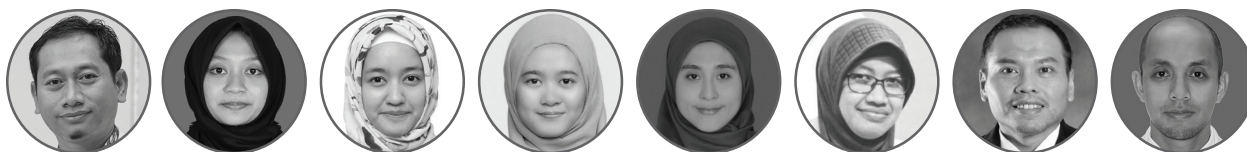


# COMBINED PUPILLOPLASTY AND IRIS-FIXATED IOL IMPLANTATION



A novel technique for treating complicated aphakia with atonia and insufficient capsular support in vitrectomized eye.

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**R**epairing surgically aphakic patients who have had a previous vitrectomy is complicated due to insufficient capsular support and/or major alterations in the anatomy of the anterior chamber, especially in the presence of iris defects.<sup>1,2</sup>

A significant cause of iris defects is pupil atonia, one of the most common complications of anterior segment surgery. In one survey, 60% of responding cataract and refractive surgeons encountered at least one case of pupil atonia after cataract surgery in the last 5 years.<sup>3,4</sup> Light sensitivity is common in patients with an atonic pupil secondary to trauma; thus, these cases require a challenging surgical technique for repairing the defects.<sup>5,6</sup>

Pupilloplasty, commonly used to repair damage associated with iris dysfunction, recreates the proper size of the pupil while maintaining the structural integrity of the iris tissue. Trauma, postoperative sequelae, elevated IOP, chronic uveitis, herpes simplex virus, herpes zoster virus, and proliferative disorders can all have a substantial impact on physiological pupillary dimensions, and as such, the iris must be thoroughly assessed for proper management of the defect.<sup>1,7</sup>

## CASES

The primary consideration of our study was whether iris dysfunction may be repaired with a combination of pupilloplasty and iris-fixated IOL implantation. In most trauma cases, the defect can only be repaired using the suturing technique. However, in the case of proliferative diseases such as iridocorneal endothelial syndrome or epithelial down growth, prosthesis is required to replace an iris in poor condition.<sup>1,8</sup>

Cases of iris defect in aphakic-vitrectomized eyes present ophthalmologists with a whole new set of challenges, considering even typical treatments are complex and difficult. Using a case series approach, we describe the management of three aphakic vitrectomized patients (three eyes) who have a pathologically wide pupil (atonia) and insufficient capsular support. We used the single-pass four-throw (SFT) approach with a secondary iris-fixated IOL implantation.

Vitrectomy and lensectomy were performed in patients with nucleus drop or posterior luxation of cataract. After 1 month, pupilloplasty and IOL implantation using an artisan iris-fixated technique were performed. All surgical procedures were performed by the same surgeon (S.S.).

We chose the SFT technique because it provides some advantages over other techniques, including reduced surgical manipulation, fast surgical time, and dissemination of the pigment in previously compromised eyes.<sup>7,8</sup> It also offers faster rehabilitation and reduced inflammation in postoperative settings.<sup>9</sup> Recently, interest in the SFT technique has grown because it can significantly reduce photophobia and glare.<sup>10,11</sup> All procedures were performed under local anesthesia (topical pantocaine and intracameral lidocaine 2%) under monitored care.

## SURGICAL STEPS

The first step in the pupilloplasty is to make a small incision in the cornea and fill the anterior chamber with lidocaine, carbachol, and viscoelastic materials. Then, make two incisions on either side in the limbus along the axis of the iris defect. Using a 26-gauge needle, introduce a polypropylene

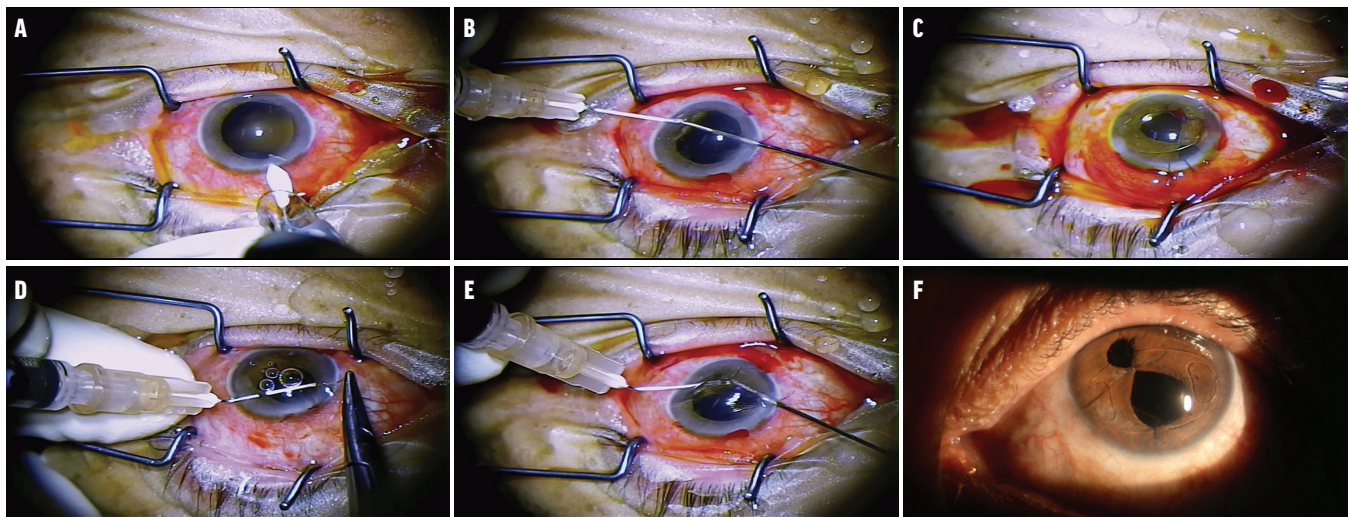


Figure 1. During pupilloplasty using the SFT technique in case number one of an aphakic-vitrectomized eye, a small incision is introduced to fill the anterior chamber with lidocaine, carbachol, and viscoelastic materials (A). Then, two incisions are made on both sides of limbus, along the axis of iris defect (B). A 26-gauge needle is introduced into the anterior chamber and passed through the iris tissue (C). The 26-gauge needle is pulled along with the suture, then securely tied (D). In the contralateral side (the upright side of the iris), procedures B and C are repeated until proper pupil size is achieved (E). The artisan IOL is inserted, and the lens is properly enclavated in the anterior chamber (F).

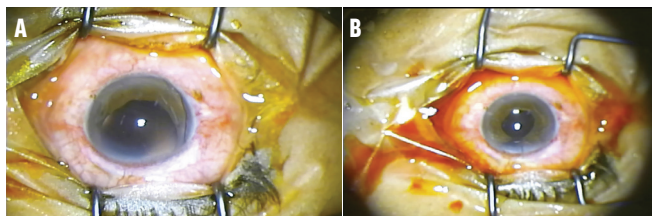


Figure 2. Before pupilloplasty in case number two, the patient has a pathologic large pupil in an aphakic-vitrectomized eye (A). Postoperatively, a well-rounded pupil was achieved and the IOL was well implanted (B).

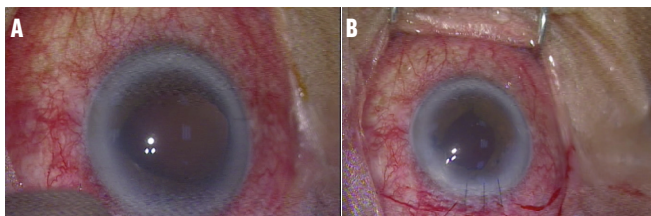


Figure 3. Preoperatively, the third patient in the series has a pathologically large pupil in an aphakic-vitrectomized eye (A). The condition of the pupil and retropupillary iris-fixed IOL improved after the reconstruction was complete (B).

suture through the limbal incision, passing straight through the iris (1 mm from pupil) and exiting through the contralateral side of the iris. Tie the suture securely and repeat the procedure until the normal pupil size is achieved.

After the pupilloplasty procedure is complete, insert an iris-fixated IOL into the anterior chamber while avoiding the previous suture. Adjust the optical part of the IOL with the pupil's position, then enlave the IOL. Perform an iridectomy, remove the viscoelastic, and suture the cornea.

All three cases used SFT pupilloplasty without iris prosthesis (Figures 1-3). Follow-up examinations were scheduled up to 3 months postoperative to assess the success of the

procedure by comparing visual acuity and IOP at baseline and 3 months after the operations.

RESULTS

In all three patients, visual acuity showed significant improvement 3 months postoperative (Table). This result was similar to a previous study in which uncorrected visual acuity rose significantly from  $1.15 \pm 0.29$  logMAR to  $0.37 \pm 0.17$  logMAR at 6 months after surgery ( $P < .05$ ).<sup>3</sup>

In addition, IOP from admission date to 3 months after surgery showed normal results with a range of 16 mm Hg to 17 mm Hg for all patients. The mean preoperative IOP was

| TABLE. DEMOGRAPHICS AND OUTCOMES |        |              |             |                                           |                        |              |                        |
|----------------------------------|--------|--------------|-------------|-------------------------------------------|------------------------|--------------|------------------------|
| Case                             | Gender | Affected Eye | Age (years) | Uncorrected Visual Acuity (Snellen Chart) |                        | IOP (mm Hg)  |                        |
|                                  |        |              |             | Preoperative                              | 3 months postoperative | Preoperative | 3 months postoperative |
| 1                                | Male   | Left         | 62          | 1/60                                      | 6/60                   | 17           | 17                     |
| 2                                | Female | Right        | 57          | 0.5/60                                    | 6/12                   | 18           | 16                     |
| 3                                | Male   | Right        | 58          | 1/60                                      | 6/40                   | 18           | 16                     |

17.7 ± 0.58 mm Hg; 3 months after surgery, mean IOP was 16.4 ± 0.58 mm Hg. A similar result was reported in another study, in which iris-fixated IOL implantation with pupilloplasty did not affect IOP up to 6 months after surgery.<sup>3</sup>

## DISCUSSION

Iris reconstruction is necessary with atonia, as the quality of vision is significantly affected by permanent mydriasis of the pupil; patients may experience a wide range of visual disturbances such as glare, starburst, ghosting phenomena, and photophobia.<sup>12</sup>

Because of cosmetic concerns, surgeons should repair the iris to achieve improved functional and aesthetic outcomes.<sup>12</sup> All three patients included in this study were satisfied with the surgery, given that their visual acuity improved significantly and their symptoms of glare and photophobia reduced remarkably.

According to a meta-analysis conducted by Jing et al, the iris-fixated IOL procedure requires a surprisingly short surgical time due to the use of a corneal incision and IOL push-in.<sup>13</sup> This simpler process could lead to a noninvasive manipulation of the eye, reducing the potential for complications. Based on one author's experiences (S.S.), since the vitrectomized globe is at a higher risk of collapsing during the procedure, surgeons must monitor IOP carefully. If IOP drops, the globe must be filled with balanced salt solution immediately.

In our study, there were no complications reported by any patient during surgery or in 3 months of routine monitoring. Nonetheless, complications have been reported in previous studies, including temporary increase in IOP, hemorrhage, choroid effusion, and pigment adhesion.<sup>3</sup>

## CONCLUSION

Our results support previous findings that the combination of pupilloplasty and iris-fixated IOL implantation under local anesthesia can be a quick and simple way to treat aphakic-vitrectomized eyes with insufficient capsular support and atonia. Further studies with a larger sample size may provide additional insights on the use of this approach. ■

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1. Randleman JB, Ahmed IIK. Intraocular lens surgery: selection, complications, and complex cases. 1st ed. Sydney, Australia: Thieme Verlagsgesellschaft; 2016:178-183.

2. Upadhyay AM, Nataraj A. Visual outcomes and complications of posterior iris-claw intraocular lens implantation in aphakic postvitrectomized eyes. *Kerala J Ophthalmol*. 2017;29:184-188.

3. Ye P, He F, Shi J, et al. Artisan iris-fixated intraocular lens implantation in combination with pupilloplasty: correction of aphakia with pathologically large pupil and insufficient capsular support. *Can J Ophthalmol*. 2017;52(2):155-160.

4. Behndig A. Small incision single-suture-loop pupilloplasty for postoperative atonic pupil. *J Cataract Refract Surg*. 1998;24(11):1429-1431.

5. Zarranz-Ventura J, O'Connell E, Haynes RJ. Bow-string technique for iris pupilloplasty and posterior iris-claw artisan intraocular lens implant in traumatic aphakia with associated iris defects. *Retina*. 2014;34(11):2306-2310.

6. Acar N, Kapran Z, Altan T, Kucuksumer Y, Unver YB, Polat E. Secondary iris claw intraocular lens implantation for the correction of aphakia after pars plana vitrectomy. *Retina*. 2010;30(1):131-9.

7. Siepser SB. The closed chamber slipping suture technique for iris repair. *Ann Ophthalmol*. 1994;26(3):71-72.

8. Osher RH, Snyder ME, Cionni RJ. Modification of Siepser slip-knot technique. *J Cataract Refract Surg*. 2005;31:1098-1100.

9. Narang P, Agarwal A. Single-pass four-throw pupilloplasty knot mechanics. *J Refract Surg*. 2019;35(3):207-208.

10. Liu S, Cheng S. Modified method of sutureless intrascleral posterior chamber intraocular lens fixation without capsular support. *Eur J Ophthalmol*. 2013;23(5):732-733.

11. Agarwal A, Narang P, Mehta K. Phacoemulsification with single-pass four-throw pupilloplasty and pre-Descemet's endothelial keratoplasty for management of cosmetic iris implant complication. *Indian J Ophthalmol*. 2018;66(6):841.

12. Frisina R, Parrozzani R, Tozzi L, Pilotto E, Midena E. Pupil cerclage technique for treatment of traumatic mydriasis. *Eur J Ophthalmol*. 2019;30(3):480-486.

13. Jing W, Guanlu L, Qianyin Z, et al. Iris-claw intraocular lens and scleral-fixated posterior chamber intraocular lens implantations in correcting aphakia: a meta-analysis. *Invest Ophthalmol Vis Sci*. 2017;58(9):3530.

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