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

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ABSTRACT
In this case report, the anterior segment optical coherence tomography (AS-OCT) findings of a 25-year-old patient with acute hydrops associated with keratoconus are described. The patient presented to our ophthalmology department in Turkey 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 observed with hyper-osmotic (NaCl 5%) and non-steroidal 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 (Visante OCT; Carl Zeiss Meditec, Inc., Dublin, CA). By high-resolution AS-OCT, the changes in the stroma and Descemet’s membrane during the healing process of acute hydrops were demonstrated.

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 allowing aqueous humor to enter the corneal stroma that results in intrastromal edema and clefts. The 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.

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 patient 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 previously as 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 (BSCVA), intraocular pressure (IOP), slit-lamp examination and dilated fundus examination. The follow-up examinations were performed monthly. The BSCVA of the right eye was 20/30 whereas UCVA of the left eye was hand motion 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 exami-
nation 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. At each visit a full ophthalmological examination, photodocumentation of the anterior segment and AS-OCT were performed. Intrastromal confluent pseudocysts could be demonstrated in high-resolution cornea images by the Visante OCT (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. By Visante OCT, high-resolution corneal images can be recorded in any desired meridian 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 by 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 is defined as descemetocele previously by other authors. 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

![Figure 1. Appearance of acute hydrops in keratoconus by slit-lamp examination at presentation.](image)

![Figure 2. Anterior segment optical coherence tomography (AS-OCT) images of acute hydrops in chronological order. The findings were similar in 4 quadrants therefore only horizontal images have been presented for comparison. (a) High resolution corneal image on horizontal meridian at presentation. A large defect in the Descemet’s membrane is noticeable. There are numerous stromal pseudocysts with different sizes having contact with each other in a petaloid pattern. White arrow indicates the thinnest part of the cornea—the epitheliocele. The diameter of the edematous zone in the cornea was measured as 6.03 mm; the thickness was 1.61 mm. (b) AS-OCT image of the eye one month later. The pseudocysts in the anterior stroma tend to coalesce and form a big conical pseudocyst posteriorly. The epitheliocele has become thicker; the Descemet’s membrane shows a double contour at one end. (c) AS-OCT image of the eye 2 months later. One big pseudocyst has formed between the Descemet’s membrane and stroma. The free edges of the Descemet’s membrane are rolled inwards and appear thicker. (d) AS-OCT image of the eye 4 months later. The epitheliocele has disappeared. The corneal stroma appears considerably normal with no clefts between the lamellae. The pseudocyst is narrower with a smooth lining. The diameter of the edematous zone in the cornea decreased to 5.23 mm and the thickness reduced to 0.84 mm.)](image)
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 were not well understood till nowadays. It is 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.6 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 not linear but rather polygonal, got smaller similar to the healing of epithelial defects of the cornea but much slower (Fig. 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 by the time and parallel to this healing process the edematous zone in the anterior cornea gets smaller and 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 (5 to 7). Al-dave 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.5

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.

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

REFERENCES