

Increasing applications for femtosecond laser

**Nadja Geipert
in Lisbon**

THE FEMTEC™ femtosecond laser (20/10 Perfect Vision) appears to offer an effective alternative for creating the tunnels used in the implantation of corneal ring segments (INTACS™, Addition Technologies) in patients with keratoconus, according to Mark Tomalla MD, who presented his latest findings at the XXIII Congress of the ESCRS

One of the FEMTEC laser's advantages is that it enables surgeons to create tunnels in corneas that are only 200 microns thick. To create tunnels for INTACS implantation manually with a blade, a patient's cornea needs to be at least 400 microns thick, said Dr Tomalla, Clinic for Refractive and Ophthalmic Surgery in Duisburg-North, Germany.

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“You have more cases for INTACS with the femtosecond laser and it might be that the patients don't need transplantation,” he added.

The FEMTEC laser also reduces the risk of infections because the intrastromal cuts in the cornea can be made from the inside out, minimising the possibility of foreign material being introduced into the cornea.

Since December 2004, Dr Tomalla has performed tunnel-creation surgery for the implantation of INTACS on ten patients with keratoconus with excellent results. The surgery can be performed on the fellow eye six weeks after the first implantation, if stability of the eye is sufficient.

One day after surgery, the patients' visual acuity had already improved, and, after three weeks, they were ready to receive glasses or contact lenses. According to Dr Tomalla's



Mike Holzer

current results the patients' visual acuities improved by about 50%.

Dr Tomalla said this surgery has a quick learning curve. Moreover, implantation of INTACS has become easier with the help of newly-manufactured instruments.

LASIK flaps

When compared to mechanical microkeratomes, both the FEMTEC and IntraLase femtosecond laser allow surgeons to place the hinge of their flaps wherever they want, which means they can really personalise the LASIK flap for the individual patient, explained Mike Holzer MD, University of Heidelberg, Germany, in a keynote address at the ESCRS Congress.

“You can do any size that you want and any depth that you want, e.g., 60 degrees or 75 degrees. This is also especially important for cornea transplant surgery because with different angulations you can make sure that the donor tissue fits much better into the cornea than when using 90 degree cuts,” said Dr Holzer.

“We found in our experimental studies (with FEMTEC) that the cut quality is very precise and that you have very low to almost no changes in the stroma structure of the cornea. This can lead to faster recovery after the surgery,” he told *EuroTimes*.

He commented that the FEMTEC femtosecond laser might have an edge over the IntraLase femtosecond laser. Both the IntraLase and FEMTEC femtosecond laser need an interface unit between the laser system and the patient's eye. IntraLase uses a flat applanation system that consists of a suction ring and a flat contact lens surface requiring the surgeon to use high pressure and to flatten the cornea. The FEMTEC laser's



Mark Tomalla

applanation surface is curved allowing for less suction and pressure to create lasting contact.

“It imitates the natural cornea curvature. Because it really adapts to the surface of the eye, you need less suction,” said Dr Holzer.

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Keratoplasty potential

Both of the femtosecond lasers also show promise for lamellar keratoplasty. The 20/10 Perfect Vision system includes additional software that allows the FEMTEC laser to cut through the entire 500-600 microns of the cornea. This would mean that surgeons should be able to perform penetrating keratoplasty with the FEMTEC laser, he explained.

Dr Tomalla performed penetrating keratoplasty on four patients with encouraging results. Visual acuity was significantly better in all patients after surgery. He is now waiting for longterm results.

“The advantage of the laser is that you can cut the transplant very precisely for the individual patient. The laser can cut three-dimensionally into the cornea,” Dr Tomalla said.

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Dr Tomalla observed several other potential advantages when performing penetrating keratoplasty with the FEMTEC laser compared to a mechanical trepan. For example, the size of the transplant is not limited to 0.5 increments but can be any size and there is more freedom when choosing the configuration of the cut. Also, the cut is done starting from the endothelial side of the cornea, inside to outside, leading to less stress on the

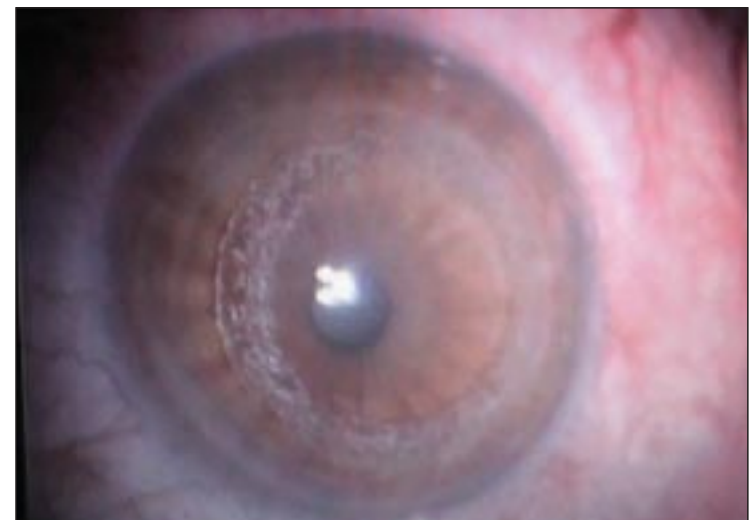
endothelial cells. In addition, surgeons can follow the process of the cutting in real time by looking through the laser's microscope.

Dr Holzer sees many other possibilities for both the FEMTEC and IntraLase femtosecond lasers in eye surgery. One procedure that he sees in the future is intra-corneal correction of refractive errors. This involves intrastromal laser ablation without creating a flap. This type of procedure is under investigation by other surgeons and not in clinical use, said Dr Holzer, who is currently involved in experimental studies on corneal transplant surgery involving the FEMTEC femtosecond laser.

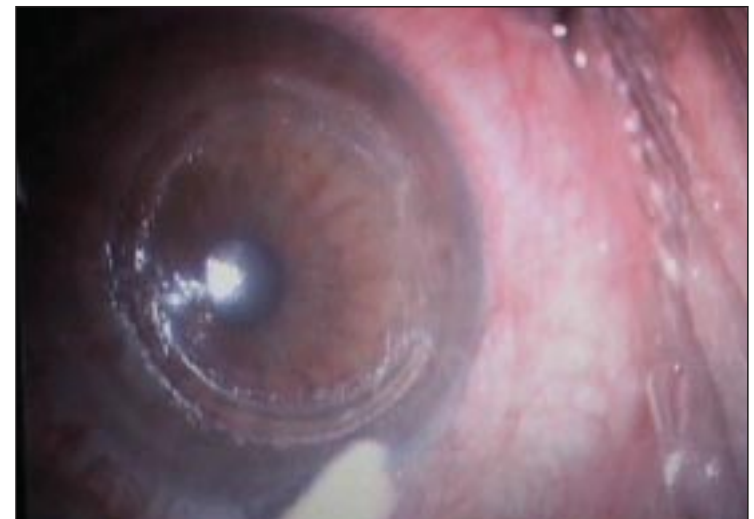
“I think the LASIK flaps are only the beginning,” he said.

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Tunnel after preparation with femtosecond laser technology



After surgery: implanted intracorneal ring segments