Original Article

Early Refractive and Clinical Outcomes of High Myopic Photorefractive Keratectomy as an Alternative to LASIK Surgery in Eyes with High Preoperative Percentage of Tissue Altered

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ABSTRACT

Objective: To assess the effectiveness of high myopic photorefractive keratectomy as an alternative to LASIK surgery in terms of early refractive and clinical outcomes in eyes with high preoperative percentage of tissue altered.
Study Design: Retrospective / observational study
Place and Duration of Study: This study was conducted at the Ophthalmology Department, Bahawal Victoria Hospital Bahawalpur from January 2018 to December 2018.
Materials and Methods: In this study 130 patients were included after getting informed consent from each patient. Medical records of 130 patients were studied in this study.PTA for LASIK surgery, PTA for photorefractive surgery, mean gain in visual acuity, was the outcome variables studied in this research.Postoperative follow up was planned at day 1, week 1 and week 6, month 3 and month 12 after the procedure, at each follow up CDVA, UDVA, slit lamp biomicroscopy and manifest refraction were evaluated at each follow up visit. On the other hand corneal topography was performed at follow up visit at six weeks, three and twelve months.The data was recorded and measured by the researcher himself. Data included age, sex, simulated average PTA , spherical equivalent, average keratometry, pachymetry, preoperative CDVA, actual average PTA with PRK (%), final SE within ±0.50D, final SE within ±1.00D, postoperative CDVA (Snellen decimal), postoperative UDVA (Snellen decimal), safety index, efficacy index, stromal haze.
Results: Actual average PTA was 30.88±2.29% in group-A, 32.25±1.86% in group-B, and 31.08±2.23% in whole cohort (p<0.001). Final SE, which was within ±0.50D of the expected SE, was achieved in 78 (80%) of group-A, 50 (75%) in group-B and 103 (79%) on the whole cohort (p=0.707). Final SE, which was within ±1.00D of the expected SE, was achieved in 90 (92%) of group-A, 58 (87%) in group-B and 118 (91%) on the whole cohort (p=0.511). Mean postoperative CDVA was 0.88 in group-A, 0.89 in group-B, and 0.88 in the whole cohort (p=0.001). Mean postoperative UDVA was 0.83 in group-A, 0.82 in group-B, and 0.83 in the whole cohort (p=0.689). Mean safety index was 1.047 in group-A, 1.046 in group-B, and 1.047 in the whole cohort (p=0.121). Mean efficacy index was 1.017, 1.018 and 1.017 in group-A, group-B and whole cohort, respectively (p=0.352). Stromal haze was observed in 10 (10%) of group-A eyes, 6 (9%) of group-B eyes and 11 (8.5%) of the total 130 eyes (p=0.901). Table-2
Conclusion: It can be concluded that photorefractive keratectomy is effective and safe in the treatment high myopia eyes thus it can be applied as safe alternative to LASIK in cases where there is risk of development of high ectasia due to high PTA score.

Key Words: Myopic Photorefractive, Keratectomy, LASIK, Ectasia

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INTRODUCTION

Excimer LASER refractive surgery leads to an increased rate of complication in patients suffering from high myopia [1]. There is a raised iatrogenic ectasia risk if LASIK (Laser assisted in situ keratomileusis) is used in high myopic patients[2]. Lately, percent tissue altered (PTA) value was declared as a strong indicator for post-LASIK ectasia risk, and PTA values>40% specifying high eyes ectasia risk using normal preoperative topography[3]. Preoperative topography if abnormal is itself a risking element, regardless of the PTA value. PKR is granted as more protective than LASIK in respect of iatrogenic ectasia risk[4]. Yet, there are many drawbacks of PKR in high myopia; it has

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been linked with reduced effectiveness, lesser predictability, and an increased stromal haze rate[5]. In high myopic photorefractive keratectomy, higher stromal haze rates can be attributed to the deep stromal ablation carried out[6]. Besides, a shorter diameter of ablation is a conventional hazard for stromal haze.

Faster rate of ablation, more advanced laser supply techniques and algorithms, best profiles of ablation, and exact eye tracking are being given by laser platforms of present generation[7]. Besides, the everyday appliance of mitomycin-C (MMC) has considerably reduced stromal haze forming rates[8]. However, refractive surgeons face a persisting photorefractive keratectomy challenge in patients suffering from high myopia. Photorefractive keratectomy in high myopic patients has been formerly examined by many large series (>100 eyes), using an older generation LASER platform[9]. As it came out to be secure and efficient, the result of photorefractive keratectomy was not contrasted to the photorefractive keratectomy result in low to moderate myopia. Not many studies have been performed on this topic in local settings that begs us to study the comparison between the two techniques of treating the high myopia. In this research, we assessed the effectiveness and security of the existing photorefractive keratectomy, using Wave Light® EX500 excimer LASER, in a big string of patients suffering from high myopia. Contrarily these patients would have a PTA>40% and, if operated using LASIK would be dealt with high risk for ectasia.

MATERIALS AND METHODS

It is a retrospective study. The study was carried out in Ophthalmology Department, Bahawal Victoria Hospital Bahawalpur. in the duration from 1st January 2018 to 31st December 2018. Study was conducted after taking the ethical approval. The reference study conducted by Nir Sorkin et al[22] was used to calculate the sample size. Consecutive (non probability) type of sampling technique was used. In this study 130 patients were included after getting informed consent from each patient. Medical records of 130 patients were studied in this study. Inclusion criteria were set as follows; eyes which had normal preoperative topography and underwent photorefractive keratectomy for > -6D the high myopia with at least three months of follow up, eyes which were defined as symmetric and regular patterns for instance, round, symmetric bowtie patterns or ovals or if eyes were mildly asymmetric based on if patients had expected PTA of more than 40 percent preoperatively and Placido disk analysis. Patient unwilling to participate, patients with systemic diseases such as diabetes, ischemic heart diseases and patients with low to mild myopia were excluded from the study. Every patient was examined preoperatively that included uncorrected distance visual acuity (UDVA) measurements and CDVA (corrected distance visual acuity) measurements, slit lamp biomicroscopy, cycloplegic and manifest refraction, pupillometry, applanation tonometry, pachymetry, corneal topography and dilated fundoscopy. Patients wearing soft contact lenses or rigid gaspermeable contact lenses had removed those 1 to 2 weeks before the preoperative examination. Out of the 130 patients whose records were studied, 98 underwent photorefractive keratectomy while 67 underwent LASIK surgery.

PTA for LASIK surgery, PTA for photorefractive surgery, mean gain in visual acuity, was the outcome variables studied in this research.All the photorefractive keratectomy procedures were performed by an ophthalmic surgeon with the experience of at least 5 years. Postoperatively 0.5% moxifloxacin 4 times daily for 1 week, 0.1% dexamethasone 4 times daily for 4 weeks and artificial tears were prescribed for several months. Postoperative follow up was planned at day 1, week 1 and week 6, month 3 and month 12 after the procedure, at each follow up CDVA, UDVA, slit lamp biomicroscopy and manifest refraction were evaluated at each follow up visit. On the other hand corneal topography was performed at follow up visit at six weeks, three and twelve months.

A designed performa was used to record the data regarding every patient. The data was measured and recorded by the researcher himself. Data included age, sex, simulated average PTA , spherical equivalent, average keratometry, pachymetry, preoperative CDVA, actual average PTA with PRK (%), final SE within ±0.50D, final SE within ±1.00D, postoperative CDVA (Snellen decimal), postoperative UDVA (Snellen decimal), safety index, efficacy index, stromal haze. Statistical analysis was done by putting the data in the computer software SPSS version 16. Qualitative variables were analyzed by taking their frequency and percentage while for quantitative variables mean and standard deviation was calculated. A one way ANOVA test was applied in case of multiple independent comparisons. P value <0.05 was taken as significant.

RESULTS

Total 130 eyes were examined. Of which 98 (75.4%) would have had PTA more than 40% with 110 micron LASIK and were designated as group-A while 67 (51.5%) would have had PTA more than 40% with 100 micron LASIK and were designated as group-B. Simulated average PTA was 43.11±1.71% with 110 micron LASIK while 42.07±1.27% with 100 micron LASIK (p<0.001). Mean age was 29.66±8.69 years of group-A while 31.22±8.36 years of group-B (p=0.252). Spherical equivalent was 8.12±3.09 D in group-A and 8.47±2.88 D in group-B (p=0.458). Average keratometry was 44.86±2.04 D in Group-A and 44.76±2.13 D in group-B (p=0.771). Pachymetry was 516.48±32.15µm in group-A and 513.72±31.46µm in group-B (0.585). Mean preoperative CDVA (Snellen

equivalent) was 0.85 in group-A while 0.83 in group-B (p<0.001). Table-I

Table No.1:

Factor	Group-A 110 micron LASIK (n=98)	Group-B 100 micron LASIK (n=67)	p-value
Simulated average PTA (%)	43.11±1.71	42.07±1.27	<0.001
Age, years	29.66±8.69	31.22±8.36	0.252
Spherical equivalent (D)	8.12±3.09	8.47±2.88	0.458
Average keratometry (D)	44.86±2.04	44.76±2.13	0.771
Pachymetry (µm)	516.48±32.15	513.72±31.46	0.585
Preoperative CDVA (Snellen equivalent)	0.85	0.83	<0.001

Table No.2:

Variable	PTA >40% with 110 micron LASIK (n=98)	PTA >40% with 100 micron LASIK (n=67)	Entire PRK cohort (n=130)	p-value
Actual average PTA with PRK (%), mean ± S.D	30.88± 2.29	32.25± 1.86	31.08± 2.23	<0.001
Final SE within ±0.50D, n (%)	78 (80%)	50 (75%)	103 (79%)	0.707
Final SE within ±1.00D, n (%)	90 (92%)	58 (87%)	118 (91%)	0.511
Postoperative CDVA (Snellen decimal)	0.88	0.89	0.88	0.001
Postoperative UCDVA (Snellen decimal)	0.83	0.82	0.83	0.689
Safety index	1.047	1.046	1.047	0.121
Efficacy index	1.017	1.018	1.017	0.352
Stromal haze, n (%)	10 (10%)	6 (9%)	11 (8.5%)	0.901

Actual average PTA was 30.88±2.29% in group-A, 32.25±1.86% in group-B, and 31.08±2.23% in whole cohort (p<0.001). Final SE, which was within ±0.50D of the expected SE, was achieved in 78 (80%) of group-A, 50 (75%) in group-B and 103 (79%) on the whole cohort (p=0.707). Final SE, which was within ±1.00D of the expected SE, was achieved in 90 (92%) of group-A, 58 (87%) in group-B and 118 (91%) on the whole cohort (p=0.511). Mean postoperative CDVA was 0.88 in group-A, 0.89 in group-B, and 0.88 in the whole cohort (p=0.001). Mean postoperative UDVA was 0.83 in group-A, 0.82 in group-B, and 0.83 in the whole cohort (p=0.689). Mean safety index was 1.047 in group-A, 1.046 in group-B, and 1.047 in the whole cohort (p=0.121). Mean efficacy index was 1.017, 1.018 and 1.017 in group-A, group-B and whole cohort, respectively (p=0.352). Stromal haze was observed in 10 (10%) of group-A eyes, 6 (9%) of group-B eyes and 11 (8.5%) of the total 130 eyes (p=0.901). Table-I

DISCUSSION

Comparison between conventional photorefractive keratectomy with Excimer laser platform and LASIK was performed in this study in treatment of eyes with high myopia and PTA greater than 40%. When results of this study were compared to the past it was seen that efficacy of photorefractive keratectomy is almost similar in all the studies[10-12]. Results of our study have shown that photorefractive keratectomy has a higher efficacy when compared to the results of the previous literature. This can be attributed the routine use of mitomycin-C (MMC) andto the innovation in the Excimer laser.In a recent study where they studied 77 eyes in which either PKR or LASIK were performed and results showed that 84.45 eyes had UCVA of 20/20 postoperatively or better [13]. This is in contrast to our study.

The results of this study show that PKR has predictability which is comparable to current high myopic LASIK as shown by the data review. UCVA data postoperatively was more improved in case of LASIK as compared to the PKR[14-16]. Even though efficacy of LASIK in curing the high myopia might be higher than PKR but the risk of development of ectasia is very high as there is deeper stromal alteration. PTA value of greater than 40% percent is considered as the risk factor to the development of ectasia. In this study no patient undergone PKR had a PTA value greater than 40%.

In previous studies PKR has been reportedly associated with the development of stromal haze but in this study stromal haze was reported in only 4.8% of the eyes and it was clinically insignificant. As compared to the previous literature this ratio is very low[17-19 and 10-12]. This can also be attributed to the use of MMC. Recent studies in which MMC was used with PKR, the ratio of stromal haze were reported in 3 to 12.12% of the cases [13, 20-22].

CONCLUSION

It can be concluded that photorefractive keratectomy is effective and safe in the treatment high myopia eyes

thus it can be applied as safe alternative to LASIK in cases where there is risk of development of high ectasia due to high PTA score.

Author's Contribution:

Concept & Design of Study:	Abdul Ghafoor
Drafting:	Mohammad Asad Faraz
Data Analysis:	Muhammad Jahan Zaib Khan
Revisiting Critically:	Abdul Ghafoor, Mohammad Asad Faraz
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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