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Original Research Article

Comparative Analysis between Primary and Secondary Dacryocystorhinonstomy in Acute Dacryocystitis

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Abstract

Introduction: Primary dacryocystorhinostomy is a technique used to relieve epiphora by removing fluid and mucus retention in the lacrimal sac and increasing tear outflow. Secondary dacryocystorhinostomy is a bypass technique that uses a bony ostium to form an anastomosis between the lacrimal sac and the nasal mucosa. Acute dacryocystitis in infants is extremely rare, affecting less than 1% of all babies. Acquired dacryocystitis affects more women than men and is more common in individuals over the age of 40, with a peak in people aged 60-70 years. Acute dacryocystitis is an acute suppurative inflammation of the lacrimal sac characterized by a painful swelling in the sac region. Acute sac inflammation is usually often caused by a blocked lacrimal duct.

Aims and Objectives: To conduct comparative analysis between primary Endoscopic dacryocystorhinostomy (EN-DCR) and secondary EN-DCR (post percutaneous drainage of lacrima sac abscess).

Methods: This is a prospective trial which has divided the patients into 2 groups, namely, control and intervention group. Patients in the control group had percutaneous lacrimal abscess drainage performed while the patients in the intervention group received early EN-DCR. Baseline characteristics were determined and the outcome variables were statistically analyzed.

Results: The study found that significant time was needed ($p<0.05$) for resolution of symptoms in control group (32.5±27.5 minutes) as compared to the Intervention group (14.9±6.2 minutes). The duration of surgery, functional success and clinical visits among the patients of Intervention group was found to be significantly lower as compared to the control group ($p<0.05$).

Conclusion: The study has concluded that primary early EN-DCR is recommended in acute form of dacryocystitis to obtain an optimum functional and anatomical efficiency as compared to the secondary procedure.

Keywords: Dacryocystorhinostomy, Epiphora, Dacryocystitis, Suppurative Inflammation.

Introduction

Since the late nineteenth and early twentieth centuries [1,2], dacryocystorhinostomy (DCR) has been a successful treatment for individuals with nasolacrimal duct obstruction. DCR was classified into two approaches: external or

endoscopic, with many procedures reported, such as laser aided endoscopic DCR and the use of various silicone stents. External DCR was originally thought to have higher success rates than endoscopic DCR [3,4], but with the advancement of endoscopic technology, endoscopic DCR has been reported to have equivalent results in recent investigations [5,6]. A meta-analysis of DCR outcomes conducted by Leong et al. revealed a success rate ranging from 64 to 100% in external DCR, 84 to 94% in endoscopic DCR, and 47 to 100% in laser-assisted DCR [7].

Primary dacryocystorhinostomy is a technique used to relieve epiphora by removing fluid and mucus retention in the lacrimal sac and increasing tear outflow. Secondary dacryocystorhinostomy is a bypass technique that uses a bony ostium to form an anastomosis between the lacrimal sac and the nasal mucosa. Acute dacryocystitis in infants is extremely rare, affecting less than 1% of all babies. Acquired dacryocystitis affects more women than men and is more common in individuals over the age of 40, with a peak in people aged 60-70 years [5-7].

Acute dacryocystitis is an acute suppurative inflammation of the lacrimal sac characterized by a painful swelling in the sac region. Acute sac inflammation is usually often caused by a blocked lacrimal duct [8, 9]. Lacrimal duct obstruction can be primary, meaning it is caused by an unknown source, or secondary, meaning it is caused by infections, inflammatory diseases, neoplasms, trauma, or mechanical forces. Females are more likely to be affected. The strong preference for females is owing to a narrower lumen of the bone naso lacrimal canal, which makes obstruction more likely [10]. Streptococcus heamolyticus, pneumococcus, and staphylococcus are the pathogens.

S. aureus (global), S. pneumoniae (Africa), and S. epidermidis (USA) are the most common gram-positive organisms isolated. There is a fluctuating preponderance of gram-negative isolates such as H. influenza (Middle East), P. aeruginosa (North India and USA), E. coli (Europe), and Corynebacterium diphtheriae (China) [11]. Cellulitis, lacrimal abscess, and subsequent formation of a lacrimal fistula between the sac and the skin are examples of acute stages. The most typical treatment strategy is a course of systemic antibiotics, abscess incision and drainage, and dacryocystorhinostomy, which can be external or endoscopic.

Scarring in the area, skin loss, a lacrimal fistula at the site [12], and pain and discomfort to the patient during the treatment are all problems of incision and drainage. It can also cause a disruption in the lacrimal pump mechanism [13]. External DCR becomes harder later because to the scar and adhesions of the sac following incision and drainage [14, 15]. Endoscopic DCR can be utilized as a first-line treatment for acute dacryocystitis with or without lacrimal abscess. Pain, edema, and epiphora are relieved immediately. The patient can avoid the painful operation of incision and drainage. There is no scar reinfection and the risk of lacrimal fistula at the site is reduced. It also promotes greater physiological and reliant tear drainage [16].

This disease was detected in 71.3% to 83.3% of middle-aged women in a US-based investigation, with a reported incidence of 2.4% among patients with lacrimal system problems [17-19]. Severe overlaying preseptal cellulitis to frank lacrimal abscess, as well as vision issues or life-threatening diseases such as sepsis, orbital cellulitis, and superior ophthalmic thrombosis [20, 21], can all occur. Warm compresses, systemic antibiotics, and percutaneous abscess drainage are used as secondary treatments for acute dacryocystitis with abscess formation, followed by external dacryocystorhinostomy once the initial infection has subsided [17]. However, this

therapy technique has numerous drawbacks. Because the underlying pathophysiology of NLDO is not treated in the early stages, infection may be extended or recurring. Percutaneous abscess drainage can lead to the development of severe cutaneous scars and fistulas. Furthermore, two-staged surgical intervention may increase patient suffering and the number of hospital visits.

Materials and Methods

Study design

A randomized control trial was conducted on patients who came to the otorhinolaryngology department of our hospital from March 2021 to October 2022. During the study period, we found 33 consecutive patients (n = 110) with acute dacryocystitis, characterized by severe lacrimal sac distention and noticeable medial canthal inflammation. The participants were divided into two groups, control and intervention groups, each with 55 patients, by block randomization.

After randomization, patients in the control group had percutaneous lacrimal abscess drainage performed under local anesthetic on the same day as a presentation (and then received EN-DCR (endoscopic dacryocystorhinostomy) later. An empirical course of systemic antibiotics was administered. After the draining site was made visible, the wound was regularly dressed until the infection disappeared. If the condition did not go away, repeated lacrimal abscess percutaneous drainage procedures were carried out. The arrangement for EN-DCR was made as a secondary treatment for the underlying nasolacrimal duct obstruction around a month after the acute dacryocystitis subsided.

Early EN-DCR was the only course of treatment given to the patients in the intervention group for acute dacryocystitis. Early surgery was scheduled as soon as feasible due to logistics and the location of the public hospital (within 2 weeks of presentation and randomization). All cases received a course of systemic, empirical antibiotics until the infection's symptoms disappeared.

Under general anesthesia, the mechanical method—which uses drills and punches to osteotomize bones—was used for all EN-DCR surgeries. Aiming for complete sac marsupialization with healing as the primary purpose, the nasal mucosal flap was kept whenever possible, permitting mucosa-to-mucosa apposition. Mitomycin C was used topically in both groups to improve ostium patency (0.4 mg/mL for 5 minutes). All cases involved the use of silicone tubes for bicanalicular intubation. The treatment was completed with nasal packing using gel foam that had been soaked in triamcinolone acetate (40 mg/mL).

Inclusion and exclusion criteria

Patients who visited our hospital's outpatient clinic followed the study procedure, and gave their informed consent are included in the study. All patients with lacrimal sac abscess formation and acute dacryocystitis who presented within two weeks of the onset of symptoms were between the ages of 18 and 90 years, and were healthy enough for surgery under general anesthesia were included in the study.

Patients are not allowed to participate in the trial if they do not adhere to the study protocol and do not give informed consent. We disqualified all patients who had undergone dacryocystorhinostomy or maxillofacial surgery, as well as those who had experienced trauma, cancer, or congenital anomalies of the lacrimal drainage system, were immunocompromised, or who had demonstrated poor cooperation during an operation or endoscopic examination.

Statistical analysis

SPSS, version 16.0, was used to conduct statistical analyses (IBM). A Wilcoxon rank sum test or an independent, unpaired, 2-tailed t-test was used to compare group means. The Fisher exact test or the 2 test was used to assess success rates and complication rates. The strength of the association was measured using the Pearson correlation coefficient. At the 5% level of significance, tests were run to see if the coefficients varied significantly from zero (2-tailed). Multiple analyses did not receive any adjustments. The statistical significance was considered to be α=0.05.

Ethical approval

The patients were given a thorough explanation of the study by the authors. The study process has been approved by the Ethical Committee of the hospital. The consent was obtained from each patient.

Results

The mean age of patients in the intervention group is 13 and 17 in the control group. The percentage of males is high (20%) in the intervention than the control group (12.7%). The percentage of females is high in control (89%) than in intervention (18%). The pre-existing obstruction in the nasolacrimal duct is seen in 87.2% of the intervention group. The laterality is significant in both groups.Table 1 shows the features of patients in both the control and intervention groups each with 55 patients.

Table 1: Patient Demographic Characteristics in each group and their significance between them

Features	Control group N=55	Intervention group N=55	p-value
Age (years); mean (SD)	60 (17)	65 (13) [55-83]	p>0.05
Female, No. (%)	29 (52.72)	31 (56.36)	p>0.05
Male, No. (%)	26 (47.27)	24 (43.63)	p>0.05
Preexisting NLDO, n (%)	39 (70.9)	48 (87.2)	p>0.05
Laterality, R/L/B, n (%)	35/22/0 (63.6/40/0)	35/22/0 (63.6/40/0)	p>0.05

NLDO, nasolacrimal duct obstruction; R/L/B, right, left, both.

Table 2 shows that the mean duration of surgery per eye is 57.3±37.9 minutes in the control group and 48.4±12.3 minutes in the intervention group. Dacryocystitis is recurrent in 7.2% of the control group. It took significantly more time (p<0.05) for resolution of symptoms in control group (32.5±27.5 minutes) as compared to the Intervention group (14.9±6.2 minutes). The duration of surgery, functional success and clinical visits among the patients of Intervention group was found to be significantly lower as compared to the control group (p<0.05).

Table 2: The outcome assessment in each group post surgery

Outcome	Control group N=55	Intervention group N=55	p value
Time to operation, mean (SD)	47.2 (30.5)	15.5 (6.5)	p<0.05
Time to symptom resolution, mean (SD)	32.5 (27.5)	14.9 (6.2)	p<0.05
Surgeon mean operation time per eye, mean (SD)	57.3 (37.9)	48.4 (12.3)	p<0.05
Recurrent acute dacryocystitis within 3 months, n (%)	8 (14.54)	0 (0)	p<0.05
Time to silicon tube removal, mean (SD)	33.7 (5.9)	34.2 (6.6)	p>0.05
Functional success at postoperative year 1, n (%)	36 (65.45)	48 (87.2)	p<0.05

Anatomical success at postoperative year 1, n (%)	41 (74.54)	48 (87.2)	$p>0.05$
Clinic visits, n (%)	20.4 (4.7)	9.5 (1.5)	$p<0.05$

Discussion

Trimarchi et al. (2019) investigated and reported on a retrospective study of 498 patients of primary and secondary endoscopic dacryocystorhinostomy. There were 426 unilateral and 72 bilateral dacryocystorhinostomies among the 498 surgeries. Anatomic success was reached in 91.54% of primary dacryocystorhinostomies and 89.36% of revision cases, whilst functional success was achieved in 90.4% of primary and 85.1% of secondary dacryocystorhinostomies. Anatomical success was achieved in 90.1% of procedures after a second revision of endoscopic dacryocystorhinostomy, while functional success was reached in 88.7% of surgeries [28].

NLDO is a prevalent condition that can be treated with a variety of surgical and nonsurgical treatments. Nasal END-DCR is one of the most commonly utilized methods because it has a high success rate with minimal morbidity and aesthetic issues. 10 While the success rates of END-DCR range from 75% to 96% in the literature [3, 22-26], our retrospective case series showed an anatomic success rate of 91.54% in primary DCR and 89.36% in revisions, with functional success rates of 90.4% in primary and 85.1% in secondary DCRs.

In a meta-analysis and comprehensive review on surgical DCR techniques, Huang et al. found equivalent results between EXT-DCR and mechanical END-DCR, with reported revision operations similar in both approaches (risk ratio (RR)=1.02; confidence interval (CI)=0.98-1.06) [27]. Hartikainen et al. compared endonasal laser-assisted DCR to external DCR and found that EXT-DCR produced much superior results (63% vs 91%). Finally, our case series demonstrates that END-DCR is one of the most successful types of surgery in the treatment of NLDO [3]. It is critical to underline that thorough endoscopic surgery and accurate follow-up are critical variables in achieving long-term anatomical and functional patency of the nasal rhinostomy.

Li et al. (2017) investigated and reported on the outcomes of EN-DCR as primary treatment and EN-DCR as a secondary treatment following percutaneous draining of a lacrimal sac abscess in acute dacryocystitis. Primary endoscopic dacryocystorhinostomy resulted in faster remission without more recurrences than secondary treatment in this randomized clinical trial of 32 patients with acute dacryocystitis and lacrimal sac abscess. There was no increase in the frequency of safety concerns or operation time, and anatomical and functional results were equivalent between the two procedures [29].

Thirty-two patients were randomly assigned to one of two therapy groups (control and intervention). The mean (SD) age of the patients was 61 (13) years, with a female predominance (27 [84%]). The mean (SD) time to symptom clearance in the intervention group was 13.8 (5.8) days compared to 31.7 (27.1) days in the control group (mean difference, 17.9; 95% CI, 3.71-32.01; P =.02). The intervention group's mean (SD) time to surgery was 11.9 (6.3) days compared to 45.6 (30.1) days in the control group (mean difference, 33.6; 95% CI, 17.92-49.33; P<.001). Recurrences happened only once in the control group and never happened in the intervention group. There were no changes in operation time or problems between the two groups. At postoperative year 1, both groups had anatomical and functional success of 87.5% (14 of 16 patients) [29].

To the best of our knowledge, we established that primary early EN-DCR is a viable therapy option in acute dacryocystitis, with long-term anatomical and functional outcomes equivalent to secondary treatment. Patients prefer single-stage surgery since there is no cutaneous incision and no need for wound care while waiting for definitive surgery. It also permits fewer outpatient visits, resulting in cheaper direct and indirect costs. Most importantly, quicker symptom resolution allows for earlier rehabilitation and increased patient comfort.

Sung et al. (2021) investigated and reported surgical outcomes of primary early endoscopic dacryocystorhinostomy (EnDCR) in acute dacryocystitis (AD), as well as the best timing for surgery. The AD group contained 41 patients, while the non-AD group had 82 people. The anatomical and functional success rates in the AD group were 87.8% and 82.9%, respectively, compared to 91.5% and 84.1% in the non-AD group. Primary early EnDCR is a safe and effective treatment for acute dacryocystitis (AD). EnDCR conducted within 3 days, in particular, contributes to speedier recovery and a shorter course of antibiotic treatment [30].

The study's strengths include a large sample size and a consistent surgical method conducted by a single skilled surgeon. Further research comparing the surgical outcomes of primary early EnDCR performed by surgeons with varying levels of experience may aid in generalizing our findings. Furthermore, to the best of our knowledge, this is the first study to investigate the impact of surgical scheduling. [31] The findings may aid clinicians in determining therapy options and optimizing the timing of therapies in patients with AD. To summarize, early EnDCR within 7 days of diagnosis is a successful and safe therapy for the primary treatment of acute dacryocystitis (AD). Furthermore, early surgery within three days of diagnosis shortens treatment time and allows for speedier recovery without severe problems. If the patient's overall state is bearable, extremely early EnDCR as a therapy option in people with AD should be examined.

Conclusion

The study has concluded that primary early EN-DCR is recommended in acute form of dacryocystitis to obtain a optimum functional and anatomical efficiency as compared to the secondary procedure. Cutaneous incision and wound dressing is absent in single stage surgery, due to which, it has more patient's compliance. Further, it was conlcuded that primary early EN-DCR can reduce the duration of surgery and the symptoms alleviate significantly earlier than secondary procedure. Therefore, primary early EN-DCR can be highly recommendable procedure. However, this study is limited by the smaller sample size and as it is a single centre study, the applicability of the findings cannot be generalized. The authors suggested to carry out more similar studies with larger and varied population. Self-reporting of the symptoms was done in this study which can be also incorporate bias in this study. The study did not taken anaesthesia into the account of its assessment.

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