

Orbital Compartment Syndrome (OCS): An Ocular Emergency

How to Perform a Sight-Saving Lateral Canthotomy and Cantholysis

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Abstract

Orbital compartment syndrome (OCS) refers to the compression of orbital contents due to an increasing volume within the orbital cavity. Of several potential mechanisms, a retrobulbar haemorrhage is the most common. OCS causes rapid ocular ischaemia and subsequent blindness and hence is an ocular emergency. It is essential that doctors are familiar with performing the sight-saving treatment of lateral canthotomy and cantholysis.

At the lateral aspect of the eyelids, the body of the lateral canthal tendon is incised (lateral canthotomy) and the inferior arm of the tendon that inserts into the lower lid is disinserted (cantholysis). This releases the lower eyelid from the orbital rim, decompressing the orbit and reducing the pressure on the globe and its vascular supply. If symptoms do not promptly improve, cantholysis should be performed on the upper lid. We discuss OCS and a step-by-step of how to perform a lateral canthotomy and cantholysis.

Keywords: Orbital compartment syndrome; Retrobulbar haemorrhage; Canthotomy; Cantholysis; Ocular emergency

Orbital compartment syndrome (OCS) refers to the compression of orbital contents due to an increasing volume within the orbital cavity. It has many possible causes, with retrobulbar haemorrhage secondary to trauma being the most common acute aetiology. Other causes include delivery of local anaesthesia, periocular or ocular surgery, infection, inflammation, tumour, vascular malformation and emphysema.

Signs and symptoms include:

- Rapid reduction in visual acuity, colour vision or red desaturation
- Pain
- Proptosis
- Ophthalmoplegia/diplopia
- Intraocular pressure >40mmHg (tense globe to palpation)
- Nausea and vomiting (associated with raised intraocular pressure)
- Eyelid swelling or bruising
- Tense orbit
- Conjunctival swelling or bruising
- Relative afferent pupillary defect (indicates compressive optic neuropathy)
- Optic disc swelling
- Central retinal artery occlusion (pale fundus with a foveal cherry red spot)

The 7 bones of the orbit create a non-distensible pyramidal structure surrounding the globe on all sides, hence any space occupying lesion posterior to the globe will cause proptosis. Proptosis is considered to be a globe sitting 2mm more anteriorly than the contralateral side. This can be measured with a device called an exophthalmometer, but in the case of OCS the proptosis is usually marked and evident without formal measurements. The medial and lateral canthal tendons of the eyelids anchor the tarsal plates, the aspect of the lid that provides the lids rigidity, to the orbital rims respectively. These tendons act as slings that limit the anterior displacement of the globe allowing retrobulbar pathology to increase intraorbital and intraocular pressure. In an acute setting this can swiftly result in optic nerve ischaemia, so swift treatment is essential to prevent blindness. In trauma cases, OCS may be avoided as the presence of orbital fractures allows haemorrhage to drain

into the sinuses rather than collecting in the orbit. Saying this, trauma causing a retrobulbar haemorrhage is the most frequent cause of OCS.

OCS is an ocular emergency as ocular ischaemia and subsequent blindness occurs within 90 minutes. Urgent orbital decompression is essential. Clinical recognition of the signs and symptoms is a key due to the limited time frame in which effective treatment can be administered. Imaging can confirm OCS is present but theoretically cases should be recognised and treated before this takes place.

A brief anatomical overview reminds us that the lateral canthal tendon connects the rigid tarsal plates of the upper and lower eyelids to Whitnall's tubercle, which lies deep to the septum inside the anterior orbital rim, inferior to the frontozygomatic suture.

How to perform a lateral canthotomy and cantholysis: (Figure 1)

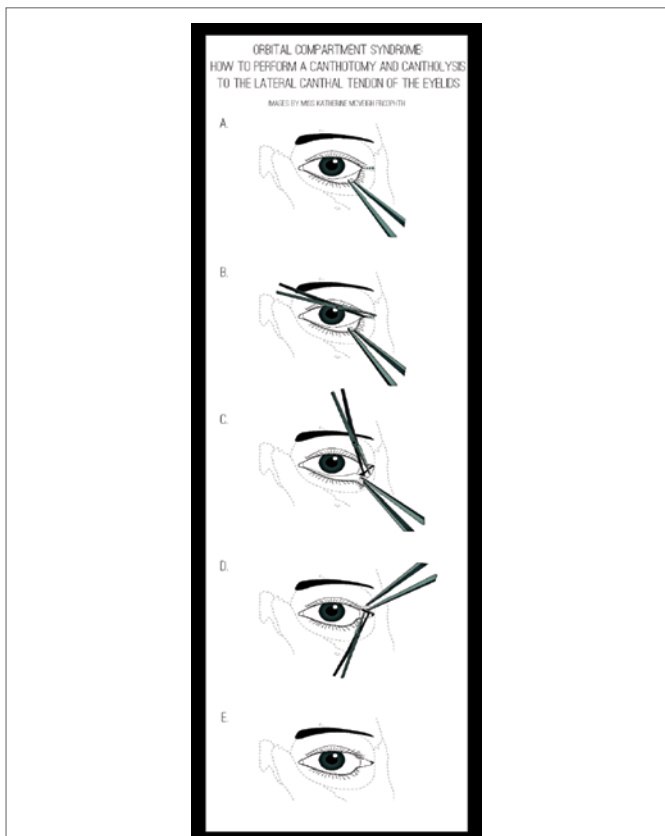


Figure 1: Performing a lateral canthotomy and cantholysis for OCS.

- A. Hold lower lid with toothed forceps
- B. Canthotomy: Make a full-thickness cut through the body of the lateral canthal tendon down to periosteum
- C. Inferior cantholysis: If possible, pull the lower lid inferiorly and anteriorly and placing the tendon under tension. Locate the taught fibres of the tendons inferior crux inserting into the lower lid and cut.
- D. Superior cantholysis: If no improvement in symptoms, repeat process on upper lid.
- E. Tendon disinsertion achieved and subsequent lid laxity. Achieve hemostasis but do not close the wound.

The procedure involves incising the body of the lateral canthal tendon (lateral canthotomy). The inferior arm of the tendon that attaches the lower lid to the orbital rim is then disinserted (cantholysis).

- The patient should lie supine with head slightly elevated.
- Mark the skin from the lateral canthal angle of the lids running approximately 1cm horizontally away from the eye.
- Where available, instill local anesthetic drops to the eyes and clean the skin.
- Instill local anesthetic into the subcutaneous periocular tissue. If no contraindications, adrenaline is beneficial in aiding hemostasis. Alternatively, place an artery clip around all tissue from the lateral aspect of eyelids to the bony orbital rim to devascularize it for 1-2 minutes.
- Hold the lower lid firmly with toothed forceps.
- **Canthotomy:** Make a full thickness incision through the lateral canthus down to the periosteum of the anterior rim of the zygomatic bone. The scissor tips should wrap around the lateral corner of the eyelids, with one blade on the skin side and the other on the conjunctival side with the tips rotated away from the globe as much as possible, directed instead towards the anterior zygomatic rim. Using straight blunt ended scissors will minimize risk of globe damage but other options including straight sharp scissors, iris scissors or a blade will all prove effective in splitting the tendon.
- **Cantholysis:** Where possible, distend the lower lid away from the globe with the forceps to place tendon fibres under tension and aid visualisation. Rotate the scissors to a vertical position with the tips down. Place the closed tips within the lateral aspect of the conjunctival pocket tarsal bed and gently sweep the tips left to right to identify the tight inferior aspect of the canthal tendon. Straddle the tendon with the scissor blades and cut. Once the tendon has been adequately disinserted, the lower lid should freely invert. This may take more than one cut and progress should be continually reassessed by gently pulling the lid anteriorly and inferiorly, with a noticeable change being felt upon complete tendon release.
- Tamponade the bleeding or apply cautery, avoiding the skin edges.
- If no change is noted within a few minutes, the superior crux of the tendon to the upper lid may be released in the same manner as the lower lid.
- If symptoms still persist, the ophthalmologists can consider surgical intervention including release of the orbital septum, decompression of the inferior orbital wall or evacuation of the haematoma.

- The lids should be left open to leave the orbit decompressed. With time, the haemorrhage will resolve and the lids tend to heal very well laissez-faire. If the wound requires addressing, refer the patient to an oculoplastic surgeon for further intervention. Some believe globe rupture to be a contraindication to canthotomy and cantholysis but views are not unanimous.
- Early recognition is key- being familiar with the signs and symptoms saves time lost on imaging
- Sight-saving treatment involves urgent lateral canthotomy and cantholysis of the eyelids

Take home messages: OCS is an emergency that can promptly result in blindness

Conflict of Interest

This manuscript is not under consideration by any other journal. The authors have all approved the manuscript and this submission. We have no competing interests or funding to declare.