https://doi.org/10.29309/TPMJ/2025.32.05.8884

The Professional Medical Journal
www.theprofesional.com
2025, Volume, 32 Issue, 05

ORIGINAL ARTICLE

A comparative analysis: Success rates of Endoscopic Endonasal versus External Dacryocystorhinostomy with silicon tube.

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Article Citation: Khalid A, Saleem Q, Sultan S. A comparative analysis: Success rates of Endoscopic Endonasal versus External Dacryocystorhinostomy with silicon tube. Professional Med J 2025; 32(05):558-564. https://doi.org/10.29309/TPMJ/2025.32.05.8884

ABSTRACT… Objective: To compare the anatomical and functional outcomes of EE-DCR and E-DCR with silicon tube. **Study Design:** Retrospective Cohort study. **Setting:** Ziauddin Hospital, Karachi. **Period:** 1st July 2019 to 30th June 2024. **Methods:** A total of 140 patients were included, divided into two groups of 70 each, EE-DCR and E-DCR. Inclusion criteria were patients aged 18-70 with nasolacrimal duct obstruction and a follow-up of at least one year. Data was analyzed using SPSS version 23, with significance level of $p < 0.05$. Outcomes such as nasolacrimal duct patency and symptom improvement were assessed during follow-up at 1st day, 1st week, 1st month, 3rd month, 6th month and 1 year. **Results:** The mean age of patients was seen as 42.43 ± 10.9 years in EE-DCR and 49.00 ± 9.01 years in E-DCR group. Anatomical success rates for both groups at 3, 6 and 12 months were comparable, with no statistically significant difference (p-value > 0.05). At 3rd month, 87.14% of the EE-DCR patients and 91.43% of E-DCR patients showed nasolacrimal duct patency. Similarly, functional success rates were assessed showing 84.29% of EE-DCR and 87.14% of E-DCR patients were symptom- free at 3rd month. **Conclusion:** Both EE-DCR and E-DCR are effective treatments for nasolacrimal duct obstruction. EE-DCR offers advantages like faster recovery and fewer complications, while E-DCR remains reliable for complex cases.

Key words: Dacryocystitis, External Dacryocystorhinostomy, Endonasal Endoscopic Dacryocystorhinostomy.

INTRODUCTION

Dacryocystorhinostomy (DCR) is a well-established and effective surgical procedure for the treatment of blocked nasolacrimal duct offering significant relief and improved quality of life for patient.[1] In this procedure an alternative functional pathway was established from the canaliculi to nose by performing an osteotomy and connecting the nasolacrimal sac to the nasal cavity.[2] DCR can be approached in different technique, each with its own advantages and disadvantages.[3] The external approach is invasive but has a high success rate, although it comes with longer recovery time.[4] The internal approach can be performed using either an Endonasal endoscopic or a trans-canalicular technique. Both of these techniques are less invasive, with short recovery times, and leave no external scars, but they require specialized expertise and instruments.[5] External DCR (E-DCR) is considered gold standard procedure because of its high success rate and easy visualization of lacrimal sac and nasolacrimal duct. This procedure can be performed under general anesthesia or local anesthesia. A small curvilinear incision, 10-12 mm in length, will be made on the side of nose 3-4 mm away from the inner canthus. The skin and underlying tissue carefully dissected, and lacrimal sac is reflected laterally, exposing the lacrimal fossa. After exposing the lacrimal fossa, an artificial communication pathway is established between nasolacrimal sac and nasal cavity by creating an ostium. The silicone tube was inserted through the both puncti, tied into the nasal cavity and removed after 3 months.[6] The internal approach is Endonasal Endoscopic DCR (EE-DCR). This procedure involves the use of a video-assisted endoscope to visualize the nasal mucosa, allowing the creation of a nasal flap.

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Article received on: 18/01/2025
Accepted for publication: 27/03/2025

Subsequently, an ostium was formed into the lacrimal bone to expose the lacrimal sac. The lacrimal sac was opened with a relaxing incision; additionally a silicon tube inserted through the upper and lower puncta, passing through the ostium and then tied into the nose.[7] The EE-DCR is less invasive procedure with an early recovery time and a high success rate.[8] Both the procedures aim to alleviate symptoms of nasolacrimal duct obstruction and improve tear drainage with choice depending on patient's individual factors and surgeon recommendation.[9]

The aim of our study is to compare the anatomical and functional outcome of EE-DCR versus E-DCR with tube.

METHODS

This research was conducted as retrospective Cohort study at Ziauddin Hospital Kemari, Karachi. The study duration encompassed the collection of data from hospital record over the previous 5 years, from July 1st 2029 to June 30th 2024.

An ethical approval was obtained from the institutional committee prior to initiation of data collection from hospital records. The reference code for this ethical approval was 9330924AKOPT, dated October 28, 2024. For sample selection we used non-purposive sampling technique and sample size was calculated by using formula

$$n = (Z\alpha/2+Z\beta)^2 \times (p^1 \times (1-p^1) + p2 \times (1-p^2)\ (p^1-p^2)^2$$

Zα/2 is the Z-score corresponding to the desired level of significance (1.96 for a 95% confidential interval. The minimum required sample size was calculated to be 70 in each group. This study employed specific inclusion and exclusion criteria to ensure a relevant patient population. The inclusion criteria comprised patient's age 18- 70 years diagnosed with nasolacrimal duct obstruction, common canalicular obstruction and acute or chronic Dacryocystitis. Additionally, only patients with complete ophthalmology and ENT medical record encompassing preoperative, Operative and postoperative information with a follow up period of at least 1 year were considered. Conversely, patients were excluded from the study if they had incomplete record, any failed endoscopic (EE-DCR) or external DCR (E-DCR), lacrimal tumor or trauma, ensuring a focused analysis on the targeted condition. This study was included140 patients, with data gathered from hospital records. All eligible patients were divided into 2 groups with 70 in each: Group A, which included patients who underwent EE-DCR with silicon tube and Group B, which included patients who underwent E-DCR with silicon tube. Collected data included pre-operative assessment, surgical details, and post- operative assessment on each follow up visits till 1 year after surgery. All data relevant to ENT examination was analyzed as well. Data from follow-up visits were collected for the 1st post-operative day, followed by 1st week, 1st month, 3rd month, 6th month and 1 year post -surgery. Information regarding the removal of silicone tube was also collected. At each follow-up, patients were examined by both an ophthalmologist and an ENT surgeon to evaluate the anatomical (objective) and functional (subjective) outcomes of surgery. Data from follow-up appointments were collected for the first postoperative day, followed by visits at the first week, first month, three months, six months, and one year post-surgery. Information regarding the removal of the silicone tube was also gathered. Objective outcomes were assessed by probing and syringing at the 3rd, 6th and 12th months to analyze the patency of nasolacrimal duct and ostium size was evaluated through endoscope. Subjective outcome were evaluated based on modified Lirket scale for epiphora throughout the follow-up period. A score 1 indicate no symptoms, 2 represented significant improvement, 3 slight improvement, 4 no improvement and 5 worsening of symptoms. Score 2, 3, 4 were considered failed DCR.[10] The data were analyzed using SPSS version 23. Quantitative variables, such as age, gender, and operation duration and recurrence rates were presented as mean ± standard deviation. Qualitative variables, like symptoms were presented as frequency and percentage. Comparison of outcome between the two treatments at each follow up was analyzed through Chi-Square Test with p value < 0.05.

RESULTS

The total number of participants in the study was 140, selected based on specified inclusion criteria. These participants were divided into two equal groups, with 70 participants in each group: one group underwent EE-DCR surgery and other E-DCR surgery. The mean age of patients in the EE-DCR group was 42.43±10.9 years and E-DCR group was 49.00± 9.01 year.

The highest number of surgeries was performed in the 31-40 year age group: 31 EE-DCR and 13 E- DCR. Younger age group, particularly 20-30 year, favored EE-DCR, while older age group 40-70 showed preference for E-DCR. Overall, EE-DCR was more common in younger individual and E-DCR in older individual. The number of men was approximately 36.4%, while women accounted for 63.6%. The men to women ratio were approximately 1:2, which reflect higher incidence of Dacryocystitis in females. In this study, 56 (40%) surgeries were performed on right eye and 84 surgeries on left eye (60%). Among the right eye surgeries, 31 received EE-DCR and 25 E- DCR, while for the left eye, 39 patients underwent EE-DCR and 45 underwent E-DCR. In the study, 63 (45%) patients presented with purulent discharge of which 36 underwent EE-DCR and 27 had E-DCR surgery. Another 63 patients (45%) presented with mucous/ watery discharge, 25 were treated with EE-DCR and 38 with E-DCR. 14 Patients (10%) with painful swelling underwent 9 EE-DCR surgeries and 5 E-DCR. The mean duration of EE-DCR surgeries was 1.63± 0.59 hour and E-DCR was approximately 2.05 ± 0.50 hour. The data showed the frequency of post-operative symptoms day after surgery. Pain was reported by 3 patients (4.3%) in EE-DCR and 2(2.9%) in E-DCR. Watering was observed in 3 patients (4.3%) in EE-DCR and 4 (5.7%) from E-DCR. The most common symptom was bleeding, affecting 9 patient's (12.9%) in EE-DCR and 11 patients (15.7%) in E-DCR. The majority of patients had no symptoms, 47 (67.1%) for EE-DCR and 36 (51.4%) for E-DCR.

The anatomical outcomes at 3rd month, 6th month and 1 year follow-up were compared for both EE-DCR and E-DCR using Chi-square Test (Table-I). Both groups showed high success rates for nasolacrimal duct patency at 3rd month with slightly higher frequency in E-DCR (91.43%) as compared to EE-DCR (87.14%). The difference was not statistically significant (p-value = 0.585). The 6th month and 1 year follow up showed similar results with 87.14% in E-DCR and 84.29% in EE-DCR. Results were not statistically significant at p-value = 0.809, suggesting that both methods were equally effective in maintaining nasolacrimal duct patency.

The Functional outcomes of EE-DCR and E-DCR were assessed at 3rd month, 6th month and 1 year follow up, based on the absence of symptoms using Chi- square tests (Table-II). At 3rd month, the success rates of both were not statistically significant, p-value= 0.30, with E-DCR having a relatively higher success (87.14%) as compared to EE-DCR (84.29%). Both the 6th month and 1 year follow up showed similar results with 84.29% in E-DCR and 81.34% in EE-DCR. There was no statistically significant difference with p-value=0.17. This suggests that both methods were equally effective in resolving symptoms such as watering or discharge.

The complication rates between EE-DCR and E-DCR were compared at 1st day post-op and 1st week post- op. (Table-III). Nasal bleeding was 2 (2.8%) in EE-DCR and 11 (15.7%) in E-DCR at 1st day post-op. It decreased significantly to 0 (0%) in EE-DCR and 4 (4.3%) in E-DCR by 1st week follow-up. The occurrence of infection was assessed similarly with 0 (0%) in both EE-DCR and E-DCR at 1 day post-op and increased to 3(4.3%) in E-DCR at 1st week a significantly higher rate of infection. Wound dehiscence was assessed at 1st month follow up with 0 (0%) in EE-DCR and 2 (2.8%) in E-DCR. Keloid formation was 0(0%) in EE-DCR as compared to 1 (1.4%) in E-DCR. This suggests that EE-DCR had fewer complications overall.

The complication rates of EE-DCR and E-DCR were compared at 3rd, 6th month and 1 year follow-up (Table-IV). Synechiae was observed at 3rd month with 5 (7.1%) in EE-DCR and 3 (4.3%) in E-DCR. The 6th month and 1 year follow-

up showed similar results with 7 (10%) in EE-DCR and 4 (5.7%) in E-DCR. Granulomas were assessed at 3rd month with 1 (1.4%) in EE-DCR and 2 (2.8%) in E-DCR. The 6th month and 1 year follow-up showed results with 1 (1.4%) in EE-DCR and 3 (4.3%) in E-DCR. Stenosis was also assessed with 3 (4.3%) in EE-DCR at 3rd month, 6th month and 1 year follow-ups. Stenosis in E-DCR was seen as 1 (1.4%) at 3rd month and 2 (2.8%) at both 6th month and 1 year follow-ups.

DISCUSSION

Dacryocystorhinostomy (DCR) remains the gold standard surgical procedure for treating nasolacrimal duct obstruction.[11] Over the years, both external (E-DCR) and endoscopic (EE-DCR) technique have evolved and offering distinct advantages and challenges.[12] While E-DCR is well-established for its direct approach and long term success, the minimally invasive nature of EE-DCR has gained attention for its reduced recovery time and improved the cosmetic outcomes.[13] However, despite the growing preference for EE-DCR, comparisons in term of functional outcomes, complication rates and long term success rate between the two techniques remain under investigation.[14]

Time Interval	Surgery Type	Open (n)	Closed (n)	P-Value	Significant Difference
3rd Month	EE-DCR	61(87.14%)	9 (12.8%)	0.585	None
	E-DCR	64 (91.4%)	6 (8.5%)		
6th Month	EE-DCR	59(84.29%)	11(15.7%)	0.809	None
	E-DCR	61(87.14%)	9 (12.8%)		
12th month	EE-DCR	59(84.29%)	11(15.7%)	0.809	None
	E-DCR	61(87.14%)	9 (12.8%)		

Table-I. Comparison of Anatomical success rates of both groups at 3rd month, 6th month and 1 year follow-up.

Time Interval	Surgery Type	No- symptoms	Watering/ discharge	p-value	Significant difference
3rd month	EE-DCR	59 (84.29%)	11 (15.7%)	0.30	0.584
	E-DCR	61(87.14%)	9 (12.8%)		
6th month	EE-DCR	57 (81.34%)	13(18.5%)	0.17	0.683
	E-DCR	59 (84.29%)	11(15.7%)		
12th month	EE-DCR	57(81.34%)	13 (18.5%)	0.17	0.683
	E-DCR	59 (84.29%)	11(15.7%)		

Table 2: Comparison of Functional success rates of both groups at 3rd month, 6th month and 1 year follow-up.

Complication	Time Interval	EE-DCR (n=70)	E-DCR (n=70)
Nasal bleeding	1st post –operative day	2 (2.8%)	11 (15.7%)
	1st post –operative week	0 (0%)	4(4.3%)
Infection	1st post –operative week	0 (0%)	0 (0%)
	1st post –operative week	0 (0%)	3 (4.3%)
Wound dehiscence	1st post –operative month	0 (0%)	2 (2.8%)
Keloid formation	1st post –operative month	0 (0%)	1(1.4%)

Table-III. Comparison of complications between EE-DCR and E-DCR at 1st day and 1st week post-op.

Complication	Time Interval	EE-DCR (n=70)	E-DCR (n=70)
Synechiae	3rd month	5 (7.1%)	3(4.3%)
	6th month	7 (10%)	4 (5.7%)
	12th month	7 (10%)	4 (5.7%)
Granuloma	3rd month	1 (1.4%)	2 (2.8%)
	6th month	1(1.4%)	3(4.3%)
	12th month	1 (1.4%)	3(4.3%)
Stenosis	3rd month	3 (4.3%)	1 (1.4%)
	6th month	3(4.3%)	2 (2.8%)
	12th month	3(4.3%)	2 (2.8%)

Table-IV. Comparison of complication between EE-DCR and E-DCR at 3rd month, 6th month and 1 year follow-up.

Our research explores the functional outcomes and complications associated with both E-DCR and EE-DCR, aiming to provide valuable insights for optimizing patient care and surgical decisions.

In the Egyptian study, the right eye was more commonly affected 53.3% than the left eye 33.3%. The successful surgical outcome at 6 month was 92.4% for endoscopic DCR and 85.4% for external DCR, showing no significant difference (P= 0.604).[15]

A Turkish prospective study analyzed outcome of endoscopic versus external DCR. The mean age of patients was 53.14± 3.41 year in external DCR and 52.05±2.15 year in endoscopic DCR. The success rate for E-DCR was 92.3% versus 91.1% for E-DCR. Patient satisfaction was higher with EE-DCR due to the absence of visible scars compared to 17% in E-DCR.[16]

Indian population based study had a mean age of 34.34±6.65 years, with female predominance 72% and right sided predilection 66%. The operation time was significantly shorter for EE-DCR (46.60±8.63 minutes) compare to E-DCR (117± 14.43 minutes) p value < 0.0001. The fewer postoperative complication seen in EE-DCR p= 0.00085. Although E-DCR had a higher success rate, the difference was not statistically significant p= 0.22144.[17]

In Pakistani article anatomical success rate was 83.33% for EE-DCR and 90% for E-DCR, while functional outcome was 76.67% for EE-DCR and 73.33% for external DCR. No statistically significant difference was observed in the short-term success between the two groups.[18]

In study conducted in Iran which included 803 patients, 77% underwent E-DCR and EE-DCR 23%. The mean age for the E-DCR was 40.8± 14.2 years, while the EE-DCR had mean age of 34.3± 9.2 years. The success rate between the two groups was showing no statistically significant difference with 92.4% in E-DCR and 91.1% in EE-DCR.[19]

Our study showed that at 3 month follow up, the anatomical success rates was 91.43% for E-DCR and 87.14% for EE-DCR (p= 0.585). At 6 month and 1 year, the rate were 87.14% for E-DCR and 84.29% for EE-DCR (p=0.808). Functional success at 3 month was 87.14% for E-DCR and 84.29% for EE-DCR (p= 0.30), while at 6 month and 1 year, functional success was 84.29% for E-DCR and 81.34% for EE-DCR (p= 0.17). Both methods demonstrated high success rate with no statistically significant differences. Our study compared complication rates between EE-DCR and E-DCR at 3 month, 6th month and 1 year. Synechiae were more common in EE-DCR (7.1% at 3rd month, 10% at 6th month and 1 year) compare to E-DCR (4.3% at 3 month, 5.7% at 6 month and 1 year). Granuloma were observed in both groups but occurred more frequently in E-DCR at the later follow up. Stenosis rates were similar for both procedures, with EE-DCR showing a consistent 4.3% at all follow-ups, while E-DCR had a slight increase over time. These results suggest that both methods are equally effective in long term success and complication. The choice between the two procedures should be based on patient specific factors, such as anatomical consideration and surgeon expertise. Further studies with large sample size and longer follow up period may clarify subtle differences and guide clinical decision making in the management of lacrimal drainage system obstruction.

CONCLUSION

In conclusion, both EE-DCR and E-DCR are effective surgical options for treating nasolacrimal duct obstruction, but each approach has distinct advantages and limitation. Endoscopic DCR, with its minimally invasive nature, offers the benefit of no visible scarring, reduce postoperative discomfort and a quicker recovery time. It is especially beneficial in patients with minimal or no anatomical nasal deformities, offering improved cosmetic outcome to the patient. However, EE-DCR requires high level of technical skill and expertise, while E-DCR is reliable option for more complex cases.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Amber Khalid:** Patient managemenet and counseling collected, analyszed and interpreted the patients data and major contributor in writing the manuscript and statistical analysis.
2	**Quratulain Saleem:** Literature search and references.
3	**Sharjeel Sultan:** Proof reading of manuscript and data collection.