

(R)GP contact lens fitting following implantation of an intracorneal ring for ectasia post-LASIK

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Florence MALET completed her medical residency training in Ophthalmology in 1985 at Bordeaux University Hospital, France. She has specialized in Cornea and Anterior segment diseases at Brest University Hospital where she was responsible for the Unit of Contact lens fitting and research for fifteen years.

Starting in September 2000, she worked at Bordeaux Hospital to develop the Contact Lens Unit in the Ophthalmology University Department of Professor Joseph COLIN. She specializes in keratoconus contact lens fitting in the French National Reference Center for Keratoconus, which opened in 2006.

She is past President of the French Contact Lens Society and president-elect of the ECLSO since June 2007. In June 1998, she received the award of Kewiet de Jonke lecturer at the International Medical Contact Lens Society of Ophthalmologists (IMCLS).

She is currently director of the French University Educational Diploma of Contactology. In May 2009 she published a book on “Contact Lenses” presented at the French Ophthalmologic Society (SFO).

Introduction

Intracorneal rings are mainly implanted into keratoconic eyes of patients who are intolerant to rigid contact lenses to prevent or to delay the need for a corneal graft. They are also used in patients who develop a post-LASIK corneal ectasia. The goal of the procedure is to stabilize and to reshape the bulging cornea, and usually only one ring segment is placed in the inferior cornea. In addition, cross-linking may also be performed at the same time to control the corneal ectasia.

Beyond preventing ectasia by completely and carefully screening the corneas of patients seeking corneal refractive surgery, the first option to enhance visual acuity following this very severe complication is contact lenses.

Case report

Our patient was a 35-year-old female who underwent LASIK in both eyes in 2006 for myopia. The initial visual acuity results were good in both eyes. Six months later she complained of a rapid and progressive visual loss in her left eye.

Some months later, she was fitted with a (R)GP contact lens. But due to lack of motivation, an increase of the ectasia and insufficient visual results, she stopped wearing the lens. Two years after the refractive surgery, she was referred to our department for surgical treatment.

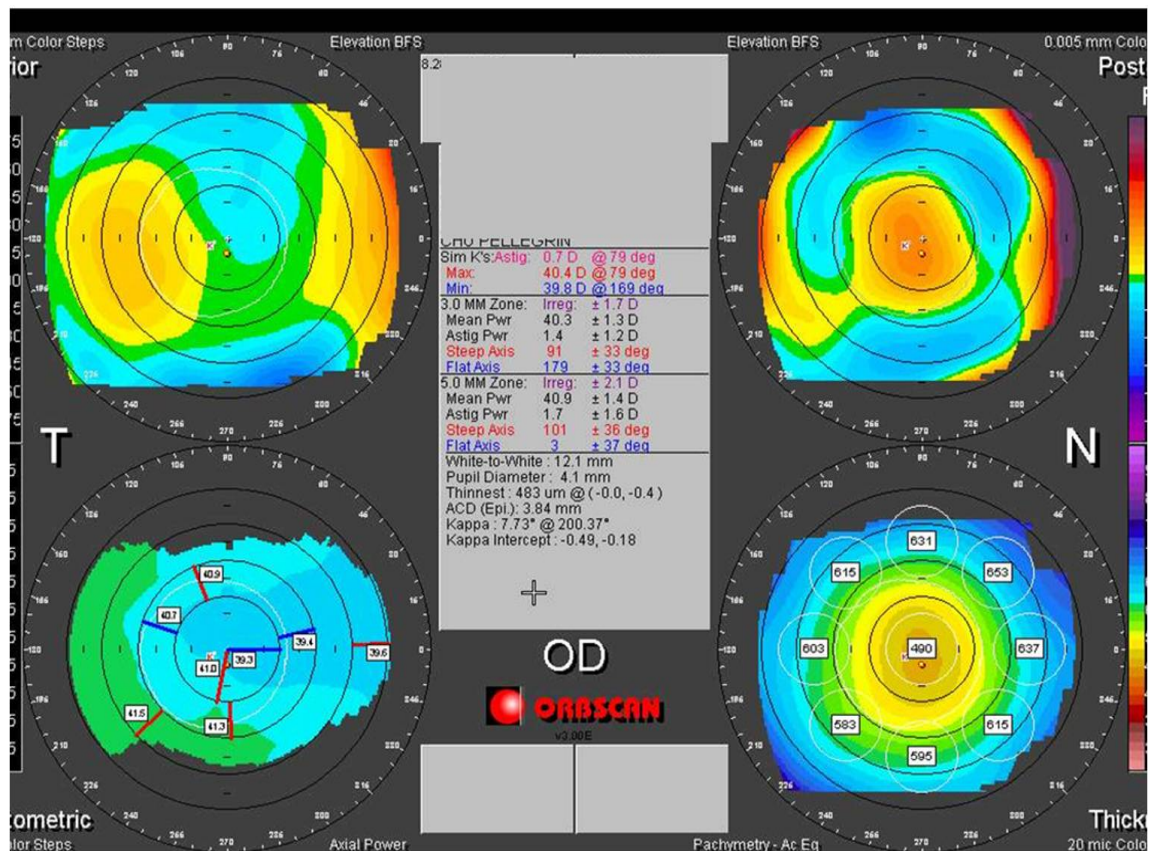
The uncorrected visual acuity was: 20/20 OD, 1/10 OS

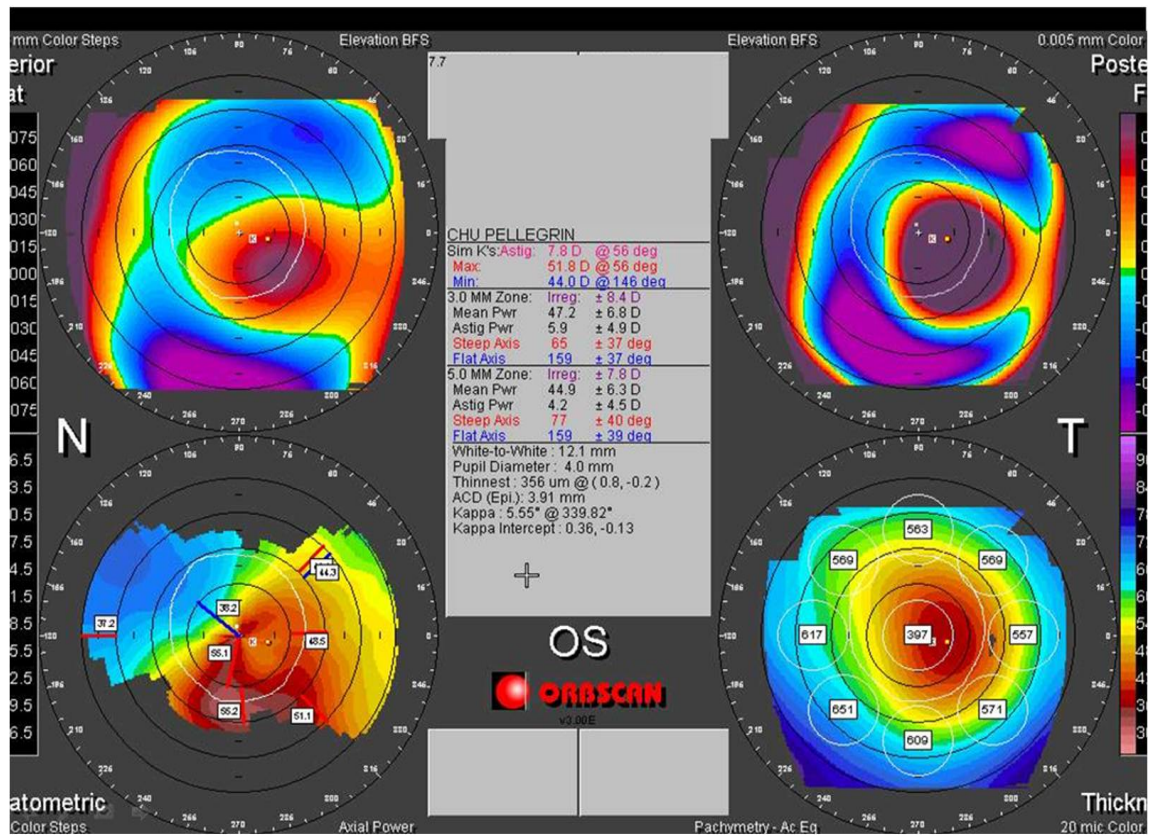
Best corrected visual acuity (OS) was 2/20 with glasses $-6.00 / -5.50 \times 70$

Videokeratography – Orbscan (see below) shows:

OD: classical oblate pattern post LASIK surgery

OS: corneal ectasia





Due to the evolving post-LASIK ectasia, we decided to implant one inferior intracorneal ring OS. The post-op visual acuity improved three Snellen lines within four months.

One year later, she returned to the hospital motivated to try (R)GP lens wear again to attempt to improve the vision in her left eye.

OS Refraction was : -3.00/ -3.00 x 50

OS Keratometry readings: 8.00 – 7.60mm @ 50° / 42.25 – 44.50D @ 60°

(R)GP characteristics: sphero-aspheric design, overall diameter 9.60 mm, BCR 8.10 mm (41.60 D), power -3.00D, material Menicon Z.

In the fluorescein pattern below, the ectasia apex and the intracorneal segment in the inferior part of the cornea can be seen.

At the one-month check up, no signs of corneal staining in the centre or over the ring were observed. Visual acuity was 8/10. Lens tolerance was judged “good” by the patient with ten hours of wear per day, every day. At the six-month follow-up visit, the patient was still wearing the (R)GP lens; slit lamp examination showed no contact lens related problems.



Discussion:

Fitting (R)GP lenses on corneas implanted with intracorneal rings is unusual because the indication for this surgery is (R)GP contact lens intolerance in keratoconus. Corneal ectasia is a rare but one of the most feared postoperative complications that can occur after uneventful excimer laser surgery, LASIK in particular.

Treatment options are: contact lenses, intracorneal rings, penetrating keratoplasty and anterior lamellar keratoplasty. The visual improvement provided with intracorneal rings does not lead to new contact lens fits in many cases. However, contact lenses may provide additional visual rehabilitation.

Current guidelines for ectasia

Algorithm for management

Avoidance:

In case of suspicion: use alternative treatment strategies than laser surgery for at risk patients. Lack of symmetrical refractive errors, differences in best spectacle corrected acuity, history of eye rubbing or atopy, etc.

- Surface ablation may be considered in case of thin corneas: L de Benito-Llopis et al have reported good results with a follow-up of more than 10 years.
- Intracorneal rings are a very good option in patients with low myopia.
- Phakic IOLs may be an interesting option in patients with higher ametropia and a deep anterior chamber.
- LASIK, with thin flaps and inverted side-cuts (Intralase IFS) may help to preserve the stromal architecture.

- Corneal crosslinking (CXL) is currently being evaluated in a combined approach with LASIK (J Kanelopoulos) to stiffen the cornea, with the objective of preventing corneal ectasia.
- New technologies for evaluating corneal biomechanical properties will be helpful to better evaluate high risk patients: ORA (Hysteresis) and elastometry.

In case of progressive ectasia:

According to Woodward et al, the majority of eyes (77 %) developing postoperative corneal ectasia may achieve functional visual acuity with (R)GP lenses and do not require further intervention. Penetrating or lamellar keratoplasty can usually be postponed or avoided by alternative methods of visual rehabilitation including:

- CXL if the corneal thickness is > 400 µm
- Lowering the intra-ocular pressure and minimizing corneal bulging
- Contact lenses
- Intracorneal rings for contact lens intolerance
- Deep lamellar keratoplasty in case of unsatisfactory visual acuity, or if the cornea is too thin

CCT	First option	Secondary options
> 400 µm	Corneal cross-linking	Contact lens <ul style="list-style-type: none"> - tolerance - intolerance: corneal ring - +/- topo guided PRK
< 400 µm	Contact lens	<ul style="list-style-type: none"> - Intolerance to Contact Lens: corneal ring - +/- topo guided PRK:OK

By very carefully screening patients preoperatively and performing intraoperative pachymetry, it is possible to reduce the risk of ectasia to a very low level. Postoperatively, ectasia still will develop in some patients who do not have risk factors or intraoperative incidents due to the natural progression of unidentified factors and to as-yet unidentified keratoconus.

Future developments that may further reduce the incidence of ectasia include enhanced corneal tensile strength measurement and advanced topographical analysis. It is unlikely that ectasia will completely cease to occur, but it also is important to remember that the development of ectasia does not, per se, constitute malpractice.

References :

- Abad JC. [Management of slipped laser in situ keratomileusis flap following intrastromal corneal ring implantation in post-LASIK ectasia.](#) J Cataract Refract Surg. 2008 ;34(12):2177-81.

- de Benito-Llopis L, Alió JL, Ortiz D, Teus MA, Artola A. [Ten-year follow-up of excimer laser surface ablation for myopia in thin corneas.](#) Am J Ophthalmol. 2009 ;147(5):768-73, 773.
- Binder PS. [Risk factors for ectasia after LASIK.](#) J Cataract Refract Surg. 2008 ;34(12):2010-1.
- [Caster AI, Trattler W.](#) Corneal ectasia after laser vision correction. [Int Ophthalmol Clin.](#) 2008 Winter;48(1):73-81
- Dawson DG, Randleman JB, Grossniklaus HE, O'Brien TP, Dubovy SR, Schmack I, Stulting RD, Edelhauser HF. [Corneal ectasia after excimer laser keratorefractive surgery: histopathology, ultrastructure, and pathophysiology.](#) Ophthalmology. 2008 Dec;115(12):2181-2191.
- Epstein RJ, Rao SN. [Early onset ectasia following LASIK: long-term follow-up and correction.](#) J Refract Surg. 2009 ;25(3):250.
- Ertan A, Colin J. [Intracorneal rings for keratoconus and keratectasia.](#) J Cataract Refract Surg. 2007 ;33(7):1303-14.
- Hafezi F, Kanellopoulos J, Wiltfang R, Seiler T. [Corneal collagen crosslinking with riboflavin and ultraviolet A to treat induced keratectasia after laser in situ keratomileusis.](#)
- J Cataract Refract Surg. 2007 Dec;33(12):2035-40.
- Kamburoglu G, Ertan A. [Intacs implantation with sequential collagen cross-linking treatment in postoperative LASIK ectasia.](#) J Refract Surg. 2008 ;24(7):S726-9.
- Kanellopoulos AJ, Binder PS. [Collagen cross-linking \(CCL\) with sequential topography-guided PRK: a temporizing alternative for keratoconus to penetrating keratoplasty.](#) Cornea. 2007 ;26(7):891-5.
- Kerautret J, Colin J, Touboul D, Roberts C. [Biomechanical characteristics of the ectatic cornea.](#) J Cataract Refract Surg. 2008 ;34(3):510-3.
- Mackool RJ. [Crosslinking for iatrogenic keratectasia after LASIK and for keratoconus.](#) J Cataract Refract Surg. 2008 Jun;34(6):879; author reply 879.
- Meghpara B, Nakamura H, Macsai M, Sugar J, Hidayat A, Yue BY, Edward DP : [Keratectasia after laser in situ keratomileusis: a histopathologic and immunohistochemical study.](#) Arch Ophthalmol. 2008 ;126(12):1655-63.
- Navas A, Ariza E, Haber A, Fermón S, Velázquez R, Suárez R. [Bilateral keratectasia after photorefractive keratectomy.](#) J Refract Surg. 2007 ;23(9):941-3.
- Randleman JB, Woodward M, Lynn MJ, Stulting RD. [Risk assessment for ectasia after corneal refractive surgery.](#) Ophthalmology. 2008 ;115(1):37-50. .

- Randleman JB, Trattler WB, Stulting RD. [Validation of the Ectasia Risk Score System for preoperative laser in situ keratomileusis screening.](#) Am J Ophthalmol. 2008 ;145(5):813-8.
- Salz JJ, Binder PS. [Is there a "magic number" to reduce the risk of ectasia after laser in situ keratomileusis and photorefractive keratectomy?](#) Am J Ophthalmol. 2007 ;144(2):284-5.
- [Trattler W, Binder PS](#) : Scoring system minimizes key variables. [Ophthalmology.](#) 2009 ;116(5):1014-5; author reply 1015-6 [Ophthalmology.](#) 2008 ;115(1):37-50.
- Tuli SS, Iyer S. [Delayed ectasia following LASIK with no risk factors: is a 300-microm stromal bed enough?](#) J Refract Surg. 2007 ;23(6):620-2.
- Uceda-Montanes A, Tomás JD, Alió JL. [Correction of severe ectasia after LASIK with intracorneal ring segments.](#) J Refract Surg. 2008 ;24(4):408-11.
- Woodward MA, Randleman JB, Russell B, Lynn MJ, Ward MA, Stulting RD. [Visual rehabilitation and outcomes for ectasia after corneal refractive surgery.](#) J Cataract Refract Surg. 2008 ;34(3):383-8.