e-CliniC 2026; Vol. 14, No. 2: 166-172
DOI: https://doi.org/10.35790/ecl.v14i2.65520
URL Homepage: https://ejournal.unsrat.ac.id/index.php/eclinic

Successful Visual Rehabilitation After Penetrating Ocular Trauma via Yamane Scleral Fixation: A Case Report

Ade J. Nursalim,[1] Ardelia Emily[2]

[1]Division of Vitreoretina, Department of Ophthalmology, Prof. Dr. R. D. Kandou General Hospital, Manado, Indonesia
[2]Department of Ophthalmology, Prof. Dr. R. D. Kandou General Hospital, Manado, Indonesia
Email: dr.adejn@gmail.com
Received: December 7, 2025; Accepted: February 5, 2026; Published online: February 9, 2026

Abstract: Penetrating ocular trauma frequently leads to traumatic cataract with capsular and zonular disruption, complicating standard in-the-bag intraocular lens (IOL) implantation. Sutureless intrascleral fixation (Yamane technique) offers a minimally invasive posterior chamber IOL option that avoids long-term suture-related complications. We reported a 68-year-old woman presented one day after penetrating needle injury to the right eye with uncorrected visual acuity (UCVA) 1/300, full-thickness corneal laceration (positive Seidel), anterior capsule tear, and zonular dialysis from 7 to 1 o'clock with lens fragments in the anterior chamber. Under retrobulbar anesthesia, corneal wound closure was performed with interrupted 10-0 nylon, followed by cataract extraction and anterior vitrectomy. In the same operation, two transconjunctival sclerotomies were created 2.0 mm posterior to the limbus (superonasal and superotemporal) using 27-gauge thin-walled needles at ~20°. A three-piece foldable IOL was implanted by the Yamane flanged-haptic technique; haptics were externalized, cauterized to 0.3–0.5 mm flanges, and tucked into scleral tunnels. The IOL centered well without tilt; no conjunctival peritomy was required. Postoperatively, UCVA improved to 1/60 on day 1, 6/60 at 2 weeks (after suture removal), and 6/15 at 1 month (6/6 with pinhole). In three-month follow-up, the retina remained attached, intraocular pressure was stable, no cystoid macular edema, and the IOL remained well positioned. In conclusion, in complex open-globe injury with inadequate capsular support, single-session repair with immediate Yamane sutureless scleral fixation of a three-piece IOL can achieve rapid, stable visual recovery and anatomic stability in geriatric eyes. Careful wound closure, symmetric needle entry, and precise flange creation are key to IOL centration and complication avoidance; continued follow-up is advised to monitor long-term flange stability.
Keywords: penetrating ocular trauma; traumatic cataract; zonular dialysis; scleral fixation; Yamane technique

INTRODUCTION

Penetrating ocular trauma is a significant cause of vision loss worldwide, with traumatic cataract formation occurring in a large proportion of open-globe injuries.[1,2] As many as 1.6 million people lose sight each year due to ocular injuries complicated by cataract.[2] Managing a traumatic cataract is often more complex than a typical age-related cataract surgery because of associated damage to the lens capsule, zonular fibers, and other ocular structures; thorough preoperative planning is crucial to optimize outcomes.[2] Visual prognosis in open-globe injuries generally depends on the severity of injury and involvement of critical structures. Notably, elderly patients tend to have worse outcomes compared to younger individuals with similar injuries. This is partly due to more rigid sclera (predisposing to severe ruptures) and a higher likelihood of comorbid ocular disease in older eyes. Nonetheless, timely surgical intervention – including primary wound closure and cataract extraction – can significantly improve vision even in geriatric patients, especially if the posterior segment remains intact.[3]

One major challenge in these cases is how to restore intraocular lens support when the native lens and capsule are disrupted. Loss of capsular/zonal support precludes standard in-the-bag IOL (intraoccular lens) implantation, necessitating alternative strategies. Options for secondary IOL fixation in an aphakic eye include anterior chamber IOLs (ACIOL), iris-fixated IOLs (either anterior or retropupillary claw lenses), or posterior chamber IOLs secured to sclera (scleral-fixated IOLs). Each approach has advantages and drawbacks, and no single technique has proven universally superior in terms of visual outcomes.[4] These ACIOLs are relatively easy to place but have been associated with long-term complications such as corneal endothelial cell loss, chronic uveitis, and secondary glaucoma.[4,5] Iris-sutured or iris-claw lenses avoid the anterior chamber but require sufficient iris tissue; they may not be feasible in eyes with extensive iris trauma and can lead to pupil distortion or chronic iris inflammation. Scleral-fixated posterior chamber IOLs allow a more anatomically correct placement of the lens and have become a preferred approach in eyes with insufficient capsular support, especially when the iris is damaged or other methods are contraindicated.[5] Traditional scleral fixation involves suturing a posterior chamber IOL to the sclera (transscleral sutured fixation), which provides good visual results but carries risks such as late suture erosion or breakage, IOL decentration, and a higher incidence of certain complications (e.g. retinal detachment) over time.[4]

In recent years, sutureless intrascleral fixation techniques have been developed to overcome these issues. Yamane et al described a double-needle flanged haptic technique in 2017 for transconjunctival intrascleral fixation of a posterior chamber IOL. In the Yamane technique, two 30-gauge thin-walled needles are used to dock and exteriorize the haptics of a three-piece IOL through scleral tunnels, and the protruding haptic ends are cauterized to create flange tips that anchor beneath the sclera. This method secures the IOL without any sutures. The Yamane SFIOL has several theoretical and observed advantages: it is minimally invasive, avoids conjunctival peritomy, and avoids suture-related complications such as exposure, knot erosion, or late suture degradation. Additionally, by eliminating scleral suture passes, the risk of hypotony or intraocular hemorrhage from suture needles is reduced.[5] Early studies indicate that sutureless intrascleral fixation yields visual outcomes comparable to other fixation methods,[4] with a potentially lower rate of postoperative cystoid macular edema and retinal detachment than sutured IOL techniques.[4,6] However, long-term data on flange stability and late complications are still limited, and careful follow-up is warranted.[4,5]

We report an elderly patient with penetrating ocular trauma complicated by traumatic cataract who underwent visual rehabilitation using Yamane sutureless intrascleral fixation of a posterior chamber intraocular lens. We detail the operative rationale and outcomes, and situate this approach within contemporary evidence for managing traumatic cataract with zonular deficiency in older adults.

CASE REPORT

A 68-year-old female was referred to the Emergency Department of Prof. Dr. R. D. Kandou General Hospital, Manado, from a regional eye clinic with complaints of ocular pain, redness, and marked visual impairment in the right eye, occurring one day after accidental trauma with a sterile hypodermic needle. On initial examination, uncorrected visual acuity was 1/300 in the right eye (OD) and 6/60 in the left eye (OS). Intraocular pressure, measured by iCare tonometer, was 9 mmHg OD and 10 mmHg OS. Slit-lamp biomicroscopy of the right eye revealed a mixed conjunctival injection, a grade 2 nasal pterygium, and a full-thickness corneal laceration with positive fluorescein staining and a positive Seidel test, consistent with an open-globe injury. The anterior chamber contained lens fragments indicative of a traumatic cataract, with associated zonular dialysis extending from the 7 to 1 o'clock meridians and a tear of the anterior capsule. The iris appeared irregular, although no relative afferent pupillary defect (RAPD) was detected (Figure 1). Examination of the left eye showed a clear cornea with a grade 2 nasal pterygium and early lens opacification consistent with immature senile cataract. Based on the clinical findings, the diagnosis for the right eye was penetrating corneal injury with traumatic cataract and zonular dehiscence in the presence of pterygium, while the left eye was diagnosed with an immature senile cataract and pterygium.

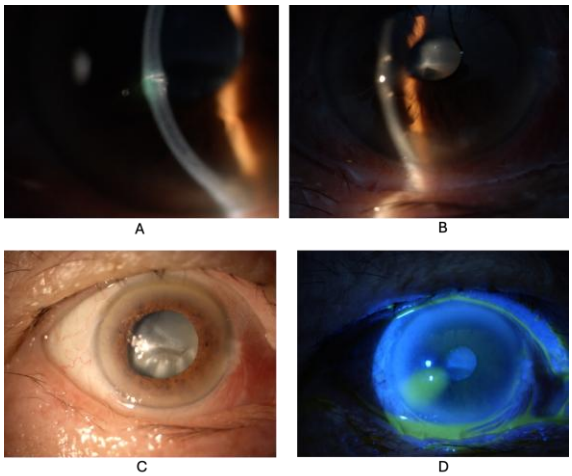

Figure 1. Preoperative anterior segment findings. A. Full-thickness linear corneal laceration; B. Dislocated lens material in the anterior chamber; C. Post-dilation: anterior capsular tear with zonular dialysis; D. Cobalt-blue view after fluorescein showing a positive Seidel sign.

Surgical management was performed under retrobulbar anesthesia. The patient underwent combined anterior segment reconstruction in a single session. A full-thickness corneal laceration was first closed with interrupted 10-0 nylon sutures to achieve a watertight seal. Standard phacoemulsification was then initiated for cataract extraction; however, intraoperative findings of anterior capsule rupture with extensive zonular dialysis precluded safe in-the-bag IOL placement. An anterior vitrectomy was performed to remove prolapsed vitreous from the anterior chamber and clear the visual axis. Proceeding in the same operation, two transconjunctival sclerotomies were created 2.0 mm posterior to the limbus in the superonasal and superotemporal quadrants (approximately 180° apart) using 27-gauge thin-walled needles inserted at a shallow 20° angle. A three-piece foldable IOL (Avansee PU6AS, 22.5 diopters based on optical biometry) was then implanted using the Yamane sutureless two-point intrascleral fixation technique. The leading haptic was docked into the lumen of a 27-gauge needle through the temporal sclerotomy and the trailing haptic into a second needle through the nasal sclerotomy, facilitated by an intraocular handshake maneuver. Both needles were withdrawn to externalize the haptics; each exposed tip was cauterized with low-temperature cautery to create a 0.3–0.5 mm flange, and the flanged ends were gently tucked into the scleral tunnels to lie flush with the scleral surface, securing the IOL

within the posterior chamber. The IOL was well centered and stable on gentle iris manipulation. No conjunctival peritomy was required, and the corneal sutures were left in place for later removal in clinic. An antibiotic–steroid ointment was applied. The procedure was completed without intraoperative complications—there was no vitreous hemorrhage, no difficulty with haptic externalization, and no IOL tilt or haptic slippage.

During postoperative follow-up, on the first postoperative day, the patient's uncorrected visual acuity in the right eye improved to 1/60. Slit-lamp examination revealed moderate corneal edema with Descemet's membrane folds; corneal sutures remained intact with no evidence of wound leakage. The anterior chamber demonstrated grade 3 vitreous haze, and the iris appeared irregular, although no relative afferent pupillary defect (RAPD) was observed. The scleral-fixated intraocular lens (IOL) was well-positioned in situ. Subjectively, the patient reported a foreign body sensation and epiphora. The postoperative medical regimen included topical levofloxacin (1 drop/hour), Protagenta (6 times/day), Siloxan (1 drop/hour), and prednisolone acetate (6 times/day), along with oral methylprednisolone 2×16 mg, ranitidine 2×150 mg, and paracetamol 3×500 mg. At the two-week follow-up, the corneal sutures were removed, and visual acuity improved to 6/60. By the fourth postoperative week, two weeks after suture removal, the patient reported clearer vision without discomfort. Visual acuity further improved to 6/15, reaching 6/6 with pinhole correction. A paracentral corneal scar was noted, while the anterior chamber remained quiet and the IOL stable. Fundoscopy and optical coherence tomography confirmed an attached retina and healthy macula. Importantly, there was no evidence of cystoid macular edema at three months (Figure 2).

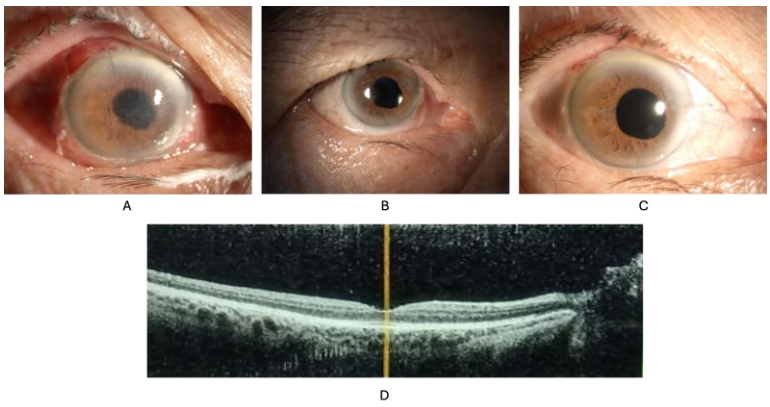

Figure 2. Postoperative course. A. Day-1 slit-lamp: intact corneal sutures, persistent corneal edema with Descemet's folds, centered pupil; B. Week-2 slit-lamp after suture removal; C. Month-1 slit-lamp: clear cornea with a paracentral stromal scar; D. Macular OCT after three months.

The patient did not develop elevated intraocular pressure or other complications. She was extremely satisfied with the visual outcome, regaining the ability to perform daily activities and drive with the aid of glasses. The outcome represented a successful visual rehabilitation given the initial severity of the open-globe injury.

DISCUSSION

This case highlights several key considerations in the management of penetrating ocular trauma with traumatic cataract in an older patient. In open-globe injuries, the initial surgical priority is to restore the integrity of the globe (corneal/scleral wound closure) and address any tissues that could cause further damage, such as removing lens material that can incite inflammation.[2] The timing of cataract removal in trauma can be primary (at the time of repair) or delayed, depending on the situation.[1] In our patient, the lens capsule was ruptured and lens matter was already dispersing, so we proceeded with primary lensectomy during the repair to prevent phacolytic inflammation. However, we deferred IOL implantation because the eye had no

capsular support and was inflamed; a secondary IOL implantation was planned once the eye was stable. This two-staged approach is common in traumatic cataract management – primary removal of the lens if indicated, followed by secondary reconstruction of the optical system – and is often safer than attempting a primary IOL fix under suboptimal conditions.[1]

When considering secondary IOL options for aphakia with no capsule, the surgeon must weigh the patient's age, ocular anatomy, and the relative risks of each method. In an elderly patient, long-term tolerance of an anterior chamber IOL may be poor if there is endothelial cell loss or angle damage from the trauma. Historically, ACIOLs have been associated with corneal decompensation, chronic uveitis, and glaucoma in some cases.[5] In our patient, given a full-thickness corneal laceration and an already compromised endothelium (from trauma and surgical handling), we avoided an ACIOL to reduce the risk of late corneal edema. Iris fixation of an IOL (either iris-claw lens or iris suture fixation) was also considered; however, the trauma had caused iris tissue loss and iridodialysis, making iris fixation less ideal. Furthermore, iris-fixated IOLs require a sufficient iris leaflet and carry the risk of pupil distortion and chronic iris trauma, especially in eyes that have had inflammation.[5] Given these considerations, a posterior chamber scleral-fixated IOL was the most appropriate choice to place the lens near the ideal anatomic position and maximize visual potential.

Scleral-fixated IOL (SFIOL) surgery can be performed with sutures or with newer sutureless techniques. Traditional transscleral suturing (using 9-0 or 10-0 polypropylene sutures) has been utilized for decades to secure a posterior chamber IOL in eyes without capsular support. While effective, sutured SFIOLs are prone to late IOL dislocation if sutures break or slip, often years after surgery, especially in younger patients who may outlive the durability of the suture material.[4] In fact, studies have shown that polyproylene scleral sutures can degrade or loosen over time, and scleral-sutured IOLs carry a measurable incidence of late complications such as IOL subluxation, retinal detachment, and suture erosion.[4,6] In a comprehensive review by the American Academy of Ophthalmology (AAO), scleral-sutured IOLs were associated with a roughly double rate of retinal detachment compared to nonsutured fixation methods over the long term.[4] This evidence has driven interest in sutureless fixation methods that avoid long-term foreign bodies (sutures) in the eye.

The Yamane flanged-haptic technique is a prime example of sutureless SFIOL innovation. By using the IOL's own haptics as anchors, the Yamane method eliminates the need for scleral sutures altogether.[5] In our case, the Yamane technique proved highly effective – the IOL was securely fixed, and the entire procedure was completed through small transconjunctival needle tracks with no need for conjunctival dissection. The postoperative course was remarkably smooth. We observed no hypotony, consistent with the Yamane approach causing minimal scleral disruption (the self-sealing sclerotomies prevent fluid egress).[5] The patient did not develop any inflammation beyond the expected postoperative course; notably, there were no signs of chronic uveitis or fibrin reaction, which can sometimes occur with sutured IOLs due to irritation from exposed knots or looping sutures in the ciliary sulcus.[4] We also saw no evidence of cystoid macular edema (CME) in follow-up. This is in line with some reports that intrascleral haptic fixation may have a lower incidence of CME compared to transscleral sutured IOLs,[6] possibly due to the reduced intraocular manipulation and absence of long-term suture irritation. In terms of IOL stability, our patient's IOL remained perfectly centered throughout follow-up. There was no haptic exposure or flange-related issue; the flanges remained buried and secure. The refractive outcome was slightly hyperopic (+1 D), which is acceptable and may reflect the effective lens position of the Yamane-fixated IOL being slightly more posterior than anticipated. Others have reported that refractive outcomes with Yamane technique are generally predictable, though slight myopic or hyperopic shifts can occur if the IOL sits differently than in-the-bag calculations.[5] In our patient, a minor spectacle correction easily achieved sharp vision.

Recent literature further reinforces these findings. A 2024 systematic review by Zhang et al[7] involving 737 eyes demonstrated that the Yamane technique achieved similar final visual acuity and complication rates to sutured fixation but offered faster visual recovery and significantly

shorter operative times (by 25 minutes). Similarly, Do et al[8] in a 1-year prospective comparative study showed that flanged Yamane fixation provided comparable long-term IOL stability to sutured fixation, while reducing surgery time by more than 50% .

When compared to iris-claw lenses, Chang et al[9] found that Yamane's approach led to better corrected visual acuity without increasing complication risk. Additionally, Gajula et al[10] reported real-world outcomes from 250 eyes undergoing sutureless scleral fixation and found consistent postoperative vision improvement and acceptable complication rates.

It is important to acknowledge that long-term data on the Yamane SFIOL in trauma cases are still limited, as the technique has been widely adopted only in the last ~5–7 years. However, emerging studies are encouraging. For example, a recent study of the Yamane technique in various complex scenarios found high rates of anatomic success and few serious complications over 1–2 years of follow-up.[5] Similarly, comparative analyses have shown that sutureless techniques can achieve visual acuities on par with sutured and iris-fixated lenses while reducing certain complications (like suture-related inflammation).[6,11] Surgeons have introduced modifications (such as using temporary haptic externalization plugs, or different gauge needles) to refine the Yamane procedure and minimize the learning curve issues like haptic slippage or IOL tilt.[5] In our case, we employed standard Yamane without additional modifications and did not encounter these issues, likely due to careful attention to creating symmetric scleral tunnels and adequate flange size.

From a visual prognosis standpoint, this case underscores that the absence of posterior segment injury is critical to a good outcome in traumatic cataract. Our patient's retina remained intact, and her corneal scar was off-center – thus, once a clear optical pathway and stable IOL were restored, she attained excellent acuity. This aligns with prior reports that good visual results can be achieved in traumatic cataract cases if the posterior segment is uninvolved and any corneal scars spare the visual axis.[1] Age by itself, while associated with worse average outcomes in trauma studies, should not discourage aggressive rehabilitation efforts in an individual patient. In fact, modern surgical techniques can substantially improve vision in older patients after trauma, provided the treatment is timely and complications are managed. Our patient's visual acuity of 20/30 is a very satisfactory result given the initial injury, and it enabled her to regain functional independence. Elderly patients may have slightly lower visual potential due to pre-existing conditions (e.g. macular changes or slower wound healing), but they can still benefit greatly from interventions like secondary IOL implantation. We also emphasize the importance of close postoperative monitoring for complications such as retinal detachment, especially in eyes that have undergone vitrectomy and trauma – in this case, the retina stayed attached through final follow-up, which we attribute to careful surgical technique and perhaps the gentler nature of the sutureless fixation reducing vitreoretinal traction.

CONCLUSION

In this elderly patient with penetrating ocular trauma, extensive zonular loss, and traumatic cataract, a single-session approach—comprising watertight corneal wound repair, lensectomy with anterior vitrectomy, and Yamane sutureless intrascleral fixation of a three-piece IOL under retrobulbar anesthesia—resulted in rapid and stable visual rehabilitation.

This case supports Yamane SFIOL as a practical, minimally invasive option when capsular and iris support are inadequate and when anterior chamber or iris-fixated lenses are less suitable—particularly in eyes at endothelial risk after corneal trauma. Key factors for success included meticulous globe closure, symmetric transconjunctival needle entry ~2.0 mm posterior to the limbus, and precise flange creation to secure haptics within scleral tunnels.

Although limited by single-case design and relatively short follow-up, the outcome underscores that carefully planned sutureless posterior chamber fixation can restore excellent function after complex open-globe injury, even in geriatric eyes. Continued surveillance is warranted to document long-term flange stability and posterior segment safety.

Conflict of interest

The authors affirm no conflict of interest in this study.

REFERENCES

1. Bhandari A, Jorvekar S, Singh P, Bangal S. Outcome after cataract surgery in patients with traumatic cataract. Delta Journal of Ophthalmology. 2016;17(2):56-8. Doi: 10.4103/1110-9173.189074
2. Gurnani GSOB. Traumatic Cataract: StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK594251/
3. Yuksel H, Turkcu FM, Cinar Y, Cingu AK, Sahin A, Sahin M, et al. Etiology and prognosis of penetrating eye injuries in geriatric patients in the Southeastern region of Anatolia Turkey. Ulus Travma Acil Cerrahi Derg. 2014;20(4):253-7. Doi: https://doi.org/10.5505/tjtes.2014.71597
4. Shen JF, Deng S, Hammersmith KM, Kuo AN, Li JY, Weikert MP, et al. Intraocular lens implantation in the absence of zonular support: an outcomes and safety update: A report by the American Academy of Ophthalmology. Ophthalmology. 2020;127(9):1234-58. Doi: https://doi.org/10.1016/j.ophtha.2020.03.005
5. Wang X, Su M, Li Y, Xie H, Sun X, Jiang F. Application of modified Yamane technique in intrascleral intraocular lens fixation combined with or without iris reconstruction. BMC Ophthalmol. 2024;24(1):235. Doi: https://doi.org/10.1186/s12886-024-03493-8
6. Li X, Ni S, Li S, Zheng Q, Wu J, Liang G, et al. Comparison of three intraocular lens implantation procedures for aphakic eyes with insufficient capsular support: a network meta-analysis. Am J Ophthalmol. 2018;192:10-19. Doi: https://doi.org/10.1016/j.ajo.2018.04.023
7. Zhang C, Palka C, Zhu D, Lai D, Winokur J, Shwani T, et al. Clinical outcomes in scleral fixation secondary intraocular lens with Yamane versus suture techniques: a systematic review and meta-analysis. Journal of Clinical Medicine. 2024;13(11):3071. Doi: https://doi.org/10.3390/jcm13113071
8. Do JR, Park SJ, Mukai R, Kim HK, Shin JP, Park DH. A 1-year prospective comparative study of sutureless flanged intraocular lens fixation and conventional sutured scleral fixation in intraocular lens dislocation. Ophthalmologica. 2020;244(1):68-75. Available from: https://sci-hub.st/10.1159/000507713
9. Chang Y-M, Weng T-H, Tai M-C, Chen Y-H, Lee C-H, Chang W-C, et al. A meta-analysis of sutureless scleral-fixated intraocular lens versus retropupillary iris claw intraocular lens for the management of aphakia. Scientific Reports. 2024;14(1):2044. Available from: https://homepage.ntu.edu.tw
10. Gajula S, Manayath GJ, Verghese S, Saravanan V, Narendran K, Narendran V. Real world outcomes of sutureless and glueless sclerally fixated intraocular lens implantation. Eye. 2022;36(12):2334-40. Doi: https://doi.org/10.1038/s41433-021-01880-9
11. Shahid SM, Flores-Sanchez BC, Chan EW, Anguita R, Ahmed SN, Wickham L, et al. Scleral-fixated intraocular lens implants-evolution of surgical techniques and future developments. Eye (Lond). 2021;35(11):2930-6110. Doi: https://doi.org/1038/s41433-021-01571-5