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4-Point scleral fixation technique using Gore-tex® sutures for cut-out plated haptic intraocular lenses

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A B S T R A C T

Purpose: To report a 4-point scleral fixation technique utilizing Gore-tex® CV8 sutures and cut-out plated haptic intraocular lenses (IOLs) lacking a 4-eyelet haptic design for aphakic patients.

Observations: This scleral fixation technique utilizes Gore-tex CV8® sutures paired with a foldable, monofocal, cut-out plated haptic IOLs wherein the sutures are passed through the holes of the plate haptics. Initially, sectoral conjunctival peritomies are performed on the temporal and medial conjunctiva. This is followed by the creation of 4 sclerotomy sites 5mm from each other and 2mm from the limbus at the exposed medial and temporal sclera. A Gore-Tex® (CV8) suture is threaded under the plate haptic. The leading suture is then inserted intraocularly through the corneal incision and externalized through the inferior sclerotomy. The trailing end of the suture which is over the haptic plate is passed intraocularly and externalized through the same port. The externalized suture is brought back intraocularly through the superior sclerotomy and then re-externalized through the corneal incision. This suture end is then threaded through the superior portion of the plate haptic in an over-under fashion. The suture which has passed under the haptic plate, is then brought back intraocularly through the corneal incision and externalized through the superior sclerotomy creating a loop. The same steps are then performed on the contralateral side. The IOL is then inserted. Centration of the IOL is then achieved by adjusting the tension on the 4 externalized suture ends. The Gore-Tex® sutures are then tied and subsequently buried into the sclerotomy. Conjunctival peritomies are then repaired.

Conclusions and importance: Four-point fixation of cut-out plate haptic IOLs is achievable with predictable outcomes showing good centration, stability, visual and refractive outcomes providing surgeons additional options for fixation of available lenses as a secondary or primary implantation or by fixation of subluxed or dropped plate IOLs.

1. Introduction

Dislocated and subluxated intraocular lenses (IOLs), and aphakia without capsular support are challenging cases that may require scleral fixation of IOLs.[1,2] The nuances of such techniques include IOL centration and stability while ensuring good visual and refractive outcomes.

In recent years, there have been novel surgical techniques developed for the management of such cases. Two of the more popular examples are techniques by Yamane et al.[3] and by Canabrava et al.[4] The former is a 2-point flanged sutureless intrascleral IOL fixation with a double-needle technique. This technique requires a three-piece IOL with prolene haptics, gauge 27 needles, and cautery for flange creation. The latter is a four-flanged intrascleral IOL fixation technique that uses a 4-eyelet haptic IOL, prolene suture, and cautery.

These techniques require usage of specific IOLs, which may be limited or unavailable due to worldwide demand and patients' financial constraints. Particularly in our local setting, 4-eyelet haptic IOLs are not always readily and consistently available for use. Another issue looming behind using prolene sutures is the long-term risk of suture breakage. Suture breaks requiring additional surgery when using prolene 10-0 have been reported to range anywhere from 0.5 % to as high as 28 %.[5–7] This caused some surgeons to shift the usage of prolene sutures to Gore-Tex® (polytetrafluoroethylene) sutures for scleral fixation due to its "potential as a long-term suture for fixation" (Kokame et al., 2018).[6,8]

Currently, there are no good long -term studies on the stability of ocular use of Gore-Tex® sutures or thicker prolene sutures (5–0, 6–0 prolene).

These challenges paved the development of a four-point intrascleral IOL fixation technique using plate haptic foldable IOLs with a cutout loop design (Oculentis, Germany; CT Asphina 404, Germany; etc) using Gore-Tex® suture for maximal IOL stability and postoperative visual outcome. Like the scleral fixation technique using the Akreos® IOL with Gore-Tex®,[8] this technique also utilizes a 4-point scleral fixation technique, albeit using the Gore-Tex® suture in a another manner. Since the Akreos® IOL has 4 eyelets (2 on each side which are separated from one another), the Gore-Tex® suture passes thru the 2 eyelets on each side of

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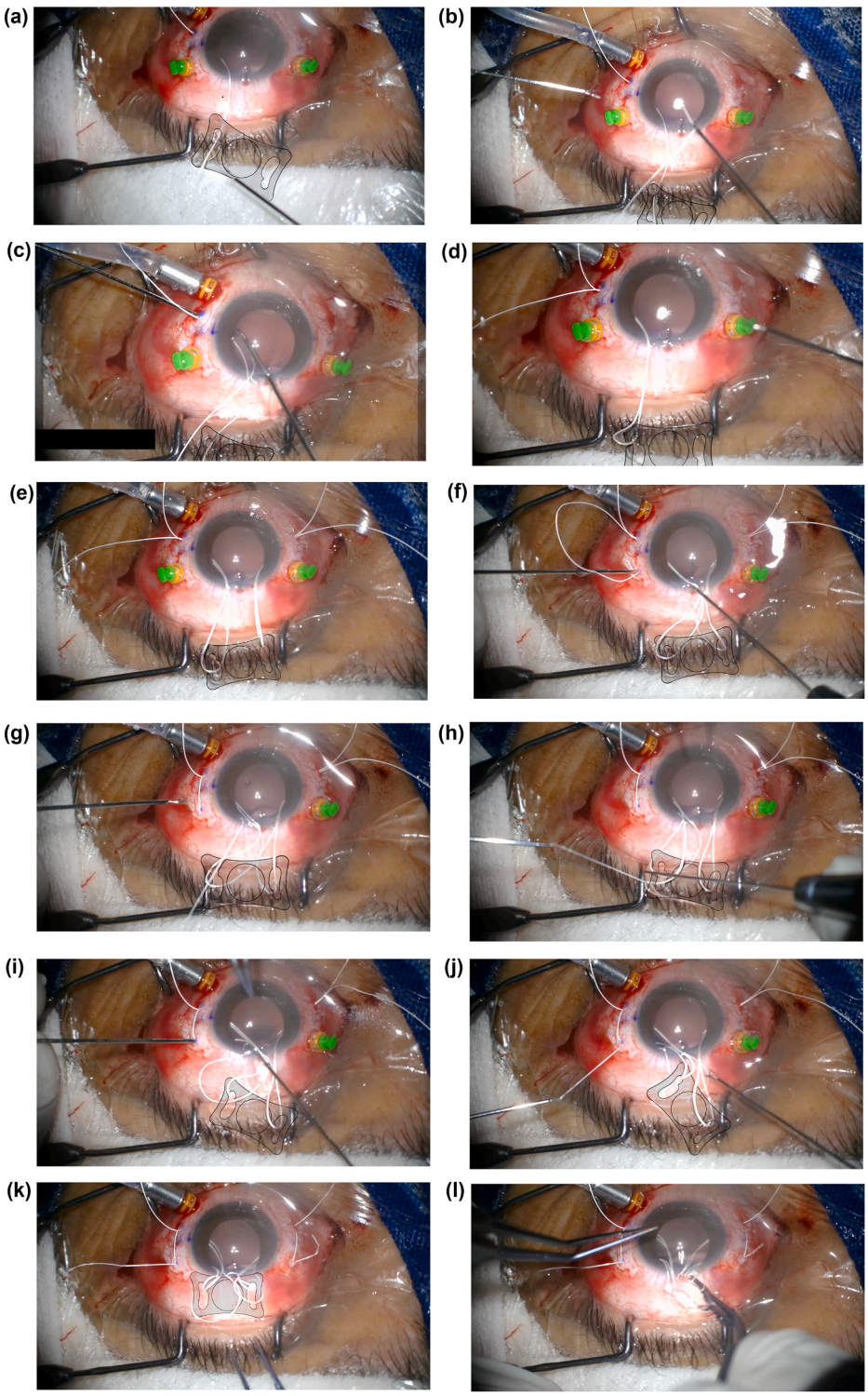

Fig. 1. A Gore-Tex® (CV8) suture was threaded under the inferior portion of the plate haptic using microforceps, followed by externalization of the leading end through the inferior sclerotomy (Fig.1A). The trailing suture was then positioned over the inferior haptic plate (Fig. 1B), inserted through the corneal incision (Fig. 1C) and externalized through the inferior sclerotomy (Fig.1D). Same steps were performed for the contralateral side (Fig. 1E). The externalized long trailing end was brought back into the eye through the superior sclerotomy (Fig. 1F) before being re-externalized through the corneal incision. (Fig.1G). This suture end was then threaded under the superior portion of the plate haptic (Fig.1H). The suture was brought back into the eye through the corneal incision (Fig. 1I) and externalized through the superior sclerotomy (Fig.1J). Same steps were then performed on the contralateral side (Fig. 1K). The lens was folded in half and implanted through the corneal incision. (Fig. 1L). The corneal incision was sutured with Nylon 10–0. The tension on the 4 externalized ends was adjusted to achieve centration. (Fig. 1M). The Gore-Tex sutures were then knotted close to the sclerotomies using a 2-1-1 throw (Fig. 1N to O) and subsequently buried into the sclerotomy (Fig. 1P). The intraocular lens showed good centration (Fig.1Q).

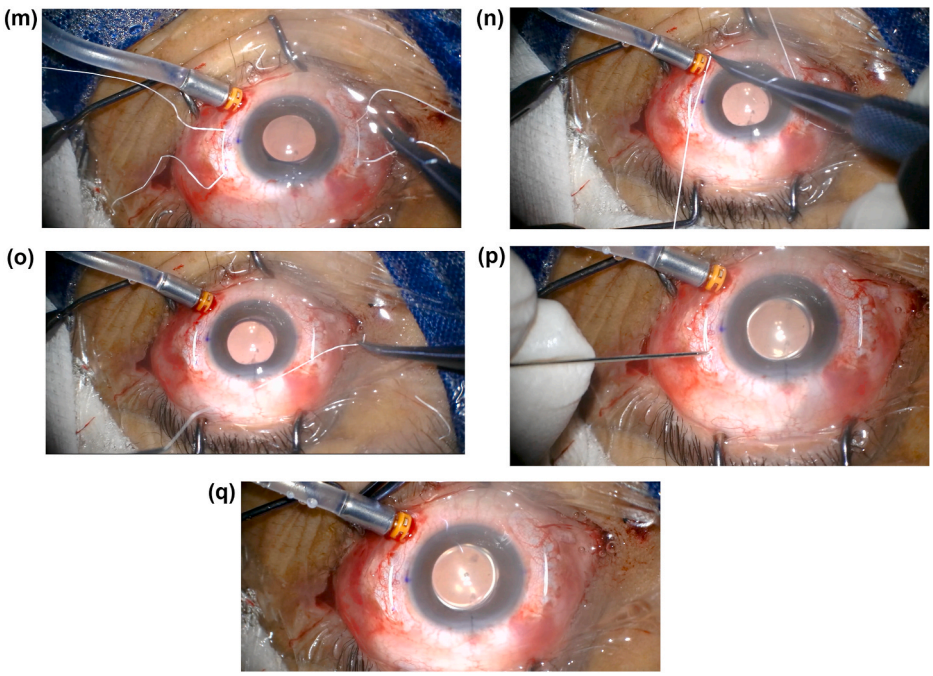

Fig. 1. (*continued*).

the IOL,[8] providing stability from tilting and rotation once fixated to the sclera. But unlike the configuration of the 4-eyelet haptic IOL, the cut-out plated haptic IOL does not possess the same configuration, as it has only 1 large eyelet haptic on each side, hence cannot be fixated to the sclera using Gore-tex in the same manner. Thus another method of fixation using Gore-tex is described which opens the way for a different configuration IOL to be sclerally fixated.

We report two cases using this intrascleral fixation technique, wherein these specific cut-out plated haptic IOLs are used with Gore-tex® via a 4-point scleral fixation.

2. Surgical technique

The technique may be done stand-alone or in combination with pars plana vitrectomy. The steps highlight the fixation technique used and may not detail the entire procedure done on the patient. It is assumed that adequate vitrectomy has been performed before the fixation of the IOL.

Sectoral conjunctival peritomies are performed on the medial and temporal conjunctiva. Placement of corneo-limbal markings at the 3 and 9 o'clock positions. Scleral markings are made 2mm from the limbus on the medial and temporal sclera. Markings are then made superiorly and inferiorly 2.5mm away from the initial scleral marking on both sides. Posterior or anterior infusion is placed. Sclerotomies on the superior and inferior markings are created using 23-gauge MVR blade or 23 gauge trochar blades. (In this case, pars plana vitrectomy was done using the same trochar ports). A 2.75mm main port is created at the superior corneo-limbal area and enlarged to 3.0–3.5mm. A foldable, monofocal closed loop plated haptic IOL is then prepared. A Gore-Tex® (CV8) suture is threaded over and then under the inferior portion of the plate haptic (Fig. 1A). The leading suture is then inserted intraocularly through the corneal incision and externalized through the inferior sclerotomy with the help of microforceps (Figs. 1A and 2A). The trailing end of the suture which is over the haptic plate (Fig. 1B) is then passed intraocularly (Fig. 1C) and externalized through the same port (Figs. 1D and 2B). The same steps are performed for the contralateral side (Figs. 1E and 2C). Removal of trochar ports done (can be omitted if not performed in the earlier steps). The long trailing end of the externalized suture is brought back intraocularly through the superior sclerotomy (Figs. 1F and 2D) and then re-externalized through the corneal incision with the aid of microforceps (Figs. 1G and 2E). This suture end is then threaded under the superior portion of the plate haptic (Fig. 1H). The end of the said suture, which has passed under the haptic plate, is then brought back intraocularly through the corneal incision (Figs. 1I and 2F) and externalized through the superior sclerotomy creating a loop (Figs. 1J and 2G). The same steps are then performed on the contralateral side (Fig. 1K). The IOL is then folded in half and inserted through the corneal incision (Fig. 1L). The corneal incision is sutured with Nylon 10–0. Centration of the IOL is then achieved by adjusting the tension on the 4 externalized suture ends (Fig. 1M). The Gore-Tex sutures are then tied into a knot close to the sclerotomies using a 2-1-1 throw (Fig. 1N to O, 2H) and subsequently buried into the sclerotomy (Fig. 1P). Sclerotomy sites may be sutured if necessary, with Vicryl 7-O. Conjunctival peritomies are then repaired also using Vicryl 7-O.

3. Case presentation

3.1. Case 1

A 72-year-old man was referred to our service for a secondary IOL due to aphakia stemming from a complicated cataract surgery. During said surgery, there was noted zonulysis. Upon examination, the visual acuity was 20/400. The anterior capsule was not appreciated. There was the presence of vitreous strands in the anterior chamber. We decided to perform pars plana vitrectomy for complete vitreous clean up and to properly assess the retinal periphery, followed by placement of a scleral fixated IOL. A Lentis Monofocal IOL L313 was used with a Gore-tex® CV8 suture securing it to the sclera using the previously stated technique. Immediately post-op, patient was placed on topical Levofloxacin and Prednisolone acetate eyedrops. Day 1 post-op patient had an uncorrected visual acuity of 20/25. IOL showed good centration and stability. Anterior chamber inflammation showed +3 cells and flare and Intraocular pressure (IOP) was 14 mmHg. 5 weeks post op, patient was already weaned of the topical medications. The patient had 20/20 uncorrected vision, had an IOP of 11 mmHg, no anterior chamber inflammation, showed good healing, and did not show any areas of scleral nor conjunctival defects (Fig. 3C and D) and good IOL placement and centration (Fig. 3A and B) which is also exhibited in the anterior segment optical coherence tomography (Fig. 3E). Target refraction was

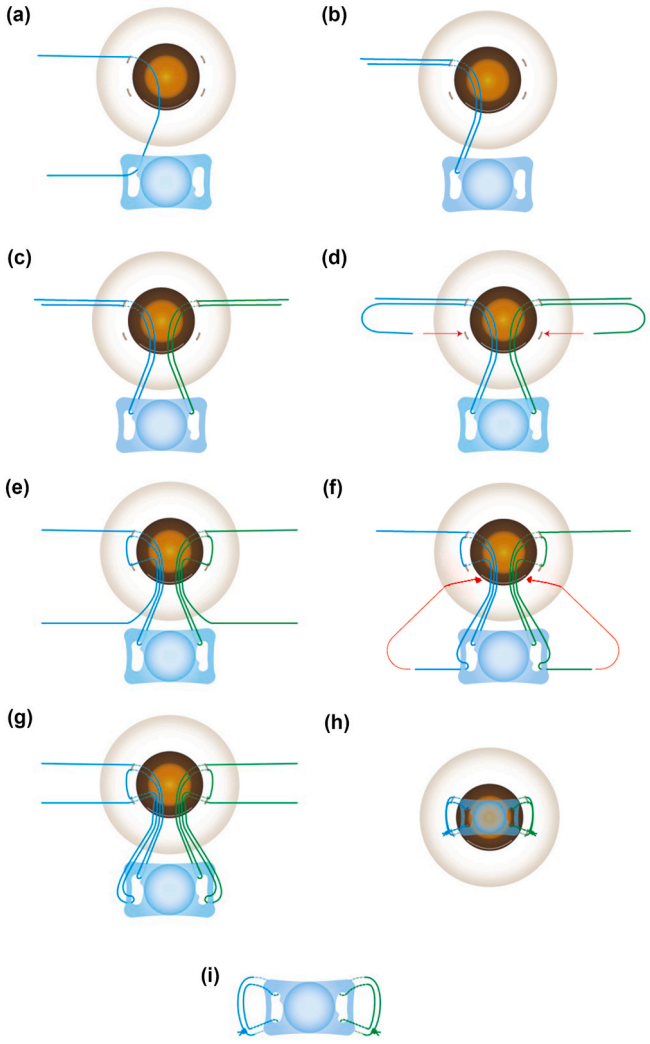

Fig. 2. Schematic Diagram: The leading end of the suture is threaded under the inferior portion of the plate haptic and externalized through the inferior sclerotomy (Fig.2A). The trailing end is passed over the haptic plate and is also externalized through the same port (Fig.2B). Similar steps are performed for the contralateral side (Fig. 2C). The externalized long trailing end is placed back into the eye through the superior sclerotomy (Fig. 2D) It is then externalized through the corneal incision (Fig. 2E) Then it is passed under the haptics, into the corneal incision (Fig. 2F) and externalized through the superior sclerotomies (Fig. 2G). The lens is then folded and inserted into the eye through the corneal incision. After IOL centration, the leading and trailing ends of the suture are then knotted and cut close to the superior sclerotomies and buried (Fig. 2H) Fig. 2I shows the orientation of the sutures in relation to the lens.

−0.25 sph by biometry using Barret universal formula aiming for a slightly myopic outcome to provide the patient with some near vision as per the patient's request. Near vision was J2. Post-op spherical equivalence is −0.625 sph with an absolute refractive prediction error of 0.375. At 8 weeks post op, patient still had a visual acuity of 20/20 uncorrected vision, had an IOP of 11mmhg, no scleral nor conjunctival defects and no anterior chamber inflammation.

3.2. Case 2

An 18-year-old male diagnosed with Marfan syndrome, who had a history of poor vision since childhood, was referred for surgery. On examination, visual acuity was 20/400 in the right eye and 20/400 which did not improve with corrected vision in the left eye. The patient had lens subluxation on both eyes. The right eye underwent phacoemulsification with a modified capsule tension ring. The left eye intraoperatively had very poor capsular support, hence anterior vitrectomy was performed after the removal of the lens via phacoemulsification. This was followed by placement of Zeiss CT Asphina 404 Monofocal IOL with a Gore-tex® CV8 suture securing it to the sclera using the previously stated technique. Immediately post-op, patient was placed on topical Levofloxacin and Prednisolone acetate eyedrops. Day 1 post-op patient had an uncorrected visual acuity of 20/40. IOL showed good centration and stability. Anterior chamber inflammation showed +3 cells and flare and Intraocular pressure (IOP) was 11 mmHg. 5 weeks post-op, patient was already weaned of the topical medications. Patient achieved a plano refraction with a target refraction of −0.09 sph. The patient had 20/40 uncorrected vision indicating presence of amblyopia due to the previously prolonged poor vision. Patient had an IOP of 14 mmHg and no anterior chamber inflammation. IOL showed good centration and stability (Fig. 4A) as well as good scleral and conjunctival healing (Fig. 4B and C). At 8 weeks post op, patient's visual acuity improved from 20/40 to 20/32 with best corrected vision, had an IOP of 14 mmHg, no scleral nor conjunctival defects and no anterior chamber inflammation.

4. Discussion

Introduced in this case report is an alternative four-point loop

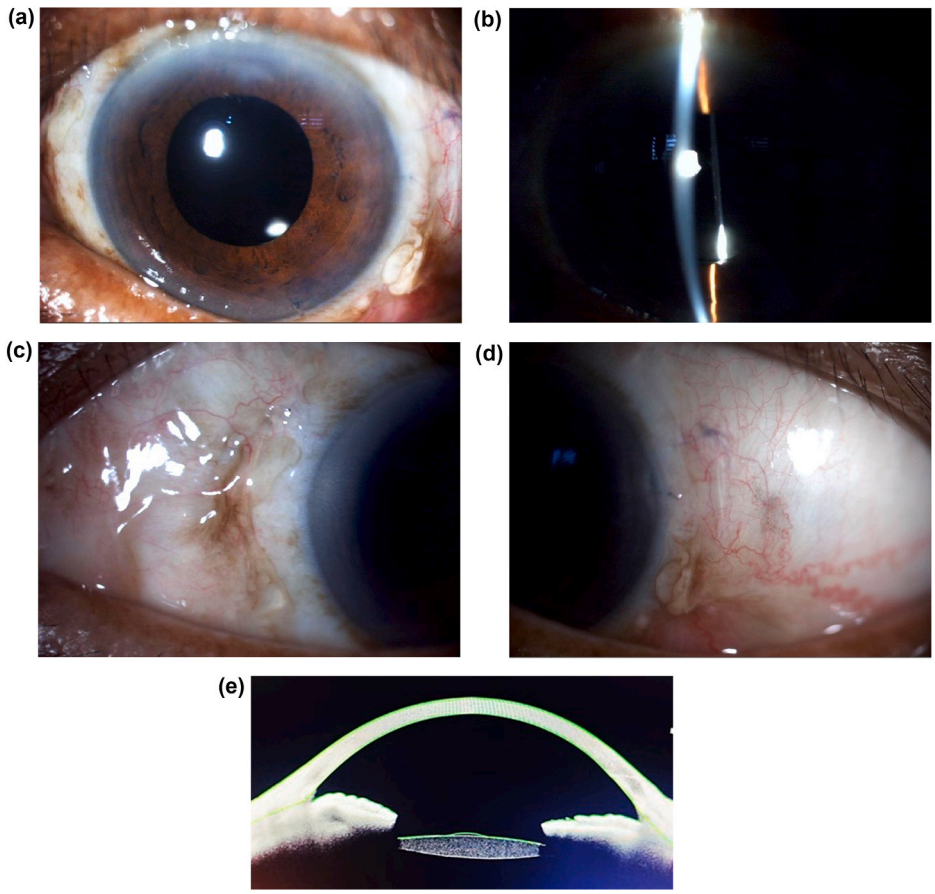

Fig. 3. Case 1: 5 weeks postoperative anterior segment photographs with Lentis Monofocal IOL L313 (A) (B) with nasal and temporal photographs where the Gore-tex® CV8 sutures are located (C) (D), Anterior segment optical coherence tomography shows good centration and absence of lens tilt (E).

technique for scleral fixation using Gore-Tex® sutures and IOLs lacking the 4-eyelet haptic design, specifically, foldable hydrophobic aspheric aberration neutral IOLs with cutout plate haptic designs. At 8 weeks post-op, the fixation method in these cases has been shown to give good surgical outcomes with regard to vision, healing, post-op refraction, centration, and stability. All patients achieved good refractive and visual outcomes despite one of the cases having amblyopia.

Due to the controversial longevity of prolene sutures intra-ocularly,[5–7] Gore-Tex® sutures were used due to their stated potential as a good suture for long-term fixation and ease of use in this procedure.[6] In these cases, hydrophobic IOLs were preferred over hydrophilic lenses that have a tendency for postoperative opacification[9] which may require additional surgery for replacement. Aspheric aberration neutral IOLs are the preferred choice for fixation in this case due to their lower incidence of spherical aberrations induced postoperatively[10] and their tolerance to some degree of tilt and decentration.[11,12]

Although this technique allows for a variety of IOLs to be fixated, it does pose some limitations with regard to the availability and price of certain materials such as the Gore-Tex® suture, and microfoceps. The procedure also entails limited sectoral peritomies to be done which is not necessary when using flange techniques such as the technique discussed by Canabrava et al.[4] In addition, despite having attained positive surgical outcomes 8 weeks after surgery, there are still possible long term-complications which include late erosion, wound dehiscence, IOL decentration or dislocation, and risk for endophthalmitis to watch out for. It is essential to note that the long-term outcomes of this technique is yet to be established therefore further evaluation is still required to adequately demonstrate long-term stability, safety, and efficacy.

Lastly, this technique is recommended for patients who do not have any anomalies relating to the sclera and conjunctiva which might affect proper healing and increase risk for surgical site exposure, dehiscence or infection.

5. Conclusion

Four-point fixation of cutout plate haptic IOLs is achievable with predictable outcomes showing good centration, stability, visual and refractive outcomes providing surgeons additional options for fixation of available lenses as a secondary or primary implantation or by fixation of subluxed or dropped plate IOLs. This technique allows surgeons additional latitude to provide stable 4-point scleral fixation that is not restricted to a 4-eyelet haptic IOL design. This technique is particularly beneficial in low-resource areas where a wide array of IOL-haptic configurations are not readily available at the surgeons disposal.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Patient consent

Written consent to publish these cases have not been obtained. This report does not contain any personal identifying information.

Declaration

After conducting a literature review on October 22, 2023 utilizing Pubmed and Google Search using the keywords: 4 point fixation, scleral fixation, Gore-tex, plated haptic, we did not find any prior reports

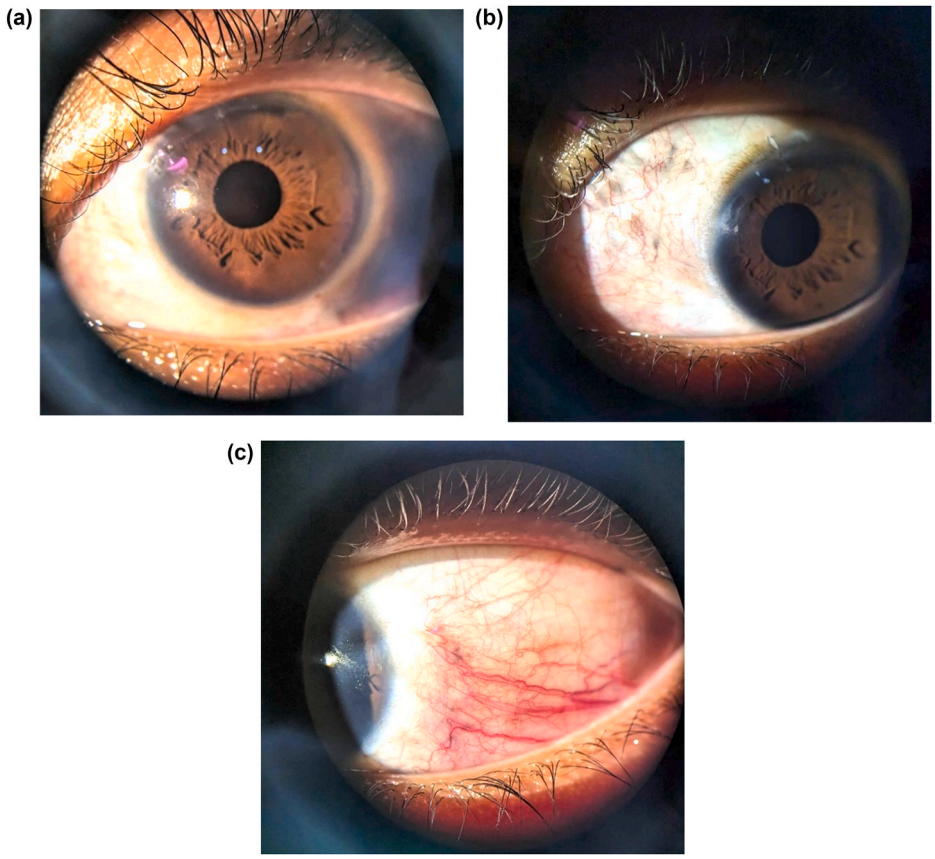

Fig. 4. Case 2: 5 weeks postoperative anterior segment photographs with Zeiss CT Asphina 404 Monofocal IOL (A) with nasal and temporal photographs where the Gore-tex® CV8 sutures are located (B) (C).

related to the presented technique.

Claims of priority

After conducting a literature review on October 22, 2023 utilizing PubMed and Google Scholar using the key words 4 point fixation, scleral fixation, gore-tex, plated haptic intraocular lens we did not find any prior reports of a case similar to ours.

CRediT authorship contribution statement

Paolo Vicente P. Paladio: Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Robert William B. King:** Writing – review & editing, Writing – original draft, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

1. Park SY, Eom Y, Lee YJ, et al. Scleral fixation of subluxated or dislocated multifocal and multifocal toric intraocular lenses. *Graefe's Arch Clin Exp Ophthalmol*. 2021;260(4):1195–1203. https://doi.org/10.1007/s00417-021-05498-1.
2. Eom Y, Lee YJ, Park SY, et al. Cable tie technique for securing scleral fixation suture to intraocular lens. *American Journal of Ophthalmology Case Reports*. 2022;27, 101646. https://doi.org/10.1016/j.ajoc.2022.101646.
3. Yamane S, Inoue M, Arakawa A, Kadonosono K. Sutureless 27-gauge needle–guided intrascleral intraocular lens implantation with lamellar scleral dissection. *Ophthalmology*. 2014;121(1):61–66. https://doi.org/10.1016/j.ophtha.2013.08.043.
4. 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):265–269. https://doi.org/10.1097/j.jcrs.0000000000000310.
5. Kristianslund O, Sandvik GF, Drolsum L. Long-term suture breakage after scleral fixation of a modified capsular tension ring with polypropylene 10-0 suture. *Clin Ophthalmol*. 2021;15:2473–2479. https://doi.org/10.2147/opth.s310648.
6. Kokame GT, Yanagihara RT, Shantha JG, Kaneko KN. Long-term outcome of pars plana vitrectomy and sutured scleral-fixated posterior chamber intraocular lens implantation or repositioning. *Am J Ophthalmol*. 2018;189:10–16. https://doi.org/10.1016/j.ajo.2018.01.034.
7. Vote BJ, Tranos P, Bunce C, Charteris DG, Da Cruz L. Long-term outcome of combined pars plana vitrectomy and scleral fixated sutured posterior chamber intraocular lens implantation. *Am J Ophthalmol*. 2006;141(2):308–312.e1. https://doi.org/10.1016/j.ajo.2005.09.012.
8. Botsford BW, Williams AM, Conner IP, Martel JN, Eller AW. Scleral fixation of intraocular lenses with gore-tex suture. *Ophthalmology Retina*. 2019;3(6):468–472. https://doi.org/10.1016/j.oret.2019.02.005.
9. Altinkurt E, Bilgin G. Scleral fixation of hydrophobic acrylic intraocular lenses using a suture burial technique. *Indian J Ophthalmol*. 2021;69(6):1600. https://doi.org/10.4103/ijo.ijo_3151_20.

10. Chen YL, Pu C, Lin KK, Lee JS, Liu L, Hou CH. A comparison of visual quality and contrast sensitivity between patients with scleral-fixated and in-bag intraocular lenses. *J Clin Med*. 2022;11(10):2917. https://doi.org/10.3390/jcm11102917.
11. Borkenstein AF, Borkenstein EM, Luedtke H, Schmid R. Impact of decentration and tilt on spherical, aberration correcting, and specific aspherical intraocular lenses: an optical bench analysis. *Ophthalmic Res*. 2022;65(4):425–436. https://doi.org/10.1159/000522510.
12. Oltrup T, Bende T, Al-Mohamedi H, et al. Comparison of spherical and aspherical intraocular lenses with decentration and tilt error using a physical model of human contrast vision and an image quality metric. *Z Med Phys*. 2021;31(3):316–326. https://doi.org/10.1016/j.zemedi.2021.01.004.