BMC Ophthalmology

CASE REPORT Open Access

Scleral melting following scleral sutured intraocular lens using a polytetrafluoroethylene (Gore-Tex®) suture

Hatem Kalantan[1], Abdulrahman Albuainain[2], Wael Otaif[3*], Abdullah M. Alfawaz[1], Mohammed M. Abusayf[1] and Abdulrahman F. AlBloushi[1]

Abstract

Purpose To report a case of scleral melting following implantation of a Gore-Tex®-sutured scleral-fixated intraocular lens (SFIOL).

Methods Single-case report.

Results A 39-year-old man with a history of blunt trauma and crystalline lens subluxation presented with a 3-week history of left-eye pain, redness, and foreign-body sensation. He had undergone *pars plana* vitrectomy, and SFIOL using silk sutures one-year earlier; however, the intraocular lens (IOL) was unstable and was replaced with a Gore-Tex® suture. On presentation, his best-corrected visual acuity was counting fingers near the face in the left eye. The left eye had episcleral and conjunctival injection, clear cornea, a deep anterior chamber with occasional cellular reaction, a peaked pupil inferonasally, and temporal subluxation of the IOL. A large area of active temporal scleral melt with prolapsed uveal tissue and an exposed Gore-Tex suture knot were noted. Systemic work-up was unremarkable. Oral prednisolone and methotrexate were initiated, and a scleral patch graft was performed to cover the exposed suture and enhance the structural integrity of the scleral wall. However, the scleral melt continued to involve the nasal side, and the patient underwent another scleral patch grafting over the nasal side. Rituximab was also administered, but the scleral melt persisted. Therefore, the Gore-Tex suture and IOL were removed. Five months later, the patient remained stable without further melting.

Conclusions Although Gore-Tex suture-related complications are rare, further long-term studies are warranted. The early detection and treatment of suture-related complications can optimize visual outcomes and prevent devastating sequelae.

Keywords Gore-Tex®, Scleral fixation, Intraocular lens, Necrotizing scleritis, Complications, Suture, Case report

*Correspondence:
Wael Otaif
Waelotaif@gmail.com
[1]Department of Ophthalmology, College of Medicine, King Saud University, Riyadh, Saudi Arabia
[2]Eye and Laser Center, Bahrain Defence Force Hospital, Royal Medical Services, Military Hospital, Riffa, Bahrain
[3]Department of Ophthalmology, King Khalid University Medical City, Abha, Saudi Arabia

Introduction

In the context of insufficient capsular support, various surgical techniques can be used for the implantation of an intraocular lens (IOL) including anterior chamber IOL insertion (ACIOL), iris-fixated IOL, or scleral fixation of an IOL (SFIOL) [1]. The selection of an appropriate surgical technique is determined by several factors, including the patient's age, anatomical structure of the iris (e.g., presence of iris defects), ocular comorbidities (e.g., glaucoma), and surgeon's experience [1, 2].

While ACIOLs are associated with a higher risk of endothelial cell loss, uveitis-glaucoma-hyphema syndrome, and pupillary block compared with posterior chamber IOLs, iris-fixated IOLs are associated with a greater risk of pigment dispersion syndrome, uveitis, pupil ovalization, and iris atrophy compared with SFIOLs [2–4]. Currently, SFIOLs have become the surgical treatment of choice for aphakic eyes without capsular support owing to the far distance between the IOL and the anterior chamber structure [5]. Polypropylene (PROLENE, Ethicon, Inc, Somerville, NJ) sutures have been used for SFIOLs since 1988 [6]. However, studies have shown that SFIOLs using 10 – 0 Prolene have higher breakage and dissolution rates [6, 7]. These findings have led many surgeons to adopt the Gore-Tex® suture CV-8 (W.L. Gore & Associates, Newark, DE) or the thicker 9 – 0 Prolene suture as preferred alternative suture materials [7]. The Gore-Tex® suture has the advantage of greater tensile strength and a presumed lower breakage rate than the Prolene suture [5]. Furthermore, it is believed that the Gore-Tex® suture is non-reactive and has a minimal inflammatory response. However, although the Gore-Tex® suture has shown promising results in the short term, a large prospective study is required to determine its long-term safety and effectiveness [5].

Herein, we reported a case of severe necrotizing scleritis and scleral melt following an SFIOL using a Gore-Tex® suture. To the best of our knowledge, necrotizing scleritis associated with a Gore-Tex®-sutured SFIOL has not been reported previously.

Presentation of case

This case study adheres to the CARE guidelines and follows the principles outlined in the Declaration of Helsinki [8]. Written informed consent for the publication of the report and associated images was obtained from the patient, with all identifying details de-identified. The Institutional Review Board (IRB) approval number is NO. E-22-8120, granted by the Research Committee of King Saud University, Riyadh, Saudi Arabia. A 39-year-old otherwise healthy man presented to our emergency room with a 3-week history of left-eye pain, redness, and foreign-body sensation. The patient had a remote history of left eye blunt trauma that was managed during childhood resulting in surgical aphakia. One year back, the patient underwent left eye pars plana vitrectomy and SFIOL elsewhere. Based on the provided report, the SFIOL was initially performed using silk sutures. However, 10 weeks after the procedures, the IOL was unstable, and the silk suture was replaced with a Gore-Tex® suture for better stability. At presentation, his best-corrected visual acuity was 20/20 in the right eye, and counting fingers near the face in the left eye. Intraocular pressure was 18 mmHg in the right eye and 16 mmHg in the left eye. Slit-lamp biomicroscopy of the left eye revealed episcleral and conjunctival injection, a clear cornea, a deep anterior chamber with occasional cellular reactions, a peaked pupil inferonasally, and temporal subluxation of the IOL. A large area of active temporal scleral melt with prolapsed uveal tissue and an exposed Gore-Tex® suture knot were noted. Nasal localized conjunctival injection with scleral thinning and an unburied and exposed Gore-Tex® suture knot was also observed (Fig. 1A and B). A dilated fundus examination of the left eye revealed an attached retina with a thin epimacular membrane. Right eye examination was unremarkable.

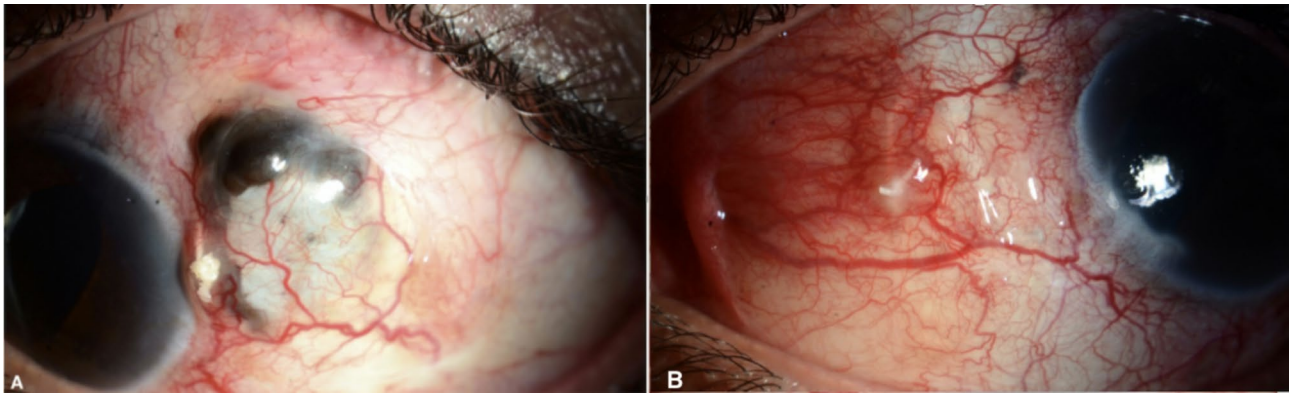

Fig. 1 At presentation, slit-lamp photographs of the left eye. (**A**) Temporal episcleral and conjunctival injection with exposed Gore-Tex® suture knot, scleral thinning, and prolapsed uveal tissue. (**B**) Nasal localized conjunctival injection with scleral thinning with an unburied knot

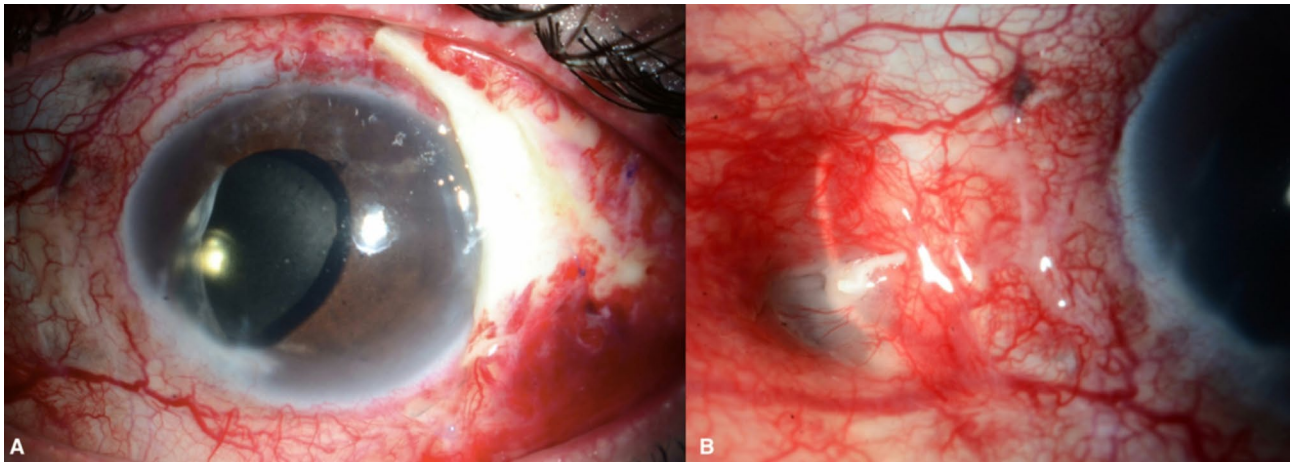

Fig. 2 Slit-lamp photographs of the left eye. (**A**) Following scleral patch graft to cover the area of extruded temporal Gore-Tex® suture. (**B**) The nasal scleral thinning progressed, and Gore-Tex® suture became exposed

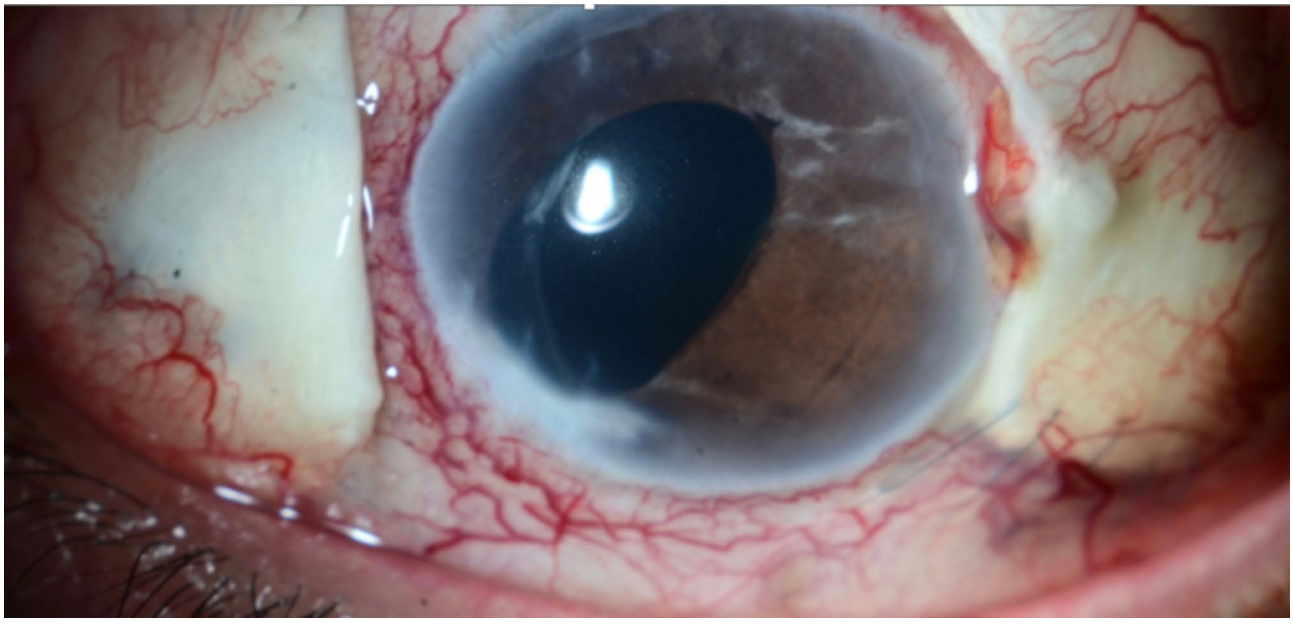

Fig. 3 Slit-lamp photograph of left eye following scleral patch graft covering the area of exposed Gore-Tex® suture and scleral thinning over temporal and nasal sides

A complete blood count; metabolic panel; tests for antinuclear antibodies, C-reactive protein, rheumatoid factor, erythrocyte sedimentation rate, antineutrophil cytoplasmic antibodies, anti-cyclic citrullinated peptide, uric acid, thyroid panel test, QuantiFERON-TB Gold test, angiotensin-converting enzyme; serological test for syphilis; and urinalysis were performed to rule out underlying infectious or autoimmune diseases. A chest radiography was performed to exclude pulmonary manifestations of systemic illness. All the tests yielded negative results. Systemic treatment with oral prednisolone (50 mg) and methotrexate (20 mg) was initiated to halt the active scleral melt. Topical treatment included moxifloxacin drops four times daily and erythromycin ointment at bedtime. The patient underwent scleral patch grafting (Tutoplast®) to cover the area of extruded temporal Gore-Tex® suture and scleral melting. Oral prednisolone was tapered slowly during the postoperative period (5 mg every two weeks), and methotrexate was maintained at 20 mg/week. Four months later, the nasal scleral thinning progressed and the Gore-Tex® suture was exposed (Fig. 2A and B), necessitating another scleral patch graft (Tutoplast®) (Fig. 3). To achieve optimal scleritis control after the second patch graft, the patient received two doses of rituximab (375 mg/m^2 body surface area) on days one and 15. On subsequent follow-up, the scleral melting continued, resulting in the exposure of the suture knot behind the scleral patch over the temporal side

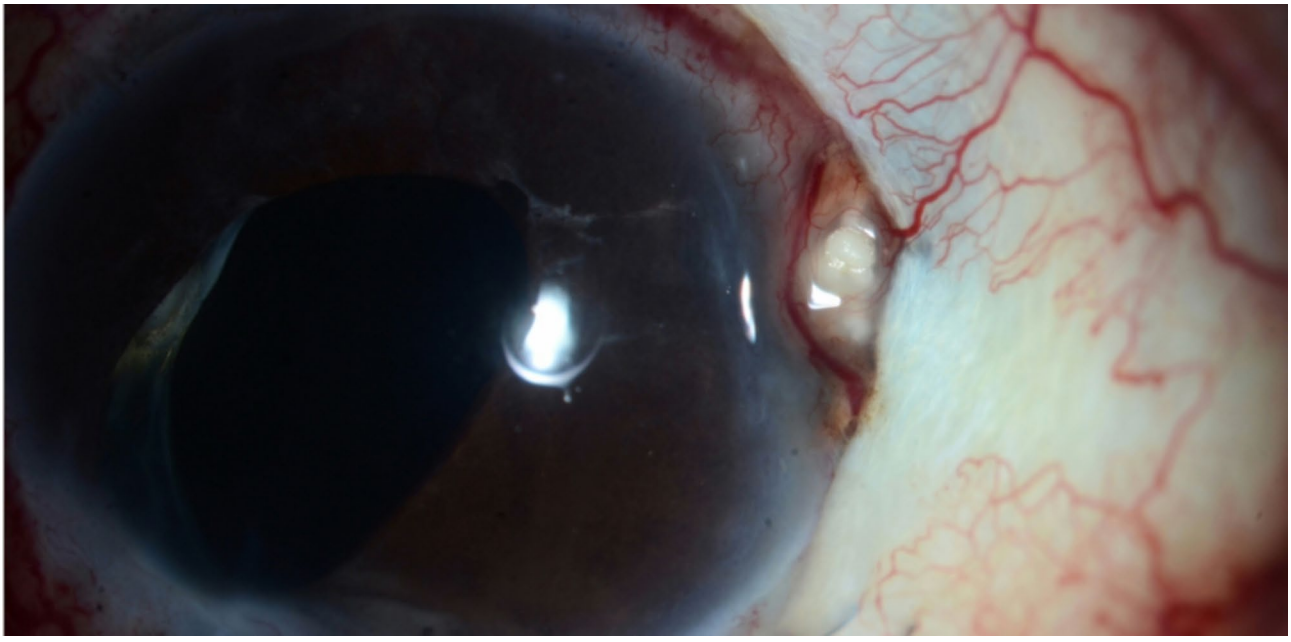

Fig. 4 Slit-lamp photograph of the left eye demonstrates progressive scleral melting and thinning despite patch graft, with exposure of the suture knot

(Fig. 4). At this time, the decision was made to remove the Gore-Tex suture and IOL. After the removal of the Gore-Tex suture and IOL, scleral melting subsided during subsequent follow-ups. The patient remained stable for the following three months without further active melting.

Discussion

Compared with other suture materials, such as Polypropylene, the Gore-Tex® suture has become the preferred choice for scleral-sutured IOLs because of its distinctive characteristics, including minimal memory, durability, and higher tensile strength. Theoretically, these characteristics decrease the risk of suture-related complications, leading to easier manipulation and reduced inflammatory response [5, 7]. Recent studies have reported short-term positive outcomes with minimal complications [5]. For instance, Khan et al. found no incidence of suture-related adverse events or retinal detachments [5].

The Gore-Tex® suture has been proven to be highly effective in cardiovascular procedures, with long-lasting durability of decades in mitral valve repairs. Because of these advantages, it has been used off-label for ophthalmic procedures [9]. While it has shown promising results in the short term, a large prospective study is required to determine its long-term safety and effectiveness. Recent reports have raised potential concerns regarding the use of the Gore-Tex® suture in a scleral-sutured IOL, including a hyperpigmented reaction near the suture [10], haptic fracture resulting from high suture tension [11], Gore-Tex® suture exposure with conjunctival erosion, and delayed-onset endophthalmitis [12]. Therefore, it is crucial to follow the recommended techniques such as ensuring a scleral groove and scleral flap, or rotating and burying the knot into the sclera to decrease the risk of suture erosion through the conjunctiva and other suture-related complications [13]. Bonnell et al. found that one of 15 participants (7%) experienced Gore-Tex® suture exposure [14]. Furthermore, Patel et al. reported a case of infectious scleritis caused by Gore-Tex® suture erosion six months after surgery, despite the knot being rotated and buried [15]. The patient was treated with debridement, IOL removal, and cryotherapy. The authors hypothesized that myopia and multiple surgical interventions for retinal detachment repair may have contributed to scleral weakness at the suture site, leading to suture erosion. Our patient's surgical history included pars plana vitrectomy, and SFIOL using a silk suture. The IOL was unstable; thus, the silk suture was replaced with a Gore-Tex® suture a few weeks later. Consequently, the patient developed necrotizing scleritis at the single suture fixation site. After consultation with the patient and retinal team, we concluded that explanting the lens would likely result in a posterior dislocation, which would complicate the situation. Additionally, the details of previous surgical interventions were not known to the treating physicians; including visual potential and type of IOL used. Given the patient's sensitive immunity, this could lead to further melting at the incision site, which may be unsalvageable. Therefore, we initially decided to begin management using a scleral patch graft to cover the exposed knot and enhance scleral wall integrity. However, scleral melting continued, necessitating the removal of the Gore-Tex ® suture and IOL. After the removal of the Gore-Tex suture

and IOL, scleral melting subsided during the subsequent follow-up. The patient remained clinically stable and free of active scleral melting for six months.

Given that the autoimmune workup and culture for infectious etiology yielded negative results, and the scleral necrosis was localized at the suture sites nasally and temporally, the immune reaction to the Gore-Tex® suture was the most likely cause of the scleral melting. Another potential drive for the scleral melt in our case was the exposed knots that induced chronic inflammation and melting of the underlying sclera. Furthermore, the use of silk sutures, derived from organic materials, in the initial SFIOL procedure may have contributed to the aggressive necrotizing scleritis observed. It is also important to note that the relationship between the use of Polytetrafluoroethylene (GORE-TEX) sutures and the subsequent scleritis and scleral thinning remains unclear. While GORE-TEX has specific known properties, the potential contributions of the previously used silk sutures should not be overlooked.

The processing of Polytetrafluoroethylene (GORE-TEX) involves the addition of a lubricating agent, often an oil, to fine PTFE powder, which raises the possibility of hypersensitivity reactions to either the polytetrafluoroethylene material itself or the coating oil used during production. Such reactions could contribute to the inflammatory complications observed in some patients. To address these issues, attempts have been made to enhance the biocompatibility of GORE-TEX through surface modifications, such as the application of a heparin-immobilized extracellular matrix (ECM) coating. Yu et al. demonstrated that this modification significantly reduces inflammatory responses in small-diameter vascular graft applications. Given the positive outcomes associated with heparin-coated intraocular lenses, it is plausible that a similar heparin ECM coating on GORE-TEX sutures could mitigate complications in ophthalmic procedures. Exploring these modifications may lead to improved patient outcomes and a reduction in adverse effects associated with GORE-TEX materials [16].

We hypothesize that several immune-mediated mechanisms that may underlie the scleral melt observed in association with Gore-Tex sutures. Gore-Tex synthetic vascular implants have been reported to fail in 50% of cases within 10 years, with chronic inflammation identified as a major contributing factor [17]. The foreign body reaction to expanded polytetrafluoroethylene (ePTFE) can trigger a persistent inflammatory response characterized by macrophage activation and lymphocyte recruitment, leading to tissue degradation. Pro-inflammatory cytokines such as IL-1 and TNF-α have been implicated in exacerbating tissue damage. Additionally, this inflammatory environment may promote aberrant angiogenesis and fibrosis, disrupting normal scleral architecture. Furthermore, there may be an immunologic response directed specifically against the synthetic material, perpetuating inflammation and compromising scleral integrity. Understanding these mechanisms is crucial for elucidating the complex relationship between Gore-Tex sutures and severe complications such as scleral melt, highlighting the need for careful consideration of biocompatibility and inflammatory responses in surgical applications of this biomaterial.

Additionally, surgically induced necrotizing scleritis (SINS) per se may have been another potential factor. SINS is believed to be caused by a delayed hypersensitivity reaction to altered or exposed scleral tissue antigens, resulting from multiple ocular surgeries. Studies have found that SINS is strongly associated with systemic autoimmune disease; moreover, further testing after the identification of SINS has revealed underlying systemic diseases, suggesting that surgical trauma may have accelerated the underlying subclinical autoimmunity [18, 19]. Furthermore, cessation of scleral melting following Gore-Tex® suture removal provided further evidence that the immune reaction to the suture may have been the underlying etiology. Given the rarity of this case, it is crucial to emphasize that more reports are needed to draw definitive conclusions about the association between this complication and the use of Polytetrafluoroethylene (Gore-Tex®).

Conclusion

We reported a case of scleral melting after implantation of a Gore-Tex®-sutured scleral-fixated IOL. Although Gore-Tex®-suture-related complications are rare and have been reported in only a few patients, further long-term prospective studies are warranted. It is also crucial to monitor patients over an extended period, as early detection and treatment of suture-related complications can optimize visual outcomes and prevent devastating sequelae.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12886-025-03926-y.

Supplementary Material 1

Author contributions

W.O and A.A. did the data collection, analysis and drafting of initial manuscript. HK, AF, MA, AB critically reviewed and provided substantial intellectual content to the original manuscript. All authors read and approved the final version prior to submission and agree to be accountable for all aspect of the work. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Funding

The authors declare no funding support for this research.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
The patient consented to participate.

Consent for publication
Written informed consent from the patient for the publication of de-identifying images in an online open-access publication was obtained.

Competing interests
The authors declare no competing interests.

Received: 18 February 2024 / Accepted: 17 February 2025
Published online: 01 April 2025

References

1. Stem MS, Todorich B, Woodward MA, Hsu J, Wolfe JD. Scleral-fixated intraocular lenses: past and Present. J Vitreoretin Dis. 2017;1(2):144. https://doi.org/10.1177/2474126417690650.
2. Tsatsos M, Vartsakis G, Athanasiadis I, Moschos M, Jacob S. Intraocular lens implantation in the absence of capsular support: scleral fixation. Eye 2022 369. 2022;36(9):1721–3. https://doi.org/10.1038/s41433-022-02024-3.
3. Mihail Z, Georgiana C, Camburu G. Uveitis-Glaucoma-hyphaema syndrome. General review. Rom J Ophthalmol. 61(1):11–7. https://doi.org/10.22336/rjo.2017.3
4. Wagoner MD, Cox TA, Ariyasu RG, Jacobs DS, Karp CL. Intraocular lens implantation in the absence of capsular support: a report by the American Academy of Ophthalmology. Ophthalmology. 2003;110(4):840–59. https://doi.org/10.1016/S0161-6420(02)02000-6.
5. Khan MA, Gupta OP, Smith RG, et al. Scleral fixation of intraocular lenses using Gore-Tex suture: clinical outcomes and safety profile. Br J Ophthalmol. 2016;100(5):638–43. https://doi.org/10.1136/BJOPHTHALMOL-2015-306839.
6. Bausili Portabella MM, Nadal J, Alvarez De Toledo J, De La Fideliz M, Barraquer Rl. Long-term outcome of scleral-sutured posterior chamber intraocular lens: a case series. Br J Ophthalmol. 2020;104(5):712–7. https://doi.org/10.1136/BJOPHTHALMOL-2019-314054.
7. Price MO, Price FW, Werner L, Berlie C, Mamalis N. Late dislocation of scleral-sutured posterior chamber intraocular lenses. J Cataract Refract Surg. 2005;31(7):1320–6. https://doi.org/10.1016/J.JCRS.2004.12.060.
8. Gagnier JJ, Kienle G, Altman DG, et al. The CARE guidelines: Consensus-based clinical case reporting guideline development. Headache. 2013;53(10):1541–7. https://doi.org/10.1111/head.12246.
9. Seeburger J, Borger MA, Falk V, Mohr FW. Gore-Tex Loop Implantation for Mitral Valve Prolapse: the Leipzig Loop technique. Oper Tech Thorac Cardiovasc Surg. 2008;13(2):83–90. https://doi.org/10.1053/j.optechstcvs.2008.03.004.
10. Chen X, Sharma P, Baumal CR. Pigmentary reaction around Gore-Tex suture in a scleral-fixated intraocular Lens. Ophthalmology. 2018;125(6):841. https://doi.org/10.1016/J.OPHTHA.2018.02.017.
11. Gupta RR, Seamone ME, Pollmann AS, O'Brien DM, Lewis DR. Dislocation of a Scleral-Fixated, hydrophobic, Single-Piece Acrylic Intraocular Lens Secondary to Eyelet Fracture from Gore-Tex suture. https://doi.org/101177/24741264198557207. 2019;3(5):395–8. https://doi.org/10.1177/2474126419857207
12. Mogil RS, Ferenchak KSM. Gore-Tex Suture-Associated Endophthalmitis in a Scleral-Sutured Intraocular Lens. *Retin Cases Br Rep* 2023 Jan 2 https://doi.org/10.1097/ICB0000000000001400 Epub ahead print PMID. Published online 2023.
13. Almashad GY, Abdelrahman AM, Khattab HA, Samir A. Four-point scleral fixation of posterior chamber intraocular lenses without scleral flaps. Br J Ophthalmol. 2010;94(6):693–5. https://doi.org/10.1136/BJO.2009.161349.
14. Bonnell AC, Mantopoulos D, Fine HF, Shah SP, Wheatley HM, Prenner JL, One-year outcomes, of a novel surgical approach for fixation of a posterior chamber intraocular lens using gore-tex suture. Retina. 2020;40(5):833–7. https://doi.org/10.1097/IAE.0000000000002456.
15. Patel NA, Shah P, Yannuzzi NA, et al. Clinical outcomes of 4-point scleral fixated 1-piece hydrophobic acrylic equiconvex intraocular lens using polytetrafluoroethylene suture. Clin Ophthalmol. 2018;12:2145–8. https://doi.org/10.2147/OPTH.S174211.
16. Yu C, Yang H, Wang L, Thomson JA, Turng LS, Guan G. Surface modification of polytetrafluoroethylene (PTFE) with a heparin-immobilized extracellular matrix (ECM) coating for small-diameter vascular grafts applications. Mater Sci Eng C. 2021;128:1–36. https://doi.org/10.1016/j.msec.2021.112301.
17. Hoenig MR, Campbell GR, Campbell JH. Vascular grafts and the endothelium. Endothelium. 2006;13(6):385–401. https://doi.org/10.1080/10623320601061615.
18. O'Donoghue E, Lightman S, Tuft S, Watson P. Surgically induced necrotising sclerokeratitis (SINS)--precipitating factors and response to treatment. Br J Ophthalmol. 1992;76(1):17. https://doi.org/10.1136/BJO.76.1.17.
19. de la Maza MS, Foster CS. Necrotizing scleritis after ocular surgery. A clinicopathologic study. Ophthalmology. 1991;98(11):1720–6. https://doi.org/10.1016/S0161-6420(91)32062-1.

Publisher's note