

A Rare Case of Traumatic Tension Pneumo-orbitum

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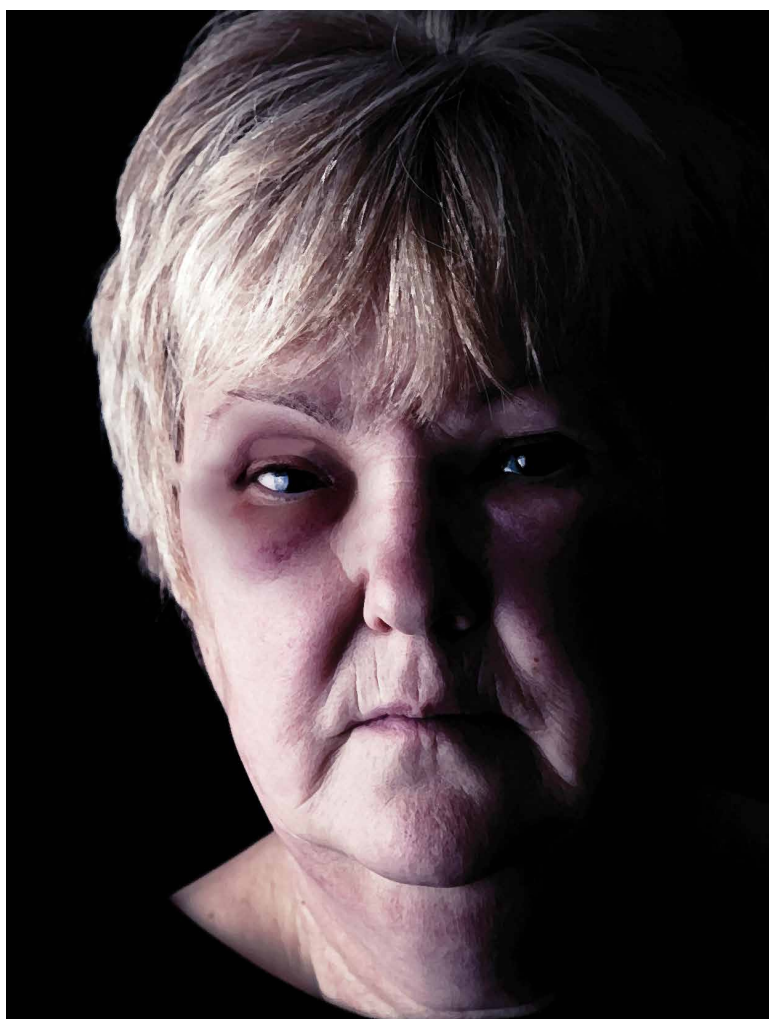
A 76-year-old woman presented with pain, swelling, and loss of vision in the right eye following a fall.

Traumatic eye injuries ranging from mild corneal abrasions to penetrating globe injuries are commonly seen in the ED, and ocular trauma accounts for nearly 1% of all complaints in the ED.¹ Up to 29% of facial fractures have associated eye injuries.² Emergency physicians (EPs) must be aware of possible eye injuries, including traumatic vision loss, and the indicators for emergent interventions.

Tension pneumo-orbitum following facial trauma is rarely reported. We present a case of orbital compartment syndrome (OCS) in an elderly woman who sustained an orbital floor fracture and required emergent lateral canthotomy to preserve vision.

Case

A 76-year-old woman presented to the ED for evaluation of pain, swelling, and loss of vision in the right eye. She said she had been sitting in a chair tying her shoes when she lost her balance and fell forward, striking her head and the right side of her face against the floor. She experienced no loss of consciousness and denied any neck pain, jaw pain, or dizziness. She also denied any chest pain, shortness of breath, weakness, or loss of function in either her arms or legs. She did, however, note a small nosebleed that had stopped before she arrived



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DOI: 10.12788/emed.2016.0050

at the ED. The patient's primary complaint was a possible nasal bone fracture.

Her medical history was significant for hypertension and coronary artery disease. Her medications include amitriptyline, an antihistamine, aspirin, clopidogrel, diltiazem, folic acid, furosemide, hydralazine, levothyroxine, prednisone, and zolpidem. She stated that she was allergic to amoxicillin and sulfa drugs.

The patient's vital signs at presentation were: blood pressure (BP), 193/82 mm Hg; heart rate, 71 beats/minute; respiratory rate, 16 breaths/minute; and temperature, 97°F. She was alert, oriented, and in no distress. Her head and neck examination showed no scalp lacerations or swelling. There was, however, significant swelling and ecchymosis around the right eye and swelling and ecchymosis around the nose, with dried blood in both nares. No septal hematoma was present. The patient had tenderness to palpation over the infraorbital area and nose. No gross facial instability was present, and Battle sign was not appreciated. No jaw or dental abnormalities were noted.

The patient's right pupil was fixed and dilated, and she could not perceive light. She did have upward and lateral movement of the eye, but was unable to look down. A minimal amount of proptosis was noted. Her intraocular pressure (IOP) was elevated at 54 mm Hg (normal range, 10-20 mm Hg). The remainder of the examination, including the neurological examination, was unremarkable.

The patient received emergent head and facial computed tomography (CT) scans. The head CT showed no acute intracranial hemorrhage, mass, or infarct. The facial CT was read as a right orbital floor fracture with intraorbital air, and a right maxillary sinus hematoma. Laboratory evaluation revealed a hematocrit of 38% and a platelet count of 544,000/mcL (normal range, 150,000-450,000/mcL). The prothrombin time was 10.9 seconds (normal range, 11-13.5 seconds); the international normal-

ized ratio was 0.8 (normal range, 0.8-1.1); and the partial thromboplastin time was 22.5 seconds (normal range, 25-35 seconds).

Because the patient was at risk for permanent visual impairment due to increased IOP from the injury, a lateral canthotomy was immediately performed. A small amount of air was released, and the proptosis was notably reduced.

At this point, the ophthalmologist arrived and used an 18-gauge needle to explore the retrobulbar space. Two pockets of air were released, which markedly reduced the tactile pressure of the globe. Repeat tonography of the globe was 28 mm Hg. The wound was left open to drain, and the patient was started on azithromycin. She was discharged home to follow up with ophthalmology.

The patient presented to the ED 2 months later for an unrelated condition. At that time, she reported a complete return of her vision with no deficits and no noticeable scarring around the eye.

Discussion

The orbit is an enclosed space, bordered by bone laterally and posteriorly—the orbital septa superiorly and inferiorly, and the globe anteriorly.³ The lateral canthus is a combined tendon-ligament that helps attach the tarsal plates of the lids and the orbicularis oculi muscles to the lateral orbital wall and zygoma, which forms the posterior orbital wall.^{3,4} The lateral canthal tendon is located beneath the lateral canthus and is comprised of the inferior and superior crus, which attaches to the inner aspect of the lateral orbital wall, forming a structure called Whitnall's tubercle.^{3,4}

Other than globe injuries, the most common findings in patients with orbital trauma are periocular lacerations (96%), orbital fractures (16%), and retrobulbar hemorrhage (8%).⁵ The most common cause of retrobulbar hemorrhage is ocular trauma, but it is also observed in facial

fractures, orbital surgery, retrobulbar injections, venous anomalies, atherosclerosis, intraorbital aneurysm of the ophthalmic artery, lacerated ophthalmic artery, hypertension, hemophilia, leukemia, von Willebrand disease, and straining.^{3,6,7}

In retrobulbar hemorrhage, an increased pressure in the orbital space can lead to optic nerve compression and vascular compromise.⁶ Important alternative diagnoses to consider include orbital cellulitis, orbital fracture, and globe rupture.³ Retrobulbar hemorrhage should be suspected in the clinical setting of exophthalmos, proptosis, diffuse subconjunctival hemorrhage, pain, visual loss or diplopia, periorbital edema, partial or complete ophthalmoplegia, resistance to retropulsion, increased IOP, a blanched ophthalmic artery on funduscopic examination, and an afferent pupillary defect.^{3,4,8,9} Less commonly, periorbital crepitus and infra-orbital hypoesthesia can be appreciated.³

If a patient with a retrobulbar hemorrhage is experiencing diminished vision, an emergent lateral canthotomy should be attempted. Retrobulbar hemorrhage can be difficult to diagnose in the setting of trauma. There can be damage to the optic nerve with associated edema and vision loss that is not associated with a retrobulbar hemorrhage and does not require a lateral canthotomy.^{3,7} A dedicated CT scan of the orbits can aid in the diagnosis, but treatment should not be delayed.⁸

Patients with retrobulbar hemorrhage may initially present to the ED with intact visual acuity, but as the pressure behind the globe increases, vision will diminish.³ Although the medical literature has not established a definitive timeframe, it is believed that permanent visual compromise develops between 1 to 3 hours after ischemia develops.⁶ Animal studies show that visual loss due to central retinal artery ischemia may be reversible up to 100 minutes.³

Not all cases of retrobulbar hemorrhage are associated with vision loss. In patients

without diminished vision, conservative treatments such as bed rest, elevation of the head of the bed, ice packs, analgesia, lowering BP, and sedatives should be attempted first.⁵ Acetazolamide and mannitol can also be considered in consultation with an ophthalmologist.

Pneumo-orbitum

The presence of pneumo-orbitum should alert the clinician to either a communication with a paranasal sinus, a gas-forming organism, or (rarely) Munchausen syndrome.¹⁰ Unlike most case presentations, most causes of pneumo-orbitum do not involve OCS and are self-limited.¹¹ Traumatic pneumo-orbitum without OCS has been reported in the literature.¹²⁻¹⁵ However, traumatic tension pneumo-orbitum is rare.¹²⁻¹⁶ One case report involved an elderly man with an orbital floor fracture who developed recurrent tension pneumo-orbitum after blowing his nose while intoxicated.¹² Another case involved a boy with tension pneumo-orbitum that required surgical decompression.¹⁶

In a patient who has experienced trauma, the combination of proptosis, elevated IOP, and vision loss likely represent a retrobulbar hematoma or OCS. A lateral canthotomy can help relieve IOP from either condition.^{17,18} Orbital compartment syndrome can be caused by edema, emphysema, and caroticocavernous fistula, leading to increased orbital pressure and decreased perfusion.^{17,18}

In a review of 10 trauma patients with OCS, all cases were intubated due to the severity of the head trauma, and all had OCS due to edema.¹⁷ In a review of eight trauma patients with OCS, all had eye pain, reduced visual acuity, and proptosis.¹⁸ Most of the patients had periorbital edema, ophthalmoparesis, a relative afferent pupillary defect (as compared to a

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fixed and dilated pupil), and chemosis.^{18,19} All of the patients with OCS required cantholysis or a lateral canthotomy.¹⁸

Lateral Canthotomy

Although EPs rarely perform lateral canthotomy, knowledge of this procedure is important, because it can prevent vision loss in the appropriate clinical setting. To perform a lateral canthotomy, the area around the affected eye is cleaned with saline irrigation.⁴ One percent or 2% lidocaine with epinephrine is then injected into the lateral canthus of the affected eye.^{4,10} A straight hemostat is applied between the upper and lower lids, producing a crush injury along the site of local anesthesia for 1 to 2 minutes.^{3,4,10} This is done to reduce the risk of bleeding by devitalizing the tissue.⁴ Straight scissors are then used to make a 1-cm horizontal incision from the lateral canthal tendon to the lateral orbital rim.⁴ This initial incision exposes the orbicularis muscle, orbital septum, palpebral conjunctiva, and an area called Eisler's pocket that sits anterior to the lateral canthal tendon.³

Cantholysis can then be performed by blunt dissection.¹⁰ The inferior crus of the lateral canthus is identified either visually or by palpation, and a 1- to 2-cm inferior-posterior cut of the inferior crus accomplishes the lateral canthotomy.^{3,4} After cutting the inferior crus, the lower lid should be pulled away easily, and if this does not occur, repeated attempts at cutting the inferior crus should be made.³ Pulling the lower eyelid down and away from the lateral orbital rim separates the skin and conjunctiva, aiding in visualization.⁴

After cutting the inferior crus, only a small amount of blood or air typically is expressed, but this is usually enough to prevent vision loss.³ When the procedure is performed correctly, the practitioner should be able to palpate a difference in the pressure of the globe, and tonography will show a reduced IOP. If the ocular pressure is still significantly elevated, the

physician can proceed to cut the superior canthus of the lateral canthal tendon in a manner similar to cutting the inferior crus of the tendon.⁴ After the procedure is performed, urgent ophthalmologic consultation is required.

The risks of performing a lateral canthotomy include mechanical injury, hemorrhage, and infection.⁴ The incision from a lateral canthotomy generally does not need suturing and will heal without significant scarring.⁴ If the scissors are aimed superiorly instead of inferiorly for the inferior crus of the lateral canthal tendon, there is risk of injuring the levator aponeurosis leading to ptosis, as well as a small risk of injury to the lacrimal gland and lacrimal artery.³

Conclusion

Our patient demonstrates a case of traumatic OCS, a vision-threatening medical condition that requires rapid diagnosis and lateral canthotomy to lower IOP and reduce the risk of permanent vision loss. While an orbital CT scan may assist in confirming the diagnosis, treatment of IOP should not be delayed.

Acknowledgement

The authors wish to thank Megan Christopher for her editorial support.

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