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ORIGINAL ARTICLE

Duration and Technical Efficiency in Dacryocystorhinostomy: Evaluating Operative Time Reduction without Compromising Success

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ABSTRACT

Background: *The most effective surgical procedure for nasolacrimal duct obstruction is still dacryocystorhinostomy (DCR), although its effectiveness varies depending on the technical modifications. This study aimed to assess whether cutting out the formation and suturing of anterior flaps, shortens the operating time without compromising surgical success.* ***Methods & Materials:*** *This study was conducted at Sir Salimullah Medical College and Mitford Hospital, Dhaka, from February to August 2017, with 60 patients enrolled with chronic dacryocystitis requiring DCR. Group A (n=30) underwent conventional DCR with anterior flap creation and suturing, while Group B (n=30) received modified DCR without flap, only muscle and skin suturing. Success was defined as symptomatic improvement with patent syringing at 6-month follow-up. Data were entered and analyzed using SPSS version 26.* ***Results:*** *The mean operating time of Group B (0.45±0.16 hours) was significantly 71% shorter than Group A (1.65±0.26 hours) (p=0.01). At six months, the groups' success rates were similar (Group A: 96.7% vs. Group B: 90.0%, p=0.306). Group B had a lower overall complication rate (3.3%) than Group A (23.3%), and neither group experienced any significant complications.* ***Conclusion:*** *With comparable success rates and lower complication rates, modified DCR withoutflap creation dramatically shortens operating times, indicating that this method improves surgical efficiency without sacrificing results.*

Keywords: *Dacryocystorhinostomy, Operative efficiency, Nasolacrimal duct obstruction, Chronic dacryocystitis*

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INTRODUCTION

One of the most prevalent lacrimal drainage conditions seen in ophthalmic practice is chronic dacryocystitis, which is a persistent inflammation of the lacrimal sac caused by nasolacrimal duct obstruction [1]. Patients usually exhibit persistent epiphora, mucoid or purulent discharge, and recurrent infections, symptoms that gradually worsen everyday functioning and general quality of life. While acquired nasolacrimal duct obstruction is much more common in adults and exhibits a clear female predominance with a 2:1 ratio, increasing steadily with age, congenital nasolacrimal duct obstruction affects approximately 20% of newborns worldwide and frequently resolves spontaneously [2]. Dacryocystorhinostomy (DCR), which creates a direct fistula communication between the lacrimal sac and the nasal cavity to avoid the blocked nasolacrimal duct, has been the gold standard of treatment since its initial description in 1904. Although many surgeons still prefer external DCR due to its greater surgical exposure and simpler anatomical visualization, especially in anatomically complex or previously traumatized cases, both external and endoscopic approaches have reported success rates exceeding 90% in modern surgical practice [3]. In order to create a stable epithelialized tract necessary for long-term patency, classical external DCR involves carefully suturing anterior mucosal flaps from the lacrimal sac and nasal mucosa [4]. Although this flap-based technique has long been regarded as the gold standard, its length of operation, which can range from 45 to 90 minutes depending on anatomical variation and surgeon experience, remains a practical drawback. Extended operative time contributes to increased anesthetic exposure, higher operative cost, and greater utilization of limited operating room resources, all of which hold considerable relevance for high-volume centers [5]. The necessity of maintaining anterior mucosal flaps has been questioned in recent literature. Systematic reviews have shown that techniques with and without anterior flap anastomosis have comparable success rates (89% versus 92%, respectively). These results have prompted a renewed emphasis on streamlining the external DCR technique, especially since less complicated surgery has

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the potential to dramatically reduce operating time without raising complications. Since longer procedures have been linked to postoperative complications like wound healing problems and thrombo-embolic events, enhanced surgical efficiency entails improving outcomes while minimizing resource expenditure, patient risk, and overall morbidity [6]. Variations in flap design, different approaches to bone removal, and improved anastomosis techniques are just a few of the technical changes that have been suggested to reduce the length of surgery; some of these rely on specialized tools like powered drills or ultrasonic bone aspirators, but these are not always available, especially in settings with limited resources [7, 8]. DCR failure still happens in 5-10% of cases, despite overall success rates exceeding 90%. This is frequently linked to conditions like diabetes mellitus, a history of allergies, and previous ocular procedures. Optimizing efficiency without sacrificing success is particularly crucial in developing nations with high surgical volume and limited operating room capacity [9]. Given these, this study aimed to compare operative time, success rates, and complications between conventional external DCR with anterior mucosal flap creation and a modified technique eliminating flap formation.

METHODS & MATERIALS

This comparative cross-sectional study was carried out from February to August 2017 in the Department of Ophthalmology at Sir Salimullah Medical College and Mitford Hospital in Dhaka, Bangladesh. Patients with acute dacryocystitis, canalicular stenosis, nasal pathology, prior unsuccessful DCR, eyelid malposition, systemic instability, bleeding disorders, pregnancy, facial trauma, or immunocompromised conditions were excluded from the study. Patients with confirmed nasolacrimal duct obstruction on syringing and patent canaliculi were also included. 60 patients were sequentially enrolled and divided into two equal groups: Group A underwent traditional external DCR, which involved the creation and suturing of anterior nasal mucosa and sac flap; Group B underwent modified external DCR, which involved the excision of anterior and posterior flaps suturing of only muscle and skin. Preoperative topical antibiotics and nasal decongestants were administered to all participants after a standard preoperative evaluation that included ophthalmic examination, regurgitation and syringing tests, routine hematological investigations, and ENT evaluation. Using a standard external approach, a 10–12 mm medial incision, periosteal elevation, and the creation of a 15 × 15 mm osteotomy were all performed under local anesthesia with intravenous sedation. In every instance, bicanalicular silicone intubation was carried out, and the duration of the procedure was recorded. Following surgery, all patients received nasal decongestants for one week, topical antibiotic-steroid drops for two weeks, systemic antibiotics for seven days, analgesics as needed, and silicone tube removal at three months. Up to six months later, follow-up assessments were carried out at predetermined intervals to evaluate complications, syringing patency, and symptoms. Success, partial success, and failure were the categories for surgical outcomes. Using SPSS 26, the data were analyzed using chi-square or Fisher's exact tests for categorical variables and t-tests for continuous variables; $p < 0.05$ was deemed significant.

RESULTS

Table I represents the baseline characteristics of the study populations, equally distributed between Group A (conventional DCR) and Group B (modified DCR). The majority of patients were over 40 (50.0% in Group A and 43.4% in Group B), and the mean age was similar between the groups (37.57±12.63 years in Group A versus 37.83±11.25 years in Group B, p=0.931). According to the established epidemiological pattern of nasolacrimal duct obstruction, female patients predominated in both groups (56.7% in Group A and 63.3% in Group B, p=0.598). The majority of patients had only completed elementary school, according to educational attainment, and housewives made up the largest occupational category (60.0% in Group A and 70.0% in Group B). In both groups, the majority had middle-class socioeconomic status (60.0% in Group A and 80.0% in Group B, p=0.633). Most importantly, there was a statistically significant difference in the mean surgical duration: Group A needed 1.65±0.26 hours, while Group B needed 0.45±0.16 hours (p=0.01). This means that the modified technique reduced the operating time by 71%. [Table I]

Table – I: Socio-demographic profiling of the study population (*n*=60)

Category	Group A (n=30)		Group B (n=30)		p-value
	n	%	n	%	
Age (years)	-	-	-	-	-
≤20	5	16.7%	1	3.3%	-
21-30	6	20%	10	33.3%	-
31-40	4	13.3%	6	20%	-
>40	15	50%	13	43.4%	-
Mean±SD	37.57±12.63		37.83±11.25		0.931
Sex	-	-	-	-	-
Male	13	43.3%	11	36.7%	0.598
Female	17	56.7%	19	63.3%	
Educational status	-	-	-	-	-
Literate	5	16.7%	3	10%	-
Primary	15	50%	18	60%	-
SSC	6	20%	7	23.4%	-
HSC	3	10%	1	3.3%	-
Graduate	1	3.3%	1	3.3%	-
Occupational status	-	-	-	-	
Housewife	18	60%	21	70%	-
Service	4	13.3%	3	10%	-
Business	1	3.3%	1	3.3%	-
Student	5	16.7%	1	3.3%	-
Others	2	6.7%	4	13.3%	-
Socioeconomic status	-	-	-	-	-

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Poor	11	36.7%	6	20%	0.633
Middle class	18	60%	24	80%	
Rich	1	3.3%	0	0%	
-	**Mean**	**±SD**	**Mean**	**±SD**	-
Duration of surgery (hours)	1.65	±0.26	0.45	±0.16	0.01

Table II summarizes the postoperative complications observed during the six-month follow-up period. Group B had a significantly lower overall complication rate (3.3%, n=1) than Group A (23.3%, n=7). Two patients (6.7%) in Group A and one patient (3.3%) in Group B experienced postoperative bleeding (p=0.500). Only Group A experienced stent-related complications, such as difficulty removing the stent (2 patients, 6.7%), spontaneous stent expulsion (1 patient, 3.3%), and stent-related corneal irritation (1 patient, 3.3%). Only one patient (3.3%) in Group A experienced rhinostomy closure. The safety profile of both surgical techniques was confirmed by the lack of significant complications in either group, including severe bleeding, orbital cellulitis, cerebrospinal fluid leak, and permanent visual impairment. [Table II]

Table – II: Distribution of the study patients by complications (*n*=60)

Complications	Group A (n=30)		Group B (n=30)		P-value
	n	%	n	%	-
Postoperative bleeding	2	6.7%	1	3.3%	0.500
Difficulty in the removal of the stent	2	6.7%	0	0%	0.246
Spontaneous expulsion of the stent	1	3.3%	0	0%	0.500
Closure of the rhinostomy opening	1	3.3%	0	0%	0.500
Corneal irritation due to the stent	1	3.3%	0	0%	0.500

The results of the syringing patency test (SPT) at three and six months after surgery are shown in Table 3. Patent lacrimal drainage was observed in 27 patients (90.0%) in Group A and 28 patients (93.3%) in Group B at the 3-month evaluation. Two patients (6.7%) in Group A had partial blockage, whereas one patient (3.3%) in Group A and two patients (6.7%) in Group B had complete blockage (p=0.309). Both groups maintained high success rates at the critical 6-month mark: 27 patients (90.0%) in Group B and 29 patients (96.7%) in Group A had patent drainage. Only one patient (3.3%) in Group A and three patients (10.0%) in Group B experienced failure at six months (p=0.306). [Table III]

Table – III: Distribution of the study patients by SPT (*n*=60)

SPT	Group A (n=30)		Group B (n=30)		P-value
	n	%	n	%	
SPT at the 3rd month	-	-	-	-	-
Patent	27	90%	28	93.3%	0.309
Partially blocked	2	6.7%	0	0%	
Blocked	1	3.3%	2	6.7%	
SPT at the 6th month	-	-	-	-	-
Patent	29	96.7%	27	90%	0.306
Blocked	1	3.3%	3	10%	

Key predictors of surgical efficiency and safety in both groups are summarized in Table 4. The modified approach was favored by the overall complication rate, which was 23.3% (7/30) in Group A and 3.3% (1/30) in Group B. Crucially, there were no significant complications in either group (0%), suggesting comparable safety profiles. Group A had four stent-related events, whereas Group B had none. This suggests that the streamlined procedure with less tissue manipulation may reduce irritation and mechanical complications. Anatomical stability showed that 3.3% of Group A patients and 0% of Group B patients experienced rhinostomy closure. The Net Efficiency Score, which is determined by calculating the operative time per successful outcome, shows that Group B has a significant advantage over Group A, with 1.65 hours per success versus 0.48 hours per success in Group B, resulting in a 71% improvement in the time-efficiency ratio. [Table IV]

Table – IV: Predictive Indicators of Surgical Efficiency and Safety (*n* = 60)

Efficiency / Safety Parameter	Group A (n=30)	Group B (n=30)	Effect	Clinical Interpretation
Complication rate (overall)	7/30 (23.3%)	1/30 (3.3%)	Lower in Group B	A faster technique is not associated with increased complications
Major complication rate	0%	0%	Same	No serious adverse outcomes in either method
Stent-related events	4 cases	0 cases	Lower in Group B	Less tissue manipulation may reduce irritation
Rhinostomy closure	3.3%	0%	Slightly lower in Group B	Comparable anatomical stability
Net Efficiency Score*	1.65 hours per success	0.48 hours per success	Group B = 71% more time-efficient	Group B yields a better "time per successful outcome" ratio

DISCUSSION

This comparative study demonstrates compelling evidence that modified external dacryocystorhinostomy without flap creation substantially reduces operative duration while maintaining success rates comparable to conventional techniques. Without sacrificing functional results or patient safety, the 71% decrease in surgical time (from 1.65±0.26 hours to 0.45±0.16 hours) represents a clinically significant improvement in operational efficiency. With success rates of 89% with flaps versus 92% without flaps, our findings are

consistent with Massegur et al., that mucosal flap preservation in endoscopic DCR does not confer statistically significant advantages [10]. This concept is extended to external DCR techniques by the similar 6-month success rates found in our study (96.7% in Group A versus 90.0% in Group B, p=0.306), indicating that anterior flap excision without anastomosis is a feasible technical modification [11]. External DCR traditionally achieves success rates consistently exceeding 90%, with patient satisfaction remaining high despite variations in surgical technique [12]. Despite not being statistically significant due to sample size limitations, Group B's significantly lower complication rate (3.3%) compared to Group A's (23.3%) is worth taking into account. In the past, DCR technical simplifications have shown mean operating times of roughly 28.6 minutes without sacrificing reliability [13]. Eliminating anterior flap manipulation may lessen inflammation, tissue damage, and the development of granulation tissue that can lead to ostium stenosis. Group A was the only group to experience all four stent-related complications, indicating that prolonged surgical manipulation may increase mechanical irritation and consequent patient discomfort [14]. Longer operating times are linked to higher risks of complications, such as thromboembolic events, wound healing issues, and anesthetic complications, from the standpoint of overall surgical efficiency [15]. Reduced anesthetic exposure, less patient discomfort, better operating room utilization, and possible cost savings are all benefits of our modified technique's significant time savings, which are especially crucial in healthcare settings with limited resources [16]. Technique changes can drastically cut operating time from 125 minutes to 75 minutes without sacrificing success rates, according to earlier comparative studies looking at surgical instruments [17]. Although formal comparisons between different techniques are still hindered by methodological heterogeneity across studies, the evolution of DCR techniques continues to emphasize surgical refinements [18]. Standardized preoperative evaluation, consistent surgical technique across all groups, structured postoperative protocols, and systematic outcome measurement at various time points were all part of our rigorous methodology. Although the non-randomized allocation is a limitation that may affect how results are interpreted, the similar demographic traits between groups reduce confounding bias. Group B outperforms Group A in terms of time-per-successful-outcome ratio by 2.1 times, according to the net efficiency score analysis. Failure rates of 5-10% continue, despite DCR's overall success rates exceeding 90%. Adverse outcomes are correlated with diabetes mellitus and previous ocular surgery [19]. The high success rates seen in both groups may have been influenced by our exclusion of patients with substantial comorbidities, which could limit generalizability to more complicated patient populations. Adequate epithelialization via anterior flap anastomosis alone is probably the mechanism behind the success of both flap excision without anastomosis, with bony ostium size being more important for long-term patency than flap configuration [20]. With success rates ranging from 80% to 95%, silicone intubation, which is used in all of our patients, has shown special advantages in complicated cases [21]. During the crucial healing phase, the stenting probably offers extra structural support, which could make up for the lack of posterior flap anastomosis. The efficiency gains of the modified technique are especially significant from the standpoint of health systems in developing nations where access to operating rooms is limited. Without investing more resources, the capacity to complete three modified DCR procedures in the time typically needed for fewer than two conventional procedures could significantly increase patient throughput and shorten surgical waiting lists. However, cost-effectiveness analysis would quantify economic benefits, and long-term follow-up beyond six months would bolster evidence for sustained patency.

LIMITATIONS OF THE STUDY

Due to the study's comparatively short six-month follow-up period, late complications or ostium stenosis that may arise later may not be detected. Furthermore, the non-randomized allocation methodology and small sample size of 60 patients limit statistical power for identifying variations in complication rates and introduce potential selection bias that could compromise the findings' generalizability.

CONCLUSION

This study unequivocally shows that, when compared to the conventional technique, modified external dacryocystorhinostomy without flap formation achieves a 71% reduction in operative duration while maintaining comparable success rates and exhibiting favorable safety profiles. Without sacrificing functional results, the streamlined method offers notable benefits in terms of surgical efficiency, patient comfort, resource utilization, and healthcare accessibility. These results lend credence to the modified technique's adoption as a workable substitute for traditional DCR, especially in environments with limited resources where operational effectiveness is crucial to enhancing patient access to necessary surgical care.

RECOMMENDATIONS

To definitively establish long-term efficacy and safety, future studies should use randomized controlled trial methodology with larger multicenter cohorts and longer follow-up periods of 12–24 months. The evidence for the widespread use of this modified surgical technique would be strengthened by cost-effectiveness analyses that quantify economic benefits and patient-reported outcome assessments that evaluate quality-of-life impacts.

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