Comparison between Standard LASIK and Customized LASIK for Correction of Refractive Errors

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Abstract

Aim: To compare the visual results between customized LASIK using the advanced customvue procedure (ACV) and standard LASIK. To assess if there is any difference in the corneal hysteresis and corneal resistance factors when using the microkeratome to make the flap compared to the femtosecond laser.

Materials and methods: 100 eyes were taken in the ACV group (group1) and 100 eyes for the standard group (group2). The visual acuities at 1 month post op were compared. The corneal viscoelastic properties were compared between femtosecond laser and the microkeratome.

Results: More patients in group 1 achieved a post op uncorrected vision of 6/5(60 to 36). More patients in group 1 gained lines from their preop best corrected vision. The viscoelastic properties decreased if either a microkeratome or a femtosecond laser was used to make the flap.

Conclusion: Customized Lasik when done and chosen with care gives better results than standard Lasik.

Introduction

Conventional Lasik are entirely based on the refractive error of the eye. Lasik is still evolving as a procedure and is getting more accurate. It is in this improvement that customized LASIK came into being. So Lasik not only corrected the lower order aberrations but also the higher order aberrations so that the patient had better vision. Though this technique promised a lot it did not deliver in the results. Earlier results showed no difference between customized LASIK and standard lasik when comparing just their visual acuity. This was thought to be due to inaccuracy in delivering the wavefront pattern calculated on to the cornea using the Zernike's calculation. Since the advent of the Fourier calculation this problem has hopefully been overcome. With this in mind we did a study to compare our results with customized LASIK with Standard LASIK.

Aims

To compare the results achieved with customized LASIK to those with Standard LASIK. To compare the changes in corneal hysteresis and resistance factor in eyes in which we used the femtosecond to make the flap to those eyes in which we used the microkeratome to create the flap.

Materials and Methods

This was a retrospective study. The Lasik patients were divided into two groups. Group 1 had 100 eyes which underwent customized LASIK and Group 2 had 100 eyes which had standard LASIK. The patients chose what type of correction they underwent unless the wave scan picture was poor. All patients underwent the usual LASIK work up. The vision achieved at 1 month was studied in both groups.

All patients had LASIK on a VISX Star 4 machine. The aberrometry measurements were taken on the wave scan using the Fourier analysis. All the measurements were taken by a single examiner. All the surgeries were done by two surgeons. The flap was cut with the femtosecond laser in some eyes and with the Moria microkeratome in others. All eyes that had any complication during surgery that could affect the vision were excluded from the study.

All eyes had their corneal hysteresis and corneal rigidity factor measurements before surgery and 1 month most operative. The eyes were divided into two groups depending on whether the femtosecond laser or the microkeratome was used. These groups were each divided into 3 sub groups depending on the amount of the corneal stroma ablated. Sub group 1 with less than 50 micron ablated, subgroup 2 with 51-100 microns ablated and sub group 3 with more than 100 microns ablated.

All the data were analyzed using the SPSS software system.

Results

Age

Group 1 had an average age group of 26.12 years (range 18-46yrs) and Group 2 had an average age of 25.25 years (range 19-41 yrs).

Sex ratio

Group 1 had 40 % Males and 60% Females. Group 2 had 45% males and 55% females.

Refractive error corrected

The average power corrected in Group 1 was -4.00D and in Group 2 was -3.69.

Visual acuity (Figure 1)

Group 1- 60 eyes achieved an uncorrected visual acuity of 6/5, 36 eyes had a visual acuity of 6/6, 3 eyes 6/9 and 1 eye 6/12.

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Group 2 – 36 eyes achieved 6/5 vision, 55 eyes achieved 6/6, 8 eyes 6/9 and 1 eye 6/12

The numbers that achieved 6/5 was statistically significant between the two groups (Chi –square test used p value less than 0.007). The visual acuity between those flaps which were cut with the femtosecond laser and those cut with microkeratome were compared in each group and there were no statistically significant difference.

More patients in group 1 gained one or more lines when compared to group 2

**Corneal viscoelastic properties**

Corneal resistance factor and the corneal hysteresis were compared between the femtosecond group and the microkeratome group. These were sub divided into 3 groups depending on the amount of cornea ablated. The first subgroup had less than 50 micron ablation, the second sub group between 50-100 microns and the third subgroup more than 100 microns ablated. The CH (Figure 3) and CRF (Figure 4) at 1 month showed a decrease in all the groups whether cut with a microkeratome or the femtosecond laser. The decrease was more when more cornea was ablated. There was no significant difference between the flaps cut with microkeratome or the femtosecond laser (using ANOVAs).

**Discussion**

The concept of correction of the individual aberrations is an advance in the LASIK surgery. This makes the procedure more customized. The aberrations due to the surgery cannot be corrected but correcting the aberrations that are present preoperatively definitely improves the chances of the patient to achieve his or her best potential vision. Though this was theoretically an excellent concept this could not be achieved due to the inability of the older Zernike’s calculation to exactly calculate the correction. This changed with the advent of the more accurate Fourier calculation. With this technique it is possible to give the patient his best potential acuity. This customized correction has an iris registration software that negates any error that occurs due to torsion of the eye on lying down. This is especially important in astigmatic correction, where a 2-4 degree torsion can change the results.
We found most of our ACV patients achieved 6/5 vision. We feel we could have achieved more patients with 6/5 acuity if we were more meticulous in capturing the pictures on the wavescan machine. It is very important to take very good pictures on the wavescan machine that fulfills certain criteria that are essential for good results. Selection of cases is also of paramount importance. Those who fall outside the refractive error limits for ACV should not be done. Those in whom you do not get readings with 0.5 D of the manifest refraction should also be denied this treatment. It is also important to see if the patient accepts the wavescan refraction when compared to their manifest refraction.

The main downside of the ACV is that it consume more corneal stroma per diopter correction and so cannot be used if eyes where we do not have enough residual bed.

The changes in the corneal viscoelastic properties were on expected lines. The thinner the cornea was made the more the changes were observed in the corneal viscoelastic properties. Our readings were at 1 month post op. We feel that the readings should be repeated 6-12 months post op to see if the cornea regains some of the lost elasticity. We found no differences in the viscoelastic properties of the cornea whether a microkeratome or a femtosecond laser was used but this again was only at one month follow up. The number of the femtosecond cases was less to get an accurate comparison. The visual acuity with the femtosecond laser was similar to that with the microkeratome. This was in contrast to the study by Tanna M et al who showed better visual results with the femtosecond laser.

The aberrations induced due to the flap making are a concern and hopefully future advances will take care of this problem.

The shortcomings of our study include a relatively short follow, lack of collection of data on the contrast sensitivity and the failure to check patient satisfaction.

Our study showed a definite better vision in the customized group compared to other studies which showed no difference in vision. On a longer follow up this might change. Ideally if one eye standard Lasik could be done and on the other eye of the same patient a customized Lasik is done it will be more accurate to compare for the patient and the observer but this may not practical since it will be difficult to convince the patient to undergo different procedures for either eye.

**Conclusion**

Though our study has certain drawbacks it shows better vision in the customized eyes at 1 month follow up using the Fourier method and this certainly merits further studies.

**References**


