CASE REPORT

Orbitopalpebral Emphysema in a Resource-Limited Setting: A Case Report

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ABSTRACT

Background: Orbital Emphysema (OE) is the presence of air in the periorbital soft tissues. The most common cause is orbital wall fractures. However, other causes include infections secondary to gas-producing microorganisms, pulmonary barotraumas, airplane trips, intubation barotraumas and frontal sinus osteomas. Non-traumatic causes such as nose blowing and lifting weights have also been reported. Although computed tomography (CT) scan is the gold standard diagnostic investigation, OE is radiologically detected in only about 50% of orbital fractures. When not well managed, there is an increase in the intraorbital pressure leading to compressive effects on the central retinal artery and the optic nerve, resulting in blindness.

Case Presentation: An adult male with history of blunt trauma presented with reduced visual acuity, proptosis, opthalmoplagia, and elevated intraocular pressure (IOP) of 30 mmHg. In the absence of CT scan, OE was diagnosed clinically supported by orbital ultrasound (B-scan) that revealed hyperechoic air collections with acoustic shadowing. The patient was managed medically with counselling against valsalva maneuvers. There was with rapid resolution of proptosis, opthalmoplagia, ocular hypertension from 30.8 mmHg to 10.1 mmHg by day 6.

Conclusion: In resource-limited setting, a high index of suspicion for orbital wall fracture is needed. Therefore, orbital emphysema should prompt the attending clinician to counsel the patient appropriately against valsalva maneuvers. Orbital ultrasonography has a high sensitivity and specificity in identifying air collection and fractures. Therefore, it can be used as an alternative to a CT scan in a resource-limited setting where skilled personnel are available.

INTRODUCTION

Orbital emphysema (OE) is characterized by trapping of air in the subcutaneous soft tissue around the orbit. It is commonly seen in patients

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with facial injuries leading to orbital wall fractures but non traumatic causes have been reported following nose blowing or sneezing (1). Following orbital wall fractures, OE is exacerbated by valsalva maneuvers like coughing, sneezing, blowing the nose and vomiting (2). While most cases have spontaneous resolution, cases that cause optic nerve ischemia and orbital compartment syndrome threaten vision very seriously, and in such cases the air must be evacuated (2). If the fracture is missed and not adequately managed, OE can rapidly increase and complicate to loss of vision (3). The gold standard in the definitive investigation for Orbital emphysema is the CT scan (1). Plain radiography like X-ray has a high false negative rate 50% and non-diagnostic rate 30% in detecting fractures in orbital trauma (1,4,5). CT identifies bony defects in OE and anatomical location of air (1,6). Timely diagnosis, thorough patient counselling, conservative management, close monitoring, and expedient surgical intervention on deterioration are keystones in OE management (7,8), and not necessarily the availability of a CT scan. A case is hereby presented to highlight the approach to OE where there is limited access to CT scan and how to prevent and recognize ocular and sight threatening complications.

PATIENT INFORMATION

A 47-year old African businessman presented with a three days history of protruding left eye associated with pain and blurry vision following a blunt facial injury sustained when he struck a metallic bar as he was walking in a dark store room.

PAST MEDICAL HISTORY

He had been living with HIV infection without comorbidities like Asthma, Tuberculosis, Chronic Obstructive Pulmonary Diseases, Hypertension, Diabetes mellitus or paranasal sinus tumour.

PAST OCULAR HISTORY

He denied previous ocular diseases or refractive errors. There was no surgery conducted to his eyes, neck or chest prior to presentation. Both eyes were in a good state of health.

PSYCHO-SOCIAL HISTORY

He was a business man in the construction industry and mostly found in the workshops of building materials. He was an alcoholic with a regular intake of twelve (12) units of alcohol in a week but denied history of smoking.

CLINICAL FINDINGS

Right eye examination revealed a normal visual acuity and normal ocular findings. On examination of the left eye, his visual acuity was 6/60 improving to 6/18 with a pin hole, intraocular pressure was 30.8 mmHg and extra-ocular motility showed restriction in secondary and tertiary positions of gaze. There was left axial proptosis of 4 mm relative to the right eye with diplopia in the six cardinal positions of gaze. His left eye showed positive Nafziger's sign (protrusion of the eye ball evidenced by differences in visualisation of the cornea reflexes between the two eyes on bird's eye view), lagopthalmos, eye lid edema with subcutaneous crepitus, diffuse conjunctival congestion with air loculations of various sizes beneath the conjunctiva (subconjunctiva emphysema), poor Bell's reflex with superficial punctate cornea staining. No pulsation, bruit or resistance to retropulsion was noted. The conjunctival fornices were free and there was no hypoesthesia along the dermatomes of the ophthalmic (V1) and maxillary (V2) divisions of the trigerminal nerve. The posterior segment was normal with no optic disc edema nor choroidal folds.

TABLE 1: PROPTOSIS CHART FOR CLINICAL ASSESSMENT

DAYS	SIDE OF EYE	CLINICAL FEATURE PARAMETERS							
DAY 1		**PROPTOSIS MEASUREMENT**	**VA**	**IOP in mmHg**	**EOM**	**PUPIL EXAM**	**FUNDUS EXAM**	**CORNEA EXAM**	**COLOUR VISION TEST**
	RIGHT EYE	19 mm	6/6	17	Free	Pharmacollogically dilated	Normal	Clear cornea	Unavailable
	LEFT EYE	23 mm (4mm difference)	6/60	30.8	Severe restriction	Pharmacologically dilated	Normal	Punctate staining	Unavailable
DAY 6		**PROPTOSIS MEASUREMENT**	**VA**	**IOP in mmHg**	**EOM**	**PUPIL**	**FUNDUS EXAM**	**CORNEA EXAM**	**COLOUR VISION**
	RIGHT EYE	19 mm	6/6	11.1	Free	RRRL	Normal	Clear cornea	Unavailable
	LEFT EYE	20 mm(1 mm difference: normal)	6/6	10.1	Free	RRRL	Normal	Clear cornea	Unavailable

Table 1 shows the sequence of clinical manifestation as they were monitored on the two occasions. Note that the patient had been administered mydriatic eye drops in both eyes prior to slit lump examination on the initial visit (day 1) hence the pupil examination could not be assessed.

DIAGNOSTIC ASSESSMENT

Within the clinic ocular ultrasound scan (B-scan) was conducted using a compact touch ophthalmic ultrasound AB/pachymeter 3 in 1 scan with a 15MHz B-mode probe. It showed normal hypoechoic vitreous with retina attached in all quadrants. It did not show any fluid collection in the orbit such as orbital or subperiosteal haemorrhage or hematoma, no foreign body or lens dislocation. Hyperechoic lesions along and posterior to the sclera with acoustic shadowing were noted as shown in figure 7 and 8 consistent with subtle air collection in the orbit.

CHALLENGES

The skill to look for orbital wall fractures using the ultrasound was beyond the attending physician.

CT scan could not be performed as the machine was not readily available.

DIFFERENTIAL DIAGNOSIS.

Orbital compartment syndrome was ruled out after finding free conjunctiva fornices on lid retraction, lid margins not tightly bound to the globe on the lid pinch test. No resistance to retropulsion and the very presence of lid sucutaneous emphysema implied the air had a wayout of the orbital compartment to the preseptal facial soft tissue spaces (1). A normal retropulsion helped rule out significant retrobalbar haemorrhage or haematoma. There was absence of pulsation and orbital bruit that would have suggested carotid carvenous fistula. The acute presentation and absence of masses around the orbit eliminated possibilities of orbital varix. However, the presence of crepitus with visible air under the conjunctiva coupled with axial proptosis with elevated intraocular pressure favored both subconjunctiva and orbital emphysema. Presence of superficial punctate cornea staining in the background of proptosis and lagopthalmos with poor Bells' reflex alluded to exposure keratopathy. Orbital wall fractures could not be clinically or radiologically be confirmed as he had normal sensation along the ophthalmic and maxillary dermatome despite the restricted ocular motility and also that patient could not do the CT of the orbit and paranasal sinuses at the time.

DIAGNOSIS AND THERAPEUTIC INTERVENTION

A diagnosis of proptosis secondary to orbitopalpebral emphysema with exposure keratopthay and acute intraocular hypertension was established. The patient was treated with oral Acetazolamide and Timolol eye drops to lower the intraocular pressure while oral and topical antibiotics were prescribed to prevent secondary infections.

- Oral Acetazolamide 500mg stat then 250mg eight hourly for three days.
- Oral metronidazole 400mg eight hourly for seven days.
- Timolol 0.5% 1 drop twice daily in the left eye for seven days.
- Moxifloxacin 0.5% 1 drop six hourly in the left eye for seven days.

Surgical needle decompression was not performed as compartment syndrome was ruled out. Eye lid taping to close the eye and protect the cornea was advised. The patient was counseled on bed rest and also to avoid valsalva maneuvers like blowing the nose, coughing or sneezing. All observations improved progressively and on the sixth (6th) day, the intraocular pressure normalized to 10.1 mmHg and visual acuity improved to 6/6. The motility restriction, eyelid edema, subconjunctiva emphysema, proptosis and lagopthalmos had resolved. The cornea returned to normal clarity. A follow up CT scan to assess for fractures was emphasised to be done as soon as possible.

FOLLOW UP

The patient was managed as an out patient and followed up in general ophthalmology clinic. Following the conservative management with strict adherence to medications and avoidance of valsalva maneuvers which the patient followed well, on the second visit the VA was 6/6, IOP reduced to 10.1 mmHg and proptosis to 1 mm. The subcutaneous crepitus had resolved

and the extraocular muscle motility was free in all positions of gaze. He continued bed rest and after two weeks he resumed his normal daily activities and a month later the patient had no complaint and the ocular vitals were still normal and identical in both eyes.

DISCUSSION

In this report, type 3 OE is discussed in the setting were radiological confirmation with a CT scan was not readily available. To the best of our knowledge, there has been no case report about OE in Zambia especially that CT scan is not readily available or accessible everywhere. There are three types of traumatic OE according to heerfordt classification (8). Type 1 involves palpebral or preseptal emphysema where the orbital septum is intact yet the lacrimal bone is fractured and therefore air passes from the nose through the nasolacrimaI drainage into the upper eyelid.Type 2 describes the accumulation of air behind an intact orbital septum but with a broken nasal mucosa following orbita fracture (4). In type 3 OE, pressure increases beyond the mechanical strength of the orbital septum and air passes freely from the orbit into the eyelid (1). Subconjunctival emphysema occurs in orbital fractures when there is direct passage of air from the paranasal sinuses through loose tissue planes of the orbits, into the subconjunctival space (9). Near the orbit are the maxillary sinus inferiorly, the frontal sinus superiorly, and the ethmoid sinus medially (2). Fractures typically occur at the thinnest portions of the orbital wall ie medial or inferior orbital wall allowing air entry from the ethmoid and maxillary sinuses, respectively. Although the lamina papyracea in the medial wall is thinner (about 0.25 mm in thickness) than the orbital ? oor which is 0.5 mm thick, orbital ? oor fractures are most common (1). Orbital emphysema can also occur spontaneously after forceful nose blowing without any history of head or neck trauma. Possible explanation for this are due to aging, inflammation in the sinus associated with chronic rhinitis, and old traumas to the orbit that weaken the orbital floor and makes it more prone to fractures with any high-pressure Valsalva maneuver (10). Although OE is usually self limiting and transient, sight-threatening complications that can result in loss of vision have been reported such as compartment syndrome, ischaemic optic neuropathy and central retinal artery occlusion. (5). If orbital compartment syndrome is suspected, urgent decompression is necessary and can be performed by canthotomy, cantholysis or by needle aspiration (4).

In the case presented, the extraocular motility restriction was attributed to OE and not tissues entrapment that occurs in orbital fractures based on total restriction with the quick resolution as soon as the air was absorbed. A forced duction test would have also been useful to clinically distinguish mechanical from functional restriction of ocular motility. This correlate with findings in the study by Moon et al (11) where the supraduction limitation recovered conservatively without surgery (12). Ocular ultrasound (B-scan) revealed supporting evidence of air in the orbital as hyperechoic areas with acoustic shadowing. The hyper-reflectivity has been attributed to the acoustic impedance difference between air and soft tissues (11). This tallies with the features described by Buttar et al and this makes ultrasound an effective cost saving diagnostic measure (13). The cost of ultrasound is much less than a CT scan and has no risk of radiation. Moreover linear probe ultrasound has a high sensitivity of 92.9% and a high specificity of 90.0% for orbital fractures but varies with operator and location of fracture (14). Pruksapong et al (14) compared ultrasound, plain X-ray and CT scan in detecting orbital

fractures. He found different sensitivities and specificities depending with the location of fractures and the operator. The linear probe ultrasound finding were better than plain X-ray with a good diagnostic performance and reliability (14).

The limitations that come with ultrasound include operator skills, experience, type and location of fracture (14). The type of probe used and frequency of the sound waves determines the quality of the image. In ruptured globe caution is advised if at all it must be performed. However, it is relatively contraindicated to avoid extrusion of the eyeball contents.

In this study, the fractures were not looked for due to limited skill which is an important observer dependant factor. However, the presence of air-tissue interface was seen as hyperechoic lines. Albonornoz et al (15) found similar features in a young woman with atraumatic OE using a point of care ultrasound. Like Ural et al (4), the OE was conservatively managed and responded well.

TABLE 2: CLASSIFICATION AND MANAGEMENT OF OE.

Stage	features	Management
mild	No sign of optic nerve compression and visual compromise.	Conservative management
moderate	Early signs of optic nerve compression / mild visual compromise, elevated IOP, moderate proptosis.	Consider needle decropresion +/ - lateral canthotomy, cantholysis
severe	Signs of marked optic nerve compression / significant visual compromise, elevated IOP, significant proptosis.	Consider emergency orbital decompression

Note:Adopted from Ng QX et al (11) for classification and management of OE.

CONCLUSION

In conclusion, OE most commonly follows orbital wall fractures due to trauma. In a case of proptosis with limited resources to perform a CT scan, point of care ultrasound can be used. It can show the presence of air, location of the fracture and an added advantage of not exposing the patient to a high dosage of radiation. B-scan is a cost effective alternative to CT scan for both the patient and the health facility. For a good visual prognosis, a high index of suspicion is needed and the patient must be well instructed to avoid the valsalva maneuvers. OE can rapidly increase and endanger vision once neglected yet on the other hand it can resolve as early as within seven to ten (7-10) days (4,6). Following the patient's presentation, the conservative management must be coupled with a close monitoring of the pupil reaction, extraocular motility, intraocular pressure and visual acuity.

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PATIENT PERSPECTIVE

The patient was happy to return to his daily activity with a normal quality of life as before.He expressed his gratitude that surgery was not conducted yet his vision was preserved and recovered well by strictly avoiding valsalva maneuvers.

INFORMED CONSENT

Written informed consent for publication was obtained from the patient.

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CONFLICTS

The authors have no conflicts of interest in this report.