Surgical punctal occlusion: a prospective study

D Liu, Y Sadhan

Aims: To assess the outcome of a surgical punctal occlusion technique.
Method: Prospectively, 11 consecutive patients (26 puncta) with severe dry eyes recalcitrant to maximal medical therapy underwent permanent punctal occlusion at a tertiary eye care centre between January 1999 and December 2000. The epithelium of the punctum and the vertical portion of the canaliculus was removed with a corneal rust ring burr. The bared punctum-canaliculus complex was closed with a 6-0 chronic suture. Success was measured by the complete functional occlusion of the punctum, tear function tests, and patients’ response.

Result: Five males and nine females, aged 26–77 enrolled in the study with three patients later excluded. As of November 2001, the remaining 11 patients had follow up ranging from 14 to 34 months (mean 24 months; median 24 months). 24 puncta (or 92%) remained occluded, including four puncta which showed anatomical reopening. Seven out of 11 patients (63.6%) stated they had symptomatic improvement regardless of their objective findings.

Conclusion: This technique resulted in a 92% permanent occlusion of the puncta and compared favourably with other reported techniques. Punctal occlusion does not appear to correlate well with Schirmer tests, the frequency of lubrication, and/or subjective feelings in these patients.

The management of severe dry eyes continues to challenge clinicians. Current available treatment is limited to symptomatic relief. Essentially, two approaches are used: constant lubrication and conservation of existing tears. In patients who do not find symptomatic relief despite medical therapy and maximal lubrication, permanent punctal occlusion is often indicated. Conventional methods of permanent punctal occlusion included cautery, laser, and various surgical techniques. In an attempt to enhance the successful occlusion rate and to determine if any correlation existed between a successful occlusion and objective and/or subjective findings, the authors modified a simple technique and studied prospectively 11 patients with 26 puncta over the past 34 months.

Materials and Methods

This study was approved by the research council and human investigative committee of King Khaled Eye Specialist Hospital. From January 1999 to December 2000, 22 patients were referred to the authors of the oculoplastic service of King Khaled Eye Specialist Hospital for consideration of permanent punctal occlusion. Fourteen of these patients enrolled in the study. These patients had already been diagnosed as having severe dry eyes by anterior segment specialists and were recalcitrant to maximal lubricant therapy. The aetiology of dry eyes remained unknown in nine patients. In five patients it was confirmed as a part of Sjögren’s syndrome. There were five males and nine females, aged 26–77. In all patients, both eyes were symptomatic. The study protocol was carefully explained to the participants and informed consent was obtained.

Preoperative examination by the authors before surgical occlusion included Schirmer I and II tests, fluorescein and rose bengal staining of the cornea and conjunctiva, in addition to checking visual acuity, biomicroscopy, and a thorough examination of the eyelids and adnexae. The patient’s lacrimal system was also probed and irrigated in the office to verify its patency. The preoperative and postoperative frequency of their lubricant application were recorded.

Patients were excluded from the study if they had already had any previous surgical punctal procedure, or if an obstructed lacrimal system was found during office probing and irrigation, punctal ectropion, or if their documentation or follow up were inadequate.

Surgical technique

The procedure was performed under local anaesthesia. A drop of topical anaesthetic was instilled in the eyes. A tiny amount (about 0.1 ml) of 2% Xylocaine with adrenaline was injected in the tissues surrounding the punctum and the vertical portion of the canaliculus. The surgical field was prepared and draped in sterile manner.

A corneal rust ring burr with a 0.6 mm diameter (Grieshaber, Switzerland) was used to remove the epithelium from the punctum and the vertical portion of the canaliculus to a depth of 2 mm. Usually, the stripped epithelium was clearly visible, wrapped around the burr. Minimal oozing was observed and no cautery was used. Particular attention was paid to the complete removal of the punctal epithelium. A simple interrupted 6-0 chronic suture with a 3/8 circle reverse cutting needle was used to bring the raw surfaces of the vertical portion of the canaliculus together. It was placed parallel to the lid margin to avoid corneal irritation (Fig 1).

Figure 1 Under local anaesthesia, a corneal rust ring burr [0.6 mm diameter] is used to remove the epithelium of the punctum and the vertical portion of the canaliculus. A 6-0 chronic suture brings the raw surfaces together.
A small amount of gentamicin ointment was instilled in the operated eye with a cold compress application immediately following the procedure. Follow up appointments were scheduled at 1, 3, and 6 month postoperative intervals. Schirmer I and II tests, fluorescein, and rose bengal staining studies were repeated at these postoperative visits.

A question was asked of the patients at the three designated postoperative visits with a simple scoring system. They were asked if symptomatically they felt better (+1), the same (0), or worse (−1) following the procedure. Scores were added. Anyone with a total score of +2 or +3 beyond the 6 month period was considered symptomatically improved. Anyone with a score of +1 or lower was considered having no improvement. In addition, the preoperative and postoperative frequency of their lubricant application were recorded and reviewed.

RESULTS
A total of 14 patients enrolled in the study during the study period. One patient was excluded because she already had an obstructed lacrimal system preoperatively. Two other patients were excluded because of inadequate documentation and/or follow up. Only 11 patients (26 puncta) were included in this report. There were four males and seven females, aged 26–77. Nine patients had both lower puncta occluded and two patients had all four puncta occluded (in two different sessions). As of November 2001, follow up ranged from 14 to 34 months with a median of 24 months (average 24 months).

Out of the 26 puncta, 20 of them (76.2%) remained completely occluded to date. Additionally, there were four puncta in three different patients (two right lower puncta and two left lower puncta) which appeared open at first sight but were found to be actually occluded. In other words, a total of 24 out of 26 puncta (92%) remained completely occluded. In all of the patients, the chromic suture resorbed without causing any corneal problem. None of the patient developed subsequent epiphora.

Seven patients responded with a score of +2 and higher, giving this procedure a subjective success rate of 7/11 or 63.7%. Postoperative tear function tests showed a minimal drop in four patients, with three of them showing no change in postoperative tear production (Table 1).

DISCUSSION
Management of dry eyes has been a constant challenge to ophthalmologists. To date, it has been essentially limited to symptomatic relief with either constant lubrication or preservation of existing tears.1–5 Permanent punctal occlusion is considered only if a patient with severe dry eyes fails to obtain relief despite maximal lubrication and other medical treatment aimed at correcting the underlying disease have been initiated.1–8 Once a punctum is (truly) permanently occluded, it is difficult to reverse the anatomical and functional blockage. Therefore, the surgeon must be extremely careful in selecting a candidate.

Before performing a procedure to occlude a punctum permanently, many authors suggested a trial of temporary punctal occlusion using various plugs.6–10 While this is prudent, one must keep in mind some of the intrinsic limitations of these devices and potential complications. More specifically, Groves and Glatt noted failure of collagen plugs to predict epiphora after permanent punctal occlusion.9,10 Redmond also pointed out some of the intrinsic limitations of these devices in making these predictions.11 Virtanen et al noted that punctal occlusion induced only a relatively short lasting subjective and objective benefit for contact lens wearers.12

Known complications from these temporary devices include corneal irritation, erosion, allergic reaction, infection and migration, luxation, and disappearance of these plugs.1,4,6–12 Tissue glue has also been used as temporary measure.1,8–12 Even if these plugs happen to work well in some individuals, they are not designed as a permanent solution.

Silicone punctal plugs have been used in various conditions with varying degrees of success.1,4–12 Before considering permanent punctal occlusion, their application should be explored.

Permanent punctal occlusion can be achieved with cautery, laser, and surgery.1,2,3,5,12 Relatively low success rates were noted in the earlier reports using the cautery technique.1,5,6,12 Knapp et al studied two different cautery techniques. They found a deep cautery application more effective than a superficial one.7 Bilateral dacryocystitis has been reported as a rare complication of permanent punctal occlusion using cautery technique.7 Nelson and Reed studied argon laser versus thermal cautery for punctal occlusion in a small number of dogs and cats.7 Benson et al and Vrabec et al found punctum occlusion by argon laser has a high failure rate.5 The cost associated with laser technique is known to be higher than that of the conventional methods.

Several surgical techniques have been described but so far none of them has been studied prospectively.1–25,27 This is probably due to the small number of patients who need a permanent punctal occlusion. Anticipating such limitation, the authors of the current study planned to prospectively study only one single surgical technique and its outcome.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Patient details and treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>Age</td>
</tr>
<tr>
<td>No.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>71</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
</tr>
<tr>
<td>3</td>
<td>77</td>
</tr>
<tr>
<td>4</td>
<td>64</td>
</tr>
<tr>
<td>5</td>
<td>66</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>63</td>
</tr>
<tr>
<td>8</td>
<td>37</td>
</tr>
<tr>
<td>9</td>
<td>44</td>
</tr>
<tr>
<td>10</td>
<td>67</td>
</tr>
<tr>
<td>11</td>
<td>26</td>
</tr>
</tbody>
</table>

C = closed completely; C* = appears re-opened but actually closed; F = failure, punctum reopened; SJ = Sjögren’s syndrome.

www.bjophthalmol.com
The principles of a successful permanent punctal occlusion include bringing together raw surfaces to heal either in the canaliculus or the punctum, or both. This study specifically addresses this issue. A controlled removal of the epithelium of the lacrimal drainage system from the punctum down to the ampullae is achieved with a corneal burr. A 6-0 chromic brings the lacrimal drainage system from the punctum down to the canaliculus or the punctum, or both. This study specifically includes bringing together raw surfaces to heal either in the lacrimal drainage system in these particular patients, or both.

Four patients showed a decrease in the frequency of their lubricant application. Patients 1 and 6 were able to decrease their frequency from every hour to every 2 hours and maintain that schedule. Patients 3 and 11 were able to further decrease their application from every hour to every 2 hours and finally to every 4 hours and maintain that new schedule. Interestingly, patient 1 only gave a score of +1 despite the closure of his puncta and decrease of lubricant application frequency. One possible explanation was the patient’s awareness the re-opening of his own left punctum. Patients 5 and 7 gave a score of +2 despite no changes in their tear function and lubricant application frequency. By contrast, patients 2, 4, and 8 only gave a score of +1 with the same objective findings—that is, no changes in tear function and lubricant application frequency. As can be seen in Table 1, there is very little correlation between the patient’s subjective score, their tear function tests, and their frequency of lubricant application.

Owing to the small sample size of the present study, it would be difficult to interpret many of the findings and the lack of a correlation between the objective findings and subjective responses. This notwithstanding, similar observations have been noted in some of the previous studies. Some of these reports also showed that the re-opening of the punctum following cautery treatment was about 25%. Although no specific time frame was given when the re-opening was first noticed in these patients, it appeared to have happened during early follow up visit because most of these patients were re-occluded and they continued their participation in these studies. A punctal plug was used in two of these reports. Spontaneous plug extrusion was noted as early as 2 weeks post-insertion and the theoretical probability of plug extrusion went up as time went on.

In summary, it appears reasonable to perform a permanent punctual occlusion in properly selected patient with the technique described herein. The authors found this technique simple and effective. It achieved a 92% success rate in a complete occlusion in 11 patients (24 out of 26 puncta). Seven out
of the 11 patients (63.7%) reported symptomatic improvement regardless of objective findings.

Authors’ affiliations
D Liu, Y Sadhan, King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia
D Liu, Ophthalmology Department, University of Missouri, Columbia, MO, USA

The authors do not have any financial interest in any of the instruments or medications used in this study.

REFERENCES
Surgical punctal occlusion: a prospective study

D Liu and Y Sadhan

Br J Ophthalmol 2002 86: 1031-1034
doi: 10.1136/bjo.86.9.1031

Updated information and services can be found at:
http://bjo.bmj.com/content/86/9/1031

These include:

References
This article cites 27 articles, 1 of which you can access for free at:
http://bjo.bmj.com/content/86/9/1031#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/