

Clinical Communications

TRAUMATIC RETROBULBAR HEMORRHAGE: EMERGENT DECOMPRESSION BY LATERAL CANTHOTOMY AND CANTHOLYSIS

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□ **Abstract**—Traumatic retrobulbar hemorrhage may result in acute loss of vision that is reversible when recognized and treated promptly. A case of traumatic retrobulbar hemorrhage is presented. The technique of emergent orbital decompression by lateral canthotomy and cantholysis is described. The anatomy of the lateral canthus and the surgical procedure are illustrated by gross dissection. © 2002 Elsevier Science Inc.

□ **Keywords**—retrobulbar hematoma; retrobulbar hemorrhage; eye trauma; orbital trauma; lateral canthotomy; lateral cantholysis; orbital decompression; orbital hemorrhage

INTRODUCTION

Traumatic hemorrhage into the retrobulbar space may result in acute visual loss. Although this ophthalmologic emergency presents most frequently to the Emergency Department (ED), discussion of this entity is notably absent from the Emergency Medicine literature. Prompt recognition and early decompression of retrobulbar hematoma may prevent loss of vision or lead to return of vision. Although consultation with an ophthalmologist is ideal, specialty support is not always available in a timely fashion. The physician encountering eye emergencies must be comfortable evaluating, diagnosing, and

treating acute visual compromise secondary to retrobulbar hematoma.

CASE REPORT

A 74-year-old man was struck with a blunt object over his left eye. He presented to the Emergency Department 3 h after the injury with complaints of pain and loss of vision. Initial visual acuity in the injured eye showed the ability to count fingers at two feet. Proptosis, severe periorbital edema and ecchymosis were noted (Figure 1). No sclera was visible secondary to diffuse subconjunctival hemorrhage and chemosis. The pupil was fixed at 3 mm. Extraocular muscle movements in the left eye were restricted in all directions. There was moderate resistance to retropulsion but formal intraocular pressure testing was not performed. The cornea was clear and the anterior chamber unremarkable. The optic nerve and retina also appeared grossly normal.

Orbital decompression was performed in the ED via lateral canthotomy and cantholysis. Almost immediately, extraocular muscle movements improved. Within 20 to 30 min, the patient's vision improved to 20/70 in the affected eye. The following day the patient's vision remained 20/70, with decreased proptosis and full ocular motility. Several intraretinal hemorrhages were noted; the optic nerve appeared normal.



Figure 1. This image demonstrates the clinical presentation of an acute traumatic retrobulbar hemorrhage.

Pathophysiology

The orbit is an enclosed space bound laterally and posteriorly by bony walls and anteriorly by the globe and the superior and inferior orbital septa. When bleeding occurs within this cavity, there is little room to accommodate the increase in volume. The globe and septum are displaced anteriorly to some extent (proptosis); however, the capacity for forward movement is limited by the eyelids and the length of the optic nerve (1–3). Posteriorly, the orbit is effectively closed as well, demonstrated by the fact that hemorrhages do not decompress spontaneously by posterior dissection (1).

The orbital space can be likened to the intracranial

space (1). Because of the limited capacity for expansion, increased volume because of hemorrhage results in increased pressure and compression of contained structures. The precise mechanism of the resultant neuropathy in the eye is not completely understood. The optic nerve may be compressed directly, or the vascular supply to the nerve may be compromised. Central retinal artery (CRA) ischemia is another proposed mechanism. Animal models suggest that visual loss secondary to CRA ischemia may be reversible for up to 100 min (25).

Traumatic optic neuropathy may result from causes other than hemorrhage. The optic nerve can be transected at the moment of impact, or stretched and contused, leading to edema and visual loss (2,6–9). Emergent

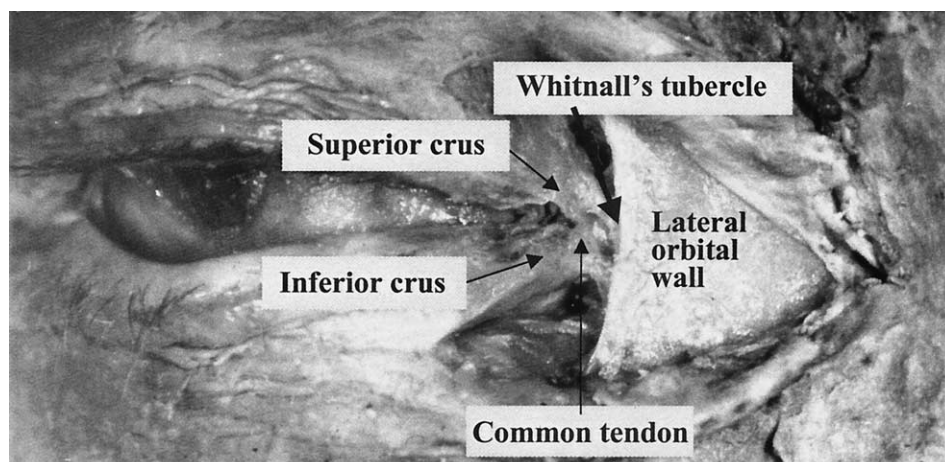


Figure 2. The inferior and superior crura (thin arrows) of the lateral canthal tendon form a common tendon at the point of attachment to the inner aspect of the lateral orbital wall (thick arrow). This point of attachment is called Whitnall's tubercle. The inferior crus of the lateral canthal tendon is cut in lateral cantholysis.



Figure 3. A clamp is placed horizontally across the lateral canthus to compress tissue and reduce bleeding.

canthotomy is not indicated in instances when hemorrhage into the enclosed orbital space is not present.

Emergent orbital decompression is reserved for the patient with a history of trauma who has visual loss, severe proptosis, diffuse subconjunctival hemorrhage, and marked periorbital edema. Partial or complete ophthalmoplegia, an afferent pupillary defect, and resistance to repulsion may be present as well. Usually visual acuity is decreased, though not necessarily initially. Vision may be intact and then deteriorate, suggesting reversible compression rather than nerve transection at the moment of impact (1,2,10). Less specific signs include periorbital crepitus and infraorbital hypesthesia.

The differential diagnosis of orbital hemorrhage includes orbital cellulitis, isolated orbital fracture, and globe rupture. Orbital fractures may be accompanied by

enophthalmos because of depression of the supporting orbital floor. Proptosis is not present with fracture unless accompanied by orbital hemorrhage. Globe ruptures usually cause low intraocular pressure and enophthalmos, without proptosis (11).

Retrobulbar bleeding, though most often because of trauma, may occur spontaneously. Many various causes have been reported, including venous anomalies, atherosclerosis, intraorbital aneurysm of the ophthalmic artery, hemophilia, leukemia, von Willebrand's disease, hypertension, and straining (12–19).

Anatomy

Understanding the anatomy of the lateral canthus is critical for proper performance of lateral canthotomy and



Figure 4. The clamp is removed leaving an impression in the soft tissue.

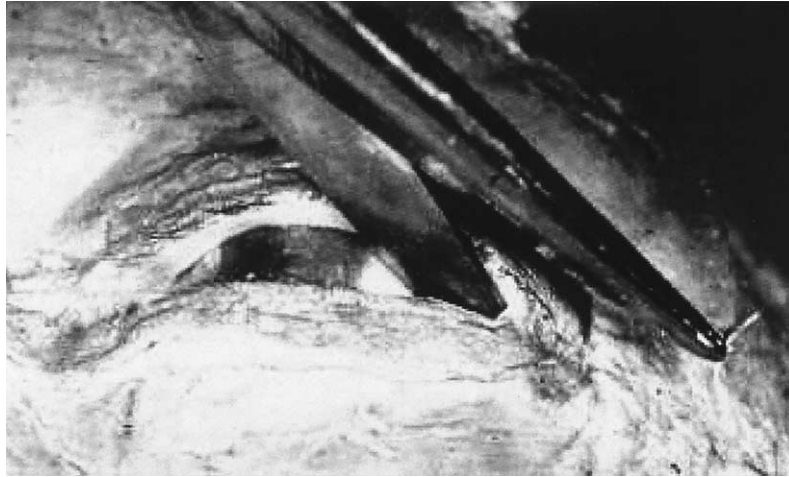


Figure 5. Sterile scissors are used to make a one centimeter horizontal incision into the tissue at the clamp site.

cantholysis. The lateral canthal tendon is a combined tendon-ligament that provides structural fixation of the lids (tarsal plates) and orbicularis oculi muscle to the inner aspect of the bony lateral orbital wall (zygoma), just posterior to the orbital rim (Figure 2). The tendon has an inferior and superior portion (Figure 2). The osseous point at which the tendon attaches is called Whitnall's tubercle (Figure 2). Dissection of the medial ends of the lateral canthal tendon demonstrates the ligamentous attachments to the tarsal plates. The orbicularis oculi muscle lies anterior to the tarsal plates and also has tendinous attachments to Whitnall's tubercle. Anterior to the lateral canthal tendon is a small pocket of orbital fat known as Eisler's pocket (22). When the inferior portion of the lateral canthal tendon is cut, the lower lid loses its structural fixation to the lateral orbital wall. It becomes

lax and is easily pulled away from the lid margin (2,20–22).

Procedure

The lateral canthal area is prepared and draped in sterile fashion. Because of the emergent nature of the clinical situation, some authors recommend only simple irrigation with normal saline (26). Lidocaine with epinephrine is administered to obtain anesthesia and hemostasis. A straight clamp is placed horizontally across the lateral canthus for about one to two minutes to compress the tissues and reduce bleeding (11) (Figure 3). The clamp is removed, leaving an impression in the edematous soft tissues (Figure 4). Sterile scissors are then used to make

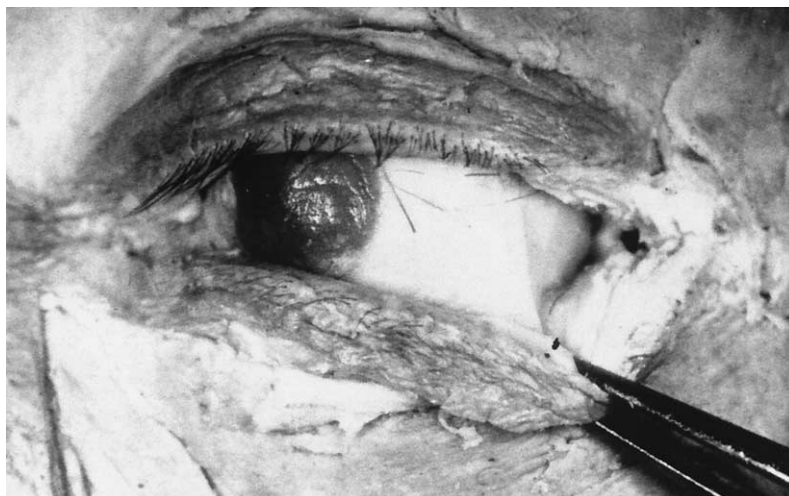


Figure 6. It is helpful to grab the lower lid and pull it down and away from the lateral orbital margin. This serves to separate the skin and conjunctiva. The inferior crus is more easily palpated than visualized at this point. A 1 to 2 cm cut is made to lyse the inferior crus.

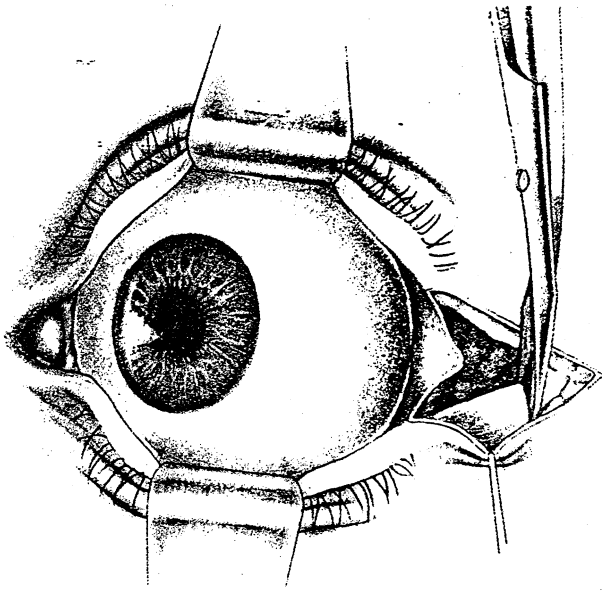


Figure 7. With the scissors pointed inferoposteriorly toward the lateral orbital rim, the inferior arm of the lateral canthal tendon is cut. Reprinted with permission from Soll, D. B. (ed.), *Management of complications in ophthalmic plastic surgery*. Birmingham, AL: Aesculapius Publishing Co.; 1976: 261.

an approximately 1 cm horizontal incision in the tissue at the clamp site (11) (Figure 5). This initial canthotomy opens skin, orbicularis muscle, orbital septum, palpebral conjunctiva, and exposes Eisler's fat pocket. It is helpful to grab the lower lid margin with a toothed forceps. Pulling the lid down and away from the lateral orbital margin separates the skin and conjunctiva (Figure 6). The inferior portion of the lateral canthal tendon can be easily palpated using a finger or the tip of the scissors (11). The tendon is more easily palpated than visualized (23). With the scissors pointed inferoposteriorly toward the lateral orbital rim, the inferior arm of the lateral canthal tendon is cut (Figure 7). This critical incision is approximately 1 to 2 cm in depth and length. The lower lid should easily pull away from the lid margin. Progressively deeper cuts are to be made until this effect is achieved (2).

Despite the decompression of high intraorbital pressure, only a small amount of blood is usually expressed with the release of the hematoma; there is no need to empty the orbit of its contents. Simply releasing the pressure of the hematoma is enough to restore vision or prevent further visual loss.

Regarding the closure of the canthotomy, most authors agree that it is to be performed several days after the procedure once the swelling has decreased (27).

Complications of Cantholysis

Extensive cantholysis may result in loss of adequate lower lid suspension and ectropion. However, this is easily repaired at a later date (24). Improper direction of the scissors superiorly may cause injury to the levator aponeurosis, resulting in ptosis. The lacrimal gland and lacrimal artery lie superiorly as well, and care must be taken to avoid these structures. After the acute process has resolved, the patient must be watched for infection and abscess formation. Fibrosis may develop, limiting extraocular motility (11).

CONCLUSION

Bleeding into the intraorbital space may cause acute visual loss by compressing the optic nerve and its vascular supply. Decompression of the tense orbit can reverse a mechanical optic neuropathy or retinal ischemia. Emergent decompression of the orbital space is the treatment of choice for retrobulbar hematoma and may preserve or restore vision.

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