



Jeffrey Machat

# Wavefront-guided re-treatments offer enhanced visual quality and happier patients

Dermot McGrath  
in London

EXCIMER laser re-treatment using the wavefront-guided Visx Star S4 CustomVue (AMO) platform is a safe and effective technique for resolving problems with quality of vision and achieving high levels of patient satisfaction after previous refractive surgery, according to Jeffrey Machat MD.

Speaking during a session on refractive surgery complications held during the XXIV Congress of the ESCRS, Dr Machat, co-medical director of TLC Laser Eye Center in Toronto, Canada, said that in his experience wavefront-guided ablations offer the best option for patients with visual symptoms such as glare or night vision difficulties after previous refractive surgery.

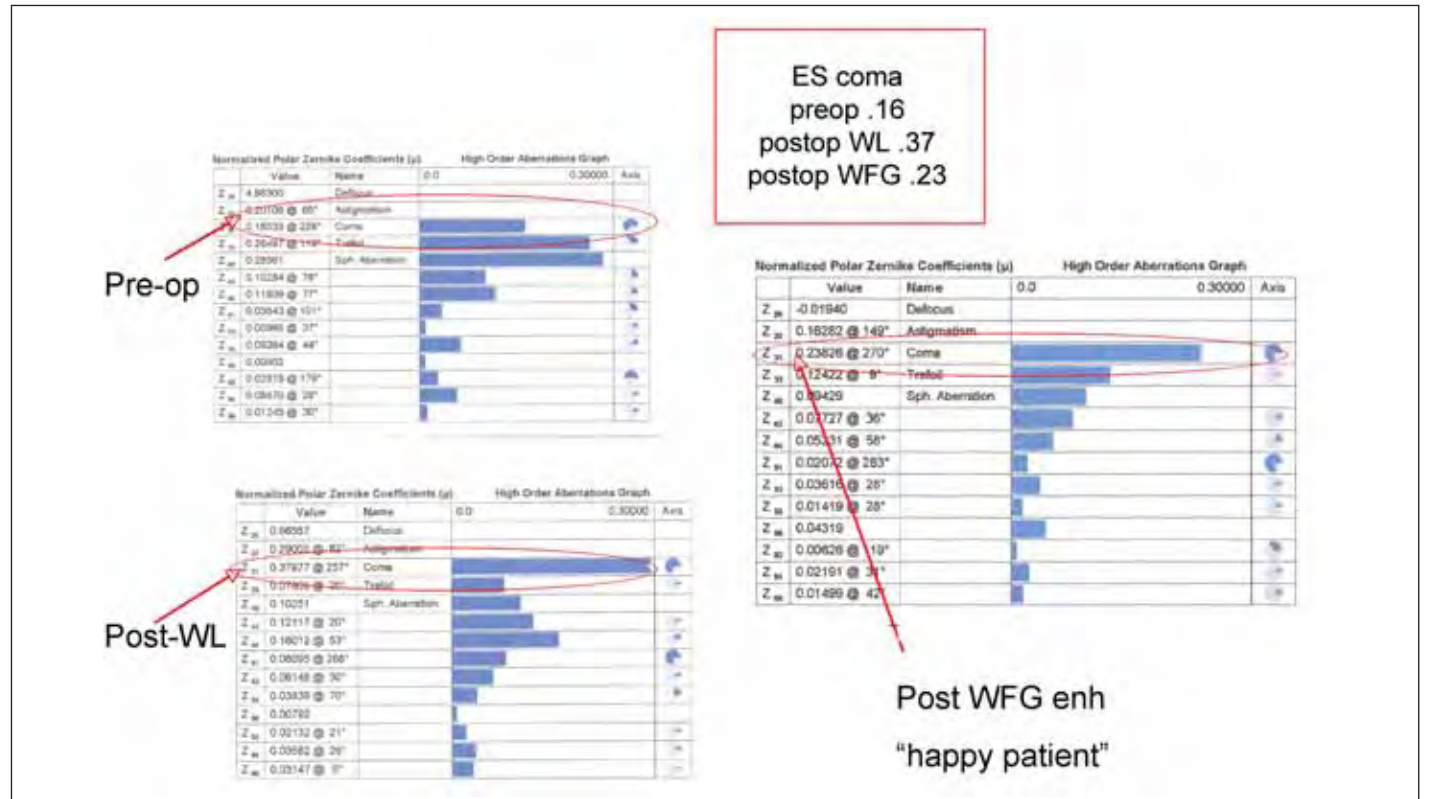
“Over the years it has become apparent to me that wavefront-optimised ablations do not reliably achieve the optimal visual acuity and quality outcomes as wavefront-guided ablations. There was always about 10 per cent of patients who could not be successfully treated using the optimised approach and that is why I have switched my practice over to 100 per cent wavefront-guided ablations using the CustomVue platform,” he said.

Explaining the difference between the two approaches, Dr Machat said that the wavefront-guided technique allows surgeons to measure and treat lower- and higher-order aberrations in the eye with the aid of an aberrometer, resulting in each patient receiving a unique custom treatment. By contrast, the wavefront-optimised approach, as used by the Wavelight Allegretto (WaveLight Laser Technologie), does not measure aberrations and uses a standardised spherical aberration coefficient on all patients to compensate for induced spherical aberration.

Dr Machat recalled the widespread problems of induced glare and night vision difficulties associated with the first-generation excimer lasers back in the early 1990s. He said that when he first heard of the concept behind the Wavelight Allegretto, he was immediately enthusiastic.

“I used to subscribe to Jack Holladay’s thinking on this and wanted to avoid taking patients with prolate eyes and making them oblate. When I saw the Allegretto Wave, I thought this might well be the solution I was looking for. Here for the first time was a system capable of performing an aspheric ablation profile, adding laser pulses to the periphery in order to deal with the problem of induced spherical aberration,” he said.

While the subsequent results on almost 2,000 patients confirmed that the Wavelight was indeed an improvement on earlier technology such as the Technolas 217Z PlanoScan or the VISX S3 SmoothScan platforms, Dr Machat said that there were



still some inherent weaknesses with the optimised approach that became evident over time.

“For a start, I was not able to correct asymmetrical higher order aberrations such as coma or trefoil, nor was I able to adjust the amount of spherical aberration correction for each individual patient. I was simply correcting a standardised amount for each diopter of myopic correction. And I wasn’t able to really manage patients who had negative spherical aberration where I was still producing the same ablation pattern for each and every patient and so this led to certain problems in our practice,” he said.

Dr Machat also noted that the wavefront data from the FDA trials showed little tangible evidence of a direct relationship between patients’ uncorrected and best-corrected visual acuity and contrast sensitivity outcomes and whether the patients had oblate or prolate corneas. Furthermore, analysis of the VISX CustomVue FDA clinical trial data also demonstrated that wavefront-guided ablations produce excellent outcomes regardless of whether the postoperative corneal shape is more prolate or more oblate, indicating that topography seems not to be the determining factor in postoperative quality of vision.

Turning to some case studies of CustomVue re-treatments, Dr Machat cited the example of a moderate myope with induced coma, trefoil, and spherical aberration, as well as residual refractive error, after his initial optimised treatment.

The Allegretto treatment increased the patient’s coma value from 0.30 to 0.44. After re-treatment with CustomVue, it was reduced to 0.23. Best-corrected visual acuity in the eye had dropped to 20/25 from 20/20 pre-operatively after optimised treatment, but was restored back to 20/20 after re-treatment. Trefoil, which had increased from 0.04 to 0.34 with Allegretto, decreased after re-treatment to 0.19.

Dr Machat said that even the patient’s spherical aberration had got worse after optimised treatment.

“This was surprising as I expected the prolate optimised ablation to improve, or at the very least not worsen, the spherical aberration actually increased from 0.07 to 0.31, which explained why the patient was so unhappy. Thankfully we were able to reduce these higher order aberrations by 30 per cent to 45 per cent by using the Visx CustomVue programme and create a happy patient again,” he said.

Looking at the overall results with the Allegretto, Dr Machat said that myopes over -6 D seemed to derive least benefit from the platform compared to mild myopes or hyperopes.

“When we were treating patients with more than -6 D of myopia we found a disproportionate number who were very unhappy with their quality of vision. These were patients who seemed to suffer the most induced spherical aberration and who had the worst problems with glare and poor visual quality,” he said.

Dr Machat cited the case of one highly myopic patient who experienced a 10-fold increase in coma, a four-fold increase in trefoil and a three-fold increase in spherical aberration after Allegretto treatment.

“With the CustomVue, we were able to reduce these higher order aberrations by more than 50 per cent and create a happy patient again, which is really what refractive surgery is all about,” he said.

Dr Machat stressed that while a majority of the Allegretto patients had been very satisfied with their results, there was little way of knowing in advance which patients would benefit least from the optimised prolate ablation profiles, such as those with negative spherical aberration, who make up about 10 per cent to 12 per cent of the population.

“For 90 per cent of our patients, the aspheric ablation profile on the Allegretto worked great, but we were still having these unhappy patients and the only way that we could properly manage them was using the Fourier wavefront ablation pattern unique to the Visx CustomVue wavefront platform. So having an optimised ablation programme is not always an optimal solution for each patient. Since we have switched over to 100 per cent CustomVue treatments, we have not had any patients with significant postoperative night glare or other quality-of-vision problems,” he concluded.

jeffmachat@hotmail.com