

# Suture Fixation of the Capsular Bag

Lens surgery in the face of zonular insufficiency.

BY ROBERT J. CIONNI, MD

**W**eakened or missing zonules present a serious challenge to the cataract surgeon. Fortunately, the use of a capsular tension ring (CTR) in these cases has been shown to decrease the risk of complications.<sup>1-4</sup> Nevertheless, although a CTR can be helpful in patients who have a moderate loss of zonular support, eyes with profound zonular compromise (or lens subluxation) may not obtain adequate stabilization or centration despite CTR placement. In 1997, Robert Osher, MD, of Cincinnati demonstrated the idea of *synthetic zonules* by suturing the CTR to the scleral wall with a 10-0 PROLENE suture (Ethicon Inc., Somerville, NJ).<sup>5</sup> Vladimir Pfeifer, MD, of Ljubljana, Slovenia, preferred to fashion a small peripheral capsulorhexis through which a similar suture passage could be made.<sup>6</sup> Although both techniques provide a solution for eyes with severe zonular insufficiency, they violate the integrity of the peripheral capsular bag and thereby risk its rupture. The modified CTR (Morcher GmbH, Stuttgart, Germany) differs from the CTR in that the former has a fixation hook that loops anteriorly into a second plane, wraps around the capsulorhexis edge, and thereby allows scleral fixation without violating the integrity of the capsular bag (Figures 1 through 3).<sup>7</sup>

## MODIFIED CTR TECHNIQUE

### The Capsulorhexis

I usually work through a near-clear corneal incision and place a generous amount of a dispersive viscoelastic over the area of zonular dialysis to tamponade vitreous. Next, placing a cohesive viscoelastic over the crystalline lens provides a deep, noncollapsing anterior chamber. I then initiate the capsulorhexis in an area remote from the dialysis in order to make use of the stronger remaining zonules for countertraction. The capsulotomy should be large enough to

allow for easy nucleus manipulation. It may be necessary to stabilize the capsular bag with a dull second instrument or with an iris retractor to complete the capsulorhexis.

### The Modified CTR

Although the modified CTR may be inserted into the capsular bag at any point after the creation of the capsulorhexis, a bulky nucleus can make visualization and the placement of the device difficult. I prefer to remove the nucleus and as much cortex as possible before placing the ring. It is often necessary to stabilize the bag during phacoemulsification with iris retractors.<sup>8</sup> The capsular tension segment (Morcher GmbH) designed by Ike Ahmed, MD, of Toronto can provide a broader area of temporary stabilization. Hydrodissection maximally frees the nucleus and thereby decreases zonular stress during manipulation of the nucleus. Moreover, hydrodissecting the nucleus completely into the anterior chamber greatly simplifies nuclear removal and helps eliminate zonular stress during phacoemulsification.

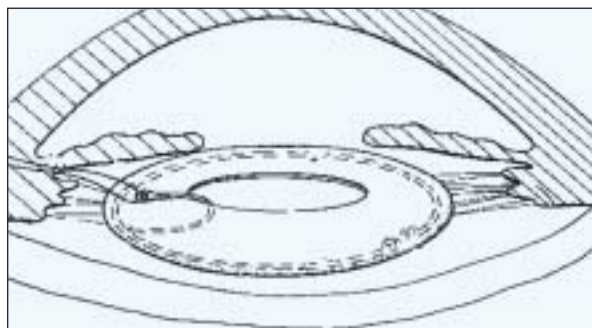


Figure 1. The modified CTR model 1-L can be sutured through the ciliary sulcus to the scleral wall without violating the integrity of the capsular bag.



Figure 2. Preoperatively, this eye exhibited congenital lens subluxation due to Marfan's syndrome.



Figure 3. After placement of a modified CTR, the surgeon centers a posterior chamber IOL in the bag.

Slow-motion phacoemulsification using low vacuum and aspiration settings to minimize the infusion reduces the risk of vitreous prolapse or of further stress to the zonules.<sup>9</sup> Viscoelastic injected between the nuclear quadrants and peripheral capsular bag lifts the nuclear fragments while expanding and stabilizing the bag during phacoemulsification.<sup>10</sup> Injecting viscoelastic against the residual anterior capsular rim and peripheral capsular bag separates the cortex from its adhesions to the capsule for easier aspiration.

Before inserting the modified CTR, I preload a double-armed 9-0 PROLENE or 8-0 GoreTex suture (W. L. Gore and Associates, Milpitas, CA) through the eyelet of the fixation hook. Alternatively, the suture can be single-armed, and the free end of the suture may be tied to the fixation hook's eyelet. Next, I place viscoelastic just under the surface of the residual anterior capsular rim to dissect any residual cortex away from the peripheral capsule, thereby making cortical entrapment less likely. Fully expanding the capsular bag with viscoelastic allows the modified CTR to glide around the bag's equator more easily. Using a smooth forceps, I insert the device through the main incision and dial it into the capsular bag. If the fixation hook does not "capture" anterior to the capsulorhexis edge, I manipulate it anteriorly with the Osher Y-Hook (Duckworth & Kent Ltd, Hertfordshire, England) or a Sinskey hook and use a second dull instrument to retract the capsulorhexis edge. The fixation hook is "dialed" until its eyelet is centered at the site of zonular weakness.

Next, I displace the fixation hook to the scleral wall to be certain that the chosen location will result in bag centration. After fashioning a scleral flap at this site, I direct the needles to exit through the ciliary sulcus while remaining anterior to the anterior capsule at all times. The needles should exit the scleral wall approximately 1.5 mm apart and 1.5 mm posterior to the corneal-scleral junction to prevent postoperative iris chaffing. I then cinch the sutures to achieve centration and tie them. If a single-armed suture is used, the needle is passed through partial-thickness sclera beneath the scleral

flap and then tied to itself. After suture fixation of the modified CTR, any remaining cortex may be aspirated. I then re-inflate the capsular bag with viscoelastic in preparation for IOL implantation. I prefer the single-piece AcrySof posterior chamber IOL (Alcon Laboratories, Inc., Fort Worth, TX) in these cases for its ease of insertion, low rate of posterior capsular opacification, and ability to stay well centered.

I manually remove viscoelastic either through the side-port incision or with an automated I/A handpiece. Instilling Miochol (CIBA Vision, Duluth, GA) ensures that the pupil becomes round. After re-approximating conjunctiva over the scleral flap, I hydrate the corneal incision and ensure that it is watertight.

## CONCLUSION

CTRs and modified CTRs of any model should not be used if a complete continuous capsulorhexis is not attained or if a posterior capsular tear occurs, because the expansive forces may cause the capsular bag to rupture. Surgical options in such cases include either suturing the IOL to the iris or to the scleral wall or implanting an anterior chamber IOL.

At present, only Morcher's CTR (distributed in the US by FCI Ophthalmics, Inc., Marshfield Hills, MA) has been approved for use in the US. Although the modified CTR can improve the surgical management of eyes with significant zonular weakness, it is important that the surgeon be familiar with advanced surgical techniques, because these cases represent some of the most difficult procedures that we ophthalmologists encounter. ■

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