Original Article

A Comparative Study of Endoscopic Endonasal Dacryocystorhinostomy with and without Stenting

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Abstract

Introduction: The definitive management of complete nasolacrimal duct obstruction from chronic dacryocystitis is surgical. The surgery of choice is dacryocystorhinostomy (DCR), which can be done external or endonasal with or without stenting. We aim to compare the anatomical and functional outcomes of endoscopic endonasal DCR with and without stenting. **Materials and Methods:** This prospective study was carried out involving 30 patients of either sex randomly divided into two groups of 15 patients each. Group A underwent endoscopic DCR with stenting of the canaliculi, whereas Group B underwent endoscopic DCR without stenting. These patients were followed up at week 1, 6, and 12. The success of surgery in each group was determined by the absence of epiphora (Munk scale grades: 0 and 1), patent ostium on irrigation, positive Jones test, and decrease in the marginal tear film volume as seen on dye disappearance test (grade: 0 and 1) at week 12. Final data were analyzed using SPSS 21 version. **Results:** About 86.6% success rate was noted in the group where stenting was done (Group A) compared to 100% success in the group without stenting (Group B). This difference was, however, not statistically significant ($P = 0.143$). Failures in the study were attributed to the closure of rhinostomy ostium at week 12 follow-up. The most common complication noted was postoperative pain around the bridge of nose. Stent-related complications such as conjunctivitis and difficulty in removal of the stent were also noted. **Conclusion:** In our study, the surgical results of endoscopic endonasal DCR without stenting were better than endoscopic dacryocystorhinostomy with stenting both anatomically as well as functionally.

Keywords: Dacryocystorhinostomy, epiphora, nasal endoscopy, probing, stent

Introduction

The most frequent cause of epiphora due to nasolacrimal duct (NLD) occlusion is thought to be chronic dacryocystitis.[1] In addition to epiphora, patients may also exhibit mucopurulent discharge from the eyes, edema of the eyelids, swelling over the lacrimal sac area, and lacrimal fistula. These symptoms may predispose patients to recurring bouts of conjunctivitis, keratitis, periorbital cellulitis, orbital cellulitis, and abscess. Dacryocystorhinostomy (DCR) is the only effective treatment for total NLD obstruction. The use of canalicular stents may be paired with this. Endoscopic DCR has several advantages over external DCR, including not requiring a skin incision, requiring less time to complete the procedure, barely interfering with the lacrimal system's natural pump function, and being able to treat concomitant intranasal pathologies concurrently.[2] In their investigation, Su[3] found that an endoscopic dacryocystorhinostomy (EnDCR) had a functional success rate of 90.7% compared to an external DCR's 90.1%. Regarding the application of canalicular stents, there are opposing viewpoints. They have been linked to a number of side effects, including stent prolapse or loss, punctual slitting, ostium granulation, secondary infections, and corneal infections.[4]

This study's objectives were to assess and contrast the morphological and functional results of endoscopic endonasal DCR with and without stenting and to further investigate the procedure's risks.

Materials and Methods

The comparative study was conducted over 18 months

Submitted: 03-Jun-2023 **Revised:** 27-Jul-2023
Accepted: 28-Jul-2023 **Published:** 22-Dec-2023

Access this article online

Quick Response Code:

Website: www.actamedicainternational.com

DOI: 10.4103/amit.amit_47_23

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How to cite this article: Prinja S, Dhanoa S, Singh G, Kaur K, Gupta S, Bansal G. A comparative study of endoscopic endonasal dacryocystorhinostomy with and without stenting. Acta Med Int 2023;10:96-101.

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from April 2021 to October 2022 in the department of otorhinolaryngology of our hospital. Ethical clearance (GGS/IEC/03) was taken from the institutional ethical committee. Written and informed consent was obtained from the patients. Nonrandom convenient sampling technique was adopted. Thereby, 30 consecutive patients having symptoms and signs suggestive of chronic dacryocystitis and fulfilling the inclusion criteria were included in the study.

Inclusion criteria

1. Patients with diagnosis of chronic dacryocystitis with NLD obstruction
2. Both sexes' patients with 18–60 years of age
3. Patients willing for surgery
4. Patients without systemic diseases or an immunocompromised state.

Exclusion criteria

1. Patients unfit for surgery
2. Obstruction of canaliculus or common canaliculus; punctal stenosis
3. Increased lower lid laxity; ectropion
4. Any previous lower lid surgery
5. Suspicion of malignancy
6. Failed external DCR and revision endoscopic DCR
7. Previous radiation therapy or bony trauma
8. Epiphora attributable to factors than NLD blockage
9. Patients with the diagnosis of chronic rhinosinusitis and nasal polyp.

Each patient diagnosed with chronic dacryocystitis underwent subjective and objective assessment preoperatively and postoperatively at week 1, 6, and 12.

Detailed assessment of the patients was done including thorough history with grading of symptoms according to the Munk score [Table 1]. Complete ophthalmic examination was done including probing, dye disappearance test [Table 2], Jones dye test, and lacrimal sac syringing. Clinical assessment of the nose and paranasal sinuses along with diagnostic nasal endoscopy was done to rule out other causes for the duct obstruction. Systemic assessment and fitness for the surgery were obtained. The patients were randomly divided into two groups of 15 patients each. Group A underwent EnDCR with stenting of the canaliculi and Group B underwent EnDCR without stenting.

Table 1: Munk scale grading

Munk scale grade	Munk scale
0	No epiphora
1	Epiphora with dabbing less than twice a day
2	Epiphora with dabbing 2–4 times a day
3	Epiphora with dabbing 5–10 times a day
4	Epiphora with dabbing>10 times a day
5	Constant epiphora

Table 2: Dye disappearance test grading

Dye disappearance test grade	Interpretation
0	No fluorescein in the conjunctival sac
1	Thin fluorescein marginal tear drop persists
2	More fluorescein persists somewhere between 1 and 3 grades
3	Widely bright fluorescein tear strip

Probing

After topical anesthetic application, the punctum was dilated with a lacrimal punctum dilator probe. A 00 Bowman lacrimal probe was used to assess the site of blockage:

- Blockage of either single canaliculus or both canaliculi: soft stop on probing
- Blockage of common canaliculus: soft stop on probing
- NLD obstruction: hard stop on probing due to medial wall of lacrimal sac reaching against the lacrimal bone.

Dye disappearance test

Two percent of fluorescein solution or fluorescein strip soaked in saline solution was applied to lower conjunctival fornix of the eye. The volume of tear strip was noted with slit lamp or indirect ophthalmoscopy and patient was reexamined at 5 min and relative volume of tear lake was determined.

Interpretation at 5 min:

i. Narrow strip suggested adequate lacrimal function
ii. Elevation of tear film or retention of fluorescein dye suggested partial or complete blockage of lacrimal system.

Jones dye test

The Jones I test

Two percent dye with fluorescein was instilled in the inferior fornix of the affected eye. Drainage of dye was demonstrated by the insertion of a swab into the nose in the area of inferior meatus, by asking them to blow their nose into a tissue. Positive test indicated the presence of dye in the inferior meatus and negative test indicated no dye observed in the inferior meatus. Preoperatively, appearance of dye was noted in the inferior meatus, whereas postoperatively, it was noted at the rhinostomy site. This was followed by irrigation of the lacrimal system.

Irrigation of lacrimal system

A blunt cannula was inserted into upper and lower punctum one by one, and the lacrimal system was irrigated with saline solution. Interpretation of results:

- If the solution flowed freely into the nose, there is no obstruction, indicating that the nasolacrimal pathway was open
- If there is backflow of saline through the irrigated punctum it is a sign of canalicular stenosis
- If reflux occurred through the opposite punctum, it indicates stenosis either deeper in the postsaccal area or in the common canaliculis.

Surgical procedure

Under general anesthesia, after nasal decongestion with

neuropatties and infiltration with lidocaine and adrenaline, an inverted U-shaped incision measuring 10 mm by 10 mm was made at the lateral nasal wall anteriorly and somewhat superior (about 2 mm) to the insertion of the middle turbinate. A 0° or 30°, 4 mm diameter nasal endoscope was used. The inferior based mucosal flap was mirrored back over the middle turbinate, reaching up to the uncinate process and being lifted off the maxillary bone. It was shielded by a labeled cotton pack that had been drenched in saline.

A round knife was used to shave the soft lacrimal bone away from the posteroinferior region of the sac. The frontal process of maxillary bone which covers A DCR punch was then used to gently poke the lacrimal sac, and it was drilled until the sac was fully revealed. A metallic lacrimal probe was inserted medially through the inferior canaliculi and gently pressed to tent the sac, enabling a more exact localization of the sac lumen, and simplifying cutting through the sac.

Lacrimal sac was opened after a sickle shaped cut was made vertically [Figures 1 and 2]. Saline irrigation was used to verify the nasal cavity's patency through the inferior canaliculus and flow into the new stoma that could be seen [Figure 3]. The nasal mucosal flaps were then cut to size, repositioned to cover the denuded bone over the opening sac, and trimmed to form a big anterior flap. The flaps were precisely positioned to oppose the nasal mucosa by being everted, incised, and adjusted.

The punctum were dilated and silastic lacrimal intubation tubes were placed through the upper and lower puncta and retrieved endonasally in patients in Group A [Figure 4]. Multiple knots were placed at the end of the tubing. The nasal cavity was packed with Merocel which was removed the next day.

Postoperative management

It included antibiotic eye drops, saline nasal drops, and oral antibiotics for 1 week and lacrimal irrigation, dye disappearance test, and Jones dye test on follow-up visits at week 1, 6, and 12. Furthermore, at every follow-up, nasal endoscopy was done and any blood clots, and granulations or adhesions found were removed.

In Group A, where stent was placed, it was removed at 6 weeks following the procedure.

Anatomical success of the surgery was defined as patent neo-ostium on irrigation, and functional success was defined as decrease in the marginal tear strip volume as seen on fluorecein dye disappearance test, positive Jones dye test I, and absence of epiphora at the end of week 12 of postoperative follow-up.

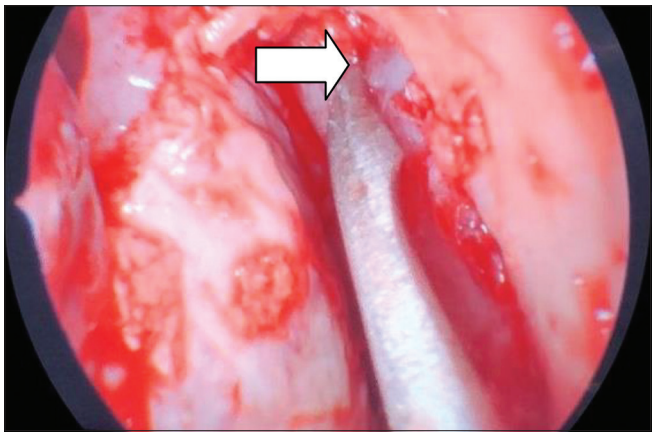


Figure 1: Intraoperative incision given over lacrimal sac (white arrow)

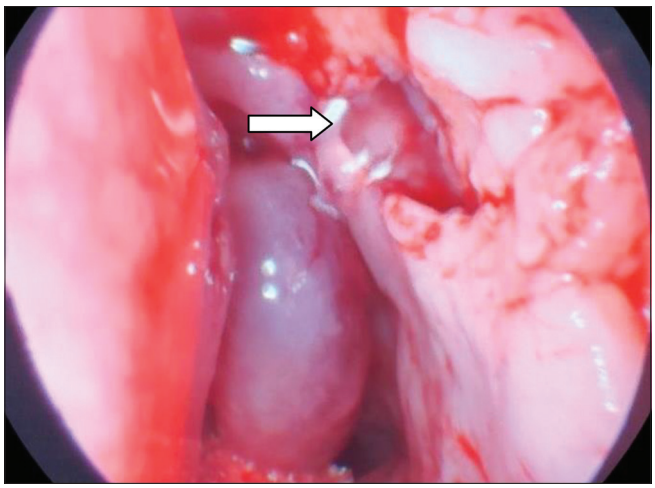


Figure 3: Intraoperative syringing shows free flow of saline from opened lacrimal sac (white arrow)

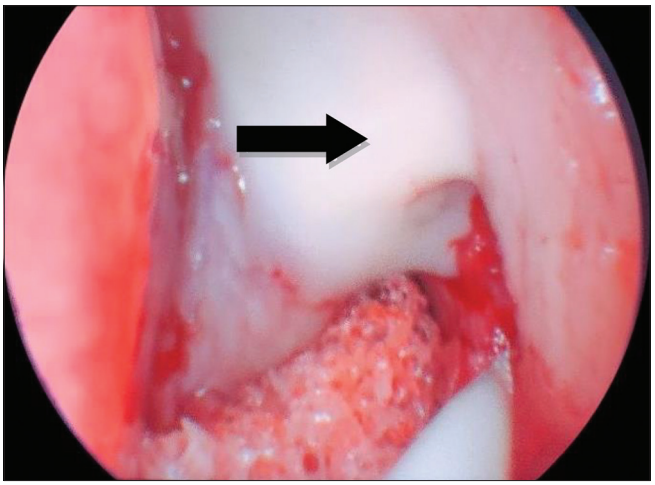


Figure 2: On incision over lacrimal sac, purulent discharge released in case of a pyocele (black arrow)

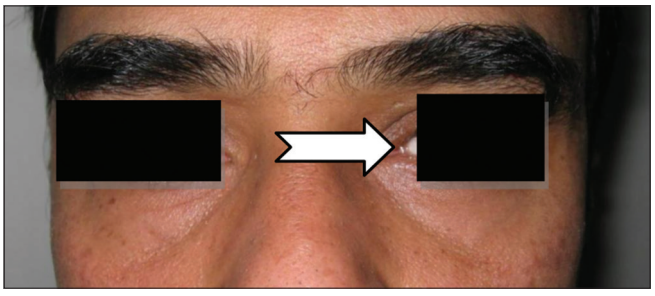


Figure 4: Lacrimal stent insitu (white arrow) in left eye postoperative

Statistical analysis

All statistical calculations were done using SPSS 21 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

Results

Age incidence

The mean age of the patients was found to be 44.13 ± 9.55 years in Group A and 41.00 ± 10.64 years in Group B. Hence, in our study, the maximum numbers of patients were seen in the age group of 31–40 years with 33.3% patients in both Group A and Group B.

Sex incidence

About 73.3% patients were females and 26.7% patients were males in both Group A and B, the ratio of which came to be 2.75:1.

Laterality

Predominance of right-sided chronic dacryocystitis was noted in both groups with 46.7% cases in Group A and 40% cases in Group B. Left-sided disease was seen in 40% patients in Group A and 33.3% patients in Group B, whereas bilaterality was seen in 13.3% patients in Group A and 26.7% patients in Group B.

Mode of presentation

Epiphora was the predominant symptom and was seen in all the cases of both groups ($n = 15$). In Group A, the second-most common complaint was discharge ($n = 11$) from the eye followed by itching ($n = 5$) and swelling ($n = 4$), whereas in Group B, itching and discharge were seen in equal number of cases ($n = 7$) followed by swelling ($n = 4$), as shown in Graph 1.

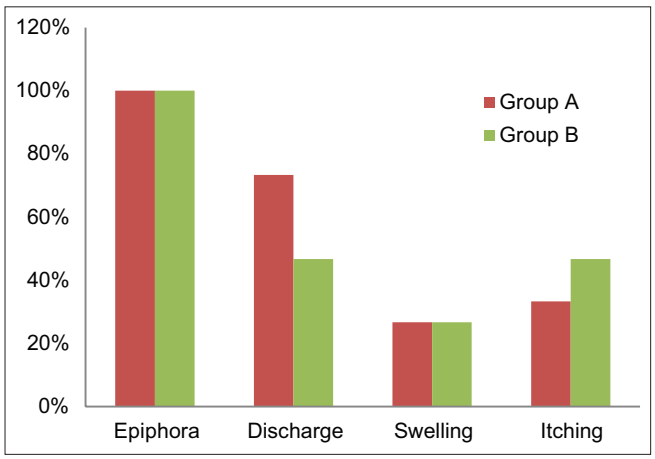
Duration of surgery

The duration of surgery in minutes was significantly less in Group B (64 ± 21.81) than in Group A (94.67 ± 12.32) as stent placement requires more time. . The *P* value of these two groups was 0.001 with Z (standard) score −3.228.

Postoperative assessment

Munk scale grades

As compared to the preoperative grades, 28 patients overall (Group A with $n = 13$ and Group B with $n = 15$) showed improvement in the Munk scale grading of epiphora at the end of 12 weeks. Preoperatively, Munk scale gardes were 3, 4, and 5 which became lower postoperatively to grade 0 and 1. Two patients in Group A did not show improvement in the Munk grades as compared to their preoperative values.



Graph 1: Bar chart showing comparison of frequency of symptoms between both groups

Dye disappearance test

As compared to the preoperative grades, 28 patients overall (Group A with $n = 13$ and Group B with $n = 15$) showed improvement in the dye disappearance test grading at the end of 12 weeks. Preoperatively, patients had grades 2 and 3, and postoperatively, grades lowered to 0 and 1. Two patients in Group A did not show improvement in the postoperative grades (Grade 2) as compared to their preoperative values (Grade 3).

Jones dye test

Postoperatively, all patients in both the groups showed a positive Jones test with appearance of dye noted at the rhinostomy site at week 1 of follow-up ($n = 15$ in Group A and B). Similar findings were noted at week 6 of follow-up postoperatively. At 12th week of follow-up, Jones test was found negative in two patients belonging to Group A, whereas all 15 patients of Group B had a positive Jones dye test.

Lacrimal syringing

Preoperatively, all the patients in the study showed NLD blockage on syringing ($n = 30$). At the end of week 12, postoperatively, two patients in Group A showed blockage on syringing compared to Group B showing patency in all the patients ($n = 15$), a difference which was found not to be statistically significant ($P = 0.143$).

Overall result

Overall success rate of the surgery in Group A was 86.6% and Group B was 100% [Table 3].

Complications

The common complications seen postoperatively were: pain around the bridge of the nose in 26.6% patients (Group A) and 33.3% patients (Group B), followed by lid edema in 13.3% patients (Group A) and 6.6% patients (Group B).

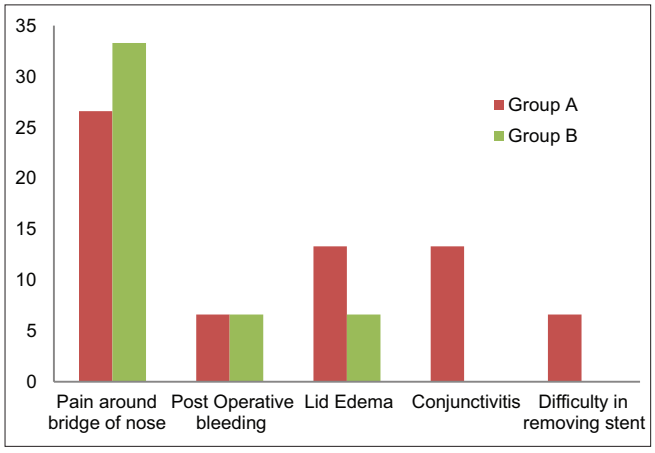
Postoperative bleeding was reported only in one patient in each group (Group A: $n = 1$, Group B: $n = 1$).

Complications such as conjunctivitis (13.3%) and difficulty in removal (6.6%) of stent were seen exclusively in Group A patients, as shown in Graph 2.

Discussion

The effective surgical endoscopic DCR is frequently used to treat NLD blockage symptoms. In addition to the advantage of avoiding exterior incisions, endoscopic technique enables us to treat associated intranasal disorders such as nasal polyposis and deviated nasal septum as well as surgical failure factors such as granulations and adhesions. Although there are conflicting

opinions about their usage, endocanalicular stenting can be combined with the surgery since it has been thought to assist maintain the patency of the ostium produced. In our research, we looked at several procedure-related problems as well as the effectiveness of EnDCR with and without a stent. Similar to what Shashidhar *et al*.[5] and Ahmad and Pant[6] reported, the majority of patients in both groups combined were in the age range of 31–40 years, making up 33.3% of all patients. Similar to the findings of Unlu *et al*.[7] (76.3%) and Naik *et al*.[8] (72.9%), the disease was seen more frequently in females (73.3%). Jacob HB proposed that females were more susceptible to chronic dacryocystitis due to higher vascular congestive factor, a narrower bone canal, and prolonged exposure to cooking smoke.[9,11] As observed by Smirnov *et al*. (56.52%)[10] and Unlu *et al*. (65.8%),[7] the right side (43%) was shown to be more frequently impacted in our study. However, no statistically significant difference was found in the incidence of side involvement in the various studies undertaken for chronic dacryocystitis undergoing endoscopic DCR.[11,12] The most frequent initial symptom across all patients (100%) was epiphora, which was followed by discharge from the afflicted eye, irritation, and swelling close to the medial canthus. The time required for endonasal endoscopic DCR without the insertion of a stent was much less than that required for the procedure with the implantation of a stent (mean duration: 64.00 min), which was statistically significantly different between the two groups. These results (48.6 min for EnDCR without a stent and 68.6 min for EnDCR with a stent) were in agreement with those reported by Chowdhury *et al*.[13] The additional time in Group A has been linked to the time needed for stent insertion, proper stent placement, and intranasal knot tying. Pain near the bridge of the nose, postoperative hemorrhage, lid edema, conjunctivitis, and difficulties removing the stent were the general problems reported in the study. The stent-related problems are consistent with those reported in previous studies, such as the meta-analysis conducted by Kang *et al*., who noticed that their patients had stent discomfort, stent extrusion, difficulty removing the stent, and punctal laceration.[14] Furthermore, at the first week of follow-up, 80% of patients in Group A and 60% of patients in Group B had raw regions and edema surrounding the site of the rhinostomy, according to postoperative nasal endoscopy. Adhesions between the joints were present in 26.7% of Group A patients and 6.7% of Group B patients mucosal flaps or between flaps and turbinate mucosa, which were managed endoscopically. At week 6 of follow-up, statistically significant difference was noted in the presence of granulations and adhesions around rhinostomy site. Granulations were produced around the stoma in 6.7% of patients in Group B. Both adhesions and granulations were present in 40% of patients in Group A and 6.7% of patients in Group B, and both conditions were treated to keep the stoma size. At week 12, mucosal adhesions were still present in 26.7% of Group A patients and 6.7% of Group B patients, and 13.3% of Group A patients had a closed ostium as determined by nasal endoscopy. According to Ressiniotis *et al*., granulation tissue or fibrosis blockage of the neo-ostium is the primary reason for failure. Due to accidental damage to the nasal mucosa, adhesions may form between the flaps of the nasal mucosa, lacrimal sac flaps, and occasionally between the nasal mucosa at the borders of the ostium and nasal septum.[15]



Graph 2: Bar chart showing difference in distribution of complications between two groups

Results of our study in comparison with other studies

In our study [Table 4], endonasal endoscopic DCR had a 93% overall success rate, with a success rate of 86.6% in the stenting group and a success rate of 100% in the non stenting group. This difference was, however, not statistically significant. Closure of the rhinostomy, which resulted in a nonpatent NLD on lacrimal syringing with Munk scale grades of 3 and 4, dye disappearance test grades of 2, and a negative Jones dye test, was the causes of 13.3% of the failures in Group A.

Silicone stents, according to proponents of their use like Yigit *et al*.[2] and Madge and Selva,[20] can maintain the

Table 3: Results of the study at the end of week 12

Overall result	Group A (%)	Group B (%)	Total (%)	χ^2	*P*
Success	13 (86.6)	15 (100)	28 (93.3)	2.143	0.143
Failure	2 (13.3)	0	2 (6.6)		
Total	15	15	30		

Table 4: Success rate of various studies

Study	Years	Success in EnDCR with stenting (%)	Success in EnDCR without stenting (%)
Smirnov *et al*.[10]	2004–2007	78	100
Unlu *et al*.[7]	2009	84.2	94.7
Smitha[16]	2012–2015	85	90
Monga *et al*.[17]	2017	92	100
Pandey *et al*.[18]	2015–2016	85.7	90.9
Chowdhury *et al*.[13]	2020	88	92
Maldhure *et al*.[19]	2021–2022	90	93.3
Our study	2021–2022	86.6	100

EnDCR: Endoscopic dacryocystorhinostomy

openness of the neo-ostium and prevent or treat stenosis of the lacrimal canaliculi. Onerci *et al*.[21] nevertheless suggested that extended tube implantation could operate as a nidus for granuloma formation and infection, which may result in long-term procedure failure. Contrarily, Ciftci *et al*.[22] in their investigation came to the conclusion that silicone intubation had no effect on the fibrosis or inflammation of the pericanalicular region and that the fibrosis of the ostium was caused by the healing process following surgical manipulations rather than silicone intubation.

Unfortunately, there were significant gaps in the current investigation. The sample size might not be sufficient. The length of follow-up is also brief, which is important because patients were not randomly assigned, and the contracture of the ostium over the postoperative period has been seen for years. For further analysis, a sizable randomized control trial is required.

Conclusion

Endoscopic DCR has become treatment of choice for relieving symptoms of NLD obstruction. In our study, our aims were fulfilled, and we concluded that the surgical results of EnDCR without stenting were better than EnDCR with stenting both anatomically as well as functionally. This difference was, however, not statistically significant (*P* value-0.143). Considering the possible complications along with factors like financial cost, the duration of surgical procedure and patient discomfort with the use of stent and endoscopic endonasal DCR without the use of stent may be the preferred choice by some surgeons.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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