BRIEF COMMUNICATION

Outcomes of Phototherapeutic Keratectomy To Treat Recurrent Corneal Erosion

Khalid M. Alabdulwahhab

- Assistant professor and consultant, Ophthalmology Department, College of Medicine, Majmaah University, Majmaah, KSA. 66, Majmaah 11952: Email : k.alabdulwahhab@mu.edu.sa: Mobile No.: 0555445814

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Abstract:

Aim: To present the outcomes of phototherapeutic keratectomy (PTK) to treat recurrent corneal erosion.

Methods: This case series evaluated eyes that had undergone PTK for recurrent corneal erosion at an eye centerin Riyadh, Saudi Arabia.Data were collected on preoperative and postoperative vision, cause of corneal erosion,treatment zone of the laser, recurrence of the erosion and pain postoperatively and the number of successful cases postoperatively. Treatment success was defined as epithelial healing for at least 6 monthspostoperatively. The factors associated to success were analysed.

Results: The study sample was comprised of 11 eyes of 11 (6 males; median age 33 years) patients with recurrent erosion. Trauma (5 eyes), pterygium excision (1 eye), Salzmann nodule (1 eye) and leucoma (1 eye) were the main causes of recurrent erosion. Postoperatively, 10 (91%) eyes achieved success. The median duration of follow up was 23 months (25% quartile, 17 months). After management, one eye had mild pain. One case had induced astigmatism greater than 1D.

Conclusion: PTK wasan effective modality for treating recurrent corneal erosion due to varying underlying aetiology. The outcomes in the Arab population were similar to published studies of other populations.

Key words: Recurrent corneal erosion; phototherapeutic keratectomy; cornea.

الملخص

الهدف : لتقديم نتائج علاج القرنية الضوئي (بي تي كي) لعلاج تقشع القرنية المتكرر.

الطريقة: قيمت سلسلة الحالات هذه العيون التي خضعت لتقشع القرنية المتكرر في أحد مراكز العيون في الرياض بالمملكة العربية السعودية. تم جمع البيانات عن قوة الرؤية قبل العملية وبعدها، سبب تقشع القرنية، حجم منطقة العلاج بالليزر، ومدى تكرار التقشع وآلام بعد العمل الجراحي وعدد الحالات الناجحة بعد العمل الجراحي. تم تعريف نجاح العلاج شفاء النسيج الطلائي للقرنية لمدة لا تقل عن ٦ أشهر بعد العمل الجراحي. تم تحليل العوامل المرتبطة بالنجاح.

النتائج: تألفت عينة الدراسة من أحد عشر عينا لأحد عشر مريضا (٦ ذكور، متوسط العمر ٣٣ سنة) يعانون من التقشع المتكرر. الضربات (٥ عيون)، استئصال لحمية القرنية (عين واحدة)، نتوآت سالزمان (عين واحدة) وابيضاض القرنية (عين واحدة) كانت الأسباب الرئيسية للتقشع المتكرر. بعد العمل الجراحي، حققت عشر (٩١٪) عيون النجاح. وكان متوسط مدة المتابعة ٢٣ شهرا (٢٥٪ الربعي، ١٧ شهرا). بعد العلاج، عين واحدة كانت تعاني من ألم خفيف. وقد أصيبت إحدى الحالات بزيادة انحراف القرنية لأكثر من ١ دايوبتر.

الاستنتاج: كان العلاج الضوئي للقرنية طريقة فعالة لعلاج تقشع القرنية المتكررة لأسباب مختلفة. وكانت النتائج للسعوديين مماثلة للدراسات المنشورة في الدول الاخرى.

Introduction:

Recurrent corneal erosion syndrome is a disabling condition that affects vision related quality of life of working adults[1]. Different treatment modalities have been attempted for centuries. The underlying principle of most proceduresis removal of the pathological epithelium to ensure a good base for improved adhesion and viability[2]. The excimer laser has been successfully used as a therapeutic modality for corneal pathologies.[3]Phototherapeutic keratectomy (PTK)has provided promising outcomes for managing recurrent corneal erosions. A randomized controlled trial of PTK for corneal erosions in a mainly Caucasian population, concluded that this procedure was safe and effective[4]. A large series evaluating PTK on an Asian population has also been published[5]. To the best of our knowledge,there is no published literature on PTK for corneal erosion in an Arab population. The population of Saudi Arabia is exposed to bright sunlight and dry dusty environment resulting in a high prevalence of corneal degenerative diseases[6]. Hence, the study of PTK for the management of recurrent corneal erosion in this vulnerable population would be beneficial.

This study presents the outcomes of all the cases of recurrent corneal erosion that were treated with PTK at an eye institute in central Saudi Arabia.

Methods:

This retrospective case series evaluated the outcomes of PTK for the management of recurrent corneal erosions at a private ophthalmic centrein central Saudi Arabia between 2014 and 2016. Data were collected via chart review. The ethics and research committee of the institution approved this study. Written informed consent was waived because this was a retrospective chart review.

One ophthalmologist performed history taking including use of medications, eye surgery, cornea surgery and systemic and ocular comorbidities. The best-corrected distance visual acuity (BCVA) was measured with an ETDRS chart placed at 6 meters distance from the patient. If patient could not read the top line of the chart, he/she was re-tested at 3meters distance. The vision of the affected eye was noted in decimal notation. The anterior segment assessment was performed with slit lamp biomicroscopy (Topcon Corp., Tokyo,

Japan). The cornea was assessed for signs of epithelial instability, corneal dystrophy and degeneration.

Manual debridement of the corneal epithelium was performed with a 57 Beaver blade. PTK was performed with the EC-5000 excimer laser (NIDEK Co. Ltd., Gamagori, Japan). This laser has a repetition rate of 30 to 40 Hz. The ablation diameter ranged between 5.5 and 7.5 mm. The total pulse energy ranged from 23 to 106 mJ. The ablation depth ranged between 15 to 70µm.

Postoperative follow up was performed at day1, 1 week, 6 weeks, 6 months and 12 months. The history of recurrence and treatment performed was reviewed ateach follow up visit. Postoperative examinations included BCVA, refraction, anterior segment and cornealexamination using slit lamp biomicroscopy. The patient was asked about symptoms such as pain, photophobia, redness, tearing andglare.

The cornea was stained with a sterile fluorescein strip to determine the presence/absence of epithelial defects. The epithelial adhesion at the site of recurrence was evaluated before and after repeated blinking.

Data were collected on a pretested data collection form. The information was transferred to a Microsoft Excel spreadsheet (Microsoft Corp., Redmond, WA, USA). For univariate analysis, we used the Statistical Package for Social Studies (IBM Corp., Armonk, NY, USA). Quantitative variables were plotted to determine if they were normally distributed. As this was a small sample size withwide variation, the median, 25% quartile, minimum and maximum values of the variables were calculated. For qualitative variables, frequency and percentage proportions were calculated.

Results:

The study sample was comprised of 11 cases of recurrent corneal erosion treated with PTK. The patient demographics and ophthalmic features are presented in Table: 1.The majority of patients were in the working age-group. Trauma was the leading corneal comorbidity that was the likely the underlying cause of recurrent erosion.

The median duration of follow up was 23

months (25% quartile, 17 months; minimum, 4 months and maximum, 105 months).

Of the 11 cases, recurrent erosion had healed at the last follow up visit in 10 eyes (89.9%; 95% confidence interval:73.9 – 100). One person had mild pain and one person had recurrent erosion for which repeat PTK was recommended.

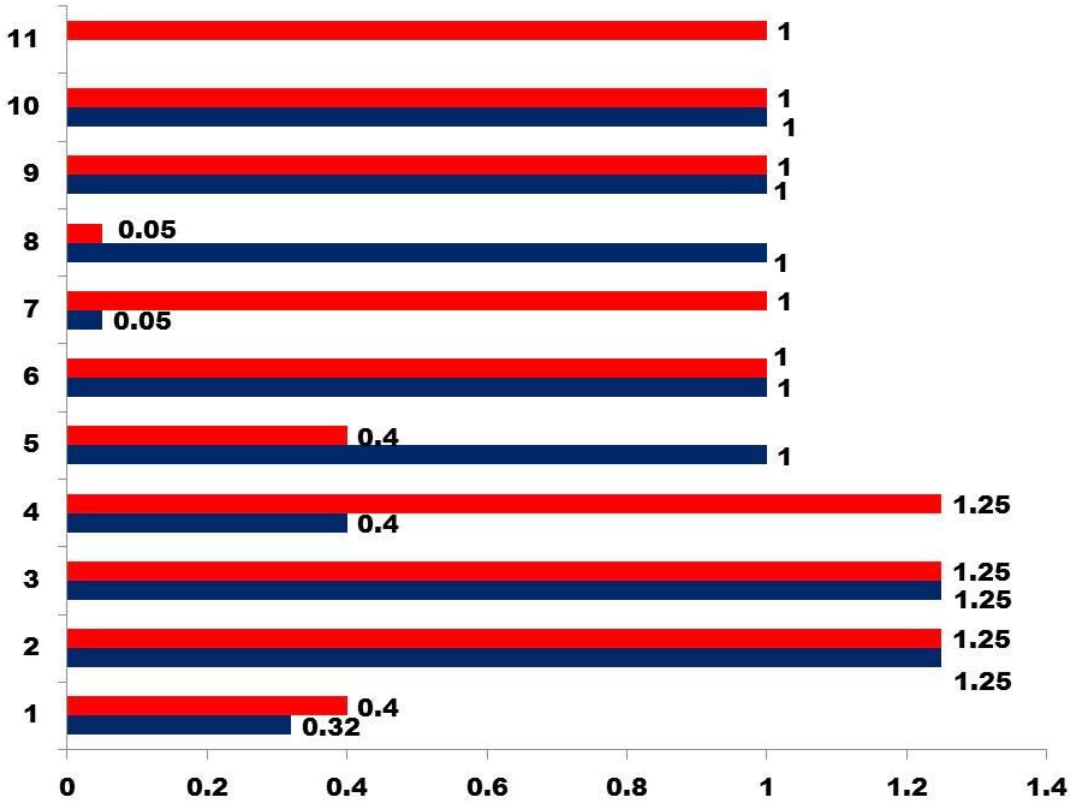
Preoperative vision and vision at last follow up visit for each case is presented in figure1. Vision improved in 3 eyes and remained unchanged in 5 eyes.Vision decreased in 2 eyes. In one eye, preoperative vision could not be noted.

One female patientwhose cornea did not respond to PTK had trauma as an underlying cause of recurrent corneal erosion and was followed out to 22 months postoperatively. Prior to intervention, this case had undergone antibiotic therapy, patching, bandage contact lens and lubricants.

Table 2 presents the outcomes of the current study and those from articles published in the previous five years.

Table:1 Demographics and ocular characteristics of patients with recurrent corneal erosion.

Qualitative variables		Number	Percentage
Gender	Male	6	54.5
	Female	5	45.5
Refractive status	Emmetropia	3	27.2
	Myopia	0	0
	Hyperopia	5	45.5
	Astigmatism >1D	1	9.1
	Missing	2	18.1
Corneal pathology	Trauma	5	45.5
	Salzmann nodule	1	9.1
	Post-surgical	1	9.1
	Leucoma	1	9.1
	Unknown	3	27.2
Quantitative variables			
Age	Median	33	
	quartile 25%	28	
	Minimum	18	
	Maximum	62	
Vision	Median	1.0	
	quartile 25%	0.4	
	Minimum	0.05	
	Maximum	1.25	



Discussion:

In this case series of PTK for recurrent corneal erosion, we noted excellent outcomes. We found good visual acuity outcomes postoperatively. However, some astigmatic changes may occur after corneal healing. Additionally, active infection seems to hinder the success of this intervention.

The success rate of corneal healing in the current study was tosimilar to previous studies enrollingdifferent populations[3,4,5]. The similar outcomes across diverse population samples could be due the stimulation of deeper layers of the epithelium induced by the laser energy that improves adhesion to Bowman's membrane and the removal of pathogens with the laser energy.

In nearly half of the study sample, ocular trauma was the underlying cause of recurrent erosion. Reidy et al[6] also reported a similar proportion of cases with trauma as an underlying cause.

Prevention of ocular trauma either by foreign body on cornea or surgical trauma can help mitigate the incidence of recurrent corneal erosion.

Hyperopic shift in eye with recurrent erosion following PTK is a known complication but generally transient in nature[7]. There were no cases of marked hyperopic shift but there were changes in the axis of astigmatism insome cases. This could be due to an inherent pathology rather the superficial corneal ablations in our study, which are less likely to cause deeper tissue changes.

There were some limitationsto this study. This case series enrolled a small sample size and a prospective study with large sample size is required prior to adopting PTK for recurrent corneal erosion into clinical practice.

Conventional approaches to treat recurrent corneal erosion by a general ophthalmologist could be effective but not as successful as PTK. However, the high cost of the laser needs to beconsidered before altering the clinical practice to manage this relatively rare condition. An option may be to refer cases to refractive surgeonswho could assist in managing recurrent corneal erosion.

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Figure:1 The best corrected visual acuity before and after phototherapeutic keratectomy for the treatment of recurrent corneal erosion.

X-axis is the best-corrected visual acuity (BCVA) in decimal notation

Y-axis indicates the case number.

Blue coloured bar denotes BCVA preoperatively and

Red coloured bar denotes BCVA at last follow up after phototherapeutic keratectomy.