Sequential and simultaneous capsular bag fixation in subluxated lens using dual support

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We describe the case of a 47-year-old man with bilateral inferiorly subluxated cataractous lenses of idiopathic etiology (≈ 9 clock hours of subluxation). Phacoemulsification and insertion of a single eyelet Cionni ring with a posterior chamber intraocular lens (PC IOL) were performed in the right eye. On the first postoperative day, there was a significant superior decentration of the PC IOL, with the inferior part of the Cionni ring visible in the pupillary axis. This was corrected by implanting a capsular tension segment (CTS) inferiorly. In the fellow eyes, a planned simultaneous Cionni and CTS insertion was performed and achieved adequate centration.

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Subluxated cataractous lenses are among the most challenging cases encountered by the cataract surgeon. However, after the introduction of a modified capsular tension ring (CTR) (Cionni ring) by Cionni and Osher1 and Cionni et al.,2 and a capsular tension segment (CTS) by Hasanee et al.,3 better stability and centration of the capsular bag have been noted, especially in severe and progressive cases of zonular deficiency. We report the clinical presentation and follow-up of a case with bilateral 270-degree subluxated cataractous lenses (idiopathic etiology) managed by phacoemulsification with implantation of a posterior chamber intraocular lens (PC IOL) and Cionni ring4–8 followed by a CTS in a staged manner in the right eye versus simultaneous Cionni ring, PC IOL, and CTS insertion in the same sitting in the fellow eye. To our knowledge, the use of different approaches in 2 eyes of a patient has not been reported.

CASE REPORT

A 47-year-old man presented with gradual, painless, and progressive diminution of vision in his right eye more than in his left eye over the past year that did not improve with spectacle correction. The patient had used spectacles for the past 20 years with a corrected distance visual acuity (CDVA) of 20/20 in both eyes until 1 year earlier. There was no history of trauma, pain, redness, floaters, or intraocular surgery and no associated systemic disease.

The patient was of average build and the systemic examination normal. On ocular examination, the CDVA was 20/120 in the right eye and 20/60 in the left eye. The near vision was Jaeger (J)18 and J12, respectively. The intraocular pressure (IOP) was 16.18 mm Hg in both eyes on applanation tonometry. Iridodonesis with phacodonesis was noted in both eyes. On full dilation, 270 degrees of inferior subluxation of the lens was noted from 8 o’clock to 4 o’clock in both eyes and the zonules, which were visible superiorly, were intact but subluxated (Figures 1, A, and 2, A and B). The lens was cataractous with grade 1 nuclear sclerosis and a mild posterior subcapsular cataract in the right eye more than in the left eye. On fundus examination, the disc and macula were healthy with a sharp foveal reflex and no treatable lesion in the periphery.

In the right eye, a slow phacoemulsification technique was performed with insertion of a PC IOL and a single-eyelet Cionni ring (type 7, Madhu Instruments) fixated to the sclera using a 9-0 polypropylene suture (6002 PP, Aurolaboratories) with straight needles (Figure 1, B). On the first postoperative day, there was significant superior decentration of the PC IOL, with the inferior optic edge and inferior part of the Cionni ring visible in the pupillary axis (Figure 1, C). On the third day, a CTS (Gupta segment, Madhu Instruments) was inserted at the 6 o’clock position, diametrically opposite the fixated Cionni ring, and centered the PC IOL (Figure 1, D). After 3 months, surgery was performed in the fellow eye and a Cionni ring (Figure 2, C) and CTS were inserted simultaneously (Figure 2, D). Adequate centration of the PC IOL was achieved on the first postoperative day.

The CDVA was 20/20 (−2.5 × 180) in the right eye and 20/32 (−0.75 −3.00 × 55) in the left eye and the near vision

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was J6 (+1.5 diopters sphere) in both eyes at 4 months and 4 weeks, respectively. The IOP was 14.16 mm Hg in both eyes on applanation tonometry. The endothelial cell count was 1847 cells/mm² (preoperatively 2234 cells/mm²) in the right eye and 2057 cells/mm² in the left eye (preoperatively 2530 cells/mm²). No iridodonesis or pseudophakodonesis was seen in either eye. On slitlamp examination, the PC IOL was clinically centered in both eyes (Figures 1, E and 2, E). No iris or pupillary abnormality was noted in either eye (Figures 1, F and 2, F). Ultrasound biomicroscopy (UBM) of the right eye at 4 months and 4 weeks showed a superior tilt of the IOL with apposition of the Cionni eyelet to the posterior surface of the iris (Figure 3, A). At 1-month follow-up, the UBM of the left eye showed a geometrically well-centered PC IOL with no visible tilt (Figure 3, B). These findings were also noted with anterior segment optical coherence tomography (Figure 4) but were better appreciated with UBM. The fundus examination did not reveal clinical macular edema or a retinal break during the follow-up.

DISCUSSION

The problems in our case were (1) the management of a severely subluxated cataractous lens and (2) the management of an early decentered modified CTR–IOL complex. Management of subluxated lenses is still a challenging situation, and every case requires an individualized approach. While CTRs have been successfully used in subluxated lenses with less than 6 clock hours of zonulysis, a fixated capsular tension device (CTD) such as a Cionni or a CTS may be required to ensure centration and stability of the capsular bag in eyes with greater extents of zonulysis (6 to 9 clock hours). However, for more than 9 clock hours of subluxation, a single device may not suffice. Several surgeons have used 2-eyelet Cionni rings in such cases. However, Moreno-Montañés et al. have described tearing of the capsulorhexis immediately after implantation when the 10-0 polypropylene sutures were pulled in opposite directions from both hooks. Our experience with the double-eyelet Cionni was similar in the past.

Khokhar et al. described insertion of a CTS with CTR in a case of microspherophakia and concluded that the “dual-support” technique takes advantage of both the CTR and CTS to overcome the generalized zonulopathy found in such cases. Early decentration of a modified CTR–IOL complex was reported by Buttani et al. They stated that unopposed traction of sutures and a modified CTR in the direction of the fixation site resulted in zonular
dehiscence in the opposite weak zonular fibers that had been assessed as healthy intraoperatively. However, because of the minimal extent, no surgical intervention was done in these cases.

Our case had a significant modified CTR–IOL decentration in the first eye so we inserted a CTS in the diametrically opposite site, thus taking the advantage of the dual support of the CTS and Cionni ring to overcome the unopposed traction on only 1 side, as seen in the case of single-eyelet Cionni fixation. However, UBM at 4 weeks and 4 months follow-up showed a superior tilt of the PC IOL with apposition of the Cionni eyelet and the posterior surface of the iris even though the PC IOL appeared to be clinically centered. We therefore considered inserting the Cionni ring and the CTS simultaneously to overcome this. Intraoperatively, we found better titration for fixation of the CTDs and thereby achieved adequate centration of the PC IOL. At the 1-month follow-up, UBM showed a geometrically well-centered PC IOL with no visible tilt.

Figure 2. Left eye. A: Preoperative photograph showing inferior subluxation of the cataractous lens from 9 o’clock to 4 o’clock. B: Intraoperative photograph showing the extent of subluxation to be from 4 o’clock to 6 o’clock (270 to 300 degrees subluxation). C: Intraoperative photograph showing Cionni ring in situ, temporarily fixated at 8 o’clock with 9-0 polypropylene suture. D: Intraoperative photograph showing both Cionni (superonasally) and CTS (inferotemporally) in situ with a well-centered PC IOL. E: Dilated pupil at 4-week follow-up. The PC IOL is well centered with both the superior knuckle of the Cionni and the inferior knuckle of the CTS visible on retroillumination. F: Undilated pupil at 4-month follow-up showing a round pupil with clinically centered IOL.

Figure 3. A: Anterior segment optical coherence tomography (OCT) of the right eye showing a centered IOL. B: Anterior segment OCT of the left eye showing a centered IOL.
In conclusion, the short-term results suggest that simultaneous insertion of a Cionni ring and a CTS are better than sequential insertion in providing centration of the IOL and stability of the capsular bag. This may be attributed to the better intraoperative titration that can be done with the simultaneous procedure. This dual-support technique takes advantage of both the Cionni and CTS to overcome the generalized zonulopathy found. It effectively counteracts lenticular myopia, strengthens the capsular bag, and does not entail the future risk for IOL–bag dislocation.

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Figure 4. Ultrasound biomicroscopy (35 MHz). A: Right eye showing inferior tilting of the IOL, which is clinically centered but not geometrical. B: Left eye showing a clinically and geometrically well-centered IOL with no tilt.