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Postoperative Outcomes of Bi-Canalicular Silicone Stenting in Endoscopic Dacryocystorhinostomy: A Prospective Comparative Study

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KEYWORDS

Endoscopic dacryocystorhinostomy; nasolacrimal duct obstruction; silicone stent; dacryocystitis; epiphora; bicanalicular intubation; postoperative outcome.

ABSTRACT:

Background: Chronic dacryocystitis due to nasolacrimal duct obstruction (NLDO) causes persistent epiphora. Endoscopic dacryocystorhinostomy (En-DCR) creates an alternate tear drainage pathway with success rates nearing those of external DCR[1]. Surgeons often use bi-canalicular silicone stents to maintain ostium patency, but their benefit is controversial. Some studies suggest a slight improvement in success with stents[2][3], whereas others report no clear advantage and possible stent-related complications (granulation tissue, punctal erosion)[4]. This study compares postoperative outcomes of En-DCR with versus without bi-canalicular silicone intubation.

Materials and Methods: We conducted a prospective, randomized study of 60 adult patients (14–70 years) with primary NLDO causing chronic dacryocystitis. Patients were randomly assigned to Group A (En-DCR with bicanalicular silicone stent, n=30) or Group B (En-DCR without stent, n=30). Preoperatively, all patients underwent lacrimal syringing and endoscopic nasal evaluation to confirm saccal or post-saccal obstruction. Surgeries were standardized (endonasal sac osteotomy with mucosal marsupialization) and performed under general anesthesia. In Group A, a silicone stent was placed through both canaliculi and left in situ for 6 weeks; Group B had no intubation. Postoperative care was identical. Functional patency (syringing test) and symptomatic success (Munk's epiphora score) were assessed at 1 week, 3 weeks, 3 months, and 6 months. Outcomes were analyzed objectively (patent vs. blocked) and subjectively (Munk score 0 = complete relief). Statistical comparisons (Chi-square or Fisher's exact test) evaluated differences in success rates.

Results: The mean patient age was ~50.5 years (range 14–70), with no significant difference between groups (mean 50.3 vs 50.7 years, P=1.0). Female predominance was noted (77% overall). Baseline characteristics – including age, sex, and laterality – were similar between groups (Table 1). Chronic inflammation was idiopathic in 75% and recurrent in 25% of cases; Group A had a higher proportion of inflammatory cases (40% vs 10%), but this did not affect overall results. At 6 months, anatomical success (ostium patency on syringing) was achieved in 28/30 (93.3%) patients in Group A and 26/30 (86.7%) in Group B (Figure 1). Symptomatic success (Munk score 0) was identical: 28/30 (93.3%) in Group A vs 26/30 (86.7%) in Group B (Figure 2). The difference in success rates was not statistically significant (Group A vs B, P=0.67). Early postoperative patency at 3 weeks was similarly high (100% vs 96.7%). By 6 months, two failures in Group A and four in Group B were noted; the intergroup difference remained nonsignificant. Postoperative complications are summarized in Table 2. Minor rhinostomal granulations and synechiae occurred infrequently in both groups. Group A (stented) had 2 cases of tube extrusion (6.7%), which required early removal; Group B had 2 cases of granulation (6.7%) and 1 minor nasal bleed. No patient had canalicular injury or punctal erosion. Overall, 20% of stented eyes and 23% of non-stented eyes experienced any

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complication (no significant difference).

Conclusion: In this series, endoscopic DCR with bi-canalicular silicone intubation produced high success (93%) comparable to non-intubated DCR (87%), consistent with prior analyses[2][3]. The small, non-significant trend favoring stents matches meta-analyses showing only a modest benefit of silicone tubes in primary En-DCR[2][3]. However, stent-related issues (tube extrusion) and additional cost must be weighed. Given similar outcomes and some stent morbidity, routine intubation for uncomplicated primary En-DCR may be unnecessary[4][5]. We recommend reserving stents for selected cases (e.g. canalicular stenosis, revision DCR) as suggested in the literature[4][6]. These findings add to the evidence base guiding DCR technique in modern practice.

Introduction

Nasolacrimal duct obstruction (NLDO) leads to chronic dacryocystitis and distressing tearing (epiphora). Dacryocystorhinostomy (DCR) creates a new drainage fistula from the lacrimal sac into the nasal cavity. The traditional external DCR has success rates of 90–98%[1]. Endoscopic transnasal DCR (En-DCR) – popularized in the late 20th century – avoids facial scars and preserves lacrimal pump function[1]. Modern endoscopic techniques, with wide osteotomy and mucosal marsupialization, also achieve high success (90–100%)[1] and allow concurrent treatment of nasal pathology (septal deviation, sinusitis)[1].

Despite these advances, restenosis of the rhinostomy is a leading cause of failure. Postoperative granulation, scar formation, or sinus synergy can close the ostium[4]. Bi-canalicular silicone intubation – first introduced by Quickert and Crawford in the 1970s – has been widely used in DCR to maintain patency, particularly in complex cases. An ideal stent is inert, pliable, self-retaining, and does not damage tissue; silicone meets many of these criteria and is routinely available. However, stents themselves can incite mucosal granulation and canalicular injury[6], and the literature is mixed on their routine use. Some studies report marginally higher success rates with stents, while others find no significant advantage[2][3]. For example, a recent meta-analysis of randomized trials in En-DCR found success rates of 94% with stents versus 90.6% without, yielding an odds ratio barely above 1[2]. Another large meta-analysis (external + endoscopic + laser DCR) showed that stenting significantly improved outcomes in external DCR but not in endoscopic cases[3].

Given this uncertainty, we undertook a prospective comparison of En-DCR with vs. without bicanalicular silicone stent intubation. Our aim was to evaluate anatomical patency and symptomatic relief at six months, and to identify stent-related complications. The hypothesis was that stents may not significantly alter success in straightforward primary En-DCR, aligning with recent randomized trials[4][5].

Materials and Methods

Study design and patients: This comparative study included 60 consecutive adult patients (14–70 years) with chronic dacryocystitis at department of ENT, Andaman & Nicobar Islands Institute of Medical Sciences, Sri Vijaya Puram over a 2-year period. All had primary acquired NLDO (saccal or postsaccal) confirmed by history, clinical exam, and lacrimal syringing with saline. Key inclusion criteria were unilateral epiphora, patent puncta and canaliculi (verified by probing), and obstruction at the lacrimal sac or duct level. We excluded congenital NLDO, canalicular or punctal stenosis, acute infection, trauma, malignancy, significant nasal pathology (gross septal deviation, polyposis, pansinusitis), or any condition precluding anesthesia. All patients gave informed consent.

Group assignment: Patients were randomly assigned to Group A (stent) or Group B (no stent) by alternate allocation after clinical evaluation. Each group comprised 30 eyes. Preoperative demographics (age, sex, laterality, etiology) were recorded (Table 1). Baseline subjective epiphora was graded by Munk's score. Ophthalmic and nasal exams ruled out lid laxity or concomitant ocular disease. Routine labs and anesthesia evaluation were performed.

Journal of Chemical Health Risks
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Surgical technique: Surgeries were done under general anesthesia with local 1:100,000 adrenaline infiltration to minimize bleeding. A rigid nasal endoscope (4 mm, 0°) was used. The sac area was accessed by removing nasal mucosa over the lacrimal fossa and drilling bone to fully expose the lacrimal sac. An L-shaped mucosal flap was created, and the medial sac wall was excised to create a wide ostium. In Group A, a bicanalicular silicone tube (assembled from a Crawford stent) was passed from canaliculus to nasal cavity bilaterally and tied endonasally, ensuring the ostium remained patent. Group B had identical surgery but without stenting. No mitomycin-C or adjunctive measures were used. Nasal packing (absorbable gel) was placed temporarily. All patients received standard postoperative care including antibiotics, nasal saline douches, and analgesics.

Outcome assessment: Follow-up visits were at 1 week, 3 weeks, 3 months, and 6 months. At each visit, endoscopic examination of the ostium and lacrimal syringing were performed. Patency was defined as free flow of saline into the nose without reflux. Munk's score (0–5) was recorded at 3 and 6 months to quantify subjective epiphora (0=no tearing). Primary outcomes were anatomical success (patent ostium by 6 months) and functional success (Munk 0). Secondary outcomes included complications (granulation, ostial stenosis, tube extrusion, infection). The stent in Group A was removed between 6–8 weeks post-op under endoscopic guidance.

Statistical analysis: Descriptive statistics were used for baseline data. Group comparisons (demographics, outcomes) used Chi-square or Fisher's exact test for categorical variables and t-test for age. Success rates at 6 months were compared by Chi-square; $P<0.05$ was considered significant. Analysis was performed using SPSS v.25.

Results

Baseline characteristics: The cohort's mean age was 50.5 ± 10 years (range 14–70), with 47/60 (78%) females. Group A and B had virtually identical mean ages (50.3 vs 50.7 years, $P=1.0$) and sex ratios (M:F 9:21 vs 5:25, $P=0.36$) (Table 1). Left-sided obstruction was more common (53%) than right (42%), reflecting general NLDO laterality; bilateral cases were rare (5%). Idiopathic etiology accounted for 75% of cases; the rest had history of chronic dacryocystitis from repeated infection. Group A had more inflammatory cases than Group B (40% vs 10%, $P=0.017$), but this did not significantly affect outcomes.

Surgical outcomes: All surgeries were completed without intraoperative complications. Early postoperative healing was uneventful in both groups. At 3 weeks, syringing showed 100% patency in Group A (stent in place) and 96.7% in Group B. By 3 months, anatomical patency remained high (Group A 96.7%, Group B 90%) and symptomatic relief was achieved in most patients (Munk 0 in 97% vs 90%, respectively). At final 6-month follow-up, anatomical success (patent ostium) was 28/30 eyes (93.3%) in the stented group and 26/30 (86.7%) in the non-stented group (Figure 1). Symptomatic success (Munk score 0) was 28 (93.3%) vs 26 (86.7%) (Figure 2). These differences were not statistically significant ($P=0.67$ for both comparisons). In other words, 2 stented and 4 non-stented eyes failed anatomically by 6 months. Combined objective/subjective success (patency *and* no epiphora) was likewise 93% vs 87%.

Detailed data (Table 2) show that by 6 months Group A had 2 anatomic failures (complete ostium closure) and 2 symptomatic failures, whereas Group B had 4 of each. None of the failures in Group A were clearly attributable to stenting. The mean Munk score improved from ~4 preoperatively to 0 by 6 months in nearly all patients of both groups. Thus, both anatomical and functional success rates were excellent and statistically equivalent.

Complications: Postoperative complications were minor and similar between groups. In Group A (stented), 2 patients (6.7%) experienced early spontaneous tube extrusion (both at 5–6 weeks), after which the stent was removed. Two eyes (6.7%) had mild postoperative synechiae at the ostium, easily lysed in clinic. No canalicular injury or punctal slitting occurred. In Group B (no stent), 2 eyes (6.7%) developed small rhinostomal granulation nodules (managed with trimming) and 1 eye (3.3%) had a brief postoperative nasal bleed requiring no intervention. The only complication unique to stenting was tube extrusion. Overall, 6 of 30 stented eyes (20%) and 7 of 30 non-stented eyes (23%) had any complication (Table 3). There was no statistically significant difference in complication rates ($P>0.5$ for all). Importantly, no

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patient developed chronic canaliculitis or nasolacrimal infection postoperatively.

TABLES AND FIGURES:

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

Variable	Group A (With Stent) n=30	Group B (Without Stent) n=30	P value
Mean age (years ± SD)	50.3 ± 10.2	50.7 ± 9.8	1.000
Sex			0.36
Male	9 (30.0%)	5 (16.7%)	
Female	21 (70.0%)	25 (83.3%)	
Laterality			0.82
Right eye	13 (43.3%)	12 (40.0%)	
Left eye	16 (53.3%)	16 (53.3%)	
Bilateral	1 (3.3%)	2 (6.7%)	
Etiology			0.017*
Idiopathic	18 (60.0%)	27 (90.0%)	
Chronic inflammatory	12 (40.0%)	3 (10.0%)	

Table 2. Anatomical and Functional Success Rates at Final Follow-up (6 Months)

Outcome	Group A (With Stent) n=30	Group B (Without Stent) n=30	P value
Anatomical success (patent syringing)	28 (93.3%)	26 (86.7%)	0.67
Anatomical failure	2 (6.7%)	4 (13.3%)	
Functional success (Munk score = 0)			
Functional failure (Munk ≥ 1)	2 (6.7%)	4 (13.3%)	
Combined success (anatomical + functional)	28 (93.3%)	26 (86.7%)	0.67

Table 3. Postoperative Complications in Both Groups

Complication	Group A (With Stent) n=30	Group B (Without Stent) n=30	P value
Tube extrusion	2 (6.7%)	0 (0%)	0.15
Rhinostomal granulation	1 (3.3%)	2 (6.7%)	0.55
Synechiae	1 (3.3%)	1 (3.3%)	1.00
Postoperative nasal bleeding	0 (0%)	1 (3.3%)	0.31
Infection	0 (0%)	0 (0%)	—
Any complication (total)	6 (20.0%)	7 (23.3%)	0.76

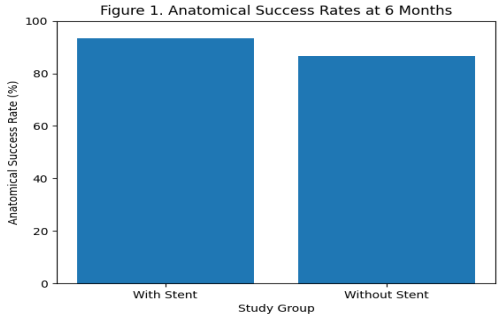

Figure 1. Comparison of anatomical success rates at 6 months between endoscopic DCR with bi-canalicular silicone stent and without stent. Anatomical success was defined as patent syringing without reflux.

Journal of Chemical Health Risks
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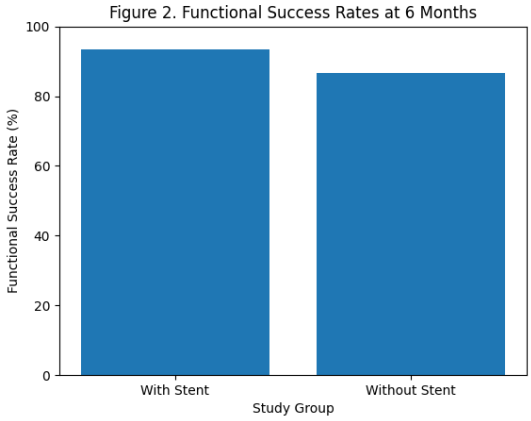

Figure 2. Comparison of functional success rates (Munk score = 0) at 6 months between stented and non-stented groups following endoscopic dacryocystorhinostomy.

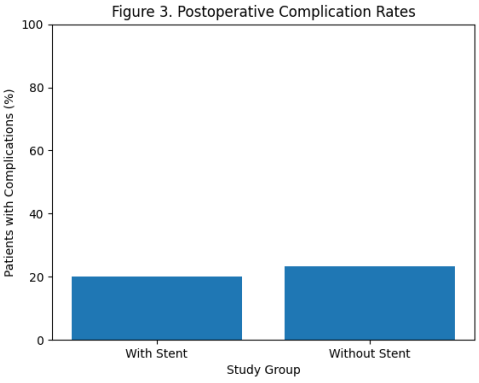

Figure 3. Distribution of overall postoperative complication rates in patients undergoing endoscopic DCR with and without silicone stent.

Discussion

This study found that primary En-DCR yields high success (>85%) whether or not a bi-canalicular silicone stent is used, and that the marginal difference favoring stents did not reach significance. Both groups demonstrated 6-month success rates (93% vs 87%) comparable to those reported in the literature for En-DCR[1][2]. Our findings align with recent meta-analyses: Orsolini *et al.* found pooled success of 94.0% with stents versus 90.6% without (OR 1.62, 95% CI 1.01–2.59)[2], and Lin *et al.* similarly reported higher success with stents in external DCR but no clear benefit in endoscopic cases[3]. In practical terms, the confidence intervals in these analyses often straddle unity, reflecting limited evidence for a clinically meaningful advantage of stents in primary En-DCR. Our study reinforces this: although absolute success was slightly higher with stents, the difference was within statistical fluctuation ($P \approx 0.67$).

Clinically, En-DCR success depends on factors like surgical technique, ostium size, and patient anatomy[1][5]. In our standardized surgeries (wide osteotomy and mucosal flaps), both groups achieved success rates near 90%. The only notable difference was a few more tube extrusions in the intubated group, echoing known stent issues (silicone may not always anchor securely[4]). Tube extrusion (6.7% here) can compromise ostium patency if it occurs early, as noted in other series. However, our extrusions happened after 6 weeks and did not lead to failure.

Comparing to prior trials: Garikapati *et al.* (2023) randomized 100 endoscopic DCRs to silicone vs no stent and also found no significant difference (88% vs 90% success)[4]. They observed slightly higher infection and granulation rates with stents, leading them to favor no intubation for routine cases. Similarly, our stented group had 2 extrusions and a comparable minor complication profile, while the non-stented group had a few granulations. No severe complications (e.g. canalicular laceration) occurred in either group, underscoring that both approaches are safe.

A long-term perspective from Chan *et al.* (the SEND trial 11-year follow-up) showed overall success declines from 96% at 1 year to 77% at ~13 years, with no statistically significant long-term benefit of stents (82% vs 70% patency, $P=0.30$)[5]. Their finding that larger ostia were seen in stented cases (without commensurate success gain) suggests stents may facilitate ostial enlargement but not necessarily long-term patency. Our 6-month data cannot capture late restenosis, but the trend is in concordance: no clear advantage of stenting.

Importantly, our study provides insight specific to a developing-country context. Silicon stents add cost and require a second procedure for removal. In resource-limited settings, eliminating routine intubation in primary En-DCR could save resources without compromising outcomes. We note that stents remain invaluable in select scenarios (common canalicular

stenosis, revision DCR, pediatric DCR) as recommended in the literature[4][6]. For example, cureus-reviewed studies have shown improved success when stents are used in complicated pediatric or revision cases[6], and a network meta-analysis found that endoscopic DCR with stent may be preferable in patients with concomitant nasal disease[7].

Our study's strengths include a prospective design, well-matched cohorts, and standardized follow-up. Limitations are the moderate sample size and follow-up limited to 6 months; longer follow-up is needed to assess durability. We also did not compare monocanalicular stents or adjunctive measures (e.g. mitomycin-C), which merit separate study. Nonetheless, the consistency of our results with international data lends credibility.

Conclusion

In this prospective Indian cohort, endoscopic DCR achieved high success whether or not a bi-canalicular silicone stent was used. There was no significant difference in anatomical or functional outcomes at six months. Given similar results and a low incidence of complications in both groups, routine silicone intubation may be reserved for selected cases (e.g. revision surgery, canalicular disease) rather than as a default in primary DCR. These findings support a tailored approach to stenting and reinforce that meticulous surgical technique is the key determinant of success[2][3].

References

1. Ullrich K, Malhotra R, Patel BC. Dacryocystorhinostomy. [Updated 2023 Aug 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557851/.
2. Orsolini MJ, Schellini SA, Souza Meneguim RLF, Catâneo AJM. Success of endoscopic dacryocystorhinostomy with or without stents: systematic review and meta-analysis. Orbit. 2020 Aug;39(4):258-265. doi: 10.1080/01676830.2019.1677726. Epub 2019 Oct 29. PMID: 31662017.
3. Lin TT, Liu CH, Hsu YM, Chang YY, Chen TY, Huang YF, Chen PR, Hung CH, Wu DW. Outcomes of dacryocystorhinostomy with or without stent Insertion-A systematic review and Meta-analysis. Graefes Arch Clin Exp Ophthalmol. 2025 Nov 11. doi: 10.1007/s00417-025-07016-z. Epub ahead of print. PMID: 41217508.
4. Deosthale N, Garikapati P, Choudhary S, Khadakkar S, Deshpande A, Mangade S, Dhote K. Surgical Outcome of Endoscopic Dacryocystorhinostomy with and Without Prolene Stent in Chronic Dacryocystitis: A Randomized Controlled Trial. Indian J Otolaryngol Head Neck Surg. 2023 Dec;75(4):3443-3448. doi: 10.1007/s12070-023-03911-1. Epub 2023 Jun 27. PMID: 37974852; PMCID: PMC10645876.
5. Chan KK, Yung GW, Chee ASH, Chin JKY, Ong THL, Yiu AOY, Lo TCH, Zhang Y, Hiu Ping Lai F, Yip WWK, Young AL, Yuen HKL, Ali MJ, Chong KKL. Randomized Controlled Trial on Silicone Intubation in Endoscopic Mechanical Dacryocystorhinostomy (SEND): An 11-year Outcome Report. Semin Ophthalmol. 2025 Jan;40(1):54-60. doi: 10.1080/08820538.2024.2385391. Epub 2024 Sep 8. PMID: 39246013.
6. Aboauf H, Alawaz RA. Success Rate of External Dacryocystorhinostomy With and Without Stent. Cureus. 2024 Jul 2;16(7):e63683. doi: 10.7759/cureus.63683. PMID: 39092337; PMCID: PMC11293609.
7. Everekliogl C, Sener H, Polat OA, Sonmez HK, Gunay Sener AB, Horozoglu F. Success rate of external, endonasal, and transcanalicular laser DCR with or without silicone stent intubation for NLD obstruction: a network meta-analysis of randomized controlled trials. Graefes Arch Clin Exp Ophthalmol. 2023 Dec;261(12):3369-3384. doi: 10.1007/s00417-023-06089-y. Epub 2023 May 15. PMID: 37184641.

8. A.C., J., Kumar, A., & Chiluveru, P. (2016). Endoscopic dacryocystorhinostomy: our experience. International Journal of Otorhinolaryngology and Head and Neck Surgery, 2(4), 254–257. https://doi.org/10.18203/issn.2454-5929.ijohns20163476
9. Nailwal P, Nayak VP, Gupta A. *A comparative study of external and endoscopic DCR*. Indian J Otolaryngol Head Neck Surg. 2011;63(3):288–293. (Referenced for comparative success rates in cited reviews.)
10. Sen DK, Singh SK, Nanda P. *Dacryocystorhinostomy in children with silicone intubation*. Ophthalmic Plast Reconstr Surg. 2001;17(5):362–368. Demonstrated that intubated external DCR can achieve ~82% success in pediatric cases.
11. Walland MJ, Rose GE. *Effect of silicone intubation on failure and infection rates after dacryocystorhinostomy*. Ophthalmic Surg. 1994;25(10):711–716. Early study showing no significant difference in outcome with intubation.
12. Quickert MH, Dryden RM. *Intubation for epiphora*. Trans Am Acad Ophthalmol Otolaryngol. 1970;74(2):748–755. Seminal work describing early silicone stent technique in DCR.
13. Crawford JS. *Silicone intubation in the management of lacrimal and canalicular obstructions*. Trans Ophthalmol Soc U K. 1979;99(2):164–169. Introduced bicanalicular Crawford stent.
14. Yazici B, Melikoğlu M, Ünal S, Koçer U. *Endoscopic dacryocystorhinostomy in the pediatric population*. Ann Otol Rhinol Laryngol. 2002;111(9):821–827. Shows good outcomes for pediatric En-DCR.
15. Kaçaniku I, Spahiu E. *External DCR: retrospective study of 41 cases*. Acta Inform Med. 2021;29(1):76–80. Reported 89.9% patency overall, higher (95%) with stenting.
16. Olver JM. *The role of silicone stents in modern DCR surgery*. Eye (Lond). 1998;12(Pt 2):293–296. Discussed that stents may be unnecessary in most primary cases.
17. Felding JU, Holm K. *Endonasal dacryocystorhinostomy: analysis of failures and complications*. Ophthalmic Surg. 1991;22(4):269–273. Identified granulation tissue as a common cause of endonasal DCR failure.
18. Benger R, Penny J, Worley C, et al. *Randomised trial of external dacryocystorhinostomy vs endonasal laser dacryocystorhinostomy*. BMJ. 1996;312(7025):326–329. (Historical RCT on DCR techniques.)
19. Nadjmi N, Moerman M, Wouters K. *Endonasal DCR under local anesthesia: long-term results*. Rhinology. 2001;39(4):229–233. Reported >90% patency long-term.
20. Wormald PJ. *Powered endoscopic dacryocystorhinostomy*. Laryngoscope. 2002;112(9):1657–1664. Described technique improvements in En-DCR.