# Comparative study of different techniques in endoscopic DCR

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**ABSTRACT**

**Introduction**

Dacryocystorhinostomy (DCR) is a surgical procedure performed to address the blockage of the nasolacrimal duct, restoring the normal tear flow from the lacrimal sac into the nose. This study aims to compare the success rates of two different techniques used in endonasal endoscopic DCR. the single mucosal flap technique and the double mucosal flap technique.

**Methodology**

A non-equivalent quasi-experimental design was employed for this study. The inclusion criteria consisted of patients who underwent endoscopic DCR for primary nasolacrimal duct (NLD) obstruction. The patients were divided into two groups based on the technique used: the single-flap technique group and the double-flap technique group. The success of the procedure was determined by the achievement of NLD patency during the follow-up period, along with a significant improvement in epiphora.

**Results**

A total of 46 cases were included in the final analysis. The average age of the patients was 49 years, with 65% being female. Among them, 20 cases underwent the single-flap technique, while 26 cases underwent the double-flap technique. The recurrence of NLD obstruction occurred in 4cases (20%) in the single-flap group, compared to only one case (3.8%) in the double-flap group.

**Conclusion**

The modified double-flap technique for NLD obstruction demonstrated a lower recurrence rate when compared to the single-flap technique. The utilisation of double flaps to cover any exposed lacrimal bone can potentially reduce the occurrence of postoperative adhesions over the nasolacrimal duct osmium.

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## INTRODUCTION

Dacryocystorhinostomy (DCR) is a surgical procedure that involves creating a connection between the lacrimal sac and the nasal mucosa to treat nasolacrimal duct (NLD) obstruction. This can be done externally through a skin incision or internally through the nasal cavity with or without endoscopic visualisation [1].

Several studies have compared the external and endonasal DCR approaches and found that both are viable options with similar success rates and surgical outcomes, despite their respective advantages and disadvantages [[2], [3], [4], [5]]. While endoscopic DCR is more commonly used nowadays, only a few studies have compared the success rates of different surgical techniques within this approach.

Material and Methods

This study utilised a nonequivalent quasi-experimental design. Patients were divided into two groups based on the surgical technique used: single-flap technique and double-flap technique. Retrospectively, data from patient charts were collected, including demographics, surgical notes, and postoperative success rates.

Approval from the institutional review board at our university-based tertiary hospital was obtained, and data from patients who underwent endoscopic DCR for primary NLD obstruction between June 2022 and December 2023 were reviewed. Eligibility criteria included patients with epiphora (excessive tearing) with or without purulent eye discharge. The diagnosis of NLD obstruction was confirmed by an ophthalmologist. The study included both males and females of all ages. Exclusion criteria consisted of incomplete medical records, follow-up period of less than 1 year postoperatively, history of previous DCR surgery. NLD obstruction is confirmed by the ophthalmologist through probing and irrigation, ruling out other eye diseases with similar symptoms. Success was defined as the achievement

of NLD patency confirmed by probing and irrigation during the follow-up period, along with the absence of epiphora as reported by the patient. Recurrence of NLD obstruction was documented if the patient reported epiphora again and the ophthalmologist confirmed obstruction through probing and irrigation.

In the single-flap technique, the nasal mucosal flap is raised above the axilla of the middle turbinate, a junction between the lacrimal bone and the frontal process of the maxilla (Fig. 1). The lacrimal bone is then removed, exposing the entire lacrimal sac. Using a Kerrison's punch and a drill, the more resistant bone portion of the lacrimal fossa of the maxilla is removed without damaging the lacrimal sac (Fig. 1). A longitudinal incision is made in the sac using a sickle knife (Fig. 3) and sac opened . Excess mucosa above the sac opening is resected.The remaining portion of the mucosal flap is repositioned to the lateral wall to cover any exposed bone, and if applicable, the upper part of the mucosal flap can be repositioned on the axilla of the middle turbinate to cover any remaining bone at that level.

In the double-flap technique, the surgeon follows the same steps as the single-flap technique but additionally creates a second flap in the lacrimal sac.

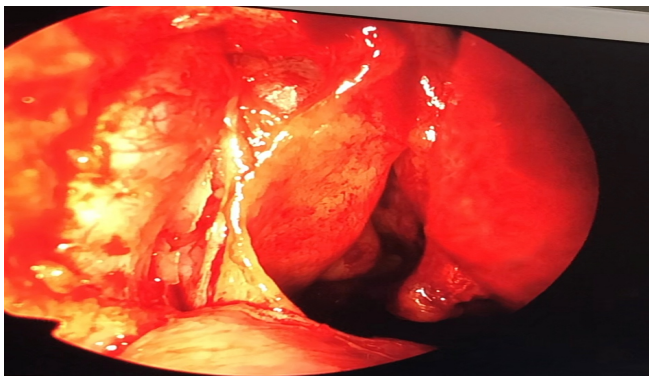
The second flap is lifted from the lacrimal sac at after making a longitudinal incision in the sac. Two incisions are made anteriorly and two posteriorly. The posterior flap of the sac is reflected backward, while the anterior flap is reflected forward to create a marsupialization of the lacrimal sac into the nasal cavity (Figure 4). The posterior flap of the lacrimal sac comes into direct contact with the initially created mucosal flap (Figure 5). When applicable, the upper part of the mucosal flap can be repositioned on the axilla of the middle turbinate to cover any remaining bone. Additionally, the mucosa covering the agger nasi wall can be juxtaposed to the medial wall of the lacrimal sac flap (Figure 6). The flaps are then secured with gel-foam. All patients were discharged on the next day of surgery with oral antibiotics and without steroid nasal spray. The study was conducted at a university-based tertiary center over a period of years, from June 2022 to December 2023.

**Results:**

The mean age of the 46 participants was 49 years (SD = 19.3), with 24 of them being female (52.17%). The mean follow-up time for the 4 cases with recurrence or follow-up was 18.4 months (SD = 7.2). The single-flap technique group consisted of 20 patients (43%) with a mean age of 42.4 years (SD = 21.6) and a mean follow-up of 20.1 months (SD = 7.6). The double-flap technique group comprised 26 patients(56.5%) with a mean age of 45.3 years (SD = 9.4) and a mean follow-up time of 21.7 months (Table 1). Four cases (23.9%) in the single-flap group experienced recurrence of NLD obstruction, compared to only one case (3.2%) in the double-flap group (Fisher's Exact Test = 6.024, p = 0.022). The 4 patients from both groups who experienced recurrence underwent revision surgery. In the single-flap group, 1 patient (25%) had a second recurrence, while the patient in the double-flap group did not experience a second recurrence. There were no significant differences in age (p = 0.793), gender (p = 0.113), or flap side (p = 0.798v h) between the groups.

**Discussion**

In our study, we examined two different endonasal endoscopic techniques for DCR (dacryocystorhinostomy). The first technique, known as the single mucosal flap technique, involved elevating a lateral wall mucosal flap to



expose the lacrimal sac by removing the lacrimal bone. The lacrimal sac was then opened longitudinally without creating a flap within the lacrimal wall.

In contrast, the double flap technique in endoscopic DCR involved creating two flaps. In addition to elevating the mucosal flap over the lacrimal bone, an additional flap was created within the lacrimal sac. The upper part of the mucosal flap could be repositioned on the axilla of the middle turbinate, and the mucosa covering the wall of the agger nasi would be juxtaposed to the medial wall of the lacrimal sac flap. This technique aimed to minimize or avoid leaving any exposed bone, thereby improving postoperative healing. Mucosa-sparing techniques like these may offer better success rates by reducing the risk of nasolacrimal stoma re-closure due to aberrant healing with granulation tissue and synechiae.

The double flap technique also had the added benefit of promoting better healing at the stoma site and preventing granulation tissue and epithelialisation, which could reduce the chances of blockage of the new stoma. This explained the higher success rate of the double flap technique compared to the single flap technique. Additionally, the double flap technique improved ostium opening.

In our study, the posterior flap of the lacrimal sac in the double-flap cohort was in direct contact with the initially made mucosal flap, minimizing or avoiding excessive healing reactions. This ensured a well-formed orifice for the DCR, resulting in a significantly lower recurrence rate compared to the single-flap cohort.

Other studies have also recommended mucosa-sparing techniques in endoscopic DCR. Modifications to techniques that preserve nasal and lacrimal mucosa have been described, showing comparable or better outcomes compared to routine treatment techniques. These techniques emphasize minimising bone exposure and ensuring effective coverage of the opened sac.

While systematic reviews have demonstrated the benefits of mucosal preservation and bone coating in endoscopic DCR, studies directly comparing cohorts with mucosa-sparing techniques are scarce. The available evidence suggests a

trend towards improved outcomes and reduced granulation when nasal and lacrimal flaps are preserved, but more studies are needed for conclusive evidence.

Our study is to directly compare the success rates of two distinct techniques with different utilisation of nasal or lacrimal mucosa in endoscopic DCR for NLD (nasolacrimal duct) obstruction. We found that maximising coverage of exposed bone using the double-flap technique resulted in significantly higher success rates compared to the single-flap technique.

Limitations of our study include the lack of randomisation of patients to the two treatment arms. However, we had strengths such as standardised diagnostic approaches, surgical settings, and techniques, extended follow-up, and a reasonable number of cases in our cohorts.

**Conclusion:**

Implementing double flaps to provide coverage for exposed lacrimal bone has the potential to lower the occurrence of postoperative adhesions near the nasolacrimal duct ostium. However, further research is required to gather a more extensive collection of evidence regarding the clinical outcomes and complication rates associated with various techniques used in endoscopic DCR. It is essential to conduct larger, well-controlled randomized trials that compare these approaches, as well as explore innovative and novel techniques that can advance our ability to treat primary NLD obstruction and enhance patient outcomes. These types of studies are necessary to progress our understanding and improve results in this field.

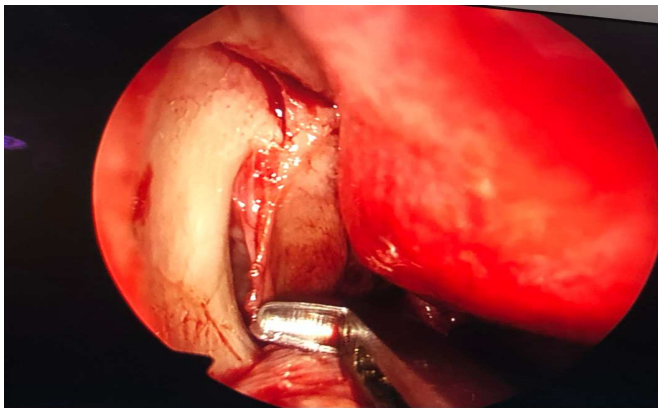


**Fig.1.** The nasal mucosal flap is raised above the axilla of the middle turbinate, a junction between the lacrimal bone and the frontal process of the maxilla.sac. Using a Kerrison's punch and a drill more resistant bone portion of the lacrimal fossa of the maxilla is removed without damaging the lacrimal sac

**Fig.2.;** Exposure of lacrimal sac.

**Fig.3;** A longitudinal incision is made in the sac using a sickle knife

**Fig.4;** The posterior flap of the sac is reflected backward, while the anterior flap is reflected forward to create a marsupialization of the lacrimal sac into the nasal cavity.

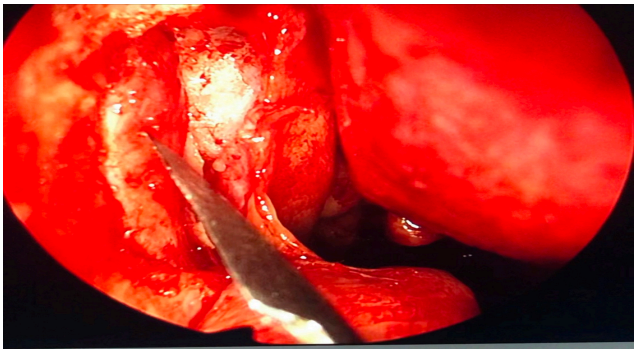
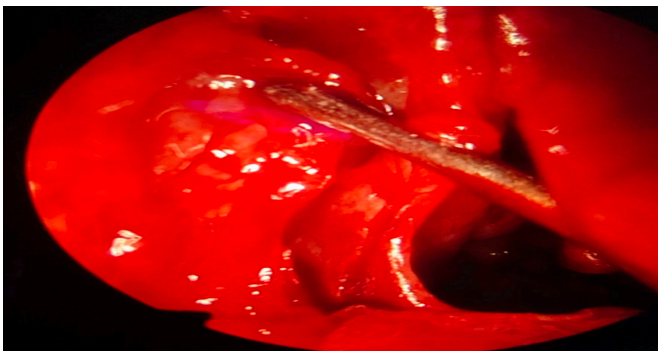
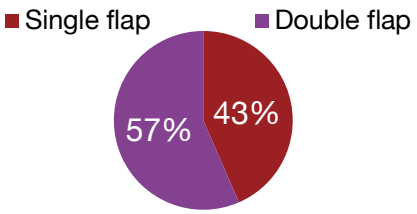


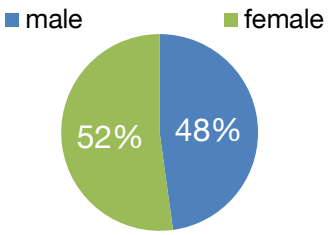
**Table 1: Descriptive Analysis of Study variables**



| Variable | N | % |
|---|---|---|
| Age (Mean = 49.1, SD = 19.3 | | |

| | | |
|---|---|---|
| Range (1–80 years) | | |
| Gender | | |
| Male | 22 | 47.83 |
| Female | 24 | 52.17 |
| Flap side | | |
| Right | 27 | 46.8 |
| Left | 19 | 53.2 |
| Flap number | | |
| Single | 20 | 43.2 |
| Double | 26 | 56.8 |
| Recurrence | | |
| No | 42 | 91.3 |
| Yes | 4 | 8.7 |

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