Review of
REFRACTIVE SURGERY

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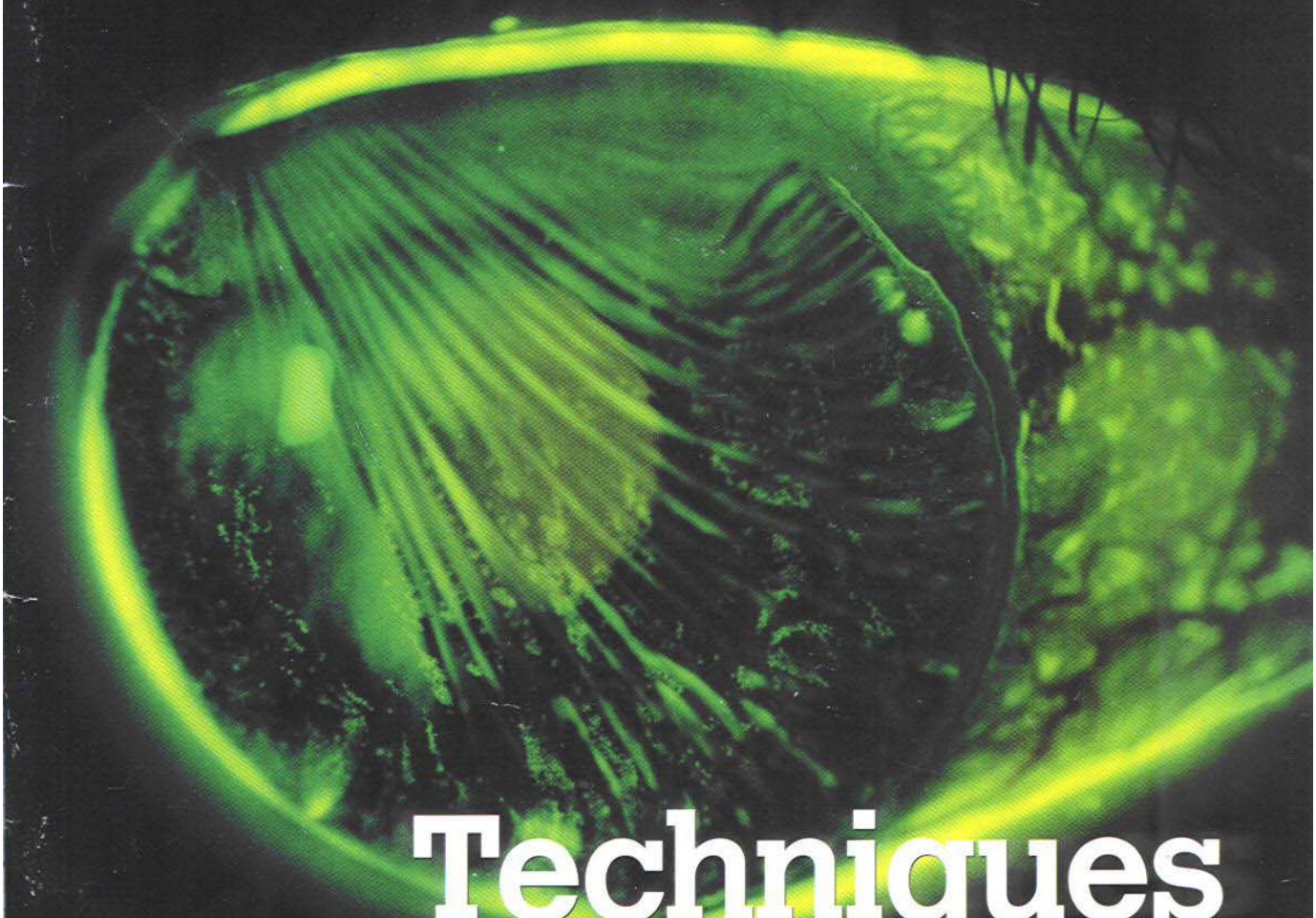

Techniques every LASIK Surgeon should master

Supplement to
REVIEW of Ophthalmology

CME: Diffuse Interface Keratitis

Bioptics takes center stage

A new approach 'stages' refractive surgery

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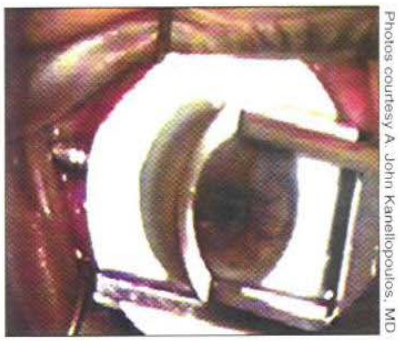
As experience with LASIK grows in the United States the long term results are gaining greater validity. Physicians are learning the surgery's limitations for very high refractive errors, and for eyes with corneal pathologies such as form fruste keratoconus or irregular astigmatism. At the same time the interest in phakic intraocular lens implants is growing with both initial U.S. and longer term international experience. These implants are continuously evolving in design and show promising results. Internationally, the most popular implants are:

- Staar Surgical's Implantable Contact Lens, a posterior chamber copolymer intraocular lens;
- Bausch and Lomb's Nuvita, a 5-mm optical zone, angle-supported anterior chamber IOL and;
- Ophtec's Artisan, an iris-supported, PMMA IOL.

A new era

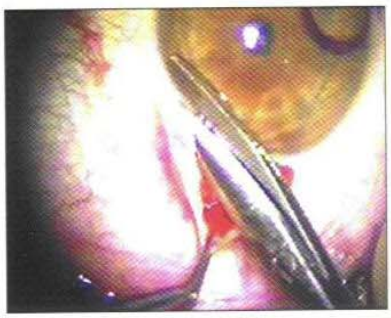
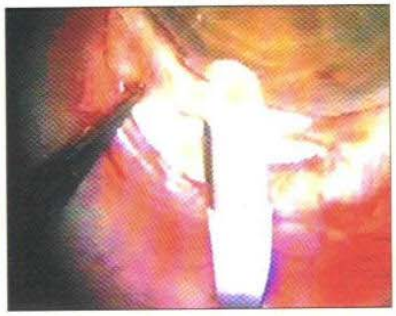
In 1999 Robert Zaldivar, MD, devised a new technique to manage very high refractive errors (–18 D to –35 D) that combined phakic IOL implantation and LASIK. He used the ICL with LASIK to correct refractive errors out of the ICL's range. Using this new concept, the maximal refractive error corrected by LASIK and that of phakic IOLs could be combined for effective refractive error correction beyond the range of either modality alone.

In my international practice, I have had success with the ICL and the Artisan lens implants. For now, I use the Artisan IOL more often because it is not angle supported, and anterior capsule opacification and pigment dispersion are avoided. The Artisan lens is



Photos courtesy A. John Kanellopoulos, MD

Figure 1. Microkeratome flap creation as first step in the first stage of the procedure.

Figures 2 and 3. A corneo-scleral incision is made with a crescent blade.

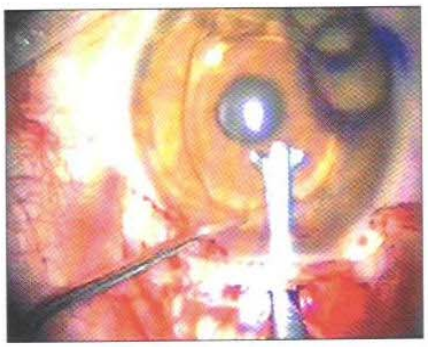
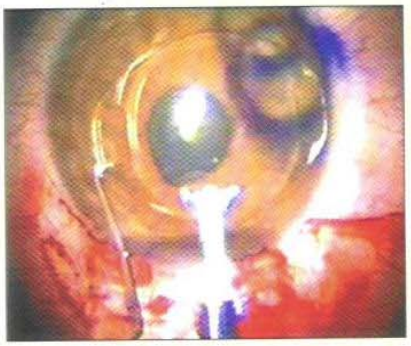
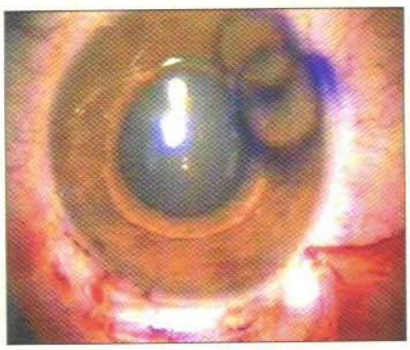


Figure 4. Introduction of the Artisan lens into the anterior chamber.





Figures 5, 6, 7. Enclavation of the lens haptics onto the iris.

available with a 6-mm optic diameter for prescriptions up to –16 D; for higher corrections, the lens is available in a 5-mm optic.

I use bioptics in a newly devised technique that stages the procedure. This combines a staged LASIK and an Artisan lens implantation in patients with more than –10 D. First, the corneal flap is made, then the Artisan lens is implanted in the same "sitting." Two months later, when the residual sphero-cylindrical refractive error can be assessed with reasonable accuracy, the LASIK flap is lifted and an ablation is performed that targets the postoperative outcome, usually emmetropia.

Surgical technique

I always try to undercorrect myopes, since I prefer to stay on the myopic side postoperatively in patients who require lenses up to –16 D; I use the 6-mm lens in patients who require correction higher than –16 D because I prefer this larger optical zone over the 5-mm IOL. I correct the residual myopia or myopic astigmatism with the "enhancement" excimer stage of the procedure.

First, a flap is created (Figure 1), the bed irrigated, and the flap replaced. Then a scleral incision is made on the steepest meridian, about 1.5 mm from the limbus; a 6.5-mm scleral tunnel to clear cornea is then created. (Figures 2, 3) I use scleral incisions for two reasons: I believe they are safer if potential postoperative trauma occurs, and they offer more stable refraction. I inject Healon GV into the anterior chamber and instill Miostat or Miochol to achieve miosis. Then the Artisan lens is implanted in the anterior chamber (Figure 4) and the wound is sutured with three interrupted 10-0 prolene sutures.

The enclavation and centration of the Artisan lens follows; for this step I use the enclavation needle and a rigid IOL forceps. (Figures 5–7) The residual viscoelastic is removed and the wound is carefully closed with one or two 10-0 prolene sutures. All knots are buried in the scleral bed and the conjunctiva is re-opposed with bipolar cautery.

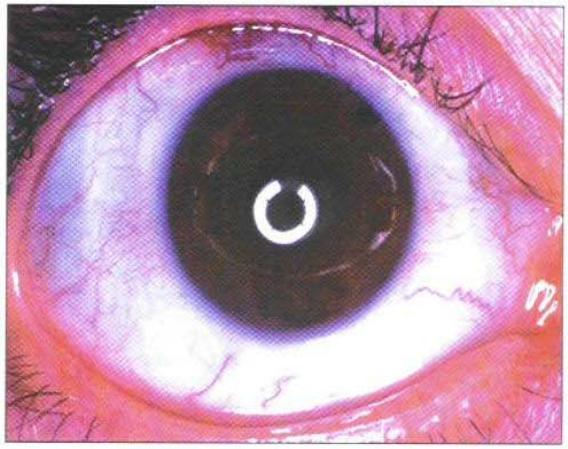


Figure 8. The final result: a –22 D eye two months following "enhancement;" UCVA is 20/20.

I instill a drop of Cosopt at the end of surgery in patients who do not have a history of asthma to avoid viscoelastic-induced ocular hypertension. I routinely perform staged bioptics under topical anesthesia in patients whom I feel will be extremely compliant during the surgery. Alternatively, I will use peribulbar anesthesia for the initial step of the bioptics procedure in less compliant patients. The use of cautery for the scleral tunnel incision causes about 1.50 D of astigmatism for the first postoperative month.

The standard postoperative regimen includes a fluoroquinolone. My preference is ofloxacin and prednisolone acetate 1% four times daily for one week; prednisolone acetate 1% is continued for another three weeks. Either the day before or the day after the surgery, a laser YAG peripheral iridotomy is performed as prophylaxis against pupillary block glaucoma.

The patient is seen the first day, first week, first month, and at two months postoperatively. At the first- and second-month visit, a careful cycloplegic refraction is performed and the residual refractive error is assessed. I am very cautious in making a decision about the refractive changes that we see at the firstmonth visit. These changes are caused by the re-expanding sclera that was previously cauterized. After two consistent readings, the existing flap is lifted and the residual refractive error is treated with the excimer. (Figure 8) For patients requiring phakic IOLs less than –16 D, the refractive error corrected at the time of the "enhancement" is about –1 D to –3 D. This is in addition to the patient's preoperative cylinder, minus –0.50 or –0.75 D. The postoperative drug regimen is ofloxacin and prednisolone acetate four times daily for six days. (Figure 8)

Worth the work

We conducted a small study[1] of 12 patients who underwent the procedure. They had a mean preoperative spherical refractive error of –14.55 D (range –11 D to –25 D); at eight weeks, their mean refractive error was –2.50 D. Ten of the initial 12 eyes required enhancement; their mean spherical postoperative refractive error was –4.50 D. Preoperative best-corrected visual acuity was 20/45. The preoperative uncorrected visual acuity was count fingers. The postoperative best-corrected visual acuity in these patients was 20/27, and the uncorrected visual acuity postoperatively was 20/42.

We saw no intraocular pressure spikes and no flap epithelial ingrowth at any stage of the procedure. One patient experienced minor halos and glare at night following the first stage of the procedure. One month after the ablation, there was no epithelial ingrowth. There was an interesting paradox of a 1.2% increase in central endothelial cell count seen at three months. This increase may be due to the cessation of contact lens wear in these patients, most of whom had worn them for decades. The preoperative central corneal endothelial cell count morphology showed significant polymegethism which seems to resolve postoperatively when contact lens use stops. This results in an artifactual increase in central endothelial cell counts, which would explain our findings. RRS

Significant Advantages

This new technique offers good, predictable approximation of emmetropia for patients with very high myopia. The Artisan IOL requires a more elaborate implantation technique than other phakic IOLs, but it also offers unique advantages. Excessive corneal thinning is avoided with the bioptics approach. Patients who have one LASIK eye and one bioptics eye report vision with the latter to be "clearer."

REFERENCES

1. Kanellopoulos, AJ. Bioptics: A new refractive procedure for high myopia combining an Artisan phakic IOL and staged LASIK for emmetropia. Paper presentation: ESCRS annual meeting, Brussels, Belgium, September 2-6th 2000.