Excimer Laser Phototherapeutic Keratectomy [PTK] followed by Anti-inflammatory Therapy for Recurrent Corneal Erosions [RCE]

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Abstract

Aim – To evaluate the role of excimer laser PTK followed by anti-inflammatory therapy in the management of RCE unresponsive to conventional treatment.

Materials and methods – A retrospective chart review of 7 patients who underwent excimer laser PTK for recurrent corneal erosions from January 2007 to January 2010 with a minimum follow-up of 6 months was done. All patients received tapering dose of topical steroids for 6 weeks and systemic doxycycline for 3 months in the postoperative period. All patients were reviewed at 1 month, 3 months & 6 months. The mean follow-up was 9.2 ± 1.4 months.

Results – None of the patients had recurrence in the follow-up period. 6 out of 7 patients (85.71%) had no change in BCVA while 1 patient with anterior stromal scarring (14.29%) had more than 2 line improvement in BCVA.

Conclusion – Excimer laser PTK followed by anti-inflammatory therapy may be effective for the treatment of RCE.

Background

Recurrent corneal erosion [RCE] is not an uncommon condition characterized by repeated episodic flaking of a portion of epithelium with resultant pain, redness and foreign body sensation, which typically occur on waking up after sleep. Although not sight threatening, it is a pestilence to most patients. At least some of the bad sufferers go to bed with the morbid fear of waking up next day morning with a painful eye. The two common causes of RCE are [1] following trauma, especially with materials with high carbon moiety like finger nail, paper, tree bark or leaf [2] corneal dystrophy, commonly epithelial basement membrane dystrophy.

Traditionally, conservative treatment of RCE included patching, bandage contact lenses, hyperosmotic agents and artificial tears. Surgical treatment was resorted to when medical treatment failure occurred. The different surgical treatments described are debridement, anterior stromal puncture with needle or Nd:YAG laser, diamond burr application, Amolis brush application and Excimer laser phototherapeutic keratectomy [PTK]. Anterior stromal puncture, though highly effective causes scarring and hence may be reserved for post-traumatic erosions away from the visual axis. In a recent review of recurrent corneal erosions, PTK was found to be the most effective treatment with 74 – 100% success rate, with higher rates in post traumatic ones.

Recent advances in corneal imaging and molecular biology have provided fresh insights into the understanding of pathophysiology of RCE guiding treatment. Patients with Anterior Basement Membrane Dystrophy [Cogan’s dystrophy] were found to have abnormal basement membrane protruding into corneal epithelium and epithelial microcysts, but normal superficial epithelial cells and stroma on confocal microscopy. In contrast, patients with post-traumatic erosions showed altered epithelial cells, activated keratocytes and inflamed mid-stromal keratocytes.

Inflammation at the cellular level is believed to hinder the formation or destabilization of adhesion complexes resulting in poor attachment to the underlying stroma in post-traumatic RCE. Anti-inflammatory therapy with topical steroids and oral doxycycline has been advocated for patients with RCE unresponsive to traditional treatment with a short-term relapse free rate of 70%.

In the light of better understanding of pathophysiology, we postulated that a combination of PTK with anti-inflammatory therapy may be better than former alone in patients who had medical treatment failure. The aim of our study was to evaluate the efficacy of excimer laser photorefractive keratectomy followed by anti-inflammatory therapy in the treatment of RCE.

Materials and methods

A retrospective chart review of 7 eyes of 7 patients who underwent excimer laser phototherapeutic keratectomy [PTK] from January 2007 to January 2010 for recurrent corneal erosions [RCE] was done. A diagnosis of RCE was based on a typical history of repeated episodes of pain, watering and lacrimation upon awakening. Though a history of trauma was commonly elicited it was not considered mandatory. Only patients who had failed medical therapy including bandage contact lens application were considered for treatment. All patients underwent detailed ophthalmic evaluation, Schirmer’s test, corneal topography and ultrasonic pachymetry. During slit-lamp biomicroscopy, the area of unhealthy epithelium was noted. All procedures were done by the same surgeon.

After informed consent, under topical anesthesia with 0.5% proparacaine, observing aseptic precautions, epithelial marking was done with a 9mm disposable corneal trephine. The epithelium was peeled off after alchoholde lamination. Excimer laser ablation of stroma was done using WaveLight.
Allegretto 400 hz excimer laser [flying spot] in the PTK mode for a depth of 10 microns with a treatment zone of 8.0 mm. Anti-hyperopia treatment of +1.0 D was done in [1] patients in whom the area of unhealthy epithelium was extending beyond the treatment zone of 8.0mm and [2] if pre-existing refractive error was more than 0.5D of hyperopia. The stroma was cleaned and a bandage contact lens applied.

All patients were advised 0.5% Loterprednol e/d for 6 weeks [4 times a day for 2 weeks, 3 times a day for 2 weeks, 2 times a day for a week and once a day for week] and systemic Doxycycline[100 mg twice a day for 2 weeks and once a day for 10 weeks]. The patients were seen on day1, 1st week,1month, 3 months, 6 months and 1year. At the 1week postoperative visit, bandage contact lens was removed. The minimum follow-up period was 6 months.

The inclusion criteria for the study were [1] A diagnosis of post traumatic or idiopathic RCE [2] Patients who have had five or more recurrences [3] Failed conservative management including use of bandage contact lenses [4] Willingness to comply with 3 months of doxycycline therapy. The exclusion criteria were [1] All causes of RCE other than post traumatic / idiopathic like bullous keratopathy or corneal dystrophy [2] contraindications for ablative corneal surgery like severe dry eye, active connective tissue disorder etc [3] lack of minimum [6 months] follow-up. Mean follow-up period was 9.2+1.4 months

Treatment success was defined as absence of typical symptomatology of recurrent corneal erosion.

Results

Age and Sex–There were 4 females and 3 males. The mean age was 34.57 years [range-16 to 52]

Treatment success – All 7 patients had treatment success at 6 months follow-up period. However, mild dryness in the treated eye was present in 3 out of 7 eyes [42.8%].

Change in UCVA–The mean preoperative uncorrected visual acuity [UCVA] was 0.443 while mean post operative UCVA was 0.619 [Fig 1] which was not statistically significant [P<0.5]

Change in BCVA- 6 out of 7 patients [85.71%] had no change in best corrected visual acuity [BCVA] while 1 patient with anterior stromal scarring [14.29%] had more than 2 line improvement in BCVA. The mean BCVA improved from 0.881 to 0.952 which was not statistically significant [P<0.5] [Fig 2].

Discussion

The treatment of recurrent corneal erosion [RCE] is often difficult and frustrating both to the patient and the physician. Conservative treatment of RCE includes patching, bandage contact lenses, hyperosmotic agents and artificial tears 2,11,12,17,18. With better understanding of pathophysiology of RCE, inflammation is believed to have a dominant role in the genesis or propagation of post traumatic RCE3,13,14,15. Confocal microscopy studies have consistently shown activated keratocytes in the anterior stroma and epithelial alterations in post traumatic RCE in contrast to abnormal basement membrane, but normal stroma in anterior basement membrane dystrophy8,9,10,12. Lacrimal fluid analysis of patients with traumatic RCE have found high levels of matrix metalloproteinases [MMPs] 9 and 2. MMPs are a group of enzymes that can degrade parts of extracellular matrix. Topical steroids and systemic doxycycline being MMP inhibitors are seen to be effective in the treatment of post traumatic RCE3,13,14,15.

Surgical treatment was conventionally reserved for 'medical
The different surgical modalities described are debridement, anterior stromal punction with needle or Nd:YAG laser, diamond burr application, Amolis brush application and Excimer laser phototherapeutic keratectomy (PTK). Among the surgical treatments, diamond burr polishing and PTK are most effective treatment modalities, with higher rates in post traumatic ones. These measures are believed to cause smoothening of Bowman’s membrane and slight reactive fibrosis resulting in formation of stronger adhesion complexes.

We hypothesised that a combination of PTK and anti-inflammatory therapy maybe more effective than PTK alone. In our study, none of the patients had recurrence of epithelial erosion in the follow-up period. Post 3 out of 7 patients complained of ‘mild dryness’ they were happy about the treatment outcome.

There was a modest improvement in the mean uncorrected visual acuity [from 0.443 to 0.65] it was not considered statistically or clinically significant. However, more importantly none of the patients lost even one line of BCVA. One patient had improvement in BCVA in BCVA as the anterior stromal scar was removed by PTK by a stromal ablation of 52 microns.

Excimer laser phototherapeutic keratectomy is indeed an effective treatment modality for the treatment of recurrent corneal erosions with success rates ranging from 74% to 100%, with higher success rates in RCE following trauma. Partial thickness transepithelial PTK is also found to be effective. The other combination treatment described in literature is partial thickness PTK limited only to 20 to 30 microns or part of the epithelium) followed by use of autologous serum drops 6 times a day for 6 weeks with a success rate of 80% with a mean follow-up of 15.5 months.

The two essential drawbacks of the present study are [1] insufficient number of patients and [2] limited follow-up.

Conclusion

Excimer laser phototherapeutic keratectomy followed by anti-inflammatory therapy may be more effective for the treatment of posttraumatic recurrent corneal erosions than PTK alone.

References