Wavefront-guided PRK effective in treating highly aberrated eyes after keratorefractive surgery

Edward E Manche

Devon Schuyler in Las Vegas

WAVEFRO NT-guided PRK is an effective treatment for highly aberrated eyes following previous keratorefractive surgery, according to Edward E Manche MD, associate professor of ophthalmology, Stanford University School of Medicine in California.

“This procedure provided excellent uncorrected and best spectacle-corrected visual acuity, excellent safety and good predictability,” said Dr Manche, speaking at the annual AAO meeting. Dr Manche presented his findings from a retrospective analysis of 25 eyes in 21 patients. All eyes had previously undergone keratorefractive surgery: 14 had undergone LASIK surgery, nine had undergone radial keratotomy surgery, and two had undergone PRK surgery. All of the patients had highly aberrated eyes, and suffered from a variety of visual complaints.

“There were a variety of underlying reasons for the aberrations, ranging from non-uniform ablations to decentration,” said Dr Manche.

Dr Manche performed the surgery in all 21 patients. He began by imaging the corneal surface with the VISX WaveScan aberrometer, which provided a customised nomogram for performing wavefront-guided PRK surgery. He also applied the 0.02 per cent topical mitomycin C for 10 seconds during surgery.

The procedure appeared to be effective at correcting refractive error. The average sphere before surgery was -1.56 D; this was reduced to -0.15 D six months after surgery. The spherical equivalent improved from -0.97 D to +0.01 D, and the mean cylinder improved from +1.18 D to +0.35 D.

Stability also appeared to be good after the first few months.

“There was a fairly significant hyperopic overshoot in the first several weeks, especially in the subset of eyes that had previous LASIK,” Dr Manche said. However, this overshoot gradually corrected itself over the next six months.

Dr Manche said that the efficacy was “quite good”, with 100 per cent of eyes seeing 20/40 or better, 61 per cent seeing 20/20 or better, and 31 per cent seeing 20/16 or better six months after surgery. There was no sub-epithelial haze seen at any time interval.

“However, there was a delayed recovery of vision in these patients – in both uncorrected and best-corrected vision – so patients need to be advised ahead of time that it’s going to take a fair amount of time to achieve their endpoint.” Predictability also was excellent. All of the eyes were within 1 D of emmetropia and 83 per cent of eyes were within 0.5 D by six months after the procedure.

There was essentially no change in total higher order aberrations, although there was a trend towards improvement in coma. Trefoil and spherical aberrations remained essentially unchanged, Dr Manche said.

The safety of the procedure was excellent. Although 10 per cent of patients lost one or more lines of BSCVA at one month, 23 per cent had gained one or more lines of BSCVA at six months. No intraoperative or postoperative complications occurred, and all eyes re-epithelialised within seven days.

A case study
Dr Manche also presented a case study of a 49-year-old patient to illustrate the use of decentralised LASIK re-treatment. The patient had undergone LASIK surgery five years earlier for myopia and had poor quality of vision, ghosting, night vision problems, and a thin residual stromal bed. Although Dr Manche said that the surgery had been “well done”, with no striae of the flap and minimal refractive error, the patient had a superior decentration ablation in both eyes and significant higher order aberrations.

The treatment plan involved removing nearly 40 microns of tissue to correct the centration, although there was only 1 D of myopia to correct. Dr Manche emphasised the need to take extreme care in this procedure, which consumes an enormous amount of tissue, even for a small refractive error.

Dr Manche reported that six months after the procedure, the higher order RMS had improved from 1.01 to 0.71 microns, coma had improved from 0.79 to 0.32 microns, and trefoil had improved from 0.32 to 0.15 microns. There was a small increase in spherical aberration, from 0.48 to 0.55 microns.

The result was a complete resolution of ghosting, with improvement in UCVA and BSCVA, excellent centration of central topographic flattening, and significant reduction in higher order RMS values, especially coma.

“I think it is a good study, although small, demonstrating the ability of wavefront-guided PRK to address refractive error and visual complaints after refractive surgery,” said Helen K Wu MD, one of the session panellists, in an interview with EuroTimes. She pointed out that the study highlights some important clinical points, such as the “rather generous” removal of tissue for even small corrections, as well as the prolonged recovery time. She said that the initial tendency toward hyperopic over-correction is an important point as well. Dr Wu, who is an assistant professor of ophthalmology at Tufts University School of Medicine in Boston, Massachusetts, said that this is a “very useful technique” in the appropriate patient. She did recommend that mitomycin C administration and surface ablation should be approached with caution in eyes with severe surface disease, such as severe dry eye.

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A summary of the research

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the safety analyses based on the three-month data showed the procedure met all FDA safety variables. No eyes had distance BSCVA worse than 20/40, a loss of two or more lines in distance BSCVA, or a greater than 2 D increase in cylinder, Dr Durrie reported.

“The BSCVA data are no surprise, but induced astigmatism has been an issue with LASIK patients. Of the patients, 5.9 per cent of patients could read J1 or better at one month, that level of near vision was achieved by only 73 per cent of patients at three months. Proportions of patients achieving J2 or better and J3 or better vision at one month were 92 per cent and 97 per cent, respectively, and remained relatively high at 88 per cent and 95 per cent, respectively, at three months.

“These results reflect the typical CK healing effect that is associated with a little regression between one and three months. In this study, mean SE was -0.3 D preoperatively, -1.05 D at one month, and -0.96 D at three months. However, our treatment was very conservative to achieve only a mild undercorrection at three months, and in clinical practice, clinicians might consider a procedure with 8 spots at 7.5mm, which should result in even better near vision outcomes,” Dr Durrie said.

Follow-up is continuing in this study to one year, and further analysis will determine whether the treatment effect is maintained or wears off. However, Dr Durrie noted that a paper in press, which he coauthored, shows the effect of CK is very stable between three months and two years.

“The benefit of the procedure seems to last longer than we originally expected. In our article that will be published, we observed an approximately +0.25 D change in refractive change between three months and two years that was similar to the change in untreated fellow eyes,” he said.

Results of a subjective questionnaire asking the post-LASIK patients about performance of vision tasks before and after the procedure showed dramatic improvements in near vision function post CK. Prior to the surgery, fewer than 30 per cent of patients were able to read menus or a golf scorecard without glasses, only 20 per cent could read newspaper or magazine print uncorrected, and fewer than 10 per cent could read fine print. At three months post-CK, the proportions of patients able to perform each of those reading tasks increased to 90 per cent, 84 per cent, and 66 per cent, respectively.

Intermediate vision also improved, with the proportion of patients able to read a computer screen without glasses increasing from 71 per cent to 95 per cent. Overall 85 per cent of patients indicated they were satisfied or very satisfied at three months after CK.

We are using Light Touch in this study. - DSD

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