

CATARACT

Glued IOL Technique Gaining Support

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INTERVIEWING AMAR AGARWAL, MBBS, FRCOPHTH, LISA B. ARBISSER, MD,
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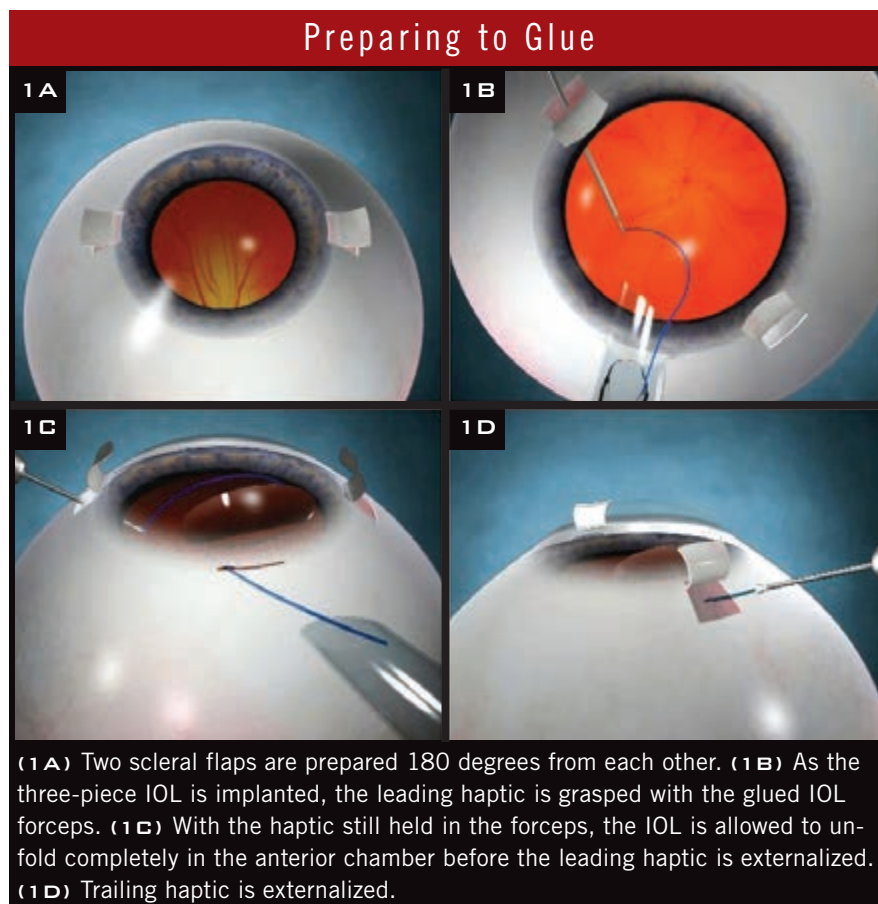
For most cataract surgeons, the process of securing an intraocular lens in an eye with weak zonules or a torn capsule means either implanting an anterior chamber (AC) IOL or suturing a posterior chamber (PC) IOL into the ciliary sulcus. But interest in a newer way to secure IOLs in these problem eyes is on the rise.

The full name of the procedure is some variation of “sutureless, fibrin glue–assisted PCIOL implantation with intrascleral tunnel fixation.” However, “glued IOL” is the shorthand label that stuck, even though glue isn’t used until the last step (see “How Do You Glue?”).

The first such implant was performed in 2007 by Amar Agarwal, MBBS, FRCOphth, director of Dr. Agarwal’s group of eye hospitals in India and professor of ophthalmology at Ramachandra Medical College in Chennai, India.¹ Since then, he has modified his technique. For example, he now secures the haptics inside scleral tunnels rather than solely under scleral flaps. His method is beginning to gain traction with cataract surgeons. For instance, at the Academy’s 2012 Spotlight on Cataract Surgery Session, 7.2 percent of the audience members indicated that they would use a glued PCIOL when faced with deficient capsular support.²

Why Go Sutureless?

Extracapsular fixation is needed by patients in whom traumatic injury, posterior capsular rupture, pseudo-



exfoliation, or other factors have damaged the posterior capsule or weakened the zonules. These patients may have subluxations; have crystalline lens fragments or a dislocated IOL in the vitreous; have visual problems from decentration; and sometimes need a secondary implant because of IOL-related complications. (With AC-IOLs, potential complications include endothelial decompensation, uveitis-

glaucoma-hyphema syndrome, and cystoid macular edema; with malpositioned or unstable PCIOLs, complications may include pigment dispersion, pupillary capture of the optic, and iris chafing and inflammation.)

In these patients, a surgeon would typically suture a PCIOL to the iris or the sclera, said Dr. Agarwal. But this creates its own set of challenges, he said. That’s because, despite three

decades of refinements in IOL suturing techniques, sutures remain problematic. Possible complications include postoperative inflammation, erosions over the sutures, induced astigmatism, and suture breakage in the years after surgery, he noted.

Considerations for Fibrin Glue

Fibrin glue has two main components that occur naturally in the blood: fibrinogen and thrombin. They are kept separate before use; once they are mixed, the thrombin promotes rapid conversion of fibrinogen to fibrin, producing a local fibrin clot.

This glue has been used in a growing number of ophthalmic procedures, such as replacing sutures in conjunctival autograft for pterygium and lamellar keratoplasty, and sealing LASIK flaps to prevent epithelial ingrowth. Its more recent role in IOL fixation comes with both pros and cons.

The healing process. Theoretically, the thrombin in the glue also interacts with endogenous fibrinogen in the sclera, raising the possibility that this would jump-start the fibrotic healing that Dr. Agarwal counts on to hold the haptics in place after the glue degrades. This hypothesis has not been tested, however. (Macrophages and fibroblasts fully resorb fibrin glue in about two weeks.³)

One of the major benefits of using glue, said Dr. Agarwal, is that, unlike sutures, it produces no inflammation.

Expense and handling. Fibrin glue has several drawbacks, one of which is its expense. "Glue is expensive. It only keeps so long in the freezer, and once you thaw it you can't refreeze it," said Lisa B. Arbisser, MD, who practices in Bettendorf, Iowa, and is clinical adjunct associate professor of ophthalmology at the University of Utah. "You have to be really quick to use it. If you wait too long, it will glue up the applicator tip."

Dr. Agarwal suggests avoiding the rush by keeping the fibrinogen and thrombin in separate cannulas; the fibrinogen is applied first, and the thrombin is placed only when the surgeon is ready to seal.

Human blood products. Fibrin glue also contains human blood products, which raises the issue of viral transmission. A patient's informed consent must be obtained before using any blood product, including fibrin glue, said Robert A. Eden, MD, assistant professor of ophthalmology at Albany Medical College in Albany, N.Y. And this may not be possible if an anticipated surgical complication necessitates extracapsular fixation.

Three hands needed. In Dr. Agarwal's original technique, the maneuvers to grasp the IOL, remove vitreous, and externalize the haptics required an assistant to hold the first haptic while the surgeon worked on the trailing haptic with two hands. "I have the fortune of having residents and a clinical fellow available to assist in surgery, since early on this technique requires three hands," Dr. Eden said.

Dr. Arbisser, who views the need for a third hand as "very impractical," said that she expects to see continued improvements in the procedure over time. In fact, several surgeons have recently reported on modifications for two-handed surgery.^{4,5}

What About the Haptic Bond?

Michael E. Snyder, MD, said that he will continue relying on Gore-Tex sutures (an off-label use) for scleral fixation of PCIOLs in problem eyes. He uses an ab externo suture loop retrieval and scleral fixation technique.

Dr. Snyder, who is in private practice at the Cincinnati Eye Institute and is a voluntary assistant professor of ophthalmology at the University of Cincinnati, is skeptical that the fibrotic healing in the sclera can keep the haptics from migrating over the long term. "Fibrosis doesn't stick to PMMA, and haptics are made from PMMA."

He speculated that the haptics might migrate externally, to the ocular surface as the sclera remodels or, potentially, slide along the internal tunnel and eventually intrude, releasing fixation. As with the problem of polypropylene suture lysis, it might take more than the current five years of follow-up for this complication to

emerge, he said. "I believe the glued scleral-fixated method has not yet stood the test of time."

Dr. Arbisser was more optimistic: "The only real question is whether the haptics will erode the scleral tunnel, and they may not. We've been doing scleral buckles for years, and it's very rare for them to erode."

Experiences in the OR

As with any new procedure, the learning curve for glued IOLs yields intriguing case reports and observations.

No room for error. In one case, Dr. Arbisser planned to orient the glued IOL vertically, with the haptics and scleral flaps 180 degrees apart at 12 and 6 o'clock. (Dr. Agarwal's technique now calls for a horizontal orientation only in eyes with a horizontal white-to-white measurement of 11 mm or less. If it is more than 11 mm, the lens should be oriented vertically, in order to assure adequate fixation of the haptics in the sclera.)

This patient had a subluxated IOL, no capsular support, iridodialysis, and a blown pupil, and the lens was slightly back in the vitreous, Dr. Arbisser recalled. However, she found out the hard way that a vertical procedure requires sufficient unscarred "scleral real estate," which this eye lacked. "I made a scleral flap that was only 300 µm deep because the patient had a previous cataract incision superiorly, where the flap had to go because of the large horizontal white-to-white," she said. "But when I brought the flap up, I was staring at bare choroid. I had to sew the flap down watertight for the three-port vitrectomy that I had planned to precede the gluing of the IOL. And I ended up sewing the lens to the repaired iris."

A case of dislocation. Dr. Arbisser described a second case, which involved a dislocated in-the-bag lens, as "the most challenging case I've ever, ever done, for fear of dropping the lens or parts of the haptic." She added that the glued IOL approach "is not an easy procedure. I'm not convinced this is any less traumatic for a bag lens dislocation than a lasso technique, espe-

cially because of the large vitrectomy required.”

Dr. Arbisser recounted some of the problems she encountered in this case and the solutions she now recommends:

1) She had trouble inserting her usual 20-gauge anterior chamber maintainer. Her solution: Use a 23-gauge maintainer.

2) In removing the bag, she lost a small piece of Soemmering’s ring into the vitreous. Her solution: Fix in-the-bag dislocations with lasso sutures, not glue.

3) When she tried to externalize the haptics, one disintegrated and the other crimped and broke off. Her solution: Use a 25-gauge retinal forceps with gentle, ultra-polished tips (Epsilon). Dr. Agarwal added that standard intraocular forceps should not be used.

Ultimately, Dr. Arbisser explanted the now-damaged IOL and successfully implanted a secondary glued IOL.

A quiet eye. Even Dr. Arbisser’s difficult case of in-the-bag dislocation eventually confirmed what Dr. Agarwal views as an important benefit of glued IOLs: no inflammation. “I was absolutely shocked at how quiet the eye was postoperatively,” Dr. Arbisser said. “There was no phacodonesis at all, and the patient’s visual acuity is completely stable.” Uncorrected visual acuity (UCVA) was 20/40 at two weeks after surgery and 20/20 at six weeks.

“I don’t think I’ll be doing this [glued IOL procedure] again for an in-the-bag lens dislocation,” she said. “But I was encouraged by the outcome of the secondary implant, and I will continue to do this procedure [in other types of cases]. I think that for a secondary implant with planned partial vitrectomy, a glued IOL might be better than what’s otherwise available.”

Nine happy patients. Dr. Eden had better experiences in his first nine glued IOL cases, and he has taught the implant method to two cornea fellows. He said that all the lenses were “beautifully centered, without any tilt or irregular astigmatism that comes with scleral or iris suturing.” The patients, all of whom received secondary IOLs, went home “20/happy,” he said. “My

How Do You Glue?

Although a complete description is beyond the scope of this article, the following steps provide a brief overview of the glued IOL procedure (see also Figs. 1A-D):

1. Two scleral flaps and sclerotomies, as well as two scleral tunnels or pockets under the flaps, are created exactly 180 degrees from one another, at either 3 and 9 o’clock or 6 and 12 o’clock; a scleral marker is used to ensure precise positioning. (See discussion of proper orientation in “No room for error” on page 32.) Fluid should always be kept in the eye during the surgery, using a trocar cannula or AC maintainer.
2. After performing a partial or full vitrectomy (to prevent retinal traction as the IOL is manipulated), the surgeon uses both hands to place the optic of a three-piece foldable PCIOL into the sulcus. The leading haptic must protrude from the injector while the IOL is being placed.
3. After the IOL optic unfolds within the anterior chamber, the leading haptic is grasped gently at the distal tip and externalized through scleral incisions. A two-forceps “handshake” technique is used to reposition the trailing haptic so it can be passed through the sclerotomy on the other side.
4. Each haptic is tucked securely into a Scharioth scleral tunnel.
5. After drying the scleral surface for optimal adhesion, the surgeon places a drop of fibrin glue underneath each scleral flap, over the tunnel entrance. The glue consists of two components that are not mixed until use; these components may be applied through a dual-chamber applicator or placed sequentially with 30-gauge needles and mixed on the ocular surface.
6. Slight pressure is applied to the flap for about 20 seconds to seal securely.

Further technical details. The procedure is presented in greater detail in recent publications^{1,2} and is demonstrated in a video on the May home page (available beginning in mid-May) at www.eyenet.org.

1 Agarwal A. *Glued IOL: Glued Intrasceral Haptic Fixation of a PCIOL*. New Delhi: Jaypee; 2012.

2 Kumar DA, Agarwal A. *Curr Opin Ophthalmol*. 2013;24(1):21-29.

happiest patient initially had scleral fixation of a pseudoexfoliation–dislocated lens-in-bag complex. He was [formerly] correctable to 20/20 with a large refractive error. He is now three months out, with a 20/20 UCVA.”

What’s Next

Dr. Agarwal is extending his glued IOL technique beyond eyes in which the lens requires extracapsular support.⁶ Multifocal IOL implants are a particularly attractive target, he said, because intrasceral fixation is so stable. “There is absolutely no pseudophacodonesis,” he said. The glued IOL technique might improve UCVA with already implanted multifocal IOLs, and it might make people whose eyes lack capsular and zonular support candidates for a presbyopia-correcting IOL, he added.

1 Agarwal A et al. *J Cataract Refract Surg*. 2008;34(9):1433-1438.

2 *EyeNet*. 2013;17(3):42-57.

3 Petersen B et al. *Gastrointest Endosc*. 2004; 60(3):327-333.

4 Narang P. *J Cataract Refract Surg*. 2013; 399(1):4-7.

5 Beiko G, Steinert R. *J Cataract Refract Surg*. 2013;39(3):323-325.

6 Kumar DA et al. *Am J Ophthalmol*. 2012; 153(4):594-660.

Dr. Agarwal is a consultant for AMO, Bausch + Lomb, and Staar Surgical; owns equity in Agarwal’s Pharma; and receives royalties from Slack and Thieme Medical Publishers.

Dr. Arbisser reports no related financial interests; Dr. Eden lectures for Allergan; and Dr. Snyder is a consultant and/or lecturer for Alcon, Dr. Schmidt Intraocularlinsen, and Haag Streit.