



Total Corneal Astigmatism Correction With Limbal Relaxing Incisions Made by Femtosecond Laser System

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Introduction

- Femtosecond laser (FSL) technology utilizes the principle of photodisruption to generate a sequence of adjacent cavitation gas bubbles precisely focused in corneal tissue allowing the creation of stromal cuts with customized shapes, depths, dimensions and orientation.
- The use of the femtosecond laser in corneal surgery has allowed for the creation of customized intrastromal dissection planes, including planar intrastromal dissections (LASIK flap preparation), vertical and oblique intrastromal cuts (PK trephination, deep anterior lamellar keratoplasty), or a combination of both (top-hat or zig-zag-shaped PK trephination) and limbal relaxing incisions.

Purpose

- To evaluate the efficacy of Lensx femtosecond laser assisted limbal relaxing incisions in the treatment of total corneal astigmatism (TCA) and its effects on anterior (AA) and posterior (PA) astigmatism.
- To evaluate which patients respond best to limbal relaxing incisions with femtosecond laser assisted cataract surgery.

Methods

- Retrospective chart review.
- Eyes that underwent cataract surgery and astigmatism correction using the Lenx femtosecond laser system from September 2012 to December 2013.
- Limbal Relaxing Incisions (LRI) at 85% corneal depth were performed using an adjusted keratotomy LRI nomogram.
- Pre-op and Post-op total corneal astigmatism (TCA), anterior corneal astigmatism (AA) and posterior corneal astigmatism (PA) were all obtained with the use of the Oculus Pentacam topographer.
- Patient age and gender were also recorded.
- Patients with prior refractive surgery (LASIK or PRK) were excluded from our study.

Results

- 84 eyes (46 female and 38 male)
- Mean pre-op TCA 1.26D (SD 0.91) and mean post-op TCA 0.97D (SD 0.73), 23.02% decrease.
- Mean pre-op AA 1.14D (SD 0.91) and the mean post-op AA 0.93D (SD 0.74), 18.62% decrease.
- Mean pre-op PA 0.34D (SD 0.19) and mean post-op PA 0.35D (SD 0.2), 3.5% *increase*.

Total Corneal Astigmatism

- Higher percentages of correction in TCA correlated with higher amounts of pre-op TCA.
- The subgroup of patients with pre-op TCA > 1.50D (n=22), mean pre-op TCA 2.55D (SD 0.75), mean post-op TCA 1.58D (SD 1.09), experienced 38.08% decrease in TCA.
- The subgroup of patients with pre-op TCA < 1.5D (n=62), mean pre-op TCA 0.80D (SD 0.35), mean post-op TCA 0.75D (SD 0.38) experienced a 6.02% decrease in TCA.

Gender

- Male patients (n= 36, mean age 67.2 years) with mean pre-op TCA 1.22D, encountered a 41.8% decrease in TCA.
- Female patients (n=46, mean age 71.9 years) with mean pre-op TCA 1.30D encountered a 8.40% decrease in TCA.

Age

- Patients between the age of 61 and 70 years (n=44, mean pre-op TCA 1.37D) experienced 32.78% decrease in TCA.
- Patients between the age of 71 and 80 years (n=28, mean pre-op TCA 1.16D) experienced 11.66% decrease in TCA.

Conclusions

- FSL LRI's can correct preop astigmatism but further studies and nomogram refinement need to be completed.
- In our study the amount of preop TCA corrected with FSL LRI's was minimal to moderate.
- There is direct association of TCA correction with AA correction.
- No effect on posterior (PA) corneal astigmatism.
- Male patients, patients between the age of 61 and 70 years and patients with TCA $> 1.5D$ respond best to astigmatic correction with FSL limbal relaxing incisions.

Discussion

- FSL limbal relaxing incisions are fast, reproducible, precise and safe.
- In our study there was minimal to moderate effect in TCA correction with the use of FS LRI's.
- Further studies with larger cohorts are needed to validate our results.
- With further data and experience, a precise nomogram and more predictable algorithm for optimal surgical outcomes can be developed.

References

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