COVER STORY

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Strategies for Astigmatism Correction in MICS

Toric microincision IOLs and LRIs can be safely combined with bimanual MICS.

BY MASAYUKI OUCHI, MD, PHD

The limbal relaxing incision (LRI) is a useful and convenient technique for reducing astigmatism, either for surgically induced astigmatism after cataract surgery[1] or during cataract surgery to correct preexisting astigmatism.[2] In the latter application, two important considerations must be taken into account: (1) the possibility of interference between phaco incision and LRI placement and (2) changes in the rigidity of the cornea.

When phaco-IOL surgery and LRI placement are performed as a combined procedure, the phaco incision and the LRIs may mutually interfere depending on the angle of astigmatism and the surgeon's preferred phaco-IOL incision. Because LRIs involve a pair of 40° to 120° arc-shaped incisions placed at various angles, the phaco-IOL incision and the LRI incision will overlap in the case of against-the-rule astigmatism if a temporal corneal incision is placed for phacoemulsification (Figure 1A). On the other hand, if a superior phaco-IOL incision is used, the LRI and phaco incision will be too close together (Figure 1B) in an eye with-the-rule astigmatism. To the best of our knowledge, LRIs are not typically combined with temporal clear corneal incision cataract surgery in cases of against-the-rule astigma-

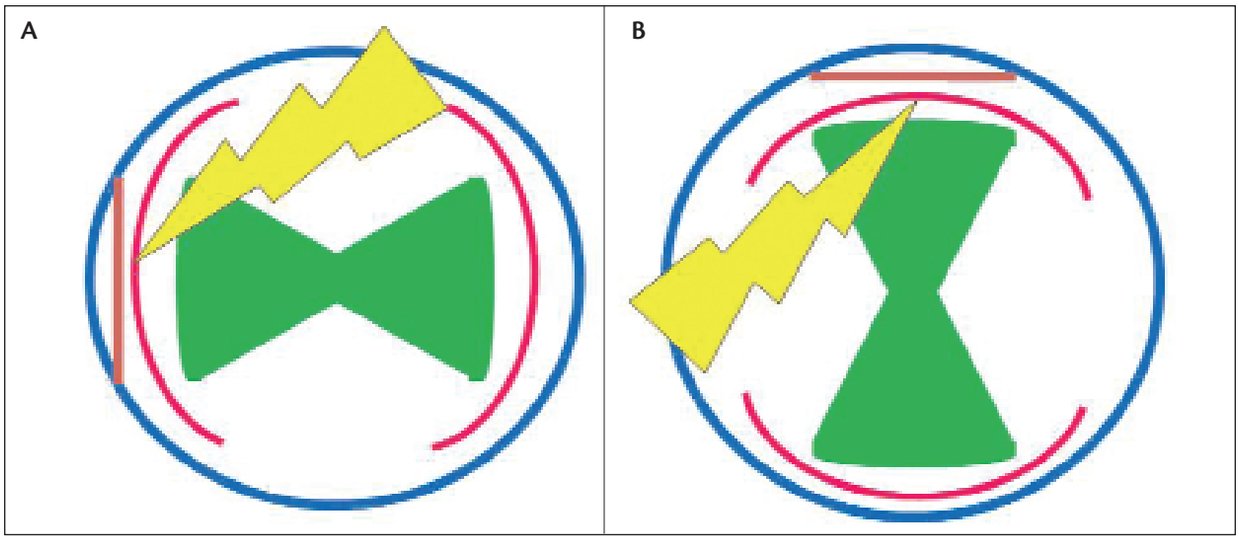

Figure 1. Interaction between the phaco-IOL incision and the LRIs. (A) For a surgeon using a temporal corneal incision, the phaco incision and LRIs will overlap in the presence of against-the rule astigmatism. (B) For a surgeon using a superior incision, the incisions will be placed close together in the presence of with-the-rule astigmatism.

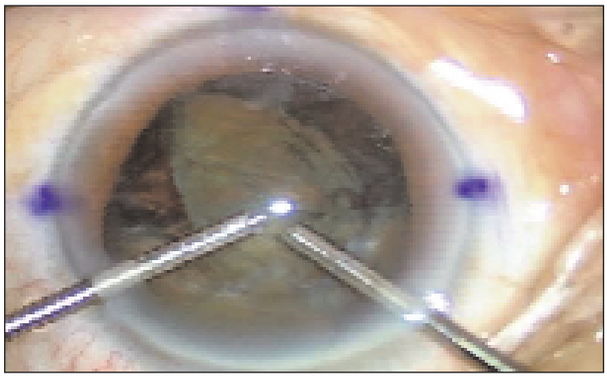

Figure 2. Bimanual phaco cataract removal via two 0.9-mm incisions using a (left) 22-gauge irrigating chopper and (right) the Agarwal 22-gauge phaco tip.

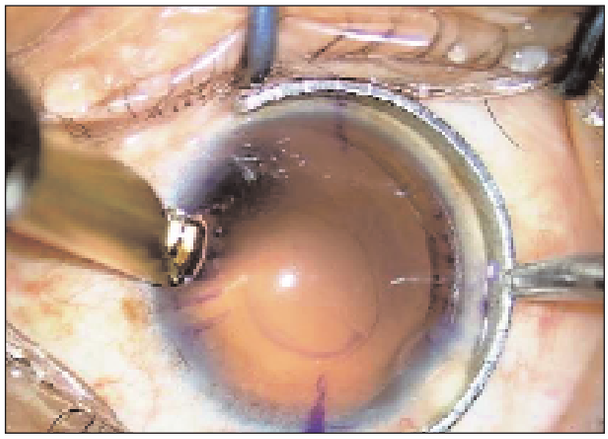

Figure 3. LRI placement after bimanual MICS lens removal.

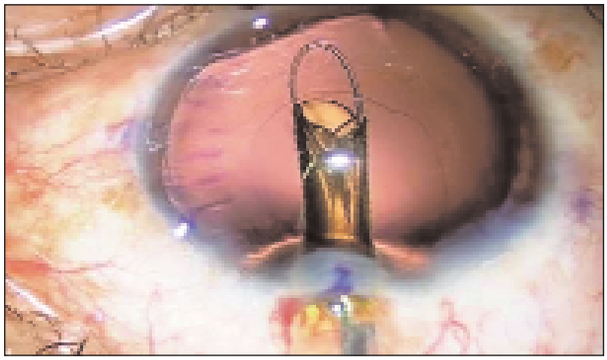

Figure 4. The iMICS Y-60H is inserted via a 1.6-mm corneal incision at a location that is far from the LRIs (orthogonal position of the LRIs).

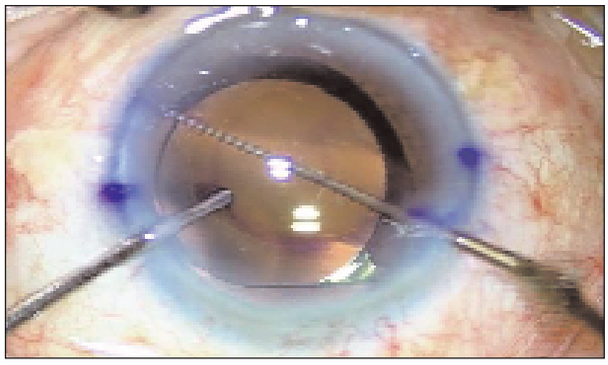

Figure 5. After bimanual phaco, a (right) lens hook is used to fine tune toric IOL placement with (left) irrigation through the other incision.

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tism; however, this surgical combination has been used in cases of with-the-rule astigmatism.[3]

The second consideration is that, regardless of which operation is done first, the second operation will be done in the presence of reduced corneal rigidity, which leads to corneal distortion, deterioration of surgical visibility, and decreased precision of LRIs. We recently established a surgical procedure to address these problems. Below we report our surgical technique for combined LRI and bimanual MICS. A video of our technique with a 0.9-mm incision can be viewed at http://eyetube.net/?v=hepal.

COMBINED SURGICAL TECHNIQUE

Prior to surgery, the steepest meridian is marked with a Fukuyama LRI marker (ASICO, Westmont, Illinois) at the peripheral cornea according to corneal topography. Next, two 0.9-mm incisions are made at the 10- and 2-o'clock positions using a 0.9-mm microvitreoretinal (MVR) knife (EdgeAhead Stiletto; BD, Franklin Lakes, New Jersey). Lens removal is carried out through these incisions with a bimanual MICS technique, which we now perform through a 0.9-mm incision using a 22-gauge phaco needle and an Agarwal 22-gauge irrigating chopper (MicroSurgical Technologies, Redmond, Washington; Figure 2).[4]

A fixation ring is placed on the eye, and the corneal limbus is then incised using a diamond LRI knife at a preplanned angle depending on the degree of astigmatism. We use the Nichamin nomogram to determine

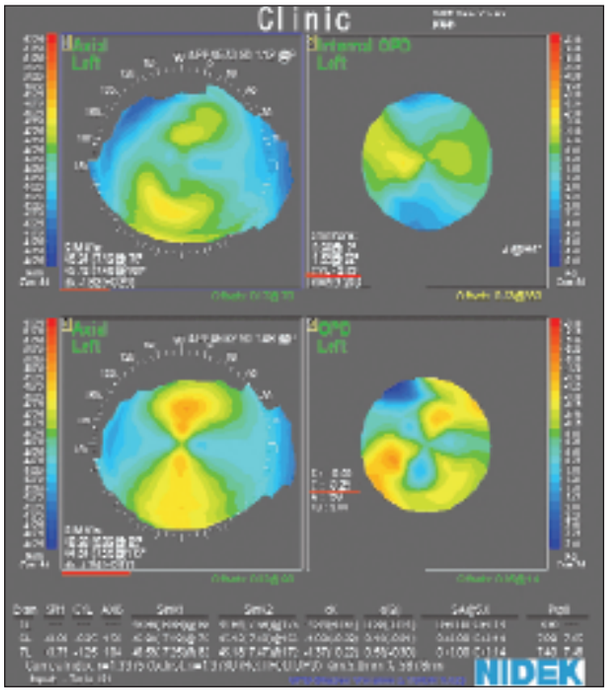

Figure 6. Total surgical effect of combined toric IOL implantation and placement of LRIs. The LRI reduced corneal astigmatism from (bottom left) 4.34 to (upper left)1.82 D. The toric IOL added (upper right) 2.63 D astigmatic correction at the IOL plane, and the total eye astigmatism was eventually (bottom right) 0.25 D.

the size and location of the incisions. Even under strong pressure, the ophthalmic viscosurgical device does not leak out through the two incisions, and corneal distortion does not occur (Figure 3). Creating LRIs as one step in this combined surgical method is as easy as creating LRIs independently because of the excellent corneal stability, even after lensectomy. In this technique, a 0.9-mm phaco incision is made at the limbus and the LRIs are made 1 mm inside the limbus.

After making one pair of LRIs, a new 1.6-mm clear corneal incision for IOL insertion is made in the cornea. This incision should be made away from the pair of arc-shaped LRIs so as not to affect them. The site of IOL insertion depends on the location of the astigmatism. For cases of against-the-rule astigmatism, the IOL is inserted via the superior site, because the LRIs are located in the nasal and temporal quadrants; in cases of with-the-rule astigmatism, the IOL is implanted via the temporal site because of the vertical LRIs. In the presence of oblique astigmatism, the IOL is implanted through one of the paracenteses, which must be enlarged.[5] We prefer the Y-60H iMICS IOL (Hoya, Tokyo; Figure 4).[6]

TAKE-HOME MESSAGE

- When phaco-IOL surgery and LRI placement are done as a combined procedure, the second operation will be performed under reduced corneal rigidity.
- In the combined surgical technique described here, bimanual phaco is performed first, followed by LRI placement and finally IOL insertion.
- The toric IOL is implanted via a newly created 2.2-mm incision.

TORIC IOL IMPLANTATION WITH AND WITHOUT LRIs

Bimanual MICS can also be advantageous in combination with toric IOL implantation. Current MICS IOLs cannot fit through the 0.9-mm incisions that we use for cataract removal, and therefore I usually insert the toric IOL via a newly created 2.2-mm incision. This main incision is used only for IOL injection and not for phacoemulsification, a strategy that helps to reduce surgically induced astigmatism. After injection of the toric IOL, we finely adjust the toric axis with the lens hook, with irrigation placed through the other incision (Figure 5).

A bimanual MICS technique is also useful with combined toric IOL implantation and LRIs.[7] We often use this combination in Japan because the only commercially available toric IOLs (AcrySof IQ Toric T3, T4, and T5; Alcon Laboratories, Inc., Fort Worth, Texas) correct no more than 2.00 D of astigmatism. Figure 6 depicts the surgical effects of combining bimanual MICS with toric IOL implantation and LRIs. I believe that this strategy would also be useful in Europe, because combining toric IOL implantation with LRIs may lessen the associated risks of each individual procedure. ■

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1. Nichamin LD. Astigmatism control. Ophthalmol Clin North Am. 2006;19:485–493.
2. Muller-Jensen K, Fischer P, Siepe U. Limbal relaxing incisions to correct astigmatism in clear corneal cataract surgery. J Refract Surg. 1999;15:586–589.
3. Jensen MK, Fischer P, Siepe U. Limbal relaxing incisions to correct astigmatism in clear corneal cataract surgery. J Refractive Surg. 1999;15:586–589.
4. Agarwal A, Agarwal A, Agarwal S, Narang P, Narang S. Phakonit: phaco emulsification through a 0.9 mm corneal incision. J Cataract Refract Surg. 2001;27:1548–1552.
5. Ouchi M, Kinoshita S. Prospective randomized trial of limbal relaxing incisions combined with microincision cataract surgery. J Refractive Surg. 2010:26:594–599.
6. Ouchi M. Using the HOYA Y-60H intra-ocular lens for micro-incision cataract surgery: early clinical results. Japanese J Cataract Refract Surg. 2008;22:67–72.
7. Ouchi M, Kinoshita S. AcrySof IQ Toric intraocular lens implantation combined with limbal relaxing incision during cataract surgery for over 2.5-diopter astigmatic eyes:The clinical results. J Refractive Surg. [In press.]