• Clinical Research •

Minimally invasive four-point scleral refixation for dislocated 4-haptic IOL by horizontal mattress sutures and Hoffman pockets

Zhao-Liang Zhang[1], *Jia-Hui Shen*[1,2], *Jun-Yi Chen*[1], *Qin-Tuo Pan*[1], *Xu-Ting Hu*[1], *Zong-Duan Zhang*[1]

[1]National Clinical Research Center for Ocular Diseases, Eye Hospital, Wenzhou Medical University, Wenzhou 325027, Zhejiang Province, China
[2]Department of Immunology, Ophthalmology and ORL, Faculty of Medicine, Complutense University of Madrid, Madrid 28040, Spain
Co-first Authors: Zhao-Liang Zhang and Jia-Hui Shen
Correspondence to: Zong-Duan Zhang. National Clinical Research Center for Ocular Diseases, Eye Hospital, Wenzhou Medical University, Wenzhou 325027, Zhejiang Province, China. zzduan@yeah.net
Received: 2025-10-17 Accepted: 2025-11-26

Abstract

● **AIM:** To evaluate the clinical outcomes of a new minimally invasive technique using horizontal mattress sutures and Hoffman pockets for four-point refixation of dislocated four-haptic intraocular lenses (IOLs).

● **METHODS:** This retrospective consecutive case series included eyes with dislocated Akreos AO60 IOLs underwent scleral refixation using a horizontal mattress double-needle suture technique with intralamellar knot burial *via* Hoffman pockets. Clinical outcomes assessed included pre- and postoperative best-corrected visual acuity (BCVA), intraocular pressure (IOP), spherical equivalent (SE), suture duration, IOL centration, and perioperative complications.

● **RESULTS:** A total of 10 eyes from 10 patients (6 males) were included. The mean age at the time of IOL refixation was 53.10±13.07y (range: 28–68y). The mean interval between initial IOL implantation and dislocation was 8.44±3.54y. The mean postoperative follow-up duration was 11.45±10.30mo. Surgical time averaged 15.3±1.77min, with no intraoperative complications. The mean axial length was 27.16±4.35 mm, with high myopia (HM) as the leading comorbidity (4/10 eyes). Postoperative BCVA significantly improved compared to preoperative values (P=0.025). Postoperative SE was significantly improved compared with preoperative (P=0.01). All IOLs remained centered throughout follow-up.

● **CONCLUSION:** This minimally invasive four-point scleral fixation technique offers a safe and effective refixation strategy for dislocated four-haptic IOLs. The horizontal mattress suture configuration combined with Hoffman pockets facilitates durable centration, avoids conjunctival dissection, and could be adopted into routine surgical practice.

● **KEYWORDS:** intraocular lens dislocation; four-haptic intraocular lens; intraocular lens refixation; scleral fixation; horizontal mattress suture; Hoffman pocket; minimally invasive ophthalmic surgery

DOI:10.18240/ijo.2026.03.08

Citation: Zhang ZL, Shen JH, Chen JY, Pan QT, Hu XT, Zhang ZD. Minimally invasive four-point scleral refixation for dislocated 4-haptic IOL by horizontal mattress sutures and Hoffman pockets. *Int J Ophthalmol* 2026;19(3):483-489

INTRODUCTION

Intraocular lens (IOL) dislocation is a rare but potentially vision-threatening complication following cataract surgery. Its cumulative incidence ranges from 0.2% to 3.0%, and it has shown a steady increase in recent decades due to rising surgical volumes and longer postoperative life expectancy[1-2]. The optimal surgical approach for managing dislocated IOLs largely depends on the degree of residual capsular support and the design of the IOL itself. Among the available techniques, scleral fixation remains the most versatile and widely utilized option, especially in cases with insufficient or absent capsular support. However, conventional two- or three-point scleral fixation methods often result in residual IOL tilt and decentration[3].

Four-point fixation techniques offer superior centration and rotational stability for four-haptic IOLs such as the Akreos AO60, which features fenestrated haptics eyelets that facilitate secure suture placement[4-5]. Since the initial demonstration by Fass and Herman[6], who used the eyelets of the Akreos AO60

to achieve four-point fixation through small incisions, several modifications have been proposed to improve visual outcomes and reduce suture-related complications. For instance, Hadayer *et al*[7] introduced a suture-based four-point fixation approach *via* small corneal incisions. However, their study reported significant postoperative corneal astigmatism and noted that the scleral sutures caused tissue trauma. Despite the theoretical advantages of four-point fixation, standardized and minimally invasive surgical protocols remain challenging to establish. Most published studies involved small sample sizes, variable techniques, and inconsistent outcome reporting[8-9]. A technique that combines the mechanical advantages of true four-point support with a tissue-sparing, suture-burial approach may improve both anatomical and visual outcomes.

Hoffman *et al*[10] previously described the creation of a partial-thickness scleral pocket through a clear corneal tunnel to allow intralamellar knot burial while preserving conjunctival integrity. This refinement reduces surgical trauma, postoperative inflammation, and eliminates the need for conjunctival peritomy or scleral flaps. When integrated with a horizontal mattress suture configuration, the technique may further enhance centration, distribute tension across haptics, and lower the risk of suture-related complications such as scleral erosion, knot exposure, and late retinal detachment[11].

To date, however, there is limited evidence for the combined use of horizontal mattress sutures and Hoffman pockets in a true four-point fixation configuration for dislocated four-haptic IOLs. The reproducibility, safety, and clinical effectiveness of this technique have not been systematically evaluated. Therefore, the present study aimed to assess the anatomical stability, visual outcomes, and early postoperative safety of a novel, minimally invasive four-point scleral fixation method that combines horizontal mattress sutures with Hoffman scleral pockets for repositioning dislocated Akreos AO60 IOLs.

PARTICIPANTS AND METHODS

Ethical Approval The study was conducted in accordance with the tenets of the Declaration of Helsinki and received approval from the institutional ethics committee (approval number: 2020-165-K-150). Written informed consent was obtained from all participants for both the surgical procedure and the use of anonymized clinical data for research purposes. There were no strict inclusion or exclusion criteria beyond clinical confirmation of IOL dislocation requiring surgical repositioning.

Study Design and Participants This was a retrospective consecutive case series conducted at Wenzhou Eye Hospital between July 2020 and March 2025. The study included eyes that underwent four-point scleral fixation of dislocated four-haptic IOLs, specifically the Akreos AO60 (Bausch Lomb, USA) or equivalent models with fenestrated haptics. All procedures were performed by a single experienced surgeon (Zhang ZD).

Data Collection and Outcome Measures Preoperative and postoperative data were extracted from electronic medical records. Collected variables included patient age, sex, axial length, ocular comorbidities, time interval between primary IOL implantation and dislocation, and potential risk factors such as high myopia (HM), rhegmatogenous retinal detachment (RRD), trauma, or prior pars plana vitrectomy (PPV).

Ophthalmic examinations were performed preoperatively and at scheduled postoperative visits. Clinical outcome measures included:

Primary outcome Best-corrected visual acuity (BCVA), measured using a Snellen chart and converted to logarithm of the minimum angle of resolution (logMAR) for analysis.

Secondary outcomes 1) Spherical equivalent (SE), calculated as sphere+0.5×cylinder; 2) intraocular pressure (IOP) measured using a non-contact tonometer; 3) suture duration, recorded from the first incision to wound closure; 4) intraoperative or postoperative complications.

Surgical Procedure All procedures were performed under retrobulbar anesthesia. A schematic overview of the key surgical steps is shown in Figure 1, and a representative intraoperative video is provided (Online Supplementary Video 1).

1) Anterior chamber preparation In cases where the IOL was dislocated into the vitreous cavity, a 23-gauge PPV was performed under retrobulbar anesthesia to retrieve and reposition the lens into the anterior chamber. For lenses partially displaced but not fully dislocated into the vitreous, anterior vitrectomy was indicated. Two 1-mm corneal paracenteses were created at the 3- and 9-o'clock meridians. Dispersive ophthalmic viscosurgical device (1.4% sodium hyaluronate) was injected to protect the corneal endothelium and maintain chamber depth.

2) Creation of Hoffman pockets Partial-thickness scleral pockets (3×2 mm) were dissected 3.0 mm posterior to the limbus at the 4- and 10-o'clock positions (Figure 1A).

3) Suture passage and horizontal mattress configuration A 10-0 polypropylene double-armed suture (PC-9, Alcon Laboratories, USA) was introduced *ab externo* through the 10-o'clock scleral pocket, 2.0 mm posterior to the limbus, entering the posterior chamber. The needle was threaded through the superonasal haptic eyelet of the IOL and externalized *via* the temporal paracentesis using a 26-gauge guiding needle. A similar maneuver was performed through the inferonasal eyelet and externalized at the 8-o'clock meridian, completing the horizontal mattress configuration on one side. This process was repeated on the opposite side to achieve a true four-point fixation (Figure 1B).

The suture end was drawn out through the 10-o'clock Hoffman pocket (Figure 1C), after which the needle was passed through a intrascleral tunnel to emerge at the edge of the same pocket (Figure 1D). The same steps were repeated on the opposite side to create a true four-point horizontal mattress construct.

4) Suture retrieval and knot burial Suture tension was titrated to achieve precise IOL centration; 3-1-1 knots were tied and buried within each Hoffman pocket. The pockets were hydrated to secure the knots, and the paracenteses were sealed with stromal hydration.

Postoperatively, tobramycin, dexamethasone eye drops (Alcon-Couvreur, Puurs, Belgium) was used 4 times daily until discontinuation. Subsequently, topical 0.1% fluorometholone eye drops (Santen Pharmaceutical Co., Osaka, Japan) was initiated, followed by tapering and discontinuation within 1mo.

Statistical Analysis Data were analyzed using SPSS Statistics version 20.0 (IBM Corp., Armonk, NY, USA). Normality of distribution was assessed using the Shapiro-Wilk test. Pre- and postoperative BCVA, SE, and IOP values were compared using paired *t*-tests. A two-sided $P<0.05$ was considered statistically significant.

RESULTS

Patient Characteristics and Surgical Parameters A total of 10 eyes from 10 patients (6 males) were included in the study. The mean age at the time of IOL refixation was 53.10±13.07y (range: 28–68y). The average interval between the initial cataract surgery and IOL dislocation was 8.44±3.54y (range: 0.5–14y). HM was noted in 4 eyes (40%), RRD in 4 eyes (40%), and prior ocular trauma in 3 eyes (30%). The mean suture duration was 15.3±1.77min. No intraoperative complications occurred in any case. Detailed patient characteristics and operative parameters are presented in Table 1.

Visual and Refractive Outcomes BCVA showed statistically significant improvement, increasing from a preoperative mean of 0.43±0.40 logMAR to 0.29±0.32 logMAR at the final follow-up ($P=0.025$). SE improved significantly from 5.16±7.41 to −2.44±1.83 ($P=0.01$). IOP remained stable after surgery as 15.26±4.84 mm Hg (Table 2).

Anatomical Stability and Safety The mean postoperative follow-up period was 11.45±10.30mo (6–39mo). All IOLs remained well centered during the follow-up period with no evidence of tilt or decentration based on slit-lamp examination (Figure 2). No cases of suture-related complications—including suture erosion, suture loosening, or scleral atrophy—were observed. No instances of postoperative inflammation, retinal tear, or retinal detachment occurred.

DISCUSSION

This study is the first to evaluate a minimally invasive four-point scleral fixation technique that integrates horizontal mattress sutures with Hoffman scleral pockets for the refixation of dislocated four-haptic IOLs. The use of Hoffman pockets enables intralamellar knot burial without conjunctival peritomy, preserving conjunctival integrity and avoiding enlargement of scleral incisions. This reduces surgical trauma and postoperative inflammation while eliminating the risk of external suture exposure. The horizontal mattress configuration allows for symmetric tension distribution across paired haptics, enhancing IOL stability and reducing the likelihood of tilt or decentration. Clinically, our results demonstrated excellent anatomical and functional outcomes: all IOLs remained well centered throughout the follow-up period, with significantly improved visual acuity and no intraoperative or postoperative complications. Compared to conventional scleral fixation techniques—which often require extensive dissection

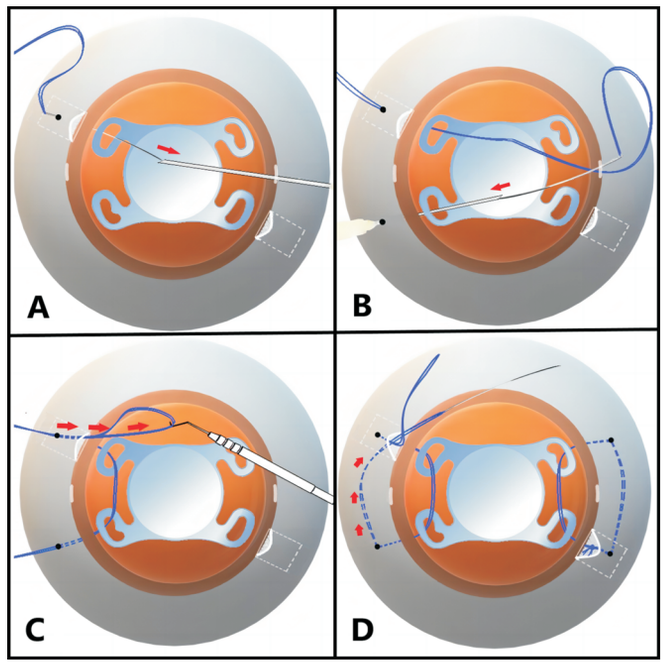

Figure 1 Schematic illustration of the surgical technique for four-point scleral fixation of a dislocated IOL using horizontal mattress sutures with Hoffman pockets A: Two partial-thickness scleral pockets (Hoffman pockets) are created 3.0 mm posterior to the limbus at the 4- and 10 o'clock positions. A 10-0 polypropylene double-armed suture is passed *ab externo* through the 10-o'clock pocket and guided into the anterior chamber. The needle is then externalized through a corneal paracentesis using a 26-gauge guiding needle (red arrow). B: The guiding needle is inserted *ab externo* at the 8-o'clock meridian to pass the suture through the inferonasal haptic eyelet. The suture is then retrieved and externalized through the same paracentesis (red arrow), completing the first horizontal mattress loop. C: After traversing the scleral wall, the suture end is retrieved through the corresponding Hoffman pocket using a lamellar scleral tunnel (red arrow). D: The same procedure is repeated on the opposite side. Suture tension is adjusted to achieve IOL centration, and knots are tied and buried within each Hoffman pocket (red arrow), completing a secure four-point fixation. IOL: Intraocular lens.

Table 1 Baseline ocular characteristics and intraoperative details of patients undergoing IOL refixation

ID	Sex (M/F)	Age, y	Eye (R/L)	AL (mm)	Ocular comorbidities	Interval to IOL dislocation (y)	Ocular surgery	Ocular trauma	Suture duration (min)	Follow-up duration (mo)
1	M	58	R	22.75	None	10	-	No	12	6
2	F	64	L	33.88	HM	10	-	No	15	39
3	F	68	R	32.99	HM	14	-	No	14	6.5
4	M	65	L	32.8	HM/RRD	8	PPV	No	15	18
5	M	46	L	25.06	None	0.5	-	No	15	8
6	F	35	R	27.29	HM / RRD/ocular trauma	12	-	Yes	17	7.5
7	M	55	L	24.06	None	4	-	No	14	6.5
8	F	57	R	23.7	None	8	-	No	17	6
9	M	55	R	24.68	RRD/ocular trauma	3	-	Yes	18	9
10	M	28	L	24.36	RRD/ocular trauma	7	-	Yes	16	8
Mean±SD	6/4	53.10±13.07	5/5	27.16±4.35		8.44±3.54			15.3±1.77	11.45±10.30

M: Male; F: Female; R: Right; L: Left; AL: Axial length; IOL: Intraocular lens; HM: High myopia; RRD: Rhegmatogenous retinal detachment; PPV: Pars plana vitrectomy. "–" indicates no history of ocular surgery.

Table 2 Pre- and postoperative visual acuity, refractive status, and intraocular pressure

ID	BCVA (logMAR)		Refraction (D)		SE (D)		IOP (mm Hg)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	0.2	0.2	+12.00DS	-0.50DS	+12	-0.5	10.9	10.9
2	0.4	0.2	-4.25DS/-2.75DC×150	-3.50DS/-2.00DC×150	-5.625	-4.5	18.3	21.5
3	0.4	0.2	-3.00DS/-1.00DC×20	-3.50DS/-1.00DC×20	-3.5	-4.0	17.5	21.2
4	1.3	0.8	+9.25DS/-2.50DC×125	-2.00DS/-0.50DC×90	+8.00	-2.25	18.2	19.2
5	0.2	0.1	-0.00DS/-1.25DC×100	-0.50DS	-0.625	-0.25	20.6	13.5
6	0.3	0.3	+10.50DS/-0.75DC×100	-4.75DS/-1.00DC×115	+10.125	-5.25	15.7	6.3
7	0.5	0.15	+13.00DS/-0.75DC×100	-0.25DS/-1.50DC×90	+12.625	-1.0	15.3	14.7
8	0.1	0	+11.0DS/-0.75DC×90	-3.50DS/-0.50DC×140	+10.625	-3.75	15.5	17.4
9	0	0	+11.50DS/-0.75DC×85	-2.00DS/-0.50DC×85	+11.125	-2.25	10.0	11.5
10	0.92	0.92	-0.75DS/-4.75DC×75	-0.25DS/-0.75DC×75	-3.125	-0.625	10.6	15.4
Mean±SD	0.43±0.40	0.29±0.32			+5.16±7.41	−2.44±1.83	15.26±3.65	15.26±4.84
P	0.025[a]				0.01[a]		0.947	

A paired sample *t*-test was used to compare the clinical data pre- and postoperatively. [a]$P<0.05$ was considered statistically significant. BCVA: Best-corrected visual acuity; logMAR: Logarithm of the minimum angle of resolution; IOP: Intraocular pressure; SE: Spherical equivalent; SD: Standard deviation; D: Diopter; Pre: Preoperatively; Post: Postoperatively; DS: Diopters sphere; DC: Diopters cylinder.

and are associated with increased risks of suture-related complications—this method achieves durable IOL centration with moderate surgical complexity, making it both effective and easily adoptable in standard clinical practice.

The incidence of late IOL dislocation has increased alongside the global rise in cataract surgery volumes and extended postoperative life expectancy[12-13]. Selecting the most appropriate surgical approach for IOL refixation remains controversial and is often influenced by surgeon experience and preference[2,14]. Among available options, sutured scleral fixation is the most versatile and widely adopted technique, particularly in cases with insufficient capsular support[2,15-16]. However, conventional fixation methods typically require conjunctival peritomy, large sclerotomies, or external knot placement, which may prolong surgical time and increase the risk of complications such as suture erosion and postoperative astigmatism[13-14,17]. Alternatively, removal and replacement of the dislocated IOL is a viable option, but this often necessitates a large corneal incision and may result in corneal endothelial cell loss or significant surgically induced astigmatism[3,17,18-21]. Therefore, achieving stable IOL repositioning while minimizing ocular tissue trauma remains a critical yet unmet clinical need.

Our results suggested that the technique evaluated in this study—horizontal mattress four-point scleral fixation using Hoffman pockets—addressesed this gap by providing consistent anatomical outcomes through a minimally invasive, suture-burial approach that avoids external knot exposure and preserves conjunctival integrity. In contrast, earlier four-point methods for Akreos AO60 fixation typically relied on 2.4–2.8 mm limbal incisions, conjunctival peritomy, and external knot rotation[9-10,22-23], which disrupted the conjunctiva, prolonged surgical duration, and increased the risk of suture-

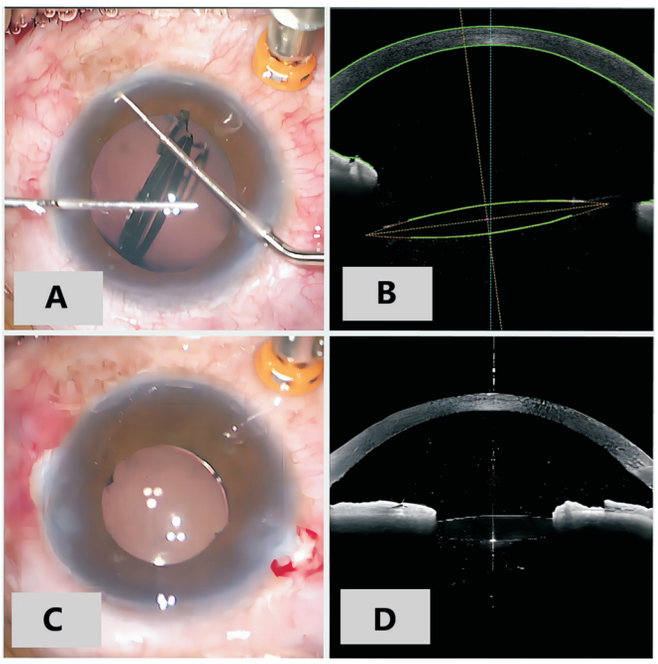

Figure 2 Representative clinical photographs and optical coherence tomography (OCT) images before and after four-point scleral refixation using horizontal mattress sutures and Hoffman pockets A: Slit-lamp photograph showing a decentered and dislocated intraocular lens (IOL) prior to surgical intervention. B: Preoperative anterior segment OCT image demonstrating posterior displacement and tilt of the dislocated IOL. C: Postoperative slit-lamp photograph taken on postoperative day 2, showing a well-centered IOL with no evidence of suture erosion or conjunctival injection. The trimmed suture ends remain completely buried. D: Postoperative OCT image confirming IOL repositioning and improved alignment within the ciliary sulcus.

related complications such as erosion[11]. A previous study employed four full-thickness scleral entry sites to create two radial scleral grooves for knot embedding, which not only disrupted the conjunctiva but also imposed secondary trauma to the scleral wall[17].

By comparison, our approach maintained a stable anterior chamber, minimized tissue damage, reduced operative time (about 15min on average), and achieved comparable or better IOL centration rates. Importantly, none of the patients in our series developed high postoperative astigmatism, suture-related complications (such as erosion or exposure), or cystoid macular edema (CME) during follow-up, which represented a notable improvement over previously reported techniques[3,8,24]. These findings support the safety and clinical utility of this simplified fixation method.

Our complication-free course aligned with previous reports showing that pocket-based fixation techniques reduced hypotony, hemorrhage and retinal complications compared with flap-based approaches[4,25-26]. The Hoffman pocket technique offered several key advantages: intralamellar knot burial avoided conjunctival dissection, minimized postoperative inflammation, and eliminated the risk of externalized knots[10,11,27]. In addition, the horizontal mattress double-needle configuration—functioning as a cross-linked construct—distributed tension symmetrically across paired haptics, thereby reducing the risk of IOL tilt and facilitating precise centration adjustments during surgery[28-30]. The 10-0 polypropylene sutures are less commonly used in ophthalmologic clinical practice due to the potential risk of the suture material breakage. Previous studies have shown that the rate of suture breakage ranges from 0.47% to 27.9%[9]. Notably, this suture technique is equally applicable to other thicker surgical sutures.

This study has several limitations that should be acknowledged. First, the sample size was relatively small, the follow-up period was short, and no control group was included for direct comparison with alternative fixation techniques. Second, the retrospective nature of the study may introduce selection bias, and all surgeries were performed by a single experienced surgeon, which may limit the generalizability of the findings. Third, although anterior segment optical coherence tomography (AS-OCT) was performed in some cases, objective and quantitative assessment of IOL centration or tilt was not systematically conducted. To address these limitations, a multicenter, prospective study with a larger sample size and inclusion of multiple surgeons is planned. This expanded cohort will also allow for the implementation of standardized AS-OCT-based metrics to quantitatively evaluate IOL tilt and decentration. Furthermore, concurrent follow-up of patients undergoing alternative fixation techniques will enable direct comparisons across surgical approaches, thereby enhancing the completeness and clinical relevance of outcome evaluation.

Four-point scleral refixation using Hoffman pockets and horizontal mattress sutures provides a minimally invasive, effective, and reproducible surgical solution for managing dislocated four-haptic IOLs. By combining the optical stability of true four-point fixation with the tissue-sparing advantages of intralamellar knot burial, this technique minimizes surgical trauma while ensuring durable centration and visual rehabilitation. The procedure does not require specialized instrumentation and can be readily adopted within standard ophthalmic surgical workflows. Given its moderate learning curve, favorable safety profile, and consistent anatomical outcomes, this approach may represent a promising and scalable option for routine clinical use.

In conclusion, this minimally invasive, easy-to-master technique demonstrates stable anatomical and visual outcomes for refixation of dislocated four-haptic IOLs. Its procedural simplicity, safety, and reproducibility make it a compelling alternative to conventional fixation methods and a viable option for broader adoption in surgical practice.

ACKNOWLEDGEMENTS

Authors' Contributions: Zhang ZL and Zhang ZD contributed to study conception and design; Zhang ZD performed the surgeries and collected clinical data; Zhang ZL and Shen JH analyzed and interpreted the data; Zhang ZL, Shen JH, Pan QT, Chen JY, and Hu XT drafted the manuscript; Zhang ZL, Shen JH and Zhang ZD critically revised the manuscript for important intellectual content. All authors have read and approved the final version of the manuscript.

Conflicts of Interest: Zhang ZL, None; **Shen JH,** None; **Chen JY,** None; **Pan QT,** None; **Hu XT,** None; **Zhang ZD,** None.

REFERENCES

1 Micheletti JM, Weber N, McCauley MB, *et al*. Punch and rescue technique for scleral fixation of dislocated single-piece intraocular lenses. *J Cataract Refract Surg* 2022;48(2):247-250.

2 Mönestam E. Frequency of intraocular lens dislocation and pseudophacodonesis, 20 years after cataract surgery–a prospective study. *Am J Ophthalmol* 2019;198:215-222.

3 Nadal J, Kudsieh B, Casaroli-Marano RP. Scleral fixation of posteriorly dislocated intraocular lenses by 23-gauge vitrectomy without anterior segment approach. *J Ophthalmol* 2015;2015:391619.

4 Zhang YX, Zheng JB, Liu JH. Intraocular suture technique for flapless two-point fixation of four fenestrated haptics intraocular lenses. *Retina* 2023;43(12):2072-2074.

5 Chen SJ, Yuan GQ, Zhu WH, *et al*. 8-0 polypropylene suture looping and overhand knot: transconjunctival approach to four-point scleral fixation of an akreos adapt intraocular lens. *Retina* 2023;43(5):860-863.

6 Fass ON, Herman WK. Four-point suture scleral fixation of a hydrophilic acrylic IOL in aphakic eyes with insufficient capsule support. *J Cataract Refract Surg* 2010;36(6):991-996.

7 Hadayer A, Puri S, Fassbender Adeniran J, *et al*. Minimally invasive ab interno four-point scleral fixation of intraocular lens. *Retina* 2019;39(1):S21-S23.

8 Hu X, Zhao B, Jin HY. Intraocular suture looping technique for flapless four-point refixation of dislocated intraocular lenses. *J Ophthalmol* 2021;2021:6648777.

9 Chen SJ, Yuan GQ, Zhu WT, *et al*. Four-point scleral fixation of an akreos adapt AO intraocular lens using double-strand 9-0 polypropylene suture. *Retina* 2023;43(12):2059-2063.

10 Hoffman RS, Fine HI, Packer M. Scleral fixation without conjunctival dissection. *J Cataract Refract Surg* 2006;32(11):1907-1912.

11 Das S, Nicholson M, Deshpande K, *et al*. Scleral fixation of a foldable intraocular lens with polytetrafluoroethylene sutures through a Hoffman pocket. *J Cataract Refract Surg* 2016;42(7):955-960.

12 Davis D, Brubaker J, Espandar L, *et al*. Late in-the-bag spontaneous intraocular lens dislocation: evaluation of 86 consecutive cases. *Ophthalmology* 2009;116(4):664-670.

13 Lee GI, Lim DH, Chi SA, *et al*. Incidence and characteristics of intraocular lens dislocation after phacoemulsification: an eight-year, nationwide, population-based study. *J Clin Med* 2021;10(17):3830.

14 Dajee KP, Abbey AM, Williams GA. Management of dislocated intraocular lenses in eyes with insufficient capsular support. *Curr Opin Ophthalmol* 2016;27(3):191-195.

15 Levy-Neuman S, Mendel L, Achiron A, *et al*. Comparison of flanged polypropylene scleral intraocular lens fixation with scleral sutured fixation. *Can J Ophthalmol* 2024;59(6):e653-e660.

16 Kim Y, Choi EY, Lee CS, *et al*. Clinical Characteristics of recurrent intraocular lens dislocation after scleral-fixated sutured intraocular lens and long-term outcomes of intraocular lens re-fixation. *Graefes Arch Clin Exp Ophthalmol* 2022;260(10):3267-3273.

17 John T, Tighe S, Hashem O, *et al*. New use of 8-0 polypropylene suture for four-point scleral fixation of secondary intraocular lenses. *J Cataract Refract Surg* 2018;44(12):1421-1425.

18 Boccuzzi D, Purva D, Orfeo V, *et al*. Supporting IOL'S in a deficient capsular environment: the tale of No "tails". *J Ophthalmol* 2021;2021:9933486.

19 Bellamy JP, Queguiner F, Salamé N, *et al*. Secondary intraocular lens implantation: methods and complications. *J Fr Ophtalmol* 2000;23(1):73-80.

20 Jafarinasab M, Kalantarion M, Hooshmandi S, *et al*. Indications and outcomes of intraocular lens exchange among pseudophakic eyes in a tertiary referral center. *BMC Ophthalmol* 2023;23(1):127.

21 Choudhary A, Sehgal G, Jayadev C, *et al*. Modified ab-externo scleral fixation method for dislocated scleral fixated intraocular lenses. *Indian J Ophthalmol* 2025;73(3):450-454.

22 Zhang JJ, Tian JY, Sun XL, *et al*. Closed continuous-loop suture: a novel surgical technique for transscleral fixation of intraocular lenses. *Retina* 2022;42(11):2221-2224.

23 Sun H, Wang CX, Wu H. Recent advances and current challenges in suture and sutureless scleral fixation techniques for intraocular lens: a comprehensive review. *Eye Vis (Lond)* 2024;11(1):49.

24 Hauser D, Ben-David D, Masarwa D, *et al*. Cystoid macular edema after four-point scleral fixation of intraocular lens. *Retina* 2021;41(10):2035-2040.

25 Ye HF, Zhang SG, Mi W, *et al*. One-year outcomes of modified technique for scleral fixation of a three-piece intraocular lens without conjunctival opening. *Front Med (Lausanne)* 2022;9:856800.

26 Benayoun Y, Petitpas S, Turki K, *et al*. Sutureless scleral intraocular lens fixation: report of nine cases and literature review. *J Fr Ophtalmol* 2013;36(8):658-668.

27 Alsirhy E, Alanazi T, Alghamdi N, *et al*. A modification on Hoffman's pocket technique with scleral fixation of intraocular lens (IOL), case series of unique scenarios. *Case Rep Ophthalmol Med* 2024;2024:7479123.

28 Zuber TJ. The mattress sutures: vertical, horizontal, and corner stitch. *Am Fam Physician* 2002;66:2231-2236.

29 Mirmohammadsadeghi A, Eslami Y. Comparison of surgically induced astigmatism between horizontal and X-pattern sutures in the scleral tunnel incisions for manual small incision cataract surgery. *Indian J Ophthalmol* 2015;63(7):606.

30 Zhang YL, Zong Y, Zhu XJ, *et al*. Comparison of sutureless intrascleral fixation and sutured scleral fixation for the treatment of dislocated intraocular lenses. *BMC Ophthalmol* 2023;23(1):271.