

Comparison between Transepithelial Photorefractive keratectomy (TPRK) and Alcohol assisted Photorefractive Keratectomy (PRK) .A retrospective study.

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Abstract

Purpose: To compare the postoperative visual outcome, patient comfort and safety after surgery between transepithelial photorefractive keratectomy (PRK) and alcohol-assisted PRK in two groups of patients.

Setting: Maharajahs Institute of Medical Sciences, Nellimarla, Andhra Pradesh, India

Design: Retrospective study.

Methods: Patients were randomized into two groups, one group of patients underwent transepithelial PRK in both eyes and second group of patients underwent alcohol-assisted PRK in both eyes. All surgeries were performed by single surgeon (Author) during a period of 6 months from January 2023 to June 2023. In all the patients aspheric treatments were planned with Custom Ablation Manager software and ablations performed with the Schwind Amaris system. Clinical outcomes were patient comfort, refraction, visual acuity. Paired t tests were applied for statistics.

Results: The study evaluated 100 eyes (50 patients) in each group. All patients completed 6 months follow-up. At 6 months, 99% of eyes in both groups achieved an uncorrected distance visual acuity (UDVA) of 0.1 logMAR or better. No eye lost 2 or more lines of corrected distance visual acuity (CDVA); 99% of transepithelial PRK eyes and 99% of alcohol-assisted PRK eyes were within ± 0.50 diopter (D) of the targeted refraction. The postoperative mean spherical equivalent was $+0.03 \text{ D} \pm 0.23 \text{ (SD)}$ and $+0.01 \pm 0.26 \text{ (SD)}$ respectively.

Conclusions: The CDVA, UDVA, and safety outcomes between transepithelial PRK and alcohol-assisted PRK were comparable. Transepithelial PRK is faster to perform and it is an all-laser procedure, which might be less stressful for the patient. Patients who underwent transepithelial PRK had less discomfort after surgery compared to alcohol assisted PRK patients who complained of discomfort for around two days on average after surgery.

INTRODUCTION

PRK is a well-established technique to correct low to moderate myopia and in patients with thin corneas who are not suitable for LASIK [1]. However, it is associated with postoperative pain and tendency to develop corneal haze [2]. Epithelium is removed prior to excimer laser by a variety of techniques such as with 20% alcohol and hockey stick spatula or epithelium brush. Hitherto PRK was preferred only in patients with low myopia as patients with moderate to high myopia tended to develop stromal haze after PRK. Application of Mitomycin C after stromal ablation significantly decreases stromal haze [3], allowing PRK to be done even for patients with moderate myopia. TPRK is a single-step, "no touch surgery" in which the epithelium and stroma are ablated in

one step without the use of any mechanical tools or chemicals [4]. Mitomycin C is also applied after TPRK .

DESIGN AND PURPOSE OF STUDY

This is a retrospective study done at Maharajah's Institute of Medical Sciences, Vizianagaram. The aim of the study is to compare the postoperative visual outcome including visual acuity and refractive error of patients who underwent TPRK and PRK. The study also assessed patient comfort in terms of intensity of pain and duration of pain following surgery. Informed consent was taken from all patients and data was anonymized for this study. The study evaluated 200 eyes of 100 consecutive patients with mild to moderate myopia (-2.0 to -6.0D) and mild astigmatism (0.0 to 2.5D) who underwent TPRK and PRK. All the Surgeries were done by single surgeon (MJSR) between January and June of year 2023 at Vizag LASER vision centre. All patients completed 6 months of follow up.

MATERIALS AND METHODS

PATIENT SELECTION

Inclusion criteria

All the participants in the study were between 18–40 years of age. The mean age of the patients who underwent TPRK was 22.8 ± 3.67 and patients who underwent PRK was 21.52 ± 2.54 . (Table 1) All had stable refraction for at least 6 months. The Refractive error was less than 6.00 diopters (D) of myopia with or without astigmatism which was less than or equal to 2.00 D. All the participants had adequate corneal thickness and only those participants whose residual stromal thickness after LASER ablation was more than 350 microns were included in the study. All the participants had corrected distance visual acuity (CDVA) of 6/12 Snellen's or better.

Exclusion criteria

Participants with severe ocular surface disease, keratoconus, cataracts or previous intraocular or corneal surgery were excluded. Participants with a history of glaucoma or posterior segment pathology were excluded. All the participants were advised not to use contact lenses at least two weeks prior to the procedure.

Preoperative evaluation

All patients underwent a complete eye examination including uncorrected distance visual acuity (UCDVA) and best corrected distance visual acuity (BCDVA) assessment, measured with Snellen's chart at 6 metres and converted to logMar scale for statistical analysis. (Table 2).

Intraocular pressure measurement was done with non contact tonometer (Nidek co Ltd) and slit lamp examination (Appasamy associates) was done to evaluate anterior segment. All the patients had dilated retinal evaluation with indirect ophthalmoscope.

Central corneal pachymetry and Scheimpflug based corneal topography assessment was done using Schwind Sirius +(Schwind eye-tech-solutions GmbH and Co KG)

SURGICAL TECHNIQUE

All procedures were done using the Schwind Amaris excimer laser (SCHWIND eye-tech-solutions GmbH & Co KG) by the same surgeon. (MJSR). For TPRK, ORK-CAM software module (SCHWIND eye-tech-solutions GmbH & Co KG) was used for automatic measurement of the amount of corneal ablation. In single-step TPRK, first, the cornea is ablated for refractive correction, then, additional ablation is done to compensate for the epithelial thickness (software default is 55 μ m). In PRK, a 8.5 mm well was placed on the central cornea and filled with ethanol 20% . After 30 s, the alcohol was absorbed using a small dry polyvinyl alcohol sponge and the loose epithelium was removed from the cornea. the stroma was ablated with laser immediately after epithelial debridement. The procedure after the ablation is same for both TPRK and PRK . Mitomycin C (MMC) 0.02% was applied to the stromal surface for 5 s per one diopter correction using a sponge. Cornea was then irrigated with BSS for 45 seconds and a Bandage contact lens was placed.

Postoperative evaluation

Slitlamp examination was done 1st post operative day and again on 5th day when bandage contact lens was removed. Next examination was done on 12th day, 30th day and 6 weeks after surgery. Visual acuity, IOP were checked on 5th day, 12th day, 30th day and 6 weeks after surgery. Patients themselves evaluated their maximum pain level in first 5 days following surgery with 0 being no pain, 1-5 mild, 6-10 moderate and 11 to 15 being severe pain.

RESULTS

Results are expressed as mean $\pm$ standard deviation. For determining statistical significance between both groups, the t-Test for independent samples were performed ($p < 0.05$ considered statistically significant). Postoperative results are summarized in Table 3.

DISCUSSION AND CONCLUSION

The two patient groups examined in our study were comparable in terms of preoperative characteristics and reflect the typical patient population seeking refractive correction. The main reason for accelerated epithelial healing and reduced pain in the TPRK group could be the smaller epithelial defect. In PRK the epithelial removal zone is larger than the ablation zone, which might delay reepithelialisation.

Visual recovery was achieved significantly faster in the TPRK group. At days 5 and 12, the mean monocular UCDVA was significantly better in the TPRK group than in the PRK group ($p < 0.001$), while six weeks after surgery both groups had achieved a comparable mean UCDVA of better than 1.0 ($p > 0.05$). Maximum pain level within the first 5 days after surgery revealed significantly less pain in the TPRK group compared to the PRK group ($p < 0.0001$).

The key findings of our study according to clinical results are that both treatments provide safe and effective refractive correction, TPRK is superior to PRK in terms of postoperative pain and visual recovery time. This study has several limitations mainly it is not a prospective study. Pain score was purely subjective and so not reliable, moreover a longer period of follow is required in such cases as post operative haze may develop later.

References

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Table 1.

	Tprk n=50	PRK n=50
AGE mean	22.8 ±3.67	21.5±2.54
GENDER		
Male	19	28
Female	31	22

TABLE 2.PREOPERATIVE VALUES

TPRK			
	Right eye	Left Eye	Both eyes
Refractive error(D)mean ± SD			
Sphere	4.71±1.43	4.71±1.50	4.71± 1.43
Cylinder	0.71±0.49	0.67±0.53	0.67±0.51
UCDVA	0.95±0.23	0.95±0.23	0.95±0.17
CDVA	0.03±0.08	0.03±0.09	0.03±0.09
PRK			
	Right eye	Left Eye	Both eyes

Refractive error(D)mean ± SD			
Sphere	2.23±1.20	2.14±1.33	2.19±1.33
Cylinder	0.98±0.66	0.88±0.58	0.90±0.59
UCDVA	0.61±0.34	0.61±0.34	0.61±0.30
CDVA	0.01±0.06	0.01±0.06	0.01±0.03

TABLE 3.Postoperative results

TPRK				PRK			
	Right eyes	Left eyes	Both eyes	Right eyes	Left eyes	Both eyes	P value
UCDVA							
Day 5	0.3 ± 0.07	0.3 ± 0.07	0.3 ± 0.07	0.3 ± 0.18	0.3 ± 0.18	0.3 ± 0.18	≤0.001
Day 12	0.0 ± 0.14	0.0 ± 0.14	0.0 ± 0.14	0.0 ± 0.12	0.0 ± 0.12	0.0 ± 0.12	≤0.001

6 weeks	0.0 ±0.09	0.0± 0.09	0.0± 0.09	0.0± 0.04	0.0± 0.04	0.0 ±0.04	≥0.05
Pain score	5.5 ±3.0	5.5± 2.7	5.5± 2.9	10.1± 1.1	10.1± 1.1	10.1± 1.1	≤0.0001