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The Effectiveness of Sleeve Technique in Treating Primary Nasolacrimal Duct Obstruction with Elevated Lacrimal Sac

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ABSTRACT

Background: Primary nasolacrimal duct obstruction (PANDO) is a common condition causing chronic epiphora and recurrent infections. Traditional surgical treatment, such as dacryocystorhinostomy (DCR), though effective, can be associated with significant morbidity and recovery time. The sleeve technique, a minimally invasive procedure, offers a potentially effective alternative. This study evaluated the effectiveness of the sleeve technique in treating PANDO with a high lacrimal sac.

Methods: A total of 200 patients with PANDO and high lacrimal sac who underwent the sleeve technique were included. Data on demographic characteristics, duration of symptoms, surgical outcomes, and postoperative complications were collected and analyzed using SPSS version 21.0.

Results: The sleeve technique was successful in 170 out of 200 patients, yielding an 85% success rate. Younger age and shorter duration of symptoms were significant predictors of success ($p < 0.05$). Postoperative complications were observed in 17.5% of patients, with mild bleeding, infection, and granuloma formation being the most common. These complications were managed conservatively and did not significantly impact the overall success rate.

Conclusion: The sleeve technique is a highly effective and reliable method for treating PANDO with a high lacrimal sac, demonstrating a high success rate and manageable complications.

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Recommendations: Future studies should focus on long-term outcomes and comparisons with other minimally invasive techniques to further validate the efficacy and safety of the sleeve technique.

Keywords: Primary Nasolacrimal Duct Obstruction, Sleeve Technique, High Lacrimal Sac, Minimally Invasive Surgery, Ophthalmology

INTRODUCTION

Primary nasolacrimal duct obstruction (PANDO) is a common condition that causes significant discomfort and morbidity due to chronic epiphora, recurrent infections, and social inconvenience. The lacrimal drainage system, comprising the canaliculi, lacrimal sac, and nasolacrimal duct, is crucial for tear drainage from the ocular surface to the nasal cavity. Obstruction at any point along this pathway can lead to tear stasis and subsequent complications. Among these, PANDO is predominantly seen in middle-aged and elderly populations, with a higher prevalence in women due to hormonal and anatomical factors [1].

Conventional treatments for PANDO have included conservative management with massage and antibiotics, as well as surgical interventions like dacryocystorhinostomy (DCR). DCR, which creates a direct anastomosis between the lacrimal sac and the nasal cavity, has been considered the gold standard for treating NLDO. However, despite its high success rates, DCR is associated with significant morbidity, prolonged recovery times, and occasional failures due to various complications such as scarring and restenosis [2].

In recent years, minimally invasive techniques have gained popularity due to their reduced complication rates and faster recovery times. The sleeve technique, a relatively novel approach, involves creating a mucosal sleeve to bypass the obstruction and connect the lacrimal sac directly to the nasal mucosa. This technique aims to maintain the physiological pathway for tear drainage while minimizing tissue disruption and scarring [3].

This study was proposed to evaluate the efficacy of the sleeve technique in treating PANDO with a high lacrimal sac. High lacrimal sac positioning can present additional challenges in surgical management due to its anatomical proximity to critical structures. Recent advancements in endoscopic equipment and surgical techniques have made it possible to approach such cases with greater precision and safety [4].

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Previous studies have demonstrated promising outcomes with the sleeve technique, suggesting it as a viable alternative to traditional DCR, especially in patients with high lacrimal sac anatomy [5]. However, comprehensive evaluations focusing on large patient cohorts and long-term follow-up data are still limited.

The aim of the study was to evaluate the effectiveness of the sleeve technique in treating PANDO with a high lacrimal sac.

METHODOLOGY

Study Design

A retrospective cohort design.

Study Setting

The research was carried out at tertiary care centre spanning from February 2022 to July 2023.

Participants

A total of 200 patients diagnosed with PANDO and a high lacrimal sac were comprised in the study. These patients had undergone the sleeve technique for their condition.

Inclusion criteria

- Patients aged 18 years and above

- Diagnosed with PANDO

- Presence of a high lacrimal sac confirmed by dacryocystography

Exclusion criteria

- Patients with secondary NLDO due to trauma or surgery

- Presence of acute dacryocystitis

- Previous lacrimal surgery

- Systemic conditions affecting wound healing (e.g., diabetes mellitus)

Sample size

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To calculate the sample size for this study, the following formula was used for estimating a proportion in a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:

- n = sample size

- Z = Z-score corresponding to the desired level of confidence

- p = estimated proportion in the population

- E = margin of error

Bias

To minimize selection bias, all consecutive participants meeting the inclusion criteria during the study period were included. Information bias was reduced by ensuring standardized data collection procedures and training of the research team.

Variables

The primary outcome variable was the success rate of the sleeve technique, defined as the resolution of epiphora and patency of the nasolacrimal duct confirmed by irrigation. Secondary variables included demographic data (age, gender), duration of symptoms, and postoperative complications.

Data Collection

Data were accumulated retrospectively from patient medical history, including preoperative assessment, surgical procedure details, and postoperative follow-up visits. A standardized data extraction form was used to ensure consistency.

Procedure

Patients underwent the sleeve technique performed by experienced ophthalmic surgeons. The procedure involved creating a sleeve of mucosa to bypass the obstruction and anastomose it to the nasal mucosa, ensuring a patent drainage pathway.

Statistical Analysis

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SPSS version 21.0 was used to analyse the data. Demographic and clinical features were gathered using descriptive statistics. The sleeve technique's success rate was computed, and t-tests for continuous variables and chi-square tests for categorical data were used to evaluate possible success predictors. Less than 0.05 was the threshold for statistical significance.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

Table 1: Demographic and Clinical Characteristics

Characteristic	Total (N = 200)
Gender	
- Female	120 (60%)
- Male	80 (40%)
Mean Age (years)	45.6 ± 12.3
Mean Duration of symptoms (months)	18.4 ± 6.7

Of the 200 patients that were part of the trial, 80 (40%) were men and 120 (60%) were women. The participants' ages ranged from 18 to 75 years old, with a mean age of 45.6 ± 12.3. Before surgery, the symptoms persisted for an average of 18.4 ± 6.7 months. The patients' clinical and demographic details are presented in Table 1.

With 170 out of 200 patients responding well to the sleeve approach, the total success rate was 85%. At the 6-month follow-up, irrigation was used to confirm the patency of the nasolacrimal duct and the remission of epiphora.

Table 2: Predictors of Success

Variables	Successful (N = 170)	Unsuccessful (N = 30)	p-value
Gender			
- Female	102 (60%)	18 (60%)	0.98
- Male	68 (40%)	12 (40%)	

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Mean Age (years)	44.8 ± 11.7	49.7 ± 14.5	0.04
Mean Duration of symptoms (months)	17.6 ± 6.3	22.1 ± 7.5	0.01

To identify potential predictors of success, the demographic and clinical features of patients with successful and unsuccessful outcomes were compared (Table 2).

The analysis revealed that patients with shorter duration of symptoms and younger age had a higher success rate. There was no considerable difference in success rates between male and female patients.

Postoperative complications were observed in 35 patients (17.5%). The most common complication was mild postoperative bleeding, occurring in 20 patients (10%), followed by infection in 10 patients (5%) and granuloma formation in 5 patients (2.5%). These complications were managed successfully with conservative treatment and did not significantly affect the overall success rate.

The chi-square test was used to assess the connection between categorical variables and the success of the procedure. The t-test was used for continuous variables. Age and duration of symptoms were found to be considerable predictors of success ($p < 0.05$).

Table 3: Postoperative Complications

Complication	**N (%)**
Mild postoperative bleeding	20 (10%)
Infection	10 (5%)
Granuloma formation	5 (2.5%)
Total	35 (17.5%)

DISCUSSION

The study evaluated the effectiveness of the sleeve technique in treating PANDO with a high lacrimal sac among 200 patients. The technique demonstrated a high success rate of 85%, defined by the resolution of epiphora and confirmed duct patency at six months post-surgery.

The analysis indicated that younger patients and those with a shorter duration of symptoms prior to surgery had significantly higher success rates. The procedure was equally effective

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across genders. Postoperative complications were relatively low, occurring in 17.5% of patients, with the most common issues being mild bleeding, infection, and granuloma formation, all of which were managed successfully with conservative treatment.

These findings suggest that the sleeve technique is a highly effective and reliable option for treating this condition, particularly when performed in patients who seek treatment promptly.

Recent studies have explored various techniques for treating NLDO with elevated lacrimal sac, providing insights into their effectiveness and outcomes. A study on endonasal endoscopic nasolacrimal duct dissection (EE-NLDD) for primary NLDO showed that the procedure was effective in achieving anatomical patency and resolving epiphora in most patients. The procedure comprised the removal of the bony structure covering the nasolacrimal duct and marsupializing the duct with nasal mucosa. All patients achieved anatomical patency, and the majority reported complete resolution or improvement of epiphora with minimal complications [6].

The use of antimetabolites as an adjunct to dacryocystorhinostomy (DCR) for NLDO was evaluated in a Cochrane review. The review included 31 studies and found moderate-certainty evidence that antimetabolites improved functional and anatomical success beyond six months post-surgery. However, there was no substantial difference in success rates at the six-month mark. The application of antimetabolites also increased the size of the lacrimal ostium and had minimal adverse effects [7].

A retrospective study on radiofrequency-assisted endofistulectomy for treating coexisting lacrimal fistulae during endoscopic dacryocystorhinostomy (ENDO-DCR) demonstrated that the technique was minimally invasive and effective. Patients experienced well-mucosalized and patent dacryocystorhinostomy ostium with no epiphora or residual scarring post-surgery [8].

Transcanalicular endoscopic dacryoplasty and silicone intubation in patients with PANDO showed a high success rate of 86.2%. The study highlighted that membranous obstructions and stenosis could be effectively managed through recanalization under direct visualization, sparing patients from bony destruction [9].

A study assessing the outcomes of endoscopic dacryocystorhinostomy (ENDO-DCR) in Kirkuk found an 80% success rate in resolving epiphora and maintaining ostium patency. The

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technique proved to be safe and effective, with minor complications reported during and after the operation [10].

An investigation into the clinical efficacy of lacrimal endoscopy-assisted silicone tube intubation for NLDO demonstrated an 87.2% success rate. The study noted that narrowing observed during lacrimal endoscopy was associated with successful treatment, while dacryolith findings correlated with surgical failure [11].

CONCLUSION

In conclusion, the sleeve technique proves to be a highly effective treatment for PANDO with a high lacrimal sac, boasting an 85% success rate. The procedure's success is influenced by the patient's age and symptom duration, with younger patients and those with shorter symptom durations experiencing better outcomes. Postoperative complications are minimal and manageable. Therefore, the sleeve technique is recommended as a reliable surgical option for patients with this condition.

Limitations: The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study’s findings.

Recommendation: Future studies should focus on long-term outcomes and comparisons with other minimally invasive techniques to further validate the efficacy and safety of the sleeve technique.

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List of abbreviations:

PANDO: Primary Nasolacrimal Duct Obstruction

DCR: Dacryocystorhinostomy

NLDO: Nasolacrimal Duct Obstruction

EE-NLDD: Endonasal Endoscopic Nasolacrimal Duct Dissection

ENDO-DCR: Endoscopic Dacryocystorhinostomy

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