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RESEARCH ARTICLE

EFFECT OF FLAT CORNEA ON VISUAL OUTCOME FOLLOWING LASIK: A PROSPECTIVE OBSERVATIONAL STUDY AT LASIK CENTRE IN NORTH INDIA

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ABSTRACT

Introduction: A trichobezoar is a mass of The relationship between preoperative keratometry (K) and visual outcomes in laser-assisted in situ keratomileusis (LASIK) has been studied in high myopia and hyperopia, but not in moderate myopia. Rao SK et al report increased under-correction in eyes with preoperative spherical equivalent (SE) of −10.0 to −11.9 diopters (D), and in eyes with flat corneas compared with steeper corneas. Williams LB et al, conversely, reported under-correction and loss of best spectacle corrected visual acuity (BSCVA) following hyperopic LASIK in eyes with steep corneas, compared with flat corneas.7Some refractive surgeons have expressed concern that a relatively steep postoperative cornea following hyperopic LASIK may reduce the quality of outcomes. However, published studies examining the association between postoperative keratometry and visual outcomes yield conflicting results. One possible reason for these conflicting findings is the covariance of postoperative keratometry with preoperative sphere. Specifically, higher levels of hyperopic correction typically result in steeper postoperative keratometry, but larger corrections (due to high preoperative sphere values) also tend to result in poorer outcomes, irrespective of keratometry. Therefore, to accurately assess how postoperative keratometry affects visual outcomes, an analysis must differentiate the effect of a large sphere correction from the effect of a steep postoperative cornea. However, studies with limited sample sizes may lack the statistical power to discriminate between these two effects, and most of the available published reports include fewer than 150 eyes. **Aims and Objectives**: To study the effect of flat cornea on the visual outcome following LASIK. **Material and Methods**: Our study was a Prospective observational study conducted at the LASIK centre at the Postgraduate Department of Ophthalmology, Govt. Medical College Srinagar. The study was conducted over a period of one and a half year on 89 patients (174 myopic eyes. The pre-LASIK examination included; assessment of uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA), slit lamp examination, biomicroscopy, non-contact tonometry, indirect opthalmoscospy, specular microscopy for measuring central corneal thickness and corneal topography. **Inclusion Criteria**: 1. Age >18 years. 2. A stable refraction change of less than 0.5 Diopters(D) in the last year 3. Preoperative cycloplegic spherical refraction between -1.00 D and -8.00 D of myopia and up to -3.00 D of astigmatism. 4. Preoperative best corrected visual acuity (BCVA) > 6/9. 5. Estimated residual thickness of the stroma of at least 250 µm after laser ablation with emmetropia being the goal in all cases. EXCLUSION CRITERIA: 1. Keratoconus or forma frustakeratoconus 2. Central corneal thickness < 450 µm. 3. Unstable refraction 4. Prior ocular and/or corneal surgery 5. Connective tissue disorder 6. Pregnancy and breast feeding 7. Severe dry eye disease. LASIK was done using the Moria One Use Plusmicro-keratome (MoriaSurgicals, France) that creates a flap of 9mm with an intended thickness of 100 micro meter with a nasal hinge. Subsequent laser ablation was done with the Carl Zeiss Meditec MEL 80 (Germany) Excimer laser. All eyes were treated using an identical method with optical zone diameter ranging from 6.00mm to 7.00mm.Corneal topography was performed on ATLAS (ZIESS) machine. Analysis of the topographic maps was done besides measuring the corneal keratometry (K) in the flat and steep axis. Pre and postoperative average K = (K flat + K steep)/ 2 was calculated.Patient were examined post-LASIK at third month and corneal keratometry was done. **Results:** Table-3: Effect of keratometry on spherical equivalent Group Mean Pre-LASIK Keratometry No. of Eyes Mean Spherical Equivalent Post LasikSpherical Equivalent A 40.12 35 -4.00 -0.75 B 44.00 118 -4.25 -0.25 C 45.50 21 -3.75 -0.25 Our study showed that Group A with mean pre-LASIK keratometry of 40.12D had mean postlasik spherical equivalent towards higher myopic side ie 0.-75diopter as compared to Group B and C with residual spherical equivalent of 0.-25diopter. **Discussion:** Our study showed that pre LASIK mean keratometry influences the visual outcome. The factors influencing the final visual outcome was attributed to the fact that eyes with pre LASIK flatter cornea(mean k 40.12 D), showed a tendency towards under correction as depicted in Table 3. We grouped eyes according to pre- LASIK keratometry and found that the post-LASIK spherical equivalent was towards higher myopic side in group A with mean pre LASIK keratometry of 40.12 D as compared to other groups despite mean pre LASIK spherical equivalent being comparable in all the groups. Our results were supported by many studies, Our study concluded flatter corneas have a tendency towards under-correction

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INTRODUCTION

The exponential growth of LASIK refractive correction makes it the most commonly performed refractive surgery in the world today. The combination of a lamellar dissection with the microkeratome and a refractive ablation in the bed with the excimer laser was first performed in rabbits by Pallikaris IG et al. (1990) in a modification of Ruiz's keratomileusis in situ. Buratto L and Ferrari, (1992) first performed this procedure in humans after inadvertently obtaining a thin resection with the microkeratome while performing a modification of Barraquer's classic keratomileusis using the excimer laser instead of the cryolathe to modify the corneal cap. LASIK is similar to PRK in that an excimer or ultraviolet laser is applied to the cornea to modify its radius of curvature. The difference is that in PRK the laser is applied directly to Bowman's layer, whereas in LASIK the laser is applied to the midstroma after a flap has been lifted from the cornea. The flap is replaced and adheres spontaneously, helped by the endothelial pump. In LASIK there is some degree of epithelial hyperplasia that causes regression of the effect, although to a lesser degree than in PRK (Chayet, 1998). No visually significant haze follows LASIK (Chang, 1998), but when the flap is too thin or is ablated accidentally with the laser, haze may occur. The optical principles are similar for PRK and LASIK. The latter is more effective and it is increasingly being used for lower corrections owing to its faster and less painful rehabilitation (Azar et al., 1998).

The relationship between preoperative keratometry (K) and visual outcomes in laser-assisted in situ keratomileusis (LASIK) has been studied in high myopia and hyperopia, but not in moderate myopia. Rao et al. (2001) report increased under-correction in eyes with preoperative spherical equivalent (SE) of −10.0 to −11.9 diopters (D), and in eyes with flat corneas compared with steeper corneas. Williams et al. (2008) conversely, reported under-correction and loss of best spectacle corrected visual acuity (BSCVA) following hyperopic LASIK in eyes with steep corneas, compared with flat corneas.[7] Some refractive surgeons have expressed concern that a relatively steep postoperative cornea following hyperopic LASIK may reduce the quality of outcomes. However, published studies examining the association between postoperative keratometry and visual outcomes yield conflicting results. One possible reason for these conflicting findings is the covariance of postoperative keratometry with preoperative sphere. Specifically, higher levels of hyperopic correction typically result in steeper postoperative keratometry, but larger corrections (due to high preoperative sphere values) also tend to result in poorer outcomes, irrespective of keratometry. Therefore, to accurately assess how postoperative keratometry affects visual outcomes, an analysis must differentiate the effect of a large sphere correction from the effect of a steep postoperative cornea. However, studies with limited sample sizes may lack the statistical power to discriminate between these two effects, and most of the available published reports include fewer than 150 eyes (Williams, 2008; Esquenazi, 1999; Ditzen, 1998; Jin, 2005; Cobo-Soriano, 2002; Tabbara, 2001).

Aims and Objectives

To study the effect of flat cornea on the visual outcome following LASIK.

MATERIALS AND METHODS

Our study was a Prospective observational study conducted at the LASIK centre at the Postgraduate Department of Ophthalmology, Govt. Medical College Srinagar. The study was conducted over a period of one and a half year on 89 patients (174 myopic eyes). We studied the effect of flat cornea on visual outcome after LASIK in moderate myopic eyes (-1.00 D to -8.00 D). A proper history regarding any ocular and systemic disease and use of contact lenses was taken. Patients using contact lenses were instructed to discontinue use of soft contact lenses two weeks and rigid contact lenses 4 weeks prior to pre-operative examination as well as before surgery to ensure refractive stability and true regression of corneal war page. The pre-LASIK examination included; assessment of uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA), slit lamp examination, biomicroscopy, non-contact tonometry, indirect opthalmoscospy, specular microscopy for measuring central corneal thickness and corneal topography.

Inclusion criteria

- Age >18years.
- A stable refraction change of less than 0.5 Diopters(D) in the last year
- Preoperative cycloplegic spherical refraction between -1.00 D and -8.00 D of myopia and up to -3.00 D of astigmatism.
- Preoperative best corrected visual acuity (BCVA) $\geq$ 6/9.
- Estimated residual thickness of the stroma of at least 250 µm after laser ablation with emmetropia being the goal in all cases.

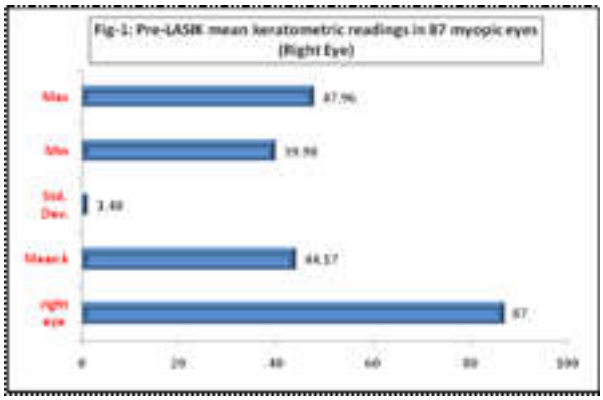
Exclusion criteria

- Keratoconus or forma frustakeratoconus
- Central corneal thickness < 450 µm.
- Unstable refraction
- Prior ocular and/or corneal surgery
- Connective tissue disorder
- Pregnancy and breast feeding
- Severe dry eye disease.

LASIK was done using the Moria One Use Plus micro-keratome (Moria Surgicals, France) that creates a flap of 9mm with an intended thickness of 100 micro meter with a nasal hinge. Subsequent laser ablation was done with the Carl Zeiss Meditec MEL 80 (Germany) Excimer laser. All eyes were treated using an identical method with optical zone diameter ranging from 6.00 mm to 7.00 mm. Corneal topography was performed on ATLAS (ZIESS) machine. Analysis of the topographic maps was done besides measuring the corneal keratometry (K) in the flat and steep axis. Pre and postoperative average K = (K flat + K steep)/ 2 was calculated. Patient were examined post-LASIK at third month and corneal keratometry was done.

RESULTS

In our study eyes there were 35 eyes with pre-LASIK keratometry of <42D in group A, 118 eyes with keratometry of 42-46D and 21 eyes with pre-LASIK keratometry of >46 D.



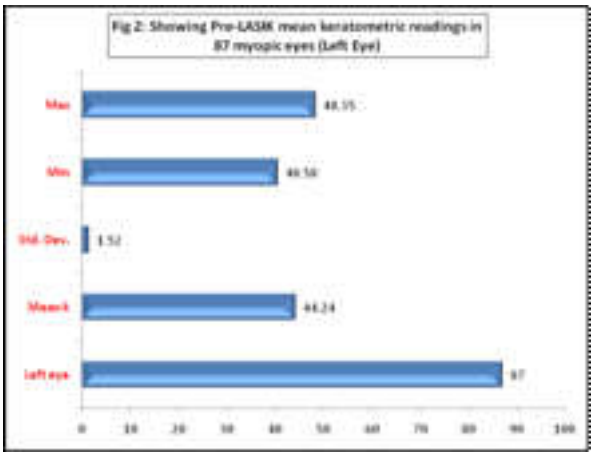


Table 1. PRE-LASIK Keratometry readings

Group	K-Reading	No. of Eyes
A	<42 D	35
B	42-46 D	118
C	>46 D	21

Table 2: POST-LASIK Keratometry readings

Groups	K-reading	No. of eyes
A-1	<35 D	15
B-1	35-39 D	47
C-1	>39 D	112

Table 3. Effect of keratometry on spherical equivalent

Group	Mean Pre-LASIK Keratometry	No. of Eyes	Mean Spherical Equivalent	Post Lasik Spherical Equivalent
A	40.12	35	-4.00	-0.75
B	44.00	118	-4.25	-0.25
C	45.50	21	-3.75	-0.25

Our study showed that keratometry significantly changed following LASIK. 15 eyes in Group A1 had <35 D reading, followed by 47 eyes in Group B1 with 35-39 D and >39 D readings in 112 eyes of Group C1. Our study showed that Group A with mean pre-LASIK keratometry of 40.12D had meanpostlasik spherical equivalent towards higher myopic sideie0.-75diopter as compared to Group B and C with residual spherical equivalent of 0.-25diopter.

DISCUSSION

Our study showed that pre LASIK mean keratometry influences the visual outcome.

The final visual outcome is dependent on many other pre and peri operative parameters like magnitude of myopia, keratometry readings, etc. The factors influencing the final visual outcome was attributed to the fact that eyes with pre LASIK flatter cornea(mean k 40.12 D), showed a tendency towards under correction as depicted in Table 3. We grouped eyes according to pre- LASIK keratometry and found that the post-LASIK spherical equivalent was towards higher myopic side in group A with mean pre LASIK keratometry of 40.12 D as comparedo other groups despite mean pre LASIK spherical equivalent being comparable in all the groups. Our results were supported by many studies, Mostafa, (1998) conducted a study to evaluate effect of preoperative and postoperative keratometry on the refractive outcome after LASIK for moderate and high myopia. Records of 812 eyes (420 patients) with myopia ≥ -6D who had LASIK were retrospectively analyzed. The refractive outcome among the different myopia groups was stratified by pre- and postoperative keratometry. A trend toward greater under correction was noted in eyes with preoperative keratometry<43.5D compared with those with steeper keratometry>46D in all myopia groups.

Conclusion

Our study concluded flatter corneas have a tendency towards under-correction.

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