Anterior Segment Optical Coherence Tomography Findings of Acute Hydrops in a Patient With Keratoconus

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ABSTRACT
The authors describe the anterior segment optical coherence tomography (AS-OCT) findings of a 25-year-old patient with acute hydrops associated with keratoconus. The patient presented with decreased visual acuity, pain, and redness in the left eye. The symptoms, clinical presentation, and topographical findings of the right eye confirmed this condition to be acute corneal hydrops. The patient was closely followed up with hyper-osmotic (NaCl 5%) and nonsteroidal anti-inflammatory (ketorolac tromethamine 0.5%) topical treatment. At the initial examination and during follow-up, the evaluation of the anterior segment was performed using optical coherence tomography. Changes in the stroma and Descemet's membrane during the healing process of acute hydrops could be demonstrated by high-resolution AS-OCT. [Ophthalmic Surg Lasers Imaging 2010;41:S114-S116.]

INTRODUCTION
Acute hydrops is a rare complication of keratoconus that is caused by a rupture in Descemet's membrane. This rupture causes endothelial dysfunction and/or absence that allows aqueous humor to enter the corneal stroma and results in intrastromal edema and clefts. Patients often present with spontaneous onset of pain, photophobia, and blurred vision; eye rubbing and allergy may be risk factors. This condition can also be seen in patients with pellucid marginal degeneration.2

We describe a case of acute hydrops associated with keratoconus in which we investigated the corneal morphology by anterior segment optical coherence tomography (AS-OCT).

CASE REPORT
A 25-year-old man was referred to our University Eye Clinic with complaints of spontaneous sudden onset of pain, decrease of vision, epiphora, and photophobia of the left eye. He had been diagnosed as having keratoconus 18 months prior. The slit-lamp findings from September 2007 revealed Vogt stria, Munson's sign, and apical scar of the left cornea; the patient was contact lens intolerant and scheduled for keratoplasty at that time. The ophthalmological examination from January 2009 included autorefraction, uncorrected visual acuity (UCVA), best spectacle-corrected visual acuity, intraocular pressure, slit-lamp examination, and dilated fundus examination. The follow-up examinations were performed monthly. The best spectacle-corrected visual acuity of the right eye was 20/30, whereas UCVA of the left eye was hand motions and could not be raised by correction.

Slit-lamp examination of the left eye revealed a central edematous corneal hydrops (Fig. 1). One month later, the UCVA increased to counting fingers from 15 cm; the edematous zone had decreased in diameter and the subjective complaints of the patient regarding pain had decreased. The patient did not come to his regular examination in the following month for personal reasons. Three months later, the UCVA of the left eye had
Increased to counting fingers from 30 cm and the hydrops had become smaller in diameter. A full ophthalmological examination, photodocumentation of the anterior segment, and anterior segment optical coherence tomography (AS-OCT) were performed at each visit. Intrastromal confluent pseudocysts could be demonstrated in high-resolution cornea images by the Visante OCT (Carl Zeiss Meditec, Inc., Dublin, CA) (Fig. 2).

DISCUSSION

AS-OCT is a new imaging technique that allows cross-sectional, clear visualization and accurate in-depth imaging of the anterior segment, enabling qualitative and quantitative analysis of the corneal layers at different levels, especially when the cornea is opaque. High-resolution corneal images can be recorded in any desired meridian by Visante OCT, enabling us to evaluate the posterior cornea that cannot be otherwise thoroughly visualized. This modality improved our evaluation of the posterior corneal morphology that was not visible by the slit-lamp examination. Imaging of Descemet’s membrane detachment using AS-OCT has been reported previously. In our case, AS-OCT demonstrated the detailed structure of intrastromal clefts in high-resolution corneal images. During follow-up, it was especially valuable in evaluating the thinnest part of the cornea that carries perforation risk. This portion of the cornea was previously defined as descemetocele. We measured the thickness of this vulnerable location of the cornea that consisted of intact epithelium and a narrow band of anterior stroma as 150 microns by the calipers of Visante OCT (Fig. 1A). We would suggest the term epitheliocele instead of descemetocele for the description of this lesion.
because it does not contain the Descemet’s membrane at that location.

The pathophysiology and healing process of acute hydrops was not well understood until recently. It has been suggested that a large central Descemet rupture causes sudden influx of aqueous humor into the stroma, creating pocket-like cystic formations (pseudocysts) that may reach the corneal surface. High-resolution AS-OCT also highlighted the biomechanism of acute hydrops. We were able to demonstrate the central rupture in the Descemet’s membrane and could follow up its natural healing process. The central defect was polygonal rather than linear and became smaller, similar to the healing of epithelial defects of the cornea but more slowly (Figs. 2 and 3). This is probably due to the slow formation and repair of the Descemet’s membrane by endothelial cells. The defect in Descemet’s membrane gets smaller at the same time the edematous zone in the anterior cornea gets smaller in diameter. But there may be variation in the area of the cornea actually scanned due to the centralization of the affected area; therefore, we may not be able to scan the same cross-section at every examination.

Corneal perforation is a rare complication of acute hydrops that has been reported previously. Aldave et al. reported 3 cases with spontaneous perforation in acute hydrops, but they also mentioned that this condition is typically self-limited in most of the cases and resolves over a period of 6 to 10 weeks as endothelial cells migrate over the exposed stroma forming a thin portion of Descemet’s membrane.

In our opinion, high-resolution AS-OCT may be helpful in predicting a possible spontaneous perforation that fortunately did not occur in this patient. This imaging technique is supportive in close follow-up of patients with imminent perforation.

High-resolution AS-OCT is efficient in determining the detailed structure of corneal changes and biomechanism causing acute hydrops in keratoconus.

REFERENCES