

Management of imbalance in a patient with third window disease associated with normal pressure hydrocephalus after head trauma, case report

Sawsan Mahmood AbuZaid ^{1,*}, Tareq mohammed Salem ², Ahmed Mohammad Smadi ¹, Anas Mohammad Elamaireh ¹, Malek Nawaf Al-Madaineh ¹, Thabet Hussein Mugdadi ¹ and Own Mahmoud Al-Khawaldeh ¹

¹ Department of Otorhinolaryngology, Jordanian Royal Medical Services, Amman, Jordan.

² Department of Neurology, Jordanian Royal Medical Services, Amman, Jordan.

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Abstract

Imbalance is a common symptom after head trauma, which could be caused by either central, peripheral vestibular disorders or both, brain concussion represents a common central cause of imbalance after head trauma, while peripheral causes include labyrinthine concussion, Benign Paroxysmal Positional Vertigo, Perilymphatic fistula, Inner ear third window disease, this imbalance is managed depending on the underlying cause, we will present a case of imbalance after head trauma in a 54 year old patient and share our experience in managing it.

Keywords: Brain concussion; Labyrinthine concussion; Benign Paroxysmal Positional Vertigo; Perilymphatic fistula; Inner ear third window disease.

1. Introduction

Dizziness is a common disorder that affects patients after head trauma, it could be related to brain concussion (Traumatic brain injury), in which there is change in the brain function after an external force (1), labyrinthine concussion is one of the peripheral causes of imbalance after head trauma; patients usually present with different degrees of unilateral or bilateral hearing loss with vertigo and imbalance(2), Benign Paroxysmal Positional Vertigo is the most common cause of dizziness after head trauma, it's etiology is related to dislodgement of the otoconia from the utricle to the semicircular canals after different intensities of head trauma, these patients usually present with positional vertigo that is managed by different repositioning maneuvers (3), perilympatic fistula could occur as a result of head trauma in which a direct communication between the middle ear and the perilymphatic spaces of the inner ear occur usually through the oval or round windows, these patients present with different auditory and vestibular symptoms, it's diagnosis requires middle ear exploration with connective tissue close of the fistula (4), Cochlear-Facial nerve dehiscence is a common type of third window disease, these patients usually report a history of head trauma before the onset of their symptoms (5).

2. Case presentation

A 54 year old male, with a previous history of ischemic heart disease, presented 2 years ago with severe imbalance after a history of head trauma, directly after the head trauma he had loss of consciousness and was admitted to the Intensive care unit for few days, he was diagnosed to have subarachnoid hemorrhage at that time,

He visited our dizziness clinic 3 months after the onset of his symptoms, with severe imbalance and left ear hearing loss,

* Corresponding author: Sawsan Mahmood AbuZaid.

Pure Tone Audiometry showed Lt Dead ear, physical examination revealed first degree spontaneous right beating nystagmus, and a positive head impulse test on the left side,

The VideoNystagmoGram VNG showed left uncompensated peripheral vestibulopathy, and abnormal oculomotor tests,

The VHIT (Video Head Impulse Test) revealed low gains with corrective saccades in the left lateral and left posterior canals, the left anterior canal showed normal gains with corrective saccades, he had normal function of all canals on the right side (**Figure 1**).

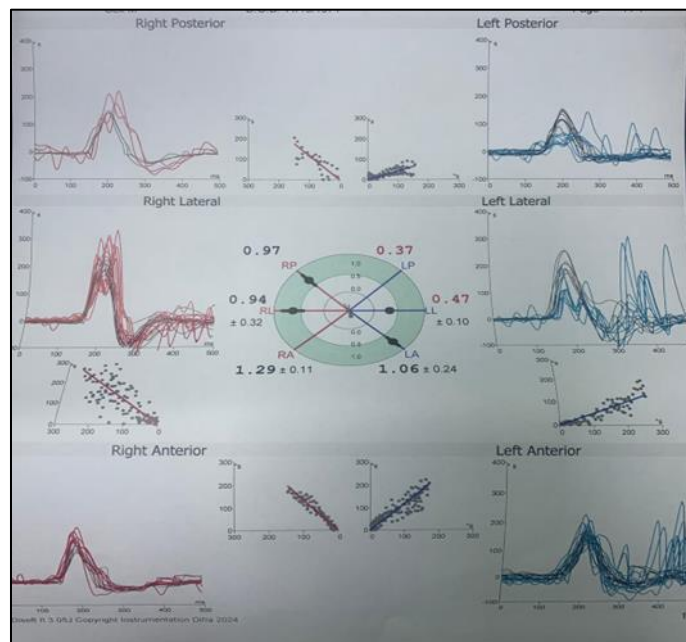
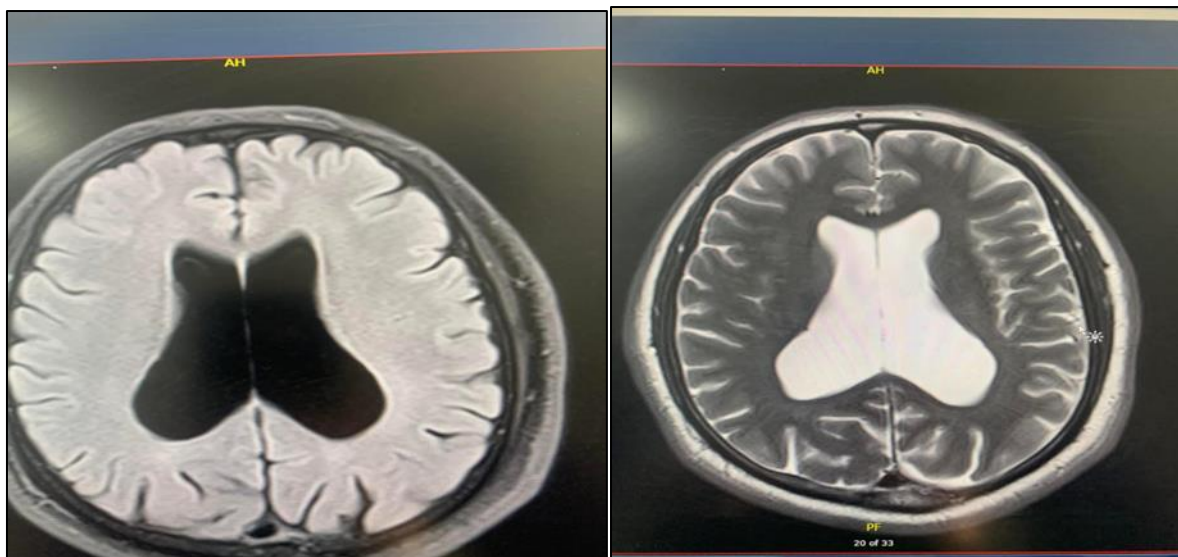


Figure 1 VHIT (Video Head Impulse Test), showing low gains with corrective saccades in the Left Lateral and left anterior semicircular canals



Figure 2 Left ear Temporal bone CT scan (Stenvers view), revealing a Cochlear – Facial nerve dehiscence



Figures 3,4 Brain MRI axial view: T1 and T2 windows showing enlarged lateral ventricles (Normal Pressure Hydrocephalus)



Figure 5 Brain MRI: Sagittal view, T2 window, revealing hummingbird sign of the midbrain and decreased midbrain – pons area ratio

So, he was diagnosed initially as left labyrinthine concussion and was sent to vestibular rehabilitation for 3 months with partial improvement of his balance.

At that time, he started to complain of inner ear third mobile symptoms, like sound induced dizziness and bone conducted hyperacusis (he feels his footsteps in his left ear),

Cervical + Ocular Vestibular Evoked Myogenic Potentials (c+o- VEMPs) were absent in the left side, but the temporal bone CT scan showed Left Cochlear – facial nerve dehiscence (figure 2),

The brain MRI was done initially and showed arrested hydrocephalus, (figures 3, 4), but his symptoms at that time was not contributed to this pathology by the neurologist.

So left ear round window obliteration surgery was done for the left cochlear –facial nerve dehiscence (his hyperacusis and sound induced dizziness improved, with no improvement in his balance).

Further assessment and examination of the patient revealed absent vertical up gaze, careful assessment of the brain MRI in the sagittal view showed humming bird sign (figure 5), the midbrain/ pons area ratio was assessed by the neuroradiologist and was found less than 0.5, so Progressive Supra nuclear palsy was diagnosed and was suspected by the neurologist to be secondary to the pressure effect of the dilated third ventricle on the midbrain.

So lumbar puncture was done for him, with immediate improvement of his up gaze and balance, he was sent to the neurosurgeon (for which a ventriculoperitoneal VP shunt was inserted) and that resulted in complete improvement of his balance.

3. Discussion

The management of chronic imbalance relies on diagnosing and treating the underlying cause, specifically after head trauma multiple etiologies may be suspected, and many patients may have more than one etiology, in our case the first diagnosis was labyrinthine concussion, it was diagnosed depending on the symptoms and findings in auditory and vestibular tests; in which he complained of total loss of hearing in his left ear after head trauma with acute vertigo and imbalance, the vestibular tests including VNG and VHIT confirmed the left vestibulopathy, accordingly left ear labyrinthine concussion was diagnosed, nevertheless the partial improvement of the balance after vestibular rehabilitation raised the suspension of the presence of another etiology for imbalance, the brain MRI that was done initially revealed normal pressure hydrocephalus, but initially was not suspected as a case of his symptoms.

The presence of third mobile window symptoms guided to more investigations and led to the diagnosis of left ear cochlear facial nerve dehiscence that presents with vestibular symptoms including sound induced dizziness (Tullio phenomenon), also auditory symptoms may be present like autophony, and bone conducted hyperacusis (5), and was treated by round window obliteration surgery (5), that led to improvement in all third window symptoms except balance.

Finally because the patient still complained of imbalance after the previous therapeutic options, further assessment of the patient revealed Progressive Supranuclear Palsy PSP, the diagnosis was based on clinical examination and imaging studies; brain MRI with hummingbird sign that is a sign of PSP (6), this pathology was suspected to be secondary to the Normal pressure hydrocephalus as the midbrain may be compressed by the pressure effect of the third ventricle in this disease, some studies on the literature support this theory (7, 8), the Normal pressure hydrocephalus could be also a result of the head trauma (9), the complete improvement of balance and gaze after VP shunt and decrease in the CSF pressure confirms that the midbrain pathology is secondary to the hydrocephalus.

4. Conclusion

This case guides physicians to the importance of investigating and suspecting more than one pathology as the cause of imbalance then treating them accordingly, especially in patients with head trauma, in addition, team work; multi-disciplinary team collaboration is required for reaching the final diagnosis in many dizzy patients.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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