Overview

Orbital compartment syndrome is an ocular emergency that requires expeditious diagnosis and management to prevent blindness. The orbit is a relatively closed compartment with limited ability to expand, and orbital pressure can rise rapidly when an acute increase in orbital volume occurs. Untreated, orbital compartment syndrome results in ischemia of the optic nerve and retina. For more information, see Medscape Reference article Acute Orbital Compartment Syndrome.

The most common causes of orbital compartment syndrome include retrobulbar hemorrhage from trauma, retrobulbar anesthetic injection, and eyelid surgery. Spontaneous retrobulbar hemorrhage due to venous anomalies, atherosclerosis, intraorbital aneurysm of the ophthalmic artery, hemophilia, leukemia, von Willebrand disease, and hypertension has also been described. Other less common causes of orbital compartment syndrome include orbital cellulitis, orbital abscess, tumors, orbital emphysema, and inflammation.

Patients with increased orbital pressure present with pain, decreased vision, diplopia, limited extraocular movements, proptosis, ecchymosis around the eye, bloody chemosis, increased intraocular pressure (IOP), resistance to retropulsion, and a relative afferent pupillary defect.

The lateral and medial canthal tendons attach the eyelids to the orbital rim and limit anterior displacement of the globe.[1] Orbital pressure can be relieved with an emergent lateral canthotomy and inferior cantholysis.[2] Without decompression, irreversible vision loss due to increasing orbital pressure may occur in as little as 90-120 minutes.[3, 4] Thus, early recognition and prompt treatment are essential to preventing vision loss.[5] Knowledge of this potentially sight-saving procedure is important for clinicians, especially those in remote areas where access to ophthalmologists is not readily available.[6]

Relevant Anatomy

The orbit, which protects, supports, and maximizes the function of the eye, is shaped like a quadrilateral pyramid, with its base in plane with the orbital rim. Seven bones conjoin to form the orbital structure, as shown in the image below.

The orbital process of the frontal bone and the lesser wing of the sphenoid form the orbital roof. The orbital plate of the maxilla joins the orbital plate of the zygoma and the orbital plate of the palatine bones to form the floor. Medially, the orbital wall consists of the frontal process of the maxilla, the lacrimal bone, the sphenoid, and the thin lamina papyracea of the ethmoid. The lateral wall is formed by the lesser and greater wings of the sphenoid and the zygoma.

The lateral canthal tendon has a superior and inferior crus that inserts at the lateral orbital tubercle (Whitnall tubercle) 3 mm posterior to the lateral orbital rim.

For more information about the relevant anatomy, see Orbit Anatomy and Eye Globe Anatomy.

Indications

Lateral canthotomy and cantholysis should be performed for retrobulbar hemorrhage with acute loss of visual acuity, relative afferent pupillary defect, increased IOP, and proptosis.[7] In the unconscious or uncooperative patient, an IOP greater than 40 mm Hg, especially with a relative afferent pupillary defect, is an indication for lateral canthotomy (normal IOP is 10-21 mm Hg).[8]

Lateral canthotomy may also be considered in patients with retrobulbar hemorrhage along with any of the following: ophthalmoplegia, cherry-red macula, optic nerve head pallor, and severe eye pain.
Glaucoma drops do not decrease intraorbital pressure.

**Contraindications**

Suspected globe rupture is a contraindication to lateral orbital canthotomy. Signs of globe rupture include hyphema; a peaked, teardrop-shaped, or otherwise irregularly shaped pupil; exposed uveal tissue, which appears reddish-brown; and extraocular movement restriction that is greatest in the direction of the rupture. Subtle signs of globe rupture include subconjunctival hemorrhage, enophthalmos, or a conjunctival laceration. For more information, see Medscape Reference article Globe Rupture.

**Anesthesia**

Local anesthesia (lidocaine 1-2% with epinephrine) is injected into the lateral canthus.

**Equipment**

Equipment needed for the procedure includes the following:

- Sterile gloves, face shield, gown (if desired)
- Lidocaine 1-2% with epinephrine
- Syringe with 27- to 30-gauge needle
- Sterile drapes
- Normal saline for irrigation
- Straight hemostat (battery cautery if available)
- Sterile iris or suture scissors or Westcott scissors
- Forceps with ≥0.3-mm teeth

**Positioning**

The patient should be supine with the head of the bed elevated 10-15°. Unexpected patient head movement can result in iatrogenic injury, including accidental globe puncture. If the patient is nervous and space permits, attempt to place a cornea protector. Taping or restraining the head with an assistant or sedation may be required. Extremely uncooperative patients may require sedation or, rarely, general anesthesia.

**Technique**

Confirm the affected eye and perform a repeat inspection, noting the typical findings of unilateral proptosis, an afferent pupillary defect, decreased visual acuity, and an intraocular pressure (IOP) of 40 mm Hg or higher.

Provide adequate anesthesia by injecting 1 mL of lidocaine 1-2% with epinephrine into the lateral canthus. Direct the needle tip toward the lateral orbital rim and begin injecting when the needle touches bone. The combination of lidocaine with epinephrine assists with hemostasis and local anesthesia.

Irrigate the eye with normal saline to clear away debris that may enter the eye or interfere with the procedure.

Use a straight hemostat to clamp (crimp) the skin at the lateral corner of the patient's eye. Clamp the skin all the way down to the orbital rim for 1-2 minutes. Clamping facilitates hemostasis and marks the location where the incision is to be made. See video below.

Crimping the lateral orbital canthus to mark where to cut the skin.

Use forceps to pick up the skin around the lateral orbit.

Use the scissors to make a 1-2 cm incision beginning at the lateral corner of the eye and extending laterally outward. See video below.

Cutting the lateral canthus.

This incision decreases some pressure but is often insufficient alone; therefore, proceed to cantholysis.

Apply continuous retraction on the lower lid and palpate the lateral canthus tendon. The author prefers to pull the lid downward. Others retract the lid superolaterally.

With the scissors directed along the lateral orbital rim (pointing away from the globe), palpate and dissect the inferior crus of the lateral canthus tendon and cut it. See video below.

Cutting the inferior canthal ligament/tendon.

If this procedure is insufficient (ie, IOP remains >40 mm Hg), cut the superior portion of the lateral tendon by dissecting superiority before cutting it. See video below.

Verifying laxity of the lower lid after inferior cantholysis.

**Pearls**

Orbital compartment syndrome is an ocular emergency that requires early intervention.
recognition and treatment to prevent blindness.

Some key points to keep in mind include the following:

- The essential component that relieves the orbital pressure is the cantholysis, not the canthotomy.
- Maintain firm retraction on the lower lid.
- When cutting the canthal ligament, aim inferoposteriorly toward the lateral rim to avoid injury to the levator muscle, lacrimal gland, and lacrimal artery, which are located superiorly.
- The eyelid wound may bleed profusely, but there is very little drainage from the retrobulbar hematoma itself. The surgeon will feel the lower lid pop upward after successful inferior cantholysis, and the lower lid will be completely mobile with inferior cantholysis.
- Tonometry and globe palpation are contraindicated in patients with an open globe injury.
- A successful procedure is marked by improved visual acuity, resolution of a previously detected afferent pupillary defect, and decrease in IOP to below 40 mm Hg.
- If inferior cantholysis does not decrease the orbital pressure, a superior cantholysis should also be performed.
- Whenever feasible, seek emergent consultation with an ophthalmologist when this procedure is performed.
- Treatment should not be delayed to obtain imaging.

The afferent pupillary defect, or Marcus Gunn pupil, is tested using the swinging flashlight test. The test is positive when the affected pupil dilates in response to light (the other normal pupil also dilates when light is shone in the affected eye). Both pupils constrict when the light is shone in the normal eye. The Marcus Gunn pupil results from injury to the afferent fibers of cranial nerve II of the defective eye, while the efferent signals from cranial nerve III of the normal eye are uninjured.

For more information, see the Medscape Reference article Neuro-Ophthalmic Examination.

Complications

Complications include iatrogenic injury to the globe or lateral rectus; ptosis due to damage to the levator aponeurosis, which is located superiorly; and injury to the lacrimal gland and lacrimal artery, which also lie superiorly. Less common complications include bleeding and infection. Extensive cantholysis may result in ectropion. Irreversible vision loss can occur if retina ischemia time is greater than 90-120 minutes.

If there is corneal exposure, lubricating ointment and a plastic moisture chamber (eg, Tegaderm patch) can be applied without pressure on the globe. Do not apply cotton patches or pressure patches over a proptotic globe.

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References


