Case Series

Traumatic Orbital Compartment Syndrome: A Sight Threatening Emergency

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Abstract

Orbital compartment syndrome is a rare presentation of orbital trauma and is an ophthalmic emergency. Delay in clinical diagnosis and subsequent surgical intervention will lead to loss of vision in nick of time. We presented a case series of orbital compartment syndrome secondary to trauma who presented to the emergency department of Tribhuvan University Teaching Hospital during the devastating earthquake in April 2015. Clinical diagnosis of orbital compartment syndrome was made in the bedside and all the patients underwent emergency lateral canthotomy and inferior cantholysis. This case series was aimed to describe clinical features and management of orbital compartment syndrome.

Key words: Orbital compartment syndrome, orbital trauma, lateral canthotomy, inferior cantholysis.

Introduction

Orbital compartment syndrome (OCS) is a rare but potentially devastating ophthalmic emergency caused by a rise in intra-orbital pressure requiring emergent orbital decompression to preserve vision. (Singh et al., 2008)The globe is confined within the bony walls of the orbit and limited anteriorly by the orbital septum, eyelids and furthermore by the attachment of the medial and lateral canthal tendons. (Sun et al., 2014) The most common cause of OCS is trauma, and diagnosis of OCS remains clinical, with patients typically presenting with acute visual acuity deterioration, diplopia, pain or proptosis over minutes to hours. (Carrim et al., 2007; Lima et al., 2009) The most common cause of OCS is trauma, and diagnosis of OCS remains clinical, with patients typically presenting with acute visual acuity deterioration, diplopia, pain or proptosis over minutes to hours. (Carrim et al., 2007; Lima et al., 2009)As orbital compartment syndrome is not a very common presentation which is encountered in everyday ophthalmic practice, we present here three cases of traumatic orbital compartment syndrome who presented to our hospital after enduring trauma. All of these cases presented to us during the devastating earthquake in the year 2015 in Nepal.

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Case 1:

18 years old female presented to the emergency department with chief complaints of sudden painful diminution of vision in the left eye

and forward protrusion of left eyeball for twenty-four hours after sustaining fall injury. Forward bulging of the left eye was gradually progressive, painful and associated with redness and swelling of lids. Diminution of vision was also sudden, painful and rapidly progressive.

On ocular examination, visual acuity in the right eye was 6/9 and in the left eye, it was no perception of light. Mechanical ptosis of the left upper lid was noted along with tense lid edema. There was the presence of relative axial proptosis of the left eye, which was tender on palpation, rapidly progressive with decreased sensation over the left infra orbital region. Extra ocular movements were full in the right eye and absent in the left eye. Conjunctiva in the left eye was congested, chemosed and prolapsed. Pupil in the right eye was round, regular and reactive to the light measuring 2.5 mm while in the left eye, it was fixed and dilated and did not show any reaction to light. Pupil measured 4.5 mm in the left eye. Fundus evaluation in right eye revealed no abnormality while in left eye; the optic disc was pale with cup disc ratio of 0.3:1. Macula had a notable cherry red spot and the whole of the retina was pale with collapsed vessels. Intra-ocular pressure measured by Perkins tonometer on the bedside was 13 mm of Hg in right eye 54 mm of Hg in the left eye.

Figure 1.1 : Left eye mechanical ptosis with lid oedema.

Figure 1.2 : Proptosis with fixed and dilated pupil in left eye.

Figure 1.3 : Conjunctival chemosis along with prolapsed conjunctiva in left eye.

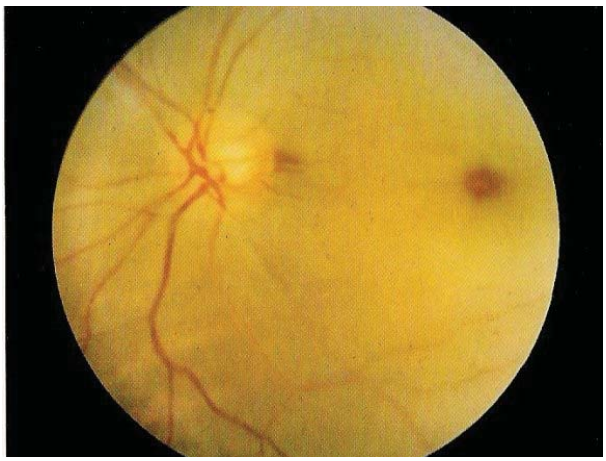

Figure 1.4 : Pale retina with collapsed vessels in left eye along with notable cherry red spot.

A provisional diagnosis of left traumatic orbital compartment syndrome was made and emergency lateral canthotomy and inferior cantholysis were done under local anesthesia as a bedside procedure in the emergency department. CT –scan of the orbit showed left retro-bulbar hemorrhage. She was started on

topical and oral anti-glaucoma medications as well as topical and oral steroid after the procedure. Intra ocular pressure came down to 43 mm Hg in the left eye, after the procedure. However, the vision of the left eye could not be saved. So, the final diagnosis was established as Left traumatic orbital compartment syndrome with left retro bulbar hemorrhage with left eye central retinal artery occlusion.

Case 2:

24 years old male presented to the emergency department with a chief complaint of sudden painful diminution of vision in the right eye for eight hours after sustaining a blow to the right side of the face with a wooden log. He also complained of inability to open the right eye since then.

On ocular examination, visual acuity in the right eye was perception of light with accurate projection of rays and in the left eye, it was 6/9. Right upper lid ptosis was present with complete ophthalmoplegia. Right eye proptosis was observed along with conjunctival chemosis. Pupil was measured to be 4.5 mm in size in the right eye with RAPD of grade IV and 2 mm in size in the left eye. On fundus examination, Optic disc and retina was pale with collapsed retinal vessels in the right eye. Left eye fundus examination showed no abnormality. Intra ocular pressure measured in the right eye was 60 mm of Hg at the time of presentation and in left eye; it was 15 mm of Hg, which was measured by Perkin's tonometer on the bedside.

Figure 2.1 : Presentation as right upper lid complete ptosis

Figure 2.2 and 2.3: Right eye conjuntival chemosis and prolapsed conjunctiva observed on lid retraction.

Figure 2.4 : 3-Dimensional reconstruction of skull bones showing fracture of right orbital medial wall and floor involving inferior rim of right orbit.

CT – scan of head and orbit showed a fracture of right orbital medial wall and floor involving inferior rim of right orbit. Urgent right lateral canthotomy and inferior cantholysis were done under local anesthesia. The patient was started on oral and topical anti-glaucoma medications and topical as well as oral steroids. Intra ocular pressure recorded after procedure came to 38 mm of Hg in the right eye. Visual acuity recorded the next day was perception of hand movement in right eye, which unfortunately did not improve on subsequent follow up. Open reduction and internal fixation of right maxillary wall fracture were done under general anesthesia in collaboration with a maxillofacial surgeon.

Case 3:

15 years old male presented to the emergency department with chief complaints of sudden painful diminution of vision and inability to open left eye for forty-five minutes. He sustained penetrating trauma to the left lower lid with a wooden stick one hour back.

On ocular examination, vision in the right eye was 6/6 while in left eye it was perception of hand movement close to face. Left lower lid laceration was present on the medial side with orbital fat prolapse. Left upper lid ecchymosis, mechanical ptosis and complete ophthalmoplegia were noted on examination. Left eye axial proptosis was observed. Sub-conjunctival hemorrhage with chemosis was also present in the left eye. The pupil was 2.5 mm in size in the right eye and 4 mm in size in the left eye with RAPD of grade IV. On fundus examination, the right eye was normal while blurring of the nasal margin of the optic disc was seen in the left eye. The retina was normal in the left eye with tortuous vessels. Intra-ocular pressure was measured to be 11 mm of Hg in right and 68 mm of Hg in the left eye on Goldmann applanation tonometry.

Figure 3.1: Left upper lid ecchymosis, mechanical ptosis and oedema. Left lower lid laceration has been sutured with 6-0 Vicryl.

Figure 3.2: Left eye sub-conjunctival haemorrhage and mid-dilated pupil.

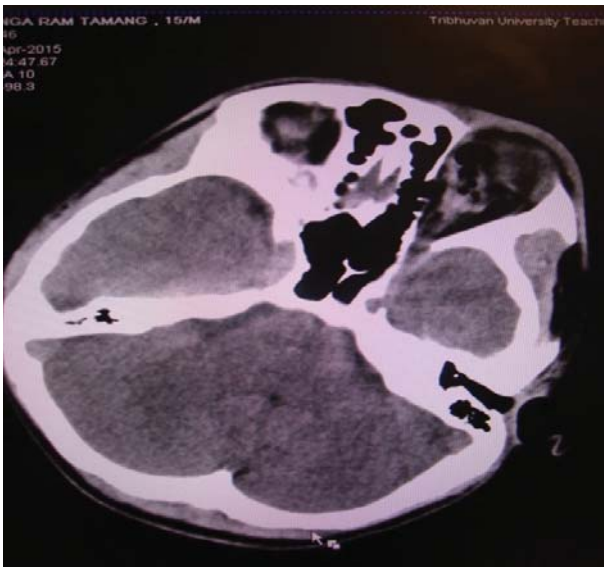

Figure 3.3 : CT scan of orbit: left intra- conal haemorrhage and air foci in the left intra-conal space.

Immediate left lateral Canthotomy with inferior cantholysis was done under local

anesthesia. He was started on topical and oral anti-glaucoma medication with topical steroid eye drops. Oral steroid was also started 1mg/kg body weight and tapered gradually. CT scan of head and orbit showed Hemorrhage in left intra-conal space and encasing optic nerve, air foci were seen in left orbit but no fracture noted. On the following day, visual acuity in the left eye had improved to 3/60. Intraocular pressure in the left eye was measured to be 29 mm of mercury. His final visual acuity, one month after the procedure, was 5/60 with no further improvement.

Discussion

In this case series, all the cases of orbital compartment syndrome were secondary to one or the other form of trauma, directly to or around the orbital space. In a major review, Lima et al. found that trauma accounted for 45% of all cases of OCS in the literature. (Lima et al., 2009) Common causes include acute orbital hemorrhage due to trauma, surgery, local injections, and preexisting medical conditions. There are other important etiologies of OCS such as fulminant orbital cellulitis or intraorbital abscess, orbital emphysema, inflammation, and tumors. Less commonly, prolonged hypoxemia with a capillary leak, foreign material in the orbit, massive fluid resuscitation after burn injury, or position-dependent edema can result in an acute rise in orbital pressure.(Lima et al., 2009) In this series, among three patients, two patients were blind before any intervention was done, and one patient had an improvement in vision after the procedure. Case 3 had regained final visual acuity of 5/60 after the procedure. Visual loss is usually attributed to one of three causes: central retinal artery occlusion, direct optic nerve compression, or compression of optic nerve vasculature.(Vassallo et al., 2002) Cause of visual loss in case 1 was central retinal artery occlusion and in case 2, it was direct optic nerve compression. In a similar case series, only three patients out of eight regained full vision in the affected eye and two patients had partial recovery of three or more lines of Snellen acuity.(Sun et al., 2014)

The delay between the time of injury and time of intervention plays a major role in visual prognosis in cases of orbital compartment syndrome. In our series, case 1 presented after 24 hours, case 2 presented after 8 hours and case 3 presented within 45 minutes of the injury. Improvement in vision was seen only in case 3. Previous animal studies have demonstrated that the retina can tolerate up to 100 min of ischemia prior to sustaining permanent damage following central retinal artery occlusion.(Hayreh et al., 1980)Hislop and Dutton demonstrated good visual recovery for their patients who underwent immediate surgical intervention, while patients left untreated or who had delayed decompression sustained complete blindness.(Hislop and Dutton, 1994) We reviewed the literature but none of the studies have suggested a time limit within which orbital decompression should be performed for maximum preservation of vision, however, Sun et al. have suggested emergent decompression, ideally within 2 hours of injury. (Sun et al., 2014)

All the patients gave a history of preceding trauma and sudden painful loss of vision. On examination, the patients presented with mechanical ptosis of upper lid with chemosis, limitation of all eye movements, proptosis, and chemosis of the conjunctiva and various grades of RAPD depending upon the severity of trauma. While examining a patient of polytrauma, mechanical ptosis of upper lid with tense edema and inability to retract the lid for the examination of the globe, should always make the examiner suspicious for orbital compartment syndrome as it is always a clinical diagnosis. In a case series of eight patients of orbital compartment syndrome, all patients reported an acute, painful loss of vision and on examination, all patients had decreased

visual acuity, proptosis and periorbital edema. (Sun et al., 2014)

On orbital imaging, all of our patients had retro-bulbar hemorrhage secondary to trauma. However, orbital wall fracture was noted only in case 2. Orbital hemorrhage secondary to facial fractures has been implicated as a major causative mechanism of OCS.(Thyne and Luyk, 1992; Wood, 1986) Globe tenting is one of the common radiological signs associated with OCS but it was not observed in any of our cases. A posterior globe angle of less than 120 degrees on CT scan is associated with a poorer prognosis.(Dalley et al., 1989)

All of our cases underwent immediate lateral canthotomy followed by inferior cantholysis. Lateral canthotomy and cantholysis is a bedside procedure and should be done under local anaesthesia.Normal intraorbital pressure has been measured at 3--6 mm Hg.(Krausen et al., 1981) In one study, an acute increase in orbital volume following a 7-ml retrobulbar injection resulted in significant topographic evidence of optic disc edema and rim changes which lasted up to 1 month.(Akar et al., 2004) Lateral canthotomy should be followed by immediate inferior cantholysis if there is no decrease in pressure. A study that simulated orbital hemorrhage by injection of normal saline into sheep orbits showed that greater reduction in intraocular pressure was achieved by lateral canthotomy and cantholysis (30.4 mm Hg) compared with canthotomy (14.2 mm Hg) or cantholysis (19.2 mm Hg) alone. (Yung et al., 1994) Further decompression can be achieved via superior cantholysis, orbital septum release and orbital wall removal.(Lima et al., 2009) However, further intervention was not done in our case as there was no visual potential in two cases and the third case improved after inferior cantholysis.

OCS is a rare presentation of orbital trauma. Knowledge about this emergency condition is invaluable not only to ophthalmologists but also to emergency physicians. In any patient presenting to emergency with trauma to the face, OCS should invariably be ruled out, even before radiological investigations. Prompt diagnosis and immediate intervention can help in preserving vision. Emergency lateral canthotomy and inferior cantholysis is a bedside procedure and doctors working in an emergency should be aware of this procedure as well. Repair of canthotomy and cantholysis can be done at a later date and it does not contribute to significant morbidity. This is a small case series as this condition presents infrequently. Literature related to this condition is scarce from our part of the world.

Conclusion:

In conclusion, Orbital compartment syndrome is a rare entity, an acute sequelae to orbital and facial trauma. It is an ophthalmic emergency which is diagnosed on clinical acumen. Timely diagnosis and prompt intervention can help in protecting and restoring the patient's sight.

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