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Cornea/External disease

Decagonal cuts enhance laser keratoplasty

No rotation or decentration occurs, and the graft can be fixated with a continuous suture.

By Michela Cimberle

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Femtosecond laser-assisted corneal grafting gains stability and centration from noncircular transplant shapes, in particular from decagonal-shaped cuts, according to one surgeon.

Mark Tomalla

"For over 2 years, we have been performing perforating keratoplasty with the latest generation of the Femtec femtosecond laser (20/10 Perfect Vision). We have operated on a total of approximately 30 patients, with rewarding results, in terms of precision, accuracy and visual outcomes," said Mark Tomalla, MD, of the Niederrhein Clinic in Duisburg, Germany.

The Femtec laser produces smooth, precise cuts that allow an easier and better relationship between donor and recipient, he said.

"There is a better adhesion between the tissues and, consequently, a faster healing with an earlier recovery of vision. Visual outcomes are excellent, with a reduced amount of astigmatism as compared with traditional methods," Dr. Tomalla said.

Safe surgery

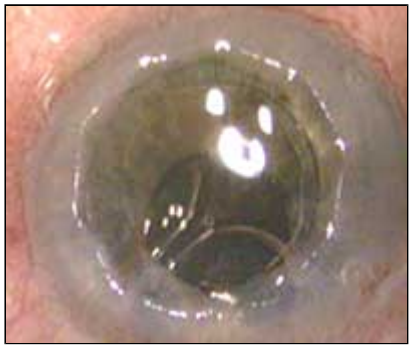
In preparing the donor cornea, the laser performs the cut with a down-up motion, starting at a variable depth, up to 1,200 µm.

"We always select a 90° cutting angle to the corneal curvature," Dr. Tomalla said. "Thanks to high laser precision, we can select identical diameters and cutting angles for both donor and recipient corneas."

Preparation of the recipient cornea is just as precise. Because of the curved patient interface of the laser, pressure on the eye during the procedure is only about 35 mm Hg.

"The innovative design of the patented patient interface is a major advantage of the Femtec laser," Dr. Tomalla said. "Minimum applanation of the eye is necessary, and the cornea retains a near-natural curvature. Unwanted IOP increases are greatly reduced, and the patients have no vision blackouts during the procedures."

Thanks to the extremely precise cutting angles, once the recipient cornea has been removed, the donor graft fits perfectly into the recipient bed, he said.



Femtosecond laser-assisted corneal grafting using decagonal-shaped cut.

Image: Tomalla M

"Visual control is maintained during the entire preparation," Dr. Tomalla said. "The eye remains a closed and, thus, stable system as long as possible during surgery."

Preparation is considerably quicker than with the usual methods. No more than 1 minute is necessary to prepare the

graft, and another minute is needed to prepare the recipient eye with the femtosecond laser, he noted.

Decagonal shape

One of the biggest advantages of the Femtec femtosecond laser is the almost unlimited ability to perform cuts of different shapes and sizes. This allows the corneal surgeon to select the diameter of transplant and the cutting angle that are better adapted to each patient, thus tailoring the keratoplasty to the specific conditions of each patient's disease situation and surgical needs, Dr. Tomalla said.

A further development of femtosecond laser-assisted perforating keratoplasty was to address the optimal transplant shape.

With special software developed by 20/10 Perfect Vision, the Femtec laser can now perform decagonal cuts during perforating keratoplasty.

According to Dr. Tomalla, cutting the graft in the shape of a decagon provides an easy and exact positioning and allows easy suturing.

"We have now performed the first three perforating keratoplasties with a decagonal shape," he said.

The actual advantage of this new pattern compared with round or oval transplant shapes is that there is no rotation or decentration during suturing, Dr. Tomalla said.

"It provides a stable fitting of the graft into the cornea, so much that fixation sutures can be omitted and double sutures are no longer required," he said. "A simple continuous suture is used."

In all three patients, the graft could be sutured into the recipient cornea easily and accurately, with an absolute fit precision of 0.01 mm, Dr. Tomalla said.

Postoperative follow-up has now reached 3 months. Refraction is stable, and mean astigmatism is also stable at 2 D. Fine Descemet's folds were visible immediately after surgery but disappeared after about 2 weeks, he said.

"In our opinion, this is a promising approach that combines the compactness and strength of an almost cylindrical shape with the stability given by the angles of the polygonal design," Dr. Tomalla said.

For more information:

- Mark Tomalla, MD, can be reached at Clinic Niederrhein, Fahrnerstr. 133-135, 47169 Duisburg, Germany; +49-203-5081711; fax: +49-203-5081713; e-mail: dr.mark.tomalla@web.de. Dr. Tomalla has no direct financial interest in the products discussed in this article, nor is he a paid consultant for any companies mentioned.
- 20/10 Perfect Vision, maker of Femtec femtosecond laser, can be reached at Am Taubenfeld 21/1, 69123 Heidelberg, Germany; +49-6221 7502-0; fax: +49-6221-7502-166; Web site: www.2010pv.com.
- Michela Cimberle is an OSN Correspondent based in Treviso, Italy, who covers all aspects of ophthalmology. She focuses geographically on Europe.