cases of nodular scleritis or uveitis. Acid-fast staining and specific culture are recommended. Next-generation sequencing is helpful to identify the organism sensitively and quickly. Considering the detrimental outcomes, timely diagnosis and combined treatment are quite important to prevent the loss of vision and eye.

Xiaofei Chen, MD
Xiaoying Pan, BS
Jian Zhu, MD
Tiecheng Liu, MD

Author Affiliations: Senior Department of Ophthalmology, Third Medical Center of Chinese PLA General Hospital, Beijing, China (Chen, Pan, Liu); Department of Rheumatism and Immunology Department, First Medical Center of Chinese PLA General Hospital, Beijing, China (Zhu).

Corresponding Author: Tiecheng Liu, MD, Senior Department of Ophthalmology, Third Medical Center of Chinese PLA General Hospital, No. 28 Fuxing Rd, Beijing 100039, China (ltc301@sina.com).

Published Online: April 20, 2023. doi:10.1001/jamaophthalmol.2023.0955

Conflict of Interest Disclosures: None reported.

Additional Contributions: We thank the patient for granting permission to publish this information.

1. Novotny L, Dvorska L, Lorencova A, Beran V, Pavlik I. Fish: a potential source of bacterial pathogens for human beings. *Vet Med*. 2004;49:343-358. doi:10.17221/5715-VETMED

2. Rallis E, Koumantaki-Mathioudaki E. Treatment of *Mycobacterium marinum* cutaneous infections. *Expert Opin Pharmacother*. 2007;8(17):2965-2978. doi:10.1517/14656566.8.17.2965

3. Shinoda K, Yagura K, Matsumoto S, Terauchi G, Mizota A, Miyake Y. Intraocular temperature at different sites in eye measured at the beginning of vitreous surgery. *J Clin Med*. 2021;10(15):3412. doi:10.3390/jcm10153412

4. Kheir WJ, Sheheitli H, Abdul Fattah M, Hamam RN. Nontuberculous mycobacterial ocular infections: a systematic review of the literature. *Biomed Res Int*. 2015;2015:164989. doi:10.1155/2015/164989

5. Schönherr U, Naumann GO, Lang GK, Bialasiewicz AA. Sclerokeratitis caused by *Mycobacterium marinum*. *Am J Ophthalmol*. 1989;108(5):607-608. doi:10.1016/0002-9394(89)90449-2

6. David DB, Hirst LW, McMillen J, Whitby M. *Mycobacterium marinum* keratitis: pigmentation a clue to diagnosis. *Eye (Lond)*. 1999;13(pt 3a):377-379. doi:10.1038/eye.1999.98

Compound Heterozygous *LTBP2* Mutations Associated With Juvenile-Onset Open-Angle Glaucoma and Marfan-Like Phenotype

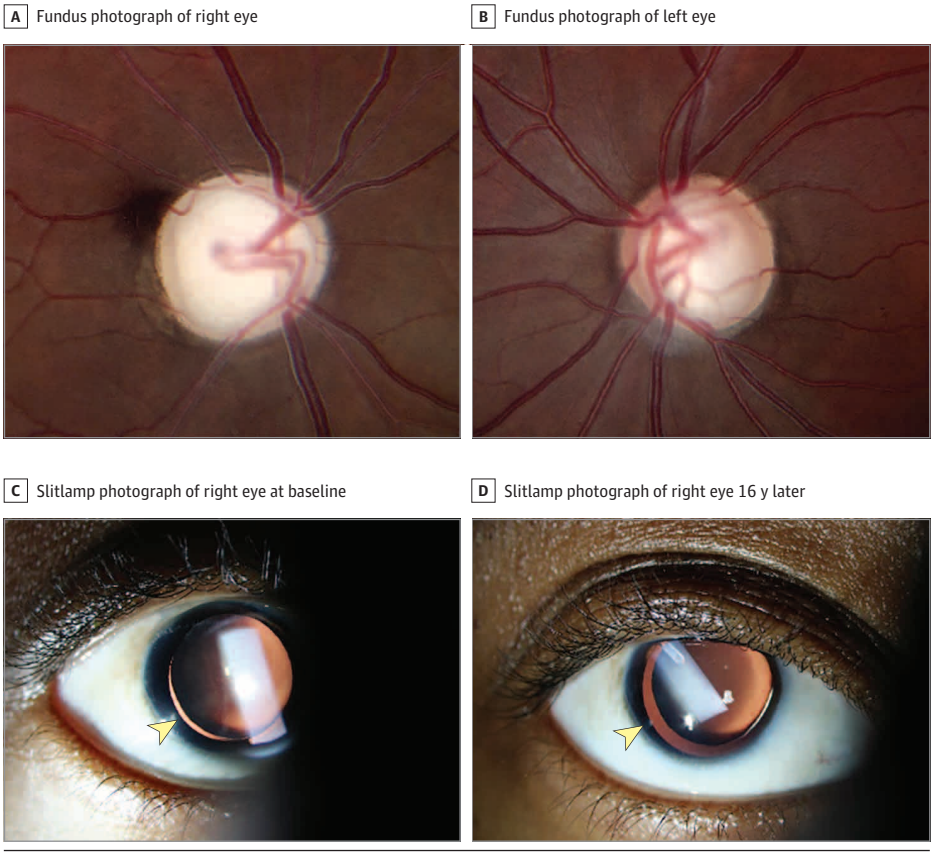
The gene encoding latent transforming growth factor β binding protein 2 (*LTBP2*) has been implicated in the development of primary congenital glaucoma (PCG) and other developmental glaucomas.[1] Mutations in *LTBP2* causing PCG have been identified in consanguineous families, suggesting an autosomal recessive inheritance pattern.[2,3] Ocular phenotypes associated with *LTBP2* mutations include goniodysgenesis resulting in elevated intraocular pressure (IOP) and glaucomatous optic nerve damage, lens instability or dislocation, and high myopia.[2,3] We present a young patient carrying compound heterozygous mutations in *LTBP2* leading to juvenile-onset glaucoma and other ocular sequelae.

Report of a Case | The patient is a 32-year-old female whose race she self-reported as African American. At age 13 years, she was diagnosed with glaucoma with elevated IOP, which was managed by bilateral trabeculectomy. Approximately 4 years later, significantly elevated IOP in both eyes was detected accompanied by severe cupping and open iridocorneal angle in each eye (**Figure 1**A and B). She had no evidence of Haab striae, buphthalmos, or high iris insertion suggestive of PCG. Ultimately, she required bilateral glaucoma tube shunt implantation. Subtle lens dislocation superonasally in the right eye was observed at her initial visit at age 17 years, which slowly progressed over a 16-year period (Figure 1C and D). At age 32 years, she developed lens dislocation in the left eye.

Given the constellation of taller stature than her relatives (180.4 cm) (**Figure 2**), long fingers, and dislocated lens, a connective tissue disorder was suspected, especially Marfan syndrome, and the patient underwent cardiac and genetic evaluation. Serial echocardiograms failed to reveal any abnormalities, but hypermobility of the shoulders, digits, and knees was observed. A comprehensive connective tissue genetic testing panel including 92 genes (Invitae) revealed 2 heterozygous variants in the *LTBP2* gene (c.709C>T p.Arg237* and c.3776-1G>C splice acceptor), not previously reported in gnomAD (0.00%) or other publications. A complete family history was negative for similar findings. Cascade testing of the patient's 2 children with normal ocular examination results at age 4 years and 10 years revealed 1 child carrying each variant, consistent with transheterozygous mutations responsible for the patient's predominantly ocular and mild systemic phenotypic manifestations.

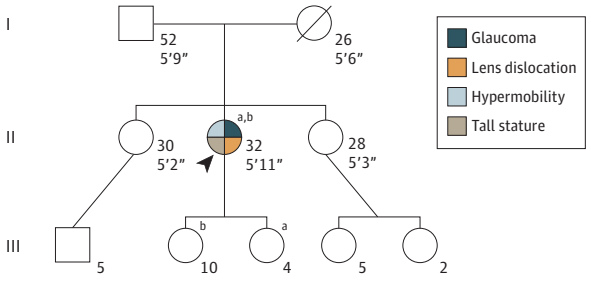
Discussion | *LTBP2* is expressed in ocular tissues that regulate IOP, including the trabecular meshwork and ciliary body.[4] Homozygous *LTBP2* mutations in a domestic cat population caused elevated IOP, globe enlargement, and elongated ciliary processes, similar to human PCG. Subtle lens dislocation with zonular instability was common, though complete ectopia lentis occurred in less than 10% of the animals.[5] In humans, homozygous *LTBP2* mutations have similarly been associated with megalocornea, ectopia lentis, and myopia.[3] Although glaucoma and ectopia lentis associated with *LTBP2* mutations have been reported, the cause of glaucoma is often attributed to ectopia lentis. Biallelic mutations in the *LTBP2* gene have been associated with microspherophakia and early ectopia lentis in patients with a Marfan-like phenotype (tall stature, high-arched palate, long arm span) and later secondary glaucoma development.[3] This patient presented with severe bilateral optic nerve cupping and subtle dislocated lens only in 1 eye. Over more than a decade, we detected slow progression of lens dislocation in 1 eye and also recently detected subtle dislocated lens in the other eye. Careful longitudinal observation suggests that glaucoma development is independent of dislocated lens. Compound heterozygous mutations in *LTBP2* have previously been reported in a patient with juvenile open-angle glaucoma.[6] However, this patient had isolated ocular pathology with no other systemic findings. Our report highlights the pluripotent functions of *LTBP2* in the eye as well as systemically. Identifying patients who carry these mutations is important

Figure 1. Fundus and Slitlamp Photographs Demonstrating Optic Severe Nerve Cupping in Each Eye and Progressive Ectopia Lentis in the Right Eye



Fundus photographs of the right eye (A) and left eye (B) showing substantial optic nerve cupping and loss of neural rim tissue at age 17 years. Slitlamp photographs of the right eye (C and D) demonstrating progressive superonasal dislocation of the native lens over more than a decade (arrowhead).

Figure 2. Three-Generation Pedigree Demonstrating Compound Heterozygous *LTBP2* Mutations Causing Ocular and Systemic Phenotypes



Open squares and open circles denote self-reported male and female individuals with normal phenotype, respectively; the slashed circle denotes a deceased individual. The age in years and height in feet and inches of each individual in the first and second generations are shown next to each symbol, as well as the age in years of individuals in the third generation. Phenotypes are illustrated with different colors above the pedigree. Genotypes of the patient and her 2 children are denoted.

[a] c.709C>T.

[b] c.3776-1G>C.

not only for close monitoring of the development of ocular and systemic sequelae, but also for family screening and genetic counseling.

Zachary Bergman, MD, MPH
Katherine Anderson, ScM
Rachel W. Kuchtey, MD, PhD

Author Affiliations: Vanderbilt Eye Institute, Department of Ophthalmology and Visual Sciences, Vanderbilt University Medical Center, Nashville, Tennessee (Bergman, Kuchtey); Vanderbilt Heart and Vascular Institute, Division of Cardiovascular Medicine, Vanderbilt University Medical Center, Nashville, Tennessee (Anderson); Department of Molecular Physiology and Biophysics, Vanderbilt University, Nashville, Tennessee (Kuchtey).

Corresponding Author: Rachel W. Kuchtey, MD, PhD, Vanderbilt Eye Institute, 2311 Pierce Ave, Nashville, TN 37232 (rachel.w.kuchtey@vumc.org).

Published Online: May 11, 2023. doi:10.1001/jamaophthalmol.2023.1488

Conflict of Interest Disclosures: None reported.

Additional Contributions: We thank the patient for granting permission to publish this information.

1. Ali M, McKibbin M, Booth A, et al. Null mutations in LTBP2 cause primary congenital glaucoma. *Am J Hum Genet*. 2009;84(5):664-671. doi:10.1016/j.ajhg.2009.03.017

2. Azmanov DN, Dimitrova S, Florez L, et al. LTBP2 and CYP1B1 mutations and associated ocular phenotypes in the Roma/Gypsy founder population. *Eur J Hum Genet*. 2011;19(3):326-333. doi:10.1038/ejhg.2010.181

3. Désir J, Sznajer Y, Depasse F, et al. LTBP2 null mutations in an autosomal recessive ocular syndrome with megalocornea, spherophakia, and secondary glaucoma. *Eur J Hum Genet*. 2010;18(7):761-767. doi:10.1038/ejhg.2010.11

4. Shi Y, Jones W, Beatty W, et al. Latent-transforming growth factor beta-binding protein-2 (LTBP-2) is required for longevity but not for development of zonular fibers. *Matrix Biol*. 2021;95:15-31. doi:10.1016/j.matbio.2020.10.002

5. Kuehn MH, Lipsett KA, Menotti-Raymond M, et al. A mutation in LTBP2 causes congenital glaucoma in domestic cats (Felis catus). *PLoS One*. 2016;11(5): e0154412. doi:10.1371/journal.pone.0154412

6. Saeedi O, Yousaf S, Tsai J, Palmer K, Riazuddin S, Ahmed ZM. Delineation of novel compound heterozygous variants in LTBP2 associated with juvenile open angle glaucoma. *Genes (Basel)*. 2018;9(11):527. doi:10.3390/genes9110527

Chronic Purulent Conjunctivitis Associated With Extensively Drug-Resistant *Pseudomonas aeruginosa*

Pseudomonas aeruginosa is an opportunistic, gram-negative bacterium known to cause severe infection in susceptible hosts through its ability to form biofilms and secrete virulence factors. The World Health Organization has classified carbapenem-resistant *P aeruginosa* as a bacterium of critical priority for the development of new treatments.[1]

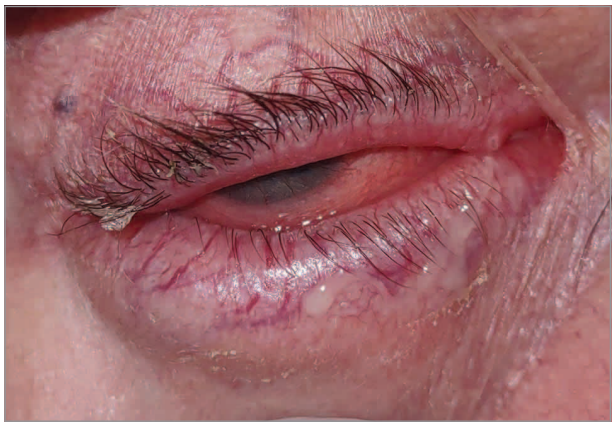
P aeruginosa is not typically encountered on the ocular surface[2] but when present can lead to conjunctivitis or liquefactive keratitis.[3] The Centers for Disease Control and Prevention (CDC) recently released a statement alerting ophthalmologists to an outbreak of carbapenem-resistant *P aeruginosa*.[4] Since the first known case in May 2022, the CDC has identified 64 resistant *P aeruginosa* infections in 13 states, 14 of which were isolated in corneal tissue and several linked to EzriCare artificial tears.[5] We present a case of purulent conjunctivitis associated with extensively drug-resistant *P aeruginosa* that is likely related to this outbreak.

Report of a Case | A 79-year-old man with paraplegia, neurogenic bladder, and chronic urinary tract infection (UTI) presented in August 2022 after 4 months of right eye redness, discharge, pain, and decreased vision. He had already been using topical moxifloxacin, bacitracin-polymyxin ointment, and antibacterial Avenova spray each 4 times daily in his right eye for chronic conjunctivitis.

On examination, his best-corrected visual acuity was 20/200 OD and 20/25 OS with normal intraocular pressures. His right eye had copious mucopurulent discharge, 3+ conjunctival hyperemia, and prominent palpebral papillae (**Figure**). The corneal epithelium was intact but diffusely hazy with punctate epithelial erosions identified with fluorescein. The anterior chamber was deep and quiet, and there was a limited view to his fundus. His left eye was unremarkable. Gram stain and cultures of the mucopurulent discharge were collected by inferior fornix swab, and the patient was admitted to the hospital. Hourly topical fortified vancomycin (2.5%) and ceftazidime (5%) were started, and intravenous meropenem was given for his chronic UTI. An orbit computed tomography scan showed normal lacrimal system and sinuses. Cultures speciated *Staphylococcus aureus* resistant to penicillin. The patient's right eye improved marginally over the 3-day hospital course, and he was discharged with a regimen of fortified vancomycin every 2 hours, saline irrigation, tobramycin/dexamethasone ointment nightly, and oral amoxicillin/clavulanic acid.

Biweekly follow-up examinations remained stable with 20/200 OD and continued 3+ conjunctival hyperemia and mucopurulent discharge with intact corneal epithelium. One month after discharge, he was readmitted for increased pain. Repeat conjunctival cultures demonstrated *P aeruginosa* resistant to all antibiotics except piperacillin/tazobactam, with a minimum inhibitory concentration of 16 µg/mL. This result was reported to the CDC. Intravenous piperacillin-tazobactam and tobramycin were added, and topical trimethoprim/polymyxin 4 times a day, tobramycin and vancomycin every 2 hours, prednisolone 4 times a day, and nightly tobramycin/dexamethasone were continued. After 10 days, a new infiltrate was noted with 10% thinning. Topical and intravenous antibiotics were stopped, and oral doxycycline, 100 mg twice a day, and vitamin C, 2 g per day, topical cyclosporine, 0.05%, and preservative-free lubrication were started to slow corneal thinning. Povidone-iodine flushes (2.5%) were initiated with marginal improvement of the mucopurulent discharge. Three separate conjunctival cultures demonstrated extensively resistant *P aeruginosa*. He was discharged with this regimen with minimal improvement. At his last visit nearly 9 months after onset of the conjunctivitis and 5 months after we initially saw him, the visual acuity in his right eye degraded to light perception with continued severe hyperemia, purulent discharge, and diffusely hazy cornea. He was awaiting evaluation with a corneal specialist at an academic center.

Figure. Mucopurulent Discharge, Conjunctival Hyperemia, and Corneal Haze in the Patient's Right Eye



There was fluctuation in the discharge throughout his course, but the gross appearance of the eye did not significantly change despite intensive topical and systemic antibiotics.

Discussion | Antibiotic resistance poses an increasing threat to treatment options for ocular infections with high risk for vision loss. This case highlights an example of an ocular surface infection associated with vision loss that intensive topical and systemic therapies have failed to resolve, with the term *extensively resistant* denoting lack of sensitivity to at least 1 antimicrobial in all but 1 category.[6] This patient's specific risk factors included age, chronic UTI, and preceding topical and systemic antibiotic use, which likely altered ocular surface flora. As drug resistance spreads, it remains to be determined whether cutoffs for systemic antibiotic minimum inhibitory