• Letter to the Editor •

Delayed endophthalmitis caused by *Gordonia bronchialis* after intraocular collamer lens implantation

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Dear Editor,

We report a case of bacterial endophthalmitis following implantation of a Staar intraocular collamer lens (ICL) caused by *Gordonia bronchialis*. ICL implantation is an effective method to correct myopia which generally offers excellent safety. There are a few reports of ocular infection caused by *Gordonia bronchialis*, but no ICL-related endophthalmitis has been reported to date. We present the first case of delayed-onset endophthalmitis after ICL implantation caused by *Gordonia bronchialis*, identified by metagenomic next-generation sequencing (mNGS). The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from the patient in the study.

A 35-year-old man complained of redness, pain, and blurred vision in the left eye for 5d after drinking and was diagnosed with "acute anterior uveitis". He underwent bilateral posterior chamber ICL implantation 3 years ago before presentation. According to his history records, the postoperative condition was unremarkable until this present.

Data were presented in Table 1. The corrected distance visual acuity (CDVA) in the left eye was 20/32. The anterior segment of the right eye was normal with a well-positioned ICL. In the left eye, slit-lamp examination showed mild conjunctival and ciliary congestion, scattered kerato-precipitates with normal fundas. Topical tobramycin and dexamethasone were applied every 2h and 1% tropicamide 4 times a day for 2d. Unexpectedly, his condition worsened 2d later in his left eye with CDVA declining to 20/200, along with ciliary congestion, 3+ anterior chamber cells with a 2 mm hypopyon, and a diffuse white granular sheet along the posterior face of the ICL. The pupil was mild-dilated due to the application of tropicamide but presented multiple posterior synechiae (Figure 1A and 1B). Fundus examination showed vitreous inflammation, and the grading of vitreous cells was 2+, while the large vessels of retina could still be obscurely observed (Figure 1C).

Results of rapid plasma reagin, T-spot, human immunodeficiency virus (HIV), rheumatoid factor, antinuclear antibody, human leukocyte antigen B27, urine test, and chest radiography presented normal totally. B-ultrasound of the left eye showed vitreous opacity without retinal detachment (Figure 1D). Ultrasound biomicroscopy (UBM) revealed the presence of granulomatous inflammation between the ciliary body and ICL (Figure 1E and 1F). He was diagnosed with infectious endophthalmitis in the left eye. An anterior chamber tap was performed to obtain an intraocular fluid sample for further tests. Gram stain smears revealed gram-positive cocci but did not identify the species. Intravenous drip and topical drugs were given accordingly including vancomycin, ceftazidime, and voriconazole. Atropine sulfate eye gel was applied meanwhile. However, his condition worsened on the next day with the left eye vision falling to counting fingers at 40 cm. Thus, a pars plana vitrectomy (PPV) with ICL removal of the left eye was performed (Figure 2A) as well as an intraocular irrigation with ceftazidime. Empirically, vancomycin was injected intravitreally at the end of the surgery.

The mNGS analysis yielded positive results for *Gordonia bronchialis* (sequence number 354, relative abundance 27.15%), No resistance genes were detected. Subsequently, the patient was proposed for a second intravitreal injection to the

Table 1 Characteristics of the patient in this visit

Parameters	OD	OS
Manifest refraction	-1.50 DS	-1.00 DS
CDVA	20/20	20/32
IOP, mm Hg	22	12
Vault, μm	470	685

CDVA: Corrected distance visual acuity; IOP: Intraocular pressure; OD: Right eye; OS: Left eye; DS: Diopter sphere.

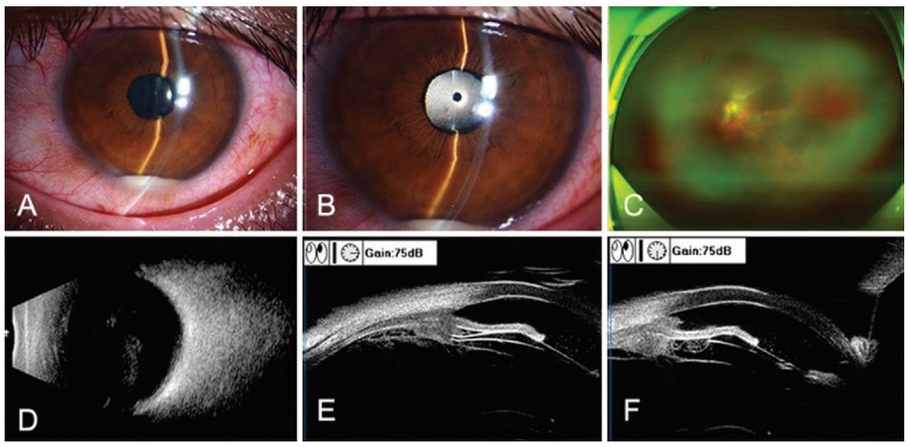

Figure 1 Clinical photographs of the left eye A: Anterior segment examination showing kerato-precipitates, moderate congestion, and hypopyon <2 mm and the ICL well centered with ideal vaulting in the left eye; B: Slit-lamp photograph showing posterior synechiae and a white granular sheet along the posterior face of the ICL; C: Posterior segment photograph showing media haze 2+; D: B-scan ultrasonography of the left eye showing dense opacities in the vitreous cavity suggestive of vitreous exudates; E, F: Ultrasound biomicroscopy showing massive exudation between iris and the intraocular lens. ICL: Intraocular collamer lens.

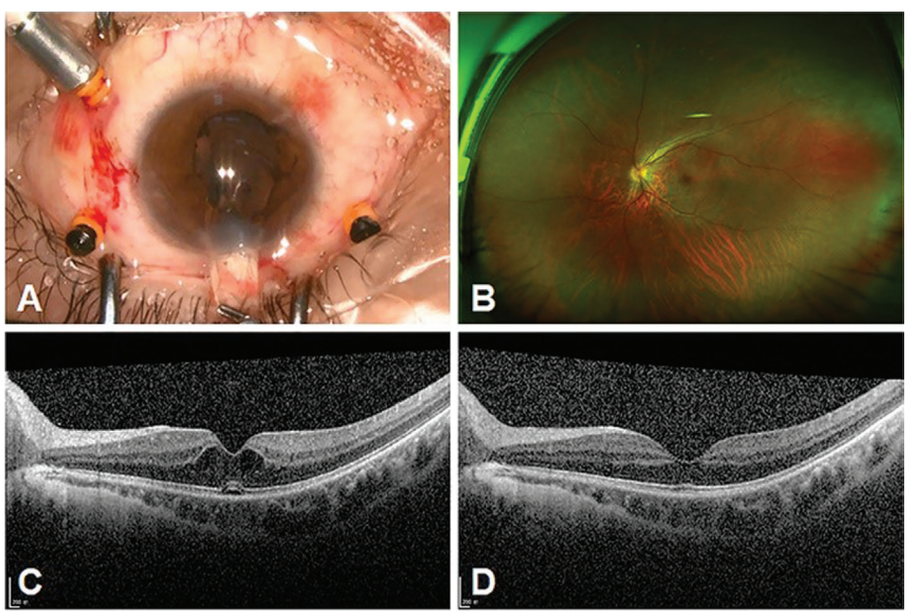

Figure 2 Macula edema after ICL explantation A: Intraoperative photograph showing removal of the ICL from the anterior segment. B: Two weeks after operation, a relatively normal fundus with clear vitreous cavity. Macula edema was not shown clearly in this image. C: Optical coherence tomography showed macula edema in the left eye. D: One week after treatment, macula edema relieved with a best corrected vision of 20/25. ICL: Intraocular collamer lens.

left eye 3d after PPV. Post-operative administration included intravenous vancomycin and ceftazidime twice/d for a week, topical levofloxacin, and tobramycin-dexamethasone eye drops 4 times/d for 4wk.

The CDVA of the left eye had improved to 20/25 and ocular inflammation resolved postoperatively 1wk. However, 4d later, his left vision declined to 20/67. Anterior chamber and vitreous inflammation were unremarkable (Figure 2B) while optical coherence tomography (OCT) revealed macular edema (Figure 2C). Accordingly, topical pranoprofen eye drops (4 times/d) were administered to the left eye, and a 14-day course of oral methylprednisolone tablets (24 mg/d) was prescribed. Encouragingly, one week later, his symptoms were relieved (Figure 2D). His left eye CDVA had improved to 20/25 and demonstrated a good prognosis after the 5-month follow-up exam.

Endophthalmitis is an extraordinarily rare but devastating complication after ICL implantation. In 2013, Couto *et al*[1] reported a chronic postoperative *Mycobacterium gordonae* endophthalmitis in a patient with angle-supported anterior chamber intraocular phakic lens. From previous studies, the endophthalmitis rate after ICL implantation has been reported as 0.0167%[2]. Of the cases reported, infections mostly occurred in the early stage postoperatively (within 1wk), and

were generally correlated to incision leakage or intraocular lens contamination.

To our knowledge, this is the first published report of delayed-onset endophthalmitis caused by *Gordonia bronchialis* that happened 38mo after ICL implantation, longer than any other case reported before, and was identified by mNGS.

Gordonia bronchialis is a Gram-positive bacterium belonging to the genus Gordonia. It is generally found in natural environments and can infect patients with immune deficiency and normal immunity. Human infections are rare. Cases of infections caused by this pathogen reported are numbered, even fewer ocular infections. Among those published clinical reports, most of them are intravascular catheter or bloodstream-related with most patients in an immunocompromised status[3-5]. Up to now, only 2 cases of endophthalmitis caused by this bacterium have been published. The first case is a post-traumatic endophthalmitis after an intraocular foreign body extraction[6]. The second described a chronic infectious endophthalmitis after cataract surgery with an intraocular lens implant[7]. It's worth noting that, in the second case, there were 2.5y between cataract surgery and the onset of endophthalmitis. By comparison, in our case, the interval time is longer for up to 3.2y. Besides, our patient was young and in good health status while the one reported before was older (63-year-old) with multiple underlying systemic disorders.

In this case, we performed a combined treatment strategy including anti-microorganism application, vitrectomy, and ICL explanation, which achieved a satisfactory outcome. Nevertheless, macular edema occurred 10d after PPV, hindering the course of treatment. We speculated that was probably caused by the initial intraocular injection of cephalosporins and the conventional secondary reaction of endophthalmitis. As for the patient is eager for visual rehabilitation, we planned an ICL implantation after total stabilization of his condition in order to avoid anisometropia.

It is well known that rapid identification of pathogens plays a decisive role in the treatment of infectious diseases. *Gordonia bronchialis* infection usually lacks specific clinical manifestation and is sometimes indistinguishable from fungi infection which also presents a subacute or chronic course. So, we cannot rule out the probability of viral or fungal infection initially. Not until the mNGS analysis confirmed the pathogen, there was no definitive test that could reveal the cause of this disease.

A noteworthy point in this case is the application of mNGS technology. Traditional culturing is relatively difficult to identify this pathogen. In the 2 previous cases of *Gordonia bronchialis* related endophthalmitis, pathogens were both detected by 16s-rRNA. By contrast, NGS has greater advantages in species identification, and relatively higher accuracy in function prediction and antibiotic resistance analysis[8]. In 2014, the NEJM published a case in which mNGS was used to diagnose meningitis infection, ushering in a new era of precision diagnosis and treatment of infectious diseases[9]. mNGS has advantages in detection accuracy and diagnosis of unexplained infections compared with traditional detection techniques[10]. Nevertheless, there's no denying that the cost of mNGS is much higher than 16s-rRNA sequencing. Considering endophthalmitis is a severe vision-threatening disease, especially with an unknown pathogen, NGS should be still taken into consideration for an accurate and rapid diagnosis.

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