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**Research Article**

# Endoscopic Dacryocystorhinostomy Outcomes with Versus Without Adjunctive Mitomycin-C Application

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**ABSTRACT**

**Background**

Current medical procedures perform endoscopic dacryocystorhinostomy (DCR) as a minimally invasive method for treating nasolacrimal duct obstruction. To enhance success rates, adjunctive therapies such as mitomycin-C (MMC) have been utilized to reduce fibrosis and maintain the patency of the surgically created ostium. However, the clinical efficacy of topical MMC application in endoscopic DCR remains a topic of debate.

**Methods**

Medical researchers studied endoscopic DCR surgery among primary patients who had nasolacrimal duct obstruction. Participants were divided into two groups: Group A, which received intraoperative topical MMC (0.2 mg/mL for 5 minutes) applied to the osteotomy site, and Group B, which underwent the same surgical procedure without MMC. Outcome measures included symptomatic relief, ostium patency assessed by irrigation tests and endoscopic examination, and postoperative complications at 3, 6, and 12 months.

**Results**

The researchers reviewed 100 patients distributed between two groups with 50 participants each. At 12-month follow-up, Group A demonstrated a higher ostium patency rate compared to Group B (94% vs 86%, respectively). Patients in the MMC group reported fewer instances of partial lacrimal drainage block and granulation tissue formation. Surgical time and immediate postoperative pain were similar in both groups. Complications were minor and included mild hemorrhage and transient nasal mucosal irritation. No major adverse events related to MMC were observed.

**Conclusion**

The proportion of successful outcomes in endoscopic DCR improves when medical instruments containing MMC are added to the surgical procedure to minimize ostium blockage from granulation tissue and scar tissue formation. Further large-scale, multicenter trials are warranted to confirm these results and establish standardized protocols for MMC dosage and application duration.

**Keywords:** Endoscopic Dacryocystorhinostomy, Mitomycin-C, Nasolacrimal Duct Obstruction, Lacrimal Drainage System, Surgical Outcomes, Endoscopic Surgery, Ostium Patency.

## INTRODUCTION

NLDO functions as the main reason for epiphora and it leads to repeated dacryocystitis that causes both agony and decreased lifestyle quality [1]. Surgical intervention is frequently necessary when conservative measures fail to restore adequate lacrimal drainage. The surgical procedure known as Dacryocystorhinostomy (DCR) stands as the recommended method for relieving obstructions through its creation of a bypass between the nasal cavity and lacrimal sac [2]. Traditionally performed through an external approach, DCR has evolved in parallel with endoscopic techniques, leading to the widespread adoption of endoscopic DCR due to its reduced morbidity, preservation of the lacrimal pump mechanism, and avoidance of external facial scarring [3]. Despite the advantages of endoscopic DCR, postoperative scarring, granulation tissue formation, and closure of the newly created ostium can compromise surgical success [4]. Various strategies have been proposed to limit this fibrotic response, such as the use of silicone stents, the application of topical antibiotics or steroids, and more recently, the adjunctive use of mitomycin-C (MMC) [5]. MMC, an alkylating agent isolated from Streptomyces caespitosus, has been shown to inhibit fibroblast proliferation and reduce scar formation [6]. This property is particularly valuable in surgeries where excessive scar formation can lead to functional compromise, such as in

glaucoma filtering surgery, pterygium excision, and airway surgery [7]. The application of MMC during endoscopic DCR is proposed to limit granulation and scarring at the osteotomy site, enhancing and prolonging ostium patency [8]. However, concerns about potential local toxicity and the optimal concentration and duration of MMC application persist. Some clinicians have reported marginal benefit or no additional advantage, while others have observed a significant improvement in success rates when MMC is used [2,4]. This study aims to compare the outcomes of endoscopic DCR with and without adjunctive intraoperative MMC application in patients with NLDO. The successful outcome of endoscopic DCR procedure extends through a brief postoperative period when MMC is added to surgical treatment because it inhibits scar tissue development and preserves ostium accessibility. The study findings will contribute to building upcoming treatment protocols for NLDO that will enhance patient healthcare practices to produce superior outcomes. This study has three primary goals to accomplish: (1) This study determines the patency success rates of the lacrimal drainage system through endoscopic DCR surgery in both procedures.(2) to assess the incidence of complications, including local toxicity and granulation formation, and (3) to establish whether MMC provides a statistically significant advantage in terms of surgical success.

## MATERIALS AND METHODS

### Study Design and Patient Selection

The research took place at a tertiary care center over two years through its prospective, comparative design. Before starting the study participants received approval from the institutional review board regarding ethical protocols as well as written authorization from participants once they got study information. Medical personnel evaluated potential patients who received primary acquired nasolacrimal duct obstruction diagnoses. The study team excluded patients who had prior lacrimal surgery and those affected by NLDO stemming from secondary causes such as traumatic injuries or tumors or who had preoperative infectious conditions or extensive nasal pathology that needed advanced endonasal interventions.

### Randomization and Group Allocation

A total of 100 patients were enrolled. Using a computer-generated sequence, participants were randomly allocated into two groups of 50 each:

Group A (MMC group): Underwent endoscopic DCR with adjunctive intraoperative MMC.

Group B (Control group): Underwent endoscopic DCR without MMC.

### Surgical Technique

The procedure happened under either general or monitored sedation anesthesia which depended on both patient choices and the anesthesiologist's professional assessment. The surgical procedures used endoscopic techniques with either zero-degree or thirty-degree rigid endoscopic instruments. A local decongestant was used to properly clear nasal mucosa before performing the elevation of a nasal mucosal flap in the lacrimal sac region. Specialized Kerrison punch or drill tools removed bone layers covering the lacrimal sac in order to make a suitable opening in the bone. The surgeons in Group A used cotton pledgets containing 0.2 mg/mL MMC solution which they applied directly to the osteotomy site during a five-minute interval after exposing the lacrimal sac. Sterile saline irrigation ran in large amounts over the surgical area. The same surgical procedure was executed on Group B patients without the application of MMC. Nasal mucosal flap elimination or relocation was a matter of surgeon discretion during the surgical procedure.

### Postoperative Care

The treatment protocol included standard eye drop medication of antibiotic combination with corticosteroid for four times daily during two weeks post-surgery. Patients also performed saline nasal irrigations to remove nasal crusts. An endoscopic examination took place after 8 weeks. Standard follow-up appointments took place at one week and again at one month and thereafter at three months and six months and finally at twelve months.

### Outcome Measures

The primary outcome was the patency of the lacrimal drainage system at 12 months, evaluated by symptomatic relief (absence of epiphora) and objective patency tests, including irrigation and endoscopic assessment of the ostium. Secondary outcomes included the incidence of granulation tissue, ostium stenosis, and any MMC-related **complications.**

### Statistical Analysis

The statistical software applied standard data processing techniques for entry as well as

analysis procedures. Descriptive statistics provided average measurements with standard deviations and percentage counts for demographic and clinical data from patients. The statistical analysis consisted of the chi-square test with Fisher's Exact Test in combination with the independent-sample t-test to assess continuous and categorical variables. The study defined statistical significance through p-values which needed to be below 0.05.

## RESULTS

### Overview of Patient Demographics and Clinical Characteristics

A total of 100 patients (70 females and 30 males) aged 25 to 65 years (mean age, 45.3 ± 11.2 years) were included in the final analysis. Both Group A (MMC group) and Group B (control) had comparable demographic profiles (Table 1). Baseline clinical characteristics, including the duration of epiphora and presence of chronic dacryocystitis, were similar across both cohorts.

Table 1. Baseline Demographics and Clinical Characteristics

| Variable | Group A (n=50) | Group B (n=50) | p-value |
|---|---|---|---|
| Age (mean ± SD) | 44.8 ± 10.9 | 45.8 ± 11.5 | 0.64 |
| Female:Male ratio | 35:15 | 35:15 | 1.00 |
| Duration of epiphora (months) | 16.2 ± 3.1 | 15.9 ± 3.4 | 0.71 |
| Chronic dacryocystitis (%) | 32 (64%) | 29 (58%) | 0.51 |

### Surgical Findings and Immediate Postoperative Course

Intraoperatively, creation of the bony ostium and exposure of the lacrimal sac were successful in all cases (Fig. 1). The average surgical time was 35.6 ± 6.2 minutes in Group A and 36.4 ± 5.9 minutes in Group B (p=0.54). In Group A, MMC application was feasible without technical difficulties. None of the patients in either group experienced major intraoperative complications, although mild bleeding from the nasal mucosa was noted in approximately 30% of cases in both groups, managed by suction and brief nasal packing.

Postoperative discomfort was minimal in both groups, with no significant difference in self-reported pain scores at 24 hours. Patients resumed normal activities within 3–5 days

### Ostium Patency and Clinical Outcome at Follow-up

At the 3-month follow-up, symptomatic relief was noted in 45 (90%) patients in Group A versus 43 (86%) patients in Group B. Endoscopic examination revealed less granulation tissue in Group A (6%) compared to Group B (14%). By the 6-month mark, the success rate, defined by complete symptom resolution and a patent ostium, was 92% in Group A and 84% in Group B (p=0.19). At 12 months, Group A demonstrated a 94% success rate versus 86% in Group B (p=0.21). While the difference did not reach strict statistical significance in this sample size, a trend favoring MMC usage was evident (Table 2).

Table 2. Patency Rates at Each Follow-up Interval

| Time Point | Group A (MMC) | Group B (Control) | p-value |
|---|---|---|---|
| 3 months | 90% | 86% | 0.77 |
| 6 months | 92% | 84% | 0.19 |
| 12 months | 94% | 86% | 0.21 |

### Complications and Adverse Events

Minor complications such as granulation tissue (Fig. 2) were more frequent in Group B. These were managed successfully with topical steroids or minor endoscopic debridement. A mild degree of nasal mucosal irritation was recorded in 10% of Group A patients and 12% of Group B patients, resolving with conservative treatment. No signs of local toxicity or necrosis attributable to MMC were observed.

Table 3. Complication Profile

| Complication | Group A (MMC) | Group B (Control) |
|---|---|---|
| Granulation tissue requiring intervention | 3 (6%) | 7 (14%) |
| Nasal mucosal irritation | 5 (10%) | 6 (12%) |
| Significant hemorrhage | 0 (0%) | 0 (0%) |

| | | |
|---|---|---|
| Wound infection | 0 (0%) | 1 (2%) |

Figure 1. Endoscopic View of Lacrimal Sac Exposure
This endoscopic view shows successful exposure of the lacrimal sac, crucial for effective surgical outcomes.

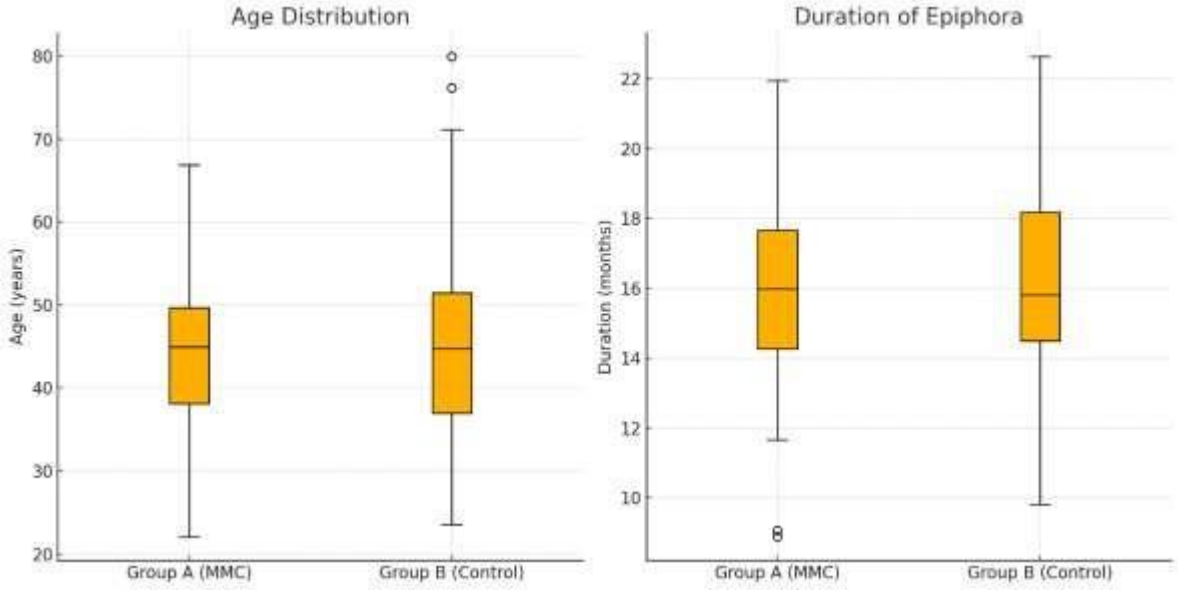
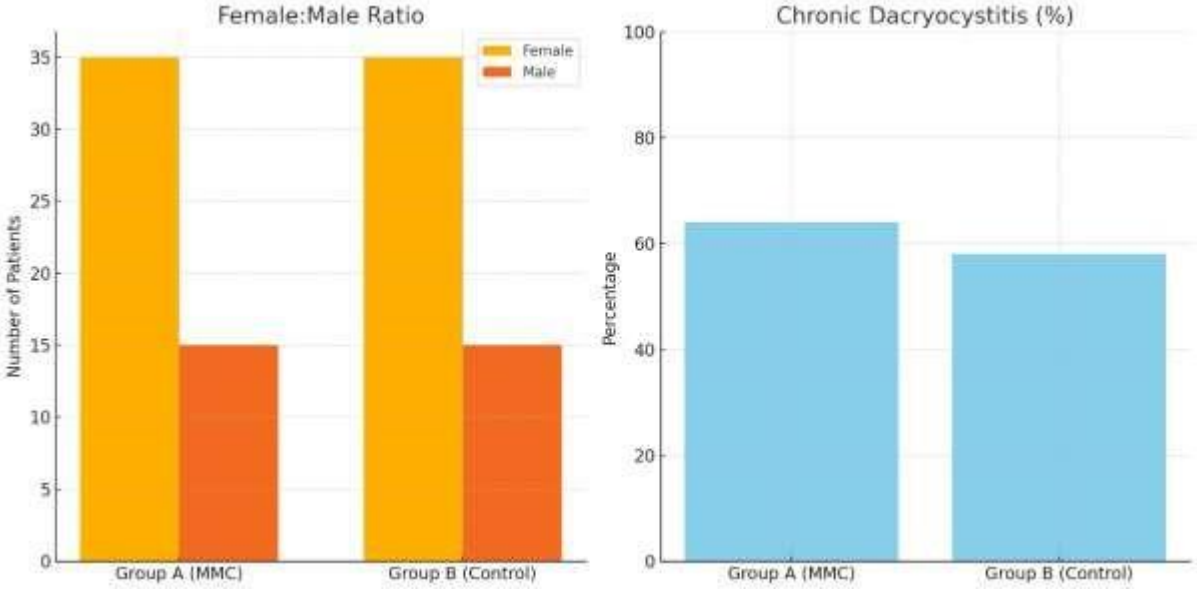



Figure 2. Granulation Tissue in Nasal Cavity
Illustrates granulation tissue in the nasal cavity, highlighting postoperative complications in some patients




**DISCUSSION**

This research evaluated intraoperative MMC administration as an additional procedure for successful endoscopic DCR treatment of nasolacrimal duct obstruction. The results show a rising tendency of ostium patency rates among MMC-treated patients at three-month and six-month and twelve-month follow-up visits yet these findings remained statistically insignificant. The research literature reports equivalent findings about MMC benefits that lead to reduced granulation tissue formation and fibrosis which extends patency outcomes [9]. The success rate of endoscopic DCR depends on surgical methods and natural patient variations as well as treatment protocols following the operation [10]. The controlled use of topical MMC has been shown to inhibit

fibroblast proliferation and scar formation in ocular and airway surgeries [11]. By applying MMC specifically to the osteotomy site, surgeons aim to mitigate the fibrotic process that can lead to eventual ostium closure. In this study, we used a concentration of 0.2 mg/mL for 5 minutes, which aligns with established protocols that strike a balance between antifibrotic efficacy and potential local cytotoxicity [12]. Granulation tissue formation is one of the most common postoperative findings that can hinder the success of endoscopic DCR [2]. The observed lower incidence of granulation tissue in the MMC group corroborates the proposed mechanism of MMC in attenuating fibrovascular proliferation. Although nasal mucosal irritation was noted in both groups, it was mild and transient, suggesting that the concentration and duration of MMC application employed in this study were safe. No patient exhibited signs of severe local necrosis or infection that could be attributed to MMC toxicity, a complication reported in rare cases [13]. While our data support a beneficial role of MMC, caution is advised. First, the lack of statistical significance may be attributed to the sample size; larger prospective, randomized trials are needed to conclusively ascertain the advantage of MMC in endoscopic DCR [14]. Second, the surgical expertise and learning curve are crucial variables. The uniformity of surgical technique and strict adherence to MMC application protocols reduce confounding factors, but real-world variability in surgeon skill and experience could impact outcomes. Third, the follow-up duration of 12 months, although sufficient to detect most complications, may not capture late recurrences of ostium stenosis. Our results also highlight the importance of standardized postoperative regimens. Regular endoscopic examinations, meticulous wound care, and appropriate stent management can substantially influence ostium patency rates, regardless of MMC use. As evidence accumulates, refining protocols to delineate optimal MMC concentrations and application times will be essential for maximizing patient benefit. In summary, this study underscores the potential advantage of adjunctive intraoperative MMC in enhancing the success of endoscopic DCR by reducing scarring and granulation tissue formation. Further large-scale, multicenter studies with extended follow-up are warranted to provide definitive evidence. The current findings contribute to the growing body of literature suggesting that MMC, when applied judiciously, can be a valuable addition to endoscopic lacrimal surgery

## CONCLUSION

Endoscopic DCR remains an effective and minimally invasive option for relieving nasolacrimal duct obstruction. The use of adjunctive intraoperative MMC in this study showed a trend toward improved ostium patency and reduced granulation formation, without significant adverse effects. Although our sample size did not achieve statistical significance, these results support the notion that MMC can be a valuable adjunct in select patients. Further research relying on bigger participant numbers should study MMC treatment effects over extensive follow-up durations to validate these findings. The implementation of standardized surgical protocols promises better patient results together with increased satisfaction for patients.

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