IS THERE A NEED TO ACCOUNT FOR CTR-INDUCED REFRACTIVE CHANGES WHEN CALCULATING IOL POWER?

If at all, it may be necessary only in more challenging cases.

BY ARUP BHAUMIK, MD; SANTANU MITRA, MBBS, DOMS; ARUP CHAKRABARTI, MS; AND MEENA CHAKRABARTI, MS, DNB

CTR Influence: From Routine to Challenging Cases

By Arup Bhaumik, MD; and Santanu Mitra, MBBS, DOMS

The surgical management of cataract in eyes with a lack of zonular support poses challenges to cataract surgeons. In the early 1990s, Hara et al1 introduced the capsular tension ring (CTR), a device designed to stretch the lens capsule and maintain the circular contour of the capsular bag equator after cataract removal in such challenging cases. Various CTR designs have been introduced since that time.2

CTRs are indicated in eyes with zonular weakness or dehiscence, including those with pseudoexfoliation syndrome, high myopia, mature cataracts, or subluxated lenses.3,4 CTRs minimize IOL decentration and tilt, at least in part by reducing capsular bag shrinkage.5

A limited number of studies have evaluated the influence of CTRs on postoperative refraction or axial IOL position. In an article published this year, Weber et al6 concluded that the presence of a CTR had no effect on postoperative anterior chamber depth. This is probably the first randomized controlled study in this category.

In 2006, Boomer and Jackson7 reported no significant difference of postoperative refraction in CTR-implanted eyes compared with control eyes; their study was based on subjective refraction. In 2010, Schild et al8 described another study based on subjective refraction in CTR-implanted highly myopic eyes. The authors found a tendency toward more precise outcomes with the use of a CTR, but there was no significant difference between CTR-implanted and control eyes. In 2014, Baranwal et al, using ultrasound biomicroscopy, concluded that a posterior hyperopic shift of 1.00 to 1.50 D occurred after CTR implantation.9

Based on these published data and on our personal experience, it would not be wrong to assume that, in patients with mild to moderate subluxated cataracts for which CTR implantation only is sufficient, the CTR probably has no influence on postoperative IOL position or subjective refraction.

However, in more challenging cases, such as in patients with.

• In mild to moderate subluxated cataracts for which CTR implantation alone is sufficient, a CTR will probably have no influence on postoperative IOL position or subjective refraction. In more challenging cases in which capsular bag fixation with a modified CTR is necessary, postoperative axial position of the IOL may change depending upon fixation technique.

• An analysis of available literature favors the opinion that the CTR does not change the position of the IOL in the capsular bag and, hence, its presence is unlikely to affect IOL power calculation and/or postoperative refractive outcomes. Optical biometry and selection of an appropriate IOL formula are paramount for precision in hitting the target refraction.
progressive zonulopathy or grossly subluxated cataracts in which capsular bag fixation with a modified CTR is necessary, postoperative axial position of the IOL may change depending upon the fixation technique used. In patients with anteriorly subluxated cataracts, the capsular bag tends to settle anteriorly after surgery with bag fixation, and this may precipitate a postoperative myopic shift. The ideal position for fixation of a Cionni ring (Morcher) or Ahmed capsular tension segment (Morcher) is 2 mm behind the limbus; fixation in a position ±2 mm from the limbus can influence the effective lens position.


Precision With Optical Biometry and IOL Formula Selection

By Arup Chakrabarti, MS; and Meena Chakrabarti, MS, DNB

In 1991, Hara et al1 pioneered the idea of inserting a ring into the capsular bag to stabilize the capsular-zonular apparatus. The equatorial

Arup Bhaumik, MD
- Senior Consultant, Department of Cataract, Cornea, and Refractive Services, Disha Eye Hospitals and Research Centre, Barrackpore, West Bengal, India
- arupbhaumik_cali@yahoo.co.in
- Financial disclosure: None

Santanu Mitra, MBBS, DOMS
- Senior Consultant, Department of Cataract, Orbit & Oculoplasty, Disha Eye Hospitals, Barrackpore, West Bengal, India
- santanu_mitra60@yahoo.co.in
- Financial disclosure: None
ring they designed maintained a circular contour of the capsular bag equator and prevented invasion of metamorphosed lens epithelial cells onto the posterior capsule. CTRs have subsequently been used during cataract surgery to stabilize the position and contour of the capsular bag, stabilize the lens capsule diaphragm during irrigation and aspiration maneuvers, and maintain IOL centration and stability after surgery in eyes with zonular dehiscence and compromised capsular bag stability.

Indications for CTR insertion are listed in the chart to the right. The effect of CTR implantation on refractive outcomes has been studied in detail by several groups of investigators. An analysis of available literature on this subject favors the opinion that the CTR does not change the position of the IOL in the capsular bag, and, hence, its presence is unlikely to affect IOL power calculation and/or postoperative refractive outcomes.

Sun et al [8] performed an in vitro evaluation of the efficacy of CTRs for managing zonular dialysis in cataract surgery and also evaluated their study population for any shift in the position of the IOL in the capsular bag induced by the presence of a CTR. The study did not reveal a change in IOL position or an effect on postoperative refraction. Similar results were published by Schild et al [4], Findl et al [5], and Boomer et al [6]. These studies also demonstrated that, although there was no consistent effect on refractive outcomes in eyes with a CTR, these outcomes showed a tendency to be more accurate and precise. Alió et al [7] reported that the use of a CTR significantly improved the refractive predictability and intraocular optical performance of eyes in which rotationally asymmetric multifocal IOLs were implanted.

These studies, as well as the personal experience of one of the authors (AC), support the belief that CTR implantation has no significant effect on refractive outcomes.

Contrary to this school of thought is a report published by Baranwal et al [9]. The authors performed ultrabiomicroscopic examination to evaluate for a shift in posterior chamber IOL position in eyes with planned or unplanned CTR implantation due to pre- and intraoperative zonular dialysis; they compared their results with control eyes without CTR implantation.

A posterior shift of IOL position, as reflected in a hyperopic result, was demonstrated by their results; hence, they advocated implantation of an IOL with 1.00 to 2.00 D additional power over the IOL power calculated preoperatively to cancel the hypermetropic shift associated with CTR use.

Brar and Warrian et al [10] demonstrated statistically significant differences between CTR-implanted eyes and control eyes, with greater arithmetic refractive predicted error and absolute refractive predicted error in the CTR group.

One of the authors (AC) routinely uses a capsular tension device when dealing with cataracts with significant zonular compromise, either acquired or congenital. Indications include ectopia lentis (Marfan syndrome), traumatic subluxation, progressive zonulopathy as in significant pseudoexfoliation, retinitis pigmentosa, postvitrectomy cataracts, super-hard cataracts, and high myopia. These devices are also used with toric IOLs in patients with high myopia, due to the belief that this reduces the incidence of postoperative IOL rotation.

In summary, we have not seen the need to alter IOL power when a CTR is implanted. Optical biometry and selection of an appropriate IOL formula are paramount for precision in hitting the target refraction.