

A John Kanellopoulos Luigi Mosca Emilio Balestrazzi

Femtosecond laser promising for DSEK/DALK procedures

Dermot McGrath
in Stockholm

USING the IntraLase femtosecond laser in corneal endothelial transplant surgery gives surgeons a viable new method of preparing the endothelial graft in a straightforward, safe and standardised fashion, according to researchers at the XXV Congress of the ESCRS.

A John Kanellopoulos MD, associate professor of ophthalmology, New York University Medical College, and medical director, Laservision Institute, Athens, Greece, said that femtosecond-assisted Descemet's stripping endothelial keratoplasty (F-DSEK) represents a promising new approach in the surgical treatment of corneal diseases.

"It is still early days but our initial clinical experience shows that the femtosecond laser has the potential to change corneal practice entirely. IntraLase-assisted DSEK is a safe and effective alternative to penetrating keratoplasty. It offers rapid visual rehabilitation with a thin graft in the centre and periphery that appears to stabilise as early as one month," he said.

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Presenting the six-month results of the first six patients who underwent femtosecond-assisted DSEK, Dr Kanellopoulos said that the visual acuity outcomes and safety data were very promising.

For these patients, an 8.5mm graft of 100 microns thickness was placed through a 4.5mm incision. The mean uncorrected visual acuity went from 20/100 on day one after surgery to 20/50 at six months, mean best-corrected visual acuity from 20/100 to 20/25 and mean cylinder from 3.5 D to 0.5 D. Endothelial cell counts were also very good and remained stable over time.

Dr Kanellopoulos noted that Pentacam Scheimpflug images of the endothelial graft highlighted the particularly smooth contours of the IntraLase cut.

"This is essentially the difference in using IntraLase for the preparation of the donor endothelial graft. It allows us to create very fine edges at the side of the graft where it may touch the iris and the difference is quite striking when compared with a cut performed by a traditional microkeratome," he said.

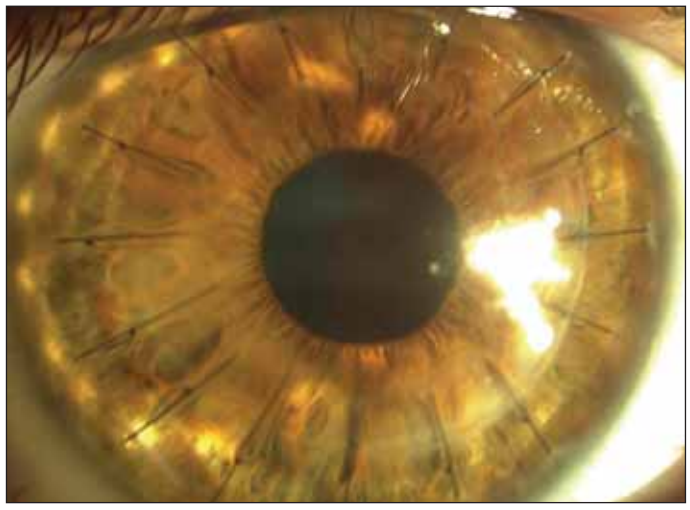
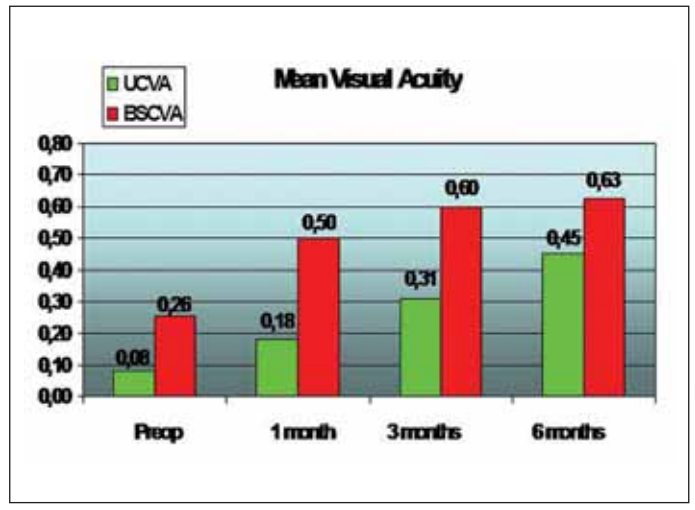


Figure 1



Courtesy of Luigi Mosca MD

Figure 2

Using video footage, Dr Kanellopoulos showed a typical F-DSEK procedure. Firstly, the donor corneal button is placed on a Katena artificial disposable anterior chamber and pressurised using air alone. The button is then placed under the IntraLase laser and a 400-microns complete flap is created in a diameter of 9.0mm. The prepared cornea is then placed endothelial side facing upwards on a Moria Hanna cutting block in order to dissect a central 8.5mm endothelial graft.

A 5.0mm scleral tunnel incision is then made in the recipient cornea and Descemet's membrane is scored and stripped using either the I/A tip or a special Moria tool (reverse Sinskey hook).

"It is important to remove all of the endothelium at this point of the procedure because one of the problems with adhesion of the graft on the backside of the cornea is due to islands of Descemet's endothelium that have been left behind," said Dr Kanellopoulos.

Prior to insertion of the lenticule, the posterior donor tissue is folded over on itself like a taco with a 40/60 overfold, with the endothelial side inward. This technique allows an 8.5mm donor button to be inserted through a 4.5mm scleral tunnel incision. Air is injected into the anterior chamber following the unfold of the donor tissue as an air bubble is used to position and maintain the graft in place.

"We want to ensure minimal manipulation of the lenticule in order to enhance the viability of the endothelial cells. It is also important to thoroughly coach the patient to stay horizontal for the first 24 hours so that the graft does not detach," he said.

Dr Kanellopoulos said that the technique appears to be safe, effective and relatively straightforward to use.

While the cost of the IntraLase system might prohibit some surgeons from experimenting with this approach, he noted that several eye banks in the US are already offering this option on pre-cut corneas for DSEK.

As well as DSEK procedures, the IntraLase femtosecond laser is also finding interesting new applications in deep anterior lamellar keratoplasty (DALK), according to Luigi Mosca MD and Emilio Balestrazzi, MD.

"Femto-DALK is a new alternative to other lamellar keratoplasty approaches and may offer a more predictable, reproducible and simple surgical technique," they said.

Dr Mosca and his chief Prof Balestrazzi, from the Catholic University of "Sacro Cuore", Ophthalmic Department, "A Gemelli" Polyclinic, Rome, Italy, said that the inspiration behind femto-DALK was to find a surgical option for keratoconus patients that would achieve comparable results to manual DALK.

"DALK preserves the endothelium layer and removes only the diseased stromal tissue. So it restores normal corneal thickness and shape and reduces the risk of graft rejection in penetrating keratoplasty procedures. However, manual intrastromal dissection is very difficult, rarely achieves precision and sometimes results in poor optical quality and low visual acuity. There is also a high risk of micro- and macro-perforations and eventual conversion to PK," they said.

Dr Mosca's study included seven eyes of seven patients with keratoconus who underwent DALK with the femtosecond laser. The surgical technique involved the use of the IntraLase to cut the stroma, leaving at least 100 microns, followed by a +4.0 D spherical hyperopic PRK ablation and a 40-60 microns PTK ablation with an excimer laser to reach the pre-Descemet's layer. Once these steps had been completed , a corneal donor button, after Descemet/endothelium layer stripping, was sutured in place with 16 single sutures using 10/0 nylon.

The results showed a clear graft in all patients (Figure.1). The mean UCVA was 0.31, mean BCVA was 0.63 (Figure 2) and mean postoperative pachymetry was 594 microns after six months. In one case, a perforation during the IntraLase cut required a transition to penetrating keratoplasty. Confocal microscopy examination showed no significant differences in endothelial pattern and density after surgery.

Based on these preliminary results, Dr Mosca and Prof Balestrazzi concluded that this femtosecond-assisted DALK technique is safe and effective, although they said that longer follow-up is needed to confirm the preliminary results.

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