ACUTE ABDUCENS NERVE PALSY IN A PATIENT WHO SUSTAINED BLUNT TRAUMA

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Background

- Abducens nerve (Cranial Nerve VI) innervates the lateral rectus (LR) muscle.
- Head trauma is one of the most common causes of cranial nerve palsies. Orbital and or facial injuries could also affect the muscle directly or the orbital course of the VI nerve and lead to palsy.

Purpose

- The purpose of this case report is to present a unique case of young man with multiple orbital fractures who also had the impingement of LR with a bony spur resulting in complete loss of abduction.

Case Description

- A 29-year-old was admitted to the emergency department on 27/07/2020 after having a 15-foot fall from the roof of his house. As a result of his fall, he sustained multiple injuries and fractures. He lost consciousness for twenty minutes following the injury and sustained a subdural hematoma.
- On admission he was evaluated with a non-contrast computed tomography (CT) Polytrauma. The CT scan revealed fracture of the left orbit at the medial, lateral and inferior walls. A bony spur from the lateral wall was noted to be impinging on the belly of his his left lateral rectus muscle (Figure 1). His other injuries included tripod fractures to the left facial bones, extensive left arm fractures and left iliac crest fracture. The patient complained of diplopia and was noted to have complete loss of abduction in the left eye. He was referred to the ophthalmology department for review of the orbital fracture and of his double vison.

Figure 1: Nonenhanced brain CT Scan at admission. Bone view showing fracture of the lateral wall of the left orbit, with a small area of hemorrhage in the left anterior temporal fossa.



- On ophthalmological examination of the patient, visual acuity was 6/6 in both eyes. Intraocular pressures were 15 mmHg OU with Tono-Pen tonometry and fundoscopy was normal bilaterally. There was ecchymoses in the periorbital region of the left eye and a left subconjunctival haemorrhage. A large angle left esotropia was seen in the primary position and marked left lateral rectus restriction and under-action of left depression was noted and confirmed on Hess chart (Figure 2a). All other extraocular muscles were intact in both eyes.

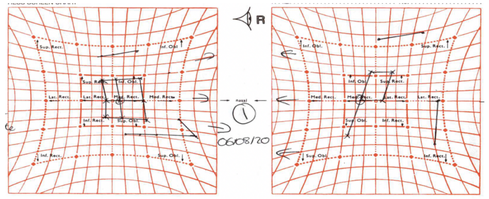
Conclusion

- Orbital mechanical causes are often overlooked in LR palsy.
- We reiterate the role of orbital imaging in any patient with cranial nerve VI or LR Palsy.
- Inability to abduct eye past the midline and bilateral palsy have a poor prognosis.
- Once a patient is diagnosed, close follow-up and early intervention may be beneficial to improve prognosis

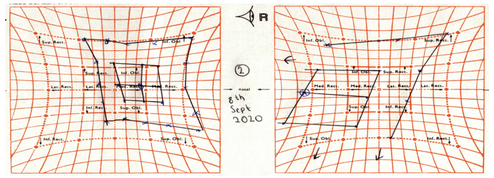
- The patient underwent smoothing of the bone spur with exploration and reconstruction of the orbital wall by maxillofacial surgeons (Figure 3).
- The Hess chart following surgery continued to show left lateral rectus palsy with overaction of the right medial rectus muscle (Figure 2b).
- After a period of unimprovement following the surgery, a magnetic resonance imaging (MRI) of the brain and the internal auditory meatus with contrast was done to further evaluate the left lateral rectus and the course of the left 6th nerve. The MRI revealed atrophy of the left lateral rectus muscle suggesting denervation.
- After three months since onset, the patient reported improved ability in abducting his left eye with corresponding improvement displayed on his Hess chart (Figure 2c).

Figure 2: Hess chart demonstrating progression from CN VI palsy to complete recovery of abduction.

2a) On Admission



2b) After Surgery



2c) After Three Months Follow-up

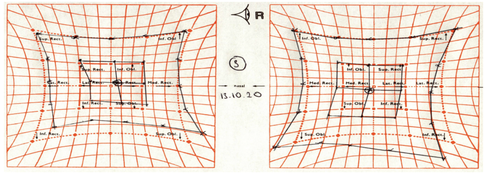
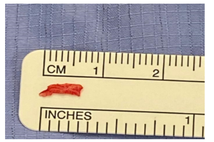


Figure 3: Bony spur that was removed from lateral rectus muscle.



Discussion

- The abducens nerve has a long intracranial course and as a result is commonly injured in head trauma, generally associated with skull fracture and intracranial bleed. In most cases, this is thought to be the cause for any VI nerve palsy.
- As the longest intracranial nerve, the abducens nerve is commonly injured after head trauma. (8) Various studies have shown that only 3.1% of abducens nerve palsy are due to trauma. Furthermore, 1% to 2.7% of those which are related to trauma are unilateral. (9)
- The case report highlights the fact that orbital causes such as direct muscle avulsion or an injury to the orbital portion of the VI nerve, as a cause for LR weakness could be easily overlooked, unless specifically examined with dedicated high-resolution orbital imaging.
- Inability to abduct eye past the midline and bilateral palsy have a poor prognosis. Once a patient is diagnosed, close follow-up and early intervention may be beneficial to improve prognosis of patient.

References:

Azarmina M, Azarmina H. The six syndromes of the sixth cranial nerve. Journal of Opthalmic & Vision Research. 2013 Apr; 8(2): 160-171.

Kumar N, Mukherjee S, Patel MP, Suni, Abhishek, Bhangale D. Delayed manifestation of unilateral 6th and 7th cranial nerve palsies following head injury. Indian J Basic Applied Med Res 2013; 2 (8) 1035-1037

Bilateral traumatic abducens nerve palsy without skull fracture and with cervical spine fracture: case report and review of the literature. *Arias MJ Neurosurgery. 1985 Feb; 16(2):232-4.*

Elder C, Hainline C, Galetta SL, Balcer LJ, Rucker JC. Isolated abducens nerve palsy: update on evaluation and diagnosis. Curr Neurol Neurosci Rep [Internet] 2016; 16:69.

Fam, D. J., Baharnoori, M., Kassardjian, C. D., & Saposnik, G. (2015). Posttraumatic Bilateral Abducens Nerve Palsy: Mechanism of Injury and Prognosis. *Canadian Journal of Neurological Sciences / Journal Canadien Des Sciences Neurologiques*, *42*(5), 344–346. https://doi.org/10.1017/cjn.2015.57

Keskin, E. S., Keskin, E., Atik, B., & Koçer, A. (2015). A case of isolated abducens nerve paralysis in maxillofacial trauma. *Annals of Maxillofacial Surgery*, *5*(2), 258. https://doi.org/10.4103/2231-0746.175752.

Lelli G, Milite J, Maher E. Orbital floor fractures: evaluation, indications, approach and pearls from an ophthalmologist's perspective. Facial Plast Surg. 2007;23(3):190–199.

G. Iaconetta, M. Fusco, L.M. Cavallo, P. Cappabianca, M. Samii, M.Tschabitscher. The abducens nerve: microanatomic and endoscopic study. *Neurosurgery*, 61 (2007), pp. 7-14

Keskin ES, Keskin A, Bekir A, Kocer A. A case of isolated abducens nerve paralysis in maxillofacial trauma. Annals of Maxillofacial Surgery. 2015 July-Dec; 5(2): 258 -261.

Goodwin, D. (2006). Differential diagnosis and management of acquired sixth cranial nerve palsy. *Optometry - Journal of the American Optometric Association*, *77*(11), 534–539.

Hung HL, Kao LY, Sun MH. Botulinum toxin treatment for acute traumatic complete sixth nerve palsy. *Eye (London).* 2005; 19:337-41.

Holmes JM, Droste PJ, Beck RW. The natural history of acute traumatic sixth nerve palsy or paresis. *J AAPOS*. 1998; 2:265-268.

Holmes JM, Beck RW, Kip KE, et al. Predictors of nonrecovery in acute traumatic sixth nerve palsy and paresis. *Ophthalmology*. 2001; 108:1457-1460.

Holmes JM, Beck RW, Kip KE, et al. Predictors of nonrecovery in acute traumatic sixth nerve palsy and paresis. *Ophthalmology*. 2001; 108:1457-1460.

Mutyala S, Holmes JM, Hodge DO, et al. Spontaneous recovery rate in traumatic sixth-nerve palsy. *Am J Ophthalmol*. 1996; 122:898-899.