Correction of Subluxated Cataracts and IOLs With a Glued Endocapsular Ring

The device offers several advantages over techniques employing suture fixation of a tension ring to the scleral wall.

BY SOOSAN JACOB, MS, FRCS, DNB

Any surgeon who has encountered a subluxated cataract or IOL understands how these situations can complicate intraoperative maneuvers and affect the postoperative outcome for the patient. Traditionally, subluxated cataracts or IOLs of less than 3 to 4 clock hours (about a quadrant) are repaired using a capsular tension ring (CTR) or capsular tension segment (CTS). Larger subluxations have traditionally been managed with the use of a CTR or CTS (or more than one, in some cases) that is anchored to the scleral wall with sutures. This technique has proven effective when performed correctly. Manipulating the needle requires skill, however, sutures often do not provide adequate support, and performing this process can be challenging for the surgeon while also significantly increasing surgical time. Additionally, adjusting the sutures once the knots have been tied down is difficult. Most CTRs/CTSs are made of PMMA and, although flexible, may have a tendency to crack and/or break. The long-term integrity of sutures is also an issue.

To address the inherent problems of suturing a traditional CTR/CTS to the scleral wall, I designed a glued endocapsular hemi ring (Epsilon Eye Instruments) that incorporates the use of fibrin glue and a scleral tunnel for transscleral sutureless fixation of the capsular bag and its contents (Figure 1).[1,2]

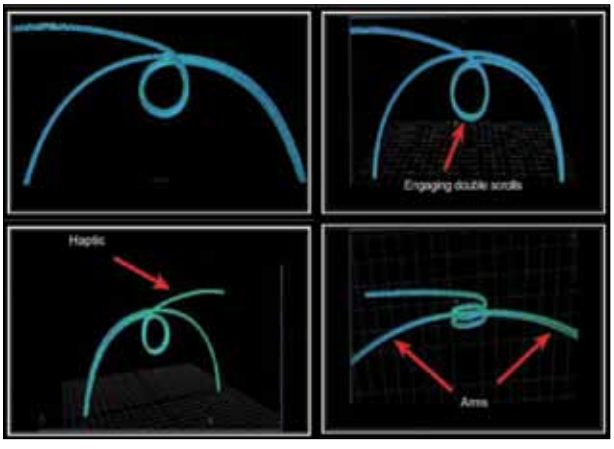

Figure 1. The glued endocapsular ring segment has two arms, a scrolled capsulorhexis-engaging mechanism, and a haptic. It is made of a single piece of 130-µm thick PVDF.

THE DEVICE

This glued endocapsular tension ring is constructed of polyvinylidene fluoride (PVDF), the same material used for many IOL haptics—the advantages being known biocompatibility, little to no risk of erosion or degradation, and a promise of long-term stability. Being made of PVDF, the device has good flexibility and shape memory. It can therefore be flexed into the anterior chamber easily, and

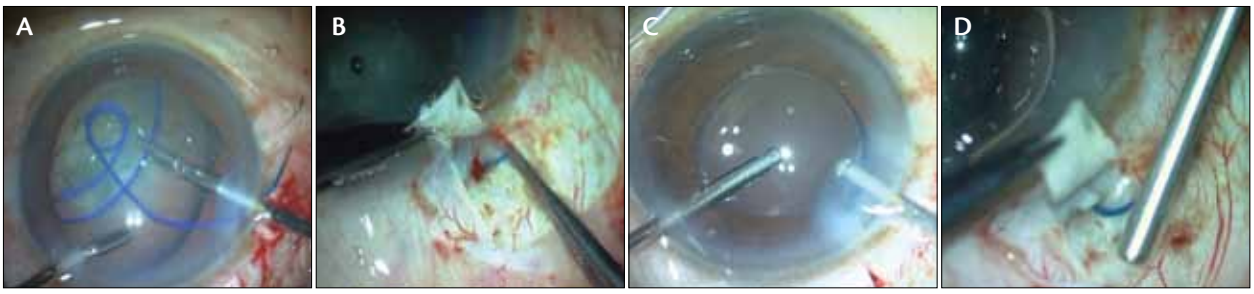

Figure 2. Use of the glued endocapsular ring segment intraoperatively. A subluxated cataract of about 180° is seen (A). A lamellar scleral flap and sclerotomy are created in the area of dialysis. The arms of the device are introduced into the anterior chamber under the capsulorhexis. The haptic is then exteriorized through the sclerotomy using the handshake technique (B). The haptic is cut to an appropriate length and tucked into an intrascleral Scharioth tunnel (C). Phacoemulsification is performed, and the IOL is implanted. A well-centered IOL can be seen. A coat hanger-like intrascleral tuck hooks the haptic onto the sclera (D). Fibrin glue is applied, and the flap is sealed down over the haptic. The conjunctiva is also closed with fibrin glue.

once inside, it regains its shape immediately. In designing the device, I borrowed the locking scroll concept from the Malyugin ring (MicroSurgical Technology),[3] which is used to engage the pupillary margin in the setting of small pupils. The scrolled engaging mechanism of the glued endocapsular ring engages the rim of the capsulorhexis and pulls the decentered capsular bag to the side of the dialysis in order to center it.

Although the device uses an open segment design so that one size fits all, the overall length of the device can be made according to a surgeon's preference. A longer span of the two arms provides a greater extent of fornical expansion, whereas in smaller subluxations, a smaller size may be sufficient to provide adequate support. Surgeons working in smaller surgical fields, for example in pediatric eyes, may also wish to use a smaller device.

INTRAOPERATIVE USE

The instrument has two arms, which slide into the capsular fornix, and a haptic that exits through a 20-gauge sclerotomy made under a scleral flap. The haptic is tucked inside a 26-gauge intrascleral Scharioth tunnel. Fibrin glue is used to seal the flap. Using the device intraoperatively is fairly simple and less time consuming than suturing a ring to the sclera (Figure 2). The surgeon starts by creating a scleral flap placed at the central point of the dialysis. The capsulorhexis and cortical cleaving hydrodissection are then performed. A 20-gauge sclerotomy is then made under the flap. After instilling viscoelastic, the surgeon introduces the device into the anterior chamber (Figure 2A). Two microforceps are used in the handshake technique to withdraw the haptic of the device through the sclerotomy. Once the haptic has been drawn out, both of the arms are placed under the capsulorhexis' margin into the capsular fornix, and the scroll locks onto the rhexis margin. This locks the entire capsular bag to the ring. Because the arms are within the capsular fornix, they expand the fornix similarly to a traditional CTR. The haptic is then trimmed and tucked into a Scharioth tunnel created at the edge of the scleral flap. The centration of the bag is adjusted by altering the degree of tuck (Figure 2B).

Following placement of the device, the surgeon may proceed with phacoemulsification, cortical aspiration, and in-the-bag placement of the IOL (Figure 2C). If required, the centration of the IOL can be adjusted at the end of surgery by changing the degree of the haptic tuck within the scleral tunnel. The flap and conjunctiva are closed using fibrin glue (Figure 2D).

ADVANTAGES

The glued endocapsular ring provides both horizontal and vertical support as well as equatorial expansion. These three components are complementary in addressing subluxated cataracts or IOLs. The device thus differs from a normal CTR, which provides only horizontal expansion. All suture-related complications are avoided. Because the device is thicker than a suture (130 µm thick), it offers superior support during surgery. In locking firmly to the sclera, it also gives greater stability in the postoperative period. The longevity of the implant is likely to be greater than that of sutured implants, which are associated with suture erosion, degradation, knot exposure, and late IOL subluxation/dislocation.

Using the glued device with the handshake technique allows faster surgery and easy adjustability. In the case of an unsatisfactory final position of a sutured ring after tying down the knot, the suture must be cut and the complicated maneuvering reinitiated. In the case of a glued ring, however, if the placement is incorrect, all the

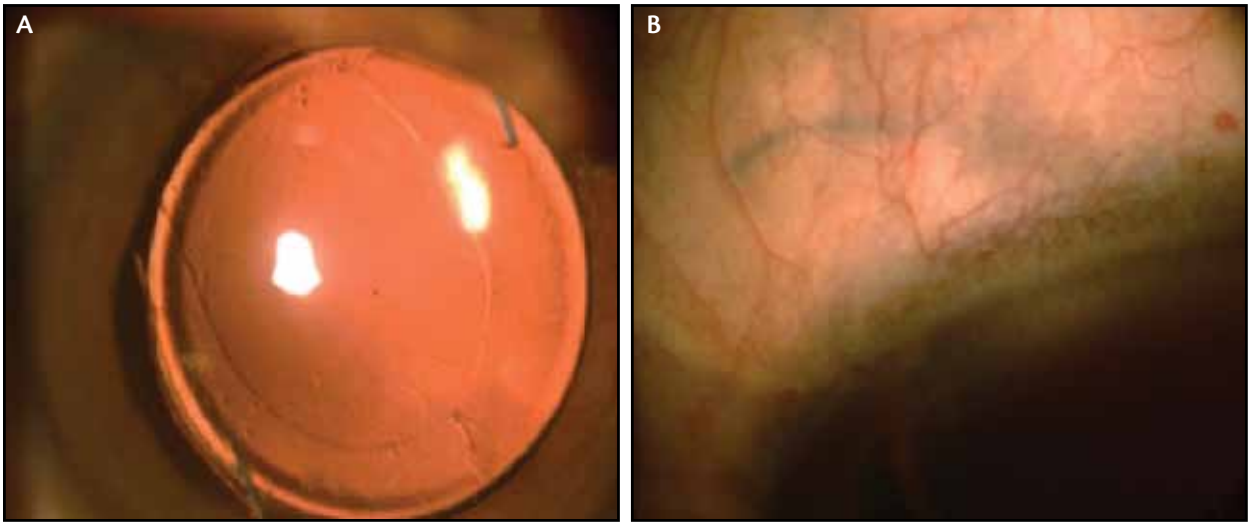

Figure 3. The 6-month postoperative appearance of an eye with a glued endocapsular ring implanted for the correction of a subluxated cataract. A slit-lamp photograph shows a well-centered bag-IOL complex (A). The eye is quiet, and BCVA is 6/6. The blue color of the haptic can be seen under the scleral flap and conjunctiva. The coat hanger tuck can also be seen, and the haptic is observed lying inert under the flap (B).

surgeon need do is interiorize the haptic through the sclerotomy into the anterior chamber and re-exteriorize it through a correctly positioned sclerotomy.

INDICATIONS

The glued endocapsular tension ring can be used for fixing medium-sized subluxated cataracts or IOLs—those greater than 3 to 4 clock hours and up to a hemisphere or slightly more. Depending on surgeons' preferences, there are many options for fixing subluxations larger than 180º, including the use of two glued endocapsular rings, just as some surgeons prefer to use two sutured endocapsular tension rings. This does, however, require greater degree of maneuvering intraoperatively.

My preference for very large subluxations with a dangling nucleus is to explant the entire cataract via lensectomy or through a corneoscleral section. Then, I implant a three-piece IOL and use intrascleral haptic fixation.[4,5] These large cataracts require so much maneuvering that it is more logical to remove the entire cataract and perform a glued IOL technique.

CONCLUSION

PVDF has long been used as haptic material, and its long-term durability, stability, and biocompatibility in the eye are known. In previous studies investigating the intrascleral haptic tuck of an IOL in the glued IOL technique, the material was found to be inert within the scleral tissue.[4,5] At our clinic, we have about 1.5 years of follow-up using this device, and we have not observed any incidence of increased IOP, uveitis, or inflammation in eyes implanted with the device. Figure 3 demonstrates a typical patient in whom this device was successfully used to correct a subluxated cataract. As noted, postoperative vision is excellent, and the eye is stable after short-term follow-up. The glued endocapsular tension ring and its accompanying technique are relatively new, so the long-term outcome is not yet known. Longer-term follow-up is ongoing. ■

Section Editor George O. Waring IV, MD, is the director of refractive surgery at the Storm Eye Institute and assistant professor of ophthalmology at the Medical University of South Carolina in Charleston. He is also the medical director of Magill Vision Center in Mt. Pleasant, South Carolina. Dr. Waring may be reached at waringg@musc.edu.

Soosan Jacob, MS, FRCS, DNB, is a senior consultant ophthalmologist at Dr. Agarwal's Eye Hospital and Eye Research Centre, Chennai, India. She acknowledged no financial interest in the products or companies mentioned herein. Dr. Jacob may be reached at dr_soosanj@hotmail.com.

1. Jacob S, Agarwal A, Agarwal A et al. Glued endocapsular hemi-ring segment for fibrin glue–assisted sutureless transscleral fixation of the capsular bag in subluxated cataracts and intraocular lenses. *J Cataract Refract Surg*.2012;38(2):193-201.
2. Osher RH, Tabin GC, Nagy ZZ , et al. Cataract surgical problem: February consultation. *J Cataract Refract Surg*. 2013;39(2):299-304.
3. Malyugin B. Small pupil phaco surgery: a new technique. *Ann Ophthalmol*. 2007;39:185-193.
4. Agarwal A, Kumar DA, Jacob S, et al. Fibrin glue-assisted sutureless posterior chamber intraocular lens implantation in eyes with deficient posterior capsules. *J Cataract Refract Surg*. 2008;34(9):1433-1438.
5. Kumar DA, Agarwal A. Glued intraocular lens: a major review on surgical technique and results. *Curr Opin Ophthalmol*. 2013;24(1):21-29.