Case Report

Pan African Journal of Emergency and Critical Care (PAJEC)

Vision-Saving Intervention: Emergency Lateral Canthotomy and Cantholysis in a Pediatric Patient with Orbital Compartment Syndrome: A case report

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ABSTRACT

Lateral canthotomy is an emergency procedure done to relieve orbital compartment syndrome (OCS), typically when intraocular pressure (IOP) rises above 40 mmHg. OCS is an ophthalmic emergency usually caused by increased pressure in the orbit, often due to retro-orbital bleeding or hematoma. We present the case of a 5-year-old child who developed orbital compartment syndrome following a road traffic accident. The patient underwent lateral canthotomy and cantholysis in the emergency department. Through this report, we aim to advocate for emergency physicians to perform this procedure in the ED setting to avoid delays associated with waiting for an ophthalmologist.

Keywords: Lateral canthotomy and cantholysis.
Orbital compartment syndrome.

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Received: April 25, 2025;
Accepted: August 5, 2025;
Published: September 3, 2025

Citation: *Besufkad Worku, Adino sitotaw, Feven Tedla, et al. Vision-Saving Intervention: Emergency Lateral Canthotomy and Cantholysis in a Pediatric Patient with Orbital Compartment Syndrome: A Case report. PAJEC.2025;3(2): Page number: 42 - 46.*

DOI: https://doi.org/10.58904/2025/210

1. Introduction

Orbital compartment syndrome (OCS) is a true eye emergency that needs to be recognized and treated quickly to avoid permanent vision loss. The orbit functions as a closed space, tightly bound by the orbital septum and surrounding periosteum. Any sudden increase in volume behind this septum, such as from bleeding or swelling, can rapidly raise orbital pressure. If not managed promptly, this elevated pressure can cut off blood flow to the optic nerve and retina, leading to irreversible damage.[2]

The most common causes of orbital compartment syndrome include retrobulbar hemorrhage from trauma, especially if in a hypocoagulable state,[3] 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 are uncommon but have also been described. Other causes include prolonged prone positioning,[4] orbital cellulitis (with or without subperiosteal abscess), expanding tumor, orbital emphysema (patient blows nose after a blowout fracture), orbital inflammatory syndrome, and aggressive fluid resuscitation in patients with burns due to third-spacing of fluid in the orbit.[5,6]

Patients with increased orbital pressure present with pain, proptosis, decreased vision, dyschromatopsia, diplopia, limited extraocular movements, 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 are in continuity with the orbital septum, which limits anterior displacement of the globe.[7]

Orbital pressure can be relieved with an emergent lateral canthotomy and cantholysis. [8] Without decompression, increased orbital pressure can cause irreversible vision loss due to direct compressive optic neuropathy, central retinal artery occlusion, compression of optic nerve blood supply, or ischemic optic neuropathy from stretching of blood vessels.[9]

Lateral canthotomy and cantholysis should be performed for ocular compartment syndrome (most commonly caused by retrobulbar hemorrhage) with acute loss of visual acuity, relative afferent pupillary defect, increased IOP, and proptosis.[10] 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).[11]

2. Case report

We present a case of a 5-year-old female child who arrived at the ED approximately two hours after being involved in a road traffic accident (RTA) as a pedestrian struck by a moving vehicle. She was brought in by her cousins, who described her as having been thrown into the air. She experienced a loss of consciousness following the incident.

She had no known past medical or medication history. Her last meal was 5 hours before the trauma. She was initially taken to the local Health Center and then referred to the Emergency Department (ED).

Blood-tinged secretions were suctioned, an oral airway was inserted, and she was subsequently intubated. Respiratory rate was 32–34 breaths per minute, with SpO2 of 94% on face mask oxygen. Auscultation revealed bilateral chest congestion. Blood pressure was 86/49 mm-Hg, and pulse was 137, feeble. She was given 20 ml/kg of cross-matched blood, after which BP improved to 132/100 mmHg and PR to 128. Glasgow Coma Scale (GCS) was E2V2M4 8/15. RBS was 134 mg/dl. Pupils were bilaterally dilated and sluggish.

Her left eye was markedly swollen and felt as hard as a rock. Significant periorbital edema made it difficult to retract the eyelid. Visual assessment was challenging due to her altered mental status. Bedside ocular ultrasound revealed signs of a retrobulbar hematoma. CT imaging confirmed bilateral frontal acute epidural hematomas and a left-sided

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retrobulbar hematoma. We did a bedside lateral canthotomy and cantholysis.

Details of the procedure

1. After confirming the affected eye and noting findings of unilateral proptosis, an afferent pupillary defect, decreased visual acuity, and an intraocular pressure (IOP) of ~40 mm Hg or higher.
2. We irrigated the left eye with normal saline.
3. We provided adequate anesthesia by injecting 1 mL of lidocaine 2% with epinephrine into the left lateral canthal area. We directed the needle tip toward the left lateral orbital rim and began injecting when the needle touched bone. The combination of lidocaine with epinephrine assists with hemostasis and local anesthesia.
4. We used a straight hemostat to clamp (crimp) the skin at the lateral corner of the patient's eye all the way down to the orbital rim for 1-2 minutes. Clamping facilitates homeostasis and marks the location where the incision is to be made.
5. We then identified the inferior crus of the lateral canthus and incised it.
6. We did not cut the superior crus of the lateral canthus since the first procedure significantly reduced the pressure.

Subsequently, the patient underwent bi-frontal craniotomy and hematoma evacuation. She was able to be extubated on the 3rd day and discharged from the hospital after 10 days with intact vision

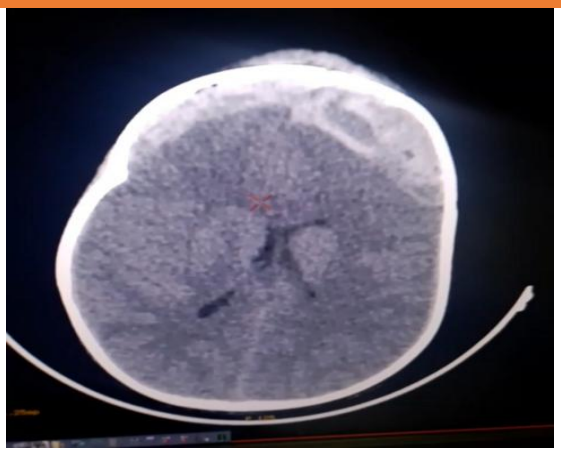

Fig 1: Head CT, which shows a bifrontal hyperdense lesion suggesting bifrontal AEDH

Fig 2: Head CT, which shows a hyperdense area inside the left orbit, which shows left retrobulbar hematoma

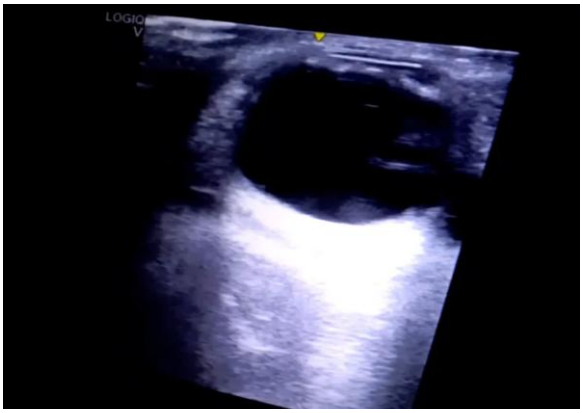

Fig 3: Ocular ultrasound image showing retrobulbar hematoma

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3. Discussion

Orbital compartment syndrome (OCS) is a rare but vision-threatening emergency that results from a rapid increase in intraorbital pressure, typically due to retrobulbar hemorrhage. If not promptly treated, OCS can lead to ischemic optic neuropathy and permanent vision loss.[12,13] Lateral canthotomy and cantholysis (LCC) is the primary emergency procedure used to decompress the orbit and preserve vision in such cases. [12,14]

Although more frequently reported in adults, OCS can occur in pediatric patients, often following blunt orbital trauma, surgical complications, or bleeding disorders.[15,20] The incidence of OCS in children is not well established due to its rarity, but clinicians must maintain a high index of suspicion, especially in trauma cases. Pediatric OCS can be particularly challenging to recognize due to difficulties in clinical examination and communication, especially in younger, non-verbal children. Key signs such as proptosis, a firm globe, decreased visual acuity, relative afferent pupillary defect (RAPD), and increased intraocular pressure should prompt immediate action.[16,20]

The procedure involves making an incision at the lateral canthus, followed by lysis of the inferior and sometimes superior canthal tendons to allow for decompression of the orbital contents. LCC is a rapid, effective, and sight-saving intervention that can be performed at the bedside with minimal equipment. Studies have reported vision preservation in approximately 67%–85% of cases when the procedure is performed within one hour of symptom onset.[14,17] Delays beyond 90–120 minutes are associated with significantly higher rates of permanent vision loss.[14,18]

In our case, the patient presented with clinical signs consistent with OCS, including proptosis, pain, reduced visual acuity, and elevated intraocular pressure following blunt orbital trauma. Prompt recognition and intervention with lateral canthotomy and inferior cantholysis resulted in immediate clinical improvement. Visual acuity improved post-procedure, and intraocular pressure normalized, supporting the effectiveness of this emergency intervention.

Despite its high success rate, LCC is not without risks. Possible complications include globe perforation (especially in cases with posterior staphyloma), eyelid notching or malposition, infection, hemorrhage, scarring or cosmetic deformity, and incomplete decompression if only partial cantholysis is performed.[13,19] In pediatric populations, the risks are slightly heightened due to anatomical differences and increased difficulty with procedural cooperation.[20] However, in the setting of impending or established OCS, these risks are justified by the potential to prevent irreversible blindness.

This case highlights the importance of timely recognition and management of OCS in children. Emergency physicians, trauma teams, and pediatric care providers should be trained in LCC as a core procedural skill.

4. Conclusion

Lateral canthotomy and cantholysis are vision-saving emergency procedures that should be promptly performed when orbital compartment syndrome is suspected, even in pediatric patients. This case highlights the importance of early recognition of clinical signs, such as proptosis, ophthalmoplegia, and elevated intraocular pressure, and the use of bedside tools like ocular ultrasound to support diagnosis when clinical examination is limited. Timely intervention in this case likely contributed to the prevention of permanent vision loss. It also emphasizes the need for heightened awareness among emergency and critical care providers to act swiftly in such rare but critical scenarios in children.

DOI: https://doi.org/10.58904/2025/210

Funding

There was no funding for this paper

Competing interest

The authors declare that they have no competing interests.

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