New PRK technique potential alternative to transplantation in keratoconic eyes

Cheryl Guttman in London

PRK using the WaveLight platform and a topographic neutralisation technique (TNT) could provide contact lens-intolerant keratoconus patients with an alternative to penetrating keratoplasty, according to the initial experience of Canadian corneal specialists David T C Lin MD, FRCSC and Simon Holland MD, FRCSC.

Patients are being considered for this procedure if they are currently on the corneal transplant list and have a best-corrected visual acuity (BSCVA) of 20/40 or better, reproducible topography maps obtained with the Allegretto Topolyzer, and a calculated residual stromal thickness of at least 350 microns after the planned ablation using the EyeQ 400 Hz excimer laser.

Mitomycin C 0.02 per cent intraoperatively for 15 seconds is used in all cases. After surgery, a bandage contact lens is placed and the eyes are treated with topical corticosteroids.

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At the XXIV Congress of the ESCRS, Dr Lin reported results from 15 treated eyes. The first two cases were performed without TNT but with topographic-directed PRK using the T-CAT software. Those eyes had very large cones, and the topographic-guided treatment resulted in decreased steepening but increased myopia. A review of those outcomes led to the development of the TNT that has been successful in improving refractive predictability for the topographic-directed ablation, said Dr Lin.

At six months, seven of the 15 eyes were corrected to within 0.5 D of intended refraction, 11 were within 1.0 D, and all were within 2.0 D. Three eyes experienced a loss of one line of BSCVA, while BSCVA was unchanged in 10 eyes and improved in two eyes. Twelve (80 per cent) patients are functioning without spectacles, he reported.

“By trying to regularise these extremely asymmetrical and asymmetrically distorted corneas, the topographically-driven ablation steepens the peripheral flatter areas and flattens the central steeper areas, and that induces a refractive change. The TNT incorporates calculations to compensate for the changes induced in sphere and cylinder, and the results with this approach have been favourable so far,” he said.

However, Dr Lin emphasised the encouraging outcomes need to be considered cautiously.

“We have been performing PRK in keratoconus eyes since 1991, and they have done remarkably well. However, surgeons need to be aware that the ablation planning for TNT is complex and challenging, and longer follow-up is needed in more eyes treated with this technique before it can be recommended for more widespread use,” he explained.

TNT planning involves four steps. The first step is to analyse the plano treatment for smoothing the cornea. The plano treatment is produced by the Topolyzer when no refractive input is entered; in a keratoconic eye, that is essentially a mini-asymmetric hyperopic treatment. Step 2 identifies the cylinder induced by the plano treatment and the amount of astigmatic treatment needed for neutralising it. Step 3 adds a myopic treatment in the centre to compensate for the initial hyperopic ablation. In Step 4, the manifest refraction is added to calculate the final treatment.

“A fundamental concept in understanding the effects of topographic-driven ablations is that the topography does not measure refraction. Therefore, the surgeon needs to input that data based on knowledge of the manifest refraction,” Dr Lin said.

Dr Lin observed that keratoconus patients awaiting corneal transplantation represent a particularly good group for developing new surgical techniques and understanding the limitations of those procedures. However, even though these patients have no other alternatives, it is still critical to appropriately manage their expectations when offering an investigational procedure.

“It can be very gratifying to operate on these contact lens-intolerant, precorneal transplant patients because they are so thankful for any improvement that helps to avoid transplantation at least temporarily. However, careful patient selection is important as this procedure may not work in very steep eyes with very advanced cones, and the potential benefits must be presented with guarded optimism. Patients need to be realistic in understanding that improvement is not guaranteed, and the informed consent must include mention that corneal transplant may still be needed in the future,” he said.

TNT is also being evaluated as a treatment for a variety of other challenging eyes, including those with small or centred optical zones after previous refractive surgery.

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