Am J Transl Res 2025;17(5):3565-3570
www.ajtr.org /ISSN:1943-8141/AJTR0164477

Case Report

Delayed uveitis after implantable Collamer lens Implantation caused by COVID-19 infection: a case report

Yan Sun[1*], Huiying Wu[2*], Xingke Yan[3*], Jibo Zhou[4], Tianyue Niu[1], Jie Zhu[5]

[1]Department of Refractive Surgery, Lanzhou Bright Eye Hospital, Lanzhou 730030, Gansu, China; [2]Department of Refractive Surgery, Nanchang Bright Eye Hospital, Nanchang 330038, Jiangxi, China; [3]Gansu University of Chinese Medicine, Lanzhou 730030, Gansu, China; [4]Department of Ophthalmology, The Ninth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai 200011, China; [5]Department of Gastroenterology, Gansu Baoshihua Hospital, Lanzhou 730060, Gansu, China. [*]Equal contributors.

Received March 12, 2025; Accepted April 25, 2025; Epub May 15, 2025; Published May 30, 2025

Abstract: This report presents a case of uveitis secondary to ankylosing spondylitis (AS) with abnormal exudative deposits and pigment adhesion on the surface of an implantable Collamer lens (ICL) in a highly myopic eye following coronavirus disease 2019 (COVID-19) infection. The etiology and treatment were analyzed. A 22-year-old male presented with decreased visual acuity in the right eye, having undergone bilateral ICL implantation for high myopia 22 months prior. During the COVID-19 pandemic, he developed ocular exudation, pigment deposition, and vision deterioration, with a confirmed diagnosis of AS. Therapeutic interventions included anti-inflammatory, antiviral, and corticosteroid therapies. Postoperative uveitis secondary to AS following ICL implantation represents a rare complication. COVID-19 infection and concurrent systemic autoimmune disorders were identified as risk factors for secondary iridocyclitis. Immunological testing confirmed AS diagnosis. Treatment with sodium hyaluronate eye drops, ganciclovir ophthalmic gel, and systemic corticosteroids improved symptoms; however, persistent punctate exudates and pigment deposits on the ICL surface exhibited limited resolution. For patients with systemic autoimmune diseases or virus-induced uveitis undergoing ICL implantation, preoperative immunological screening should be actively performed to minimize postoperative complications. Early comprehensive therapy is critical to prevent progressive vision loss and rare transparency alterations of the ICL surface caused by pigment-laden exudates.

Keywords: High myopia, ICL crystal implantation surgery, rainbow eyelash inflammation, ankylosing spondylitis

Introduction

Posterior chamber intraocular lens (IOL) implantation is a common ophthalmic procedure that has significantly improved visual acuity. However, like many surgeries, it can be associated with complications, including high or low vault, glaucoma, and cataracts. These complications can not only affect the surgical outcome but also cause additional pain and inconvenience to patients [1, 2].

The postoperative immunogenic response is often closely related to the development of cortical leakage in cataracts. When this occurs, immunocompetent cells are exposed to crystallin, which the immune system recognizes as a foreign substance, triggering a series of immune responses including antibody production, and sensitized lymphocyte-mediated immune response. Such immune responses may interfere with normal ocular physiology and hinder postoperative recovery [2]. Among the potential complications, delayed uveitis stands out as a relatively rare immune complex-mediated hypersensitivity reaction. Its mechanism is complex, involving the deposition of immune complexes at localized sites, which triggers an inflammatory response. However, it rarely leads to surface deposition on the implantable Collamer lens (ICL), a characteristic that complicates diagnosis and treatment [2, 3].

This report presents a case of delayed uveitis following ICL implantation and discusses its etiology and management. This case holds significant innovation and clinical significance. From an innovative perspective, the detailed analysis

https://doi.org/10.62347/HHLS1617

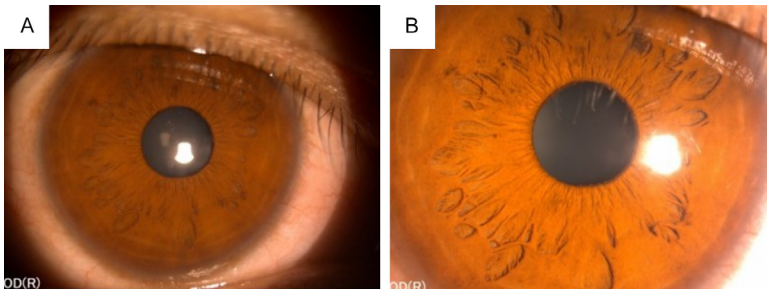

Figure 1. Preoperative slit-lamp examination of the patient. A: Magnification of 10×; B: Magnification of 25×.

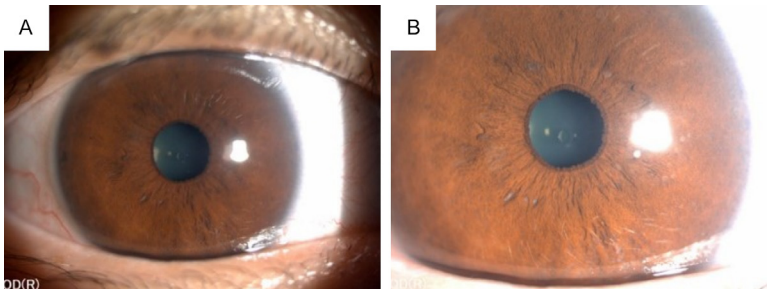

Figure 2. Slit-lamp examination of the patient one month after surgery. A: Magnification of 10×; B: Magnification of 25×.

of this specific case provides a deeper understanding of the mechanism underlying delayed uveitis after ICL implantation. While previous studies have primarily focused on common complications, relatively few studies have addressed this rare condition. The study of this case offers a new perspective and contributes to the enhancement of the theoretical framework in this field.

Clinically, this analysis holds valuable guidance for ophthalmologists in practice. It emphasizes the importance of closely monitoring the ocular condition of patients after ICL implantation, especially for those with high risk factors of delayed uveitis, to ensure early detection, diagnosis, and treatment. Furthermore, the treatment experience derived from this case may serve as a reference for managing similar cases, improving the effect and safety of treatment, and mitigating the impact of complications on patients' vision and quality of life.

Case

An 18-year-old male presented with a decade-long history of blurred vision in both eyes underwent bilateral ICL implantation. Preoperative refraction revealed: OD: -9.50 DS/-1.00 DC × 15° and OS: -9.25 DS/-1.00 DC × 175°. Ocular examination showed transparent corneas in both eyes, with no abnormalities detected on corneal topography or biomechanical analysis. The anterior chamber depth was normal, and the fundus exhibited tessellated changes with peripapillary atrophy and a cup-to-disc ratio (C/D) of 0.4. Preoperative slit-lamp findings are shown in **Figure 1**. Postoperatively, the patient achieved a visual acuity of 1.2 in both eyes, with normal intraocular pressure and no other complications. The slit-lamp examination one month after surgery is shown in **Figure 2**.

At 22 months postoperatively, the patient returned for a follow-up visit, reporting symptoms of right eye redness, photophobia, pain, tearing, and decreased vision that occurred one month prior following a cold. He had been diagnosed with conjunctivitis at a local hospital and treated with unspecified eye drops. Upon presentation, his visual acuity was 0.5 in the right eye (OD) and 1.0 in the left eye (OS), with normal intraocular pressure. Slit-lamp examination of the right eye revealed no conjunctival injection, a transparent cornea, a moderately deep anterior chamber, no keratic precipitates (KP), a round pupil with no light reaction, and numerous lipid-like particles as well as punctate and linear pigment deposits on the ICL surface (**Figure 3**). The crystalline lens was transparent, and the fundus exhibited tessellated changes with peripapillary atrophy and a C/D of 0.4. The left eye remained unremarkable. The patient was referred for immunological evaluation, which showed a negative Human leukocyte antigen (HLA)-B27 test, a C-reactive protein level of 1.38 mg/L, and an erythrocyte sedimentation rate of 2 mm/h. A diagnosis of ankylosing spondylitis (AS) was confirmed. Treatment included: Topical therapy: Tobramycin/dexamethasone eye drops, ganciclovir ophthalmic gel, and levofloxacin eye drops (4 times daily); Systemic therapy:

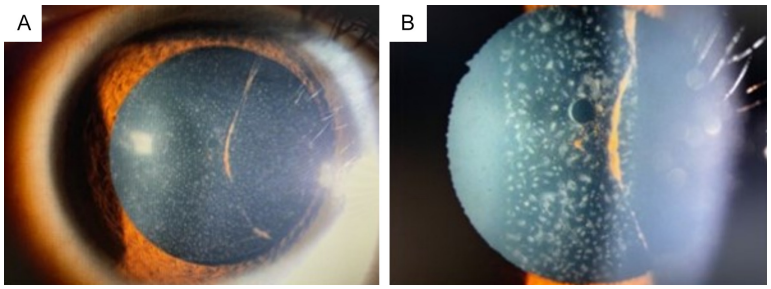

Figure 3. Slit-lamp examination of the patient 22 months after surgery. A: Magnification of 10×; B: Magnification of 25×.

Sulfasalazine and loxoprofen sodium tablets. At the 1-week follow-up, uncorrected visual acuity (UCVA) in the right eye improved to 0.6, with partial absorption of exudates, although persistent deposits remained on the ICL surface. The primary indicators of this study included ICL crystal transparency, diopter, and anterior segment performance under slit-lamp examination. Secondary indicators included uncorrected visual acuity, best corrected visual acuity, corneal condition, anterior chamber angle (ACA), aqueous humor condition, iris condition, lens condition, vitreous condition, and fundus condition. Measurement time points were established before surgery, one month after surgery, and 22 months after surgery. The patient's eye conditions before surgery, one month after surgery, and 22 months after surgery are shown in **Table 1**.

Discussion

Implantable Collamer lens (ICL) implantation is a common treatment for high myopia in clinical ophthalmology. Although this procedure achieves favorable outcomes in most cases, some rare complications may still occur after operation, among which uveitis with exudation and pigmentation on the ICL surface is extremely rare. Ankylosing spondylitis (As) an advanced refractive correction technology, ICL has provided clear vision for many patients with high myopia. However, despite its success, the incidence of postoperative uveitis, although very low, is comparable to that of endophthalmitis and toxic anterior segment syndrome (TASS) [3, 4]. This phenomenon has attracted great attention from the ophthalmology community, as investigating the causes of these complications and exploring effective treatment methods are crucial for further standardizing the ICL surgical procedure and minimizing adverse consequences [4].

Postoperative complications of posterior chamber intraocular lens (IOL) generally follow a predictable pattern, with most complications occurring within two weeks after operation. During this period, complications may arise due to surgical trauma and the stress response of ocular tissues. Delayed complications are relatively uncommon but often present with typical features, such as fibrous exudates on the anterior chamber and IOL surface. This fibrous exudation may adversely affect the patient's vision by compromising the transparency and optical properties of the IOL [5]. The pathogenesis of uveitis after ICL implantation is considered to differ from the early postoperative inflammatory reaction. While the early postoperative inflammatory response is usually triggered by direct ocular tissue damage from the surgical procedures, uveitis following ICL implantation is more likely to be an immune-mediated response. The mechanism of this immune response is complex and may involve the body's immune system recognizing and attacking the intraocular lens material [6, 7].

In the present case, the patient developed uveitis 22 months after ICL implantation. Notably, the onset of uveitis was caused by a cold complicated by conjunctivitis. As a common upper respiratory tract infection, a cold can provoke systemic and local inflammatory reactions. When conjunctivitis occurs, inflammatory factors may affect the eyes through blood circulation or local diffusion, leading to the recurrence of uveitis [7]. During this episode, the patient experienced recurrent exudation and pigment dispersion. More seriously, the cross-linked proteins on the ICL surface were destroyed, allowing pigments and other substances to deposit on the IOL surface. This deposition not only affected the optical properties of the IOL surface but also may have caused further irritation and damage to intraocular tissues. In response, anti-inflammatory treatments were administered, and over time, the pigment and exudates gradually dissolved, with the patient's vision improving.

Table 1. Ocular condition of the patient before surgery, one month after surgery, and 22 months after surgery

Index	Right eye			Left eye		
	Preoperative	Postoperative 1 month	Postoperative 22 months	Preoperative	Postoperative 1 month	Postoperative 22 months
Naked vision	0.04	1	0.2	0.06	1	1
Best corrected vision	1	1.2	uncorrectable	1	1	1
Diopter	-9.50DS/-1.00DC×15°	+0.75/-0.75×140°	-2.50/-1.00×175°	-9.25DS/-1.00×175°	+0.50/-0.25×76°	+0.25/-0.25×65°
Corneal condition	Clear	Clear	Clear	Clear	Clear	Clear
Anterior chamber Angle ACA	36.1°	28.9°	23.2°	37.7°	29.6°	25.2°
Aqueous humor	Transparent	Transparent	Transparent	Transparent	Transparent	Transparent
Iris condition	Smooth texture, no pigment loss	Smooth texture, no pigment loss	The texture is blurred, and the exudate is visible above the pupil in a linear pattern	Smooth texture, no pigment loss	Smooth texture, no pigment loss	Smooth texture, no pigment loss
ICL implantation	No	Yes	Yes	No	Yes	Yes
ICL transparency	No	Transparent	The surface of ICL is densely covered with inflammatory exudation and protein	No	Transparent	Transparent
Condition of the lens	Transparent	Transparent	Transparent	Transparent	Transparent	Transparent
Vitreous condition	Transparent	Transparent	Transparent	Transparent	Transparent	Transparent
Fundus condition	Roughly as usual	Roughly as usual	Roughly as usual	Roughly as usual	Roughly as usual	Roughly as usual

ACA: anterior chamber angle; ICL: implantable Collamer lens.

Through a series of examinations and analyses, the possibility of bacterial infection related to the surgery was excluded, which provided an important basis for follow-up treatment and observation. It is important to note that this patient was not initially diagnosed with AS, a systemic autoimmune disease that seriously affects the quality of life of patients. AS affects not only the joint system but also multiple organs and tissues. Ocular involvement in AS often presents as uveitis, especially in young to middle-aged men. Uveitis in AS patients typically exhibits a recurrent and unilateral pattern, with symptoms such as eye swelling, pain, photophobia, lacrimation, and associated signs including ciliary body injection, keratic precipitates, inflammatory cells in the anterior chamber, fibrous exudates, and adhesions of the pituitary-retrohypophyseal and retrohypophyseal areas [8, 9]. These symptoms not only cause physical discomfort but can also significantly impact vision.

In this case, the patient had a history of coronavirus disease 2019 (COVID-19). During the pandemic, conjunctivitis developed following a cold, leading to symptoms including eye swelling, photophobia, pain, tears, and visual impairment. Studies have shown that ocular infections caused by SARS-CoV-2 often exhibit unique pathogenesis. Unlike some viral infections, ocular infections caused by SARS-CoV-2 are usually due to the direct invasion rather than a secondary immune response [10, 11]. Specifically, conjunctivitis linked to COVID-19 is closely related to the detection of SARS-CoV-2 RNA in the tears. Feline coronavirus has been shown to induce suppurative anterior uveitis and vasculitis in several animal models. In COVID-19-associated uveitis, characteristics include diffuse pigmentation on the anterior capsule of the lens, white immunoprecipitation, angular precipitation, and anterior chamber spots.

From a pathophysiological standpoint, SARS-CoV-2 primarily infects host cells through its spike protein (S protein). The S protein consists of two subunits, S1 and S2. During infection, transmembrane serine protease 2 (TMPRSS2) cleaves the S protein, releasing the S1 subunit [12, 13]. The S1 subunit binds to angiotensin-converting enzyme 2 (ACE2) through the receptor-binding domain (RBD), thereby facilitating viral entry into host cells. The S2 subunit promotes the fusion of the virus envelope with the host cell membrane, allowing the virus to enter the cell for replication. The iris, as a crucial ocular tissue, expresses ACE2 receptors at high levels, making it a primary target for the coronavirus [14]. When the virus attacks iris cells, it triggers the release of inflammatory cytokines, which exacerbate microvascular damage mediated by AS immune complexes, thereby worsening ocular symptoms.

In this complex context, the ICL used in this patient is a biocompatible material composed of collagen copolymer. The material generally has good biocompatibility and optical properties, can be well compatible with eye tissues under normal conditions, and provides clear vision correction effect for patients [14, 15]. However, in this case, a series of complications such as uveitis occurred due to the combined effect of many factors. Although the final outcome of the surgery was positive, this case provides valuable insights for ophthalmology. In future clinical practice, close attention should be paid to the eye condition of patients with high myopia after ICL implantation, particularly in special circumstances such as cold and infection. Enhanced monitoring and preventive measures are crucial to reducing the risk of complications and ensuring optimal eye health and visual recovery for patients.

Acknowledgements

This work was supported by the Lanzhou Science and Technology Planning Project (2022-3-67; 2022-3-20); Gansu Province Innovation-driven Boosting Project (GXH2024-0328-2) and Lanzhou Health and Hygiene Industry Research Project (A2024027) and Gansu Province Science and Technology Plan Project (23CXGA0115).

Disclosure of conflict of interest

None.

Address correspondence to: Jie Zhu, Department of Gastroenterology, GanSu Baoshihua Hospital, No. 733, Fuli West Road, Xigu District, Lanzhou 730060, Gansu, China. Tel: +86-0931-2377766; E-mail: shyyxhzj@126.com

References

[1] Shi M, Wei R, Zhou X and Liu S. Pharmacological accommodative changes of haptic position

and its impact on vault after ICL implantation. J Refract Surg 2025; 41: e22-e28.
[2] Qi H, Xie X and Zhang Q. Presumed atypical late-onset toxic anterior segment syndrome after implantable collamer lens implantation: a case report. BMC Ophthalmol 2024; 24: 347.
[3] Almasri GK and Pichi F. Uveitis-glaucoma-hyphema syndrome secondary to implantable collamer lens. Ocul Immunol Inflamm 2025; 33: 176-179.
[4] Karakurt Y, Aktaş N, Somuncu AM, Uğurlu A and Çiçek I. Anterior and posterior ocular changes in patients with active and inactive ankylosing spondylitis. Med Sci Monit 2025; 31: e946834.
[5] Jiang Y, Chen X, Cheng M, Li B, Lei Y, Lin IC, Xu G, Mingwei L, Zhou X and Wang X. Immediate versus delayed sequential bilateral ICL implantation: a retrospective comparison of vault height and visual outcomes. Asia Pac J Ophthalmol (Phila) 2024; 13: 100075.
[6] Martinez A, Lavergne E, Brauge C, Laveran E, Bertagnoli S, Boucraut-Baralon C and Pierre Bessière P. Feline coronavirus-associated uveitis: the eye as a gateway to systemic spread and feline infectious peritonitis? Vet Microbiol 2025; 301: 110355.
[7] Feinstein P. Rapid degradation of the human ACE2 receptor upon binding and internalization of SARS-Cov-2-Spike-RBD protein. bioRxiv [Preprint] 2024; 2024.03.07.583884.
[8] Wang S, Feng J, Zhu R, Jin X, Ding Y, Jin D, Guo Y and Zhang H. Characteristics of ocular findings of patients with coronavirus disease 2019 in China. Front Med (Lausanne) 2025; 11: 1292821.
[9] Neerukonda SN, Vassell R, Lusvarghi S, Liu S, Akue A, Kukuruga M, Wang TT, Weiss CD and Wang W. Characterization of spike S1/S2 processing and entry pathways of lentiviral pseudoviruses bearing seasonal human coronaviruses NL63, 229E, and HKU1 spikes. Microbiol Spectr 2025; 13: e0280824.
[10] Peng Y, Xiong L, Qu H, Liu Y and Wang Z. Analysis of the correlations between changes in posterior segment and anterior chamber segment after implantable collamer lens implantation in highly myopic patients. BMC Ophthalmol 2025; 25: 33.
[11] Wei R, Tang Z, Shi M, Cheng M, Cheng C, Wang X, Zhou X and Liu S. Spatial variation in ciliary body morphology and the effect on haptic position and peripheral vault after ICL implantation. J Refract Surg 2025; 41: e199-e206.
[12] Li Y, Zhang F and Xiong Y. Clinical observations of EVO-ICL implantation with single incision without viscoelastic agent. BMC Ophthalmol 2024; 24: 344.
[13] Yao J, Feng J, Li W, Liu C, Li Y and Wang X. SMILE and ICL implantation on the ocular surface and meibomian glands in patients with postoperative myopia. BMC Ophthalmol 2024; 24: 522.
[14] Soldevila A, Rojas E, Ferragut-Alegre Á and Barraquer RI. Regression of Glaukomflecken in Urrets-Zavalía syndrome after myopic ICL implantation. J Fr Ophtalmol 2024; 47: 104089.
[15] Huang T, Zhang H and Li K. Assessment of clinical efficacy and safety of ICL implantation in patients with relatively shallow anterior chamber depth in early and midterm postoperative time. Heliyon 2024; 10: e39791.