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Transfixion of Silicone Intraocular Lens with 7-0 Polypropylene Suture for Scleral Fixation

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Abstract

Purpose: To describe a new scleral fixation technique that comprises the transfixion of silicone foldable Intraocular Lens (IOL) with 7-0 polypropylene suture.

Methods: Before surgery, the authors performed the transfixion of the IOL optic in four points with 7-0 polypropylene suture under a surgical microscope. Four sclerotomy sites were marked 2 mm from the limbus, and two scleral grooves were created in between. The IOL was introduced into the posterior chamber. The four ends of the needleless polypropylene sutures were externalized through the sclerotomies using micro graspers, tightened for optimum IOL centration, and tied. The exposed sutures were placed within the scleral grooves, and the knots were buried within the sclerotomies. This technique was performed uneventfully in 4 cases.

Results: The silicone IOL was stable in all eyes 6 months after surgery, with no signs of IOL subluxation, dislocation, tilt, or suture-related complications, such as erosion or infection.

Conclusion: The transfixion of the silicone foldable posterior chamber IOL for stable four-point scleral fixation using polypropylene suture provides excellent stability and prevents IOL tilt and decentration. Also, this technique provides an excellent alternative for surgeons who use silicone IOL.

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Introduction

The rupture of posterior capsule in cataract surgery occurs in 0.9% of cases [1], and when there is not sufficient capsular support for the Posterior Chamber Intraocular Lens (PC-IOL) implantation, there are many options. For more than three decades, the Anterior Chamber Intraocular Lenses (AC-IOL) [2,3] and the PC-IOL sutured to the sclera [4,5] have been the most frequently used as secondary implantation in the absence of capsular support. When placed properly, a transscleral sutured PC-IOL is not in contact with the iris, thus avoiding the risk of pigment dispersion, endothelial dysfunction, iris defects, pupil distortion and glaucoma associated with AC-IOL implantation [6]. The technique of suturing a PC-IOL to the sclera was initially described by Malbran et al. in 1986 [7]. It has been used rigid Polymethylmethacrylate (PMMA) PC-IOL for many years. Since then, techniques have evolved and advanced, with the development of new foldable PC-IOL that allows its implantation through smaller incisions with less induction of postoperative astigmatism [8]. Recently, many surgical techniques for scleral fixation with suture or suture less comprise the use of one-piece or three-piece foldable acrylic PC-IOL following the world-wide tendency of implanting foldable acrylic IOL after phacoemulsification [9-11]. However, in some countries, there are surgeons who use silicone PC-IOL after cataract surgery. In a recent publication [12] we reported a new scleral fixation technique, the transfixion of foldable acrylic IOL with polytetrafluoroethylene suture (Gore-Tex CV8) that is usable for every acrylic PC-IOL available in the market, regardless of whether it is a three-piece, single-piece, or haptic shape, showing good postoperative results. However, the Gore-Tex suture is not available in some countries or it is not approved since the manufacturer's label warning against its intraocular use. We present an alternative to the initial transfixion technique by using a silicone PC-IOL with 7-0 polypropylene suture for scleral fixation.

Surgical Technique

The foldable silicone PC-IOL was prepared before surgery under the surgical microscope. Using

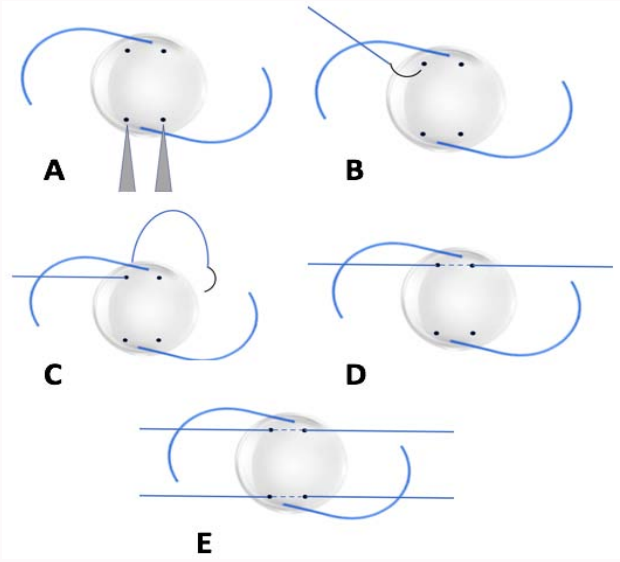

Figure 1: Diagram of the silicone Intraocular Lens (IOL) transfixion. (A) Four marks are made on the IOL optic, two on either side, 1 mm from the haptic base, and 2.5 mm apart, for the transfixions. (B and C) The needle of the 7-0 polypropylene suture is passed through the first transfixion point, from the anterior to the posterior face of the IOL. (D) The needle is passed through the second transfixion point from the posterior to the anterior face of the IOL. (E) The same technique for IOL transfixion is repeated on the opposite side of the IOL.

a caliper, four marks were made on the IOL optic, two on either side- 1 mm from the haptic base, and 2.5 mm apart - for performing the transfixions (Figure 1A). The needle of the 7-0 polypropylene suture was passed through the first transfixion point from the anterior to the posterior face of the IOL (Figure 1B, 1C). Then, the needle was passed through the second transfixion point from the posterior to the anterior face of the IOL (Figure 1D). The same technique was repeated on the opposite side of the IOL (Figure 1E). We used the foldable silicone 3-piece IOL (SofPort, Bausch & Lomb, Inc) (Figure 2).

The intraoperative steps for this procedure comprised making 3 clock-hour conjunctival peritomies, 180º apart, on the nasal and temporal sides. Four sclerotomy sites were marked (2 each on the nasal and temporal side) 2 mm from the limbus and 4 mm apart. A 4-mm vertical, partial-thickness scleral groove was then created between the sclerotomy sites using a 15º blade. A 20-gauge microvitreoretinal blade was used to perform four sclerotomies at the pre-marked scleral spots. Two 1.2-mm side- paracenteses incisions were made in the peripheral clear cornea with a 15º lance tip to facilitate bimanual irrigation/aspiration, bimanual anterior vitrectomy (if required), and injection of an Ophthalmic Viscosurgical Device (OVD).

A limbal corneal incision of 3.4 mm was created superiorly with a blade. Cohesive OVD was used to maintain the integrity of the globe during the surgery. One end of the needleless 7-0 polypropylene suture was then placed in the anterior chamber through the main wound; using a handshake technique, this was then retrieved and externalized through the inferior sclerotomy with micro graspers (Figure 3A). The other end of the needleless suture was similarly retrieved and externalized through the opposite scleral opening (Figure 3B). The IOL was then folded on its long axis using forceps and introduced into the posterior chamber through the corneal wound (Figure 3C, 3D). The other ends of the needleless sutures were similarly retrieved through the superior scleral openings using the same handshake technique (Figure 3E). The two sets of sutures on the nasal and temporal sides were then tightened, adjusted for optimum IOL centration (Figure 3F), and tied; the excess sutures were cut. The exposed polypropylene suture was placed within the surgically created vertical scleral groove. The suture knots were buried within the sclerotomies (Figure 3G). The conjunctiva was sutured with 10-0 nylon (Figure 3H).

Results

The technique was used to perform scleral fixation of the silicone IOL in four surgical aphakic eyes. The surgeries were performed by one surgeon (A.P). The visual acuity and refractive outcomes of all four patients are presented in Table 1. No eyes lost lines of best corrected visual acuity. There were no intraoperative complications. There were no postoperative complications, such as infection, suture erosion, iritis, or other sign of uveitis. In this study, significant improvement in visual acuity was also noted in all cases within the first postoperative week. In addition to the improved visual acuity, all IOLs were well centered, with no subluxation, tilt, or dislocation during the 6-month follow-up (Figure 4A). There was no sign of optic tears at the transfixion points of all 4 cases and no signs of suture degradation at 6-months follow-up (Figure 4B). The Ultrasound Biomicroscopy (UBM) showed in all four eyes a well-centered IOL without tilt during the 6-month follow-up (Figure 5).

Discussion

The suture of silicone PC-IOL by passing 9-0 polypropylene suture through its optic for iris fixation was described by Parker and Price [13]. Recently, we reported the transfixion of the foldable acrylic PC-IOL with polytetrafluoroethylene suture for scleral fixation [12]. After our initial study, we decided to try other options regarding IOL material and sutures. In many countries, some surgeons use silicone PC-IOLs after phacoemulsification. On the other hand, the use of polytetrafluoroethylene suture is not approved or it is difficult to find in some countries. We performed the transfixion technique in a three-piece silicone PC-IOL with 7-0 polypropylene suture for scleral fixation in order to provide an alternative for doing the same technique but using other IOL material and suture. This technique presents the same advantages described with the previous reported transfixion technique. With the stable four-point fixation, the IOL tilt in two-point fixation techniques is avoided [14-16]. Furthermore, the four-point fixation of the IOL aids in centration, with adjustments to the polypropylene suture on both the temporal and nasal sides. Optic decentration is a known complication of transscleral fixation of PC-IOLs, inducing lateral shift of focus and radial astigmatism [17].

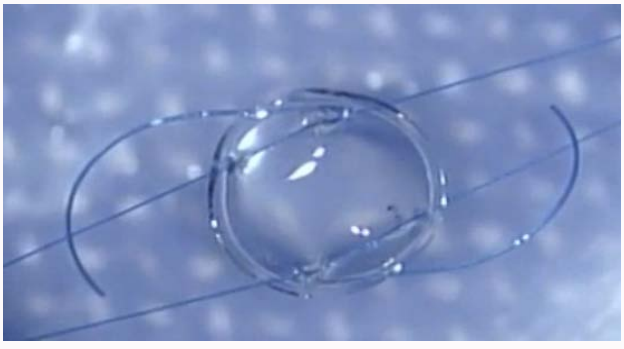

Figure 2: Microscope view of the silicone Intraocular Lens (IOL) transfixion.

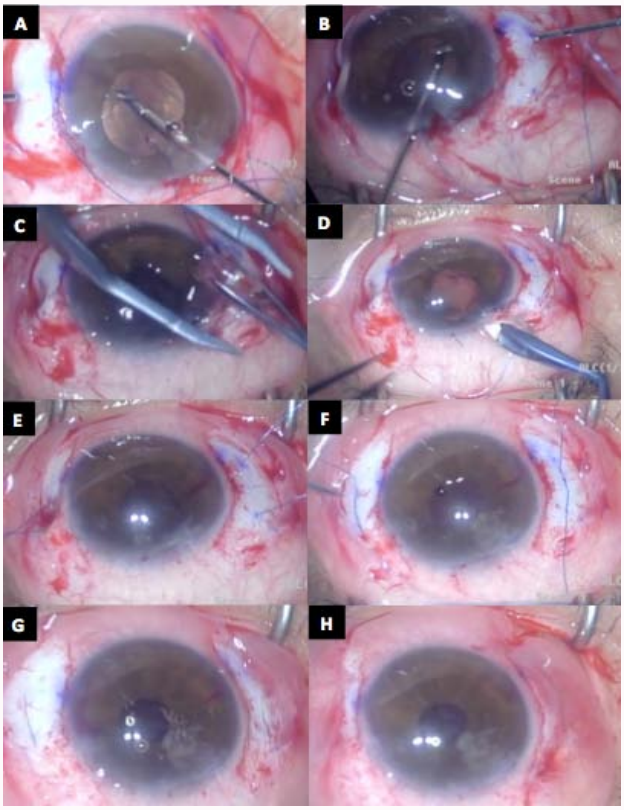

Figure 3: Intraoperative view of the silicone Intraocular Lens (IOL) scleral fixation using the 7-0 polypropylene suture. (A) One end of the needleless polypropylene suture is placed in the anterior chamber through the main wound. The end of the needleless suture is then retrieved and externalized through the inferior sclerotomy with micro graspers. (B) The other end of the needleless suture is similarly retrieved and externalized through the opposite scleral opening. (C and D) The IOL is then folded on its long axis using forceps and introduced into the posterior chamber through the corneal wound. (E) The other ends of the needleless sutures are similarly retrieved through the superior sclerotomies using the same handshake technique. (F) The two sets of sutures on the nasal and temporal sides are then tightened, adjusted for optimum IOL centration, and tied. (G) The exposed polypropylene suture is placed within the surgically created vertical scleral groove. The suture knots are buried within the sclerotomies. (G) The conjunctiva was sutured with 10-0 nylon.

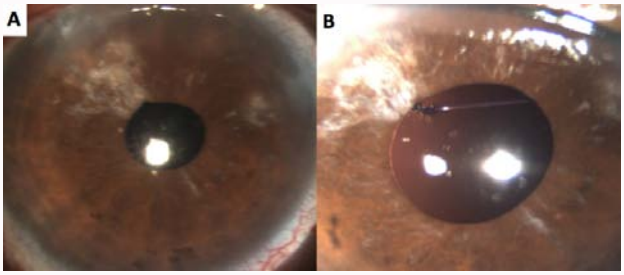

Figure 4: Anterior segment photograph. (A) One week after the transscleral fixation of a silicone posterior chamber intraocular lens (PC-IOL) with the transfixion technique. (B) Under mydriasis, there are no signs of optic tears and suture degradation at the 6-months follow-up.

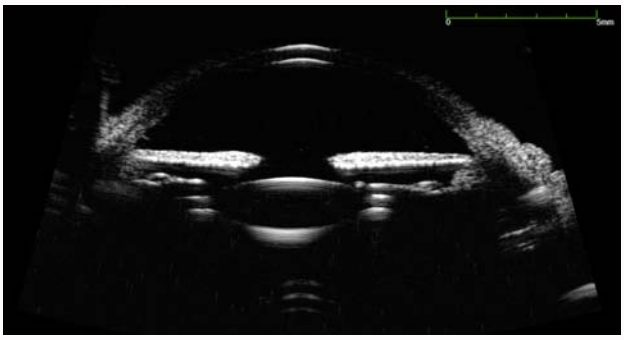

Figure 5: Ultrasound bio microscopy at the 6-months follow-up.

In our study, the ultrasound bio microscopy in all four eyes showed a well-centered IOL with no tilt at the 6-month follow-up.

The main IOLs materials are hydrophobic or hydrophilic acrylate, Polymethylmethacrylate (PMMA), and silicone [18]. Different types of material are associated with different types of IOLs opacifications, which include photochemical material alterations, precipitations and depositions, glistenings, and discoloration. Opacification of silicone IOLs has been associated with systemic medications like amiadorone and rifanbutin, ocular conditions like the use of silicone oil for retinal surgery, and the presence of asteroid hyalosis [19].

Silicone oil- silicone IOL interaction is a complication not generally seen by the cataract surgeon, but rather at a later stage in a patient's postoperative course, when he is in the care of the vitreoretinal surgeon. Silicone IOLs should not be used in patients with current vitreoretinal disease or those who are at high risk of future vitreoretinal disease that may require silicone oil injection because silicone oil droplets adhere well to silicone IOL [20]. In addition, it is known that calcification in silicone IOLs is associated with the coexistence of asteroid hyalosis, as more than 85% of patients with calcification had clinically detectable ipsilateral asteroid hyalosis [21]. Calcification is thought to be caused by the same process as asteroid hyalosis because asteroid bodies are rich of calcium and phosphate.

Despite these specific clinic situations, the use of silicone IOLs in cataract surgery is safe. Studies on IOL uveal biocompatibility showed some differences among materials, especially in cell deposition. However, cellular reaction was generally found to be of low grade and clinically insignificant in acrylic and silicone IOLs [22]. In one study comparing hydrophobic acrylic and silicone IOLs, it was found that both IOL materials were compatible and safe for use in pediatric cataract surgery with similar visual axis clarity and postoperative outcome [23].

Comparing the transfixion of acrylic PC-IOL with the silicone IOL, it is easier to perform in silicone IOLs since the material is softer and offers less resistance to needle passage. The 7-0 polypropylene suture has more rigidity and memory compared to polytetrafluorethylene suture making it less easy to manipulate. However, 7-0 polypropylene sutures have a high tensile strength that allows them to sit stable in the pupillary area while passing each side through the sclerotomy sites [24]. Due to its thickness, it eliminates the complications associated with 10-0 sutures, including degradation over time and subsequent IOL malposition [24]. In addition, this size of suture allows to bury the sutures within the sclerotomies, which reduces complications associated with exposed sutures [25].

According to our experience with the transfixion technique, there are several possible combinations that could be made: Foldable acrylic IOLs with 7-0 polypropylene suture or silicone IOLs with polytetrafluorethylene suture, depending on the particular availability of each surgeon.

Table 1: Visual acuity and refractive outcomes.

Case	Preoperative UDVA	Preoperative Refraction	Preoperative CDVA	Postoperative UDVA	Postoperative Refraction	Postoperative CDVA	IOL
1	CF 3mt	+12.5 -1.5 × 100°	20/30	20/80	-0.25 -1.25 × 100°	20/25	Silicone three-piece
2	CF 2mt	+13.5 -1.5 × 90°	20/25	20/100	-0.5 -1.5 × 70°	20/25	Silicone three-piece
3	CF 1mt	+15 -0.50 × 45°	20/25	20/100	+0.25 -0.50 × 50°	20/20	Silicone three-piece
4	CF 3mt	+11.75 -1.75 × 70°	20/25	20/100	+0.5 -1.5 × 75°	20/25	Silicone three-piece

CF: Counting Fingers; UDVA: Uncorrected Distance Visual Acuity; CDVA: Corrected Distance Visual Acuity

Despite our excellent outcomes with no signs of IOL tilt, decentration, subluxation, dislocation, or suture erosion at the 6-months follow-up, further larger case series with longer follow-ups are necessary to better assess the long-term visual outcomes, overall safety, and complications.

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References

1. Mulhern M, Kelly G, Barry P. Effects of posterior capsular disruption on the outcome of phacoemulsification surgery. Br J Ophthalmol. 1995;79:1133-7.
2. Weene LE. Flexible open-loop anterior chamber intraocular lens implants. Ophthalmology. 1993;100(11):1636-9.
3. Rattigan SM, Ellerton CR, Chitkara DK, Smerdon DL. Flexible open-loop anterior chamber intraocular lens implantation after posterior capsule complications in extracapsular cataract extraction. J Cataract Refract Surg. 1996;22(2):243-6.
4. McCluskey P, Harrisberg B. Long-term results using scleral-fixated posterior chamber intraocular lenses. J Cataract Refract Surg. 1994;20(1):34-9.
5. Trimarchi F, Stringa M, Vellani G, Iato MS. Scleral fixation of intraocular lens in the absence of capsular support. J Cataract Refract Surg. 1997;23(5):795-7.
6. Kwong YYY, Yuen HKL, Lam RF, Lee VY, Rao SK, Lam DS. Comparison of outcomes of primary scleral-fixated versus primary anterior chamber intraocular lens implantation in complicated cataract surgeries. Ophthalmology. 2007;114(1):80-5.
7. Malbran ES, Malbran E Jr, Negri I. Lens guide suture for transport and fixation in secondary IOL implantation after intracapsular extraction. Int Ophthalmol. 1986;9(2-3):151-60.
8. Werner L. Intraocular lens evolution in the past 25 years as told by the Journal of Cataract & Refractive Surgery. J Cataract Refract Surg. 2021;47(2):147-9.
9. Canabrava S, Andrade N, Henriques PR. Scleral fixation of a 4-eyelet foldable intraocular lens in patients with aphakia using a 4-flanged technique. J Cataract Refract Surg. 2021;47(2):265-9.
10. Agarwal A, Kumar DA, Jacob S, Baid C, Agarwal A, Srinivasan S. Fibrin glue-assisted sutureless posterior chamber intraocular lens implantation in eyes with deficient posterior capsules. J Cataract Refract Surg. 2008;34(9):1433-8.
11. Yamane S, Sato S, Maruyama-Inoue M, Kadonosono K. Flanged intra-scleral intraocular lens fixation with double-needle technique. Ophthalmology. 2017;124(8):1136-42.
12. Pineda-Fernández A, Chen Y, Rodriguez L. Transfixion of foldable intraocular lens with polytetrafluoroethylene suture for scleral fixation. J Refract Surg. 2021;37(3):180-85.
13. Parker DS, Price FW Jr. Suture fixation of a posterior chamber intraocular lens in anticoagulated patients. Cataract Refract Surg. 2003;29(5):949-54.
14. Bergren RL. Four-point fixation technique for sutured posterior chamber intraocular lenses. Arch Ophthalmol. 1994;112(11):1485-7.
15. Lockington D, Ali NQ, Al-Taie R, Patel DV, McGhee CN. Outcomes of scleral-sutured conventional and aniridia intraocular lens implantation performed in a university hospital setting. J Cataract Refract Surg. 2014;40(4):609-617.
16. Durak A, Oner HF, Koçak N, Kaynak S. Tilt and decentration after primary and secondary transsclerally sutured posterior chamber intraocular lens implantation. J Cataract Refract Surg. 2001;27(2):227-32.
17. Holladay JT. Evaluating the intraocular lens optic. Surv Ophthalmol. 1986;30(6):385-90.
18. Grzybowski A, Markeviciute A, Zemaitiene R. A narrative review of intraocular lens opacifications: Update 2020. Ann Trans Med. 2020;8(22):1547-71.
19. Srinivasan S. Intraocular lens opacification: What have we learned so far. J Cataract Refract Surg. 2018;44(11):1301-2.
20. Hakan Öner F, Saatci OA, Sarioglu S, Durak I, Kaynak S, Çabuk M. Interaction of intraocular lenses with various concentrations of silicone oil: An experimental study. Ophthalmologica. 2003;217(2):124-8.
21. Espandar L, Mukherjee N, Werner L. Diagnosis and management of opacified silicone intraocular lenses in patients with asteroid hyalosis. J Cataract Refract Surg. 2015;41(1):222-5.
22. Abela-Formanek C, Amon M, Schild G, Schauersberger J, Heinze G, Kruger A. Uveal and capsular biocompatibility of hydrophilic acrylic, hydrophobic acrylic, and silicone intraocular lenses. J Cataract Refract Surg. 2002;28(1):50-61.
23. Bhusal S, Ram J, Sukhija J, Singh Pandav S, Kaushik S. Comparison of the outcome of implantation of hydrophobic acrylic versus silicone intraocular lenses in pediatric cataract: Prospective randomized study. Can J Ophthalmol. 2010;45(10):531-6.
24. John T, Tighe S, Hashem O, Sheha H. New use of 8-0 polypropylene suture for four-point scleral fixation of secondary intraocular lenses. J Cataract Refract Surg. 2018; 44:1421-5.
25. O'Driscoll AM, Quraishy MM, Andrew NC. Elastic polypropylene suture in cataract surgery: Long-term follow-up. Eye (Lond). 1996;10(Pt 1):99-102.