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Efficacy of External Dacryocystorhinostomy with and without Mitomycin-C in Chronic Dacryocystitis

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Short title*:* Efficacy of mitomycin-C as antifibrotic in DCR.

ABSTRACT

Propose: To compare the Efficacy of external dacryocystorhinostomy with and without Mitomycin-C in patients with chronic dacryocystitis.

Patients and methods: This was prospective, randomized, comparative, interventional study included 40 patients with chronic dacryocystitis who were randomly divided into two equal groups Group (A) included 20 patients in whom mitomycin-C (0.2 mg/ml) for 10 minutes was used with external DCR, and Group (B) included 20 patients in whom mitomycin-C was not used. All patients received systemic antibiotics, antibiotic eye drops, nasal decongest spray. Follow-up visits were done at 1, 3 weeks; 1 and 3 months. Successful outcomes were defined by resolution of symptoms, DDT (dye disappearance test) and by irrigation.

Results: There was no statistically significant difference between both groups regarding age, gender, laterality of lesions or preoperative symptoms. At the end of 3 months follow up, there was a significant difference between the two studied groups regarding patency, complete patency was found in 95% and 55% of patients in group (A) and (B), respectively. Partial patency was found in 5% and 30% of patients in group (A) and (B), respectively and failure was found in only 15% of group (B) ~~only~~. ~~So,~~ the success rate was higher in group (A) than group (B). Regarding postoperative complications, wound infection was found in 1 case in group (A) and 5 cases in group (B).

Conclusion: Applying mitomycin-C intraoperatively in external DCR provided may offer better surgical results regarding symptoms relief, the lacrimal drainage system patency and increases the chances of success of external DCR surgery.

Key Words: Dacryocystorhinostomy, Mitomycin-C, Dacryocystitis, nasolacrimal duct.

INTRODUCTION

The infection of the lacrimal sac caused mostly by nasolacrimal duct blockage is known as dacryocystitis.[1] This disease might be acute or persistent. The main complaint of chronic dacryocystitis is ocular watering.[2]

When chronic dacryocystitis first manifests, it generally looks as a painless swelling near the inner canthus.[3] Pressure on the lacrimal sac may sometimes cause mucopurulent discharge to regurgitate through the canaliculi, even though swelling may not be visible right away.[4] The most widely utilized method for treating epiphora brought on by nasolacrimal duct obstruction is external dacryocystorhinostomy. A surgical anastomosis is carried out between the middle meatus nasal mucosa and the lacrimal sac by creating an incision in the intervening bone.[5]

The most prevalent cause of external dacryocystorhinostomy failure is the formation of fibrous tissue in the flap anastomosis, which blocks the osteotomy site and obstructs the common canalicular end. Keeping fibrous formations from forming might increase the success rate. To do this, anti-fibrotic drugs like mitomycin-C may be utilized. Mitomycin-C is an alkylating antibiotic derived from Streptomyces caespitosus. It inhibits RNA production that is reliant on DNA and halts the creation of collagen.[6] In this research, patients who presented with chronic dacryocystitis due to nasolacrimal duct blockage were compared for the

efficiency of external dacryocystorhinostomy with and without intraoperative mitomycin-C.

PATIENTS AND METHODS:

This was prospective, randomized, comparative, interventional study in which a comparison of external dacryocystorhinostomy (DCR) with and without mitoycin-C was performed. This study was held at Mansoura Ophthalmic Center, Mansoura University, Egypt on 40 patients attended Mansoura Ophthalmic Center with chronic dacryocystitis who underwent external dacryocystrhinostomy. They were divided into two equal groups included twenty patients with 20 eyes. Group (A) included 20 eyes of 20 patients who underwent external dacryocystrhinostomy with mitomycin-C and Group (B) included 20 eyes of 20 patients who underwent external dacryocystrhinostomy without mitomycin-C.

Inclusion criteria:

Adult patients between 20-60 years from both genders with nasolacrimal duct obstruction.

Exclusion criteria:

Recurrent dacryocystitis after previous DCR, bone deformity after trauma, congenital malformation of eye lid, and autoimmune diseases that affect tear production (Behcet disease, systemic lupus erythematosus, rheumatoid arthritis).

Every patient was subjected to history taking that included personal history (name, age, gender, residence, occupation), Onset and duration of the complaint, medical history (previous medical illness, previous trauma, medication used) and history of any nasal or sinus disease or previous lacrimal surgery.

Full ophthalmological examination included visual acuity using Landlot rings, fundus examination using volk 90D or 78D lens, intraocular pressure (IOP) using Goldmann applanation tonometer. Slit lamp biomicroscopy was done to examine eyelids to exclude any abnormalities which can cause ocular irritation as rubbing lashes or trichiasis and ectropion, to examine puncti (stenosis or malposition), and for evaluation of tear meniscus using fluorescein dye.

The dye disappearance test (DDT) was done to assess tear out flow. Fluorescein 2% drop was instilled in the conjunctival sac of each eye then the tear film was observed with cobalt blue filter of slit lamp and re-evaluated after 5 minutes. The inadequate tear flow will retain the dye.

Probing and irrigation of lacrimal drainage system was done after DDT to detect level of obstruction of lacrimal drainage system. After topical anesthesia, the punctum was dilated by a Nettleship dilator. Then lacrimal cannula with saline-filled syringe was advanced through the upper punctum, then through the canaliculus after traction of the eye lid and fluid was injected. Reflux through the opposite punctum suggests an obstruction in the common canaliculus or more distal. Fluid coming directly back through the same punctum indicate a canalicular obstruction, irrigation through nose indicates an anatomically patent system. Probing to differentiate between common canalicular obstruction and nasolacrimal duct obstruction.

Preoperative precautions included complete blood picture, bleeding profile, CT orbit and nasal and paranasal sinuses, controlling systemic blood pressure and other systemic disease and nasal decongestant for 1 weak.

Ethical Considerations

The study was conducted after approval of the protocol by the Local Research Committee & the Studies Committee as well as the Research Ethics Committee of our institute (MS.22.08.2099). An informed written consent was obtained from all patients. The aim, procedures and duration of the study were explained in a simple way. The patients had the right to refuse participation without affecting the medical care expected to be offered to the patient. The patients had the right to withdraw from the study at any time without any penalty and without giving reasons.

Surgical Technique

Standard surgical techniques of an external DCR dacryocystorhinostomy were used in all patients of both groups. All patients were operated under general anesthesia. The nasal mucosa was anaesthetized and vasoconstricted with pledgets saturated with a mixture of 2% lignocaine (lidocaine) and 1:100 000 adrenaline. A skin incision was performed using 15-plade scalpel over anterior lacrimal crest for approximately 10-12 mm.

The periosteum and lacrimal sac are separated from the bone using a freer's elevator, which then reflects them laterally to reveal the lacrimal fossa. The periorbita and lacrimal sac are similarly elevated posterolateral off the lacrimal sac fossa. All

efforts should be made to preserve the medial canthal tendon and dissected only when needed. Osteotomy was made using a Kerrison punch which inserted at lamina papyracea at junction of ethmoid and lacrimal bone, then the osteotomy was enlarged.

The lacrimal sac was opened to form anterior and posterior flaps. The nasal mucosa was cut in a similar fashion to the lacrimal sac. Then, the posterior nasal and lacrimal sac flaps were joined with 5-0 Vicryl suture. A silicone tube was used to intubate the lacrimal system and it was tied together with a 4 – 0 silk suture in the nasal cavity.

In the mitomycin-C group a piece of cellulose sponge attached with a long thread, saturated with 0.2 mg/ml mitomycin-C was placed over the anastomosed posterior flaps and osteotomy site with the long thread passing out through the nostril. After 10 minutes of application, the cellulose sponge soaked with MMC was removed through the nostril. The anterior nasal and lacrimal sac flaps were sutured together. orbicularis muscle was closed by 5-0 Vicryl suture. The skin incision was sutured with subcuticle 6 - 0 prolene suture. In the other group, the same procedures were performed but intraoperatively MMC was not used. Silicone tubes were removed at 6 weeks after surgeries in all patients.

Post Operative Follow Up

Postoperative care with systemic antibiotic, eye drops with antibiotic, nasal decongestant spray. Patients were followed-up for 1, 3 weeks; 1 and 3 months for the patency of lacrimal drainage system. Successful outcomes were defined by resolution of symptoms, and irrigation with saline.

Statistical Data Analysis

All data were collected, tabulated and statistically analyzed using SPSS 26.0 for windows (SPSS Inc., Chicago, IL, USA). Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. All statistical comparisons were two tailed with significance Level of P-value ≤ 0.05 indicates significant, $p < 0.001$ indicates highly significant difference while, $P > 0.05$ indicates Non-significant difference. The used tests were Chi-square (X2) test of significance used in order to compare proportions between qualitative parameters. Independent T-test was used in order to compare between two independent groups with parametric quantitative data.

RESULTS

Table (1) There was no statistically significant difference between the two studied groups in preoperative demographic or clinical data

Table 1: Demographic data and Systemic disorders among the study population

	Mitomycin-C group (n = 20)	**Control group (n=20)**	**Test of Sig.**	**P**
Age				
Mean ± SD.	44.6 ± 10.7	47.2 ± 10.3	t=- 0.783	0.438
Median (IQR)	46 (36.5 - 53.25)	48.5 (41.25- 56.25)		
Range (Min- Max)	34 (26 - 60)	33 (27 - 60)		
Age distribution				
20-30	2 (10%)	2 (10%)	X^2=0.75	0.861
30–39	5 (25%)	3 (15%)		
40–49	6 (30%)	6 (30%)		
50–60	7 (35%)	9 (45%)		
Gender				
Male	5 (25%)	6 (30%)	X^2= 0.125	0.723
Female	15 (75%)	14 (70%)		
Systemic Disorders				
DM	3 (15%)	2 (10%)	X^2= 0.229	0.633
Hypertension	4 (20%)	1 (5%)	X^2= 2.057	0.151

X^2: Chi- Square test; SD: standard deviation; IQR: interquartile range; t: Independent T test; p: p value for comparing between the studied groups; P-value < 0.05: Significant.

Table 2: Clinical history among the study population

	Mitomycin-C group (n = 20)	**Control group (n = 20)**	**Test of Sig.**	**p**
History of watering	2 (10%)	2 (10%)	X^2= 0	1
History of discharge	18 (90%)	17 (85%)	X^2 = 0.229	0.633
History of ocular trauma	0 (0%)	0 (0%)	X^2 = 0	1
History of dacyrocystrinostomy surgery	0 (0%)	0 (0%)	X^2 = 0	1

X^2: Chi- Square test P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.001: Highly significant

Table **(3)** showed Clinical Examination among the study population. Regarding Laterality, there was no statistically significant difference between the two studied groups (p= 0.723). Regarding deviated nasal septum, there was no statistically significant difference between the two studied groups (p= 0.736). Regarding Tear meniscus height, there was no statistically significant difference between the two studied groups (p=0.429). Table **(4)** showed Intraoperative and immediate post-operative complications among the study population. Regarding Intraoperative complications, there was no statistically significant difference between the two studied groups (p= 0.488). Regarding Immediate post-operative complications, there was no statistically significant difference between the two studied groups (p= 0.149). Table **(5)** showed Postoperative follow up results from 1week to 3 months among the study population. Regarding Patency, there was a significant difference between the two studied groups (p= 0.013). Regarding Tear meniscus height, there was no statistically significant difference between the two studied groups (p= 0.06). Regarding Symptoms, there was a significant difference between the two studied groups (p= 0.002).

Table 3: Clinical Examination among the study population

	Mitomycin-C group (n = 20)	**Control group (n = 20)**	**Test of Sig.**	**p**
Laterality				
Right	14 (70%)	15 (75%)	X^2= 0.125	**0.723**
Left	6 (30%)	5 (25%)		
Deviated Nasal septum				
Yes	7 (35%)	6 (30%)	X^2= 0.114	**0.736**
No	13 (65%)	14 (70%)		
Tear meniscus height				
Moderate	17 (85%)	15 (75%)	X^2 = 0.625	**0.429**
High	**3 (15%)**	**5 (25%)**		

X^2: Chi- Square test. P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.001: Highly significant

Table 4: Intraoperative and immediate post-operative complications among the study population

	Mitomycin-C group (n = 20)	**Control group (n = 20)**	**Test of Sig.**	**p**
Intraoperative complications				
Sac mucosal damage	1 (5%)	0 (0%)	X^2= 2.429	**0.488**
Severe bleeding	2 (10%)	2 (10%)		
Nasal mucosal damage	2 (10%)	5 (25%)		
Immediate Post- operative Complications				
Epistaxis	1 (5%)	2 (10%)	X^2= 3.806	**0.149**
Wound infection	**1 (5%)**	**5 (25%)**		

X^2: Chi- Square test. P-value > 0.05: Non-significant; P-value < 0.05: Significant; P-value < 0.001: Highly significant

Table 5: Postoperative follow up results at the end of 3 months among the study population

	Mitomycin-C group (n = 20)	**Control group (n = 20)**	**Test of Sig.**	**p**
Patency				
Complete block	0 (0%)	3 (15%)	X^2 = 8.705	**0.013**
Partially patent	1 (5%)	6 (30%)		
Passage patent	19 (95%)	11 (55%)		
Tear meniscus height				
Normal	17 (85%)	10 (50%)	X^2 = 5.615	**0.06**
Moderate	2 (10%)	6 (30%)		
High	1 (5%)	4 (20%)		
Symptoms				
Asymptomatic	18 (90%)	7 (35%)	X^2 = 12.911	**0.002**
Improved	1 (5%)	7 (35%)		
No improvement	**1 (5%)**	**6 (30%)**		

X^2: Chi- Square test. P-value > 0.05: Non-significant; P-value < 0.05: Significant; P-value < 0.001: Highly significant

DISCUSSION

Dacryocystitis is an infection of the lacrimal sac that is caused by nasolacrimal duct obstruction the majority of the time. This condition could be chronic or acute in nature. Watering of the eye is the initial manifestation of chronic dacryocystitis. Constantly asymptomatic inner canthular edema is frequently observed as the initial manifestation of chronic dacryocystitis. Although enlargement may not be readily apparent, applying pressure to the lacrimal sac can cause mucopurulent discharge to regurgitate through the canaliculi.[7]Epiphora caused by nasolacrimal duct obstruction is most frequently treated with external DCR.[8]

By producing an aperture in the intervening bone, a surgical anastomosis is established between the lacrimal sac and the nasal mucosa of the middle meatus during this procedure. Common causes of external DCR failure include growth of fibrous tissue in the flap anastomosis, obstruction at the common canalicular end, and closure of the osteotomy site.9

During the wound healing process, fibrous tissue growth, fibrosis, and granulation tissue formation manifest as stenosis of the common canaliculus aperture or closure of the osteotomy in the lateral wall of the nostril, ultimately leading to the unsuccessful outcome of DCR surgery. An increase in success rate can be achieved through the prevention of fibrous tissue growth. This objective may be accomplished through the use of anti-fibrotic agents such as mitomycin-C.10

An alkylating antibiotic, mitomycin-C is produced by Streptomyces caespitosus. It inhibits collagen synthesis and inhibits DNA-dependent RNA synthesis. Mitomycin-C exhibits remarkable antifibrotic activity. It inhibits the proliferation of cells, thereby preventing the formation of scar tissue. In order to increase the success rate of a number of ophthalmic surgical procedures, mitomycin-C is being utilized. The administration of mitomycin-C in external DCR surgery is both safe and efficacious, leading to favorable outcomes in DCR procedures.11

Consequently, between June 2022 and June 2023, this prospective study was conducted on 40 patients with chronic dacryocystitis who underwent external DCR and attended Mansoura Ophthalmic Center. Twenty patients received mitomycin-C intraoperatively, while twenty patients did not. The purpose of the research was to assess the efficiency of external dacryocystorhinostomy with and without mitomycin-C intraoperatively in patients presenting with chronic dacryocystitis due to nasolacrimal duct obstruction. The age distribution of patients in the mitomycin group in the current study was as follows: (26-60 years) (mean 44.6 ± 10.7 years); in contrast, the age range of patients in the control group was (27-60 years) (47.2 ± 10.3 years). In Mukhtar *et al.*,[12] The mean ages of patients who underwent external DCR with and without mitomycin-C were comparable in both studies, measuring 38.77±10.96 years and 40.96±10.05 years, respectively.

In Shaikh *et al.*,[5] The average age of patients in the external DCR group that received mitomycin-C was 37.77±11.96 years, whereas those in the external DCR group that did not receive mitomycin-C had an average age of 39.96±09.05 years.

Approximately 30% of both groups exhibited a deviated nasal septum in the present study, with no statistically substantial variation. Similarly, in Qadir *et al.*,[2] Out of 35 patients without a mildly deviated nasal septum, 15 (30%) cases exhibited surgical failure, while 4 (11.4%) cases failed. This finding suggests that mild deviated nasal septum cannot be ascribed as a cause of surgical failure. Murthy *et al.*,[13] revealed that Five cases (10%) exhibited moderate deviated nasal septum in their research. A moderate deviated nasal septum cannot be ascribed as the cause of surgical failure. Our study found that, in contrast to previous research, the preponderance of cases in both categories presented with right-sided dacrocystitis. A higher incidence of dacrocystitis has been observed on the left side as opposed to the right.[13]

In our research pronounced intraoperative hemorrhage was seen in 10% of both groups without significant difference. In Qadir *et al.*,[2] Severe intraoperative hemorrhage occurred in four cases (8%), two in each group. The bleeding was attributed to injuries sustained to the angular vein, lacrimal bone striking, and nasal mucosa incision. In Murthy *et al.*,[13] Severe intraoperative hemorrhage was observed in six cases (12 percent), with two cases in each group. However, complications such as extensive nasal hemorrhage, mucosal

necrosis, wound infection, or delayed wound repair that were induced by mitomycin C were not observed.

Postoperative epistaxis was observed in 5% of the mitomycin C group and 10% of the control group in our study, with no statistically substantial variation.

According to Tarbet and Custer (1995), 3.9% of external dacryocystorhinostomy instances resulted in post-operative epistaxis. In Qadir *et al.*,[2] Five (10%) patients experienced postoperative epistaxis, with three occurring in the Mitomycin C group and two in the control group. In Murthy *et al.*,[13] Five cases (10%) exhibited postoperative epistaxis; two cases were in the conventional group and three were in the Mitomycin C group. This happened after the nasal compress was taken off on the first post-operative day. None of the cases necessitated anterior nasal closure and were treated conservatively for three days with ethamsylate tablets taken three times daily.

Postoperative wound infection was observed in 5% of the mitomycin C group and 25% of the control group in our study. Liao *et al.*,[14] One case of delayed lesion recovery attributed to the use of Mitomycin C has been documented.

In Qadir *et al.*,[2] In the conventional group, two cases of postoperative wound infection (4 percent) were observed. In Murthy *et al.*,[13] In the conventional group, two cases of postoperative wound infection (4 percent) were observed. Additionally, one of these patients experienced significant intraoperative hemorrhaging. The condition was treated conservatively with topical and systemic antibiotics. Positive response to treatment was observed. Infection of the lesion was not observed in the Mitomycin C group.

The findings of this research have specified that with respect to the postoperative follow-up outcomes observed in the study population after a duration of three months. In relation to patency, a notable disparity was observed between the two groups under investigation. complete patency was found in 95% and 55% of patients in group (A) and (B), respectively. Partial patency was found in 5% and 30% of patients in group (A) and (B), respectively and failure was found in only 15% of group (B) only. This suggests that the external dacryocystorhinostomy incorporating mitomycin-C exhibits greater efficacy than the external dacryocystorhinostomy lacking mitomycin-C. This finding suggests that Mitomycin C is efficient in enhancing the patency rate of the lacrimal drainage system. There is a statistically significant difference. External DCR success rates were enhanced by intraoperative anti-proliferative agents, such as Mitomycin-C, according to a second study conducted in Andana, Turkey.[15]

Our findings are similar in nature to the research carried out by Liao *et al.*,[14] revealed that External DCR surgery accompanied by intraoperative MMC administration had a greater rate of success than DCR surgery without intraoperative MMC administration. Furthermore, the application of MMC did not lead to an escalation in complications. In a similar vein, a study conducted in China reached the conclusion that intraoperative Mitomycin-C is a safe and effective adjuvant in DCR that contributes to a sustained success rate. In the standard DCR group, the result was 83%, but in the Mitomycin-C group, it was 94%.[16]

Another study conducted by Rahman *et al.*,[17] Using ninety patients, the success rate and consequences of intraoperative mitomycin C in DCR surgery were assessed. The procedure's success rate was determined to be 97.77%. They came to the conclusion that the use of intraoperative mitomycin C in external DCR is secure, efficient, and contributes to successful DCR surgical outcomes.

Ari *et al.*,[18] conducted a prospective, double masked, randomized controlled trial on 100 Turkish patients to assess the efficacy of intraoperative adjunctive MMC treatment in external DCR surgery. The success rate was significantly greater in the MMC group (96%) than the control group (84%) at the end of 1 year. Cheng *et al.*,[19] A meta-analysis examining the efficacy of Mitomycin-C in endoscopic DCR surgery determined that patients who received treatment with Mitomycin-C had significantly better outcomes than those who did not. Qadir *et al.*,[2] found that Twenty cases (80%) in the conventional group and twenty-four cases (96%) in the Mitomycin C group had patent passage on lacrimal syringing at the end of six months. Upon lacrimal sac syringing, failed cases exhibited either clear fluid regurgitation or mucopurulent regurgitation.

Mukhtar *et al.*,[12] Three months following surgery, patency was observed in 78 out of 80 patients in the mitomycin

C group. The efficacy, or achievement rate, is indicated to be 97.5%. At the conclusion of three months following surgery, patency of the lacrimal drainage system was observed in 69 out of 80 patients in the control group. The data suggests that the achievement rate for group B was 86.25%. Additionally, MMC administration was not connected to a rise in complications. Murthy *et al.*,[13] found that at the end of 6 months, 22 (88%) cases in the conventional group and 24 (96%) cases in the Mitomycin C group had patent passage on lacrimal syringing. In Jawad *et al.*,[20] A comparison is made between the success rate of DCR + Mitomycin-C and that of conventional DCR. The efficacy rate of the Mitomycin-C group was 96.67 percent, which is significantly higher than the conventional DCR group's 79.1 percent.

There is a drive to improve the success rates of endoscopic DCR compared to external DCR, and the anticipated rise in surgical success rates is due to the use of Mitomycin-C in endoscopic DCR. Previous original research on endoscopic DCR patients yielded conflicting findings; although some studies demonstrated the effectiveness of mitomycin-C therapy, others found no difference between the group receiving mitomycin-C treatment and the non-treated group.[20]

In our research, following a three-month period, four cases (20%) in the conventional group exhibited a high tear meniscus height (>1 mm). A mean tear meniscus height of 1 mm was observed in 6 (30%) of the eye samples, while 10 (50%) had a normal tear meniscus height of less than 1 mm. After 3 months, 1 eye (5%) of the Mitomycin C group exhibited a high tear meniscus height, 2 eyes (10%) displayed a moderate tear meniscus height of 1 mm, and 17 eyes (85%) maintained a normal tear meniscus height of less than 1 mm. While lacking statistical significance, the observation of a tear meniscus objectively demonstrates the effectiveness of the Mitomycin C utilization.

Also, Liao *et al.*,[14] In the conventional group, 32 eyes (72.7%) exhibited normal tear meniscus height, 7 eyes (16%) displayed moderate tear meniscus height, and 5 eyes (11.3%) displayed high tear meniscus height. Out of the 44 eyes examined in the Mitomycin C group, 41 (93.1%) had a regular tear meniscus height, 1 eye (2.3%) had a moderate tear meniscus height, and 2 eyes (4.6%) had a high tear meniscus height. This finding completely aligns with the current study's emphasis on the significant effectiveness of Mitomycin C. This is consistent with Qadir *et al*.,[2] The conventional group included four cases (16%) with a high tear meniscus height more than 1 mm at the end of six months. 20 eye samples (80%) had typical tear meniscus height less1 mm, while one eye (4%), exhibited a moderate tear meniscus height of 1 mm. After six months, one eye (4% of the Mitomycin C group) developed an elevated tear meniscus height, while twenty-four eyes (96%) maintained a typical tear meniscus height.

In relation to symptoms, a notable disparity existed between the two groups under investigation; 90% of the mitomycin C group exhibited no symptoms, 5% demonstrated ameliorated symptoms, and 5% did not experience any improvement in symptoms. 35% of the control group was asymptomatic, 35% experienced symptomatic improvement, and 35% did not experience any improvement in symptoms. This is comparable to research carried out by Ari *et al*.,[18] revealed that A greater proportion of eyes in the MMC group (45% versus 33%; p=0.005) maintained symptom-free status during the one-year follow-up period than in the control group. A considerably greater number of patients in the control group experienced symptomatic improvement at the one-year follow-up compared to the MMC group. The efficacy of the drainage system demonstrated a statistically significant increase in success rate for the MMC group in comparison to the control group.

This result may be explained by using external DCR in conjunction with operational mitomycin-C washing over the osteotomy and anatomized flaps to minimize adhesions surrounding the osteotomy site and allow the opening of the common canaliculus. Thus, mitomycin-C absorption in DCR surgery is a modified approach that effectively raises the success rate of external DCR.[5]

Larger sample sizes and extended follow-up periods are required to ascertain the long-term impacts of intraoperative MMC usage during external DCR and to provide a more precise evaluation of the efficiency of intraoperative MMC during DCR. The modest sample size and three-month follow-up period are constraints of this study. Utilization of MMC

intraoperatively during external DCR surgery results in a short-term improvement in procedure outcome.

CONCLUSION

In conclusion using 0.2 mg/ml mitomycin-C for 10 minutes intraoperatively in external DCR provided much better surgical results regarding symptoms relief, the lacrimal drainage system patency and increases the chances of success of external DCR surgery, than conventional external DCR without mitomycin-C and hence can be considered as a safe and effective modification in conventional DCR

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Data Availability: The authors declare that all data supporting the findings of this study are available within the article and its supplementary information file.

Competing interests: The authors declare no competing interests.

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Ethics declarations: All procedures performed in the study followed the 1964 Helsinki declaration and its later amendments, University Ethics Committee approved the project.

Conflict of interest

Nashaat S. Zaki, Ibrahim T. El-Adawy, Ahmed A. Ibrahim, Ayman M. Fawzy. All authors have no conflicts of interest that are directly relevant to the content of this review.

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