Diamond burr superficial keratectomy for recurrent corneal erosions

H Kaz Soong, Q Farjo, R F Meyer, A Sugar

Aims: To evaluate the efficacy and safety of diamond burr superficial keratectomy in the treatment of recurrent corneal erosions.

Methods: A retrospective review of 54 eyes (47 patients) with recurrent corneal erosions treated with diamond burr superficial keratectomy. Preoperative and postoperative visual acuities and refractions, slit lamp examination findings, and the incidence of recurrent erosion after keratectomy were studied. Specular microscopy was also performed in six patients before and after surgery.

Results: 30 eyes had underlying map dot fingerprint anterior basement membrane corneal dystrophy, while 24 eyes did not. Postoperative follow up time ranged from 3 to 53 months (mean 12.3 months). Corneal erosion recurred in three eyes (6%) after diamond burr superficial keratectomy. This procedure improved the best corrected visual acuity from 20/26 to 20/22 by logMAR statistical evaluation (p=0.002) and caused very little change in the refractive spherical equivalent. No endothelial cell loss or changes in morphology were noted on specular microscopy.

Conclusion: Diamond burr superficial keratectomy appears to be an effective and safe method of treating recurrent erosions and is a good alternative therapy to needle stromal micropuncture, Nd:YAG induced epithelial adhesion, and excimer laser surface ablation.
entire central corneal surface was gently polished with a fine diamond burr (Ugo-Fisch polishing drill), using multiple, even, circular movements, taking care not to induce irregular topography by pushing too hard or tarrying in one region too long. In the remaining 10 eyes with focal erosions well outside the centre, only the affected areas were treated. In order to assure uncomplicated re-epithelialisation, a narrow 1–2 mm rim of corneal epithelium was left intact in the circumferential periphery unless visible erosions were obvious in that area. Whenever possible, in order to reduce the chances of producing haze or refractive changes, treatment was limited to no deeper than anterior Bowman’s layer. A bandage soft contact lens was then applied and the eye was started on a combination tobramycin-dexamethasone (Tobradex colloïum) four times daily, which was subsequently tapered over a period of 1–3 weeks. In roughly half the patients, a topical non-steroidal anti-inflammatory agent (diclofenac or ketorolac) was also used four times daily for about a week.

The patients were seen at least once during the first postoperative week, and then at 1 and 3 months thereafter. Some of the patients who were referred from a long distance were eventually returned to their local ophthalmologists for follow up. Patients who had less than 3 months of postoperative follow up were excluded from the study. Preoperative and postoperative clinical examination included visual acuity measurements, manifest refraction, keratometry, and slit lamp biomicroscopy. In six eyes, specular microscopic studies of the corneal endothelium were performed preoperatively and postoperatively to assess the cellular counts and morphology. The cell counts were compared preoperatively and postoperatively with Student’s t test.

Statistical evaluation for the preoperatively and postoperatively visual acuities was performed with the logMAR (log of the minimum angle of resolution) program. Manifest refractions before and after DBSK were converted into spherical equivalents in order to evaluate refractive change after surgery.

**RESULTS**

Before DBSK, all 54 eyes had failed on medical treatment for recurrent erosion, which consisted of artificial tears, lubricating ointments, patching, hypertonic agents, and bandage contact lenses. Twenty nine eyes had also undergone sometimes multiple previous surgical interventions for their recurrent erosions. Twenty five of these eyes had undergone needle stromal micropuncture therapy or Nd:YAG laser surface adhesion therapy, three had undergone simple epithelial debridement, and one had undergone excimer laser surface ablation. In each case, corneal erosions recurred within 2 months after these antecedent surgeries.

DBSK improved the best corrected visual acuity from 20/26 (logMAR 0.107) to 20/22 (logMAR 0.043) by logMAR statistical evaluation (p=0.002).

The mean preoperative and postoperative dioptric spherical equivalents by manifest refraction were –1.38 (SD 2.95) and –1.41 (2.58), respectively. The change in spherical equivalent from before to after DBSK was –0.37 (0.15). Forty nine eyes (91%) had <0.50 dioptre change in the spherical equivalent after DBSK, while five eyes (9%) had >0.50, but <1.50 dioptre change.

Three eyes (6%) had a recurrent corneal erosion within 2 months after DBSK; however, following re-treatment with DBSK, none of these eyes had further recurrences in at least 2 years. Two of the three eyes with recurrence had underlying map dot fingerprint dystrophy. Although no eyes had anterior stromal scarring resulting from the procedure, 11 eyes did show faint anterior stromal haze lasting about a month before fading. Specular microscopy of the endothelium showed neither evidence of morphological change nor decreased in cell density (p<0.05)

**DISCUSSION**

It has been over 125 years since recurrent corneal erosion syndrome was first described by Hansen in the Danish literature. In 1906, Frank treated recurrent corneal erosion by debriding the epithelium and applying chlorinated water. Over a 3 year period, only two of his patients required re-treatment. Thysen reported a 60% cure rate in 1959 with chemical cautery with iodine. Buxton and Fox reported in 1983 an 85% success rate with total epithelial debridement, followed by use of bandage contact lens therapy. In 1984, Wood described excellent results using superficial corneal puncture therapy with diathermy. McLean and coworkers described in 1986 superficial puncture therapy with a 20 gauge hypodermic needle with an 86% success rate after one therapeutic session. The eyes that had recurrence after initial therapy underwent a second session, which effectively prevented further recurrences. More recently, the use of Nd:YAG laser superficial corneal spots instead of needles showed good results with less scarring. In 1987, Buxton and Constad reported a 3% recurrence rate in patients treated with total epithelial debridement when they polished the limbus with a diamond burr; however, they did not polish the central cornea.

Our study strongly suggests that DBSK is a safe and effective treatment of recurrent corneal erosions. It appears to be a good alternative surgical therapy to simple epithelial debridement, needle stromal puncture, Nd:YAG laser induced epithelial adhesion, and excimer laser anterior corneal ablation. Table 1 enumerates the advantages and disadvantages of this technique in comparison with other current surgical modes of therapy.

To date, the exact anatomical and functional mechanisms of action for procedures that affect Bowman’s layer, such as DBSK, needle stromal puncture, Nd:YAG laser treatment, and

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Advantages and disadvantages of diamond burr superficial keratotomy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages:</strong></td>
<td></td>
</tr>
<tr>
<td>• Inexpensive</td>
<td></td>
</tr>
<tr>
<td>• Requires little surgical skill</td>
<td></td>
</tr>
<tr>
<td>• Requires no sophisticated equipment, such as lasers</td>
<td></td>
</tr>
<tr>
<td>• Causes no permanent corneal scarring and can be used to treat visual axis</td>
<td></td>
</tr>
<tr>
<td>• Possibly removes more abnormal basement membrane than debridement alone</td>
<td></td>
</tr>
<tr>
<td>• Low recurrence rate of erosion after treatment</td>
<td></td>
</tr>
<tr>
<td>• Re-treatments are simple</td>
<td></td>
</tr>
<tr>
<td>• No chance of corneal perforation</td>
<td></td>
</tr>
<tr>
<td>• Causes no significant refractive shift</td>
<td></td>
</tr>
<tr>
<td>• Removes superficial corneal opacities, if any present</td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages:</strong></td>
<td></td>
</tr>
<tr>
<td>• Eye is often painful while epithelial defect is present</td>
<td></td>
</tr>
<tr>
<td>• Chance of persistent epithelial defect (eg, in diabetic and neurotrophic corneas)</td>
<td></td>
</tr>
</tbody>
</table>

**Advantages and disadvantages of diamond burr superficial keratotomy**
excimer ablation, are unknown. It is generally accepted that these procedures may involve reactive fibrosis or production of extracellular matrix proteins responsible for proper adhesion of the epithelium to its substrate. Brown and Bron noted that epithelial debridement alone was no more effective than medical therapy alone, and that scarring of Bowman’s layer might be necessary for prevention of recurrent erosions.

Authors’ affiliations
H Kaz Soong, Q Farjo, R F Meyer, A Sugar, WK Kellogg Eye Center, University of Michigan Medical School

REFERENCES


Contributors please note:

Communications from all countries except the UK and Republic of Ireland should be sent to Professor C Hoyt, Editor, British Journal of Ophthalmology, University of California, Department of Ophthalmology, 10 Kirkham Street, K 301, San Francisco, CA 94143-0730, USA (tel: 001 415 502 6871; fax: 001 415 514 1521).

Manuscripts from the UK and the Republic of Ireland should be sent to Professor Andrew Dick, UK Editor, British Journal of Ophthalmology, Division of Ophthalmology, University of Bristol, Lower Maudlin Street, Bristol BS1 2LX (tel: +44 (0) 117 929 4496; fax: +44 (0) 117 929 4607).
Diamond burr superficial keratectomy for recurrent corneal erosions

H Kaz Soong, Q Farjo, R F Meyer and A Sugar

doi: 10.1136/bjo.86.3.296

Updated information and services can be found at:
http://bjo.bmj.com/content/86/3/296

These include:

References
This article cites 19 articles, 1 of which you can access for free at:
http://bjo.bmj.com/content/86/3/296#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/