was $-2.01 \pm 7.40$ and $-0.96 \pm 4.34$ diopters; mean induced astigmatism in conventional notation was $3.76 \pm 0.82$ and $3.46 \pm 1.36$ diopters; mean induced astigmatism in polar values was $7.53 \pm 4.02$ and $7.40 \pm 2.86$ diopters on the traditional and shaped PKP groups, respectively.)

Busin first described the novel wound configuration described as “top hat” for PKP, theoretically providing better resistance against leakage attributable to the self-sealing posterior lip. Sutures therefore would not need to be as tight, which might reduce initial suture-induced astigmatism. Incision healing might be stronger attributable to increased wound surface area. Complete suture removal has been reported as early as the third postoperative month, potentially permitting more rapid visual rehabilitation as compared with traditional PKP.

Despite these theoretical advantages, there has been limited adoption of this manual surgical technique among corneal surgeons. The procedure has a technically demanding learning curve and requires more time to perform. The use of a femtosecond laser to create the resection not only could decrease procedure time but could also create a more precisely matched donor-recipient wound edge. This study demonstrates the feasibility of performing deep corneal resections using the IntraLase femtosecond laser in a single step. Our results mirror those shown by Busin and our previous report. Mechanical stability was shown to be superior to traditional PKP. The use of corneal marks to assist in symmetrical placement of sutures was feasible. In human applications, this feature should help minimize irregular astigmatism induced by asymmetrical alignment of the graft tissue to the host.

**REFERENCES**


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**Confocal Microscopy of a Femtosecond Laser LASIK Flap Before Separation**

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**PURPOSE:** To describe stromal changes after a femtosecond laser-assisted in situ keratomileusis (LASIK) flap was created but not separated.

**DESIGN:** Case report.

**METHODS:** As part of a randomized paired-eye study comparing LASIK flap creation by a femtosecond laser to a mechanical microkeratome, a femtosecond laser flap was successfully created on one eye of one patient, but the flap was not separated because of a flap-related complication in the fellow eye. Confocal microscopy of the femtosecond laser flap was performed before and at intervals after it was created.

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RESULTS: Activated keratocytes and interface haze were visible at one day after femtosecond laser treatment, with gradual resolution toward normal two months. The femtosecond laser flap was easily separated four months after it was created.

CONCLUSIONS: Corneal photodisruption by the femtosecond laser is associated with transient keratocyte activation and corneal haze, but marked wound healing does not occur to hinder flap separation several months later. (Am J Ophthalmol 2007;143:691–693. © 2007 by Elsevier Inc. All rights reserved.)

FEMTOSECOND LASERS PRECISELY PHOTO DISRUPT THE cornea to create dissections of any geometric configuration while minimizing collateral tissue damage.\textsuperscript{1,2} Corneal haze is transiently higher after laser-assisted in situ keratomileusis (LASIK) with the flap created by a femtosecond laser than with a mechanical microkeratome.\textsuperscript{3} Because minimal haze has been detected after creating but not separating femtosecond laser flaps, haze has been suggested to be the result of subsequent flap separation or stromal ablation (Kesler-Diaz A, et al, IOVS 2006;47 ARVO E-Abstract 2731).

A 29-year-old woman with myopia was enrolled in a randomized paired-eye study comparing LASIK flap creation by a 15-kHz femtosecond laser (IntraLase FS; IntraLase, Irvine, California, USA) to flap creation with a mechanical microkeratome.\textsuperscript{3} The study protocol required the femtosecond laser flap be created first; LASIK would then be performed on the fellow eye with the flap created by a mechanical microkeratome; finally, the femtosecond laser flap in the first eye would be separated and LASIK completed. Confocal microscopy was performed preoperatively per the study protocol (Figure 1). A flap was successfully created in the left eye with the femtosecond laser (raster energy 2.2 \textmu J; side-cut energy, 2.5 \textmu J; raster spot and line separation, 11 and 9 \textmu m, respectively), but the flap was not separated and LASIK was not completed because a button-hole flap was created in the right eye. The cornea treated with the femtosecond laser was examined by confocal microscopy at intervals after flap creation. Both eyes were treated with a topical corticosteroid dose that was tapered over two months.

Confocal microscopy showed activated keratocytes in images centered at the interface as early as one day after the flap was created by the femtosecond laser (Figure 2). Increased reflected and scattered light (haze) was apparent, originating from keratocytes and possibly from extracellular matrix. Keratocyte activation and haze diminished at each examination over two months (Figure 3).

Four months after the button-hole complication, the patient was treated with photorefractive keratotomy in the right eye; 20/15 uncorrected vision was obtained. LASIK was successfully completed in the left eye by easily separating the flap that had been created by the femtosecond laser four months earlier.

Our case shows that photodisruption with the femtosecond laser causes keratocyte activation and corneal haze, even without tissue separation or stromal ablation. The findings are contrary to those of a rabbit study, in which corneal haze was barely detectable after the femtosecond laser flaps were created but not lifted (Kesler-Diaz A, et al, IOVS 2006;47 ARVO E-Abstract 2731). The discrepancy

FIGURE 1. Confocal microscopy image of left cornea before intended laser-assisted in situ keratomileusis (LASIK) procedure at a depth that would correspond to the interface after femtosecond laser flap would be created. Normal keratocyte nuclei are represented as bright objects against a dark background. Cell processes are typically not visible in confocal images of normal corneas.

FIGURE 2. Confocal microscopy image centered at the interface one day after femtosecond laser-assisted in situ keratomileusis (LASIK) flap was created but not separated. Keratocyte nuclei appear more granular and cellular processes are visible, consistent with keratocyte activation. Increased reflectivity and scatter from activated cells, and possibly extracellular matrix, causes increased corneal haze.
could be explained by differences in the wound healing response between rabbits and humans, or by the use of different laser energy levels. Upgrades to the IntraLase femtosecond laser will reduce the energy required to create flaps, and the use of this laser is likely to be associated with reduced keratocyte activation and haze. Although keratocyte activation is associated with a greater wound healing response, in our patient, the flap was easily separated four months after it was created. Despite increased haze after LASIK with the femtosecond laser, short-term results demonstrate refractive stability and vision equal to LASIK with microkeratomes.

References


Influence of Ocular Hypotensive Eyedrops on Intraocular Pressure Fluctuation With Postural Change in Eyes With Normal-tension Glaucoma

Takahiro Kiuchi, Yuta Motoyama, and Tetsuro Oshika

Purpose: To investigate the effect of various ocular hypotensive eyedrops on the intraocular pressure (IOP) fluctuations caused by the postural change in patients with normal-tension glaucoma (NTG).

Design: Randomized crossover single-blind study.

Methods: Twenty-four eyes of 24 newly diagnosed NTG patients were enrolled. One of the three eyedrops including timolol maleate, latanoprost, and brinzolamide was randomly administered for one month. Each patient received all three eyedrops with a one-month washout period between the drugs. The IOP at baseline and after each treatment trial was measured in both sitting and supine positions.

Results: Compared with the baseline level, the magnitude of IOP elevation associated with the postural change did not alter significantly by the application of any eyedrops (one-way repeated-measures analysis of variance, \( P = .288 \)).

Conclusions: The mechanism of action underlying the IOP change with the postural change is different from the pharmacologic action of these hypotensive agents. (Am J Ophthalmol 2007;143:693–695. © 2007 by Elsevier Inc. All rights reserved.)

The intraocular pressure (IOP) rises with the postural change from the sitting to supine positions, which is more remarkable in eyes with normal-tension glaucoma (NTG). We have previously reported that significant positive correlation exists between the magnitude of IOP elevation by the postural change and the progression of visual field damage in patients with NTG. Various topical hypotensive eyedrops with variety of pharmacologic mechanisms are available. To our best knowledge, however, the effect of those drugs on the IOP...