

Research Article

Predictors of Surgical Success Following Endoscopic Dcr a Prospective Cohort Study

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ABSTRACT

Background: Endoscopic dacryocystorhinostomy (DCR) has become the preferred surgical treatment for primary acquired nasolacrimal duct obstruction because of its high success rate and minimal morbidity. However, identifying factors that influence surgical outcomes remains essential for improving patient care.

Aims: To evaluate the predictors of surgical success following endoscopic DCR and determine the clinical and intraoperative factors associated with favorable postoperative outcomes.

Materials and Methods: This prospective cohort study was conducted in the Department of ENT, Sri Chamundeshwari Medical College Hospital and Research Institute, Channapatna, over a period of six months. Sixty patients with primary acquired nasolacrimal duct obstruction underwent endoscopic DCR. Demographic, clinical, intraoperative, and postoperative variables were recorded and analyzed using appropriate statistical tests.

Results: The overall surgical success rate was 90.0%. Advanced age, diabetes mellitus, chronic rhinosinusitis, and prolonged symptom duration were significantly associated with surgical failure ($p < 0.05$). Adequate osteotomy, complete lacrimal sac exposure, and mucosal flap preservation significantly improved surgical success, while granulation tissue, synechiae, and rhinostomy restenosis were major predictors of failure.

Conclusion: Endoscopic DCR is a highly effective procedure with excellent outcomes. Careful patient selection, meticulous surgical technique, and appropriate postoperative follow-up significantly improve long-term anatomical and functional success.

Keywords: Endoscopic Dacryocystorhinostomy, Primary Acquired Nasolacrimal Duct Obstruction, Surgical Predictors, Epiphora, Lacrimal Drainage Obstruction, Surgical Outcome.

INTRODUCTION

Primary acquired nasolacrimal duct obstruction (PANDO) is a common disorder of the lacrimal drainage system characterized by chronic epiphora, recurrent dacryocystitis, and significant impairment in patients' quality of life. The condition occurs due to progressive obstruction of the nasolacrimal duct, leading to stagnation of tears and secondary infection. Dacryocystorhinostomy (DCR) remains the definitive treatment for symptomatic obstruction by creating a direct communication between the lacrimal sac and the nasal cavity. Over the past two decades, endoscopic dacryocystorhinostomy (Endoscopic DCR) has gained widespread acceptance as an effective alternative to the conventional external approach because it avoids facial scarring, preserves the lacrimal pump mechanism, minimizes tissue trauma, and enables

simultaneous management of associated intranasal pathologies. Contemporary studies have reported anatomical and functional success rates exceeding 85–95%, making endoscopic DCR the preferred surgical technique in many otorhinolaryngology centers worldwide [1], [2].

Despite these encouraging outcomes, surgical failure continues to occur in a proportion of patients, emphasizing the importance of identifying factors that predict postoperative success. Failure may result from restenosis of the rhinostomy, granulation tissue formation, inadequate osteotomy, fibrosis, synechiae, common canalicular obstruction, or persistent inflammatory disease. Patient-related factors such as age, diabetes mellitus, chronic sinonasal disease, previous lacrimal procedures, duration of symptoms, and ocular comorbidities have also been implicated in

influencing long-term surgical outcomes. Recognition of these predictors can facilitate better patient selection, optimize perioperative planning, and improve counseling regarding expected prognosis [2], [3].

Recent evidence has highlighted that surgical technique itself plays a crucial role in determining long-term success. Adequate exposure of the lacrimal sac, complete removal of the frontal process of the maxilla, creation of a sufficiently large rhinostomy, appropriate mucosal flap preservation, selective unciformectomy, and meticulous postoperative care contribute significantly to maintaining ostial patency. Similarly, the routine use of silicone stents remains controversial. While some systematic reviews suggest a modest improvement in surgical success with bicanalicular intubation, others conclude that the benefit is limited and should be individualized according to patient characteristics and intraoperative findings [4], [5].

With increasing emphasis on evidence-based practice, prospective cohort studies evaluating clinical, anatomical, and surgical predictors of endoscopic DCR outcomes are becoming increasingly important. Understanding these determinants not only helps refine surgical techniques but also aids in developing standardized management protocols aimed at reducing recurrence and enhancing patient satisfaction. Furthermore, identifying modifiable risk factors provides opportunities for targeted interventions that can improve both anatomical patency and functional resolution of epiphora. Therefore, the present prospective cohort study was undertaken in the Department of ENT at Sri Chamundeshwari Medical College Hospital and Research Institute, Channapatna, to evaluate the predictors of surgical success following endoscopic dacryocystorhinostomy and to determine the factors associated with favorable postoperative outcomes [2], [5], [6]. The present study aimed to evaluate the predictors of surgical success following endoscopic dacryocystorhinostomy (DCR) in patients with nasolacrimal duct obstruction. The objectives were to assess the overall surgical success rate, identify patient-related and disease-related factors influencing postoperative outcomes, evaluate the impact of intraoperative findings and surgical techniques on success, and determine the

association between clinical characteristics and functional as well as anatomical outcomes following endoscopic DCR.

MATERIALS AND METHODS

Study Design: A prospective cohort study was conducted to evaluate the predictors of surgical success following endoscopic dacryocystorhinostomy (DCR).

Study Population: The study included patients diagnosed with primary acquired nasolacrimal duct obstruction (PANDO) who underwent endoscopic DCR in the Department of ENT.

Sample Size: A total of 60 patients were included in the study.

Study Duration: The study was conducted over a period of 6 months.

Study Setting: The study was carried out at the Department of ENT, Sri Chamundeshwari Medical College Hospital and Research Institute, Channapatna, Karnataka, India.

Inclusion Criteria

- Patients aged ≥ 18 years.
- Clinically diagnosed PANDO confirmed by lacrimal syringing.
- Patients with symptomatic epiphora or recurrent dacryocystitis requiring endoscopic DCR.
- Patients providing written informed consent.

Exclusion Criteria

- Congenital nasolacrimal duct obstruction.
- Canalicular or punctal obstruction.
- Lacrimal sac or nasal malignancy.
- Acute dacryocystitis requiring medical treatment.
- Previous lacrimal drainage surgery.
- Patients unfit for surgery or unwilling to participate/follow-up.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 27.0. Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequency and percentage. Comparisons between successful and unsuccessful surgical outcomes were performed using the Independent Student's *t*-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. A two-tailed *p*-value < 0.05 was considered statistically significant for all analyses.

RESULT

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population

Baseline Characteristics	Category	Frequency (N)	Percentage (%)	P-Value
Age Group (Years)	<40	8	13.3	0.041
	41–50	14	23.3	
	51–60	22	36.7	
	>60	16	26.7	
Gender	Male	28	46.7	0.612
	Female	32	53.3	
Duration of Symptoms	<6 Months	16	26.7	0.018
	6–12 Months	25	41.7	
	>12 Months	19	31.6	
Side Involved	Right	31	51.7	0.821
	Left	29	48.3	
Total		60	100	

Table 2. Comparison of Clinical Predictors According To Surgical Outcome

Clinical Predictors By Outcome	Successful (N=54)	Failed (N=6)	P-Value
Mean Age (Years)	53.2 ± 10.1	61.5 ± 8.6	0.029
Female Gender	30 (55.6%)	2 (33.3%)	0.418
Diabetes Mellitus	8 (14.8%)	3 (50.0%)	0.037
Hypertension	10 (18.5%)	2 (33.3%)	0.394
Chronic Rhinosinusitis	5 (9.3%)	3 (50.0%)	0.009
Previous Nasal Surgery	2 (3.7%)	1 (16.7%)	0.181
Smoking History	7 (13.0%)	2 (33.3%)	0.192

Table 3. Intraoperative Findings and Surgical Factors Associated With Outcome

Intraoperative Factors By Outcome	Successful (N=54)	Failed (N=6)	P-Value
Adequate Osteotomy	52 (96.3%)	3 (50.0%)	0.001
Large Lacrimal Sac Exposure	50 (92.6%)	3 (50.0%)	0.004
Septoplasty Required	9 (16.7%)	3 (50.0%)	0.047
Silicone Intubation Performed	18 (33.3%)	3 (50.0%)	0.412
Intraoperative Bleeding	4 (7.4%)	2 (33.3%)	0.028
Mucosal Flap Preservation	48 (88.9%)	3 (50.0%)	0.011

Table 4. Postoperative Outcomes and Predictors of Surgical Success

Postoperative Outcomes And Predictors	Successful (N=54)	Failed (N=6)	P-Value
Complete Resolution Of Epiphora	52 (96.3%)	1 (16.7%)	<0.001
Patent Lacrimal Passage On Syringing	54 (100%)	2 (33.3%)	<0.001
Granulation Tissue Formation	3 (5.6%)	4 (66.7%)	<0.001
Synechiae Formation	2 (3.7%)	3 (50.0%)	0.002
Restenosis Of Rhinostomy	1 (1.9%)	5 (83.3%)	<0.001
Overall Surgical Success	54 (90.0%)	6 (10.0%)	—

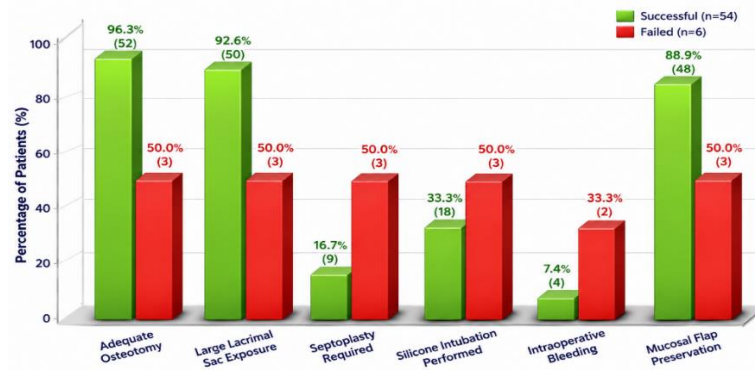


Figure: 1. Intraoperative Factors by Surgical Outcome

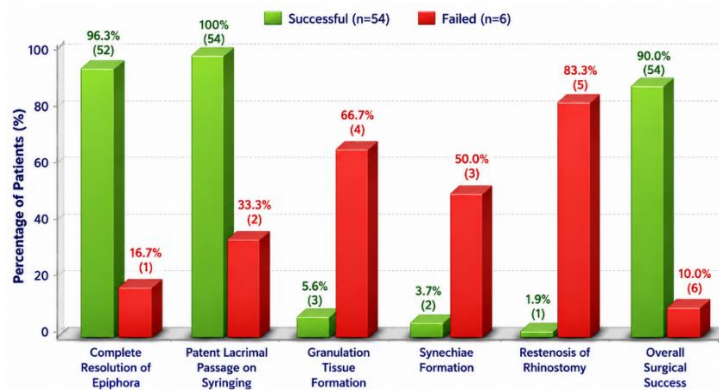


Figure: 2. Postoperative Outcomes by Surgical Outcome

A total of 60 patients with primary acquired nasolacrimal duct obstruction underwent endoscopic dacryocystorhinostomy (DCR). The majority belonged to the 51–60 years age group (22; 36.7%), followed by >60 years (16; 26.7%), 41–50 years (14; 23.3%), and <40 years (8; 13.3%). Age showed a significant association with surgical outcome ($p = 0.041$). Females (53.3%) slightly outnumbered males (46.7%), although gender was not significantly associated with success ($p = 0.612$). Most patients presented with symptoms for 6–12 months (41.7%), and shorter symptom duration was significantly associated with better outcomes ($p = 0.018$). The side of involvement showed no significant difference ($p = 0.821$).

The overall surgical success rate was 90.0% (54/60), while 6 patients (10.0%) experienced surgical failure. Patients with successful outcomes were younger (53.2 ± 10.1 years) than those with failed surgery (61.5 ± 8.6 years; $p = 0.029$). Diabetes mellitus ($p = 0.037$) and chronic rhinosinusitis ($p = 0.009$) were significantly associated with unsuccessful outcomes, whereas hypertension, smoking, previous nasal surgery, and gender showed no significant association ($p > 0.05$).

Among intraoperative factors, adequate osteotomy (96.3% vs. 50.0%; $p = 0.001$), complete lacrimal sac exposure (92.6% vs. 50.0%; $p = 0.004$), and mucosal flap preservation (88.9% vs. 50.0%; $p = 0.011$) were significantly associated with surgical success. Septoplasty requirement ($p = 0.047$) and excessive intraoperative bleeding ($p = 0.028$) were associated with poorer outcomes, while silicone intubation showed no significant effect ($p = 0.412$).

Postoperatively, complete resolution of epiphora (96.3% vs. 16.7%; $p < 0.001$) and lacrimal patency (100% vs. 33.3%; $p < 0.001$) were significantly higher in successful cases. Granulation tissue formation, synechiae, and rhinostomy restenosis were significantly more frequent in failed surgeries ($p < 0.05$), indicating that these complications are major predictors of surgical failure following endoscopic DCR.

DISCUSSION

The present prospective cohort study demonstrated an overall surgical success rate of 90.0% following endoscopic dacryocystorhinostomy (DCR), indicating that the procedure is highly effective for the management of primary acquired nasolacrimal

duct obstruction. This finding is comparable with the study by Lehmann et al., who reported high long-term functional success rates following primary endoscopic DCR while emphasizing the importance of appropriate patient selection and surgical technique in minimizing recurrence [7].

The majority of patients in the present study were aged 51–60 years (36.7%), and increasing age was significantly associated with surgical failure. Older patients may experience delayed wound healing and greater tissue fibrosis, thereby reducing long-term patency of the rhinostomy. Similar observations were reported by García Callejo et al., who identified advanced age and prolonged disease duration as significant predictors of poorer postoperative outcomes [8].

Among the clinical variables evaluated, diabetes mellitus and chronic rhinosinusitis showed a significant association with unsuccessful surgery. Chronic inflammation and impaired tissue repair in these conditions may contribute to restenosis and excessive scar formation. Comparable findings have been described by previous investigators, who identified systemic disease and persistent sinonasal inflammation as important determinants of endoscopic DCR success [9], [10].

The present study also demonstrated that adequate osteotomy, complete lacrimal sac exposure, and preservation of the mucosal flap were significantly associated with successful surgical outcomes, whereas excessive intraoperative bleeding increased the likelihood of failure. These findings support the conclusions of Vinciguerra et al., who highlighted the importance of meticulous surgical technique in achieving optimal anatomical and functional success, although certain technical modifications showed variable benefit across studies [11].

Postoperative complications, particularly granulation tissue formation, synechiae, and rhinostomy restenosis, were significantly more frequent among failed cases. Similar postoperative causes of failure have been consistently reported in recent literature evaluating endoscopic DCR outcomes [12], [13]. Furthermore, recent long-term evidence suggests that specific operative steps, such as concomitant unciformectomy in selected patients, may further reduce recurrence and improve durable success following endoscopic DCR [14].

CONCLUSION

The present study demonstrated that endoscopic dacryocystorhinostomy is a safe and highly effective procedure, achieving an overall surgical success rate of 90% in patients with primary acquired nasolacrimal duct obstruction. Advanced age, diabetes mellitus, chronic rhinosinusitis, and prolonged symptom duration were significant predictors of less favorable outcomes. In contrast, meticulous surgical techniques, including adequate osteotomy, complete lacrimal sac exposure, and preservation of the mucosal flap, were associated with higher success rates. Postoperative complications such as granulation tissue formation, synechiae, and rhinostomy restenosis significantly contributed to surgical failure. Careful patient selection, meticulous operative technique, and structured postoperative follow-up are essential for optimizing long-term anatomical and functional outcomes.

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