

Topography Wavefront Enhancement of Previous Corneal Refractive Surgery



By Dan Reinstein, MD

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Dr. Reinstein combines his post-doctorate fellowship sub-specialty training in cornea and refractive surgery, ophthalmic ultrasound, and ultrasound bioengineering. His special interests include the systematization of surgical technique, and the assessment and correction of the complications of refractive surgery. He has consulted for Carl Zeiss Meditec on the development of the MEL 80 and CRS-Master since 2001.

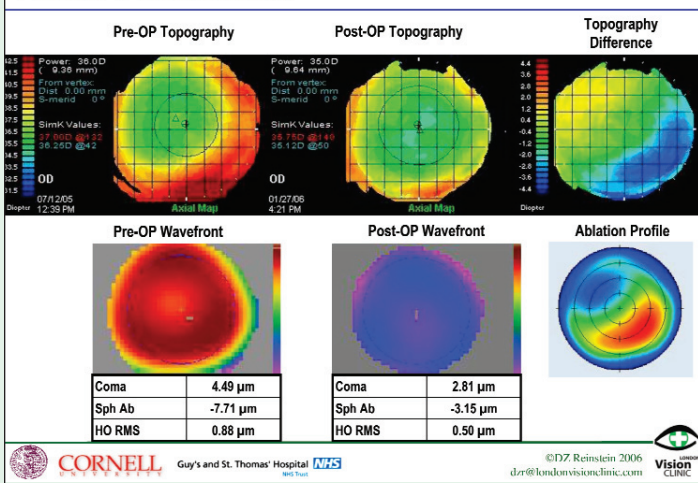
Dr. Reinstein's presentation introduced the latest version of the CRS-Master treatment planning platform, which incorporates a new TopoLine topography driven system in addition to the familiar WASCA-based wavefront treatments. According to Dr. Reinstein, the system is capable of correcting decentrations and performing ablation "zone expansions" for the reduction of spherical aberration. Using a range of clinical examples, he illustrated the usefulness of this platform for "repair" purposes.

We had the exciting opportunity of testing the prototype CRS-Master II starting in the summer of 2005. What makes the CRS-Master II topography wavefront treatment system different from other topography guided systems is that information from the corneal shape as well as the corneal and ocular wavefront are incorporated into the treatment plan. This means that the accuracy of the refractive results (lower order aberrations) is much improved over previous topography-only systems. In our practice to date we have treated more than twenty patients for "repair" purposes using the CRS-Master II topography wavefront treatment system to correct high refractive errors with corneal irregularities in transplants, older small zone treatments and decentrations. An impressive 70% of eyes are within 0.5D and 94% are within 1.00D of intended. Below are two examples of cases that we have successfully treated.

Patient 1 underwent LASIK for -8.00 DS in 1998 with the LADARvision excimer laser and the Bausch & Lomb Hansatome 180. He then had an enhancement for +0.75-1.25x5 and presented to the London Vision Clinic in July 2005 with a refraction of +0.25-0.25x40 20/20. The patient was also 20/20 uncorrected. The patient was complaining of significant night vision disturbances. The contrast sensitivity was at the low end of the normal range. The ATLAS topography exam (top left) revealed a decentered topography and a small optical zone. The WASCA exam (bottom left) showed that the patient had significant higher order aberrations, particularly spherical aberration and coma. The patient was treated as PRK with the Carl Zeiss Meditec MEL 80 excimer laser using a topography guided treatment generated using the Carl Zeiss Meditec CRS-Master II system (ablation profile; bottom right). The intended post-operative refraction was plano.

Six months post-operatively, the patient's refraction was +0.50-0.75x62 20/16. Both the uncorrected and best corrected visual acuity improved one line to 20/16. The contrast sensitivity was improved by two patches for 3, 6, and 12 cpd and was unchanged for 18 cpd. The post-operative topography is well-centered with a large optical zone (top middle, plotted on the same scale as the pre-op for direct comparison). The topography difference map (top right) shows the area of infero-nasal flattening that was achieved corresponding to the ablation profile generated by the CRS-Master II ablation algorithm. The treatment has significantly reduced the higher order aberrations; in particular the coma and spherical aberration have been reduced to less than half the pre-operative value (bottom middle, plotted on the same scale as the pre-op for direct comparison).

Patient 1: Decentration

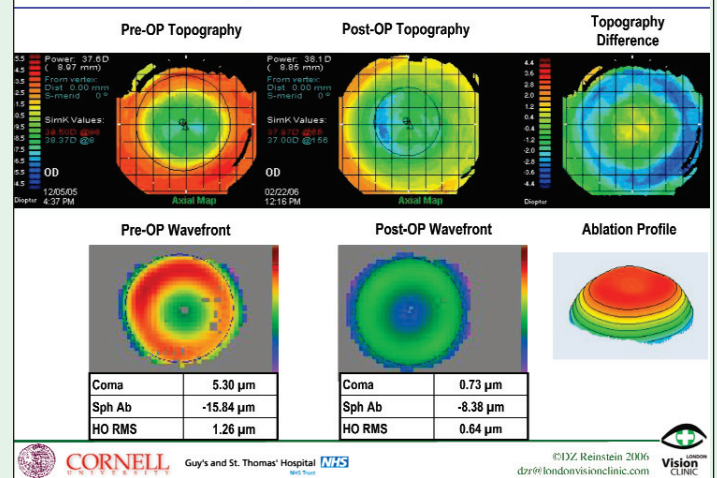


Patient 1

Patient 2 underwent PRK for -7.50 DS in 1992 with the Summit excimer laser. A 4.50 mm optical zone was used for the treatment. He presented to the London Vision Clinic in May 2005 with a refraction of +0.75-0.25x11 20/20. The patient was 20/25 uncorrected. The patient was complaining of severe night vision disturbances and double vision, especially in dim lighting. The patient had decreased contrast sensitivity below the normal range. The ATLAS topography exam (top left) revealed a 4 mm optical zone. The WASCA exam (bottom left) showed that the patient had severe higher order aberrations, particularly spherical aberration and coma. The patient was treated as PRK with the Carl Zeiss Meditec MEL 80 excimer laser using a topography guided treatment generated using the Carl Zeiss Meditec CRS-Master II system (ablation profile; bottom right). The intended post-operative refraction was plano.

Three months post-operatively, the patient's refraction was +1.50-0.50x142 20/25. The uncorrected visual acuity was 20/50. The contrast sensitivity was improved by one patch for 12 and 18 cpd and was unchanged for 3 and 6 cpd. The post-operative topography shows an enlarged optical zone (top middle, plotted on the same scale as the pre-op for direct comparison). The topography difference map (top right) shows the ring of peripheral flattening that was achieved by the CRS-Master II topography guided ablation. The treatment has significantly reduced the higher order aberrations; in particular the coma has been removed and the spherical aberration has been halved (bottom middle, plotted on the same scale as the pre-op for direct comparison). The patient gave a subjective rating of improvement in symptoms of 7.5 out of 10.

Patient 2: Zone Expansion



Patient 2