Original Research Article

Role of mitomycin-C in endoscopic dacryocystorhinostomy with lacrimal sac stenting

Jogeshwar Singh¹, Manish Munjal¹*, Sanjeev Puri¹, Parth Chopra¹, Shubham Munjal¹, Akshi Garg¹, Hemant Chopra¹, Dinesh Garg²

¹Department of Oto-rhino-laryngology-Head Neck Surgery, ²Department of Ophthalmology, Dayanand Medical College, Ludhiana, India

Received: 29 August 2020
Revised: 10 October 2020
Accepted: 12 October 2020

*Correspondence:
Dr. Manish Munjal,
E-mail: manishmunjaldr@yahoo.com

ABSTRACT

Background: This study critically evaluates the effectiveness of mitomycin-C in conventional endoscopic dacryocystorhinostomy (ENDODCR) that minimizes the reclosure of a neo-ostium by retaining an enlarged marsupialized lacrimal sac.

Methods: The combined retrospective and prospective study included 24 patients in the study group, who underwent endoscopic dacryocystorhinostomy in the Department of Otorhinolaryngology and Ophthalmology in a period of 1.5 years (June 2006 to January 2008).

Results: An 83.33% primary success rate was observed, without any serious complications. Obstruction of the neo-ostium with granulation tissue was observed in 20.83% cases. Overall, the success rate of group I was 91.67% as compared to 75% in group II.

Conclusions: Intra operative mitomycin-C application is effective in increasing the success rate of DCR surgery in standard nasolacrimal duct obstruction, and no significant complications resulted from its use.

Keywords: ENDODCR, Mitomycin-C, Stenting

INTRODUCTION

Nasolacrimal duct obstruction is a common disorder clinically manifested by the presence of epiphora. Recurrent infection may also occur as a result of stagnation and the most likely site being at the junction of the lacrimal sac and the nasolacrimal duct.¹

Various techniques are used to treat the symptoms of epiphora, namely medial canthal lacrimal sac massaging, nasolacrimal duct syringing, silicone intubation and dacryocystorhinostomy. (DCR) Dacryocystorhinostomy may be undertaken via an external or an internal approach. Unsuccessful outcome of DCR is likely due to obstruction of the common cannaliculus and synechia at the neo-dacrostome.²³

Silicone stents utilized to maintain patency of the dacrostome post DCR; lead to a foreign body reaction and thereby granulation tissue.⁴

Anti-proliferative agent applied at the neo-ostium reduces the fibrosis of healing.⁵

Hata et al 1955 developed Mitomycin-C from Streptomyces ceasipitosus with half-life 8 to 48 minutes. It is an alkylating and anti-proliferative agent (Liao et al).⁶ It reduces fibroblast collagen synthesis by inhibiting DNA dependant RNA synthesis and can suppress cellular prileration at any stage of cell cycle.⁷

Aim of the study was to study the efficacy of Mitomycin-C in preventing restenosisis dacrocystorhinostomy.
METHODS

This prospective and retrospective study was carried out in the Department of Otorhinolaryngology and Ophthalmology at Dayanand Medical College and Hospital, Ludhiana. 24 randomly selected patients having nasolacrimal duct obstruction were included in this study. Radiological evaluation such as Dacrocystogram, x-ray/CT scan of paranasal sinuses was undertaken to detect any sinus pathology.

All patients underwent endoscopic dacryocystorhinostomy in the Department of Otorhinolaryngology and Ophthalmology in a period of 1.5 years (June 2006 to January 2008).

The patients were divided in two groups.

**Group I**

12 prospective patients where endoscopic dacryocystorhinostomy with silicone stenting along with usage of mitomycin-C was carried out over fifteen months. Mitomycin-C preparation in the concentration of 0.5mg/ml was applied with a cotton Q tip for 5 minutes and washed with saline.

**Group II**

12 retrospective patients over past one and half year where endoscopic dacryocystorhinostomy with silicone stenting had been undertaken.

An endoscopic DCR was performed in all cases. All patients were followed upto a minimum of 6 months. Patency of the stoma was checked by sac syringing and endoscopic inspection of stoma and to find out any local complications.

**Inclusion criteria**

Only the patients followed up for at least six months were included in the study.

**Exclusion criteria**

Patients lost to follow up; pediatric age group, malignancies; chronic granulomatous diseases of the nose; punctal, canicular or common canicular block.

Success criteria were patients who had relief from symptoms and endoscopic visualization of a patent stoma.

In the end, the patients in whom endoscopic dacryocystorhinostomy with silicone stenting had been done were compared with the patients in whom endoscopic dacryocystorhinostomy with silicone stenting with application of Mitomycin-C was used.

RESULTS

All the patients presented with epiphora (100%). Ten patients presented with swelling at the medial canthus of the eye (41.67%). One patient presented with swelling at the puncta (4.17%). Two patients presented with nasal discharge (8.33%). One presented with visual disturbance, that is, amblyopia (4.17%).

| Chief complaints                  | Group I Cases | Group I % | Group II Cases | Group II % | Total Cases | Total % |
|----------------------------------|--------------|-----------|----------------|------------|------------|---------|
| Epiphora                         | 12           | 100       | 12             | 100        | 24         | 100     |
| Swelling at medial canthus       | 6            | 50.00     | 4              | 33.33      | 10         | 41.67   |
| Swelling at puncta               | 0            | 00.00     | 1              | 8.33       | 1          | 4.17    |
| Nasal discharge                  | 0            | 00.00     | 2              | 16.67      | 2          | 8.33    |
| Visual disturbance               | 0            | 00.00     | 1              | 8.33       | 1          | 4.17    |

The chief complaints of the patients were epiphora (100%) followed by swelling at the medial canthus of the eye (41.67%).

| DCG                              | Group I Cases | Group I % | Group II Cases | Group II % | Total Cases | Total % |
|----------------------------------|--------------|-----------|----------------|------------|------------|---------|
| B SC*                            | 1            | 8.33      | 2              | 16.67      | 3          | 12.50   |
| B CC**                           | 7            | 58.33     | 6              | 50.00      | 13         | 54.17   |
| B NLD***                         | 4            | 33.33     | 3              | 25.00      | 7          | 29.17   |
| Mucocoele                        | 0            | 00.00     | 1              | 8.33       | 1          | 4.16    |
| **Total**                        | 12           | 100.00    | 12             | 100.00     | 24         | 100.00  |

DCG was done in all the patients.

In group I, common canaliculus was blocked in seven patients (58.33%), nasolacrimal duct was blocked in four patients (33.33%) and superior canaliculus was blocked in one patient (8.33%).

In group II, common canaliculus was blocked in six patients (50.00%), nasolacrimal duct was blocked in 3 patients (25.00%), superior canaliculus was blocked in two patients (16.67%), and one patient had mucocoele (8.33%).

In total, thirteen patients had blockage at common canaliculus (54.17%), seven patients had blockage at nasolacrimal duct (29.17%) and three patients had blockage at superior canaliculus (12.50%), and one patient had mucocoele (4.16%).
Success rate in group I was 91.67% as compared to group II where success rate was 75%. There was one failure in group I (8.33%). There were three failures in group II (16.67%).

Table 3: Success in terms of patent dacrostome (N=24).

| Results   | Group I | Group II | Total |
|-----------|---------|----------|-------|
|           | Cases  | Cases    | Cases |
| Success   | 11     | 9        | 20    |
|           | 91.67% | 75.00%   | 83.33%|
| Failure   | 1      | 3        | 4     |
|           | 8.33%  | 25.00%   | 16.67%|

Table 4: Complications or late sequel (N=24).

| Complications | Group I | Group II | Total |
|---------------|---------|----------|-------|
|               | Cases  | Cases    | Cases |
| Granulations  | 3      | 2        | 5     |
|               | 25.00% | 16.67%   | 20.83%|
| Synechiae     | 3      | 6        | 9     |
|               | 25.00% | 50.00%   | 37.50%|
| Orbital       | 3      | 1        | 4     |
|               | 25.00% | 8.33%    | 16.67%|
| Visual        | 0      | 0        | 0     |
|               | 0.00%  | 0.00%    | 0.00% |
| Epiphora      | 1      | 3        | 4     |
|               | 8.33%  | 25.00%   | 16.67%|
| None          | 2      | 0        | 2     |
|               | 16.67% | 0.00%    | 8.33% |

In group I there were three cases who presented with granulations (25.00%), three cases who presented with synechiae formation (25.00%), three cases with orbital complications (25.00%) like emphysema, and one patient presented with persistent epiphora (8.33%).

In group II, six patients presented with synechiae formation (50.00%), three with persistent epiphora with no relief of symptoms, two with granulations (16.67%), and one with orbital complications (8.33%).

In total, nine patients presented with synechiae (37.50%), five with granulations (20.83%), four with orbital complications (16.67%), and four with persistent epiphora (16.67%). None of the patients presented with visual complications.

Symptoms were relieved in eleven patients in group I (91.67%) and in group II in nine patients (75.00%).

DISCUSSION

The therapeutic modality of choice for nasolacrimal duct obstruction, irrespective of the cause, is dacryocystorhinostomy. Caldwell 1893 advocated the intranasal and Toti 1904 the external dacryocystorhinostomy.8,9 McDonagh 1989 pioneered in utilizing the nasal endoscope for performing internal DCR.8

Both the traditional external approach and the endoscopic approach have high success rates. The external approach suffers the disadvantage of an external scar, which in addition to poor cosmesis, can make revision surgery extremely difficult. The endoscopic approach offers the added advantage of avoiding an external scar, thereby providing for improved cosmesis. It also has the advantage of being a one stage procedure wherein any co-existing nasal pathology can be treated. The stoma can be fashioned more accurately under endoscopic visualization. This scarless surgery, is quick, with minimal trauma to the orbicularis occuli muscle which assists the lacrimal pump.10 Under direct endoscopic vision, the stoma can be sufficiently enlarged and properly positioned to increase the likelihood of continued patency.

The late untoward sequel is the formation site of granulation tissue or synechiae at the operative and
recurrence of epiphora.\textsuperscript{11,12} Wide resection of bone especially in its superior extent, with mucosal flaps are the surgical, and silicone stents or topical application of mitomycin-C are the non-surgical techniques to minimize synechiae.

Selig et al found intra operative use of mitomycin-C 0.2 mg/ml, minimizes post-operative granulations, fibrosis and scarring.\textsuperscript{13} Apuhan et al study using 0.5 mg/ml application for 2.5 minutes showed a success rate of 91% in endodcr.\textsuperscript{14} Camara et al found a statistically significant (p=0.007) success with mitomycin-C.\textsuperscript{15} Thereby maintaining a bigger post-operative stoma throughout the post-operative observation period and they emphasized that its intra operative use is easy and safe.

Dolmetsch et al noted that non laser endonasal dacryocystorhinostomy with mitomycin-C was a safe and successful procedure for the treatment of congenital nasolacrimal duct obstruction in children. It had the advantage of leaving no scar and of preserving the medial canthal structures. They had a success rate of 94.4%.\textsuperscript{16}

Yim and Wormald et al emphasized that the use of mitomycin-C at low concentrations (0.4 mg/ml), used as an adjunct for nasolacrimal duct probing can improve both subjective and objective outcomes without imposing significant additional risks.\textsuperscript{17}

Ghosh et al and Zileliçoğlu et al reported no significant difference with or without application of mitomycin-C.\textsuperscript{7,18} Prasanna et al concluded that it did not influence occurrence of granulations and synechiae nor did it alter the success rates significantly.\textsuperscript{19}

In our study success rate in group I (with Mitomycin-C application) was 91.67% as compared to group II where success rate was 75%. There was one failure in group I (8.33%). There were three failures in group II (16.67%). Results of our study have been found nearly comparable to other workers.

There were no major intraoperative and postoperative complications in the present study. The most common complication encountered was synechiae formation in 37.5%, followed by granulations in 20.83%.

**CONCLUSION**

Intra operative use of mitomycin-C in conjunction with lacrimal sac stenting improves both subjective and objective outcomes and its use is easy and safe as a result patency of ostium is maintained without any serious risk of complications as well as cost effective to the patient.

**ACKNOWLEDGEMENTS**

Authors would like to thank Dr. Kapil Dua Ex Asst. Prof. ENT for assistance during the study.

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

**REFERENCES**

1. Sharma BR. Non endoscopic endonasal dacryocystorhinostomy versus external dacryocystorhinostomy. Kathmandu Univ Med J. 2008;6(24):437-42.
2. Leong SC, Macewen CJ, White PS. A systematic review of outcomes after dacryocystorhinostomy in adults. Am J Rhinol Allerg. 2010;24(1):81-90.
3. Karkos PD, Leong SC, Saistry A, et al. Evidence-based applications of mitomycin-C in the nose. Am J Otolaryngol. 2011;32(5):422-5.
4. Agarwal S. Endoscopic dacryocystorhinostomy for acquired nasolacrimal duct obstruction. J Laryngol Otol. 2009;123(11):1226-8.
5. Fergie N, Jones NS. Dacryocystorhinostomy. In: Gleeson M, Browning GG, Burton MJ, Clarke R, John H, Jones NS, et al eds. Scott Brown’s otorhinolaryngology, head and neck surgery. 7th edn. London: Hodder Arnold; 2008:1689-1698.
6. Liao SL, Kao SC, Tseng JH, Chen MS, Hou PK. Results of intraoperative mitomycin C application in dacryocystorhinostomy. Br J Ophthalmol. 2000;84(8):903-6.
7. Zileliçoğlu G, Ugurbaş SH, Anadolu Y, Akner M, Aktürk T. Adjunctive use of mitomycin-C on endoscopic lacrimal surgery. Br J Ophthalmol. 1998;82(1):63-6.
8. McDonough M, Meiring JH. Endoscopic transnasal dacryocystorhinostomy. J Laryngeal Otol. 1989;103(6):585-7.
9. Jones LT. The cure of epiphora due to canalicular disorders, trauma and surgical failures on the lacrimal passages. Trans Am Acad Ophthalmol Otolaryngol. 1962;66:506-24.
10. Ishio K, Sugasawa M, Tayama N, Kaga K. Clinical usefulness of endoscopic intranasal dacryocystorhinostomy. Acta Otolaryngol Suppl. 2007;559:95-102.
11. Korkut AY, Teker AM, Ozsutcu M, Askiner O, Gedikli O. A comparison of endonasal with external dacryocystorhinostomy in revision cases. Eur Arch Otorhinolaryngol. 2011;268(3):377-81.
12. Araujo Filho BC, Voegels RL, Butugan O, Neto CD, Lessa MM. Endoscopic dacryocystorhinostomy. Brazil J Otorhinolaryngol. 2005;71:721-5.
13. Selig YK, Biesman BS, Rebeiz EE. Topical application of mitomycin-C in endoscopic dacryocystorhinostomy. Am J Rhinol. 2000;14(3):205-7.
14. Apuhan T, Yıldırım YS, Eroglu F. Effect of mitomycin-C on endoscopic dacryocystorhinostomy. J Craniofac Surg. 2011;22(6):2057-9.
15. Camara JG, Bengzon AU, Henson RD. The safety and efficacy of mitomycin-C in endonasal endoscopic laser assisted dacryocystorhinostomy. Ophthalmic Plast Reconstr Surg. 2000;16(2):114-8.

16. Dolmetch AM, Gallon MA, Holds JB. Non laser endoscopic dacryocystorhinostomy with adjunctive mitomycin-C in children. Ophthalmol Plast Reconstruct Surg. 2008;24(5):390-3.

17. Yim M, Wormald PJ, Doucet M, Gill A, Kingdom T, Orlandi R, Crum A, Marx D, Alt J. Adjunctive techniques to dacryocystorhinostomy: an evidence-based review with recommendations. In International Forum of Allergy & Rhinology 2020 Sep 2.

18. Ghosh S, Roychaudhury A, Roychaudhuri BK. Use of mitomycin-C in endo-DCR. Indian J Otolaryngol Head Neck Surg. 2006;58(4):368-9.

19. Prasannaraj T, Kumar P, Narasimhan I, Shivaparakash KV. Significance of adjunctive mitomycin-C in endoscopic dacryocystorhinostomy. Am J Otolaryngol. 2012;33(1):47-50.

Cite this article as: Singh J, Munjal M, Puri S, Chopra P, Munjal S, Garg A, et al. Role of mitomycin-c in endoscopic dacryocystorhinostomy with lacrimal sac stenting. Int J Otorhinolaryngol Head Neck Surg 2020;6:2017-21.