

# Intracorneal ring: a good alternative to LASIK?

Introducing a new system for the treatment of moderate & high myopia

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I have been developing a new technology for the surgical treatment of myopia for some years now and I presented the results with my first set of patients at this year's ASCRS congress in San Diego, USA. Overall, I believe that this new, minimally invasive method of surgery could present a feasible alternative to invasive LASIK and intraocular surgery in moderate to high myopes.

The procedure, which has been named Corneal IntraStromal Implantation Surgery (CISIS), employs the use of a small and closed ring-shaped inlay (MyoRing; DiopTex) which, rather than being placed on the top of the cornea, is squeezed into a pocket slightly underneath the surface of the cornea. MyoRing is a deformable and continuous ring implant, made of PMMA (**Figure 1**).

The PocketMaker microkeratome (DiopTex) (**Figure 2**) makes up the second part of the system (CISIS; Corneal IntraStromal Implantation System) and is used to create the closed intracorneal pocket 300 µm under the surface of the cornea.

The ring can be permanently worn without the need for replacement and special care and can be simply removed at any time. The CISIS has been CE mark approved for use in Europe.

The procedure itself is reversible, pain-free and quick and easy to perform, taking only a few minutes to complete. From the point of invasiveness of the procedure we place our technology somewhere between "classical" refractive surgery and contact lenses.

## How easy is it?

The PocketMaker microkeratome is temporarily fixed to the eye via a suction ring and a micron-guided diamond blade creates an intrastromal pocket via a 3 mm incision tunnel. With the exception of the small incision tunnel, the intrastromal pocket is closed along the entire circumference.

Once the pocket is created, the PocketMaker is removed from the eye and the MyoRing is introduced into the pocket via the small incision tunnel. The corneal pocket is 300 µm in depth and it has a diameter of some 9 mm.

## First patient results indicate so far so good

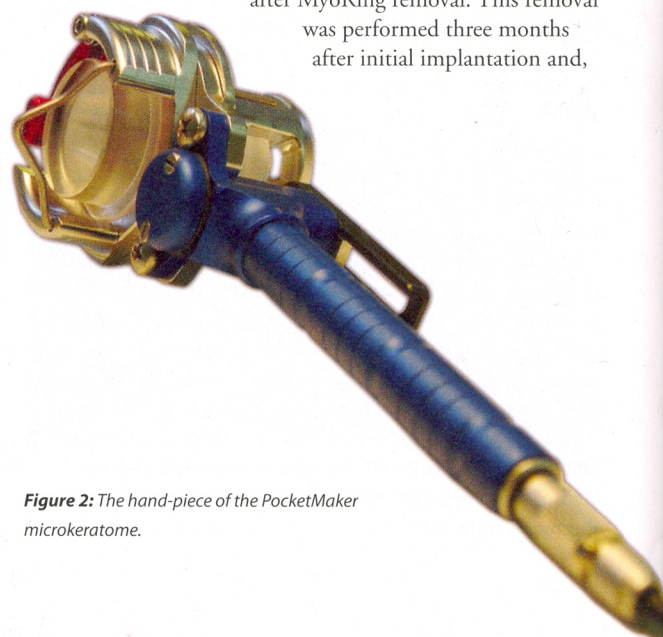
The power of this technology was particularly evident in one of my patients that was suffering from myopia of -13 D and astigmatism of -3 D in his right eye. Two weeks after CISIS, this patient's right eye was (and still is) emmetropic. It even gained one line compared with best corrected visual acuity before surgery. **Figure 3** shows the eye four months after surgery. The photograph was taken from the side and, from this angle, the implanted MyoRing appears similar to a hard contact lens to the observer, however, usually it is less visible.

The patient is very satisfied with the outcome and has not reported any problems with his vision during the day or night. A particular advantage is that, not only has the patient's high spherical component vanished with this treatment, but so too has the significant cylindrical value. To the best of my knowledge, there is currently no other technology available, which allows the surgical treatment of such difficult refractive errors to be so simple. Although such high degrees of myopia can be treated with this device, CISIS can also be used for the treatment of all degrees of myopia, ranging from -1 to -20 D.

## What are the limitations?

A limiting factor for MyoRing implantation in high myopes, however, is the pupil size of the patient. If the mesopic pupil size is smaller than the optical zone of the implant, patients have been very satisfied after MyoRing implantation and, usually, no visual symptoms are reported. **Figure 4** shows a qualitative relationship between Diopters, ring thickness and optical zone. Patients with a large pupil size may suffer from visual symptoms like glare and halos during night vision.

If the mesopic pupil size, however, does not exceed the optical zone by more than 1 mm, most patients who suffered from high myopia before surgery were satisfied with the implant and described their symptoms to be comparable to that experienced with contact lenses before surgery. It is, however, important to note that the procedure is reversible in those patients who do experience problems with the implant. The removal of MyoRing implants from the corneal pocket is very quick and easy to perform; only a spatula and forceps are required. **Figure 5** shows the right eye of a patient three weeks after MyoRing removal. This removal was performed three months after initial implantation and,

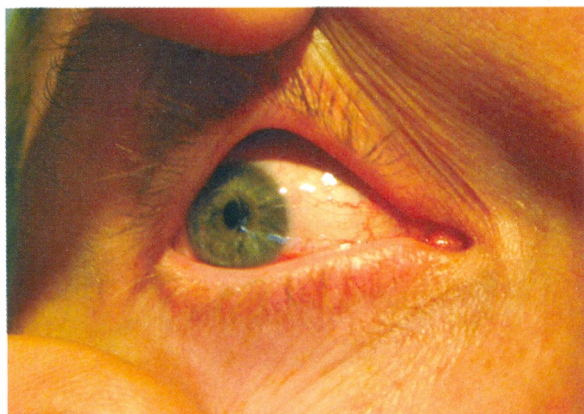


**Figure 2:** The hand-piece of the PocketMaker microkeratome.



**Figure 1:** The MyoRing implant.





**Figure 3:** An eye implanted with MyoRing, four months after surgery.

after removal, the patient had unchanged refraction and no loss in best corrected visual acuity compared with the situation before implantation. The patient was able to wear his old contact lenses without any complaints.

### Corneal biomechanics are unaltered

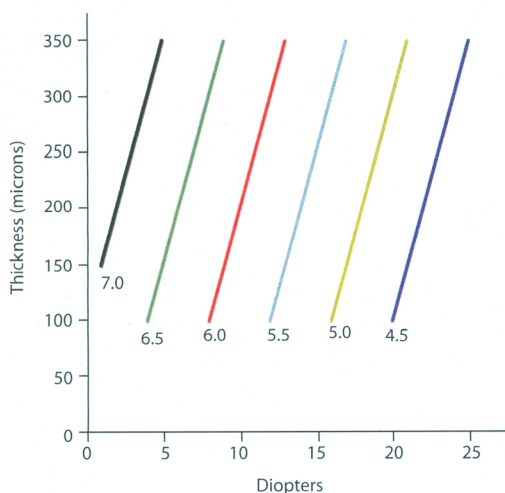
Of particular importance is the biomechanical safety of the procedure. Since the PocketMaker microkeratome does not create a flap, the biomechanical stability of the cornea remains unchanged by the procedure. This is a considerable advantage over LASIK.

The CISIS procedure appears safe and effective so far and I use it as a minimally invasive alternative to LASIK and intraocular surgery for the treatment of moderate and high myopia. For myopia of less than 8 D, I currently still employ excimer laser surgery (e.g. LASEK and LASIK). For higher myopes, however, I preferably perform MyoRing implantation within our excimer laser treatment room environment. I consider intraocular surgery with phakic IOL implantation if the patient's pupil size is too large. However, I also had patients suffering from myopia of more than 16 D with very large pupils who were satisfied with the implantation, by



**Figure 5:** The right eye of a patient three weeks after MyoRing removal.

using 1% pilocarpine eye drops once daily for inducing moderate miosis. Therefore, when in doubt, I initially choose MyoRing implantation and, if the patient is not satisfied, I simply remove the implant and switch to a more invasive treatment, such as intraocular surgery if appropriate.



**Figure 4:** Qualitative relationship between Diopters, ring thickness and optical zone. The coloured lines represent different sizes of optical zones. The measurements are in mm.

### In short...

Albert Daxer, MD, PhD describes a new method of treating myopia, which involves the use of an intracorneal implant (MyoRing) and a specifically designed microkeratome (PocketMaker microkeratome). According to Dr Daxer, the procedure is effective, simple to perform, reversible and less invasive than excimer laser surgery and phakic IOL implantation. He currently employs the new system in his practice as a minimally invasive alternative to LASIK and intraocular surgery for the treatment of moderate and high myopia.



#### AUTHOR

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Dr Daxer has a financial interest in the products mentioned within the article.