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The retrograde suture needle threading technique for in-situ repositioning of dislocated intraocular lenses with eyelets

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Abstract

Background Rescuing dislocated intraocular lenses (IOLs) with eyelets after scleral suture fixation presents technical challenges and risks of ocular tissue damage. We propose a novel in-situ rescue technique for repositioning dislocated IOLs with fixation eyelets. This approach avoids large incisions, accommodates dislocations in any direction, and offers a safer, more efficient alternative to traditional methods.

Methods The technique was performed on four patients with dislocated IOLs following scleral suture fixation. Under retrobulbar anesthesia, a retrograde suture-guided approach was employed. A double-armed polypropylene suture was introduced retrogradely into the eye via a puncture site. The suture arms were threaded through the fixation eyelet of the IOL haptic. One arm was then cut and hooked out through the eyelet. The broken ends of the two sutures were tied together. The IOL was adjusted to its proper position, and the suture was tightened to secure it to the sclera.

Results All four patients underwent successful in-situ IOL refixation without intraoperative complications. Postoperative examinations confirmed well-centered IOLs in all cases. Postoperative vision has significantly improved compared to preoperative vision. Over a follow-up period of 11–36 months, no redislocation or major complications were observed.

Conclusion This in-situ rescue technique provides a safe, effective, and straightforward solution for fixing dislocated perforated IOLs. Its simplicity and positive outcomes position it as a promising option for managing these complex cases.

Keywords Scleral fixation, Dislocated, Subluxed, Intraocular lens, Ophthalmology

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Background

Intraocular lens (IOL) dislocation following scleral fixation represents a significant postoperative complication in IOL implantation surgery. Management strategies for this issue include IOL exchange or secondary fixation of the dislocated haptic [1–5]. However, IOL exchange presents technical challenges due to factors such as the presence of scleral flaps and conjunctival scarring, which often obscure the contralateral fixation point. Moreover, pre-existing fixation loops embedded within the ciliary sulcus are difficult to visualize and release, further complicating the surgical process. This creates a unique dilemma where intact, non-dislocated loops remain inaccessible, preventing complete IOL removal. As a result, secondary scleral fixation of the dislocated haptic is frequently considered a more feasible and effective solution for managing these complications.

For intraocular lenses (IOLs) with C-loop haptics, secondary fixation of a dislocated haptic can be achieved by externalizing the haptic through a corneal or scleral incision, followed by extracorporeal knot tying and refixation [6–8]。 However, IOLs with hollow haptics, commonly plate-haptic lenses or closed loop haptics, or IOLs with four eyelets designs with fixation holes, present significant challenges. The dislocated haptics in such lenses often cannot be externalized and must be repaired in situ, which adds considerable technical difficulty. Traditional approaches require multiple intraocular suture passes, which are inherently complex and carry risks of intraocular inflammation or damage to ocular structures [1, 9, 10]。 To address these challenges, we propose a novel and simplified method for in situ repair of single-suture breakage in IOL with eyelets, offering a safer and more effective solution.

Table 1

	Patient1	Patient2	Patient3	Patient4
Age, gender	58 M	62 F	79 F	57 M
eye	OS	OS	OD	OD
preoperative best-available visual acuity (BCVA)	1.69	0.5	0.69	1
intraocular pressure (IOP)	10.0	23.6	9.8	15.0
IOL type	Rayner	Rayner	Rayner	SBL-3
Time since IOL implantation	4y	2y	1 m	2y
Causes of dislocation	N	N	Trauma	N
Previous ocular history	N	N	N	N
Postoperative BCVA (logMAR)	0.22	0.3	0.22	0

M; male, F; female, OD; right eye, OS; left eye, IOL; intraocular lens, y; years, m; months, BCVA; best corrected visual acuity, IOP: intraocular pressure

Method

With approval from the hospital's ethics committee and informed consent from all patients, four patients who experienced dislocation following scleral fixation of IOLs underwent the surgical procedure outlined. Patient characteristics are summarized in Table 1. All surgeries were performed by the same surgeon (X.F.). Retrobulbar anesthesia was administered using 2 mL of 2% lidocaine (Shanghai Zhaohui Pharmaceutical Co., Ltd). A 2 mm corneal incision was made to retrieve the dislocated haptic and stabilize it in the anterior chamber. The suture needle retrograde threading technique was employed to complete external suture guidance. First, a puncture mark was made 2 mm posterior to the limbus. A 23-gauge needle was used to create a puncture into the posterior chamber at the designated point (Fig. 1A). One 10 – 0 looped polypropylene suture on a long-curved needle (PC-9, Product Code: 8065307901, Alcon Laboratories, Inc.) was then introduced into the eye retrogradely through the puncture site using the end of a needle (Fig. 1B). The two suture arms were completely passed through the fixation eyelet of the IOL haptic and hooked out of the limbus cornea (Fig. 1C). One of the suture arms was cut (Fig. 1D, E) and extracted through the eyelet using a hook (Fig. 1F, G). The broken ends of the two sutures were tied together (Fig. 1H). The IOL was adjusted to its proper position, and the suture was tightened to secure it to the sclera (Fig. 1I). The accompanying video (An additional movie file shows this in more detail [see Additional file 1]) provides a detailed demonstration of the surgical procedure.

Result

The described technique was applied to four patients (four eyes) with IOL dislocation following scleral fixation. Postoperative follow-up ranged from 11 to 36 months. No intraoperative or postoperative complications related to the procedure were observed. Postoperative visual acuity improved in all cases compared to preoperative levels. The median visual acuity improved significantly from 0.85 logMAR preoperatively to 0.22 logMAR postoperatively. Slit-lamp examination confirmed that all IOLs were well-centred and stable (Fig. 2A demonstrates anterior segment photographs of a case with a well-centred IOL). Throughout the follow-up period, all refixated IOLs maintained excellent fixation and stability.

Discuss

This technique successfully achieved in-situ secondary fixation of the dislocated IOL haptic without any complications, such as vitreous prolapse. It provides a viable alternative for managing single-suture breakage in IOL hollow haptics after scleral fixation.

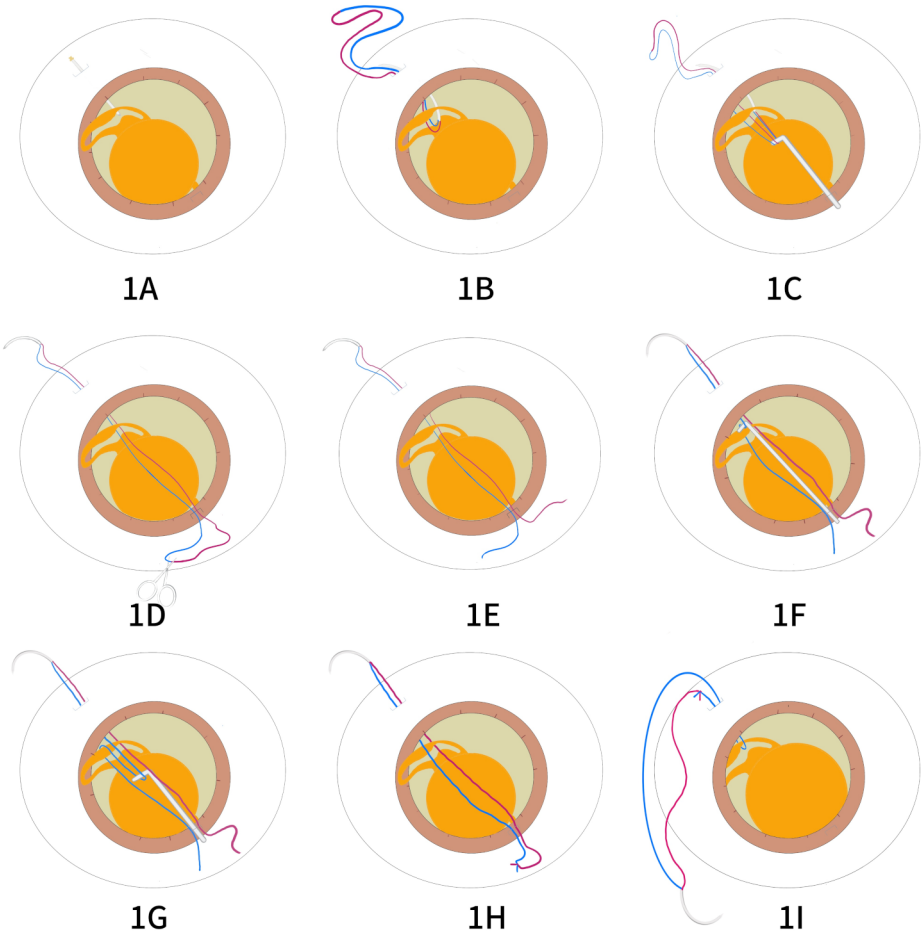

Fig. 1 Step-by-step illustration of the IOL fixation procedure. (**A**) A 23-gauge needle creates a puncture 2 mm posterior to the limbus into the posterior chamber. (**B**) A 10-0 polypropylene suture on a long-curved needle is introduced retrogradely through the puncture site. (**C**) The suture arms are passed through the IOL haptic eyelet and hooked out of the limbus cornea. (**D**, **E**) One suture arm is cut. (**F**, **G**) The cut suture arm is extracted through the eyelet using a hook. (**H**) The broken suture ends are tied together. (**I**) The IOL is adjusted, and the suture is tightened to secure it to the sclera

This technique successfully enables in situ secondary fixation of dislocated IOL hollow haptics. Ophthalmologists widely use IOLs with eyelets for scleral fixation, as the small eyelets allow sutures to pass through [11–13]. However, polypropylene sutures are prone to degradation and breakage over time, posing risks for IOL dislocation [14, 15]. In some cases, IOLs with dislocated haptics cannot be externalized and must be repaired in situ, making the rescue of IOLs with single-haptic breakage a significant challenge for ophthalmologists. Currently, there is no standardized method for managing such cases. The most common approach involves passing a needle through the fixation eyelet to secure the IOL. However, techniques that rely on threading the needle through the haptic eyelet carry risks, including needle dislodgement into the vitreous cavity or intraocular hemorrhage from repeated suture passes [1]. Alternatively, specialized instruments can be used to thread sutures through the haptic hole and secure the dislocated haptic to the sclera. Still, this method is limited by its technical complexity and is challenging to perform on IOLs with small fixation holes [16–18]. In contrast, the described technique requires only a small scleral and corneal incision, avoiding the need for a scleral flap or specialized tools. It allows for straightforward in situ fixation without inducing additional astigmatism or intraocular damage. The procedure also maintains stable intraocular pressure during surgery, making it a safe and effective solution for managing single-suture breakage in IOL with hollow haptics.

The suture needle retrograde threading technique proposed in this study offers significant advantages in terms of convenience, safety, and simplicity [19]. Previously, creating a C-shaped suture loop required repeated scleral punctures or the use of a syringe relay method, which increased procedural complexity and the risk of intraocular damage [2, 15, 20]. In contrast, the retrograde suture method requires only a single scleral puncture,

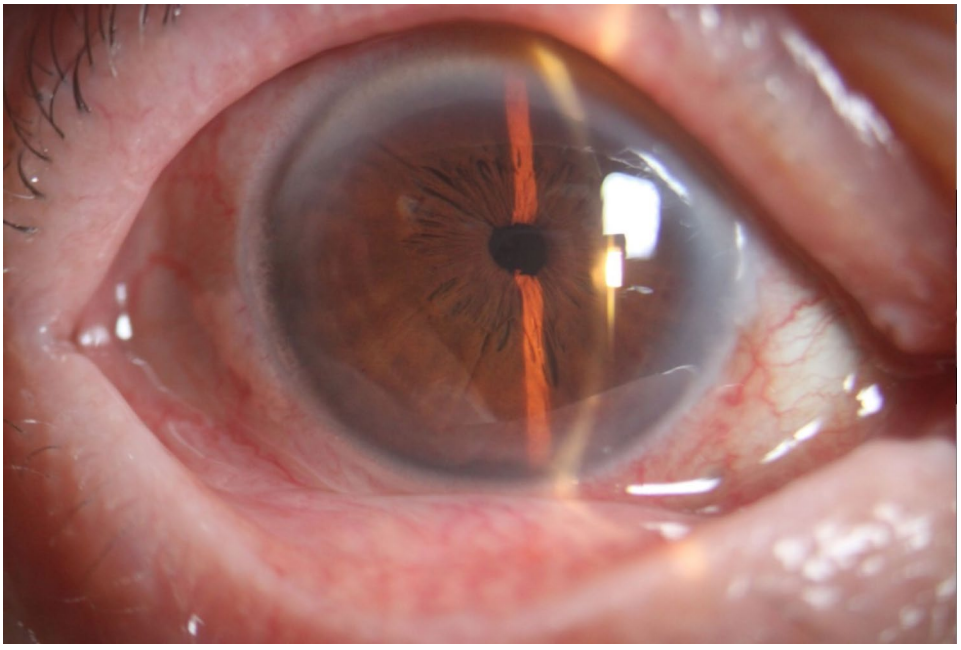

Fig. 2 Ademonstrates anterior segment photographs of a case with a well-centred IOL

eliminating intraocular needle manipulation and thereby enhancing surgical safety. Moreover, the curved arc of the suture needle allows the needle tail to align with and easily pass through the fixation hole precisely. Once the suture passes through the eyelet, it can be retrieved and externalized, adapting seamlessly to various angles without causing procedural difficulty or loss of control. This streamlined process ensures a high degree of operability and reduces potential complications, making it a safer and more efficient approach for IOL haptic fixation.

The use of a C-shaped suture loop simplifies the surgical procedure and allows for intraoperative adjustment of the intraocular lens (IOL) position. Compared to knot-tying techniques, the C-shaped suture loop reduces procedural complexity and minimizes irritation to intraocular tissues caused by suture tails. Additionally, the C-shaped loop facilitates intraoperative adjustments to optimize IOL centration in cases of suboptimal positioning. By utilizing a double-armed 10 – 0 polypropylene suture, we can create a double C-ring structure. This provides additional support to the intraocular lens and decreases the risk of re-splitting at the single-line junction.

While this technique offers several advantages, there are still caveats. It requires a high level of surgical skill to thread the suture through the small fixation eyelet of the IOL haptic, which may pose a learning curve for less experienced surgeons. A useful surgical trick is to use a Sinskey hook to guide the suture through the eyelet under direct visualization gently. Additionally, when cutting and extracting the suture, care must be taken to avoid excessive traction on the IOL, which could lead to further dislocation or damage to the haptic. We recommend using a gentle hooking motion with a micro-hook to retrieve the suture smoothly. These steps enhance the precision and safety of the procedure. In addition, when performing retrograde guidance, the needle used needs to be of a certain length. We used the long-curved needle configuration (approximately 15.3 mm in length) to ensure precise control during threading and prevent the needle from straying into the vitreous cavity or failing to target specific structures, thereby enhancing the safety of the procedure.

Although this technique is limited to IOLs with fixation eyelets and showed no major complications in our small cohort, its applicability is limited to specific designs and larger studies, and longer follow-ups are needed to confirm the long-term stability of refixed IOLs while assessing risks such as suture erosion or late redislocation; In addition, this technique has not yet been explored in other scenarios. For instance, it can be applied to IOL dislocations without capsular support, capsular tension ring (CTR)-IOL complex dislocations, or capsular bag-IOL complex dislocations by puncturing the capsule with a syringe to create a hole before applying this method. Necessitating further applications, larger-scale studies, and extended follow-ups to comprehensively evaluate its feasibility, broaden its scope, and validate its clinical effectiveness.

Conclusions

This technique offers a safe, efficient, and practical approach for the in-situ fixation of dislocated perforated IOLs. Its straightforward execution and favorable outcomes establish it as a reliable option for managing these challenging cases.

Abbreviations

IOL	Intraocular lense
M	Male
F	Female
OD	Right eye
OS	Left eye
Y	Years
m	Months
BCVA	Best corrected visual acuity
IOP	Intraocular pressure
CTR	Capsular tension ring

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12886-025-04105-9.

Supplementary Material 1

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Not applicable.

Author contributions

G.Y, and F.X. conceived the study. Z.Z, C.S and F.X. conducted this study and provided writing suggestions. L.C., Q.C., and K.Y. analyzed and interpreted the patient data. X.H. and S.H. were the main contributors in writing the manuscript.X.H. and W. H.prepared figures. All authors read and approved the final manuscript.

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Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The procedures were performed according to the Declaration of Helsinki and were approved by the Ethics Committee of Guangxi Zhuang Autonomous Region People's Hospital. Written informed consent was obtained from all the participants and/or their legal guardians.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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