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Evaluation of efficacy and safety of Trans PRK for the treatment of low to moderate myopia with astigmatism

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Abstract: *Background:* Transepithelial Photorefractive keratectomy (Trans PRK) is most commonly indicated in eyes which cannot undergo LASIK procedure due to inadequate corneal thickness (estimated residual stromal thickness beneath the flap after the ablation would have been less than 250 µm). Here no corneal flap is created and both epithelium and stroma are ablated in single procedure, decreasing overall treatment time and minimizing risk of corneal dehydration. Aim of this study is to evaluate efficacy and safety of Trans PRK for the treatment of low to moderate myopia with astigmatism, using the Alcon Ex 500 excimer laser. *Methodology:* This retrospective cohort study included myopic eyes (-1.0 to -6.0 D of myopia with -1.0D to -4.0D astigmatism). TransPRK was performed using Alcon Ex 500 excimer laser. Refractive results, predictability, safety, and efficacy were evaluated during the 3-month follow-up. *Results:* A total of 100 eyes of 50 consecutive subjects were studied. Mean UDVA was found to be 0.11 log mar post op 1 month and 3 months. At the end of 3 months 88eyes had grade 0 haze and only 12 eyes had 0.5 grade haze. No eye lost any number of preoperative CDVA in our study. *Conclusion:* Advanced surface ablation nomogram (TransPRK) for the treatment of mild to moderate myopia with astigmatism in eyes with thinner corneas, not suitable for LASIK procedure, was found to be safe, predictable and effective.

Keywords: Trans PRK, Myopia, Astigmatism

Introduction

Photorefractive keratectomy (PRK) is a surface ablation procedure which can correct myopia and myopic astigmatism. The procedure causes more postoperative pain, delayed epithelial healing, and stromal haze, when compared to Laser in situ keratomileusis (LASIK). [1-3] However, because of the flap-related complications of LASIK, surface ablation techniques are preferred by many surgeons [4]. There has been an increasing trend of employing PRK in surface ablation refractive surgery these recent years. PRK has shorter learning curve, lower surgical cost and lower risk for corneal ectasia [5].

Transepithelial PRK (TransPRK) has been established as a technique of PRK practiced worldwide for a few decades. It was introduced in late 1990s by Alio et al [5] to reduce the risk of conventional PRK which employed mechanical debridement prior to laser ablation [6-7]. In transPRK, ablation of the corneal epithelium and stroma is performed using an excimer laser rather than mechanical or chemical debridement techniques. Hence, it prevents flap-related complication as in laser assisted in-situ keratomileusis (LASIK) or mechanical debridement-related conditions such as stromal dehydration, uneven epithelial debridement resulting in rough stromal wound bed, Bowman's layer defect, an irregular anterior stromal surface, and retained islands of residual epithelium [8-9].

Material and Methods

In this retrospective, cohort study, included 100 eyes of 50 patients with myopia and myopic astigmatism who underwent TransPRK between March 2022 and August 2022. The study was ethically approved by the Ethics Committees of Local Institutional Review Board. A written informed consent was taken from all of the patients.

Inclusion Criteria were Phakic patients with low to moderate myopia (-1.0 to -6.0 D of myopia with -1.0D to -4.0D astigmatism) Spherical equivalent from -3.5 to -8D, healthy myopic patients 18 years or older. Vision correctable to at least 20/20 bilaterally. Refractive status to be stable for at least 1 year. Corneal pachymetry greater than 480µm. The estimated residual Stromal thickness after ablation would have been 300-350 µm. Prior to preoperative evaluation, hard (PMMA) contact lens discontinued for at least 3 weeks and soft lens discontinued for at least 3 days. Pupil diameter of equal or less than 7mm under scotopic conditions.

Complete Ophthalmologic Examination included uncorrected (UDVA) and corrected (CDVA) distance visual acuities, Manifest and cycloplegic refractions, slit lamp evaluation of the anterior segment and the fundus examination with IDO. Applanation tonometry and tear-film assessment was done. Preoperative refractive work up included combined Placido-Scheimpflug Imaging Based Topography System (SIRIUS), Ultrasonic Pachymetry. Prior to the surgery, proparacaine hydrochloride 0.5% eyedrops was instilled, eye was draped, and a lid speculum was placed between the lids. Eye was thoroughly irrigated with balanced salt solution (BSS). Epithelium and stroma were ablated in a single-step using the TransPRK nomogram.

After excimer ablation, a sponge soaked with mitomycin-C (MMC) 0.02% was placed on the stroma 10 s for each dioptre. The MMC was rinsed from the ocular surface and a contact lens placed on the cornea. Postoperatively, patients received moxifloxacin hydrochloride 0.5% eyedrop, artificial tears, oral diclofenac potassium and oral vitamin C. They were examined at 1d, 1wk, 1, and 3months, and as necessary. Epithelial healing was assessed on the slit lamp. After complete epithelial healing, BCL was removed and fluorometholone 0.1% eyedrop was given. Patients were encouraged to return for examination if vision deteriorated at any time after surgery.

Haze grading using the Fantes et. al system [10]

0 = no haze;
+0.5 = trace haze on oblique illumination;
+1.0 = corneal cloudiness not interfering with the visibility of fine iris details
+2.0 = mild effacement of fine iris details;
+3, +4 = details of the lens and iris not discernible.

Results

A series of 50 patients i.e.100 eyes who underwent TransPRK were studied over a period of 6 Months (March 2022 to August 2022). The results are analysed below;

Table-1: Various Parameters and Values	
Parameters	**Value**
No of Patients	50
Age(yrs) Mean	24
Gender	
- Male	20
- Female	30

Table 1 shows mean age was 24 yrs and male were 20 and female were 30 patients. Table 2 shows Mean UDVA was 1.08 and 0.11 post op 1 and 3 months. P value was found to be statistically significant.

Table-2: Mean vision Pre Op and Post Op with P value			
Parameters	**Preop**	**Post op 1month (p value)**	**Post op 3month (p value)**
Mean UDVA (logMAR)	1.08	0.11 (0.000)	0.11 (0.000)
Mean Spherical Equivalent	-3.732758621		

Table-3: Various Parameters Pre Op and Post Op			
Parameters	**Preop**	**Post op 1month (p value)**	**Post op 3month (p value)**
Mean CCT (microns)	506	421(o.ooo)	424.9(0.000)
Mean SimK1 (D)	43.95	40.34(0.000)	40.43(0.000)
Mean SimK2 (D)	45.11	41.08(0.000)	41.16(0.0000)
Mean Pupil (mm)	3.45	3.50(0.000)	3.67(0.007)

Table 3 Compares various variable pre op and post op 1 and 3 months. These were found to be statistically significant.

Table-4: Optical Zone and Treatment time	
Parameters	
Mean Optical Zone(mm)	6.41
Mean Treatment Time (ablation)	42.58 s

Table 4 shows mean OZ and Mean treatment time.

Table-5: Corneal Haze Post Op						
	Post-operative corneal haze grades					Total
	0	0.5	1	2	3-4	
1 Month	0	84	16	0	0	100
3 Month	88	12	0	0	0	100

Table 5 shows post op haze grading where at the end of 3 months none of the patients had grade 1 haze.

Discussion

In our study, we evaluated for safety, efficacy, and corneal transparency (haze) in the eyes, which underwent TransPRK. Postoperative corneal haze formation is a well-known complication of surface ablation techniques [11-12]. The degree of haze correlates clinically with the severity of symptoms. An important step in the evolution of surface ablation treatments is the introduction of MMC as an adjunctive therapy which was used to reduce the haze formation and hence played an important role in the resurgence of PRK.[13-14].

In our study we found that use of MMC reduced post op corneal haze. In myopic patients who had single-step t-PRK, Chen et al. reported that the one-step topography guided t-PRK with 1 KHz excimer laser (iRES, iVIS Technology, Taranto, Italy) provided safe, effective, predictable, and stable results with low pain and no visually significant haze [15]. This is comparable to our study.

In 49 eyes of 25 patients who underwent t-PRK Aslanides et al. reported that TransPRK provides promising results in the early post-operative period. Visual rehabilitation, re-epithelialization and pain were faster in the early post-operative period. In our study, the patients had faster epithelial healing and reported less postoperative pain and discomfort [16]. A study by Lee et al. compared conventional PRK, two-step t-PRK, and LASEK using Visx Star S3 and concluded that the postoperative pain, subepithelial opacity, and the BCVA were similar in the three groups regardless of the epithelial removal procedure [9].

No eye lost any number of preoperative CDVA in our study. Similarly, previous studies reported that no high myopic eye treated with single-step TransPRK lost 2 or more lines of CDVA [17-18]. In contrast, loss of two or more lines of CDVA have been reported in 15%, 2.7%, and 0.7% of high myopic eyes treated by mechanical PRK, LASEK, and LASIK, respectively [19-20].

Conclusion

Advanced surface ablation nomogram (TransPRK) for the treatment of mild to moderate myopia with astigmatism in eyes with thinner corneas, not suitable for LASIK procedure, was found to be safe, predictable and effective.

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Conflicts of interest: There are no conflicts of interest.

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