

**Management of Post-LASIK Ectasia with
Combined:
Same-day, Topography-guided **Partial** PRK and
Sequential Collagen Cross-linking.**

Introduction.

- CXL in ectasia since 2003
- Topo-guided PRK following CXL
- tgPRK + CXL 2004
- The largest case series of post-LASIK ectasia that underwent (tgPRK) to reduce or eliminate induced myopia and astigmatism, followed by combined, same-day, sequential, UV-A corneal collagen cross-linking (CXL).

Bibliography

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Methods.

- 32 consecutive ectasia cases underwent partial PRK (Wavelight Allegretto) immediately followed by CXL (3mW/cm²) for 30 minutes using 0.1% topical riboflavin sodium phosphate.
- We analyzed UCVA, BSCVA, MRSE, keratometry, central ultrasonic pachymetry, corneal topography (Oculus Pentacam), and specular microscopy. Mean follow-up was 35.5 months (21 to 68 mo.)

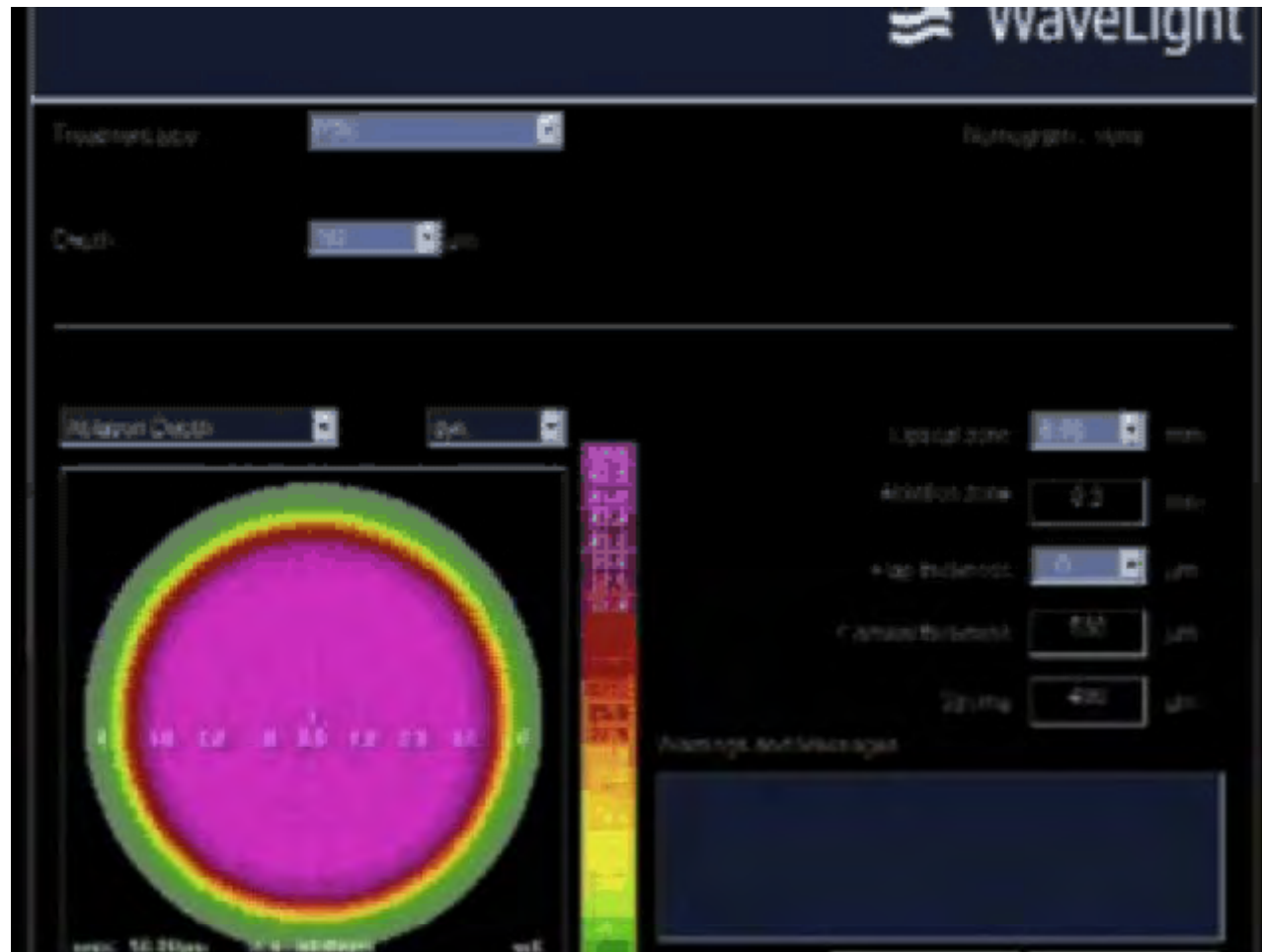
Surgical Technique

- **Step 1-The (partial, spherically corrected) topography-guided PRK technique:**
- We have devised this technique based on the proprietary Wavelight (Erlagen, Germany) customized platform. We have described previously the employment of the topography-guided platform with this device in order to normalize irregular corneas even ectasias²³⁻²⁵.
- This customized excimer laser treatment is guided by topography images, and is completely different than wavefront-guided treatments. As it has not yet received U.S. FDA approval.
- This proprietary software utilizes topographic data from the linked topography device (Topolyzer- Wavelight, Erlanger, Germany). By default, it permits the consideration of 8 topographies (of pre-determined threshold accuracy), averages the data and enables the surgeon to adjust the desired post-operative cornea asphericity (chosen as zero in all cases), the inclusion, or not, of tilt correction (no tilt was chosen in all cases), as well the adjustment of sphere, cylinder, axis and treatment zone (OZ of 5.5 was chosen in all cases). The image of the planned surgery is generated by the laser software^{20, 21}.
- We used the topography-guided PRK to normalize the cornea, by reducing irregular astigmatism while treating part of the refractive error. To remove the minimum possible tissue, we decreased the effective optical zone diameter to 5.5 mm (compared to our usual treatment diameter in routine PRK and LASIK cases of at least 6.5mm). We also planned ~70% treatment of cylinder and sphere (up to 70%), in order not to exceed 50 microns in planned stromal removal. The value of 50 microns was chosen arbitrarily by the surgeon, based on his experience with this platform treating irregular corneas.
- Following the placement of an aspirating lid speculum (Rumex, Florida, USA) a 6.5mm, 50 micron PTK was performed in order to remove the cornea epithelium. Then the partial topography-guided PRK laser treatment was then applied. A cellulose sponge soaked in mitomycin-C 0.02% solution was applied over the ablated tissue for 20 seconds followed by irrigation with 10 ml of chilled balanced salt solution.

Surgical Technique

- **Step 2-Collagen Cross-linking (CXL) Procedure**
- For the next 10 minutes, 0.1% riboflavin sodium phosphate ophthalmic solution (Priavision, Merlo Park, CA) was applied topically every 2 minutes. The solution appeared to “soak” in the cornea stroma rapidly, as it was centrally devoid of Bowman’s membrane. Following the initial riboflavin administration, 4 diodes, emitting ultraviolet light of about 370 nm wavelength (365 to 375nm) and 3mW/cm² radiance at 2.5cm was projected onto the surface of the cornea for 30 minutes (Keracure prototype device; Priavision, Menlo Park, CA, after which a bandage contact lens was inserted. A “).. The Keracure device has a build-in beeper alerts clinicians every 2 minutes during the 30 minute treatment in order to install the riboflavin solution in a timely fashion. A bandage contact lens (was placed on the cornea at the completion of the 2 combined procedures.
- After the CXL, topical Ofloxacin (Allergan, Inc., Irvine, CA) was used four times a day, for the first 10 days and prednisolone acetate 1% (Pred Forte, Allergan, Irvine, CA) was used four times a day, for 60 days. Protection from all natural light with sunglasses was encouraged along with oral 1000mg of Vitamin C daily for 60 days post-op. The bandage contact lens was removed at ~day 5 following complete re-epithelialization.
- All cases were evaluated before and following both treatments for age, sex, UCVA, BSCVA, refraction, keratometry (K), topography, pachymetry, endothelial cell counts (ECC), cornea haze on a scale 0-4: (0=clear cornea, 1=mild haze, 2=moderate haze, 3=severe haze and 4=reticular haze (obstructing iris anatomy)), and ectasia stability as defined by stability in mean keratometry and topography.

Video



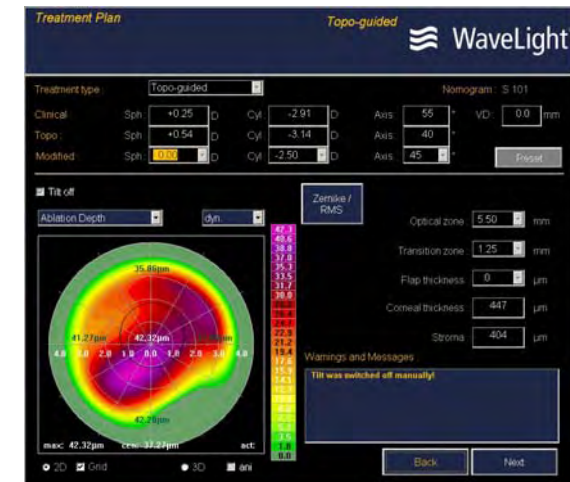
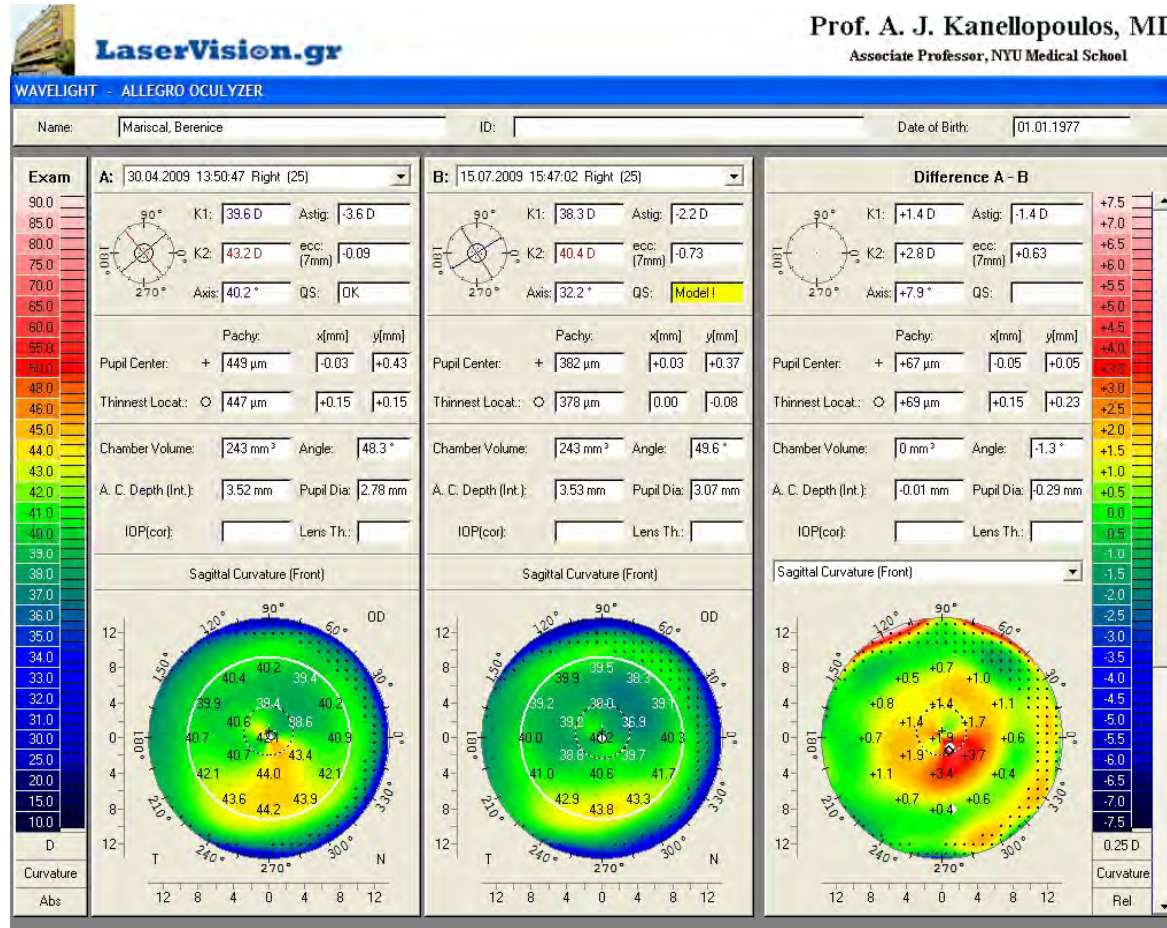
Results.

- **27 of 32** eyes had an improvement in their UCVA and had a BSCVA $\geq 20/45$ at the last visit. 4 eyes showed some topographic improvement but no improvement in BSCVA. One of the treated eyes required a subsequent cornea transplant.

Case 1

- This 32y/o female underwent LASIK in both eyes in nov 2005 for a refractive error of -3.75 In the OD and -4.00 in the OS. No other data were available in regard to the surgery. The vision was good for 2 years and then started to deteriorate. Her treating surgeon diagnosed post LASIK ectasia in dec 2007.
- We first evaluated the patient in april 2008. The UCVA was 20/50 in the OD and 20/20-2 in the OS.
- The BSCVA was 20/20 with -0.25 -3.25@ 45 and 20/15 with + 0.50 -1.25 @100 respectively. The keratometry readings were 39.25 43.25 @ 136 and 38.75 and 40.75 @ 65 respectively. The pachymetry readings were 445 um and 460 um respectively. The diagnosis of post-LASIK ectasia was confirmed by Pentacam maps in the OD (figure). The tgPRK/CXL was performed in may 2008 in the OD.
- The planned correction was Plano -2.50 @45 after a 6mm in diameter, 50 um n depth PTK. 0.02% MMC in a moistened weck-cell was used after the ablation and onto the stroma for 20 seconds. In January 2010 (20 months following the treatment) the UCVA was 20/25, the BSCVA was 20/20-1 with - 0.25 – 0.75 @ 141. Keratometry was 38.75 and 39.75 @ 125. Pachymetry was measured at 395 um. The difference map of pre and post treatment is noted in figure
- The endothelial cell count was unchanged at 20 months (2650 to 2600)
- The cornea OCT image of pre and at 20 months is seen in figure as well.
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US patient Difference pre- post- and treatment plan



OCT pre and 20 months post

Patient: Berenice MARISCAL
DOB (age): 01/01/1977 (33)
ID:

Disease: ECTASIA
Algorithm Version: A4, 0, 0, 143
Gender: F

Photographer:
Exam Date: 04/10/2009
Physician:

OD CL - Line SSI = 29.9 6.00mm Scan Length



of Averages: 9



Diagnosis:

Report Date: Monday January 18 18:44:13 2010

Patient: Berenice MARISCAL
DOB (age): 01/01/1977 (33)
ID:

Disease: ECTASIA
Algorithm Version: A4, 0, 0, 143
Gender: F

Photographer:
Exam Date: 07/15/2009
Physician:

OD CL - Line SSI = 30.3 6.00mm Scan Length



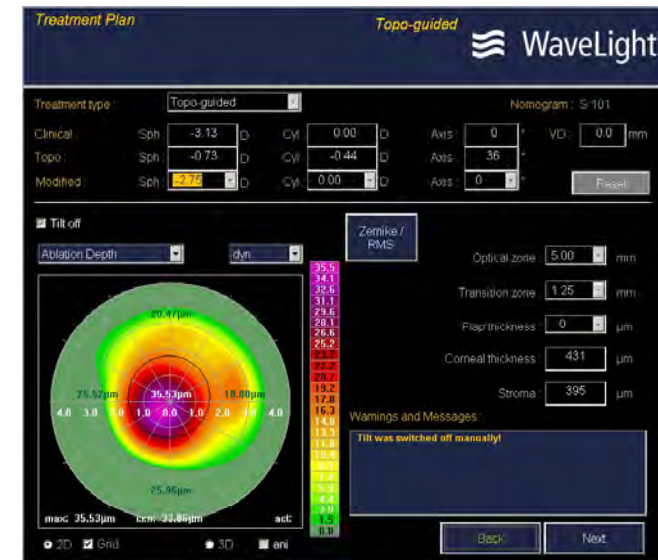
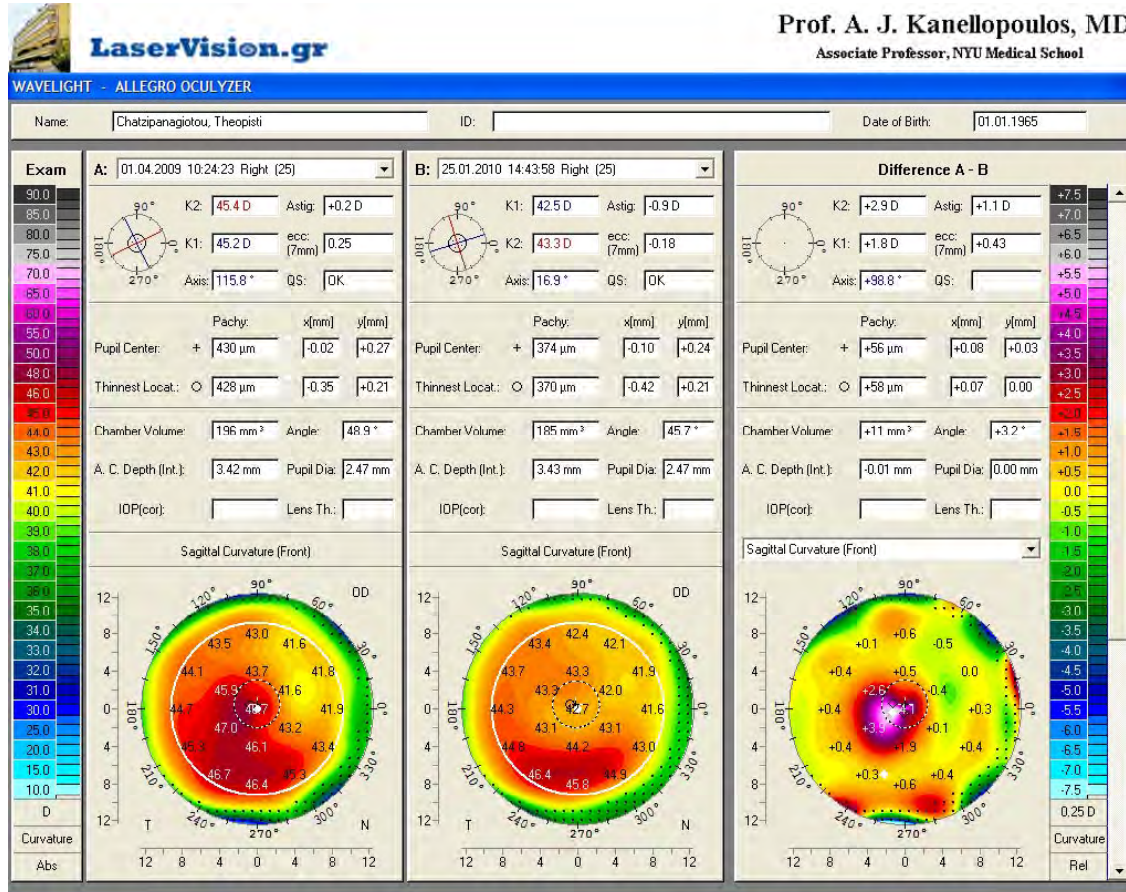
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Diagnosis:

Report Date: Monday January 18 18:41:13 2010

Case 2 OD

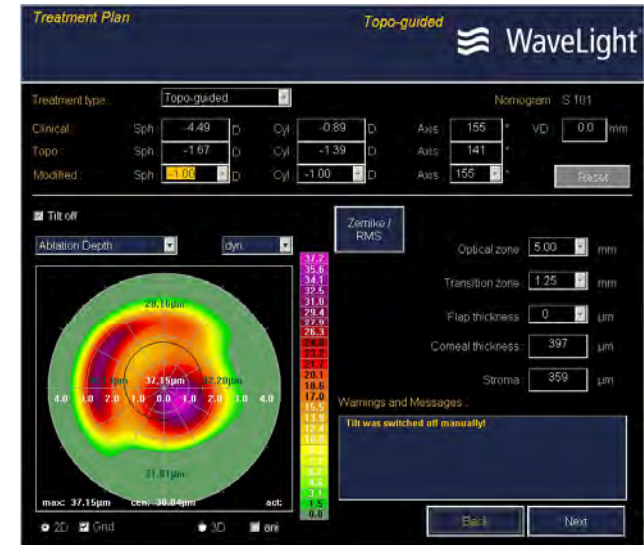
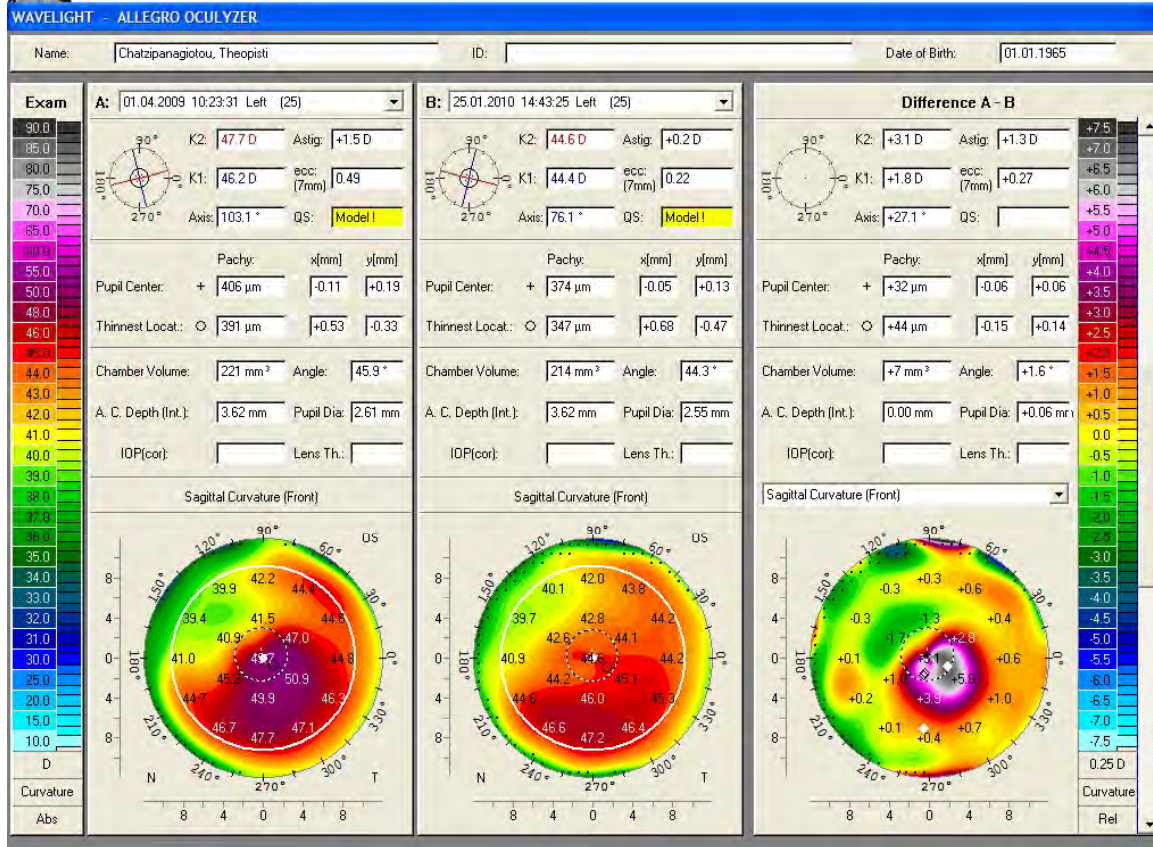


Case 2 OS



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Conclusions

- The same day tgPRK/CXL approach appeared to halt ectasia progression, and appeared to improve the UCVA and BSCVA by reducing myopic and irregular astigmatic refractive errors in the majority of eyes that are usually severely handicapped following the development of iatrogenic ectasia.
- **We strongly recommend this alternative to transplant surgery**

Thank you

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