

## Scleral Fixation Intraocular lenses

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**Abstract:** Background: The 1ry indication for scleral fixation of intraocular lenses (IOL) is dislocation as a principal complication of cataract surgery. Inadequate capsular support is the most common cause of IOL dislocation. Other indications include traumatic phakic lens dislocation (cataractous or clear), surgically aphakic eyes or anterior chamber IOL with complications (persistent hyphema, uveitis). Methods: 20 eyes of 20 patients were done, surgery was done only when the IOL was dislocated peripheral to the visual axis and was causing symptoms of visual loss sufficient to interfere with the patient's activities of daily living, or patients who were left aphakic for a 2ry implantation procedure. A modification of the technique was done which made the procedure faster and preserved the surrounding conjunctiva. Results: Best corrected visual acuity (BCVA) preoperatively ranged from 1/60 -6/60 and postoperatively between 6/60 – 6/6. Statistical analysis of the logarithm of the minimum angle of resolution (LogMAR) between the preoperative and postoperative visual acuity revealed significant improvement ( $p \leq 0.05$ ). Intraoperative complications included one case of accidental iris injury, two cases of mild vitreous hemorrhage, two cases of moderate vitreous hemorrhage. Early postoperative complications included pupillary block. Midterm post operative complications occurred in one case with the occurrence of cystoid macular edema. Conclusion: Scleral fixation of IOL is a safe procedure with minimal complications, but needs surgical skills to be managed optimally.

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**Key words:** Scleral fixation, Intraocular lenses, Aphakia, IOL dislocation.

### Introduction

The indication for intraocular lens (IOL) scleral fixation is widely variable. The 1ry indication is IOL dislocation as a principal complication of cataract surgery, with early reports of 13% rate of IOL dislocation<sup>(1)</sup>. Inadequate capsular support is the most common cause of IOL dislocation and most commonly manifests in the early postoperative period<sup>(2)</sup>. Fixation of intraocular lenses in cases of insufficient or no capsular support is challenging and requires a large armamentarium of techniques to resolve different situations<sup>(3-24)</sup>. Other indications include traumatic phakic lens dislocation (cataractous or clear), surgically aphakic eyes or anterior chamber IOL with complications (persistent hyphema, uveitis). The reported incidence of dislocation of rigid posterior chamber IOLs (PCIOLs) is from 0.2% to 2%<sup>(25,26)</sup>. Management decisions are based on the clinical features of every individual case and surgeon preference. Management options described for dislocated PCIOLs include IOL repositioning with or without scleral fixation sutures (depending on residual capsular support) and IOL removal (with or without reimplantation of the same or alternative

IOL)<sup>(19,27,28)</sup>. IOL repositioning without scleral fixation suture is generally preferred technique if there is adequate capsular support. In the absence of adequate capsular support, the dislocated PCIOL may be sutured to the sclera or exchanged. The scleral suture fixation technique requires undamaged open-loop haptics. A PCIOL may be exchanged for a sutured PCIOL or an anterior chamber IOL (ACIOL)<sup>(29,30)</sup>. Dislocation of the phakic human lens is uncommon but serious complication, as it requires sophisticated techniques to remove safely, especially if it is dislocated in the vitreous cavity. Dislocation of a PCIOL into the vitreous cavity is another uncommon but serious complication with numerous techniques for its management<sup>(3,5,6,13,14,17,18,31-41)</sup>. During surgical intervention, an important consideration is whether to remove, reposition, or exchange the dislocated PCIOL after performing a pars plana vitrectomy. If adequate capsular support is found to be present, the same intraocular lens may be positioned into the ciliary sulcus. Alternatively, the dislocated PCIOL may be sutured to the sclera if capsular support seems inadequate. If the PCIOL is removed, the patient may be left aphakic if intraocular lens implantation is contraindicated for

any reason. However, when there is no contraindication to lens insertion, the patient may receive either a sutured PCIOL or an anterior chamber intraocular lens (ACIOL). Historically, ACIOLs, especially rigid and closed-loop lenses, have been associated with a higher rate of complications compared with PCIOLs<sup>(42)</sup>. These complications can lead to poor visual results and include bullous keratopathy, glaucoma, uveitis, hyphema, and cystoid macular edema. Newer, open-loop ACIOL designs, however, seem to have a lower rate of complications<sup>(43)</sup>. In case of ACIOL complications, exchange of the anterior chamber IOL to a sclerally fixated PCIOL is done. Previous studies describing the visual results in subjects who underwent intraocular lens exchange have reached conflicting conclusions. Some studies have found similar final visual results between eyes that received an ACIOL and those that received a PCIOL<sup>(44)</sup>, whereas other studies have found better postoperative visual results in eyes that received a PCIOL<sup>(45)</sup>.

### **Patients and Methods**

The study cohort included 20 eyes of 20 patients. Preoperative data included age, gender, type & duration of dislocation (surgery, trauma) or aphakia, coexisting ocular diseases, preoperative best-corrected visual acuity (BCVA), preoperative type of IOL, category of IOL dislocation (in the bag), and previous surgery including pars plana vitrectomy, sclera buckling procedure, or neodymium:yttrium-aluminium-garnet (Nd:YAG) capsulotomy. Surgery is recommended only when the IOL was dislocated peripheral to visual axis and was causing symptoms of visual loss sufficient to interfere with the patient's activities of daily living, or patients who were left aphakic for a 2ry implantation procedure. The scleral suture fixation technique for acrylic IOLs was previously reported<sup>(18, 46)</sup>. A modification of the technique was done which made the procedure faster and preserved surrounding conjunctiva (fig. 1). All surgeries were done by one surgeon (1<sup>st</sup> author A.S.).

### **Scleral fixation technique:**

We followed the technique reported by Richard Hoffmann (fig 1) where two limbal vertical incisions half corneal thickness 2.5 mm in length were done at 1:30 and 7:30 meridians. A 2.6 mm crescent knife was used to create a reversed sclera pocket 2.5mm backwards across the limbus into the sclera subconjunctivally. Polypropylene sutures (10-0) on a straight needle were introduced 1 mm

posterior to the limbus through the wall of the scleral pocket traversing the conjunctiva, sclera pocket and into the eye. The needle is passed across the eye behind the iris and delivered from the opposite side 1 mm behind the limbus through guidance by a 25 G needle introduced through the sclera pocket of the other side 180 degrees away. This needle is again introduced into the eye 1mm adjacent to its exit to pass to the opposite side in the same manner previously described. Finally, we have two 10/0 threads passing across the eye and 2 separate ends on either side of the limbus. A two step corneal incision 7mm is done. The two 10/0 threads are retrieved through the wound by ainsky hook. Every two ends are tied to the hole on the haptic of sclera fixation PMMA 6.50 optic IOL, whenever the dioptric power was available or on the haptics if not. The two ends were pulled to centralize the IOL. The corneal wound in closed with 3 interrupted 10/0 nylon stitches. The 2 10/0 prolene threads on either side were retrieved from the corneal side of the scleral pocket and tied to one another on either side separately and buried in the sclera pocket.

In vitreous dislocated IOLs; 3 port 20 Gauge pars plana vitrectomy was done in the usual manner with perflurodecalin floatation of the dislocated IOL and retrieval with serrated vitrectomy forceps and into the anterior chamber above the iris, where it is removed through corneal incision. In cases where there was traumatic dislocation of the cataractous lens, the same former technique was done with removal of the lens by phacofragmatome. In cases where total vitrectomy was performed, peripheral retinal indentation was done with intraocular laser treatment to any suspicious peripheral tears and fluid air exchange was done with the eye left with air tamponade with no traction on the retina. In case of surgical aphakia, conjunctiva was not opened and anterior chamber vitrectomy was done either through two corneal side ports or through the main corneal wound. In cases of anterior chamber IOL subluxation, anterior vitrectomy was done through 2 corneal side ports and IOL was fixated with an anteriorly opened needle introducing the 10/0 prolene through the sclera pocket and retrieving it in the manner described earlier. The anterior chamber iris captured IOL was removed through corneal incision with anterior vitrectomy, All were followed by sclera fixation of a 6.5 optic Polymethylmethacrylate (PMMA) IOL. Visual acuity was converted to the logarithm of minimum angle of resolution for statistical analysis.

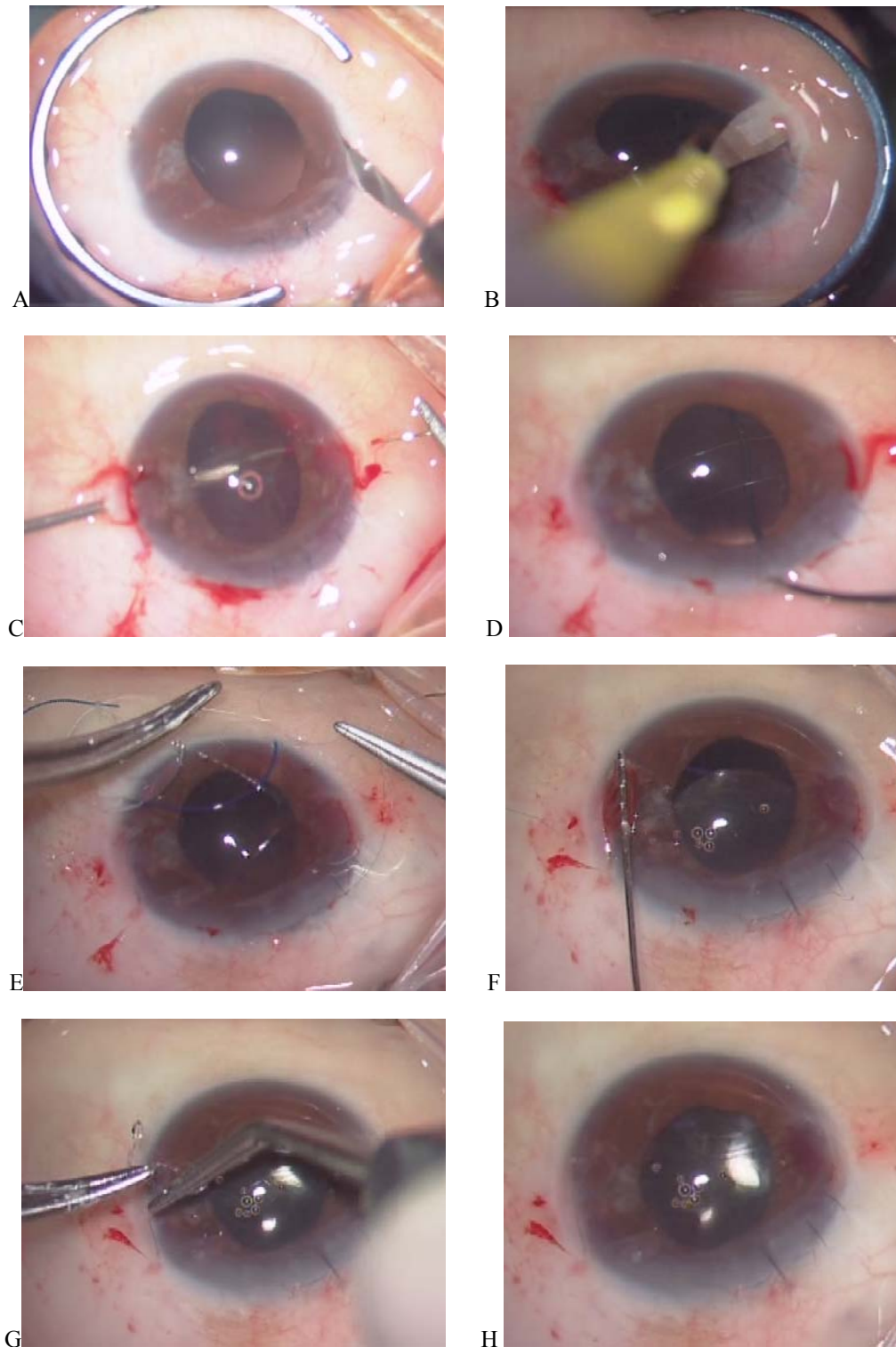


Figure1: Steps of scleral fixation: A- Limbal incision. B- Tunnel dissection. C- 10/0 prolene introduction and retrieval. D- 10/ 0 prolene thread retrieval. E-Haptic tying. F- 10/0 prolene pocket retrieval. G- 10/0 prolene tying and embedding in the sclera pocket. H- Final picture with no conjunctival opening.

**Statistical analysis:**

The mean differences in paired designs were applied using paired t-test to analyze the differences in logMAR of visual acuity in the collected sample of this study at a confidence interval 95% and significance level 0.05.

**Results:****Preoperative Characteristics**

The study cohort included 20 eyes of 20 patients (8 males, 12 females), with mean age of the patients was 52.9 years (range, 25-70 years; (Table 1). There were 11 (55%) right eyes. The median interval from 1ry procedure to the present procedure is 66 days (range, 14–120 days). The indications for scleral fixation were vitreous IOL dislocation during the 1ry procedure in 3(15%) eyes; surgical aphakia without enough capsular support for 1ry IOL implantation in 9 (45%) eyes; Traumatic cataractous phakic lens vitreal dislocation in 5 (25%) eyes; IOL sublaxation with the optic bisecting the pupil and peripheral anterior synechia and residual cortical matter in 2 (10%) eyes; Anterior chamber captured IOL suffering from chronic iritis in one (5%) eye. The preoperative mean BCVA logarithm of minimum angle of resolution was 1.67 (range of Snellen visual acuity, 1/60 – 6/60). There were 2 (10%) polymethyl methacrylate (PMMA) IOLs, 3 (15%) one piece acrylic IOLs, and 1 (5%) ACIOLs (Table 1).

Table 1. Baseline Characteristics

No. of patients	20
Eyes	20
Gender (%)	Female 12 eyes 60 %
Age (yrs)	Mean 52.9 Range 25–70
Right	11eyes 55 %
Types of dislocated IOL (n = 6)	
PMMA 1-piece	2 (10 %)
1-Piece acrylic IOL	3 (15 %)
ACIOL	1 (5 %)
Preoperative BCVA	
Mean logMAR	1.67
Range (Snellen)	1/60 – 6/60
Interval from IOL implantation to dislocation	Range 14 day to 120 days

ACIOL \_ anterior chamber intraocular lens; BCVA \_ best corrected visual acuity; IOL \_ intraocular lens; logMAR \_ logarithm of minimal angle resolution; PMMA \_ polymethylmethacrylate.

The median follow-up after dislocated IOL management or implantation was 18 months (range, 11months-24months). The postoperative mean BCVA logarithm of minimum angle of resolution was 0.24 (range of Snellen visual acuity, 6/60 – 6/6). Intraoperative complications included one case of accidental iris injury during anterior vitrectomy (Table 2). Two cases of mild vitreous hg which resolved after 2 weeks of bed rest (Fowler position). Two cases of moderate vitreous hg which mandated doing total vitrectomy during the procedure. Early postoperative complications included pupillary block with elevation of the IOP which resolved completely after a course of mydriatics. Mid term post operative complications occurred in one case with the occurrence of cystoid macular oedema (Irvine gass syndrome).

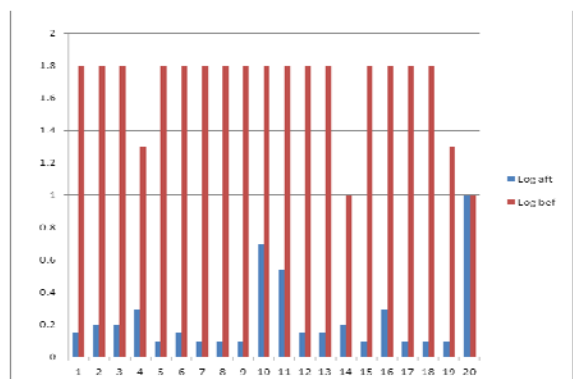
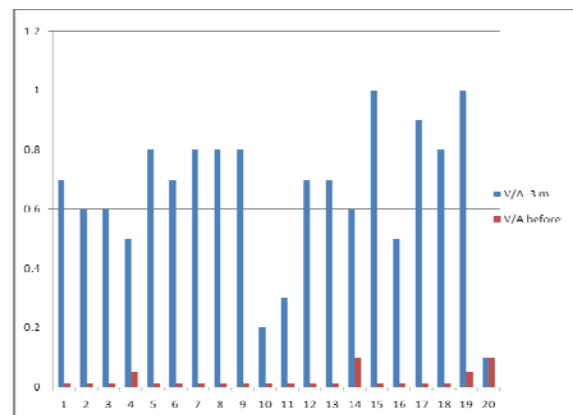


Figure2: graph of visual acuity pre and postoperative by 3 months, Figure3: graph of visual acuity LogMar conversion pre and postoperative by 3 months.

Best corrected visual acuity (BCVA) preoperatively ranged from 1/60 – 6/60 and postoperatively between 6/60 – 6/6 (Figure 2, 3). Statistical analysis of the logarithm of the minimum angle of resolution (LogMAR) between the

preoperative and postoperative visual acuity revealed significant improvement ( $p \leq 0.05$ ).

Table 2: complications.

Complications	
nteroperative	accidental iris injury (n:1)
	Mild vitreous hemorrhage (n:2)
	Moderate vitreous hemorrhage (n:2)
	Retinal tears (n:2)
ostoperative	
Early	Papillary block (n:1)
Midterm	Cystoid macular oedema (n:1)

### **Discussion:**

Previous studies have not definitively set surgical indications and optimal timing for management of dislocated IOLs; neither did this study. The management approach depends on surgeon preferences and individual case specifics, including integrity of capsule remnants, type of IOLs, and coexisting ocular pathology<sup>(47-50)</sup>. The surgical approach in this series was influenced by the specialty (vitreoretinal) and the preferences of the operating surgeon (AS), but standardization was established regarding the scleral fixation itself, while the remainder of the procedure was determined by the case pathology and operative circumstances. The stability and centralization of the sclerally fixated IOLs in this study were excellent during the follow up period with no rotation or subluxation. The visual acuity significantly improved postoperatively. Postoperative retinal detachment has been reported in 3%21 to 14%10 of cases. In the current study, postoperative retinal detachment didn't develop in any case postoperatively. In cases where total vitrectomy was performed, peripheral retinal indentation was done with intraocular laser treatment to any suspicious peripheral tears and fluid air exchange was done with the eye left with air tamponade with no traction on the retina. Knot exposure, intraocular hemorrhage, transscleral suture fistulas, and endophthalmitis have been reported with transscleral sutures, but none with the present technique. The scleral pocket technique done minimized this incidence. Intraoperative and postoperative intraocular hemorrhage is usually self-limited, with two cases resolved after 2 weeks but 2 (10%) patients received vitrectomy during the scleral fixation owing to moderate nature of the hemorrhage, which was related to the transscleral suture passes. Cystoid macular edema occurred in one case and was treated accordingly. Recent case studies of in-the-bag IOL dislocation have suggested predisposing factors

of pseudoexfoliation, uveitis, trauma, status after vitrectomy, and long axial length<sup>(27,33,48,51-59)</sup>. Postoperative retinal detachment occurred more commonly with in-the-bag IOL dislocation compared with extracapsular dislocation, but none in this study. Intraoperative retinal breaks were encountered in 2 eyes; 10%) in this study during the course of vitrectomy and were treated with intraocular laser. Suturing of a dislocated PCIOL to the sclera could be technically demanding, potentially resulting in an increased number of intraoperative and postoperative complications such as intraocular hemorrhage, retinal tears, and retinal detachment, with a long-term risk of lens rotation, as well as endophthalmitis<sup>(36,48,60,61)</sup>. Repositioning a dislocated PCIOL into the ciliary sulcus is easier and less traumatic than suturing a lens into the sclera, however, there is the possibility of postoperative lens dislocation because of inadequate capsular support<sup>(35)</sup>. Finally, although technically easier to place, ACIOLs may be associated with a higher long term risk of corneal decompensation, glaucoma, and uveitis<sup>(42,43,62)</sup>. In contrast, PCIOLs have a long-term safety record in eyes with other ocular diseases such as glaucoma, uveitis, and diabetic retinopathy<sup>(63,64)</sup>. This series is rather few, but it adds to the belief of the safety and stability of sclerally fixated IOLs.

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