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Case report

Severe bilateral descemetoceles in Alpha-1 antitrypsin deficiency

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ABSTRACT

Purpose: To report a case of severe bilateral descemetoceles in a patient with alpha-1 antitrypsin (A1AT) deficiency during intensive care unit hospitalization.

Observations: A 42-year-old male presented with sub-acute bilateral vision loss during an intensive care unit hospitalization following liver and kidney transplantations. On exam, this patient's best-corrected visual acuity was 20/80 in both eyes. There were bilateral descemetoceles inferotemporally in both eyes with overlying epithelial defects and dense surrounding punctate epithelial staining. The patient was initially treated with gatifloxacin drops and frequent lubricating ointment. Given the concern for impending perforation, cyanoacrylate glue with bandage contact lens was applied to both eyes. His best corrected visual acuity remained unchanged in the right eye and improved to 20/30 in the left eye. Upon medical stabilization, anterior lamellar graft was performed in the right eye, with plans for the same treatment in the left eye in the future.

Conclusions: As A1AT is found in the tear film and is believed to play a role in regulating protease activity in the cornea, we hypothesize that this patient's A1AT deficiency exacerbated the progression of corneal ulceration leading to severe descemetocele formation.

1. Introduction

Alpha-1 antitrypsin (A1AT) deficiency is an inherited disorder in which impaired production of A1AT, a protease inhibitor, leads to pulmonary emphysema and liver cirrhosis from unregulated tissue breakdown and the deposition of abnormal A1AT.[1] A1AT is also present in the tear film and has been shown to regulate proteolytic degradation within the cornea.[2] We present a case of a patient with A1AT deficiency who developed severe bilateral descemetoceles during intensive care unit hospitalization.

2. Case report

A 42-year-old male with a history of alpha-1 antitrypsin deficiency, liver cirrhosis, end-stage renal disease, Moyamoya disease, type 2 diabetes mellitus with mild non-proliferative retinopathy, hypertension, hyperlipidemia, and peripheral vascular disease complained of blurred vision in both eyes. The ophthalmology service at our tertiary care hospital was consulted. The patient had undergone a combined liver and kidney transplantation 2 weeks prior with a complicated post-operative course in the intensive care unit requiring re-intubation for respiratory distress and gastrointestinal bleeding. Upon re-extubation 5 days later, he complained of blurred vision and ocular irritation bilaterally. On his initial bedside exam, he had best-corrected visual acuities of 20/80 in both eyes. Slit lamp exam revealed descemetoceles inferotemporally bilaterally measuring about 1.5 × 1.5 mm in the right eye and 3.2 × 2.4 mm in the left eye. There was no overlying epithelium and the epithelial defect extended to the adjacent stroma surrounding the descemetoceles. The anterior chamber was deep and formed in both eyes. Fundoscopy exam showed mild nonproliferative diabetic retinopathy.

The patient was medically unstable and limited therapeutic options were feasible. The patient was initially treated with gatifloxacin drops, erythromycin ointment, and aggressive lubrication in both eyes. Cyanoacrylate glue was then applied to both descemetoceles at the bedside after 5 days and bandage contact lenses were placed. A bedside tarsorrhaphy was attempted 1 week following initial presentation, but the patient was unable to tolerate the procedure. The patient was monitored carefully throughout the remainder of his hospitalization.

Upon discharge, the patient followed up in our clinic. At 1 month following initial presentation, the glue and contact lenses were absent. The descemetoceles had re-epithelialized and appeared stable in size, measuring 1.5 × 1.5 mm in the right eye and 3.2 × 2.4 mm in the left eye (Fig. 1). Surgical intervention was discussed and planned as soon as

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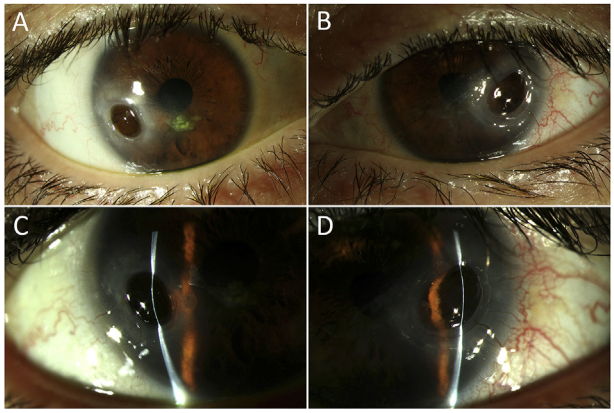

Fig. 1. Slit lamp photographs of the right eye (upper and lower left) and left eye (upper and lower right) show large descemetoceles at 1 month following initial presentation.

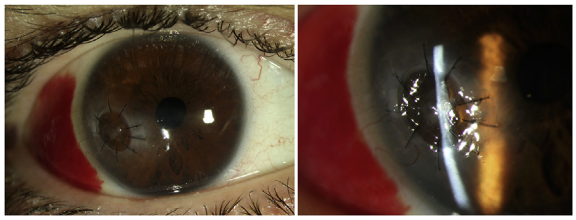

Fig. 2. Right eye after tectonic keratoplasty.

the transplant team deemed the patient medically optimized. Over the course of the next several months while the patient slowly recovered from his transplant surgery and associated complications, his best-corrected visual acuity remained around 20/80–20/100 in his right eye and improved to 20/30 in his left eye. Gradually, the descemetocele in the right eye increased in size to 2.4 × 2.4 mm, while the descemetocele in the left eye remained stable in size. It is unclear why the right descemetocele increased in size when the patient's condition appeared stable. Given the progression in the right eye as well as the patient's desire to perform surgery in the eye with poorer vision first, surgery in the right eye was recommended first. Once the patient was cleared for surgery, a tectonic anterior lamellar keratoplasty was performed in the right eye, with future plans to perform tectonic keratoplasty in the left eye (see Fig. 2).

3. Discussion

Alpha-1 antitrypsin is a protease inhibitor that is synthesized by the liver and serves to protect tissue and oppose digestion of proteins by enzymes such as neutrophil elastase, collagenase and trypsin. A1AT deficiency is a hereditary condition that causes abnormal protein folding and accumulation of A1AT in the liver, resulting in low serum levels of A1AT and predisposing to liver cirrhosis, pulmonary emphysema, panniculitis and vasculitis.[1] In the eye, A1AT has been shown to be present in the tear film, aqueous humor and cornea, where it plays an important role in maintaining the structural integrity and transparency of the cornea by preventing proteolysis of structural proteins, including collagen and proteoglycans.[2–4] The role of A1AT may be especially critical in the body's defense against corneal ulceration in conditions such as infectious keratitis, in which neutrophil elastase and other enzymes are released by inflammatory mediators and break down stromal collagen and proteoglycans.[5] Interestingly, levels of A1AT are reduced in the cornea of keratoconus patients, further supporting its role in maintaining the structural integrity of the cornea and possibly preventing corneal ectatic disease.[6,7]

Individuals with A1AT deficiency have also been found to have decreased A1AT levels in the tear film.[8,9] Manners et al. reported a case of a 5-year-old female with A1AT deficiency that presented with corneal ulceration and scarring after recurrent lower lid styes.[8] Here we report a case of severe bilateral descemetoceles in a critically ill patient with A1AT deficiency. While critically ill patients can develop corneal ulceration and descemetoceles, it would be unusual for a patient without any predisposing factors or exposure to develop such severe, bilateral descemetoceles. We believe that their development and progression was mediated by his underlying genetic condition, in which abnormally low levels of A1AT permitted the unopposed action of proteolytic enzymes to cause accelerated destruction of the corneal stromal matrix. It is possible that his 5 days of intubation may have been associated with exposure keratopathy that contributed to the disruption of the corneal, although this is uncertain, as he did not have lagophthalmos upon presentation to our service. The operative and anesthesia notes from the liver and kidney transplantation were reviewed and the eyes were protected and patched during the entire surgery. Of note, this patient was diagnosed with Moyamoya disease during this admission after his brain MRI showed marked stenosis and irregularity of bilateral intracranial internal carotid arteries and bilateral anterior cerebral arteries. While unclear what role, if any, this may have contributed in the development of his descemetoceles, there have been reports of carotid artery stenosis leading to corneal and scleral melts.[10,11] Ultimately, multiple underlying factors may have led to an increased susceptibility to epithelial and stromal degradation in this patient.

4. Conclusions

Systemic deficiency of alpha-1 antitrypsin, a protease inhibitor, classically results in liver cirrhosis, pulmonary emphysema and vasculitis. This report presents a case of severe bilateral descemetoceles in a patient with alpha-1 antitrypsin deficiency, highlighting the role of alpha-1 antitrypsin in regulating and preventing keratolysis and collagen breakdown of the cornea. It is thus advisable that patients with alpha-1 antitrypsin deficiency receive close ophthalmologic follow-up for new corneal epithelial defects or ulcers, especially in conditions that may increase risk of corneal epithelial breakdown such as in exposure keratopathy during prolonged hospitalizations.

5. Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Conflicts of interest

The following authors have no financial disclosures: JM, JB.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajoc.2019.100513.

References

1. Stoller JK, Aboussouan LS. A review of alpha1-antitrypsin deficiency. *Am J Respir Crit Care Med.* 2012;185:246–259.
2. JU Prause. Serum albumin, serum antiproteases and polymorphonuclear leucocyte neutral collagenolytic protease in the tear fluid of patients with corneal ulcers. *Acta Ophthalmol.* 1983;61:272–282.
3. Twining SS, Fukuchi T, Yue BY, Wilson PM, Boskovic G. Corneal synthesis of alpha 1-proteinase inhibitor (alpha 1-antitrypsin). *Investig Ophthalmol Vis Sci.* 1994;35:458–462.
4. Ando H, Twining SS, Yue BY, et al. MMPs and proteinase inhibitors in the human aqueous humor. *Investig Ophthalmol Vis Sci.* 1993;34:3541–3548.
5. Slansky HH, Dohlman CH. Collagenase and the cornea. *Surv Ophthalmol.* 1970;14:402–415.
6. Sawaguchi S, Twining SS, Yue BY, Wilson PM, Sugar J, Chan SK. Alpha-1 proteinase inhibitor levels in keratoconus. *Exp Eye Res.* 1990;50:549–554.
7. Ahn CS, McMahon T, Sugar J, Zhou L, Yue BY. Levels of alpha1-proteinase inhibitor and alpha2-macroglobulin in the tear film of patients with keratoconus. *Cornea.* 1999;18:194–198.
8. Manners RM, Donaldson ML, Low C, Fenton PJ. Corneal ulceration in a patient with alpha 1 antitrypsin deficiency. *Br J Ophthalmol.* 1994;78:653–654.
9. Berman MB, Barber JC, Talamo RC, Langley CE. Corneal ulceration and the serum antiproteases. I. Alpha 1-antitrypsin. *Investig Ophthalmol.* 1973;12:759–770.
10. Stewart RM, Quah SA, Nguyen DQ, Kaye SB. Conjunctival-corneal melt in association with carotid artery stenosis. *Clin Ophthalmol.* 2008;2:649–655.
11. Schotveld JH, Beerthuizen JJ, Zaal MJ. Scleral melting in a patient with carotid artery obstruction. *Cornea.* 2006;25:101–103.