



ROLE OF MITOMYCIN-C IN ENDOSCOPIC DACRYOCYSTORHINOSTOMY- OUR EXPERIENCE

Otorhinolaryngology

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ABSTRACT

Aim-To compare outcomes of endoscopic dacryocystorhinostomy (DCR) with and without intraoperative mitomycin-C (MMC) application. **Methodology-** 50 patients selected randomly for endoscopic DCR, 23 with right eye involvement, 13 with left, and 14 with bilateral dacryocystitis. Patients included between age group 15-75 years, both genders, having unilateral or/and bilateral chronic dacryocystitis. Patients with acute dacryocystitis, canalicular obstruction, granulomatous systemic diseases, malignancies of the nose or lacrimal sac, and congenital or traumatic lacrimal obstruction were excluded. Using a simple randomization method, 25 patients underwent DCR with intraoperative MMC (Group A) and 25 without MMC (Group B). **Results-** By 3 months, subjective relief was noted in all except one patient in Group A and two in Group B. Objective assessment by sac syringing showed full patency in all patients at 1-week. However at 2-weeks and 1-month, partial blockages occurred in one patient from Group A and two from Group B. Granulation tissue was minimal in Group A (only one case at 2-weeks) and more persistent in Group B, suggesting better healing with MMC. **Conclusion-**MMC may enhance ostium patency and reduce granulation tissue formation. However, with ongoing improvements in endoscopic DCR, further large-scale studies are needed to validate its routine use.

KEYWORDS

dacryocystorhinostomy (DCR), nasolacrimal duct (NLD), mitomycin-C (MMC)

INTRODUCTION

Chronic dacryocystitis is infection or inflammation of lacrimal sac which causes obstruction of lacrimal pathway. The causes of obstruction of lacrimal pathway include congenital nasolacrimal duct obstruction, lacrimal fistula, lacrimal duct cyst or any acute or chronic inflammation, trauma or neoplasm, granulomatous disease or due to radiation therapy.^[2,3] Presenting symptoms are watering of eyes and swelling of lacrimal sac. Epiphora or imperfect drainage of tears is a very common condition encountered in clinical practice by ophthalmologists and otorhinolaryngologists^[4]. Dacryocystorhinostomy (DCR) is a procedure in which lacrimal flow is made to flow through the nasal cavity by making an opening in nasal cavity. Endoscopic dacryocystorhinostomy is the most common and most popular surgical procedure performed for nasolacrimal duct obstruction^[4,5].

Despite of its advantages like it is minimally invasive procedure with improved visualization and faster recovery time, there are certain causes of failure of endoscopic DCR^[6,7]. The reason for failure involves an overgrowth of fibrous tissue in the flap anastomosis which causes the closure of osteotomy site. Attempts have been made to use stents, balloon catheters, and anti-metabolites to enhance the outcome. Many studies have been done using Mitomycin-C as anti-metabolite which is safe and conducive for achieving excellent results from surgery.^[8] Therefore, the failure rate may be reduced if antiproliferative drugs are applied to the anastomosed flaps and osteotomy site to prevent fibrous tissue formation and scarring. Mitomycin-C (MMC) is an alkylating antibiotic and considered a systemic chemotherapeutic agent, derived from *Streptomyces caespitosus*. It inhibits fibroblast proliferation and reduces collagen production as it has the ability to inhibit DNA-dependent RNA synthesis.^[9] This study was conducted to compare the results of endoscopic DCR with and without intraoperative Mitomycin-C by doing post operative sac syringing and endoscopic nasal examination, also noting any intra or post operation complications.

MATERIAL AND METHODS

The study was approved by Ethics Committee. Informed consent was

obtained from all patients prior to their participation. 50 patients participated in the study, 23 patients with right eye complaint, 13 with left eye and 14 with both eyes dacryocystitis, all patients selected with simple randomization for endoscopic dacryocystorhinostomy. Inclusion criteria include patients with age group between 15-75 years both males and females.

Exclusion criteria - Cases excluded were canalicular obstruction, acute dacryocystitis, granulomatous systemic diseases affecting the lacrimal passages, malignant tumors of nose and lacrimal sac, patients with bleeding disorders, pregnancy or nursing mothers. On examination sac syringing was done which showed partial or complete regurgitation from lower punctum.

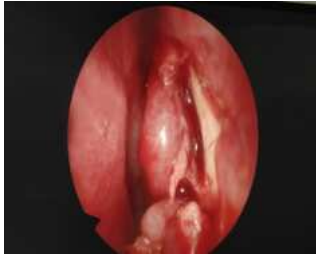


Picture 1: Resident Performing Sac Syringing in the Otorhinolaryngology Ward

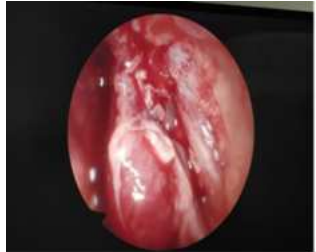
Dacryocystography (DCG) was done to localize the site of blockage of lumen of entire lacrimal drainage system. With randomization patients were classified into two groups. Group A patients were applied Mitomycin-C after surgical procedure and Group B patients were not applied mitomycin-C. Both groups were compared based on their post operative sac syringing results and endonasal examination. Sac syringing was done after 1st week, then follow up was done after 2nd week, 1st month and 3rd month.

Method Of Application Of Mitomycin-C - All the procedures were

done under general anaesthesia using 0-degree endoscope. Lacrimal sac can be found beneath the lateral nasal wall anterior to the attachment of middle turbinate. A U-shaped incision made in lateral nasal wall in front of axilla of middle turbinate and 2 mm above it. A 1-1.5 cm posteriorly based mucosal flap elevated and removed from the lacrimal bone to expose only that much part of lacrimal bone. Thick bone from the frontal process of maxilla and thin lacrimal bone removed. Lacrimal sac identified by pressure at the medial canthus and incised vertically using a sickle knife, syringing done using normal saline to confirm the patency.



Picture 2: Lacrimal Bone Exposed



Picture 3: Lacrimal Sac Identified

In group A of 25 patients 0.2 mg/mL Mitomycin-C was applied through a cotton ball and kept at the rhinostomy site for 5 minutes, where as in group -B no Mitomycin - C was applied.



Picture 4: Mitomycin Soaked Abgel Placed at Rhinostomy Site

Post Op Care - All patients were examined on the first day after surgery after the anterior nasal pack removal. In addition, they were given antibiotics (in forms of oral systemic plus topical eye drops) for ten days and was advised nasal douche for 1 week for removal of nasal crusts.

Follow Up - All the patients were assessed after 1st week, 2nd week, 1st month, 3rd month postoperatively for anatomical and functional results. Anatomically, patients were assessed by nasal endoscopy to see the rhinostomy for any granulations, adhesions, crusts, synchia, and functional asse-ssment was done by assessing relief of symptoms and checking the patency by sac syringing. No funding was required.

RESULT

There were total 50 patients in the study on which DCR was done, out of which 25 participants in Group A mitomycin -C was applied and in group B Mitomycin-C was not applied.

Table 1: Age & Gender Distribution

Age (years)	Male [N (%)]	Female [N (%)]	Total [N (%)]
15 - 30	1 (2%)	2 (4%)	3 (6%)
31 - 45	7 (14%)	15 (30%)	22 (44%)
46 - 60	9 (18%)	6 (12%)	15 (30%)
61 -75	3 (6%)	7 (14%)	10 (20%)
Total	20(40)	30(60)	50(100)

The study includes a total of 50 patients who underwent endoscopic dacryocystorhinostomy (DCR) with or without mitomycin-C (MMC) application, with a higher prevalence observed in females (30 cases,

60%) compared to males (20 cases, 40%). Age-wise distribution reveals that the majority of cases (44%) fall within the 31 -45 years age group, where females (30%) outnumber males (14%). The second largest group (30%) comprises patients aged 46 –60 years, with a slightly higher proportion of males (18%) compared to females (12%). In the elderly population between 61 -75 years age groups, 20% of cases were reported, with females (14%) again being more affected than males (6%). The lowest incidence (6%) was seen in individuals in 15 - 30 years age group, with a slight female predominance.

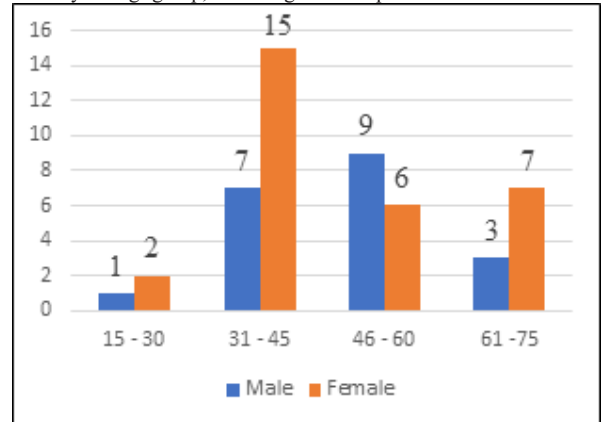


Figure 1: Age & Gender Distribution

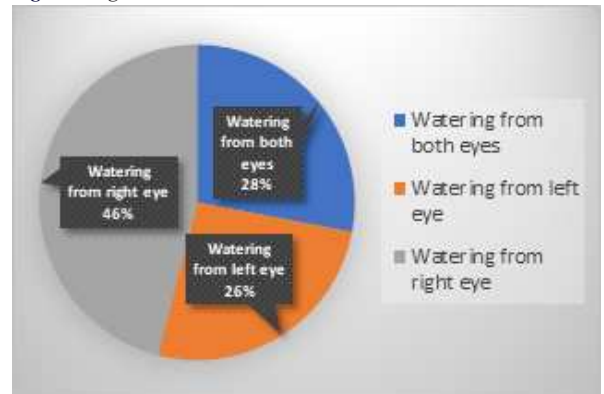


Figure 2: Chief Complaints

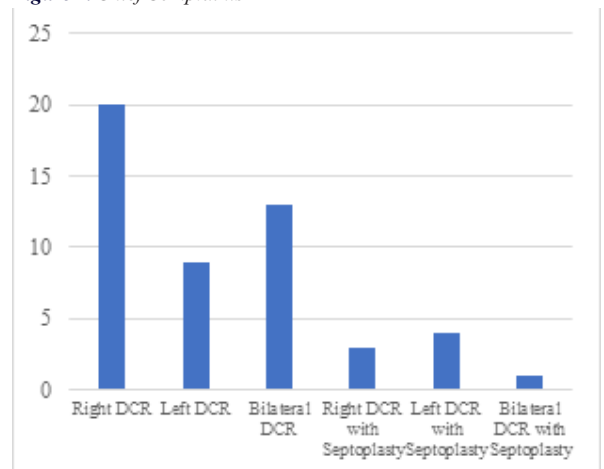


Figure 3: Types of Surgery Conducted

Out of the 50 patients included in the study, 25 patients were assigned to Group A, where Mitomycin-C (MMC) was administered, while the remaining 25 patients formed Group B, who underwent the procedure without MMC.

Table 2: Comparison of Presenting Symptoms Group A & Group B

Presenting Symptoms	Group A (N=25)	Group B (N=25)	P value
Epiphora	25	25	0.580
Purulent Discharge	7	11	

External swelling	3	2	
P value- 0.580 statistically insignificant			

The presenting symptoms among the two study groups, Group A (Mitomycin-C treated) and Group B (without Mitomycin-C), showed notable similarities and differences. Epiphora (excessive tearing) was the most common symptom, affecting all 25 patients (100%) in both groups, indicating a complete nasolacrimal duct obstruction. Purulent discharge was observed in 7 patients (28%) in Group A and 11 patients (44%) in Group B, suggesting a higher incidence of infection-related symptoms in the non-Mitomycin-C group. Additionally, external swelling was present in 3 patients (12%) in Group A and 2 patients (8%) in Group B, reflecting a mild variation in the inflammatory response. There is statistical insignificant relation between the two groups for symptoms.

Table 3: Clinical Findings In Patients Undergoing Endoscopic DCR In Both Groups

Clinical findings	Group A (N =25)	Group B (N =25)	P value
Regurgitation on Syringing	25	25	0.563
Discharge on pressure in lacrimal fossa area	15	12	
P value- 0.563 statistically insignificant			

The clinical evaluation of patients in Group A (Mitomycin-C treated) and Group B (without Mitomycin-C) showed similar patterns of nasolacrimal duct obstruction. Regurgitation on syringing, a key diagnostic sign of complete nasolacrimal duct obstruction, was present in all 25 patients (100%) in both groups, confirming the severity of the condition. Additionally, discharge on pressure over the lacrimal fossa area, indicative of active infection or chronic inflammation, was observed in 15 patients (60%) in Group A and 12 patients (48%) in Group B. The clinical findings between the 2 groups are statistically insignificant. The following Tables 4 and 5, does the comparison of Subjective and Objective Improvement Between Group A and Group B. The acronyms used in those table column headings stands for: C.I. – Complete Improvement, P.I. – Partial Improvement, N.I. – No Improvement, F.F. – Free Flow, P.B. – Partially Blocked and T.B. – Total Blocked.

Table 4: Subjective Improvement

Time Point	Group A			Group B			P Value
	C.I.	P.I.	N.I.	C.I.	P.I.	N.I.	
1 st week	25	0	0	25	0	0	1
2 nd week	24	1	0	24	1	0	1
1 st month	24	1	0	22	2	0	0.562
3 rd month	24	0	1	22	1	2	0.368

P value- statistically insignificant

At 1 week and 2nd week, both groups showed identical outcomes with all patients experiencing complete relief or partial relief, resulting in p-values of 1, indicating no significant difference between the groups. At 1 month, Group A had slightly more patients with complete relief compared to Group B, which had more with partial relief, yielding a p-value of 0.562, suggesting no statistically significant difference. By 3 months, a few patients in both groups reported no relief, with a p-value of 0.368, indicating that the difference between the groups remained statistically insignificant throughout the study period.

Table 5: Objective (Sac Syringing)

Time Point	Group A			Group B			P Value
	F.F.	P.B.	T.B.	F.F.	P.B.	T.B.	
1 st week	25	0	0	25	0	0	1
2 nd week	24	1	0	23	2	0	0.758
1 st month	24	1	0	23	2	0	0.758
3 rd month	23	0	2	22	0	3	0.657

P value- statistically insignificant

At 1 week, both groups had identical results with all patients experiencing free flow, resulting in a p-value of 1, indicating no significant difference. By the 2nd week and 1 month, Group A showed a slightly higher number of patients with free flow compared to Group B, which had more cases of partial block, but the p-value of 0.758 suggests that these differences were not statistically significant. At 3 months, a few patients in both groups experienced blockages, but the p-value of 0.657 still indicates no significant difference between the

groups over the study period.

Table 6: Comparison Of Postoperative Complications Between Group A & Group B

Complications	A Group with MMC			
	1 st week	2 nd week	1 st month	3 rd month
Granulation	0	1	0	0
Crusts	2	2	0	0
Adhesions	4	3	0	0
Complications	B Group without MMC			
	1 st week	2 nd week	1 st month	3 rd month
Granulation	1	3	3	2
Crusts	4	2	0	0
Adhesions	6	2	0	0

P value- 0.090 statistically insignificant

This study compares postoperative complications between Group A (Mitomycin-C treated) and Group B (without Mitomycin-C) over different follow-up periods (1 week, 2 weeks, 1 month, and 3 months). Granulation tissue formation was minimal in Group A, with only one case observed at the second week and none thereafter. Group B had one case at one week, which increased to three at the second week and one month, slightly reducing to two cases at three months. Crust formation was seen in both groups during the first two weeks but resolved afterward with nasal douching. Group A had two cases at one and two weeks, whereas Group B had four cases at one week and two cases at two weeks. Adhesions were noted in both groups, with Group A showing four cases at one week and three at the second week, which completely resolved by one month. In Group B, adhesions were slightly more frequent, with six cases at one week and two at the second week, also resolving by one month. The p-value (0.090) was statistically insignificant, indicating that the differences in complications between the two groups were not significant. However, granulation tissue formation was more persistent in Group B, suggesting better healing outcomes in the Mitomycin-C-treated group.

DISCUSSION

Recent advancements in endoscopic instrumentation have markedly improved the surgical management of dacryocystitis. Endoscopic dacryocystorhinostomy (DCR) has emerged as a highly effective procedure for relieving epiphora resulting from primary acquired nasolacrimal duct (NLD) obstruction. Although earlier research emphasized the necessity of silicone stenting for ensuring long-term ostium patency, contemporary studies suggest that similar outcomes are attainable without the use of stents. Additionally, the application of antifibrotic agents such as Mitomycin-C has shown efficacy in preventing fibrosis and maintaining ostium patency postoperatively.

The present study and the study by Majhi S et al both provide valuable insights into the demographic distribution of patients undergoing endoscopic dacryocystorhinostomy (DCR). In the current study, the majority of cases presented with epiphora, with a higher incidence of unilateral involvement, particularly in the right eye. Similarly, Majhi S reported that the maximum number of cases fell within the 16–30 years age group, with a mean age of 33.7 years. This is comparable to findings from Jha and Ramalingam, who observed a mean age of 30 years in their study.

Regarding gender distribution, the present study found a slightly higher number of females (56.66%) compared to males (43.33%), with a male-to-female ratio of 1:1.31. This aligns with the findings of Majhi S, who also observed a predominance of female patients⁽¹⁰⁾. Jha and Ramalingam et al reported an even higher female preponderance, with 72.8% females and 27.2% males⁽¹¹⁾. The observed female predominance across studies is consistent with previous literature, which describes chronic dacryocystitis as more common in females, often with a ratio of approximately 3:1.

These findings suggest that anatomical and hormonal factors may contribute to the higher prevalence of dacryocystitis among females. The slight variations in gender distribution and mean age across studies highlight the need for further research to identify potential regional or environmental influences on disease prevalence and presentation.

In this study, the primary presenting complaint among patients undergoing endoscopic dacryocystorhinostomy (DCR) was epiphora,

with a majority having unilateral involvement. Right-sided DCR was the most commonly performed procedure (38%), followed by left-sided DCR (22%) and bilateral DCR (22%). A subset of patients required additional septoplasty, which was performed in 16% of cases. The need for septoplasty in certain patients was likely due to anatomical variations such as deviated nasal septum, which can impact surgical access and postoperative outcomes^[11].

The presenting symptoms were comparable between the two groups, with all patients experiencing epiphora. Purulent discharge was observed more frequently in Group B (44%) compared to Group A (28%), suggesting a higher incidence of secondary infection or chronic inflammation in Group B.

Clinical examination findings, including regurgitation on syringing and discharge on pressure over the lacrimal sac, were similar in both groups, with no statistically significant differences ($p = 0.580$ and $p = 0.563$, respectively). These findings indicate that both groups had similar baseline disease severity and lacrimal obstruction characteristics, making them comparable for postoperative outcome evaluation.

Partial relief was noted in a slightly higher percentage of patients in Group B, and two patients in this group reported no improvement at the end of three months. Objective assessment using sac syringing showed a high rate of free flow in both groups, though Group B had a slightly higher rate of partial blockage during follow-up, and three patients had complete blockage at three months. This suggests that the healing process and surgical success are influenced by the extent and location of the obstruction, with distal blockages being more prone to recurrence due to excessive granulation and fibrosis.

Postoperative complications, including granulation tissue formation, crusting, and adhesions, were more frequently observed in Group B. Granulation tissue was present in three patients of Group B at one month, whereas only one patient in Group A developed granulations, which resolved by the second week. Granulation formation is a natural response to surgical trauma, but excessive granulation can obstruct the surgical ostium, leading to recurrence of symptoms. The lower granulation rate in Group A suggests a potential advantage of Mitomycin-C application, which is known to reduce fibrosis and granulation tissue formation.

Crusting was noted in both groups initially but resolved completely within one month. This is a common postoperative finding due to the healing process of the nasal mucosa and the presence of residual blood clots or mucus secretions. Adhesions were observed more frequently in Group B at one week (6 cases vs. 4 in Group A) but resolved in both groups by one month. Adhesions between the surgical ostium and surrounding nasal structures can compromise the newly created drainage pathway, but proper postoperative care, including saline irrigation and steroid nasal sprays, helps in preventing permanent adhesions.

Although these complications were more frequent in Group B, the difference was not statistically significant ($p = 0.090$). This suggests that while there was a trend towards better healing in Group A, the sample size may have been insufficient to establish a definitive conclusion.

The predominance of unilateral involvement, particularly in the right eye, may suggest an anatomical predisposition or the influence of external factors leading to nasolacrimal duct obstruction. Various studies have indicated that factors such as nasal septal deviation, eye rubbing related to handedness, or differences in tear drainage anatomy could contribute to this preference for laterality^[12]. However, the occurrence of bilateral involvement in 28% of cases implies that systemic or environmental factors might also play a role in nasolacrimal duct dysfunction in certain patients.

Regarding previous findings, Ha and Ramalingam et al reported a 90% success rate for endoscopic DCR^[11]. The use of mitomycin-C (MMC) has been debated, with traditional views emphasizing the necessity of silicone stenting for maintaining ostium patency. However, recent research, including studies by Mishra et al., indicates that ostium patency can be effectively maintained without stents when antifibrotic agents like MMC are used^[10]. This study aligns with those findings, as all patients had open and functional nasolacrimal

ducts postoperatively, indicating successful outcomes even without routine stenting.

CONCLUSION

The present study demonstrated endoscopic dacryocystorhinostomy (DCR), with or without the application of mitomycin-C (MMC), is a highly effective and safe procedure for managing nasolacrimal duct obstruction (NLDO). All 50 patients in the study experienced smooth postoperative recoveries, with minimal complications reported.

The addition of Mitomycin-C (MMC) in Group A resulted in slightly better outcomes, with 100% symptom resolution at all follow-up intervals and fewer postoperative complications compared to Group B (without MMC). Patients in Group B experienced a slightly delayed recovery, with a few cases of persistent symptoms and a higher incidence of granulation tissue formation and duct blockage.

The findings of this study suggest that endoscopic DCR is a highly effective procedure for treating nasolacrimal duct obstruction, with a high success rate in both groups. The use of adjunctive measures, such as Mitomycin-C, may help improve outcomes by reducing fibrosis and maintaining long-term patency.

While the overall differences in complications were not statistically significant, Group A showed a trend towards better outcomes, indicating that further studies with larger sample sizes and longer follow-up periods are necessary to validate these findings. Proper patient selection, meticulous surgical technique, and careful postoperative management are essential for optimizing success rates in endoscopic DCR procedures.

These findings suggest that Mitomycin-C plays a beneficial role in enhancing surgical success by minimizing postoperative fibrosis and granulation tissue formation. Thus, its use in DCR may contribute to improved long-term outcomes and should be considered in clinical practice.

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