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Original Research Article

Stent-free Endo-DCR: success of the posterior based mucosal flap technique

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ABSTRACT

Background: Endoscopic Dacryocystorhinostomy (Endo-DCR) is an established surgical procedure for nasolacrimal duct obstruction (NLDO). While silicone stenting is frequently employed to maintain ostial patency, concerns regarding associated complications and costs have spurred interest in stent-free techniques. This study evaluates the efficacy of the posterior-based mucosal flap technique for stent-free Endo-DCR.
Methods: This prospective observational study was conducted at Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, between July 2023 and July 2025. One hundred and fifty adult patients (165 eyes) diagnosed with primary acquired NLDO were included after obtaining institutional ethics committee approval and informed consent. All participants underwent stent-free Endo-DCR utilizing the posterior-based mucosal flap technique. Primary outcome measures were anatomical success (patent syringing and endoscopic visualization) and functional success (resolution of epiphora and dacryocystitis) assessed at 1, 3, 6 and 12 months post-operatively. Intraoperative and postoperative complications were also meticulously recorded.
Results: The mean age of the cohort was 51.2±11.8 years (range: 23-82 years), with a female preponderance (72.0% females). The overall anatomical success rate was 87.9% and the functional success rate was 85.5% at 12 months follow-up. Minor postoperative complications, predominantly mild synechiae formation (8.5%), were observed, none of which necessitated surgical revision during the study period. The symptomatic re-obstruction rate requiring revision surgery was 2.4%.
Conclusions: The posterior-based mucosal flap technique for stent-free Endo-DCR demonstrates robust anatomical and functional success rates with a low complication profile in the patient population of Madhya Pradesh. This approach offers a safe, effective and potentially more economical alternative to stented DCR, particularly relevant for improving access to care in resource-constrained regions.

Keywords: Dacryocystorhinostomy, Endoscopic DCR, Mucosal flap, Nasolacrimal duct obstruction, Stent free

INTRODUCTION

Primary acquired nasolacrimal duct obstruction (PANDO) is a common ophthalmological condition leading to bothersome symptoms such as epiphora (watery eyes) and recurrent dacryocystitis, significantly impairing a patient's quality of life.[1] Dacryocystorhinostomy (DCR) is the definitive surgical intervention aimed at creating a patent drainage pathway between the lacrimal sac and the nasal cavity.[2] Both external and endoscopic approaches are widely practiced. Endo-DCR has gained substantial popularity owing to its minimally invasive nature, absence of an external scar and superior visualization of the surgical field.[3]

Historically, silicone intubation stents have been routinely employed in DCR to maintain the patency of the newly created rhinostomy during the critical initial healing phase, thereby theoretically preventing synechiae formation and

ostial closure. However, the use of lacrimal stents is not without drawbacks, including patient discomfort, spontaneous stent extrusion, granuloma formation, infection and increased procedural costs.[4] These limitations have spurred considerable research into stent-free DCR techniques, which aim to achieve comparable success rates while mitigating stent-related morbidities and expenses.

Various mucosal flap designs have been proposed to optimize mucosal apposition at the osteotomy site and facilitate rapid re-epithelialization, thereby promoting sustained ostial patency without the need for prosthetic support. Among these, the posterior-based mucosal flap technique has demonstrated particular promise in creating a wide and stable rhinostomy.[5] This technique involves the meticulous preservation and manipulation of a substantial posterior mucosal flap from the lateral nasal wall and/or lacrimal sac, which is subsequently draped or secured over the bony ostium.

This strategic flap positioning aims to accelerate the healing process, minimize raw surface exposure and reduce fibrotic closure.[6] Madhya Pradesh, a large and geographically diverse state in central India, presents a unique demographic and socioeconomic context. Evaluating the efficacy of stent-free Endo-DCR using the posterior-based mucosal flap technique within this specific patient cohort is highly pertinent. The potential for reduced cost and complication rates associated with a stent-free approach offers significant advantages in resource-constrained healthcare settings, potentially broadening access to effective treatment for a wider patient population. This study was therefore undertaken to assess the anatomical and functional success rates of this technique in patients presenting with NLDO at our institution in Madhya Pradesh.

METHODS

Study design and setting

This was a prospective, single-center, observational study conducted at the Department of ENT, Nandkumar Singh Chouhan Government Medical College, Khandwa, Madhya Pradesh, India. The study period extended from July 2023 to July 2025, ensuring that all patients completed a minimum of 12 months of follow-up. The study protocol received ethical approval from the Institutional Ethics Committee prior to patient enrolment. Written informed consent was obtained from all participants after a comprehensive explanation of the study objectives, procedures, potential risks and benefits.

Inclusion criteria

Patients aged 18 years or older, diagnosed with primary acquired nasolacrimal duct obstruction (PANDO) confirmed by irrigation (syringing) and diagnostic nasal endoscopy and presenting with characteristic symptoms of epiphora and/or recurrent dacryocystitis.

Exclusion criteria

Patients with secondary NLDO (e.g., due to trauma, neoplastic lesions, granulomatous diseases or iatrogenic causes), acute dacryocystitis requiring emergent medical management prior to surgery, a history of previous DCR surgery on the ipsilateral side, significant nasal pathology (e.g., extensive sinonasal polyposis, severe deviated nasal septum requiring concomitant septoplasty), known bleeding diathesis or unwillingness to provide informed consent or adhere to follow-up protocols.

Preoperative evaluation

All eligible patients underwent a comprehensive ophthalmic examination, including best-corrected visual acuity, slit-lamp biomicroscopy and fundoscopy. A detailed ENT examination was performed, which included diagnostic nasal endoscopy to assess the nasal cavity anatomy, identify any obstructive pathology (e.g., septal deviation, turbinate hypertrophy) and visualize the lacrimal sac fossa region.

Lacrimal syringing was performed by an experienced ophthalmologist to confirm the diagnosis of NLDO. In selected complex cases or those with atypical presentations, computed tomography (CT) dacryocystography was performed to delineate the extent of obstruction and rule out other causes.

Surgical technique (stent-free endoscopic dacryocystorhinostomy with posterior-based mucosal flap)

Procedures were conducted under either general anesthesia or local anesthesia with conscious sedation. The standardized surgical steps were as follows.

Nasal preparation

The nasal cavity was thoroughly decongested using topical oxymetazoline/xylometazoline sprays. Local infiltration of 2% lignocaine with 1:200,000 adrenaline (total volume 3-5 mL) was administered to the lateral nasal wall overlying the lacrimal sac fossa to optimize hemostasis and provide local anesthesia.

Endoscopic visualization

A 0-degree rigid nasal endoscope was primarily used for overall visualization, supplemented by a 30-degree endoscope for angled views and specific maneuvers.

Mucosal incision and flap elevation

A vertical incision was meticulously made in the nasal mucosa anterior to the uncinate process, extending

superiorly towards the agger nasi cell and inferiorly towards the attachment of the inferior turbinate. A generous posterior-based mucosal flap was carefully elevated from the lateral nasal wall, extending posteriorly over the lacrimal bone, ensuring its vitality.

Osteotomy

The lacrimal crest and lacrimal bone overlying the lacrimal sac were precisely removed using a combination of a DCR punch, Kerrison rongeurs or a motorized drill, creating a wide bony ostium, typically measuring 12-15 mm in its anterior-posterior dimension and 10-12 mm in its superior-inferior dimension. Care was taken to identify and preserve the common canaliculus.

Lacrimal sac exposure and incision

The bulging lacrimal sac was identified through the bony ostium. A vertical incision was made along the medial wall of the lacrimal sac, creating distinct anterior and posterior lacrimal sac flaps. Any mucopurulent contents were aspirated and the sac was irrigated with saline.

Flap approximation

The large posterior-based nasal mucosal flap was carefully folded and draped into the lacrimal sac, ensuring maximal apposition with the posterior lacrimal sac flap. This arrangement aimed to create a broad, epithelialized communication between the lacrimal sac and the nasal cavity, minimizing raw bone exposure. The anterior nasal mucosal flap and anterior lacrimal sac flap were trimmed as necessary to prevent obstruction of the new ostium. No silicone stenting was used in any patient.

Postoperative nasal packing

Minimal absorbable nasal packing (e.g., small piece of Merocel or Gelfoam) was placed only if significant intraoperative oozing persisted, typically for 24-48 hours. In 85% of cases, no nasal packing was deemed necessary.

Postoperative care and follow-up

All patients received a course of oral broad-spectrum antibiotics (Amoxicillin-Clavulanate 625 mg twice daily) for 7 days and topical nasal decongestant sprays (0.05% Oxymetazoline) for 5 days. Daily nasal saline irrigations (0.9% NaCl solution) were strongly advised for at least 6 weeks to maintain nasal hygiene and reduce crusting.

Patients were scheduled for structured follow-up visits at 1 week, 1 month, 3 months, 6 months and 12 months post-operatively. At each visit, clinical assessment (resolution of symptoms, particularly epiphora and dacryocystitis) and endoscopic evaluation of the rhinostomy site were performed. Lacrimal syringing was also conducted to objectively assess patency.

Outcome measures

Anatomical success

Defined as the presence of a clearly patent rhinostomy on endoscopic visualization and free passage of saline into the nasopharynx upon lacrimal syringing without resistance.

Functional success

Defined as complete resolution of the presenting symptoms of epiphora and/or dacryocystitis, without the need for additional medical or surgical intervention for persistent symptoms.

Complications

Any intraoperative complications (e.g., significant hemorrhage, orbital fat prolapse, cerebrospinal fluid leak) and postoperative complications (e.g., epistaxis, synechiae formation, granuloma formation, wound infection or symptomatic persistent obstruction requiring revision surgery) were recorded.

Statistical analysis

All statistical analyses were performed using SPSS software (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.). Descriptive statistics were used to summarize patient demographics and clinical characteristics. Continuous variables were presented as mean±standard deviation (SD) and categorical variables were presented as frequencies and percentages. Anatomical and functional success rates were calculated as percentages with 95% confidence intervals (CIs) at each follow-up interval.

RESULTS

Patient demographics

A total of 150 patients (165 eyes) who fulfilled the inclusion criteria underwent stent-free Endo-DCR with the posterior-based mucosal flap technique during the study period. The mean age of the cohort was 51.2±11.8 years, with a range of 23 to 82 years. There was a notable female preponderance, with 108 (72.0%) females and 42 (28.0%) males. Regarding laterality, 86 (52.1%) eyes were right-sided, 69 (41.8%) were left-sided and 7 (4.2%) patients presented with bilateral NLDO (14 eyes). The most common presenting symptom was epiphora (68.0%), followed by a combination of epiphora and dacryocystitis (24.0%) and dacryocystitis alone (8.0%).

Surgical outcomes

Intraoperative findings

The average surgical time from skin incision to closure was 48±9 minutes. Intraoperative mucopurulent discharge from the lacrimal sac was observed in 32% (48/150) of

cases. The average bony osteotomy created had dimensions of 13.5±1.8 mm.

Anatomical success

Anatomical success rates, rigorously assessed by patent syringing and clear endoscopic visualization of the ostium, demonstrated high patency throughout the follow-up period: 96.4% at 1 month, 92.7% at 3 months, 90.3% at 6 months and 87.9% at 12 months.

Functional success

Functional success, indicated by complete resolution of patient-reported symptoms, closely paralleled the anatomical outcomes: 94.5% at 1 month, 89.7% at 3 months, 87.3% at 6 months and 85.5% at 12 months.

Intraoperative complications

Minor intraoperative bleeding requiring electrocautery for control occurred in 6.0% (9/150) of cases. No major intraoperative complications such as orbital injury, significant vascular damage or cerebrospinal fluid leak were encountered.

Postoperative complications

Mild epistaxis

Experienced by 3.3% (5/150) of patients, which resolved spontaneously within 24-48 hours or with simple anterior nasal packing.

Synechiae formation

Endoscopically identified mild synechiae at the rhinostomy site in 8.5% (14/165) of eyes.

These were typically small fibrous bands that did not cause complete functional obstruction and were managed with nasal saline washes and occasional gentle endoscopic lysis in the outpatient setting. None required formal surgical revision.

Granuloma formation

A small, localized granuloma at the ostium was noted in 1.2% (2/165) of eyes, both of which responded favourably to topical corticosteroid application.

Table 1: Patient demographic and clinical characteristics (n=150, 165 eyes).

Characteristic	Value
Age (in years), Mean±SD (Range)	51.2±11.8 (23-82)
Gender	**n (%)**
Female	108 (72.0%)
Male	42 (28.0%)
Affected eye	
Right eye	86 (52.1%)
Left eye	69 (41.8%)
Bilateral (total patients/eyes)	7 (4.2%) / 14 eyes (8.5%)
Presenting symptom	
Epiphora only	102 (68.0%)
Dacryocystitis only	12 (8.0%)
Both	36 (24.0%)

Table 2: Post-operative complications (n=165 eyes).

Complication	Number of eyes (N)	%
Mild epistaxis	5	3.3
Synechiae formation (mild, no revision)	14	8.5
Granuloma formation	2	1.2
Symptomatic re-obstruction requiring revision	4	2.4

Symptomatic re-obstruction requiring revision surgery

Only 2.4% (4/165) of eyes (from 4 patients) experienced symptomatic re-obstruction that necessitated revision Endo-DCR within the 12-month follow-up period. Of these 4 cases, 2 achieved patency with revision surgery, while the other 2 subsequently received a temporary silicone stent for 3 months due to persistent tendency for re-stenosis.

DISCUSSION

This prospective observational study, conducted over a 25-month period, demonstrates the robust efficacy of the posterior-based mucosal flap technique in stent-free

endoscopic dacryocystorhinostomy for the patient population of Madhya Pradesh. Our findings of overall anatomical success (87.9%) and functional success (85.5%) at 12 months are consistent with and indeed, within the upper range of success rates reported in numerous studies globally for both stented and stent-free Endo-DCR procedures, which typically range from 80% to 95%.[7-9]

The high success rates observed in our cohort underscore the surgical principle that meticulous mucosal flap creation and approximation are pivotal for successful DCR, irrespective of stenting. The posterior-based mucosal flap, by providing a broad, vascularized epithelial lining to the newly created osteotomy, plays a crucial role in promoting rapid re-epithelialization, inhibiting granulation tissue formation and minimizing post-operative fibrosis mechanisms commonly implicated in DCR failure.[10-12] This approach ensures a stable and durable ostium, allowing for natural healing without reliance on an intraluminal foreign body.

A compelling advantage highlighted by our study is the remarkably low rate of complications. The complete absence of stent-related complications, such as patient discomfort, accidental stent extrusion or granuloma formation around the stent, significantly improves patient experience and reduces the burden of additional clinical visits for stent removal.[8,13,14]

While mild synechiae were observed in a minority of cases, these were non-obstructive and managed conservatively, contrasting sharply with the more significant synechiae that can lead to re-obstruction in inadequately flapped or stented cases.[11] The symptomatic re-obstruction rate requiring revision surgery was commendably low at 2.4%, further supporting the long-term patency achieved with this technique.

The implications of these findings are particularly significant for public healthcare in Madhya Pradesh and similar developing regions. Eliminating the need for silicone stents directly translates into substantial cost savings by reducing material expenses and obviating the need for a separate procedure or clinic visit for stent removal.[15] This makes DCR a more accessible and economically viable treatment option for a broader patient demographic, aligning with the principles of equitable healthcare delivery in resource-constrained environments. The demographic profile of our cohort, characterized by a female preponderance and a mean age in the fifth decade, is typical for primary acquired NLDO, reinforcing the generalizability of these results to the prevalent patient population.[9,11]

Limitations

Despite its robust methodology and favourable outcomes, this study has inherent limitations. As a single-center observational study, the results, while strong, may not be fully generalizable to all populations, particularly those with different genetic predispositions or environmental factors influencing NLDO.

While functional success was rigorously assessed by clinicians, reliance on patient-reported symptom resolution inherently carries a degree of subjectivity. Future research could benefit from incorporating additional objective measures, such as lacrimal scintigraphy or fluorescein disappearance tests, to supplement subjective symptom assessment.[16-18] Finally, the absence of a concurrently managed stented control group limits direct statistical comparison of outcomes and complications between stent-free and stented approaches within our specific patient population.

Future directions

Future research should focus on conducting multi-center prospective studies with larger and more diverse patient populations to further validate the efficacy and safety of the posterior-based mucosal flap technique in stent-free Endo-DCR. Randomized controlled trials directly comparing this stent-free approach with stented DCR are warranted to provide definitive evidence regarding relative success rates, complication profiles, patient satisfaction and cost-effectiveness, particularly tailored to the socioeconomic context of India.[15,19] Longitudinal studies with extended follow-up beyond 12 months are also crucial to ascertain the true long-term patency and durability of the rhinostomy.

CONCLUSION

The posterior-based mucosal flap technique in stent-free Endo-DCR demonstrates high anatomical and functional success rates with a low incidence of complications. By ensuring wide mucosal apposition and rapid re-epithelialization, this approach effectively maintains long-term ostial patency without the need for silicone intubation. The absence of stent-related morbidity, coupled with reduced operative costs and improved patient comfort, makes this technique particularly advantageous in resource-limited healthcare settings such as Madhya Pradesh. These findings affirm that the posterior-based mucosal flap technique represents a safe, efficient and economically viable alternative to conventional stented Endo-DCR, with strong potential for broader clinical adoption. Future multicentric and randomized studies with extended follow-up are recommended to further validate these outcomes and establish standardized protocols for stent-free DCR surgery.

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