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Case Presentations of the Harvard Affiliated Emergency Medicine Residencies

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LATERAL CANTHOTOMY AND CANTHOLYSIS: EMERGENCY MANAGEMENT OF ORBITAL COMPARTMENT SYNDROME

Adam D. Rowh, MD,* Jacob W. Ufberg, MD,* Theodore C. Chan, MD,† Gary M. Vilke, MD,† and Richard A. Harrigan, MD*

*Department of Emergency Medicine, Temple University School of Medicine, Philadelphia, Pennsylvania and †Department of Emergency Medicine, University of California, San Diego, California

Reprint Address: Adam D. Rowh, MD, Department of Emergency Medicine, Temple University School of Medicine, 7043 McCallum St., Philadelphia, PA 19119

☐ **Abstract—Background: Orbital compartment syndrome is a sight-threatening emergency. Vision may be preserved when timely intervention is performed. Objective: To present a case of orbital compartment syndrome caused by traumatic retrobulbar hemorrhage and the procedure of lateral canthotomy and cantholysis, reviewed with photographic illustration. Discussion: Lateral canthotomy and cantholysis are readily performed at the bedside with simple instruments. The procedure may prevent irreversible blindness in cases of acute orbital compartment syndrome. Conclusions: Emergency physicians should be familiar with lateral canthotomy and cantholysis in the management of orbital compartment syndrome to minimize the chance of irreversible visual loss.** © **2015 Elsevier Inc.**

☐ **Keywords—lateral canthotomy; canthotomy; cantholysis; orbital compartment syndrome; retrobulbar hemorrhage; ocular trauma**

INTRODUCTION

Facial and ocular trauma can result in retrobulbar hemorrhage, which can cause rapid vision loss that can be permanent if not aggressively managed. Significant hemorrhage in an enclosed orbital space may result in an orbital compartment syndrome (OCS). Resultant retinal ischemia produces rapid and irreversible visual loss. Although emergent ophthalmologic consultation and intervention is ideal, often, emergency physicians will not have access to an ophthalmologist in the timeframe required to treat OCS arising from traumatic retrobulbar hemorrhage.

Lateral canthotomy and cantholysis (LCC) is a simple procedure, which, when performed expeditiously, can be vision saving (1–5). A case report is presented, followed by a review of the relevant anatomy, pathophysiology, technique, and potential complications of the procedure.

CASE REPORT

A 45-year-old man presented to the Emergency Department (ED) after being assaulted with a blunt object. He sustained multiple facial injuries, including a severe eye injury. He complained of decreased visual acuity and severe pain in the right eye. A grade IV (100%) hyphema and 360° subconjunctival hemorrhage were noted, together with proptosis and restricted extraocular movements (Figure 1).

As part of initial trauma management, an unenhanced computed tomography scan of the head was obtained, which demonstrated retrobulbar hemorrhage on the right side without evidence of globe rupture. Visual acuity testing revealed no light perception in the affected eye, and intraocular pressure (IOP) was measured to be 79 mm Hg. Ophthalmology was emergently consulted, but

Figure 1. Gross appearance of the patient's eye after blunt trauma. There is marked soft tissue swelling, 100% (grade IV) hyphema, and 360° subconjunctival hemorrhage.

the physician was nearly 2 h away. The decision was made to proceed with emergent LCC.

After LCC, the patient's pain immediately improved and IOP decreased to 35 mm Hg. His ocular injuries were managed as an inpatient by Ophthalmology, and at time of discharge, he had regained a visual acuity of 20/40 in the affected eye.

DISCUSSION

Anatomy of the Relevant Orbital Structures

The articular edges of the eyelids form the palpebral fissure (the natural shape of the open eyelids). The canthi are the anatomic junctions of the upper and lower lids at the medial and lateral extremes of the palpebral fissure. Subcutaneously, the structure of each lid is formed by the tarsal plates, dense fibrous bands that run from medial bony orbit to lateral bony orbit (Figure 2). Posteriorly, each tarsus is attached to the conjunctiva. Together, the globe, the tarsal plates, and their insertions (fascial septae) form the anterior anatomic border of the orbit. The orbit is bounded posteriorly and on all sides by the bony skull (6). The volume of a normal adult orbit is approximately 30 mL (7).

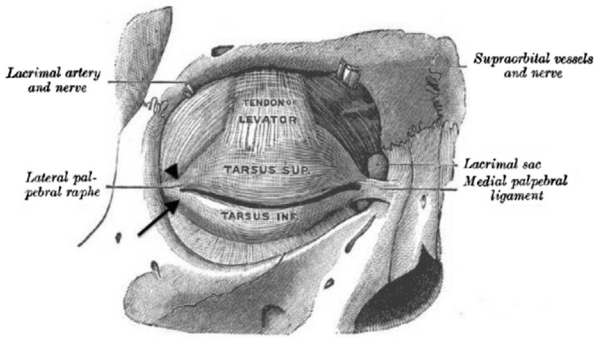

Figure 2. The fibrous tarsal plates, joining medially and laterally to form the canthal tendons, also known as palpebral ligaments (arrow, inferior crus of lateral canthal tendon; arrowhead, superior crus). Reproduced from *Gray's Anatomy*, public domain.

Laterally, the superior and inferior tarsal plates join to form the lateral canthal tendon, which inserts just posterior to the rim of the bony orbit at Whitnall's tubercle. This canthal tendon is distinct from the fascial orbital septum, which is located more superficially (8).

Arterial circulation to the eye is via the ophthalmic artery and its branches, which arises from the internal carotid. Venous drainage is into the ophthalmic veins, which merge and join the cavernous sinus, the pterygoid plexus, and the facial vein (9).

Pathophysiology of Orbital Compartment Syndrome

Normal intraorbital pressure is 3–6 mm Hg (10,11). Normal intraocular pressure is 10–20 mm Hg (12). Blunt trauma to the face or globe can cause bleeding in the retrobulbar space, which quickly causes an increase in retrobulbar pressure due to the lack of distensibility of the surrounding structures. Retinal ischemia results, and vision loss can be permanent after as little as 60–100 min of ischemia (13). Arterial blood flow has been demonstrated to cease at tissue pressures significantly lower than diastolic blood pressure (14,15). When the vasa nervorum are affected by increased intraorbital pressure, optic nerve ischemia will result. When the central retinal artery is affected by increased intraocular pressure, retinal ischemia will result. The orbit lacks lymphatic drainage, so the only drainage is via the compressible ophthalmic veins (7). As little as 7 mL of fluid experimentally injected into the orbit can produce persistent retinal changes (16).

Although trauma is the most common etiology of acute OCS among ED patients, other causes may include orbital cellulitis/abscess, tumor, spontaneous hemorrhage, massive fluid resuscitation, or prolonged hypoxemia (7,17).