Changes in Contrast Sensitivity in Patients after Laser in Situ Keratomileusis

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ABSTRACT

Purpose: To find the changes in Contrast-sensitivity in patients before and after Laser in situ keratomileusis (Lasik) surgery patients.

Methodology: After ethical approval this quasi experimental study was conducted from December, 2022 till August 2023. Patients planned for LASIK were included by convenience sampling. After informed consent, Visual acuity with Snellen chart was measured by asking the patient to cover one eye from 6 meter or 20 feet away, then patient read the letters of each row, the smallest row that the patient can read indicated the visual acuity in that eye. Refractive error was measured by using autorefractometer. Contrast-sensitivity was measured by using Pelli Robson-chart at 1 meter with their best refractive correction. Contrast sensitivity was recorded before and 40 days after surgery. Data was entered and analyzed in SPSS version 26. Statistical significance was checked by applying paired sample t test. P value of less than 0.05 was considered significant.

Results: This study included 45 individuals with mean age 25±5. Contrast-sensitivity of Right eye before-Lasik was 1.25±0.55 which increased to 1.62±0.59. Likewise, Contrast-sensitivity of Left Eye before-Lasik was 1.37±0.51 and 1.75±0.57 post operatively. The increase in contrast sensitivity was statistically significant (p=0.002).

Consultant: Contrast-sensitivity in all patients significantly improved after LASIK surgery. To enhance the cosmetic appearance of a patient with minimum possibility of complications LASIK surgery is the better method.

Key words: Contrast sensitivity, LASIK, Visual acuity.

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INTRODUCTION:

Refractive errors are irregularities in the shape of the eyes which prevent light from properly focusing on the retina, resulting in a blurry and distorted vision.[1] Refractive error is a condition in which from a distant object light is focused above and behind the retina.[2] Myopia, presbyopia, Hyperopia and Astigmatism are the types of Refractive errors. Blurry vision from distances and asthenopia (Eye ache, photophobia,

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discomfort, headache, red eye etc.) are the symptoms of Refractive errors. Refractive surgeries, contact lenses, glasses all are the treatment of refractive errors.[3]

With the passage of time various techniques for correction of refractive error have evloved.[4] LASIK, PRK, LASEK, RK and trans- PRK are the most common surgeries to correct refractive errors. Laser-assisted subepithelial keratomileusis (LASIK) is an important procedure for Refractive errors in 1998.[5] The working principle of Laser-assisted Subepithlial Keratomileusis (LASIK) is that the eye optical power can be altered by changing the Corneal Curvature.[6]

LASIK is becoming a more common surgical option for myopia, as seen by increasing number of procedures performed worldwide. A femtosecond laser can be used to form a flap that is subsequently folded back. Stromal tissue removed in myopic laser resulting in decrease in the eye's refractive power or flattening of the corneal curvature. Goal of surgery is to improve vision and decrease the use of spectacles or contact lenses.[7,8] Visual function and functional vision should be considered in the assessment of vision related abilities. Individual attributes heavily influence assessment processes. Visual functions tests can measure visual acuity, contrast sensitivity (CS), and depth perception. Each of these attributes represents a different component of visual function and can impact an individual's functional vision.[6]

Letter-optotype (Pelli-Robson) and Regan charts are the most common methods to measure Contrast-sensitivity with a sine wave grating (FACT). Pelli Robson is affordable, simple to use and requiring minimum time. When measuring a patient's contrast sensitivity, optometrist often use the Pelli Robson Contrast-sensitivity chart. This chart is best viewed from 1 meter, with the characters occupying 2.85 degrees of viewing angle. Testing at this distance is often to be beneficial for a wide range of patients.[9] Lasik become a successful and reliable method to reduce refractive errors. Many studies show that CS improves after Lasik.[10]

There are countless ocular conditions that decrease CS such as eyes with diabetes disease, cataract, glaucoma and many more. Driving at night problems and different targets are complaints in the reduction of CS. Patients are not satisfied with the spectacles correction. Therefore, Contrast-sensitivity is important for the assessment of daily-vision. Many patients attain satisfactory vision after LASIK, but few patients have best corrected visual acuity 6/6 but the complaints of blur vision and night driving difficulty is due to decreased Contrast-sensitivity (CS) after LASIK. Most of the research show that Contrast-sensitivity improved after LASIK. The capability of the LASIK to correct the vision quality consequently improved in contrast sensitivity.

METHODOLOGY

After ethical approval this quasi experimental study was conducted from December, 2022 till August 2023 at Amanat Eye Hospital, Lahore. On the day of data collection, subjects were selected by obtaining informed consent. After informed consent and extensive history, Visual acuity was measured by using Snellen Visual-acuity chart. Snellen visual acuity was measured by asking the patient cover one eye from a distance of 6 meters or 20 feet and read the letters of each line; the smallest line the patient can read indicated the visual acuity in that eye. Refractive error was measured using an autorefractometer. Contrast sensitivity was measured using a Pelli-Robson diagram at 1 meter with their best correction. The Pelli-Robson diagram measured contrast sensitivity by using a single capital letter. Contrast varies from high to low in the Pelli-Robson chart. Patients begin reading the letters with the highest contrast until they were able to read two or three letters in one group. The patients were given a score based on the contrast of the last two groups in which two or three letters were read correctly. Statistical significance was checked by applying paired sample t test. P value of less than 0.05 was considered significant.

RESULTS

This study included 45 individuals with mean age 25±5. Contrast-sensitivity of Right eye before-Lasik was 1.25±0.55 which increased to 1.62±0.59. Likewise, Contrast-sensitivity of Left Eye before-Lasik was 1.37±0.51 and 1.75±0.57 post

operatively. The increase in contrast sensitivity was statistically significant (p=0.002), Table 3.

Figure 1: Gender Distribution

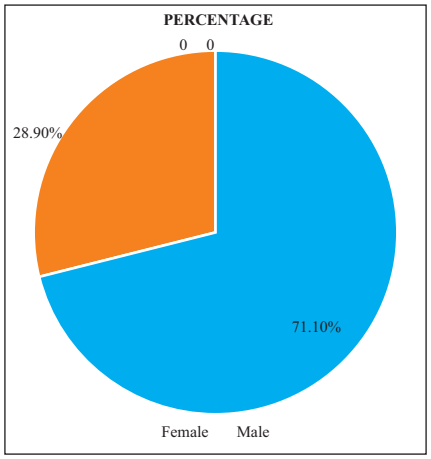

Table 1: Contrast Sensitivity in Right Eye

Contrast Sensitivity of Left Eye	N	Mean	Standard Deviation
Pre - Operative	45	1.25	0.55
Post- Operative	45	1.62	0.59

Table 2: Contrast Sensitivity in Left Eye

Contrast Sensitivity of Left Eye	N	Mean	Standard Deviation
Pre - Operative	45	1.37	0.51
Post- Operative	45	1.75	0.57

Table 3: Paired sample t-test of Right Eye before and after Lasik.

	Paired Differences					T	Df	Sig (2-trailed)
				95% confidence interval of the difference				
Contrast-sensitivity of right eye before - Lasik	Mean	Std. Deviation	Std. error mean	Lower	Upper			
Contrast-sensitivity of right eye after - Lasik	.37000	.74562	11115	59401	14599	3.329	44	0.002

DISCUSSION

We measured Contrast-sensitivity before and after operation. In a previous study by Hieda O. et al, 95 patients underwent LASIK. They concluded that Contrast-sensitivity did not decrease after-operation and the result was statistically significant (P<0.05).[11,12] In our study the sample size was 45 patients. We concluded that Contrast-sensitivity was not reduced after surgery and the significance result of our study was P<0.05.

Ashley Tuan K-M, studied changes of Contrast-sensitivity and Visual Acuity after LASIK. They conclude that Contrast-sensitivity improved in patients and optical quality of the eye also improved after LASIK. Student t-test showed a significance result as P was<0.05.[13] Our study conclude that Contrast-sensitivity improved after LASIK. Paired t-test shows a significant result of Contrast-sensitivity before-operatively and after-operatively was P<0.05.

In the study Jun W, studied the difference in Contrast-sensitivity before and after LASIK. They measured Contrast-sensitivity with BVAT. They concluded that Contrast-sensitivity was not reduced and remained same after LASIK.[14,15] Our research was based on that comparison of Contrast-sensitivity before and after LASIK. And our results show a significant increase of Contrast-sensitivity after LASIK.

Kim Wan T, et al. studied the Contrast-sensitivity after LASIK. The study consists of 149 patients. Contrast-sensitivity was measured with VCTS before and after LASIK. They show a significant result of Contrast-sensitivity after LASIK.[16] Our study was based on comparison of Contrast-sensitivity in before and after LASIK, our sample size was 45 patients. We conclude that Contrast-sensitivity was significantly improved after LASIK.

In the study Mutyala S. et al, studied the evaluation of Contrast-sensitivity after LASIK. This study involved 65 patients. They measured Contrast-sensitivity before LASIK and 1 week, 1 month and 3 months after LASIK. They concluded that LASIK had limited effect on Contrast-sensitivity for up to three months after surgery.[17] Our study showed that CS significantly increased after Lasik.

A study by Mahdy R, et al. compared the changes in CS after PRK and LASIK. Their study included fifty patients. Their age ranged from 18 to 40 years. Their CS was checked before and after one week,

one month and three months by with Pelli Robson-charts. They concluded that CS improved after LASIK and PRK.[18] Our outcomes of study were as CS increased after Lasik surgery.

Quesnel N-M, et al. conducted a study to saw the effect of Lasik on CS function for myopic patients. Thirty four volunteers with their age ranging from 18 to 50 years were included in their study. CS was checked before and after 1 to 9 months of Lasik. They concluded that after the Lasik surgery even with 20/20 VA their CSF was decreased.[19,20] Our study ended up with the results that CS improved after LASIK surgery.

In a study Chan J.W.W, et al. checked CS after Lasik in one year follow-up. Forty one patients were included in this study. There CS was monitored for 1 year of follow-up. They concluded in their study that Contrast-sensitivity decreased after Lasik surgery especially in higher myopia.[21,22] Our study showed that Contrast-sensitivity does not decrease after the Lasik surgery.

Our study was a single centre study with a short sample size. To overcome this limitation, we should do our research on large sample size with long duration of time.

CONCLUSION

Contrast-sensitivity was significantly improved after LASIK surgery. To enhance the cosmetic appearance of a patient with minimum possibility of complications LASIK surgery is the better method.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Baord / Ethical Review Board No. REC UOL 193.01.2024

Author Contributions: Ayesha Asif: Concept, Design, Data Collection

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Bilawal Yaseen: Data Collection, Literature Review

Hira Javed: Data Collection and Analysis

Ambreen Ziarat: Data Collection, Critical Review

REFERENCES

1. Khalil I, Anwar H, Noor H, Zahid M. Assessment of Contrast-sensitivity in before and after trans-epithelial photorefractive keratectomy. Adv Ophthalmol & Vis Sys.2020; 10(2):36-39.
2. Ahmed Z, AL Rasheed S, Alghamdi W. Prevalence of refractive error and visual impairment among school-age children of Hargeisa, Somaliland, Somalia. EMHJ.2020; 26(11) 1362-1370.
3. Zhu X et al. Comparison of after operative visual quality after SMILE and LASEK for high myopia. PLOS ONE. 2017; 12(8):1-12.
4. Hansraj R. Night vision of the after LASIK myope. S Afr Optom.2007;66(4) 141-149
5. Tahir H, Parry N, Brahma A, Ikram K, Murray I. contrast sensitivity-based orientation changes in refractive surgery patients. Ophthalm & Physiol Opt.2009; 29(3):363-369.
6. Mostafa E. Effects of flat cornea on visual outcomes after LASIK.J Ophthalmol.2015;1-7.
7. Salah-Mabel I et al. Anatomical and visual outcomes after LASIK performed in Myopic Eyes with the wave light Refractive Suite Alcon. J Ophthalmol. 2020;1-20.
8. Bennet C, Bex P, Bauer C, Merabet L. The assessment of visual function and functional vision. Semin Pediatr Neurol. 2019; 31:30-40.
9. Njeru S, Osman M, Angela M. The effect of test distances on visual Contrast-sensitivity measured using the Pelli Robson-chart. Trans. Vis. Sci. Tech.2021; 10(2):32.
10. Zhang J, Zhough Y, Tian L. Visual performance after Conventional LASIK and Wave front-guided LASIK with iris registration: Results at year 1 year. Int J Ophthalmol.2013; 6(4):498-504.
11. Agarwal S, Thornell E, Hughes P. Visual outcomes and higher order aberrations following LASIK on eyes with low myopia and astigmatism. Open Ophthalmol J.2018; 12:84-93.

12. Hieda O et al. Long-term course of Contrast-sensitivity in eyes after laser-assisted in situ keratomileusis for myopia. J Ophthalmol.2020; 68(12):2981-2984.

13. Kaiserman I, Hazarbassanov R, Varssano D, Grinbaum A. Contrast-sensitivity after wave font-guided Lasik. Ophthalmology.2004; 111(3):454-457.

14. Yamane N et al. Ocular High-Order Aberrations and Contrast-sensitivity after conventional Laser in Situ Keratomileusis. Invest Ophthalmol.2004; 45(11):3986- 3990.

15. Chan J.W.W, Edwards M, Woo G, Woo V. Contrast-sensitivity after laser in situ keratomileusis one-year follow-up. J of Cat & Refract Surg.2002; 28(10):1774-1779.

16. Mutyala S, et al. Contrast-sensitivity evaluation after laser in situ keratomileusis. Ophthalmology.2000; 107(10):1864-1867.

17. Heydarian S, Behrooz J, Vahabbi R, Jafarzadehpour E. The evaluation of yellow vs. blue color Contrast-sensitivity before and after LASIK. Iranian J Med Phys. 2007; 4(1):31-40.

18. Mahdy R, Saif M, Mohammad S. Comparative study of Contrast-sensitivity changes after laser in situ keratomileusis and photorefractive keratectomy in mild and moderate myopia. Geriatric Ophthalmol.2020; 3:81-85.

19. Sakata N, et al. Changes in Contrast-sensitivity Function and Ocular Higher Order Aberration by Conventional Myopia Photorefractive Keratectomy. Japanese J Ophthalmol.2007; 51:347-352.

20. Wang Z, Cheng J, Yang B, Long S, Wu D. Changes in Contrast-sensitivity functions after photo refractive keratectomy and laser in situ keratomileusis. Hong Kong J Ophthalmol.1997; 1(2):67-70.

21. Mico R, Charman W. Choice of spatial frequency for Contrast-sensitivity evaluation after corneal refractive surgery. J Refract Surg. 2001; 17(6):646-651.

22. Quesnel N-M, Lovasik J, Ferremi C, Boileau M, Ieraci C. Laser in Situ Keratomileusis for myopia and the Contrast-sensitivity function. J Cat & Refract Surg. 2004; 30(6):1209-1218.