LASIK XTRA: DOES IT HAVE A ROLE IN REFRACTIVE SURGERY?

CXL helps maintain the biomechanical stability of the cornea after LASIK flap creation.

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In a refractive surgery procedure that involves flap creation, whether with a microkeratome or a femtosecond laser (namely, LASIK), it makes sense to perform CXL at the same time. This approach, dubbed LASIK Xtra, certainly has a role in the refractive surgeon’s armamentarium, although it has both clear indications and contraindications.

The biomechanical strength of the cornea decreases when a flap is created. John Marshall, PhD, FRCPath, FRCOphth(Hon), and others have published studies indicating that corneal strength decreases in relation to the thickness of the flap. According to Professor Marshall, an 80- to 90-μm flap causes a 15% decrease in the strength of the cornea, and flaps of 140 μm decrease corneal strength by 25% to 30%. In my own studies, I have found that corneal resistance factor (CRF) measurements on the Ocular Response Analyzer (Reichert Technologies) decrease by 1 unit with a 100-μm femtosecond laser flap and by 2 units with a 100-μm microkeratome flap.

There is no doubt that CXL increases the strength of the cornea. In the majority of corneas in which a flap is created for excimer laser surgery, the resulting decrease in corneal strength is not drastic enough to produce ectasia; however, logic dictates that, if possible, we should use a procedure that increases the strength of the cornea when a debilitating surgery such as LASIK is performed. The only downside to this would be if the addition of CXL were to change the results of the LASIK surgery. My own studies have suggested that there is no change in the final outcome between LASIK and LASIK Xtra. Another study has confirmed this finding.

INDICATIONS

The combination of CXL and LASIK is not indicated in all patients. Based on my experience, LASIK Xtra may be indicated in the following cases:

- Young LASIK candidates (less than 24 years of age);
- Patients with severe ocular allergies, due to the risk of heavy eye rubbing;
- Patients with completely normal corneas with no signs of keratoconus but with a family history;
- Patients with thin corneas with normal preoperative evaluation (in which risk of ectasia has been ruled out);
- High myopes (requiring large resections);
- Patients who require retreatments, particularly if the thickness of the previous flap is unknown;
- Patients who experienced unexpected thick flap creation during standard LASIK; and
- Patients who experienced unexpected irregular flap creation with variable thickness along its surface.

A. John Kanellopoulos, MD, has stated that, in the peripheral ablation patterns used for hyperopic treatments, CXL locks in the new corneal shape, and, therefore, regression is delayed.
LASIK Xtra: No Change in Refractive Results

We found that 16 eyes (32%) maintained similar CRFs, eight eyes (16%) had a mean 0.8 unit improvement in CRF, and 26 eyes (52%) had a mean 0.89 unit decrease in CRF. In a previous study of CRF decrease with femtosecond laser-created flaps, 100% had a mean decrease of 1 unit. From this result, it could be deduced that CXL helps to maintain the biomechanical stability of the cornea after LASIK flap creation. Other studies have confirmed this idea.9,10

**TECHNIQUE AND RESULTS**

LASIK Xtra is a simple procedure that adds only a few minutes to standard LASIK surgery. After excimer laser ablation is completed, with the flap still lifted, riboflavin (Vibex Xtra; Avedro) is instilled onto the stromal bed for 90 seconds. Then the riboflavin is rinsed out with balanced saline solution, and the flap is repositioned. The cornea is then exposed to UV-A light for 75 seconds, with a total energy of 2.30 J/cm².

Long-term results are needed to confirm that LASIK Xtra is able to reduce ectasia development in LASIK patients. Because there has been only a few years since its introduction, we are not yet able to prove that LASIK Xtra works to prevent weakening of the cornea or to return the cornea to its preoperative biomechanical strength. Unfortunately, although substantial research has been conducted to find a system that measures the strength of the cornea in an accurate manner, the only available method we have is not accurate and produces some false positive and false negative cases.

The Ocular Response Analyzer is the only system in use today to study the coefficient of hysteresis (CH) and CRF. These two measurements, made preoperatively and postoperatively, can be used to evaluate changes in the biomechanical strength of the cornea. The ideal study, however, would be to treat one eye with CXL and leave the other eye untreated to truly understand the benefit of the procedure. To the best of my knowledge, no study like this has been published.

At my clinic, we compared pre- and postoperative CRF in 50 eyes treated with LASIK Xtra with femtosecond laser flaps.

**WARNING**

It is erroneously believed by some that LASIK Xtra is indicated for the treatment of keratoconus. This procedure is not indicated when keratoconus is detected or when a preoperative evaluation indicates the possibility of ectasia development. In such cases, surface ablation with CXL is the preferred approach.

**REFERENCES**