



Cyres K Mehta

Corneal wavefront-guided LASIK very effective in eyes with highly irregular corneas

Roibeard O'hEineachain
in Mumbai

LASIK ablations directed at correcting corneal wavefront error can bring about dramatic improvements in vision in patients who have undergone penetrating keratoplasty or who have amblyopia due to corneal aberrations, according to Cyres K Mehta, MS(Ophth) FASCRS(US), Mumbai, India.

Speaking at the 2006 EyeAdvance Congress in Mumbai, Dr Mehta noted corneal wavefront-guided ablations are particularly well-suited to eyes with highly irregular corneas. He noted that 80 per cent of the aberrations of the eye originate in the cornea and that the corrections of corneal aberrations are not limited by pupil size, allowing optical zones of up to 8.5mm.

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Dr Mehta noted that one group of patients heretofore neglected in the field of refractive surgery are those with a high degree of unilateral higher order aberrations, a condition he calls “corblyopia”.

“The term ‘corblyopia’ refers to corneal amblyopia, where the eye seems normal and has normal corneal topography but is significantly aberrated on corneal wavefront analysis. In such cases BCVA is typically between 6/12 and 6/36 and cylinder is 2.5 D or more,” Dr Mehta explained.

He added that he has achieved good results using a corneal wavefront guided approach in 14 patients with corneal amblyopia. He noted that while their pre-operative BCVA ranged from 6/12 to 6/24, their postoperative BCVA ranged from 6/9 to 6/6.

Dr Mehta described in detail the pre-operative findings and postoperative results in three corneal amblyopia cases. The first patient was an 18-year-old amblyope with 6.0D of cylinder an RMS of 6.0 microns and a BCVA of 6/24. Following corneal wavefront guided LASIK he had an RMS of only 2.0 microns and BCVA improved to 6/12, a gain of two lines.

The second patient he described was a 27-year-old anisometropic amblyope with

a sphere of -2.0D and a cylinder of -3.0 D, a highly distorted wavefront and a BCVA of 6/18.

Three weeks postoperatively the patients had only 0.75 D of cylinder an uncorrected visual acuity of 6/6 and minimal amount of aberrations.

The third patient was an 11-year-old male anisometropic amblyope with a pre-operative UCVA of 6/6 in his right eye but a BCVA of only 6/18 in his left eye, which had a sphere of -6.75 D and -0.5 D of cylinder. One day postoperatively he had a UCVA of 6/9.

Dr Mehta noted that his findings raise the question of whether all anisometropic amblyopes should undergo corneal wavefront analysis to see if they might benefit from laser correction of their higher order aberrations. Also

unanswered is the question of what the youngest age should be for patients undergoing such procedures.

“Is there a cut-off age? We have performed corneal wavefront LASIK on patients as young as eight years with spectacular results,” he said.

Corneal wavefront technique

When performing the LASIK procedures Dr Mehta used the Carriazo Pendular microkeratome and a Schwind Esiris 200Hz flying spot laser, which has a 0.8mm spot size with a Gaussian profile and a 330 Hz eyetracker.

To obtain corneal wavefront measurements Dr Mehta uses the Keratron Scout topographer (Optikon). The device is a placido disc-based system with 28 border mires and generates an arc step reconstruction of the corneal surface that is accurate to within one micron, Dr Mehta said.

The accuracy of the topographer enables the calculation of the optical path difference between the corneal wavefront and an ideal wavefront. The distortion of a wavefront as it emerges from the eye is equal and opposite to the cornea's variance from an ideal shape but only about one third of its magnitude, he explained.

“The concept of optical path difference is the keystone of this whole exercise. It is the “rule of 3”. For every three microns of distortion on the corneal surface there is one micron of corneal wavefront error.”

Good results in Post-PK and post-RK eyes

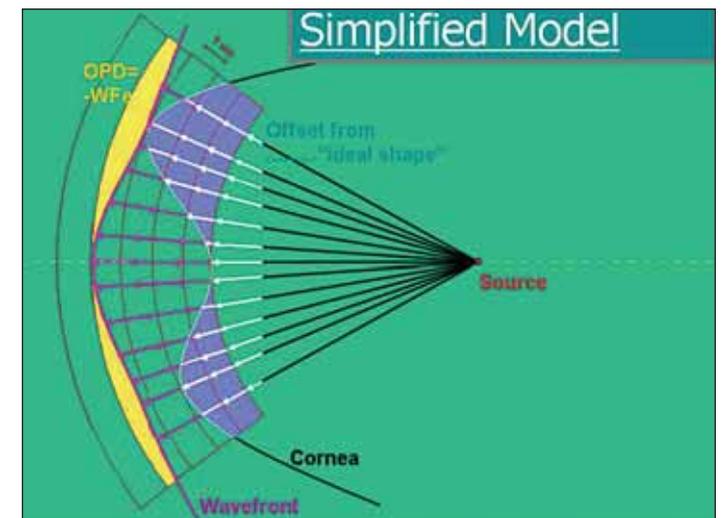
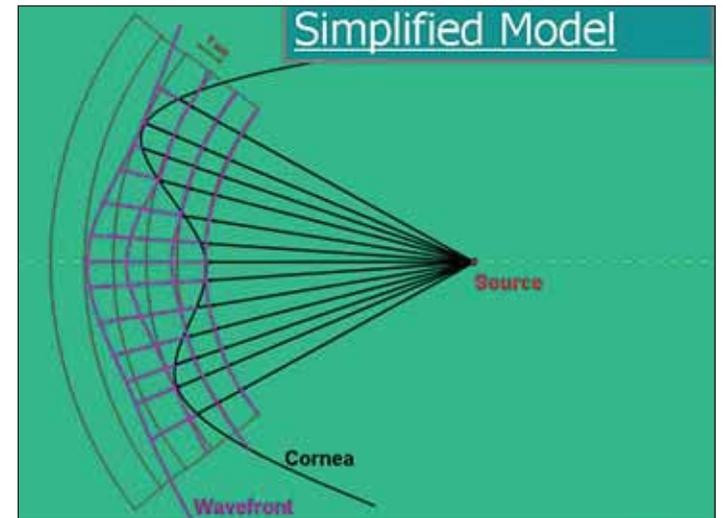
Dr Mehta has also conducted a trial using corneal wavefront-guided treatment of 60 eyes with high amounts of aberrations following penetrating keratoplasty and radial keratotomy.

The study showed that after one month's follow-ups 15 eyes (25 per cent) gained three lines of BCVA, while 42 eyes (70 per cent) gained two lines and three patients gained four lines. In addition, the patients' corneal aberration RMS decreased by 41 per cent to 56 per cent. Furthermore, 40 per cent had a postoperative cylinder less than 1.0 D.

As an example of the kind of results that can be achieved with corneal wavefront-guided LASIK in eyes that have undergone penetrating keratoplasty, Dr Mehta described the case of a patient who underwent the procedure five years after receiving a corneal graft.

The patient had a pre-operative sphere of -4.0D and a cylinder of -5.0 D and a BCVA of 6/12. At one month's follow-up the treated eye had a plano sphere, only half a dioptre of astigmatism and a UCVA of 6/6.

Dr Mehta noted that the rationale behind using corneal wavefront-guided LASIK in eyes that have undergone penetrating keratoplasty is that approximately eight per cent to 20 per cent of eyes have significant irregular astigmatism that cannot be satisfactorily managed with glasses or contact lenses.



Courtesy of Cyres K Mehta, MS(Ophth) FASCRS(US)

He added that while there is no established time interval between the initial keratoplasty and LASIK procedures, most investigators recommend a period of approximately three to six months after suture removal, and 12 to 18 months after the corneal graft procedure. Other factors to consider are the stability of the cornea and the integrity of the endothelium.

“Using corneal wavefront guided LASIK to treat post-keratoplasty and post-RK eyes has proved very successful, and all eyes with aberrated corneas whether post-keratoplasty or post-RK should have corneal wavefront guided LASIK performed for optimum improvement in BCVA and drastic reduction in aberrations,” he added.

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