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Headache to a Patient with the Coexistence of Chiari I Malformations and Primary Empty Sella Syndrome: A Case Report

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Abstract
Background: Chiari I malformations (CM-I) and Primary Empty Sella syndrome (PESS) are rare disorders of structural defects within a skull. Headache is the most common presenting symptom in both conditions. However, CM-I and ESS comorbidity in patients with severe headaches is yet to be reported.
Case description: The patient was a 38-year-old woman with a one-year history of headaches at various localisations (occipital and bilateral frontal) preceded by mood agitation. Physical examination was significant for obesity. Magnetic resonance imaging (MRI) revealed a 6.4 mm cerebellar tonsil descent through the foramen magnum and hypointense (CSF-filled) flattened sella. The lipid panel showed elevated cholesterols (total) and low-density lipoprotein (LDL) levels. She was medically managed, with no report of symptoms relapses at one-month and two-month follow-ups.
Conclusion: This is the first report on comorbid CM-I and PESS in adults presenting with cephalalgia. PESS and CM-I co-occurrence may present with mixed headache localisation; careful history-taking and imaging are mandatory for diagnosis confirmation. Future extensive studies are warranted to analyse the pathophysiological interplay between these two rare disorders.

Keywords: Adult, Case report, Chiari I malformations, Empty sella syndrome

Introduction

Chiari malformations are a spectrum of hindbrain pathologies affecting the cervical cord, cerebellum, base of the skull, and brainstem; Chiari malformations type 1 (CM-I) is the most common (McClugage & Oakes, 2019). With the advent of neuroimaging techniques, CM-I is increasingly identified in the population.

CM-I is defined as the caudal displacement of one or both cerebella tonsils by > 5 mm and 3–5 mm below the foramen magnum (McClugage & Oakes, 2019). Headaches (Chiari headache) are the most typical presenting symptoms in CM-I and vary based on the patient's age (McClugage & Oakes, 2019; Olesen, 2018). However, typical adult presentations include occipital headaches and neck pain worsened by the Valsalva manoeuvre, coughing, or sneezing (Olesen, 2018). Furthermore, epidemiological studies on CM-I have shown female

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preponderance, with a prevalence rate of 0.1% to 0.5% (McClugage & Oakes, 2019).

The term empty sella syndrome (ESS) refers to a rare condition in which the subarachnoid space herniation into the sella turcica results in compression and flattening of the pituitary gland and pituitary stalk stretching through an incompetent seller diaphragm (Chiloiro et al., 2017; Miljic et al., 2000). ESS incidence varies in autopsy cases and is estimated to be 5.5 -12%, while in patients undergoing neuroimaging, it is estimated to be 12% and up to 35% in clinical practice (Chiloiro et al., 2017).

Based on pathophysiology and aetiology, ESS is subdivided into two categories: primary ESS (PESS), known for lacking a specific identifiable cause, and secondary ESS, resulting from surgery, radiation, haemorrhage, or infarction of the pituitary gland (Miljic et al., 2000). Headaches are the most frequently reported symptoms of PESS (Catarci et al., 1994).

However, despite headache being the most common presenting feature among these two rare disorders. Comorbidity is yet to be reported in scientific literature. We present the first case report on the coexistence of CM-I with PESS, confirmed by magnetic resonance imaging (MRI); we further report a marked symptom improvement during the follow-up period.

Case report

The patient was a 38-year-old female who presented to the neurology department with a history of recurrent headaches that persisted for over a year. She elaborated that the headache episodes were severe and associated with dizziness and neck pain. She also reported left-sided facial and lower limb numbness. The nature of the headaches was pulsating and brief (approximately <5 minutes), localised bilaterally at the frontal region and occipital area with neck movement restriction. Headaches were aggravated by noise but not change in position, smell, or menstruation. No accompanying photophobia, vomiting, or nausea were reported. She had no history of radiation, pituitary gland surgery, or trauma. Before each headache attack, she experienced an agitated mood. There were no symptoms suggestive of hypopituitarism. She reported prior multiple consultations at different hospitals without significant headache relief. She was obese, with intact blood pressure (121 / 94 mmHg). Neurological examination was unremarkable.

Laboratory testing identified elevated cholesterol levels with total cholesterol of 6.10 (0-5.2), LDL 4.53 (2.59-3.34), and HDL 1.1 (1-2.2) mmol/l. Initially, we ordered a spine MRI (Fig. 1B), which revealed a 6.4mm caudal descent of the cerebellar tonsil through the foramen magnum, suggesting CM-I. Nevertheless, this could not fully explain our patient's frontal localisation of headache and preceded mood disturbances. We then ordered a brain MRI (Fig. 1A), which showed CSF-filled (hypodense) sella turcica and tonsillar herniation, suggesting co-occurrence of CM-I and PESS.

The patient was started with a 75 mg pregabalin and atorvastatin 20 mg oral dose daily and instructed on a dietary approach to reduce weight along with physiotherapy. Monthly evaluation with a neurologist was set, with scheduled repeated ophthalmologic examinations and pituitary function tests. At the one-month follow-up, she reported improved symptoms of headache, dizziness, facial numbness, and lower limb numbness. However, no adverse effects of the medications were reported.

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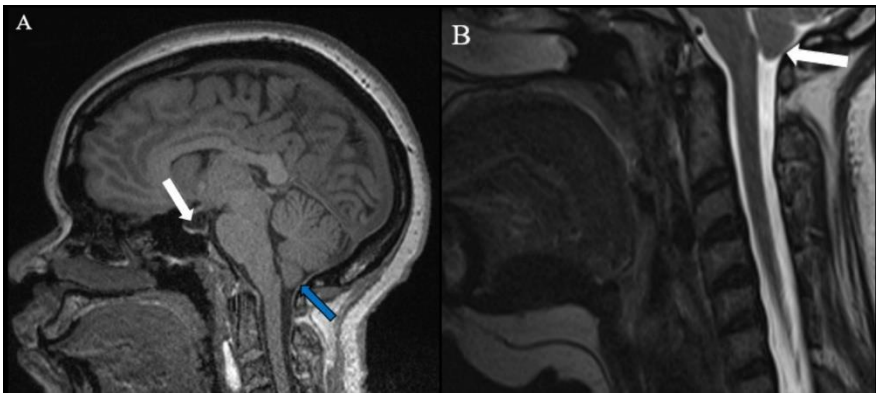

Figure 1 (A) T1-weighted brain MRI, sagittal view. The white arrow shows CSF-filled sella and flattened contents. The blue arrow indicates the descent of the cerebellar tonsil through the foramen magnum. (B) T2-weighted, spine MRI, sagittal view. The white arrow shows the descent of the cerebellar tonsil through the foramen magnum caudally.

Discussion

We presented a case report of the co-occurrence of PESS and CM-I in a patient with recurrent and severe headaches. To our knowledge, no prior reports have been published demonstrating comorbid ESS and CM 1 in adults presenting with headaches.

CM-I was diagnosed based on the fulfilment of the third edition of the International Classification of Headache Disorders (Olesen, 2018), which included demonstrated CM-I on spine MRI, a history of short-lasting headache presentation, occipital localisation, neck pain, and associated symptoms of cranial nerve involvement. However, our patient had multiple headache localisation, including bilateral frontal region, accompanied by mood changes and elevated cholesterol levels, which CM-I could not fully explain. Hence, we had to explore brain MRI further.

Several hypotheses on the pathophysiology of the CM-I-related headache have been developed; Oldfield's and William's theories are the most common. While Oldfield's view depicted a caudal pulsatile pressure effect with mechanical influence on the spinal cord, William's theory explains the role of expanding the intraabdominal pressure and its consequence in higher craniocaudal pressure on trigeminal afferents of the meninges, resulting in a headache (McClugage & Oakes, 2019).

PESS was confirmed by the MRI (brain) and other supportive features, including frontal headache presentation and obesity (Catarci et al., 1994; Chiloiro et al., 2017). Most PESS patients are asymptomatic; however, an increased likelihood of PESS has been proposed in middle-aged, overweight women presenting with recurrent headaches (Catarci et al., 1994). Despite headache being the most frequent complaint in ESS, it has been reported to be nonspecific; however, our patient headache localisation is similar to (Catarci et al., 1994), who reported up to 82% of the patients presenting with anteriorly localised headaches and with daily occurrence. Furthermore, like a previous study (Catarci et al., 1994), our patient did not present with ophthalmological findings. The agitated mood in our patient preceded headaches; indeed, psychiatric disturbances have previously been reported in PESS, with mechanisms remaining largely unknown (Kuzman et al., 2008). Our case lacked CSF dynamics evaluation and pituitary levels due to our hospital's limited setting. However, other reports on PESS patients reported that pituitary functioning was within the normal range (Sutar, 2020). Furthermore, the

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dyslipidemia observed in patients may be linked to obesity, as the etiological relationship between headache and hyperlipidemia has been previously suggested in the literature (Olesen, 1977).

Several mechanisms have been proposed to explain the occurrence of ESS; these include chronic intracranial hypertension (IH), incompetence/absence of the diaphragm sellae, and temporary expansion followed by regression of the pituitary gland, allowing the CSF accumulation into the sella turcica, and hence its enlargement and remodelling (Chiloiro et al., 2017). Likewise, the interplay between intraabdominal, intrathoracic, and intracranial pressure due to obesity proposes the aetiology of headaches in our patients (Chiloiro et al., 2017). On the other hand, headaches have been postulated to arise secondary to traction on pain-sensitive vascular-meningeal structures in the sella cavity (Miljic et al., 2000). Indeed, this makes idiopathic IH a crucial differential diagnosis in our patients.

Comprehending the natural history is essential in CM-I therapeutic decision-making. A definitive presentation of cephalalgia and imaging findings is critical for deciding a CM-I treatment option (McClugage & Oakes, 2019). However, our patient lacked features of Valsalva-induced headaches or an associated syrinx, which could necessitate surgery options (McClugage & Oakes, 2019). Similarly, ESS treatment aims to reassure the patient and keep the patient symptom-free; weight loss and medication to target headaches have proven efficient in obese and overweight ESS patients (Catarci et al., 1994). On that basis, we managed our patient medically and weight loss instructions and kept the patient on monthly follow-ups, and the patient reported a successful outcome.

Conclusion

Headaches are multifactorial. PESS and CM 1 can co-occur with multiple headache presentations (localisation). Despite Tanzania's limited resources and busy outpatient settings, detailed patient history and confirmatory imaging are mandatory to establish the precise aetiology of headaches. Extensive studies are warranted to examine the interaction between CM 1 and ESS.

Ethical considerations: Informed consent was sought from the patient.

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Conflict of interest: The Authors have no conflict of interest to declare.

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