Original Article

Comparing the success rate of external dacryocystorhinostomy with anterior flap versus flap excision in managing chronic dacryocystitis

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ABSTRACT

Background: Nasolacrimal duct obstruction (NLDO) is characterized by epiphora and recurrent episodes of acute dacryocystitis. Despite the temporary effect of antibiotics in the acute phase, it is primarily managed by dacryocystorhinostomy (DCR). There is a new modification of external DCR that is performed without either anterior or posterior flaps. This study aimed to compare the outcomes of flapless and single-flap external DCR in adult patients with chronic symptomatic dacryocystitis secondary to NLDO.

Methods: In this retrospective, non-randomized, interventional, comparative study of patients with chronic dacryocystitis secondary to primary acquired NLDO, we compared the surgical outcomes and complication rates of flapless external DCR to those of external DCR with only anterior flap suturing. We excluded patients who declined participation and those with soft stops, nasal problems, lid margin abnormalities, lid malposition or laxity, previous lacrimal surgery, lacrimal fistula, trauma involving the lacrimal drainage system, lack of adequate follow-up, or severe septal deviation or turbinate hypertrophy. Anatomical and functional success rates were determined at the last follow-up visit and were compared. Postoperative complications were recorded and compared between groups.

Results: We included 53 patients with a male-to-female ratio of 16 (30.2%) to 37 (69.8%); 25 eyes underwent flapless DCR (group 1) and 28 eyes underwent anterior flap suturing DCR (group 2). The two groups had comparable demographic characteristics (all $P > 0.05$). Furthermore, anatomical (92.0% in group 1 and 92.9% in group 2) and functional (84.0% in group 1 and 92.9% in group 2) success rates at final follow-up were comparable between groups (both $P > 0.05$). At the one-month postoperative examination, premature tube extrusion was more often reported in group 1 (12.0%) compared to group 2 (7.1%). At the two-month follow-up examination, tube extrusion was noted in 4.0% in group 1 and 0.0% in group 2, yet the difference failed to attain statistical significance ($P > 0.05$).

Conclusions: We found that neither surgical method was superior in terms of anatomical or functional success rate at a maximum of one year after external DCR. Flapless DCR is a simple, effective, and reproducible alternative to the single anterior flap suturing technique for managing NLDO in adults with chronic dacryocystitis. However, further randomized clinical trials with larger sample sizes and longer follow-up periods are recommended before generalization can be justified.

KEYWORDS

nasolacrimal ducts, nasolacrimal duct obstruction, epiphora, dacryocystitides, dacryocystostomy, dacryocystorhinostomies, surgical flap, surgical anastomosis

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INTRODUCTION

Epiphora, or excessive eye watering, is commonly encountered by ophthalmologists and otolaryngologists [1]. Tearing involves several steps, including tear formation in the lacrimal gland, vaporization from the ocular surface, spreading through blinking, and draining via the nasolacrimal duct. Abnormalities in any step can result in epiphora [2]. Epiphora is often caused by acquired nasolacrimal duct obstruction (NLDO) in adults and children [3].

NLDO is characterized by epiphora and recurrent episodes of acute dacryocystitis. Although antibiotics may temporarily control acute disease, the primary management is surgical dacryocystorhinostomy (DCR), which can be performed through an external or endonasal approach [4, 5]. NLDO is more common in female individuals because of a relatively narrow lacrimal fossa, which predisposes to obstruction [6], and because of hormonal changes that induce generalized de-epithelization, possibly affecting the lacrimal sac and duct [7].

The surgical success rate following endonasal DCR ranges from 63% to 94%. Possible complications include bleeding, nasal mucosal scarring, granuloma formation, osteotomy-nasal septal adhesion, and damage to the orbital contents [8]. External DCR remains the preferred technique in certain scenarios, such as in elderly patients or those with previous facial fractures or unusual anatomy, when a biopsy of the lacrimal sac is needed, when septoplasty is required, and in cases of proximal or mid-canalicular stenosis [9].

The classic DCR procedure involves suturing both the anterior and posterior flaps, as recommended by many surgeons. The procedure is difficult owing mainly to the narrow space and the smaller flap size [10, 11]. Therefore, the original DCR method has been extensively modified. The one-flap technique was reportedly as effective as the two-flap technique [12]. Currently, there is a new modification described by several authors, in which external DCR is performed with neither anterior nor posterior flaps [13, 14].

The current study aimed to compare the outcomes of two surgical techniques for external DCR—flapless and single anterior flap suturing—in adult patients with chronic dacryocystitis secondary to NLDO.

METHODS

In this retrospective, comparative, non-randomized, interventional study, we analyzed the records of patients with epiphora secondary to anatomical obstruction of the nasolacrimal duct, as confirmed by probing and syringing, from January 2019 to August 2021. The Damietta Faculty of Medicine Ethics Committee of Al-Azhar University, Cairo, Egypt (reference number DFM-IRB00012367-21-12-011) approved the study protocol. All participants provided written informed consent to participate in the study.

We included all eligible patients admitted to our department for external DCR: 25 eyes were treated with flapless external DCR (group 1) and 28 eyes were treated with single anterior flap-suturing DCR (group 2). We excluded patients who declined participation and those with soft stops, nasal problems, lid margin abnormalities, lid malposition or laxity, previous lacrimal surgery, lacrimal fistula, trauma involving the lacrimal drainage system, lack of adequate follow-up, or severe septal deviation or turbinate hypertrophy.

During the preoperative assessment, eligible participants underwent complete medical and ocular history, physical and ophthalmological examinations, measurement of best-corrected distance visual acuity using a Snellen chart (Auto Chart Projector CP 670; Nidek Co., Ltd., Gamagori, Japan), intraocular pressure measurement using the Goldmann applanation tonometer (AT900; Haag-Streit, Koeniz, Switzerland), and undilated and dilated slit-lamp biomicroscopy (BX 900 Photo Slit-Lamp; Haag-Streit). All participants underwent full general, ophthalmic, and nasal assessments to rule out nasal pathology causing epiphora. Lacrimal drainage system was investigated using a regurgitation test, irrigation and probing, and a fluorescein dye disappearance test [15]. Nasendoscopy and otorhinolaryngological examination [16, 17] were performed to assess the nasal cavity.

All participants underwent external DCR [18] by a single surgeon (E.R.E.) using a hypotensive technique, under general anesthesia in the anti-Trendelenburg position [19]. A nasal pack soaked in lidocaine 2% with 1:200 000 diluted adrenaline was inserted into the ipsilateral nare as high as above the middle turbinate. Dilatations of the upper and lower puncta were performed using a Nettleship dilator for the vertical section of the canaliculus and Bowman probes of increasing diameters. A 3-cm curved incisional area over the anterior lacrimal crest was marked and infiltrated with lidocaine 2% and adrenaline 1:200 000. The incision was made 3 mm nasal to the inner canthus along the nasojugal fold region [20]. One-third of the incision was above the inner canthus, and the lower two-thirds were below it. The medial palpebral ligament was identified. Westcott scissors were used to separate the orbicularis muscle, the periosteum was reflected with a Freer elevator, and the lacrimal sac was elevated from the lacrimal fossa. The lacrimal sac was inflated using viscoelastic material (hydroxypropyl methylcellulose 2%) to facilitate its incision, creating horizontal 'H' shaped anterior and posterior flaps.

In group 1, the anterior and posterior flaps were excised, leaving a small lacrimal sac stump around the common canaliculus (Figure 1A). However, in group 2, only the posterior flap was removed, leaving the anterior flap intact for suturing to the anterior nasal mucosal flap (Figure 1B). A nasal osteotomy with an opening of approximately 10 × 10 mm was performed over the lacrimal fossa using a Kerrison bone punch. The nasal mucosa was cut posteriorly to form anterior and posterior flaps. These were cut completely in group 1, leaving the common canaliculus facing the nasal cavity. The anterior flap was preserved in group 2. After removal of the decongesting nasal pack, the metal guide of the silicone tube (MediiUSA, Medi Instruments Inc., NY, USA) was inserted through the upper punctum, upper canaliculus, and bony ostium to be retrieved from the operative field through the nasal cavity and out of the nares. The silicone tube was removed three months after nasal endoscopy. The anterior nasal mucosal flap was sutured to that of the lacrimal sac using three 6-0 absorbable Vicryl sutures in group 2. The cut medial palpebral ligament was resutured to the anterior lacrimal crest using a 5-0 absorbable Vicryl suture. The orbicularis muscle was then re-approximated using three interrupted 6-0 absorbable Vicryl sutures. The skin was subsequently closed using a 6-0 absorbable Vicryl suture. Finally, a nasal tampon was inserted into the ipsilateral nare to be removed two days postoperatively.

Postoperatively, patients were instructed not to rub or remove the silicone tube. We prescribed systemic broad-spectrum antibiotics (amoxicillin 625 mg + clavulanic acid 125 mg, Augmentin 1 g twice daily for one week), a systemic analgesic (ibuprofen 400 mg twice daily for one week), combined antibiotic / steroid eye drops (tobramycin 0.3% / dexamethasone 0.1%, Tobradex®; Alcon, Fort Worth, TX, USA) four times per day for two weeks, and 0.3% Tobrin® eye ointment (Egyptian International Pharmaceutical Industries Co.; E.I.P.I.CO., El Asher Ramadan City, Cairo, Egypt) applied to the external wound for one week. Patients were followed up on the first postoperative day, the second day for tampon removal, and at one week, one month, three months, six months, and nine months.

At each visit, the lacrimal system was assessed using a slit lamp to evaluate the appearance of the punctum, position of the silicone stent, wound status, and any complications such as bleeding or ecchymosis. Patients were instructed to report the degree of epiphora, if present. Finally, lacrimal syringing was performed. Anatomical success was determined based on ostium patency at the time of syringing and irrigation [21]. Patients who had a demonstrably patent system but were not satisfied with the state of their symptoms were considered to have anatomical success [22] but a subjective failure. Any patient who reported "no epiphora" or "much improved" at the 10-week follow-up visit (subjective relief of epiphora) and also had a patent ostium verified by syringing and irrigation was considered to have full or functional success [22, 23]. Restoration of lacrimal function was defined as the absence of tearing [24]. The Munk score was used to determine functional success [25], with an epiphora grade of 0 or 1 considered successful. A score of "0" was assigned for no epiphora, "1" for epiphora requiring dabbing with a tissue less than twice daily, "2" for dabbing 2 – 4 times daily, "3" for dabbing 5 – 10 times daily, "4" for epiphora requiring dabbing more than ten times daily, and "5" for constant tearing [26].

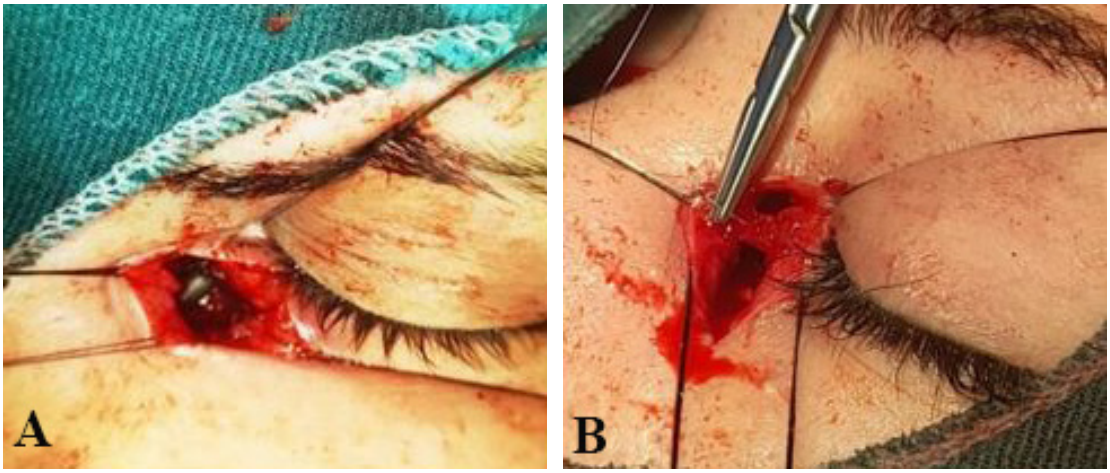

Figure 1. Intraoperative appearance of the external dacryocystorhinostomy incision, showing representative cases from (A) group 1 and (B) group 2. (A) Anterior and posterior flaps were excised in group 1, leaving a small lacrimal sac stump around the common canaliculus. (B) In group 2, only the posterior flap was removed, leaving the anterior flap intact to be sutured to the anterior nasal mucosal flap.

Statistical analyses were performed using SPSS Statistics for Windows (version 24.0; IBM Corp., Armonk, NY). The data normality assumption was tested using the Kolmogorov – Smirnov test. Categorical data are represented as numbers and percentages and were compared using the chi-square test [27]. Continuous data are represented as mean and standard deviation (SD) and were compared using an independent *t*-test [28]. The *P*-value was considered significant if < 0.05.

RESULTS

We included 53 patients with a male-to-female ratio of 16 (30.2%) to 37 (69.8%); 25 were treated with flapless external DCR (group 1) and 28 were treated with single anterior flap-suturing external DCR (group 2). Table 1 displays the comparable demographic characteristics, laterality of the surgical site, and follow-up duration between the study groups (all $P > 0.05$). However, there was a female-sex predominance in both groups, and most women were postmenopausal (Table 1).

Table 2 compares the surgical outcomes of the study groups. The anatomical success rates were 92.0% in group 1 and 92.9% in group 2, with no statistically significant difference ($P > 0.05$). The functional success rates were 84.0% in group 1 and 92.9% in group 2, with no statistically significant difference ($P > 0.05$). Premature tube extrusion was reported more frequently in group 1 (12.0%) compared to group 2 (7.1%) at the one-month postoperative examination. At the two-month postoperative examination, tube extrusion was much less common in both groups: 4.0% in group 1 and 0.0% in group 2. However, this difference was not statistically significant ($P > 0.05$) (Table 2).

Silicone stent repositioning was performed in all patients with early tube extrusion (Figure 2). Postoperative edema of

Table 1. Comparison of demographic and other characteristics of the study groups

Variables	Group 1 (n = 25)	Group 2 (n = 28)	*P*-value
Age (y), Mean ± SD (Range)	46.8 ± 7.6 (36 to 60)	45.3 ± 7.7 (38 to 62)	0.480
Sex (Male / Female), n (%)	7 (28.0) / 18 (72.0)	9 (32.1) / 19 (67.9)	0.740
Laterality (Right / Left), n (%)	14 (56.0) / 11 (44.0)	15 (53.6) / 13 (46.4)	0.640
Duration of follow-up (m), Mean ± SD (Range)	11.0 ± 2.2 (6 to 12)	11.5 ± 1.5 (6 to 12)	0.340

Abbreviations: y, years; SD, standard deviation; n, number of participants; %, percentage; m, months. Note: Group 1, flapless external dacryocystorhinostomy, Group 2, anterior flap external dacryocystorhinostomy.

Table 2. Comparison of surgical outcomes between study groups

Variables	Group 1 (n = 25)		Group 2 (n = 28)	*P*-value
Anatomical success, n (%)	23 (92.0)		26 (92.9)	0.310
Functional success, n (%)	21 (84.0)		26 (92.9)	0.900
Premature tube extrusion, n (%)	**First month**	3 (12.0)	2 (7.1)	0.450
	Second month	1 (4.0)	0 (0.0)	

Abbreviations: n, number of participants; %, percentage. Note: Group 1, flapless external dacryocystorhinostomy; Group 2, anterior flap external dacryocystorhinostomy.

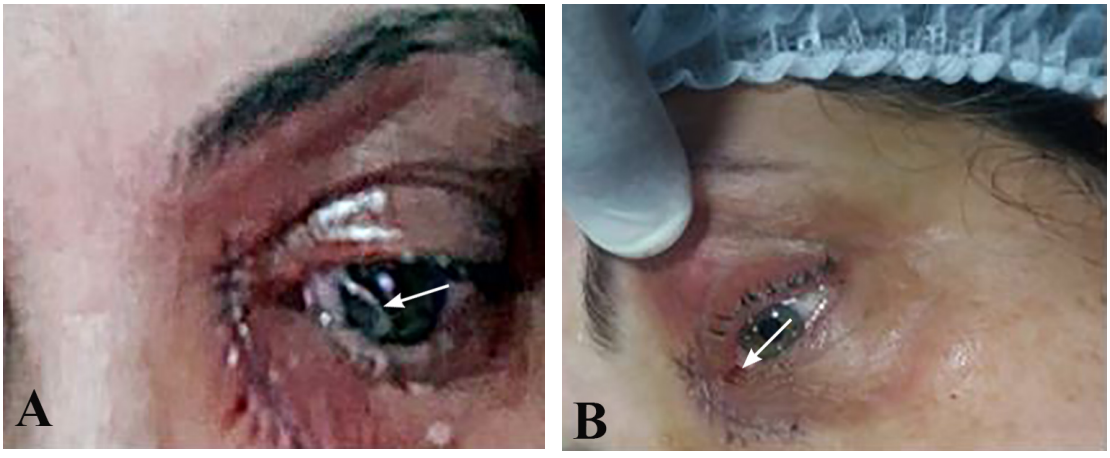

Figure 2. (A) Early silicone tube (MediiUSA, Medi Instruments Inc., NY, USA) extrusion (white arrow) after external dacryocystorhinostomy for anatomical obstruction of the left nasolacrimal duct. (B) Successful repositioning (white arrow).

both eyelids was reported in three eyes in group 1 and two eyes in group 2. However, the swelling disappeared within one week of treatment with systemic anti-edematous agents (chymotrypsin / trypsin, Alphintern®; Amoun Pharmaceuticals, Egypt). Minimal intraoperative bleeding was reported in two patients in group 1 and four patients in group 2. Neither group experienced wound infection, wound dehiscence, or fistula formation. In addition, no significant postoperative epistaxis or cheesewiring of the puncta was observed.

DISCUSSION

The findings of this comparative study, with a maximum one-year follow-up after external DCR with and without mucosal flap preservation, revealed no significant differences in surgical success or complication rates between the two procedures. The risk of postoperative premature silicone tube extrusion at one month was higher in group 1 (12.0%) than in group 2 (7.1%). At the two-month follow-up, extrusion was reported in 4% in group 1 and none in Group 2. However, this difference was not statistically significant.

Similar to our results, previous studies comparing the surgical outcomes of flapless external DCR without Mitomycin C (MMC) [13, 29] and MMC-augmented flapless external DCR [30] revealed comparable functional and anatomical success rates at the end of six-month to one-year follow-up versus those of the anterior flap-preserved group. This lack of difference may be linked to the excision of the posterior flap. However, Takahashi et al. reported comparable surgical outcomes between external DCR with double-flap anastomosis and flapless surgery [14], which indicates that even with preservation of the posterior flap, flapless external DCR could have a comparable success rate.

Our participants with flapless external DCR had a high anatomical or functional success rate, comparable to that of the anterior flap-preserved group. Likewise, Haefliger et al. reported a high anatomical success rate (92%) one year after flapless external DCR, without a major negative impact on the surgical outcome [31]. Ranjan et al. reported 99.26% anatomical success and 98.66% functional success rates for 2165 patients at the one-year follow-up after MMC-augmented flapless external DCR [32]. These results suggest that flapless external DCR, as a simple and less time-consuming surgical technique, could be as effective as either the anterior flap [13, 29, 30] or both the anterior and posterior flap preservation techniques [14] of conventional external DCR. However, further systematic reviews and meta-analyses are required to verify this hypothesis.

In the current study, patient characteristics were comparable between the two groups. However, there was a marked female predominance in both groups, and most women were post-menopausal. We observed a 92.9% rate for both anatomical and functional success in participants with only anterior flap suturing at a maximum follow-up period of one year, indicating a high success rate compared to those of similar studies [33-35]. Similar to our success rates, Dave et al. reported anatomical and functional success rates of 91.1% (124 of 135) and 90.3% (123 of 135), respectively, at six months after standard external DCR with only anterior flap suturing in pediatric patients. However, no significant sex predominance was identified, with 59 boys (51.7%) and 55 girls (48.3%) [33]. Sharma et al. reported anatomical and functional success rates of 92.9% and 89.3%, respectively, six months after standard external DCR with only anterior flap suturing in adult patients with primary acquired NLDO. As in the current study (69.8%), they found a predominance of women (78.6%) among patients with NLDO [34]. Kacaniku et al. reported a 96.2% functional success rate in adult patients at more than one year after external DCR with only anterior flap suturing, and the majority of participants were women (71.2%) [35]. This observed difference in sex distribution of NLDO between pediatric [33] and adult patients [34, 35] could indicate respective differences in the pathogenesis of NLDO. For example, the lower nasolacrimal duct is narrow in middle-aged women [6], and secondary hormonal changes that induce generalized de-epithelization can affect the lacrimal sac and duct [7].

The current study did not include patients who underwent suturing of both the anterior and posterior flaps for comparison with those who underwent external DCR with only anterior flap suturing. However, the literature has reported that the former is not superior to the latter, as the difference in anatomical or functional success rates is not statistically significant [12, 13, 36-41]. Likewise, studies on the surgical outcomes of endoscopic DCR found that mucosal flap preservation was not superior to flapless surgery because the difference in success or complication rate was not statistically significant [42-47]. Because anterior flap suturing is easier and less time-consuming than suturing both flaps [36], and similarly, flapless external DCR is technically simpler and could shorten the operative time, further cost-effectiveness studies are needed to reveal the economic benefits of flapless external DCR.

This interventional comparative study found that the success and complication rates of flapless external DCR were comparable to those achieved with anterior flap-preserving external DCR, as reported in most previous studies. This study was limited by its retrospective nature and the lack of randomization. Further prospective randomized clinical trials are needed to produce robust results and to generalize the inferences from these trials to a target population.

CONCLUSIONS

We found that anterior flap-preserving external DCR was not superior to the flapless technique in terms of anatomical or functional success rate after a maximum one-year follow-up. Flapless external DCR is a simple, effective, safe, and reproducible alternative to the single anterior flap technique for managing NLDO in adults with chronic dacryocystitis. Further randomized clinical trials with larger sample sizes and longer follow-up periods are recommended before generalization is warranted.

ETHICAL DECLARATIONS

Ethical approval: The Damietta Faculty of Medicine Ethics Committee of Al-Azhar University, Cairo, Egypt (reference number DFM-IRB00012367-21-12-011) approved the study protocol. All participants provided written informed consent to participate in the study.
Conflict of interest: None.

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