

Research Article

A Comparative Study of Conventional Versus Mitomycin C Augmented External Dacryocystorhinostomy

Dr. Anjali Beniwal^{1*}, Dr. Archana Garg², Dr. Urvashi Meena³, Dr. Rakesh Porwal⁴

¹3rd Year Resident, Department of Ophthalmology, Jawaharlal Nehru Medical College and Hospital, Ajmer.

²Professor and Unit Head, Department of Ophthalmology, Jawaharlal Nehru Medical College and Hospital, Ajmer.

³Assistant Professor, Department of Ophthalmology, Jawahar Nehru Medical College and Hospital, Ajmer.

⁴Senior Professor and Head, Department of Ophthalmology, Jawaharlal Nehru Medical College and Hospital, Ajmer.

Corresponding Author: Dr. Anjali Beniwal

3rd Year Resident, Department of Ophthalmology, Jawaharlal Nehru Medical College and Hospital, Ajmer.

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ABSTRACT

Background: Primary acquired nasolacrimal duct obstruction (PANDO) is a common cause of chronic epiphora and recurrent dacryocystitis in adults. External dacryocystorhinostomy (DCR) remains the gold standard surgical procedure for treating nasolacrimal duct obstruction. However, postoperative fibrosis and closure of the osteotomy site may compromise long-term surgical success. Mitomycin C (MMC), an antifibrotic agent, has been used as an adjunct during DCR to reduce scar formation and improve ostium patency.

Methods: A hospital-based randomized interventional study was conducted in the Department of Ophthalmology, Jawaharlal Nehru Medical College, Ajmer, from June 2024 to May 2025. Eighty patients diagnosed with chronic dacryocystitis secondary to nasolacrimal duct obstruction were randomly allocated into two groups. Group A (n=40) underwent conventional external DCR, while Group B (n=40) underwent external DCR with intraoperative application of 0.2 mg/ml MMC for 5 minutes. Patients were followed on postoperative day 1, day 14, 3 months, and 6 months. Anatomical success was assessed by syringing patency and functional success by fluorescein dye disappearance test (FDDT).

Results: At 6 months, anatomical success was achieved in 92.5% of patients in the conventional DCR group and 97.5% in the MMC group. Functional success rates were similarly 92.5% and 97.5%, respectively. Postoperative complications were minimal in both groups. Granulation tissue formation was observed in only one patient in the MMC group. No revision surgery was required in either group.

Conclusion: External DCR is a highly effective procedure for managing nasolacrimal duct obstruction. Adjunctive intraoperative MMC demonstrated slightly higher anatomical and functional success rates with a comparable safety profile. MMC may be considered a useful adjunct in external DCR to improve long-term surgical outcomes.

Keywords: External Dacryocystorhinostomy, Mitomycin C, Nasolacrimal Duct Obstruction, Chronic Dacryocystitis, Epiphora, Lacrimal Drainage Surgery.

INTRODUCTION

Primary acquired nasolacrimal duct obstruction (PANDO) is one of the most common disorders affecting the lacrimal drainage system and represents a significant cause of chronic epiphora in adults. The condition results from progressive inflammation and fibrosis of the nasolacrimal duct, ultimately leading to obstruction of tear drainage and persistent watering of the eye. Patients frequently present with epiphora, recurrent discharge,

mucopurulent regurgitation, and recurrent episodes of dacryocystitis, all of which significantly affect quality of life and daily activities (1,3).

The pathogenesis of PANDO is multifactorial and involves chronic inflammatory changes within the lacrimal drainage system. Histopathological studies have demonstrated epithelial alterations, subepithelial fibrosis, vascular proliferation, and chronic inflammatory cell infiltration within the nasolacrimal duct.

These changes gradually narrow the ductal lumen, resulting in impaired tear outflow and eventual obstruction (3,4). The disease is more frequently encountered in females, which may be related to anatomical differences in the nasolacrimal drainage system and hormonal influences (2).

Dacryocystorhinostomy (DCR) is the standard surgical treatment for nasolacrimal duct obstruction. The procedure establishes a direct communication between the lacrimal sac and the nasal cavity, bypassing the obstructed nasolacrimal duct. Since its introduction, external DCR has remained the gold standard owing to its consistently high success rates, which generally exceed 90% in most published series (5,6). Despite excellent outcomes, surgical failure may occur due to excessive fibrosis, closure of the osteotomy site, granulation tissue formation, or inadequate mucosal healing (7).

Various modifications have been proposed to improve the long-term success of DCR. Among these, the use of Mitomycin C (MMC) has gained considerable attention. MMC is an antimetabolite antibiotic derived from *Streptomyces caespitosus* that inhibits fibroblast proliferation and suppresses scar formation. By reducing postoperative fibrosis at the osteotomy site, MMC may help maintain a larger and more patent rhinostomy, thereby improving surgical success (8,9).

Several studies have evaluated the role of MMC as an adjunct during DCR. Qadir et al. reported improved patency rates in patients receiving intraoperative MMC compared with conventional surgery (10). Similarly, Puzari and Kumar demonstrated higher success rates and better long-term outcomes in MMC-augmented DCR procedures (11). Camara et al. and Liao et al. also reported favorable results with MMC use without significant complications, supporting its safety and efficacy as an adjunctive treatment (12,13). Long-term studies have further suggested that MMC may reduce postoperative restenosis and maintain ostium patency over extended follow-up periods (14).

Although several reports have shown promising outcomes with MMC, variations in concentration, exposure duration, patient selection, and surgical technique have produced inconsistent findings. Moreover, evidence regarding the routine use of MMC in external DCR remains limited in many developing regions, including India, where chronic dacryocystitis continues to represent a substantial ophthalmic burden (2).

MATERIALS AND METHODS

Study Design and Setting

A hospital-based randomized interventional study was conducted in the Department of Ophthalmology, Jawaharlal Nehru Medical College, Ajmer, Rajasthan, India, after obtaining approval from the Institutional Ethics Committee. The study was carried out from June 2024 to May 2025, with an additional two months allocated for data compilation, statistical analysis, and manuscript preparation.

Study Population

The study included adult patients diagnosed with chronic dacryocystitis secondary to primary acquired nasolacrimal duct obstruction (PANDO). A total of 80 eligible patients were enrolled and randomly allocated into two equal groups using an opaque sealed-envelope randomization method.

- **Group A (n = 40):** Conventional External Dacryocystorhinostomy (DCR)
- **Group B (n = 40):** External DCR with intraoperative Mitomycin C (MMC)

Inclusion Criteria

1. Age >18 years
2. Chronic dacryocystitis with nasolacrimal duct obstruction
3. Willingness to provide informed consent

Exclusion Criteria

1. Obstruction at sites other than the nasolacrimal duct
2. Age below 18 years
3. Pregnancy
4. Severe nasal pathology including deviated nasal septum
5. Acute dacryocystitis
6. Nasal mucosal tear during surgery
7. Thin-walled atrophic lacrimal sac identified intraoperatively

Preoperative Evaluation

All patients underwent a comprehensive ophthalmic examination including visual acuity assessment, slit-lamp biomicroscopy, lacrimal sac examination, regurgitation test, syringing and probing, fluorescein dye disappearance test (FDDT), and ENT evaluation for associated nasal pathology. Routine hematological investigations were also performed before surgery.

Surgical Technique

All procedures were performed under local anesthesia using lignocaine with adrenaline.

Conventional External DCR

A standard external DCR was performed through a curvilinear skin incision placed medial to the medial canthus. Following exposure of the lacrimal sac fossa, a bony osteotomy

measuring approximately 12 × 15 mm was created. Anterior flaps of the lacrimal sac and nasal mucosa were fashioned and anastomosed using 6-0 silk sutures. The wound was closed in layers.

MMC-Augmented External DCR

The surgical steps were identical to conventional DCR. Following osteotomy creation and prior to flap anastomosis, a surgical sponge soaked in 0.2 mg/mL Mitomycin C was applied to the osteotomy site for five minutes. The area was subsequently irrigated thoroughly with 10 mL normal saline before completion of the procedure.

Postoperative Care and Follow-up

Patients received oral antibiotics, analgesics, topical antibiotics, nasal decongestants, and routine postoperative instructions. Follow-up

examinations were performed on postoperative day 1, day 14, 3 months, and 6 months.

Outcome Measures

Primary Outcome

- Anatomical success assessed by patent lacrimal syringing.

Secondary Outcomes

- Functional success assessed by FDDT.
- Postoperative complications.
- Need for revision surgery.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Quantitative variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Chi-square test and Student's t-test were used where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Demographic and Clinical Characteristics of Study Participants

Variable	Conventional DCR (n=40)	DCR + MMC (n=40)	P value
Mean age (59–68 years), n (%)	10 (25.0)	10 (25.0)	NS
Female gender, n (%)	35 (87.5)	39 (97.5)	0.203
Left eye involvement, n (%)	23 (57.5)	19 (47.5)	0.502
Duration of symptoms 6 months–1 year, n (%)	18 (45.0)	21 (52.5)	NS
Positive ROPLAS, n (%)	20 (50.0)	23 (57.5)	NS

Table 2. Clinical Presentation of Patients with Nasolacrimal Duct Obstruction

Clinical Presentation	Conventional DCR n (%)	DCR + MMC n (%)	Total n (%)
Epiphora only	19 (47.5)	15 (37.5)	34 (42.5)
Epiphora + Discharge	2 (5.0)	4 (10.0)	6 (7.5)
Epiphora + Lacrimal Sac Swelling	1 (2.5)	2 (5.0)	3 (3.75)
Epiphora + Discharge + Sac Swelling	18 (45.0)	19 (47.5)	37 (46.25)

Table 3. Postoperative Complications and Subjective Symptoms

Outcome	Conventional DCR n (%)	DCR + MMC n (%)
Day-1 Nasal Bleeding	4 (10.0)	6 (15.0)
Day-1 Pain	19 (47.5)	14 (35.0)
Day-1 Watering	5 (12.5)	3 (7.5)
Periorbital Swelling	5 (12.5)	5 (12.5)
Granulation Tissue at 6 Months	0 (0)	1 (2.5)
Revision Surgery Required	0	0

Table 4. Anatomical Success (Syringing Patency) At Follow-Up

Follow-up	Conventional DCR n (%)	DCR + MMC n (%)
Day 1 Patent	40 (100)	40 (100)
2 Weeks Patent	40 (100)	40 (100)
3 Months Patent	40 (100)	39 (97.5)
6 Months Patent	37 (92.5)	39 (97.5)

Table 5. Functional Success Based on Fluorescein Dye Disappearance Test (FDDT)

Follow-up	Conventional DCR n (%)	DCR + MMC n (%)
2 Weeks Positive FDDT	40 (100)	40 (100)
3 Months Positive FDDT	40 (100)	39 (97.5)
6 Months Positive FDDT	37 (92.5)	39 (97.5)

DISCUSSION

External dacryocystorhinostomy (DCR) remains the gold standard surgical procedure for the treatment of primary acquired nasolacrimal duct obstruction (PANDO). The present randomized interventional study compared the efficacy and safety of conventional external DCR with intraoperative Mitomycin C (MMC)-augmented external DCR in 80 patients with chronic dacryocystitis. The findings demonstrated high success rates in both groups, with slightly superior anatomical and functional outcomes in the MMC group at six months of follow-up.

In the present study, the majority of patients were females, accounting for 87.5% of the conventional DCR group and 97.5% of the MMC group. Female predominance in nasolacrimal duct obstruction has been consistently reported in previous studies and is believed to be related to anatomical differences in the lacrimal drainage system, including a narrower bony nasolacrimal canal and hormonal influences on mucosal tissues (2,3). Most patients belonged to the sixth and seventh decades of life, which is in agreement with previous reports showing increased incidence of PANDO in older adults due to progressive inflammatory and fibrotic changes within the lacrimal drainage pathway (1,4).

Epiphora was the most common presenting complaint in the present study, either alone or in combination with discharge and lacrimal sac swelling. Nearly half of the patients presented with the classical triad of epiphora, discharge, and sac swelling. Similar clinical presentations have been reported by Tarbet and Custer as well as Welham and Henderson, who identified chronic epiphora and recurrent dacryocystitis as the most frequent manifestations of nasolacrimal duct obstruction requiring surgical intervention (6,7). These findings reinforce the importance of timely diagnosis and surgical management to prevent recurrent infections and chronic discomfort.

The principal outcome of this study was the assessment of anatomical success based on lacrimal syringing patency. At six months, anatomical success was observed in 92.5% of patients undergoing conventional DCR and 97.5% of patients receiving MMC-augmented

DCR. Although the difference was modest, the MMC group demonstrated a numerically higher success rate. These findings are comparable to those reported by Qadir et al. (10), who found improved patency rates following intraoperative MMC application. Similarly, Puzari and Kumar (11) reported superior long-term outcomes in MMC-augmented DCR compared with conventional surgery. The beneficial effect of MMC is attributed to its antifibrotic action, which inhibits fibroblast proliferation and reduces postoperative scar formation around the osteotomy site.

Functional success assessed by fluorescein dye disappearance testing closely paralleled the anatomical outcomes. Functional success at six months was 92.5% in the conventional group and 97.5% in the MMC group. These results are consistent with the observations of Camara et al. (12) and Liao et al. (13), who reported improved functional drainage outcomes with adjunctive MMC use. Preservation of a patent ostium through inhibition of excessive wound healing likely contributes to sustained tear drainage and symptomatic relief.

Postoperative complications were minimal in both groups. Mild pain on the first postoperative day was the most frequently reported symptom. Nasal bleeding, transient watering, and periorbital swelling occurred infrequently and resolved with conservative management. Only one patient in the MMC group developed granulation tissue during follow-up. Importantly, no patient required revision surgery. These findings support the safety profile of MMC reported by Camara et al. (12) and Yildirim et al. (14), who demonstrated that low-concentration intraoperative MMC can be used safely without significant ocular or nasal complications. Furthermore, ultrastructural studies by Ali et al. (15) have shown minimal adverse effects on surrounding nasal mucosa when MMC is used in controlled concentrations. The mechanism underlying improved outcomes with MMC is likely related to suppression of fibroblast proliferation at the osteotomy site. Excessive fibrosis and cicatricial closure remain the most common causes of DCR failure (7). MMC reduces fibrovascular tissue proliferation and helps maintain a larger rhinostomy opening during the healing phase, thereby decreasing

the risk of restenosis (8,9). This pharmacological effect may explain the slightly better long-term patency observed in the MMC group in the present study.

The strengths of this study include its randomized design, standardized surgical technique, and uniform follow-up schedule. However, several limitations should be acknowledged. The sample size was relatively small, and follow-up was limited to six months. Longer follow-up periods and larger multicentric studies would provide stronger evidence regarding the long-term effectiveness and safety of MMC augmentation in external DCR. Overall, the present study demonstrates that both conventional and MMC-augmented external DCR are highly effective procedures for the management of nasolacrimal duct obstruction. Although conventional DCR achieved excellent success rates, adjunctive intraoperative MMC provided slightly higher anatomical and functional success without increasing complications. These findings support the selective use of MMC as an adjunct to external DCR, particularly in patients at increased risk of postoperative fibrosis and surgical failure.

CONCLUSION

External dacryocystorhinostomy remains a highly successful surgical procedure for the treatment of primary acquired nasolacrimal duct obstruction. Both conventional external DCR and Mitomycin C-augmented external DCR demonstrated excellent anatomical and functional outcomes with minimal postoperative complications.

The use of intraoperative Mitomycin C resulted in slightly higher anatomical and functional success rates at six months compared with conventional surgery. Furthermore, MMC was well tolerated and did not increase the incidence of significant postoperative complications. Based on these findings, intraoperative Mitomycin C may be considered a safe and useful adjunct in external dacryocystorhinostomy to improve long-term surgical patency and functional success.

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