INTRODUCTION
The posterior capsule is a crucial requisite for successful cataract surgery with IOL implantation. Absence or lack of posterior capsular support either due to atopic or causes or due to trauma/autolysis/dislocation/diagnosis can prevent IOL placement in the posterior chamber. Most commonly, posterior capsulotomy (PC) can occur in early learning curve in phacoemulsification or in case of intraoperative diagnosis which can take the surgeon by surprise. In case of pre-existing subluxation/ dislocation of the lens or IOL, the surgeon is better prepared and is able to anticipate the need for IOL implantation without posterior capsular support. Various techniques have been described to achieve in-the-bag IOL fixation in the posterior chamber using Fibrin Glue. The first and the second PC IOL implantation in this technique, a posterior chamber IOL is placed in the eye and the haptics brought through a scleral tunnel created under scleral flaps made 180 degrees away from each other. The IOL haptics are tucked into a scleral pocket to prevent any side-ways or up-down movement. This is re-enforced with fibrin glue, scleral flaps repositioned and conjunctiva closed with the same glue, the entire procedure being completely suture less.

SURGICAL TECHNIQUE
Under peribulbar anesthesia, superior rectus is caught and clamped. Localized peritomy and wet dissection of the sclera at the desired site of exit of the IOL haptics is done. Infusion cannula or anterior chamber maintainer is inserted. If using an infusion cannula, one can use a 23 G subtenon trocar and cannula.

Positioning of the infusion cannula should be preferably in inferonasal quadrant to prevent any possible tension. Two partial thickness limbal based scleral flaps about 2.5 mm × 3 mm are created exactly 180 degrees diagonally apart (Figures 1A and B).

Reconstruction of Reilease
It is available in a sealed pack, which contains freeze dried human fibrinogen (20 mg/0.5 ml), freeze dried human thrombin (250 IU/0.5 ml), aprotinin solution (1500 kiu in 0.5 ml), one ampoule of sterile water, four 21G needles, two 20 G blunt injection needles and an applicator with two mixing chambers and one plunger guide. First, the aprotinin solution is taken in a 2 ml sterile syringe and mixed with the freeze dried fibrinogen and is then shaken by slow circular motion. The reconstituted vial is then placed in a preheated water bath of 37 degrees for no more than 10 minutes. 0.5 ml of water for injection is aspirated and injected into the vial of freeze dried thrombin followed by gentle agitation of the vial. Reconstitutions considered complete when no undissolved particles are visible. Both the reconstituted fibrinogen and the thrombin are loaded separately in two 2 ml sterile syringes and mounted on to the Reilease applicator for use. Then, the reconstituted fibrin glue thus prepared is injected through the cannula of the double syringe delivery system under the superior and inferior scleral flaps. Local pressure is given over the flaps for about 10-30 seconds for the formation of fibrin polymers.

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Special Situations
In cases of those patients who have a luxated IOL, similar limbal scleral flaps as described earlier are made and the luxated IOL haptic is then grasped with the 23/25 gauge rhinos forceps and externalized under the scleral flaps (Figures 5A and B).

Advantages
This fibrin glue assisted subluxation PC IOL implantation technique would be useful in a myriad of clinical situations where scleral fixed IOLs (SFLs) are indicated, such as subluxated IOL, dislocated IOL, protrusivity or secondary IOL implantation.

Two straight sutureless with a 20G/22G needle are made about 1.0-1.5 mm from the limbus under the existing scleral flaps. This is followed by 23 G vitrectomy via the sclerostomy for externalizing the lens or anterior route to remove all vitreous traction. A clear corneal/scleral tunnel incision is then prepared for introducing the IOL. While the IOL is being introduced with one hand of the surgeon using a Heffner forceps, an end gripping 23G/25G microheats forceps (Micro Surgical Technology, USA) is passed through the inferior scleral flap with the other hand. One can use any end opening forceps like a micro rhinos forceps. The tip of the leading haptic is then grasped with the microheats forceps, pulled through the inferior scleral following the curve of the haptic (Figures 2A and B) and is externalized under the inferior scleral flap.

Figure 1A and B Scleral flaps (4) of 2.5 × 3 mm made about 1.5 mm from the limbus. Two flaps 180 degrees diagonally apart

Figure 2A and B Image showing sclerotomy made with 22 G needle beneath the flaps. Haptics externalized by 25 G forceps through the scleral flaps (3).

Similarly, the trailing haptic is internalized with a monopolar forceps and tip of the haptic is caught with a end gripping forceps in a hand shake manner and haptics are externalized through the superior sclerostomy under the scleral flap. Limitic wound is sutured with 10-0 monofilament nylon if it is a scleral tunnel incision. The tips of the haptics are then tucked made a scleral tunnel made with 23G/25G needles at the point of exitation. Scleral flaps are created identical under the superior and inferior scleral flaps and an anterior chamber maintainer on the infusion cannula is removed. Conjunctiva is also closed with the same glue. In patients with a subluxated or dislocated IOL from previous surgery, the same IOL can be fixed using fibrin glue (Figures 4 A and B).

Figure 3A and B: Reconstructed fibrin glue (PG) injected beneath the scleral flaps over the haptics and scleral flaps (4) closed

Figure 4 A: Anteriorly dislocated IOL

Figure 4 B: Same IOL as in Figure 4A fixed in the posterior chamber using Fibrin Glue

FIBRIN GLUE
The fibrin kit the authors used is Reilease (Reliance Life Sciences, India). Another widely used tissue glue namely TempSure (Baxter) can also be used. The fibrinogen and thrombin are first reconstructed according to the manufacturer’s instructions. The commercially available fibrin glue that is virus inactivated is checked for viral antigen and antibodies with polymerase chain reaction; hence the chances of transmission of infection are very low. But with tissue derivatives, there is always a theoretical possibility of transmission of viral infections.
No tilt: Since the overall diameter of the routine IOL is about 12–13 mm, with the haptic being placed in its normal curved configuration and without any traction, there is no distortion or change in shape of the IOL optic. (Figure 6). Externalization of the greater part of the haptic along its curvature stabilizes the axial positioning of the IOL and thereby prevents any IOL tilt.

Figure 6 Anterior segment OCT showing 360 degrees good centration of the IOL

Less pseudophacodonesis: When the eye moves, it acquires kinetic energy from its muscles and attachments and the energy is dissipated to the internal fluids as it stops. Thus, pseudophacodonesis is a result of oscillations of the fluids in the anterior and posterior segment of the eye. These oscillations, initiated by movement of the eye, result in shearing forces on the corneal endothelium as well as interocular tension leading to permanent damage. Since the IOL haptic is stuck beneath the flap, it would prevent the anterior movement of the haptic and thereby reducing the pseudophacodonesis.

Less UGH syndrome: The authors expect less incidence of UGH syndrome in fibrin glue-assisted IOL implantation, as compared to sutured scleral fixed IOL. This is because, in the former, the IOL is well stabilized and stuck to the scleral bed and thereby, has decreased intraocular mobility, whereas in the latter, there is increased possibility of IOL movement or persistent rub over the ciliary body.

No suture related complications: Visually significant complications due to late subluxation/0 which has been known to occur in sutured scleral fixed IOL may also be prevented as sutures are totally avoided in this technique. Another important advantage of this technique is the preservation of pupil related complications, such as suture knot exposure or dislocation of IOL after suture disintegration or broken suture.

Rapidity and ease of surgery: All the time taken in SPIL for passing suture into the IOL haptic eyelets, to ensure good centration before tying down the knots, as well as time for suturing scleral flaps and closing conjunctiva are significantly reduced. The risk of retinal photic injury2,5 which is known to occur in SPIL would also be reduced in this technique due to the short surgical time. Fibrin glue takes less time (Rekate (20 seconds)/Tisswe (3 seconds)) to act in the scleral bed and it helps in adhesion as well as hemostasis. The preparation time can also be reduced in elective procedures by preparing it prior to surgery as it remains stable up to four hours from the time of reconstitution. Fibrin glue has been shown to provide airtight closure and by the time the flap starts degrading, surgical adhesion would have already occurred in the scleral bed. This is well shown in the follow-up anterior segment OCT (Figure 7) where postoperative perfect scleral flap adhesion is observed.

Stability of the IOL Haptic

As the flaps are manually created, the rough opposing surfaces of the flap and bed heal rapidly and firmly around the haptic, being helped by the fibrin glue early on. The major uncertainty here is the stability of the fibrin patch in vivo. Numerous animal studies have shown that the fibrin glue is still present at 4–6 weeks. Because postoperative fibrosis starts early, the flaps become stuck secondary to fibrosis even prior to full degradation of the glue (Figures 8A to D). The ensuing fibrosis acts like a firm scaffold around the haptic which prevents movement along the long axis (Figure 8A). To further make the IOL rock stable, the authors have started tucking the haptic tip into the sclera wall through a tunnel. This prevents all movement of the haptic along the transverse axis as well (Figure 9B). The stability of the lens first comes through the tucking of the haptic in the scleral pocket created. The tissue glue then gives it extra stability and also seals the flap down. Externalization of the greater part of the haptics along its curvature stabilizes the axial positioning of the IOL and thereby prevents any IOL tilt.

The following sequential surgical steps illustrate how Glued IOL implantation using a foldable IOL can be done. (Figure 10–38)

FIGURE 10: Aphakic case. No capsule seen

FIGURE 11: Scleral markers applied on the cornea. This will help to get marks created on the cornea 180 degrees apart to make scleral flaps

FIGURE 12: Marks made on the cornea. Conjunctiva cut on either side of the marks

FIGURE 13: Scleral Flaps made 180 degrees apart

FIGURE 14: Sclerotomy made 1 mm from the limbus under the sclera flap using a 20 G needle
FIGURE 15: 23 G vitrectomy to remove anterior and mid vitreous

FIGURE 16: Clear corneal incision

FIGURE 17: Foldable IOL being injected slowly. It is to note the cartridge is inside the eye. One should not do wound assisted as the injection might happen too fast. This can either break the IOL or push it so fast that it might go into the vitreous cavity.

FIGURE 18: Foldable IOL injection continued with one hand. This injector has a pushing mechanism so one hand can be used. The other hand holds an end opening micro-hexis forceps (23 G) and is passed through the sclerostomy under the scleral flap and is ready to grab the haptic.

FIGURE 23: Trailing haptic is fixed into the anterior chamber. The other hand holds the end opening micro-hexis forceps and is passed through the other sclerostomy under the scleral flap

FIGURE 24: End opening forceps ready to grab the haptic tip

FIGURE 25: Haptic caught

FIGURE 26: Haptic is gradually pulled towards the sclerostomy

FIGURE 27: Haptic externalized

FIGURE 28: Both haptics externalized and can be seen lying under the scleral flaps

FIGURE 29: Virectomy done at the sclerostomy site

FIGURE 30: 25 G needle makes a scleral pocket at the edge of the flap where the haptic is

FIGURE 31: Forceps holds the haptic and flexes it to tuck it inside the scleral pocket
If haptic is not held at the tip then you may find difficulty in extracapsular haptic and resultant breakage of haptic.

**Depth of tunnel:** Depth of scleral tunnel should be two third of the sclera. Superficial tunnels can result in sub conjunctival haptics in late post-operative period.

**Centre for Sight Experience & Results**

At our Centre in New Delhi, India we have performed posterior chamber IOL fixation with Fibrin Glue in more than 246 eyes. BDI at 6 weeks of surgery was ± 12 ± 17 of the 246 eyes. Surgical time was recorded and culcures were eliminated. While there was a learning curve in the first 25 cases, in the last 250 cases, all patients had a well centered IOI, with no pseudophakodonesis. There was no significant anterior chamber inflammation in any of the patients after 1 week of surgery. No case of IOI luxation, glaucoma or corneal edema was noted. Transient hypesthesia was seen in 15 eyes which recurred after 1 week. Vitreous hemorrhage which resolved within 3 weeks occurred in 4 eyes in the first 30 cases but did not occur in the last 44 cases. One case of haptic exposure was seen which was replaced in an alternative scleral tunnel under the scleral flap. Till this follow up all patients had a stable IOI, with no IOA decentration and no significant lens induced astigmatism.

**To conclude:** Fibrin-glue posterior chamber IOL using Fibrin Glue is a viable option in patients with deficient capsular support. After an initial learning curve, excellent results are obtained in terms of IOI stability and centration, reduced incidence of CME, elimination of sutures and lesser surgical time. Greater follow up is required to assess long term results.

**REFERENCES**


