

Assessment of contrast sensitivity in pre & post trans-epithelial photorefractive keratectomy

Abstract

Purpose: study was to compare the contrast sensitivity before and after Trans- PRK.

Methods: The comparative study was conducted in department of ophthalmology Medina teaching hospital Faisalabad. Total 30 myopic volunteers of both genders, with ages ranging from 20 years to 35 years, who had not undergone any ocular surgery or medical treatment for systemic or ocular diseases e.g. diabetes, Alzheimer's disease, glaucoma, macular degeneration, dry eye and cataract. Data was collected through non-probability convenient sampling technique from Sep 2018- May 2019. Data was entered in to SPSS version 20 and analyzed by using Paired sample t-test.

Results: Significant improvement was seen in contrast sensitivity after Trans-PRK 0.00 ($p < 0.005$) by paired sample t-test. Contrast sensitivity test before and after Trans-PRK of right and left eye showed mean of right eye -4.1533 ± 0.18678 and left eye mean -2.2167 ± 0.24378 respectively.

Conclusion: Our research concluded that, there is greater statistical difference between before and after Trans-PRK contrast sensitivity measurements. Contrast sensitivity improves after surgery significantly. Trans-PRK procedure is best method to correct refractive errors and removal of glasses and contact lens permanently with minimum chance of complications.

Keywords: contrast sensitivity, lasik, trans-prk

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Introduction

Refractive errors mean irregularity in shape of eyes to light correctly focus on retina that cause blurred and impaired image. There are following types of refractive errors myopia, hyperopia, astigmatism and presbyopia.

Symptoms include blurred image at different distances or asthenopia (red eye, headache, eyeache, discomfort and photophobia etc.¹ It can be treated by glasses, contact lenses and refractive surgeries.² Refractive surgery

is type of eye surgery used to treat refractive error to make patient free from their glasses and contact lenses. Most popular types are LASIK, LASEK, RK, PRK and Trans- PRK.³ LASIK was first introduced by Prof. Joaquim I. Barraquer. It is most famous type of laser eye surgery. Advantages include minimum post-op discomfort, more stability and predictable in high refractive error groups, minimum corneal haze and good

procedure with faster visual rehabilitation. LASEK is type of refractive surgery has some technical problems and longer time to perform than other procedures (PRK, LASIK).⁴ Trans-epithelial PRK is one of the types of laser refractive surgery. Excimer laser used to correct refractive errors by ablate the corneal epithelium to reshape cornea. It prevents need of mechanical removal of epithelium or epithelial debridement by using alcohol in process of PRK.⁵ Photorefractive Keratectomy (PRK) is a very useful, safe and effective technique used to treat refractive errors. PRK is more suitable for those who are not able to undergo LASIK due to thin cornea, epithelium basement membrane diseases and subtle topographical irregularities. Trans-epithelial PRK is a modified and another method of PRK using Amaris excimer laser. The quality of this technique is one step, non-touchy and minimum induced pain and trauma by

using excimer laser.⁶ Contrast sensitivity is distinguished minimum disparity in luminance of two objects.⁷

Contrast sensitivity is not similar to visual acuity. Visual acuity is spatial resolving ability of visual system of high contrast conditions, whereas contrast sensitivity is threshold contrast need to see target.⁸ Contrast Sensitivity can be tested by using different methods including letter optotype (Pelli-Robson) and Regan charts is sine wave grating (FACT). Pelli-robson is inexpensive and easy to use, less time required to perform.⁷ Many ocular conditions decreased contrast sensitivity such as cataract, diabetic eye diseases and glaucoma etc. Difficulty in night driving and differentiate different contrast objects are complaints in reduced contrast sensitivity. Patients are not comfortable with their correction. Therefore, contrast sensitivity is important for comprehensive assessment of daily vision. It should test routinely to assess small losses in vision and visual changes.⁹ Many patients achieved satisfactory vision after refractive surgery. But some patients are having best corrected visual acuity of 1.0 decimal (snellen 6/6 meter, LogMAR 0.0 and feet 20/20) but still complaints of blur vision and problem in night driving is due to reduced contrast sensitivity after PRK and LASIK.¹⁰

Methods

Comparative study was conducted at Department of Ophthalmology, Madinah Teaching Hospital (MTH) Faisalabad on 30 individuals with either gender or age ranging from 20-35 years. Duration of study was Sep-2018 to May-2019. Non-Probability Convenient sampling technique was used. Stable refractive error (myopia) from 6-months and not used contact lens from last 4 weeks were included in inclusion criteria and individuals with age less than 20 years and greater than 35 years, Ocular disease (Congenital anomalies of cornea and retina, keratoconus, keratoglobus, media opacity, aphakia, glaucoma and all

retinal diseases). Dry eye, Papilledema, Multiple sclerosis, Visual pathway lesions, Cataract, Diabetic ocular diseases, Trauma history, keratoplasty, scleral buckling, pregnant women due to unstable hormones were excluded in this study. After informed consent and extensive history visual acuity was checked by using LCD Snellen visual acuity chart

(HUVITZ HDC-9000 N) at 6-meter distance. Amount of refractive error were measured by using auto-refract meter (ARK-510A NIDEK) Contrast sensitivity measures by using Pelli- Robson chart. Before PRK procedure we were taken contrast sensitivity measurements by using Pelli- Robson chart at standard distance of 1-meter with their best correction. We were repeated procedure three times to reduce the examiner and patient error. This test was performed monocularly then binocularly. Note readings preoperatively and give follow-up time to patients. After 2-months follow-up, tested visual acuity then we tested contrast sensitivity by using Pelli-Robson chart at 1-meter standard

distance thrice monocular then binocularly and note readings to avoid examiner and patients' errors. Sample was divided in different age groups for ease. Data was analyzed by paired t-test by using latest version 20 of SPSS.

Results

The study included sixty eyes of 30 patients with ages ranging between 20-35 years (mean 25.73). Eleven (36.7%) subjects were male and nineteen (63.3%) females were included in this study. On the basis of refractive error (myopia) assessed all 30 patients pre-operatively and post-operatively. Comparison of pre-operative contrast sensitivity and post-operative contrast sensitivity shows that statistically significance 0.00(p<0.05) difference between pre-post photorefractive keratectomy result, Right eye pre and post PRK contrast sensitivity mean is -0.41533 ± 0.18678 and in left eye- 0.22167 ± 0.24378 (Figure 1).

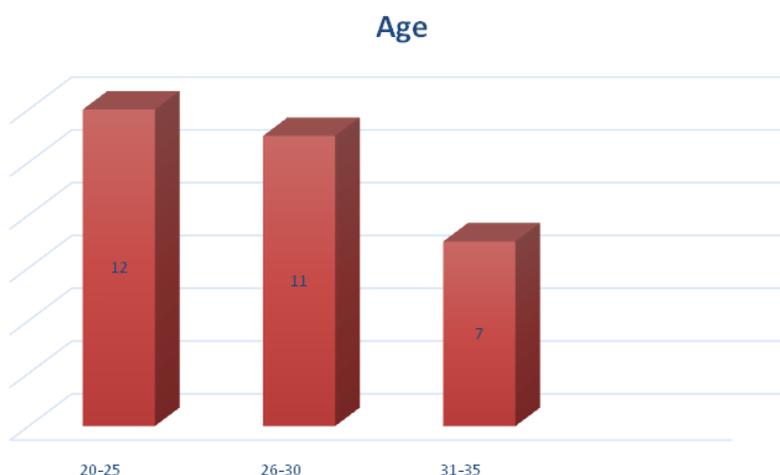


Figure 1 Bar chart showing rate of different age groups.

Figure 1 shows that, rate of different age groups. Age are divided in to three groups. 1st group included 20-25 year, 2nd group included 26-30 and 3rd included 31-35 year of age. Bar chart showing that total 12(40%) of patients are with age 20-25 years so group 1 has highest rate. Then 2nd group has highest rate because 11(36.7%) patients are with age ranging from 26-30 years then 3rd group very low number of patients only 7 (23.3%) were including in this study with age 31-35 years.

Table 1, show that, by using paired sample t-test there is highly significant result of contrast sensitivity (p=0.00) in both right and left eye pre-operatively and post-operatively. Contrast sensitivity of right eye means -0.41533 ± 0.18678 and mean of left eye -0.22167 ± 0.24378 . this is showed that contrast sensitivity significantly increased after PRK operation in both right and left eyes.

Table 1 Paired sample t-test determined significance of contrast sensitivity pre and post-operatively Trans-PRK

	Paired differences					T	df	Sig. (2-tailed)	
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
					lower				Upper
Pair 1	Contrast sensitivity of right eye pre-operatively and post-operatively	-0.4153	0.18678	0.0341	-0.48508	-0.34559	-12.179	29	0
Pair 2	Contrast sensitivity of left eye pre-operatively and post-operatively.	-0.2217	0.24378	0.04451	-0.3127	-0.13064	-4.98	29	0

Figure 2 shows the contrast sensitivity before and after Trans-PRK of right eye. This BAR chart shows that contrast sensitivity of right eye .41533±0.18678 before and after Trans-PRK procedure. Contrast sensitivity changed significantly after procedure. Contrast sensitivity increased after procedure 0.00 (P<0.05). Figure 3 figure shows that

contrast sensitivity before and after Trans-PRK. BAR chart shows that contrast sensitivity of left eye mean -.22167±0.24378 pre-operatively and post-operatively. Statistically contrast sensitivity increased after surgery.

BAR CHART OF CONTRAST SENSITIVITY OF RIGHT EYE PRE AND POST-OPERATIVELY

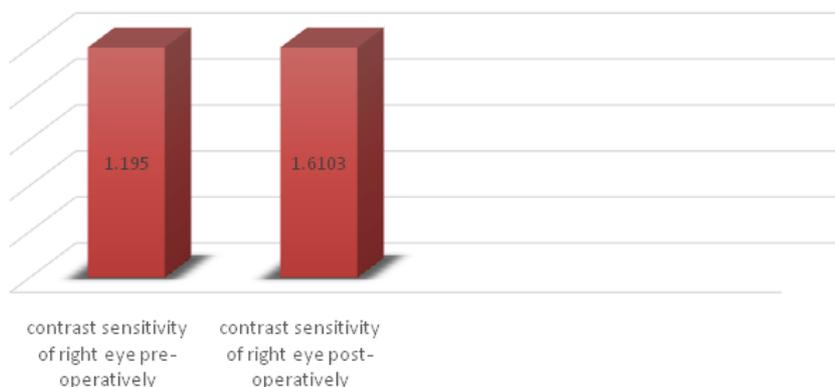


Figure 2 Bar chart determining contrast sensitivity of right eye pre-operative and post-operative Trans-PRK.

BAR CHART OF CONTRAST SENSITIVITY OF LEFT EYE PRE AND POST-OPERATIVELY

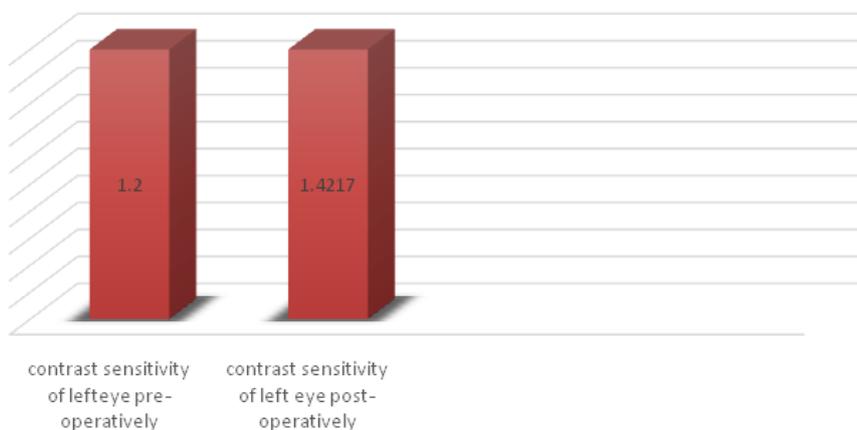


Figure 3 BAR chart determines contrast sensitivity of left eye pre-operative and post-operative Trans-PRK.

Discussion

Transepithelial PRK is modified form of PRK. Based on Amaris excimer laser it is more effective and safe method commonly used now a days. It causes minimum pain or trauma to eye as is one step and non-touchy technique. Contrast sensitivity is ability to detect object from their background of different thresholds. It is tested by different charts Pelli-Robson, VISTECH charts and FACT chart etc. Contrast sensitivity is important for daily visual task of different contrasts and most for night driving. Many patients have not satisfactory vision

until having a good visual acuity reason is reduced contrast sensitivity. Therefore, it is tested in routine eye examination especially after refractive surgery. In present research main objective was to

measure contrast sensitivity by using Pelli-Robson chart before and after Trans-PRK refractive surgery. And also compare the contrast sensitivity pre-operative and post- operative Trans- PRK Refractive surgery.¹¹

A prospective randomized study was carried out by Montés to evaluate the Efficacy, stability, safety and corneal high order abrasion and contrast sensitivity after both femtosecond LASIK and standard LASIK. 100 patients were undergoing procedures. By using results, he concluded that femtosecond LASIK more effective procedure because contrast sensitivity and VA is improving postoperatively. Our research also found a statistically significant result (p<0.05) that contrast sensitivity improved after Trans-PRK refractive surgery. Barreto carried out a research to compare contrast sensitivity

after wave front Lasik & wave front PRK for myopic and myopic astigmatic patients. Total 35 patients were tested. After statistical analysis results shows that contrast sensitivity increased after both procedures.¹² Our study describe that statistically contrast sensitivity increased after Trans-PRK 0.00($p < 0.05$). Results of this study strongly support that contrast sensitivity improved significantly after Trans-PRK. Kaiserman and their colleagues conducted study in 2004 to compare the contrast sensitivity in wave-front guided LASIK and standard LASIK.¹³ Results shows that contrast sensitivity improved. This study shows that contrast sensitivity improved after corneal refractive surgery. Mai concluded that after statistical analysis, the contrast sensitivity reduced after refractive surgery femtosecond laser INTRACOR procedure. Mai carried out study to evaluate the Contrast Sensitivity loss after femtosecond laser and conventional Lasik surgery.¹⁴ Results of this study shows that contrast sensitivity decreased more in femtosecond procedure. But our study demonstrate that contrast sensitivity significantly improved after trans-epithelial photorefractive keratectomy. A study was conducted by Applegate on assessment of visual performance and abrasions after radial keratotomy. After getting results they concluded that Radial keratotomy induced aberrations and loss in contrast sensitivity.¹⁵ However, our study Statistically by using paired sample t- test demonstrated that contrast

sensitivity improved significantly after Trans-PRK refractive surgery. Results of my study were not in favor of the study of Tomidokoro carried out on Corneal irregular astigmatism and contrast sensitivity after photorefractive keratectomy. Results show that corneal irregular astigmatism significantly affects the contrast sensitivity. It decreased contrast sensitivity after PRK. According to my study there is greatest statistical difference in contrast sensitivity between pre-operative and post- operative Trans-PRK Contrast sensitivity significantly 0.00 ($P < 0.05$) improved significantly after Tran-PRK.

Conclusion

We concluded that, contrast sensitivity improved significantly 0.00($P < 0.05$) after Trans-epithelial photorefractive keratectomy. Results of our study were statistically significant. It is best surgical procedure to correct refractive errors and remove the glasses, better technique to improve person cosmetic appearance with least chance of complications.

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Conflicts of interest

Authors don't have any conflict of interest and financial disclosure.

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