

Management of severe intraocular lens tilt using transsulcus retention sutures



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In eyes lacking capsular support, scleral-fixated intraocular lens (SF IOL) implantation serves as an effective solution. However, unintended SF IOL tilt can adversely affect patient outcomes. Drawing inspiration from the use of retention sutures in other surgical settings, we introduce a novel technique that uses transsulcus retention sutures (TSRSs) to treat severe SF IOL tilt in the use of 3 patients. The index case presented with uveitis–glaucoma–hyphema syndrome after double-flanged scleral fixation, while 2 other patients suffered from malfunction of the haptic–optic junction during flanged haptic scleral fixation. Severe optic tilt was noted in all 3 patients.

Paired TSRSs were made by passing 9-0 polypropylene to and from the opposite scleral wall 3 mm apart in the sulcus plane, centered over the IOL optic, to either segregate the IOL optic from the posterior iris or to sandwich the IOL between 2 pairs of TSRS. Resolution of severe tilt and their sequelae were achieved in all cases.

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Online Video

Successful cataract treatment is synonymous with removal of the cataract and implantation of the intraocular lens (IOL) within the capsular bag. However, not all eyes have the necessary capsular support for this treatment. Whether due to ocular trauma, a previous operative complication, or a genetic condition, endocapsular implantation is contraindicated in a subpopulation of patients with cataract.¹ In these eyes, many surgeons turn to scleral-fixated IOLs (SF IOLs), which place the optic in the posterior chamber, closer to the natural location of the crystalline lens, making SF IOLs a safe option for the corneal endothelium and iris.²

However, SF IOLs come with their own set of complications, including unintended tilt. A review of SF IOLs found that IOL subluxations/dislocations occur as a post-operative complication in 2.86% of successful SF IOL implantations.³ Even 5 degrees of IOL tilt can cause noticeable visual symptoms, such as glare, astigmatism, visual halo, and monocular diplopia.⁴ Severe IOL tilt can also cause uveitis–glaucoma–hyphema (UGH) syndrome, which occurs from the mechanical irritation of intraocular structures.⁵ Treatment often requires surgical procedures, such as IOL exchange or repositioning, requiring maneuvers that may be challenging.⁶

We present 3 patients in which an alternative procedure is performed. Transscleral retention sutures (TSRSs) were used to mechanically support the tilted IOL, compartmentalize it to the sulcus, and return it to a planar

orientation. This maneuver was inspired from others using retention sutures for other purposes. As described by Gentile, retention sutures can be used as a barrier in an aphakic eye maintaining silicone oil in the posterior chamber.⁷ These retention sutures have also been used to support an IOL during scleral fixation.⁸ Similarly, in this report of 3 cases, the retention sutures serve as a physical barrier to prevent the IOL from tilting. This is, to our knowledge, the first time this procedure has been described in the literature for this indication. The purpose of this study was to propose the use of TSRS as an alternative option to IOL exchange or repositioning to alleviate IOL tilt.

Patient Consent Statement

Consent was obtained from all patients, and an Institutional Review Board/Ethics Committee approval was not required.

SURGICAL TECHNIQUE

Iris Segregation

The goal of this surgical technique is to mechanically support a tilted IOL with pairs of TSRS to return it to a planar position. To achieve this, after establishing anesthesia, the center of the intraocular lens is marked on the overlying cornea. The anterior chamber is formed with an ophthalmic viscosurgical device. Paired conjunctival peritomies are created 180 degrees apart at an axis away from

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the axis of haptic scleral fixation. Two sets of paired marks are then made on the sclera 180 degrees apart, 2.5 mm posterior to the surgical limbus, and approximately 3 mm apart from its mate, straddling the center of the IOL. A partial thickness scratch incision is then made in the sclera connecting the paired markings. A 9-0 polypropylene TSRS is fashioned by passing the suture with a long straight needle (STC-6, Ethicon, Inc.) from the marking at one end of the scratch incision across the sulcus, docking the needle into a large bore 30-gauge needle (TSK Laboratory Japan) entering from the mirrored marking at the opposite scratch incision, externalizing the polypropylene suture, and then passing the needle back transiting the sulcus to and from the mated markings by a similar docking procedure (Figure 1). Both suture passes should be made anterior to the IOL, segregating it from the iris. At a supraphysiologic intraocular pressure (IOP), tension is applied to the sutures, and the tag ends tied with 3-1-1-1 throws. The knot can then be buried into the sclera.

IOL Sandwich

A variation of this technique can also be performed in which 2 pairs of TSRS are fashioned, with 1 pair anterior and 1 pair posterior to the IOL. After the round-trip transit of suture posterior to the IOL, the needle and suture are passed again in a similar fashion to and from the same sclerotomy in a plane anterior to the IOL. Care was taken to avoid inadvertently cutting the suture with either of the needles by inserting the needles in the same sclerotomy just adjacent to the suture along the outer perimeter of the loop. With the eye at supraphysiologic IOP, and the suture tag ends exiting the eye on the same side, the needles are then detached, adequate tension applied to the sutures, and the tag ends secured with 3-1-1-1 throws. The knot is then buried into the sclera by holding onto both exposed loops of polypropylene and rotating them simultaneously. The result is a flanged-haptic scleral-fixated IOL sandwiched between 2 layers of paired TSRS (Figure 2).

We present 3 cases in which these techniques are used.

CASE REPORTS

Case 1

A 76-year-old man presented with recurrent bouts of iritis and microhyphema recalcitrant to topical medical therapy of his right eye, as well as corneal edema. His ocular history of the right eye was significant for blunt traumatic ruptured globe status postrepair, vitrectomy and lensectomy, and recurrent submacular choroidal neovascularization treated with anti-VEGF injections. His preoperative vision was hand motions peripherally. Double-flanged scleral fixation of a poly(methyl methacrylate) IOL (CZ70BD, Alcon Laboratories, Inc.) using 5-0 polypropylene sutures had been performed 5 months earlier.⁸ His IOL was centered and stable but had obvious tilt with the superior aspect of the lens forward coinciding with a large iris transillumination defect. UGH syndrome was diagnosed in his right eye caused by chronic chafing of the posterior iris from a severely tilted scleral fixated IOL.

In the operating room under usual intraocular surgical conditions to the right eye, anesthesia was achieved with a subtenon block. After performing the TSRS IOL segregation technique, the IOL was in a planar configuration and found to be stable when challenged with intraocular instruments (Video 1). An uneventful Descemet stripping endothelial keratoplasty (DSEK) was then performed.

Case 2

An 83-year-old woman (preoperative corrected distance visual acuity [CDVA] 20/50 with $-2.25 +0.50 \times 135$) was referred after she was left aphakic after posterior capsule rupture during phacoemulsification to her left eye. There was no residual cataract material in the eye, and only a scant amount of capsule remained after a vitrectomy performed contemporaneously. After her consultation, a secondary lens implantation with intrascleral flanged-haptic fixation

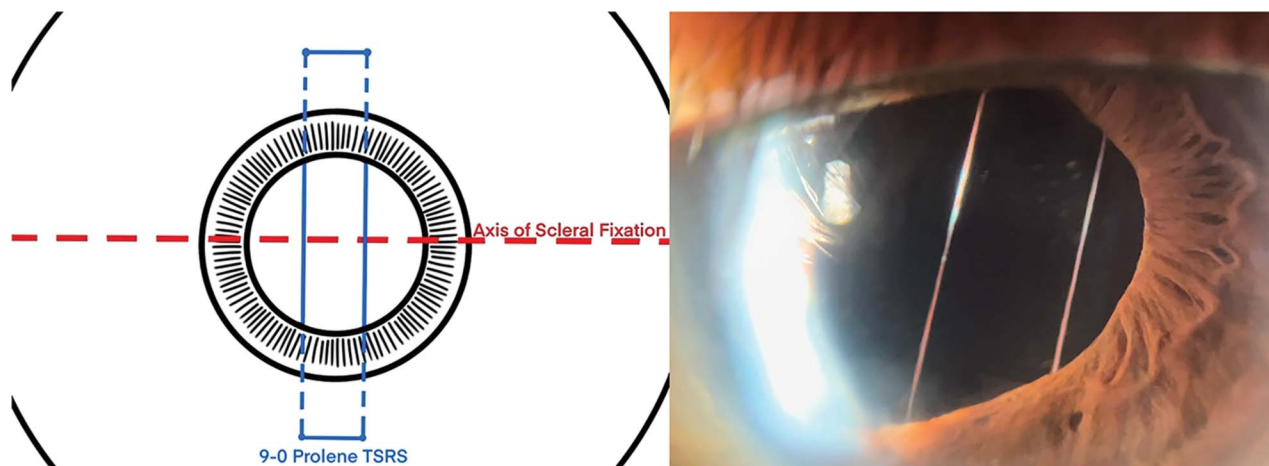


Figure 1. Schematic of TSRSs (*left*). Slitlamp photograph of the patient described in case 1, 18 months after TSRS and DSEK (*right*). TSRS = transsulcus retention suture

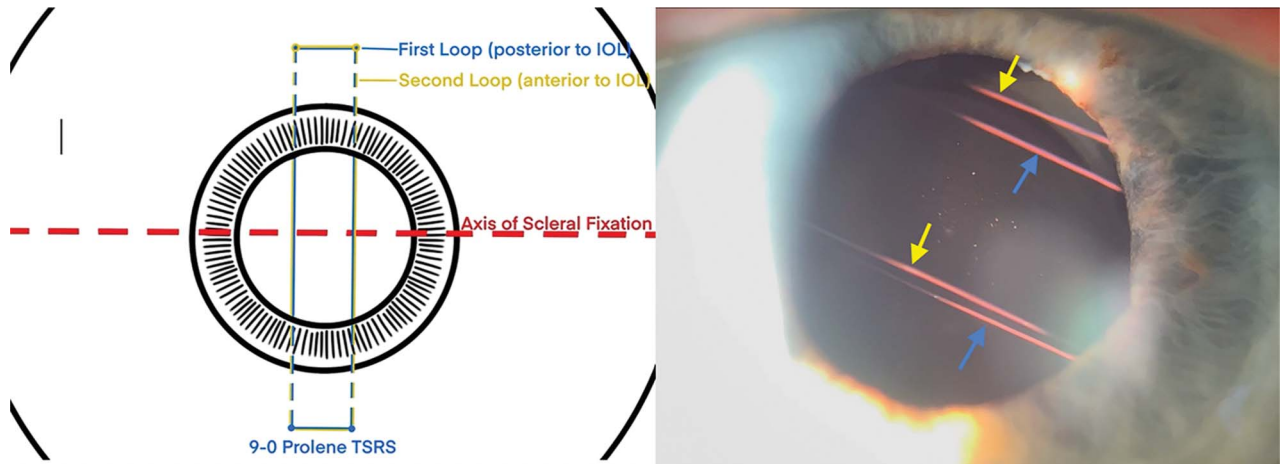


Figure 2. Schematic of modified TSRS (left). Slitlamp photograph of the patient described in case 2, 2 months after placement of modified TSRS (right). Sutures can be seen posterior (blue arrows) and anterior (yellow arrows) to IOL optic. TSRS = transscleral retention suture

of a 3-piece acrylic IOL (CT Lucia 602, Carl Zeiss Meditec AG) was performed.⁹

Case 3

A 67-year-old woman was referred for recurrent inflammation and vitreous hemorrhage after complicated cataract surgery. Her preoperative CDVA was 20/30 with $-1.25 +1.00 \times 150$, and her examination showed a subluxated 3-piece acrylic IOL in the sulcus with iris transillumination defects and dense intracapsular Sommering ring. She was diagnosed with UGH syndrome. Removal of the subluxated IOL and entire capsule with Sommering ring was performed, along with flanged haptic scleral fixation of a 3-piece acrylic IOL (CT Lucia 602).⁹

In both cases 2 and 3, intraoperatively after initial scleral fixation of the IOL, it was noted that severe tilt was present. To address this, repositioning was attempted. The haptic flanges were cut, and the IOL was refixed with new scleral tunnels. However, the IOL tilt remained, and it was apparent that one of the haptics did not align with the optic, signifying a defect in the haptic-optic junction, which has been previously described.¹⁰ For this reason, the IOL sandwich variation of the aforementioned technique was used.

The position of both IOLs seemed greatly improved with no obvious tilt, remaining centered and stable to challenge with intraocular instrument manipulations.

RESULTS

Case 1

Eighteen-month follow-up showed no recurrence of iritis or hyphema with the IOL in a planar configuration (Figure 1). The sutures were intact. Lens, DSEK graft, and cornea were clear, but vision was limited to counting fingers at 2' due to his maculopathy.

Case 2

The patient's postoperative course was uneventful. After 2 months, her uncorrected visual acuity was 20/50 and

corrected to 20/25 with a refraction of -1.50 sphere. The IOL was centered and stable in a planar configuration.

Case 3

The patient's postoperative course was uneventful. After 6 months, her uncorrected visual acuity was 20/40 and corrected to 20/25 with a refraction of $-1.25 +1.50 \times 130$. Her simulated keratometry was 45.30@139 and 44.47@049, and her internal optical path difference (OPD-Scan III, Nidek Co., Ltd.) was $-0.51@129$, 0.17@39, cyl +0.68. The IOL was centered and stable in a planar configuration. She had no further signs or symptoms of UGH syndrome.

DISCUSSION

IOL tilt can occur from any method of scleral fixation. Although mild tilt can lead to lenticular astigmatism, severe tilt can lead to UGH syndrome. The cases above illustrate IOL tilt from different pathophysiologies. Along with mispositioned sclerotomies, double-flanged suture scleral fixation can tilt due to the technique's inherent 2-point fixation, and flanged haptic scleral fixation of an IOL can tilt from distortion of the haptics or disruption of the haptic-optic junction.⁹⁻¹¹

Management of IOL tilt depends on the severity. Induced astigmatism can be corrected with spectacles or contact lenses. Although UGH syndrome can be managed medically, surgical options are indicated for refractory cases, which present with various surgical duration and complexity. The challenge in case 1 was that repositioning or exchanging the IOL required removal of the double-flanged suture and would require a posterior segment approach for removal.

The challenges in cases 2 and 3 lay in that despite multiple attempts to reposition the lens, severe tilt persisted. In these cases, a defect in the haptic-optic junction was noted.¹¹ An IOL exchange would have otherwise been indicated at a separate sitting in the future. Modifying the technique to have sutures both anterior and posterior to the

optic created broad support of the optic, essentially weaving it into a planar configuration. The postoperative refraction of case 2 and the internal optical path difference from case 3 suggest a grossly planar orientation of the IOL with minimal induced lenticular astigmatism.

The retention suture has been described in certain clinical settings, including to retain silicone oil in the posterior chamber in aphakic patients undergoing retinal detachment repair, to support an IOL during scleral fixation, as well as to protect the corneal endothelium from ACIOLs during keratoplasty and after trabeculectomy.^{7,8,12,13} To the authors' knowledge, the cases presented above represent the first reports of the use of TSRS for the treatment of severe tilt of SF IOLs. Although 10-0 polypropylene has been known to erode over time, 9-0 polypropylene is considered very durable. One main benefit of TSRS is that no direct manipulation of the lens or intraocular tissue is necessary. Passing of the needles and sutures occurs within a closed system in the relatively safe plane of the ciliary sulcus. The effect of the maneuver is instantly observed once tension to the suture has been applied. In the cases above, this benefit allowed for retention of the lenses, preventing posterior segment surgery and the need for exchanging the IOLs.

In conclusion, pairs of TSRS of 9-0 polypropylene can be used to support tilted SF IOLs. Although the outcomes of the above cases have been positive, long-term follow-up is necessary. Consideration of the optical qualities and durability of other suture material and diameters is warranted.

WHAT WAS KNOWN

- SF IOLs are a reliable technique for IOL implantation in eyes that lack proper endocapsular support.
- Severe IOL tilt, with its varying etiologies, can be difficult to surgically remedy through IOL reposition or exchange.

WHAT THIS PAPER ADDS

- To the authors' knowledge, this is the first report of TSRS to alleviate severe SF IOL tilt.

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