Measurement of Intraocular Pressure During Corneal Flap Preparation

To the Editor:

We read with interest the study by Vetter et al, “Intraocular Pressure During Corneal Flap Preparation: Comparison Among Four Femtosecond Lasers in Porcine Eyes,” which appeared in the June 2011 issue of Journal of Refractive Surgery. Vetter et al measured the changes in intraocular pressure (IOP) during lamellar flap creation using four different femtosecond lasers. We also analyzed IOP changes that occur during both external eye compression and flap creation in an animal model, and we would like to address the method used by Vetter et al in their study.

Vetter et al measured IOP in the vitreous cavity using a needle inserted through the optic nerve. However, as found in previous studies of our own, we believe the vitreous cavity may not be the most appropriate place to measure IOP when a cannulation method is used. In our first study, a significant difference was found in IOP measured in the anterior chamber versus the vitreous cavity. Furthermore, we found that IOP measured within the vitreous cavity during the external IOP-increase induction was close to the IOP measured in the anterior chamber during the first seconds of the procedure. Afterwards, IOP in the vitreous cavity reached a “plateau,” while IOP in the anterior chamber continued to rise. As the cannulation method of measuring IOP depends on the liquid flow through the cannula and tubes, the high viscous nature of the vitreous gel may occlude or decrease the flow within the lumen of the cannula placed in the vitreous cavity. This finding may be one reason for these differences in IOP measured between the anterior chamber and vitreous cavity.

We believe we have provided evidence to suggest that the anterior chamber is a better place to monitor the changes in IOP due to surgical maneuvers. Intraocular pressure recorded in the vitreous cavity (with a cannula) is lower, and thus less sensitive to changes in IOP. Therefore, we do not believe that using the vitreous cavity for cannulation is the best way to detect differences in intraoperative IOP changes among several surgical devices.

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The authors have no proprietary interest in the materials presented herein.

REFERENCES


Reply:

We thank Drs Hernández-Verdejo and Teus for their comments and agree that the vitreous body can occlude cannulas of 20 or 21 gauge size. This leads to false pressure recordings if the pressure is measured by an external pressure transducer via the cannula. As a consequence, the obtained pressure curve shows a “plateau-like” shape with no sudden changes. This happened frequently during our measurements of intraocular pressure (IOP) in porcine eyes. However, only measurements with a continuously unblocked cannula were included in the studies. This was assured by two control mechanisms.

First, prior to each measurement, the cannula was inserted through the optic nerve and a discrete indentation was applied to the globe. A sharp peak in the pressure curve could be observed if the cannula was unblocked. In cases of blockage, the needle was extracted, flushed with saline, reinserted through the same entrance, and the insertion site was sealed with histoacrylic glue. If this happened twice, a new porcine globe was used.

Second, during each measurement, the pressure curve was continuously evaluated for plateaus and for “missing” sudden pressure changes. If blockage of the needle was suspected, the measurement was aborted and the same procedure, as described before, was applied. Example pressure curves with unblocked cannulas are displayed in our previous publications and show characteristic steep increases and decreases of the IOP.

An alternative approach could be the cannulation of the anterior chamber as proposed by Hernández-Verdejo et al. Blockage of the cannula, however, is also possible by the iris, lens, or cornea. During contact glass related deformation of the anterior chamber these tissues could move towards and obstruct the tip of the needle. In our case, we opted to measure the IOP in the vitreous cavity. As we were testing five different devices (four femtosecond lasers and one microkeratome) with variable designs of the contact glass and suction ring we expected difficulties in achieving a standardized
anterior chamber insertion technique that would be feasible with all devices used.

Because all measurements with suspected blockage of the cannula were excluded, we believe the measured values accurately reflect the IOP in the vitreous cavity.

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A Simple, Reproducible, and Cost Effective Axis Marking System for Toric Lens Implantation

To the Editor:

Toric intraocular lenses (IOLs) can neutralize corneal astigmatism. Their efficacy, however, relies on the correct alignment of their cylinder axis counter to the axis of astigmatism. Although calculated preoperatively, the correct axis must be easily and accurately identified on the eye at the time of surgery. Marking can be difficult, with errors in alignment resulting in suboptimal correction of astigmatism and patient dissatisfaction. This has prompted the development of a growing number of axis-marking methods and instruments, but none are ideal. Some of the challenges with current methods are their cost, cumbersome manipulations, a considerable learning curve for the surgeon, need for sterilization of instruments, and a lack of adaptability. These issues are barriers to the greater adoption of toric IOL technology. We are pleased to describe a simple, accurate, and easily reproducible method for axis marking that addresses these challenges.

A calibrated decal (TopCon Axis sticker for slit-lamp, Model 71-MESL11014S; TopCon Corp, Tokyo, Japan), indicating angles 0° to 180°, is applied to the vertical surface of the running plate of the slit-rotator (Fig). This allows for accurate placement of the slit at any angle. The slit beam is set to its narrowest width (~1 mm) and longest length (~10 mm), dialed to the desired angle, and projected on the patient’s cornea so that it spans the visual axis and corneal limbus. Using the projected beam as a guide, the axis of astigmatism is marked while the patient is in a seated position with a superficial epithelial scratch using a 30-gauge needle at the corneal limbus in both the upper and lower quadrants. Dual scratches 180° apart maximize the accuracy when dialing the toric IOL into final position. It is recommended that the axis markings be done just before the patient is prepped with povidone-iodine and draped for surgery. This, together with the usual pre-, intra-, and postoperative antibiotic regimen, minimizes the risk of infection, and the superficial scratches are less invasive than the paracenteses and main corneal incision. No additional markings or instruments are required intraoperatively as the superficial limbal abrasion is seen under the operating microscope.

We validated this technique in two ways. First, no error occurred between marks made with the calibrated slit-lamp and direct measurements made by an ophthalmic protractor (beveled degree gauge; ASICO, Westmont, Illinois) on Styrofoam balls (mean error= 0°, standard deviation=0, n=10). Second, a blinded independent observer was able to use the calibrated slit-lamp to estimate the angle of marks on mounted cadaveric porcine eyes with an average error of only 3.2° (standard deviation=2.6°, n=10), but a paired samples two-way *t* test revealed these estimates were not different from initial marks (*P*> .05, n=10).

The method described herein is accurate and cost effective. The simplicity of the technique allows even novice surgeons to make accurate axis markings. Negating the requirement for any specialized pre- or intraoperative instrumentation reduces operating costs. Independence from sterile instruments also per-
mits multiple toric IOLs to be implanted in a single surgical day in centers where autoclave turnaround time is limiting.

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