapy of choice for most patients with acquired NLD obstruction. Usual indications or such modality include recurrent dacryocystitis, chronic reflux of mucous, painful swelling of the lacrimal sac and unremitting epiphora. For patients with dacryocystitis, infection should be treated, if possible, before dacryocystorhinostomy is done.

Although there are many minor variations in surgical technique, all share the feature of creating an anastomosis between the lacrimal sac and the nose through a bony ostium. The most important differential step between the two techniques is whether the surgeon uses an intranasal approach or an external (transcutaneous) approach [3].

External dacryocystorhinostomy is usually performed by a standard skin incision, followed by bone removal and an anastomosis formed by the connection of nasal and lacrimal sac mucosa. Major complications



include an ugly skin scar over the incision, infection, trauma to the medial canthal ligament and epistaxis [4].

The endoscopic surgical technique was less popular and helpful before the use of modern technical devices used to visualize the endo-nasal anatomy.

Since the 1990s, endoscopic techniques with the help of modern endoscopic devices have become popular for the treatment of nasolacrimal duct obstructions, both for primary and revision cases [4]. Advantages of the endoscopic approach include no skin scar as well as less risk of skin infections and other complications.

The aim of this study was to compare the success rate and advantages of both external dacryocystorhinostomy and endoscopic dacryocystorhinostomy regarding patency rate, patient preference and surgery complications.

## Methods

This study was conducted in Department of Ophthalmology at the Diwaniya teaching hospital (Iraq) in conjunction with the Department of Otorhinolaryngology from December 2013 to December 2016.

A total of 58 consecutive mechanical endoscopic dacryocystorhinostomy and 50 conventional external dacryocystorhinostomy cases were included in the study. Before surgery, all patients underwent a complete eye exam including slit lamp examination to exclude congenital punctual anomalies. Irrigation of the nasolacrimal drainage system was also performed with a fluorescein dye, and the patients were then sent to the ENT department for pre-operative naso-scope evaluation to exclude intranasal pathology that may require septo-plasty.

All patients were followed up at 2 weeks, 6 weeks, 12 weeks and 6 months. Patency was checked objectively by syringing the sac for external dacryocystorhinostomy and by both sac syringing and nasoscope exam of the stoma for endoscopic dacryocystorhinostomy. The outcome of the external and endoscopic dacryocystorhinostomy operations were categorized into complete cure or no improvement according to the symptomatic relief following operation.

Endoscopic dacryocystorhinostomy was performed by an otolaryngologist and an ophthalmologist under general anesthesia by using standard functional endoscopic sinus surgery (FESS) instruments.

Standard external dacryocystorhinostomy surgery was performed under general anesthesia by an ophthalmologist. A vertical skin incision was made nasally to the medial canthus tendon. The periosteum at the anterior lacrimal crest was also incised, and the lacrimal fossa was entered. Parts of the lacrimal and maxilla bones were removed to create a large opening, and mucosal flaps were sutured. Silicone tubes passed through the puncta and the rhinostomy opening and were tied in the nose, followed by standard skin closure.

Post-operative care after both types of surgeries included systemic antibiotics and a combination of antibiotic-steroid eye drops.

Patients were followed up and examined at the first postoperative week, then after one month. The silicone tubes were removed at six months, and the final check-up was performed one year from the surgery to assess the success rate of the operation.

## Results

The mean age and distribution of the patients are shown in the

table [Table 1]. The age of the patients undergoing external surgery ranged from 33 to 72 years and that of patients undergoing endoscopic surgery ranged from 23 to 77 years. There was no significant difference in mean age of patients and control groups [50.88±10.99 years versus 47.36±12.48 years, respectively ( $P=0.126$ )], as shown in table [Table 1]. The first group included 17 (34.0%) male and 33 (66.0%) female patients, respectively, whereas the second group included 15 (25.9%) male and 43 (74.1%) female patients, respectively. There was no significant difference between the two gender groups ( $P=0.066$ ), as shown in the table [Table 1]. These findings ensure age and gender matching between patients and control groups, which is a pre-requisite for this case-control study.

Where: n is number of cases; † is Independent samples t-test; ¥ is Chi-Square test; and NS is not significant.

The success rate associated with the endoscopic procedure was higher than that associated with the external approach [53 (91.4%) vs. 41 (82.0%)]; however, the difference was not statistically significant ( $p=0.148$ ), but patients subjected to endoscopic surgery had a 2.33-fold better chance of obtaining a successful operation than those undergoing external surgery (95% CI between 0.72 and 7.47). Moreover, the success rate was even better following revision in both surgical procedures [55 (94.8%) versus 42 (84.0%)] and was much better with endoscopic surgery, exhibiting a borderline significance level of  $p=0.064$ ; the odds ratio and 95% confidence interval were 3.49 and (0.87-13.97), respectively, suggesting that the endoscopic approach is associated with an approximately 3.5-fold better success rate compared with the open approach.

The most striking finding was that complications in the form of hemorrhage were greatly reduced in the case of endoscopic surgery compared with open surgery [8 (13.8%) vs. 23 (39.7%)], and the difference was highly significant ( $p<0.001$ ). In terms of the odds ratio, the endoscopic surgery reduced the risk of hemorrhage by 81% [OR of 0.19; 95% CI of (0.07-0.48)]. On the other hand, patients who wish to perform surgical intervention for the other eye were associated significantly more with the endoscopic approach than the open procedure [54 (93.1%) vs. 40 (69.0%), respectively ( $p=0.043$ ), OR=3.38; 95% CI of (0.99-11.54)], as shown in table [Table 2].

Where: † is Patient's wish to do surgery to other eye; n is number of

**Table 1:** Mean age and distribution according to gender.

Characteristic	External n=50	Endoscopic n=58	P
Age			
Mean±SD years	50.88 ±10.99	47.36±12.48	0.126†
Range (min.-max.) years	39 (33-72)	54 (23-77)	NS
Gender			
Male, n (%)	17 (34.0%)	15 (25.9%)	0.066¥
Female, n (%)	33 (66.0%)	43 (74.1 %)	NS

**Table 2:** Outcome and complications associated with both surgical types.

Characteristic		Endoscopic	External	P	Odds Ratio (95 % CI)
		n=58	n=50		
Outcome	Success	53 (91.4%)	41 (82.0%)	0.148	2.33 (0.72-7.47)
	Failure	5 (8.6%)	9 (18.0%)	NS	
Revision outcome	Success	55 (94.8%)	42 (84.0%)	0.064	3.49 (0.87-13.97)
	Failure	3 (5.2%)	8 (16.0%)	NS	
Complication	Hemorrhage	8 (13.8%)	23 (39.7%)	<0.001	0.19 (0.07-0.48)
	No	50 (86.2%)	27 (46.6%)	HS	
Wish†	Yes	54 (93.1%)	40 (69.0%)	0.043	3.38 (0.99-11.54)
	No	4 (6.9%)	10 (17.2%)	S	



cases; NS is not significant; HS is highly significant; S is significant; and CI is confidence interval.

## Discussion

External DCR has been the first choice for surgeons in the treatment of acquired NLDO for many years since it offers a high success rate and direct visualization of the surgical field. Limitations like scar formation in the face, which is cosmetically unacceptable, and medial canthal injury, which interrupts the normal pump physiology, aid in the development of the endoscopic technique [5].

The main advantages of the endoscopic technique are the lack of skin incision, which is a great advantage especially in young female patient and also in dark-skinned individuals who have a higher risk for scar formation; preservation of lacrimal pump mechanism, since the medial canthal tendon is preserved in the endoscopic technique, and the orbicularis muscle is not touched; shorter rehabilitation time and early recovery from the surgery; reduced risk for postoperative complications like hemorrhage; and other rare but serious complications like CSF rhinorrhea, subcutaneous emphysema, orbital fat prolapse, and medial rectus muscle injury [6]. Although, the endoscopic technique has some limitations, including expensive instrumentation, long time of surgery, slow learning curve with a long training requirement compared with the external approach and the inability to visualize the sac correctly and remove mass completely like in tumor cases [7-10].

The external approach is technically easier than the endoscopic approach with direct visualization of the surgical field, which assists in the formation of a large bony opening with less risk of closure. It also assists in the good epithelization of the newly formed duct since an epithelial flap is usually made in the external approach with the ability to take a biopsy and remove any mass completely. Also, a recent study suggests that tumor suspicion is a contraindication for the endoscopic approach [11]. In our study, the most common complication encountered was hemorrhage. It was more common in the external approach than the endoscopic one, since it is a minimum invasive technique, and otolaryngologists are more familiar with the anatomy of the nose and use cautery more than ophthalmologists. Hemorrhaging was lower in endoscopic surgery (13.8%) vs. 23 (39.7%) external surgery, and the difference was highly significant ( $P < 0.001$ ). In terms of odds ratio, the endoscopic surgery reduced the risk of hemorrhage by 81% [OR of 0.19; 95% CI of (0.07-0.48)]. Other risk factors—for example the risk for hemorrhage like Ischemic heart disease and DM—were not investigated in the study. A large group study with all risk factors included is needed to assess the difference more accurately.

Success in surgery is defined as both anatomical patency of the nasolacrimal duct (objective form), which is represented by a positive irrigation test, and symptom relief in the patient (subjective form), which is represented by a mean absence of epiphora after the surgery. Both objective and subjective forms should be present to label the surgery a success. The success rate associated with the endoscopic procedure was higher than with the external approach [53 (91.4%) vs. 41 (82.0%)]; however, the difference was not statistically significant ( $p = 0.148$ ).

Similar studies have shown rates of success for endoscopic surgery that vary from 63% to 99%, and some show that it was more successful than the external approach [12,13]. Although in 2001, the American academy reported that it is difficult to obtain an evidence-based determination about the relative efficacy of both approaches due to a lack of studies [11].

Revision can be done for both the external and endoscopic approach in terms of both objective and subjective forms usually after one year of follow up. Also, the success rate of the revision was higher in the endoscopic type than the external approach (94.8% vs. 84.0%). Success rates reported in the literature range from 70-90% using single revision [14-15].

Pitfalls of our study were the lack of a good follow-up schedule for the patients in the first year after the surgery. Some patients were delayed in showing up for the follow-up visit for months. Also, some studies show that regular cleaning of the osteotomy site during follow-up visits would increase the success rate. In addition, there was no standard size for the osteotomy between patients. This might affect the result of the surgery, and a long follow-up time schedule (e.g., more than 1 year) might affect the success rate of the study. Such follow-up times are needed in future studies.

Endoscopic dacryocystorhinostomy is a simple, minimally invasive technique for resolution of acquired NLDO in adults. It presented a higher success rate than the ordinary external approach in our study with a lower rate of complications. Revision can be done easily with a higher success rate. Patient preferences were also taken into consideration while deciding the type of surgery to perform. The endoscopic approach yields a combined work between ophthalmologists and otolaryngologists for optimum management of patients with acquired NLDO.

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