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.
whole 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 produc-
ing 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 combina-
tion tobramycin-dexamethasone (Tobradex collyrium) 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 postop-
erative 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 fol-
low 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 preoperative and
postoperatively with Student's t test.

Statistical evaluation for the preoperatively and postopera-
tive 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, lubricat-
ing ointments, patching, hypertonic agents, and bandage con-
tact lenses. Twenty nine eyes had also undergone sometimes
multiple previous surgical interventions for their recurrent
erosions. Twenty five of these eyes had undergone needle strom-
al micropuncture therapy or Nd:YAG 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 statisti-
cal 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 diopter change in the spherical equivalent
after DBSK, while five eyes (9%) had >0.50, but < 1.50 diopter
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 macroscopy of the endothelium showed
neither evidence of morphological change nor decreases in cell
density (p<0.05)

DISCUSSION
It has been over 125 years since recurrent corneal erosion syn-
drome was first described by Hansen in the Danish
literature. In 1906, Franke 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. Thygeson 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
Constadt reported a 3% recurrence rate in patients treated
with total epithelial debridement when they polished the lim-
bus with a diamond burr; however, they did not polish the
central cornea.

Our study strongly suggests that DBSK is a safe and effec-
tive treatment of recurrent corneal erosions. It appears to be a
good alternative surgical therapy to simple epithelial debride-
ment, needle stromal puncture, Nd:YAG laser induced epithel-
ial 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 Advantages and disadvantages of diamond burr superficial keratotomy</th>
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<tr>
<td><strong>Advantages:</strong></td>
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<tr>
<td>● Inexpensive</td>
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<td>● Requires little surgical skill</td>
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<td>● Requires no sophisticated equipment, such as lasers</td>
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<td>● Causes no permanent corneal scarring and can be used to treat visual axis</td>
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<td>● Possibly removes more abnormal basement membrane than debridement alone</td>
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<tr>
<td>● Low recurrence rate of erosion after treatment</td>
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<td>● Re-treatments are simple</td>
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<td>● No chance of corneal perforation</td>
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<td>● Causes no significant refractive shift</td>
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<td>● Removes superficial corneal opacities, if any present</td>
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<td><strong>Disadvantages:</strong></td>
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<tr>
<td>● Eye is often painful while epithelial defect is present</td>
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<tr>
<td>● Chance of persistent epithelial defect (eg, in diabetic and neurotrophic corneas)</td>
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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.4

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1 Trobe JD, Laibson PR. Dystrophic changes in the anterior cornea. Arch Ophthalmol 1972;87:378–82.

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