Topography-Guided Phototherapeutic Keratectomy For Irregular Astigmatism In A Post-Cataract Surgery Patient

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Purpose/Objective: To report the post-operative outcome of a topography-guided phototherapeutic keratectomy (PTK) for irregular astigmatism in a post-cataract surgery patient.

Methods: Case report

Case Summary: A year prior to consult, a 65 year-old female underwent an uncomplicated cataract surgery on the right eye. Patient completed all of her post-op medications and followed up regularly with her ophthalmologist at that time. During her follow-ups, her vision was unimproved and a corneal opacity was noted on the pseudophakic eye that was probably even present before her surgery. The patient was then referred to a cornea specialist in our institution. Best-corrected visual acuity (BCVA) was 20/20 for the left eye and 20/60 on the right eye. Slit lamp exam revealed an unremarkable anterior segment for the left eye but revealed sub epithelial fibrosis covering about a third of the superior aspect of the right cornea and partially involving the pupil.(Figure 1) This was confirmed with optical coherence tomography of the anterior segment. (Figure 1) Corneal topography was done and showed irregular astigmatism.[1] (Figure 2) Corneal wavefront aberration analysis, point spread function (PSF) and image simulation results were documented. Topography-guided PTK was then performed. No complications were reported and patient followed up regularly. Day 1 post-laser treatment, BCVA has already improved to 20/50 and finally after 7 weeks, improved to 20/30 +2 along with a significant resolution of the corneal opacity previously noted. Aberration analysis (Table 1), PSF (Figure 3) and image simulation (Figure 4) post laser treatment all showed a significant improvement compared with baseline.

Discussion: Excimer laser phototherapeutic keratectomy (PTK) has been found to be an effective treatment for a variety of superficial corneal disorders. Corneal surface irregularity, epithelial instability, and superficial opacity may all benefit from the procedure. It is considered a bridge between medical and surgical management of different corneal diseases and can be used for therapeutic and / or refractive indications. Visual improvement after PTK may due to reduction on scar density or removal of leukomas, as well as a reduction of irregular astigmatism. The main diagnosis and planning of PTK is based on clinical judgment, on slit lamp examination, and the amount of refractive error. Imaging techniques are used to plan and manage the postoperative outcome. Corneal topography helps in the planning and following up of patients after a PTK procedure. It also helps in correcting the pre-existing refractive error by the topography-guided laser treatment. This helps in reducing irregular astigmatism and improving visual acuity. Despite the PTK techniques available, treatment of irregular astigmatism remains suboptimal. New technology in which topographic data are incorporated directly into laser software will be helpful for the treatment of all types of astigmatism.

Conclusion: Phototherapeutic keratectomy is a safe and effective procedure in the management of superficial corneal diseases such as corneal scars, degenerations, and dystrophies. Topography Guided ablations may be utilized for difficult cases such as those with irregular astigmatism. Careful Pre-operative evaluation and regular post-operative examination helps in ensuring the best refractive outcomes.

Keywords: Irregular Astigmatism, Phototherapeutic Keratectomy, Corneal Topography, Higher order aberrations, Cataract

Table 1 : Pre & Post Operative Aberrations

ABERRATION	PRE OP	POST OP
OBLIQUE TREFOIL	-1.170	0.336
VERTICAL COMA	-1.087	1.035
HORIZONTAL COMA	0.294	0.651
HORIZONTAL TREFOIL	-1.072	-0.895
OBLIQUE QUATREFOIL	-1.135	0.315
OBLIQUE 2ND ASTIGMATISM	-0.333	-0.136
SPHERICAL ABERRATION	0.189	-0.095
WTR/ATR 2ND ASTIGMATISM	1.977	0.256
HORIZONTAL QUARTREFOIL	-0.412	-0.349

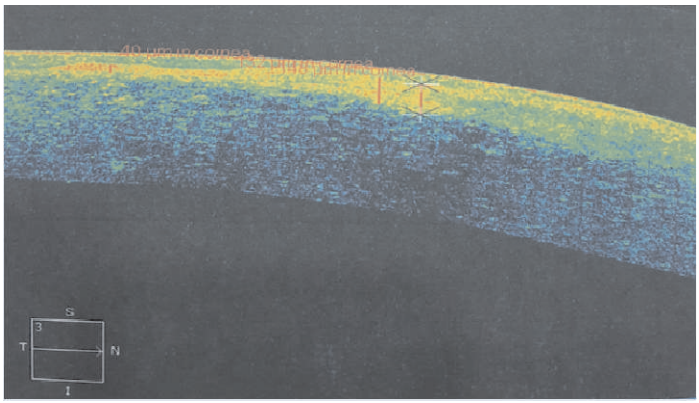

Figure 1 : Anterior segment OCT showing corneal opacity in superior third of cornea

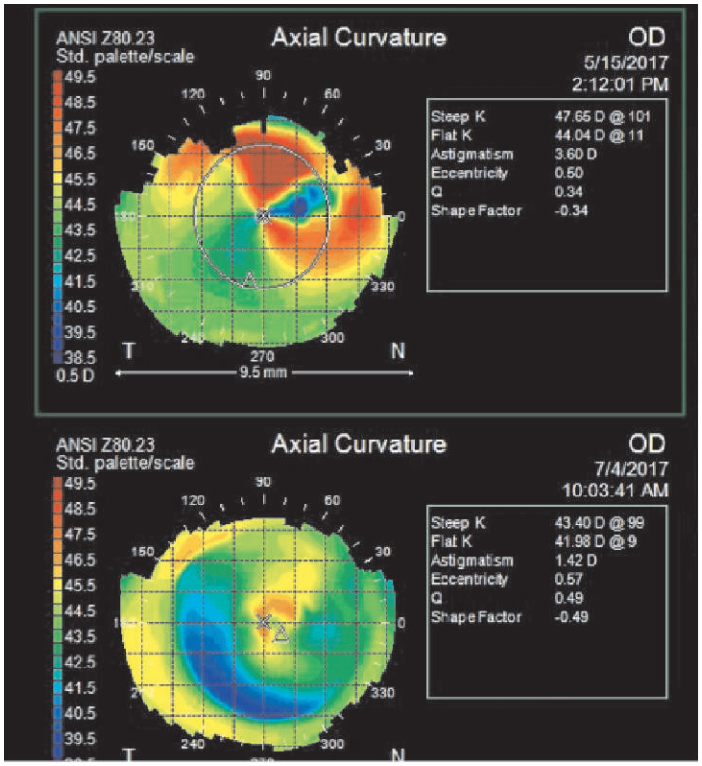

Figure 2 : Pre & Post operative corneal topography

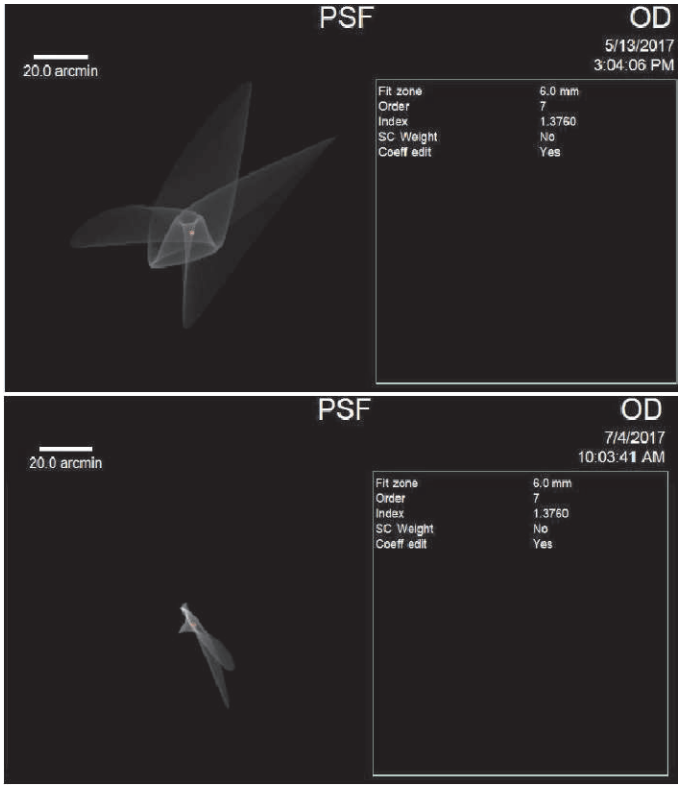

Figure 3 : Pre & Post Operative PSF (Point spread function)

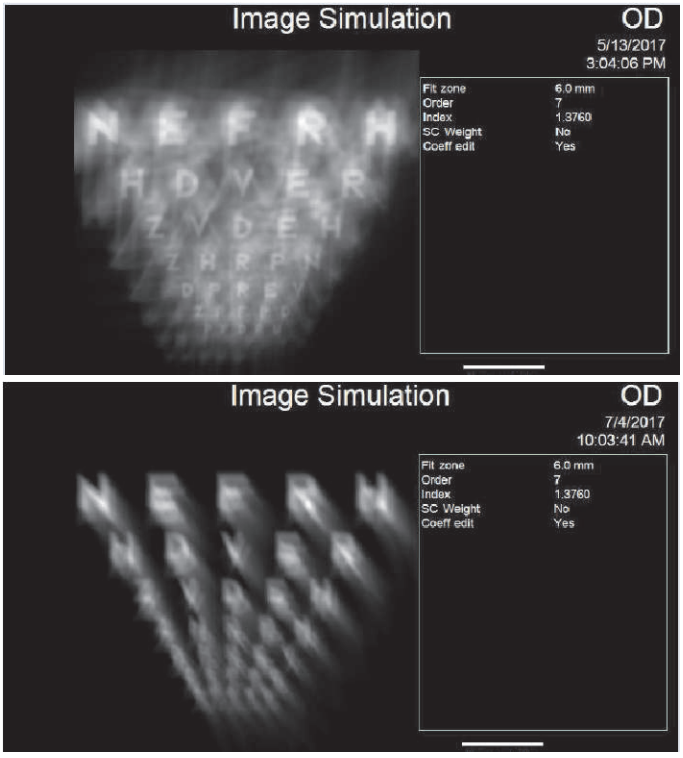

Figure 4 : Pre & Post Operative Image Simulation

References

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