

Femtosecond Laser–Assisted Capsulotomy Markings for the Alignment of Toric IOLs: A New Technique

To the Editor:

The management of corneal astigmatism during cataract surgery is of crucial importance because it may determine the refractive outcomes, visual performance, and overall satisfaction rate of patients undergoing the procedure.¹ Accurate determination of the astigmatism axis is crucial to its optimal correction, whereas the procedures for corneal astigmatism management may be categorized as corneal-based and lens-based.^{2,3} Several approaches have been used in clinical practice to mark the axis of corneal astigmatism prior to surgery.^{4,5} The most common is freehand marking at the level of the cornea using a surgical pen, but marking instruments using gyroscopic technology have been also used.⁴ More recently, preoperative iris registration using corneal topography platforms has been implemented, allowing for axis determination through overlay imaging via the surgical microscope. The creation of femtosecond laser corneal intrastromal marks⁵ may also facilitate toric intraocular lens (IOL) placement during cataract surgery. Montes de Oca et al.⁶ compared the outcomes of manual marking and femtosecond laser intracorneal marks (assisted with preoperative iris registration) and concluded that they demonstrate similar accuracy for toric IOL alignment.

We describe the feasibility of a new approach of axis marking for toric IOL axial alignment using femtosecond laser–assisted capsulotomy marks as an axis reference. Prior to cataract surgery, corneal astigmatism is assessed using the Cassini topography platform (i-optics, Hague, Netherlands), which allows for corneal astigmatism axis repeatability of 3°^{7,8} while offering iris registration and for image acquisition to be coupled with the LENSAR laser platform (LENSAR LLC, Orlando, FL). The latest software operating system of LENSAR (Streamline IV) allows for the creation of marks (used for axis determination) on the capsulotomy edge. The marks are small tabs at the capsulotomy edge with a height of 300 μm and an arc length of 5° at their base (**Figure 1**, **Video 1**, available in the online version of this article). Two tabs are created 180° apart to define the desirable axis (the design of the capsulotomy marks creates a protrusion rather than notching at the capsulotomy edge; this approach does not introduce weakness at the capsulotomy edge that could lead to extensions). After the implantation of the toric lens during cataract surgery, the axis

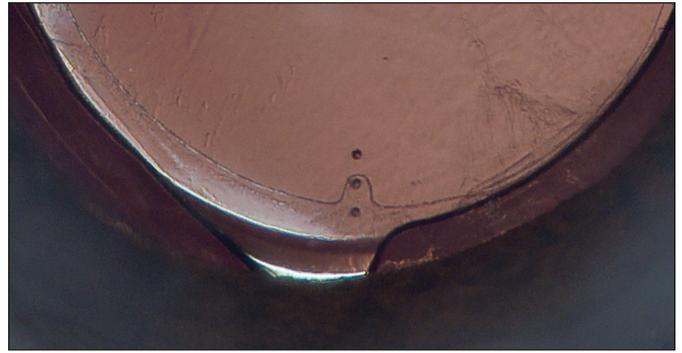


Figure 1. Postoperative day 1 after toric intraocular lens (IOL) implantation, showing the toric marks on the optic of the IOL and the capsulotomy tab used for IOL alignment.

marks on the IOL are aligned with the capsulotomy marks (**Figure 1**, **Video 1**).

This axis marking modality offers several advantages when compared to other techniques. Marking at the level of the capsulotomy offers axis reference at the same plane as the toric IOL, avoiding parallax issues that axis markings at the level of the cornea may demonstrate. Furthermore, the capsulotomy tabs remain present after surgery as an anatomical landmark and facilitate the assessment of IOL axis position during the early postoperative follow-up. Aside from the clinical postoperative assessment, the capsule marks may be used for cases in which IOL rotation is required postoperatively (secondary IOL rotation). All other marking techniques do not remain present for a long time after surgery. For example, the ink of the surgical pens or the gyroscopic marking instruments fades away and sometimes is not even visible during cataract surgery. The femtosecond laser–assisted corneal intrastromal marks also dissipate rapidly after their creation and their creation is not feasible with the femtosecond laser in cases of corneal opacities (ie, arcus).

Toric IOL alignment based on capsulotomy markings is feasible. This new axis marking modality seems to overcome several disadvantages of the known axis marking techniques and offer surgeons the versatility of avoiding parallax. Further clinical studies are needed to validate this new surgical approach by evaluating postoperatively the IOL axis orientation along with the capsulotomy marks axis orientation to the intended axis determined preoperatively.

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