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ARTICLE

CONTRAST SENSITIVITY AFTER EXCIMER LASER PHOTOREFRACTIVE KERATECTOMY

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ABSTRACT

OBJECTIVES: *Evaluation of contrast sensitivity before and after excimer laser photorefractive keratectomy.*

METHOD: *A comparative cross sectional (analytical) study was conducted in the College of Ophthalmology and Allied Vision Sciences KEMU/ Mayo Hospital Lahore. A total of 34 patients of aged 20-32 years were selected. A self made proforma was filled related to contrast sensitivity evaluation after excimer laser photorefractive keratectomy with the help of Velorum Visual Acuity System (VVAS) on baseline week one (1) week 3 and on week 4 follow up. This study was conducted in October, November and December 2019.*

RESULTS: *Contrast sensitivity noted were pre-operative (2.65±0.664 %), after laser on week one (19.88±0.857 %), on week three (10.29±0.985) and on week four (5.94±0.556 %). As p-value is less than 0.05 (Kruskall Wallis test <0.001) it shows that there is significant difference between pre- and post-laser results.*

CONCLUSION: *Contrast sensitivity decreases after excimer laser photorefractive keratectomy, results shows significant difference even after four weeks.*

KEYWORDS: *Contrast sensitivity, Photorefractive keratectomy, PRK, Velorum Visual Acuity System.*

INTRODUCTION

Eye is the organ of a visual system. Eyes provide the living being vision - the ability to process and receive the visual signals from different stimulus; these signals stimulate the photoreceptors and converted into the electro chemical signals in neurons. The eye is complex optical system which collects light from surrounding environment and converts it into the form of an image. Eyes contain trillions of light cells known as Rods and Cones which are named for their unique shapes. Cones are responsible for colour vision and details and rods are responsible for night vision and peripheral vision.The goal of refractive surgery is to improve unaided vision in ametropic patients without the aid of spectacles and contact lenses.[1] For the rating of contrast sensitivity different charts are used like, Pelli Robson contrast sensitivity chart, Arden Grating, Cambridge low contrast gratings,[2] The Vistech printed charts and Velorum visual acuity system (VVAS). Velorum visual acuity system is used to evaluate all visual functions. Its suitable for researcher's because it is portable. All procedures are also getable but they are not easily portable.

Contrast sensitivity evaluation was introduced in 1956. It caters much more information about vision than Snellen visual acuity testing, because it determines how a patient could remain efficient in this varying environment which is enriched with the things of different shades, colors', size and brightness, some being too close and some too far, some objects have fine detail but some have a gross view. When signal in the form of light wave from all these images stimulate retinal photoreceptors cells where signals are transmitted to the brain, the end result is provided by the latter as sensation of world in front of us. Therefore to evaluate how one can function with efficacy in a complex environment, it is necessary to measure contrast sensitivity as a function of spatial frequency.[3]

Visual acuity testing using other standard clinical tests is fruitful but gives incomplete information about visual ability. Visual acuity testing gives information about the ability of a person to resolve very fine detail at high special frequency. It does not means that he or she can perform well in all environmental conditions. Real world is not always high contrast black and white. Person has to view in vision degrading condition such fog, humidity, bright, night, temperature, day time and so on. To assess the subtle changes in visual performance other aspects of visual performance like contrast sensitivity (and others) should be assessed.[4]

Contrast sensitivity decreases with age. It has been noted that from age twenties to onward contrast sensitivity decreases about 10% for each decade of life. Various other factors are involved in declining the contrast sensitivity. For example it may be decreased in myopia, similarly in Parkinson disease spatiotemporal contrast sensitivity it may be decreased. [5] Glaucoma[6] and diabetes are examples of diseases that affect retinal vasculature. The most common etiological factor for vision loss in diabetic patient is due to diabetic retinopathy. Early damages to retinal vasculature is main cause of lowering contrast, multiple sclerosis and other diseases that effects optic nerve may causes a decline in contrast sensitivity functions.[7]

This study evaluated the quality of vision through changes in contrast sensitivity after excimer laser photorefractive keratectomy, because the contrast sensitivity could be affected after laser due to multiple factors like corneal haze and remaining irregular astigmatism.

MATERIALS AND METHOD

Ethical clearance to conduct this Comparative cross sectional (analytical) study was obtained from the College of Ophthalmology and Allied Vision Sciences, King Edward Medical University, Lahore. This study was conducted from September to December 2019. A total of 34 patients were involved in this study, the contrast sensitivity measured with the help of Velorum Visual Acuity System (VVAS) preoperatively and postoperatively after one, three and four week follow up. The ethical sanction and informed consent was also obtained. All the data were collected with self made Performa. The dependent variables of this study were contrast sensitivity measured with Pelli-Robson test and the independent variables were gender, age, room illumination and testing distance. All the data were entered and analyzed using statistical package for social sciences (SPSS version 20.00). Quantitative variables refractive error and contrast sensitivity were entered.

RESULTS

Table : 1

Duration		N	Minimum	Maximum	Mean		Std. Deviation Statistic	P Value
		Statistic	Statistic	Statistic	Statistic	Std. Error		
Week 1	Contrast sensitivity	17	18	21	19.88	.208	.857	<0.001
Week 3	Contrast sensitivity	17	9	12	10.29	.239	.985	
Week 4	Contrast sensitivity	17	5	7	5.94	.135	.556	

This table shows the mean values of contrast at all three follow ups. The mean values of contrast on week one19.88±0.857 %, on week three 10.29±0.985 % and on fourth week follow up it were 5.94±0.556%.

DISCUSSION

Currently many surgical procedures are available for refractive error correction to correct moderate and high myopia. The earlier procedure for myopia like epikeratophakia is no more durable and accurate.[8] The traditional technique that offers moderate certainty is cryolathe myopic keratomileusis. But due to occurrence of irregular astigmatism after the procedure, its use has become limited.[9] After that a new technique had come that have minimized the complications and improved the results as compared to traditional technique. In modern era that advanced technology was in the form of in situ keratomileusis. But despite above all issues, excimer laser photorefractive keratectomy offers good results for low to moderate myopia, however, retroversion of effect, poor certainty, and corneal haze can occurs in case of high myopes.[10]

Our study shows a decrease in contrast sensitivity value after excimer laser photorefractive keratectomy surgery. The values of contrast sensitivity decreases on first, third and fourth follow up. The mean value of contrast sensitivity decreases on each follow up it means contrast sensitivity improves with the passage of time. It means that after PRK contrast improve on first third and fourth follow up and this is significant. Although there are low numbers of the patient in both case and control groups were low but at fourth follow

up show mean value of the contrast sensitivity near to control group but this difference is still significant. In cases all were taken who had gone through the PRK surgery, but in control group all were normal and had not gone through the surgery. The sample size in our study was small and there was time constraint as well. Larger studies should be conducted. In summary, our results showed that contrast sensitivity decrease after excimer laser photorefractive keratectomy but it goes on improving with the time after four weeks it reaches near normal values but still showed significant difference. Further studies on PRK effect on contrast should be directed.

CONCLUSION

The results show statistically significant decrease in contrast sensitivity after photorefractive keratectomy. Results show significant difference even after four week

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