

Enlarged Anterior Chamber: CT Finding of a Ruptured Globe

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Summary: A deep anterior chamber of the globe is a clinical sign of posterior scleral rupture, an ophthalmologic emergency. On axial CT, the depth of the anterior chambers of ruptured globes was greater than the depth of the anterior chambers of normal globes. The discrepancy between the depth of the two anterior chambers in any patient can also suggest posterior scleral rupture.

Index terms: Eyes, injuries; Eyes, computed tomography

Rupture of the globe is an ophthalmologic emergency. Prompt diagnosis and treatment are imperative to prevent further injury to the eye (1). Traumatic rupture of the posterior sclera may decompress the vitreous and allow retropulsion of the lens (the lens sinks backward slightly). The resulting "deepening" of the globe's anterior chamber is a well-known clinical sign of scleral rupture (1). We encountered three patients who underwent computed tomographic (CT) scanning after facial trauma, each of whom had unilateral enlargement of the anterior chamber on the side of the trauma. Rupture of the posterior sclera was confirmed at surgery.

Materials and Methods

Measurements were made on axial CT scans of 3-mm-thick sections through the orbits. The anterior chamber of the globe was measured at the level of the equator of the globe, from the back of the cornea to the anterior surface of the lens, along a line perpendicular to the long axis of the lens (Fig 1).

These measurements were made retrospectively on scans of 3 patients in whom posterior scleral rupture was found at surgery and prospectively on scans of 10 control subjects. The control subjects were chosen from all patients scanned over a period of 2 days, the only requirements being that adequate views of both anterior cham-

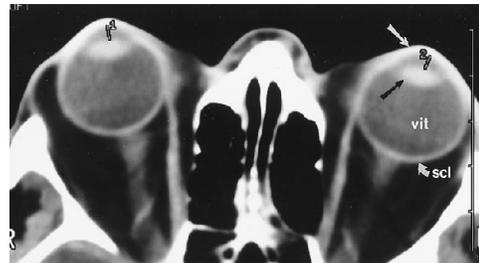


Fig 1. Axial CT scan through normal orbits at the equator of each globe. The CT cursors (1, 2) measure the depth of each anterior chamber from the back of the cornea (white arrow) to the front of the lens (black arrow). Each cursor is positioned perpendicular to the long axis of the lens. Vit indicates vitreous; scl, sclera.

bers were available on 3-mm-thick axial scans and scleral rupture was not a concern.

Results

One patient (case 1) had an anterior chamber 4 mm deep on the side of rupture; the normal side was 2 mm deep (Fig 2). The second patient (case 2) had an anterior chamber 5 mm deep on the side of injury (Fig 3); the contralateral chamber was 3 mm deep. The third patient (case 3) had an anterior chamber 5 mm deep (Fig 4). He had undergone prior enucleation of the contralateral globe. In all three patients, a small posterior scleral rupture was identified at surgery and repaired. In the control subjects, the anterior chamber on each side measured between 2 and 3 mm. The discrepancy was less than 1 mm between left and right in each patient. The depth of the anterior chambers of the abnormal globes was statistically greater than the depth of the anterior chambers of the normal globes ($P < .007$, Mann-Whitney U test).

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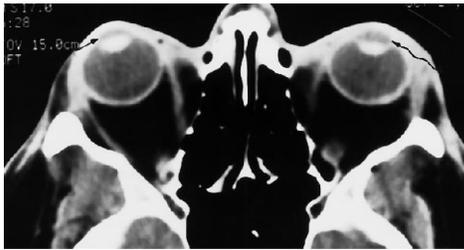


Fig 2. Case 1. The left anterior chamber (*wavy arrow*) is deeper than the right (*straight arrow*).

Discussion

The sclera invests the globe and continues anteriorly as the cornea. Between the cornea and the lens is aqueous humor (Fig 1). The iris divides the aqueous into the larger anterior chamber and the smaller posterior chamber (2). In the ophthalmologic literature, the depth of the normal anterior chamber ranges from about 2.5 to 3.5 mm; the depth varies with the method of measurement, age, and sex (3). On CT, the anterior and posterior chambers appear as a single fluid-filled compartment (Fig 1). Vitreous, a refractile gel, fills the posterior two thirds of the globe behind the lens (Fig 1).

"Indirect" rupture of the sclera involves sclera remote from the site of impact (1). A small traumatic rupture of the posterior sclera (behind the ciliary body) may permit vitreous to prolapse through the defect (4). With decompression of the vitreous, the lens sinks backward slightly, though the normal attachments of the lens, the suspensory ligaments or ciliary zonules (2), remain intact. This retropulsion of the lens enlarges or deepens the anterior chamber. A deep anterior chamber is a well-known clinical finding in a patient with a ruptured globe (1, 5).

The diagnosis may not be suspected clinically. Blood in the anterior chamber (hyphema) often prevents identification of a deep anterior chamber at slit-lamp examination (1). In addition, a ruptured globe occasionally will have normal intraocular pressure and normal visual acuity, though more often vision in the affected eye is limited to light perception (or worse) (1).

Although the number of patients in this study is small, two observations appear to be important. In any patient, a discrepancy on CT images of 2 mm or more between the depths of the anterior chambers of the normal and abnormal eyes can raise the possibility of scleral rupture. The absolute depth of the anterior chamber, if 5

mm or greater, is also suggestive of rupture. Admittedly, the difference between the depths of the normal and abnormal anterior chambers is small, and conceivably could be mimicked by partial volume averaging (if using sections 3 mm thick) or by measuring at a level not precisely the equator of the globe. Thinner sections, or overlapping sections, might facilitate the diagnosis, though at a cost of greater irradiation of the lens.

One limitation of this study is the retrospective format. It is currently unknown (and was not the purpose of this study to determine) how many patients with surgically proved rupture



Fig 3. Case 2.

Top, The left anterior chamber is enlarged (*arrow*).

Bottom, The right anterior chamber is normal (*arrow*). The best levels at which to measure each eye are often on different axial images.



Fig 4. Case 3. The left anterior chamber is enlarged (*wavy arrow*) and contains blood. There is blood in the vitreous (*high-lighted arrow*) and extensive preseptal soft-tissue swelling on both sides. There is a prosthetic right globe (*black arrow*).

will have an enlarged anterior chamber on CT images.

Primary angle-closure glaucoma may present clinically with a shallow anterior chamber (2). Conceivably, the shallow anterior chamber of a glaucomatous globe could be misinterpreted as normal, and the normal anterior chamber as enlarged, by simple inspection of the CT scan without making the measurements. Obviously, the clinical setting is important when using anterior chamber asymmetry to suggest rupture of the posterior sclera. With a complete traumatic posterior dislocation of the lens, the lens may sink to the dependent aspect of the vitreous (6). Incomplete dislocation of the lens, or subluxation, is more common, as some of the suspensory zonules usually remain intact (7). Subluxation of the lens may deepen the anterior chamber (8), but the lens is tilted (7) or rotated (8), and the diagnosis is usually clinically apparent.

In conclusion, the familiar CT findings of a lacerated globe are a small, irregular globe that contains blood or air (9). To these, we add the CT observation of an enlarged anterior chamber as a finding in rupture of the posterior sclera.

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