Results of intraoperative mitomycin C application in dacryocystorhinostomy

Shu L Liao, Shine C S Kao, Jason H S Tseng, Muh S Chen, Ping K Hou

Abstract

Aims—To evaluate the long term results of intraoperative mitomycin C application in dacryocystorhinostomy (DCR) surgery compared with results of the conventional procedure.

Methods—In this prospective randomised controlled study, a total of 88 eyes diagnosed with acquired nasolacrimal duct obstruction were randomly divided into a conventional DCR group and a mitomycin C group in which mitomycin C was used during DCR surgery. The surgical procedures in both groups were exactly the same, except that in the patients in the mitomycin C group, a piece of neurosurgical cottonoid soaked with 0.2 mg/ml mitomycin C was applied to the osteotomy site for 30 minutes. The results of the DCR surgeries were evaluated by objective findings such as irrigation and the height of tear meniscus and subjective symptoms by asking patients the condition of tearing improvement.

Results—Among the 44 eyes in the mitomycin C group, 95.5% of patients remained totally symptom free after 10 months of follow up; while in the conventional group, 70.5% of patients were reported to be symptom free and 18% of patients to have an improvement in their symptoms. There was a significant difference between these two groups. As far as objective findings were concerned, there were 41 eyes in the mitomycin C group classified as having a normal and one eye with moderate tear meniscus level, compared with 32 eyes and seven eyes, respectively, in the conventional group. There was also a significant difference between these two groups. The non-patency rate in the mitomycin C group is 4.5% compared with 11.4% in the conventional group. There were no complications such as abnormal nasal bleeding, mucosal necrosis, or infection except one patient with delayed wound healing.

Conclusions—Intraoperative 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.

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Most ophthalmic surgeons accept dacryocystorhinostomy (DCR) as a highly successful procedure in managing epiphora due to nasolacrimal duct obstruction. From previous studies, it appears that the success rate for this procedure is about 90%. The two most frequent causes of DCR failure are obstruction of the common canaliculus and closure of the osteotomy site. Thus, if we can inhibit fibrous tissue growth and scarring by applying antiproliferative agents over the anastomosed flaps and osteotomy site, the failure rate may be decreased.

Mitomycin C, an antiproliferative agent, has been widely used in pterygium excision and trabeculectomy with favourable results. Our previous study also demonstrated that DCR with intraoperative mitomycin C application can maintain larger osteotomy size than that of the conventional procedure. In this paper, we evaluate the long term success rate of DCR surgery with intraoperative mitomycin C soaking.
mg/ml mitomycin C was placed over the anastomosed posterior flaps and osteotomy site with the long thread passing out through the nostril, and was then removed transnasally after an application time of 30 minutes. The anterior nasal and lacrimal sac flaps were closed with additional 5-0 Vicryl sutures, as were the peristium and orbicularis muscle in separate layers. The skin incision was sutured with a running 6-0 nylon suture. The mitomycin C saturated cottonoid was removed transnasally after a 30 minute soak by pulling the long thread out from the nostril. In the conventional group, the same procedures were performed except for the absence of the mitomycin C application. Silicone tubes were removed at 6 months after surgeries in all patients.

To evaluate the long term results of both groups, we documented the subjective symptoms and classified them as symptom free (no tearing), improvement, and no improvement in tearing by asking patients about the tearing condition at 10 months’ follow up after operation. In addition, two objective findings such as the height of tear meniscus and patency of irrigation were documented at the same time (Table 1). We measured the height of tear meniscus mixed with a fixed amount of fluorescein stain (5 µl fluorescein by using micropipette) under cobalt blue light at slit lamp examination. A normal tear meniscus (<0.1 mm), moderate tear meniscus (0.1 mm <=0.2 mm), and normal tear meniscus (<=0.1 mm). All the examinations were done by the same physician with double blind control. If non-patency was noted, transnasal endoscopy was used to verify the area of obstruction. A χ² with Yates’s correction was used to compare the results of subjective symptoms and objective findings after DCR surgeries for both groups.

**Results**

There were 88 DCR surgeries in this study; 44 eyes were in the mitomycin C group and the remaining 44 eyes were in the conventional group. There was no significant difference in age between the two groups (p >0.1). All patients except two in the mitomycin group remained symptom free (42 eyes) after 10 months’ follow up. The satisfaction rate in the mitomycin C group was 95.5% (42/44). While in the conventional group there were five eyes remaining symptom free (42 eyes) after 10 months (p <0.01). The patency rate of the lacrimal drainage system in the mitomycin C group was 95.5%, and that in the conventional group was 88.6%.

During the follow up period, no complications such as abnormal nasal bleeding, mucosal necrosis, or infection were noted in any patients. One patient showed delayed wound healing. Wound disruption was noted during skin suture removal about 7 days after surgery; it may be the result of accidental contact of mitomycin C soaked sponge on the skin wound and could have been prevented by carefully managing the sponge. Fortunately, the wound healed within 2–3 weeks after DCR surgery leaving a barely visible scar with a successful result.

**Discussion**

Dacryocystorhinostomy has been accepted as a highly successful procedure in dealing with epiphora from nasolacrimal duct obstruction. A review of the literature reveals an average failure rate of 9.4%. Failure is generally defined as having symptoms of excessive tearing with the inability to irrigate. McPherson and Egelston noted that three out of seven patients in their study who underwent a second operation were found to have dense scar tissue present at the osteotomy site. Pico stated that “in every instance, the cause of failure was obstructed ostectomy area, revealing that fibrous tissue growth, scarring, or granulation tissue formation had been noted at the osteotomy area. The patency rate of the lacrimal drainage system in the mitomycin C group was 95.5%, and that in the conventional group was 88.6%.

<table>
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<tr>
<th>Table 1</th>
<th>Evaluation of the results of DCR surgery</th>
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<td><strong>1 Subjective symptoms:</strong></td>
<td>Tearing condition:</td>
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<td><strong>2 Objective findings:</strong></td>
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<td>(A) Height of tear meniscus:</td>
<td>Normal (&lt;0.1 mm)</td>
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<tr>
<td>(B) Irrigation:</td>
<td>Patent</td>
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From the literature described above, we see that fibrous tissue growth, scarring, and granulation tissue formation during the healing process will decrease or compromise the...
Results of dacryocystorhinostomy with intraoperative mitomycin C

Using 0.5 mg/ml mitomycin C and soaking for 905

Ugurbas et al showed that an appropriately large osteotomy made during surgery can narrow down to a final size of approximately 2 mm due to tissue growth and scarring. Thus, if we can reduce fibrous proliferation at the osteotomy site and at the anastomosed flaps, the success rate of DCRs may become much higher. We know that mitomycin C, an anticancer agent isolated from Streptomyces caespiptus, has the ability to significantly suppress fibrosis and vascular ingrowth after exposure to the filtration site of the trabeculectomy for glaucoma. The effect of mitomycin C in glaucoma filtering surgery has been widely discussed and proved to be effective in reducing intraocular pressure. In DCR surgery, we tried to use mitomycin C soaking over the osteotomy site and the anastomosed flaps to suppress fibrous proliferation and scar formation. This methodological observation should reduce the fibrous adhesion between the osteotomy site and the nasal septum as well as inhibit scarring around the opening of the common canaliculus. Thus, mitomycin C should prevent further shrinkage of the final surface area of the osteotomy and prevent the obstruction of the common canaliculus opening.

In our previous study, the mean actual osteotomy size in mitomycin C group shrank from 66.28 mm² (100%) initially to 27.10 mm² (40.89%) 6 months after DCR surgery. On the other hand, the mean actual osteotomy size in control group shrank from 65.55 mm² (100%) initially to 10.83 mm² (16.52%) 6 months after DCR surgery. It is concluded that application of the mitomycin C over the osteotomy site is effective in maintaining a larger osteotomy site. Ugurbas et al studied the histopathological effects of mitomycin C on transnasal DCR by using 0.5 mg/ml mitomycin C and soaking for 2½ minutes over the osteotomy site. The light and electron microscopy showed attenuated epithelium as well as looser and hypocellular subepithelial connective tissue on mitomycin C soaking specimens. They concluded that mitomycin C soaking can result in a decrease in density and cellularity of mucosa, and hence, enhance the success of DCR surgery. Yeatts and Neves reported eight cases of repeat DCR using mitomycin C soaking with successful results. They recommended that the adjunctive use of mitomycin C may increase the success rate of repeat DCR.

In this study, there were 42 eyes totally free from epiphora in the mitomycin C group after 10 months' follow up. Only two out of 44 eyes (4.5%) failed to respond to DCR surgery. While in the conventional group five out of 44 eyes (11.4%) were reported to be unsatisfactory with the results of DCR surgery; 31 eyes were free from epiphora and eight eyes reported to be improved in this group. There was a significant difference between the two groups according to the subjective symptoms reported by patients.
The authors have no proprietary interest in the development or marketing of any materials mentioned here.


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