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Case Report

The Diagnostic Challenge of Distinguishing Temporal Lobe Encephaloceles from Sphenoid Sinus Mucoceles

Ein Wan Chin*, Liang-Chye Goh, Aun Wee Chong
Department of Otorhinolaryngology, Faculty of Medicine, University of Malaya, Kuala Lumpur, 50603, Malaysia
*Corresponding author: clarachineinwan@gmail.com

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ABSTRACT

Background: Temporal lobe encephaloceles are rare defects involving brain herniation through the skull base, often misdiagnosed as sphenoid sinus mucoceles—cystic lesions due to mucus buildup. Both conditions share overlapping neurological, nasal, and ophthalmologic symptoms, but require different treatments. **Objective:** To emphasize the importance of accurate diagnosis in distinguishing temporal lobe encephaloceles from sphenoid sinus mucoceles and to highlight the role of imaging in clinical management. **Methods:** A 27-year-old healthy man presented with seizure and loss of consciousness, with a history of head trauma 13 years earlier. Physical examinations, including cranial nerve and cerebellar assessments, were normal. Rigid nasoendoscopy was unremarkable. Imaging included CT and brain MRI. **Results:** CT scan suggested an expanded left sphenoid sinus likely mucocele with temporal lobe encephalomalacia. Brain MRI confirmed a left temporal lobe encephalocele. The patient underwent successful transcranial repair. **Conclusion:** Misinterpretation of imaging may lead to incorrect management. Comprehensive evaluation, particularly with MRI, is essential to differentiate encephaloceles from mucoceles for appropriate treatment planning.

Keywords: diagnostic error, diagnostic imaging, encephalocele, mucocele, paranasal sinus

1. Introduction

Temporal lobe encephaloceles is a rare malformation that involves brain parenchymal herniation into surrounding areas, such as the sphenoid sinus through a congenital or acquired defect of the skull base [1]. Paranasal sinus mucoceles are expansile cystic lesions caused by mucus buildup inside the sinus cavity, mostly involving the frontal and ethmoid sinuses, while sphenoidal sinus mucoceles comprise only 1–2% [2,3]. Both conditions have a significant impact on adjacent vital structures and share similar clinical symptoms, including neurological manifestations (headaches, vomiting, and cranial nerve palsies), nasal symptoms (rhinorrhea), and ophthalmologic symptoms (visual disturbance, oculomotor palsies, and exophthalmia) [2,3]. When imaging results are misinterpreted, temporal lobe encephaloceles may be mistaken for sphenoid sinus mucoceles. Such misdiagnoses can have substantial clinical ramifications because optimal treatment strategies differ depending on the underlying pathology. We describe a case in which a temporal lobe encephalocele was mistaken for a sphenoid sinus mucocele, delaying the correct diagnosis and treatment.

2. Case Presentation

A previously healthy 27-year-old man had a tonic-clonic seizure episode and loss of consciousness in public. There was no visual aura, bowel or urine incontinence, limb weakness, fever, or change in behavior before the attack. He denied any headache, nasal or ocular symptoms. Thirteen years ago, he had accidentally struck his head on a ceiling fan blade and experienced blank stares, palpitations, chills, sweating, and piloerections occasionally but did not seek treatment.

Upon examination, he was alert with normal cranial nerve function, no limb weakness, and no cerebellar or meningitis signs. Rigid nasoendoscopy showed patent sphenoethmoidal recess and no protruding mass. A computed tomography (CT) scan revealed an expanded left sphenoid sinus reported as sphenoid sinus mucocele with left temporal lobe encephalomalacia (Fig.1a & 1b). Urine toxicology tests were negative, and electroencephalogram (EEG) results indicated a focal seizure condition. The patient required intravenous phenytoin and was discharged with regular oral sodium valproate.

Given that patient still has recurrent seizures despite compliance with medication and encephalomalacia changes adjacent to the sphenoid sinus, brain magnetic resonance imaging (MRI) was arranged and discovered T2-weighted hyperintense with T1-weighted fluid-attenuated inversion recovery (T1W FLAIR) hyperintense fluid seen within an expanded sphenoid sinus which communicated with the fluid in the left middle cranial fossa (Fig.2a & 2b), diagnosis was revised as left temporal lobe encephalocele with encephalomalacia, and compensatory dilatation of the left lateral ventricle. The patient's care was modified to transcranial repair of the sphenoid encephalocele.

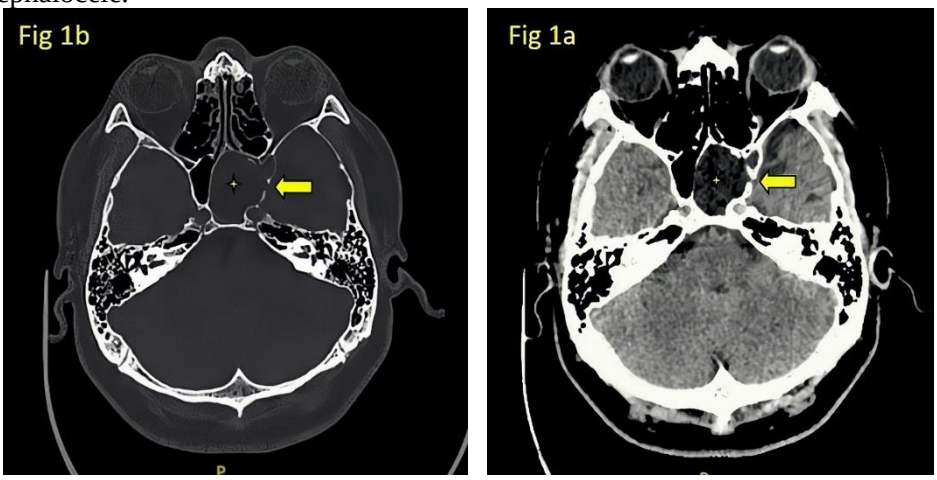

Figure 1. (1a) shows the soft tissue window; (1b) shows the bone window of the patient's plain CT brain in axial view, the yellow arrow demonstrates a defect at the left lateral sphenoid sinus wall and the yellow star shows an expanded left sphenoid sinus.

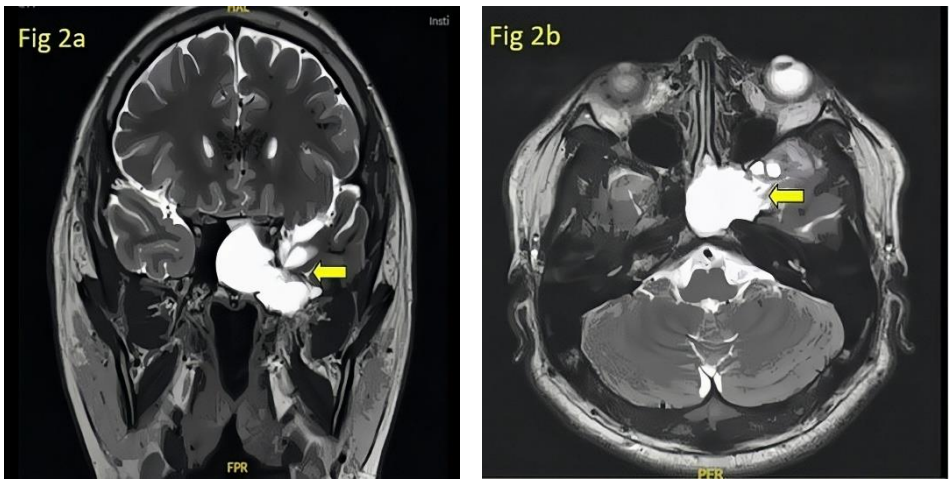

Figure 2. (2a) shows the coronal view; (2b) shows the axial view of the T2-weighted MRI scan. The arrow points at the expanded sphenoid sinus communicating with the fluid in the left middle cranial fossa.

3. Discussion

In this case, the young adult with a history of head trauma exhibits a rare combination of temporal lobe encephalomalacia, sphenoid encephalocele, and focal seizure disorder. This is in line with earlier research emphasizing the temporal lobe's susceptibility to severe brain injury [4]. The temporal lobe encephalomalacia changes alter neuronal circuitry and the excessive surge of excitatory neurotransmitter systems, predisposing individuals to the onset of seizures [5].

Most encephaloceles are present from birth due to neural tube defects; however, in minority instances, they can be secondary causes such as traumatic, neoplasm, inflammatory, or iatrogenic. A prevailing explanation for the congenital encephaloceles involves the failure of separation between the surface ectoderm and the neuroectoderm following the closure of the neural folds during early embryonic development, thus the encephaloceles persistently connect with the subarachnoid space [6–8]. In our patient, the encephalocele herniated into the sphenoid sinus from the temporal lobe, likely from a missed skull base fracture due to a previous insult or enlarged congenital deformity. On the other hand, mucocele development was believed to be due to the obstruction of the sinus ostium, leading to fluid retention within a mucoperiosteal-lined cavity, resulting in a progressively expansile, locally erosive, and encapsulated mass [2,9]. Seizures, meningitis, meningoencephalitis, cerebrospinal fluid (CSF) fistula, visual disturbance, and brain abscess can occur in giant infected mucoceles or eroded sinus mucoceles, resembling encephalocele presentation. However, in patients experiencing intractable seizures, particularly with a history of head trauma, the likelihood is higher for the presence of a temporal lobe encephalocele [10,11]. This case is clinically noteworthy and emphasizes the importance of thorough evaluation in patients presenting with seizure disorders after head trauma.

Due to its subtle presentation and propensity for misdiagnosis as a benign sinus mucocele on initial imaging examinations, sphenoid sinus encephalocele can be difficult to diagnose. In this instance, the misdiagnosis was unintentionally made on the CT scan, and it was later confirmed on the MRI. The sphenoid sinus's growth and its communication with the left middle cranial fossa suggested there is a bony defect of the skull base and continuity of brain parenchyma in the sphenoid sinus, which indicates the presence of encephalocele. This underlines the significance of using cutting-edge imaging methods, like MRI, to pinpoint the specific anatomical characteristics of such lesions. In cases of mucocele, CT scan may exhibit a homogeneous mass and iso-density with brain parenchyma, well-defined margin, and erosive to the sinus wall. Magnetic resonance imaging reveals variable intensity on T1-weighted images and a hyperintense mass on T2-weighted images [11,12].

A multidisciplinary approach from neurology, neurosurgery, and otolaryngology is necessary for the treatment of patients with focal seizure disorder, sphenoid sinus encephalocele, and temporal lobe encephalomalacia. The initial line of treatment is usually antiepileptic drugs, like phenytoin and sodium valproate. However, surgery may be considered in cases with refractory seizures or severe functional impairment [13]. The choice to undergo surgery is based on several factors, including the frequency and intensity of the patient's seizures, their overall clinical health, and the presence of any associated problems.

There is little research in the literature on the relationship between sphenoid sinus encephalocele and temporal lobe encephalomalacia. The ethmoid and frontal sinuses, on the other hand, have been linked to seizure disorders in investigations that have documented occurrences of encephaloceles [14,15]. These publications emphasize how crucial it is to take encephaloceles into account when treating individuals who have refractory seizures or unusual imaging results.

This case underscores the crucial significance of comprehensive assessment for individuals with intractable seizure disorders post-head trauma, given the potential for overlooked skull base fractures leading to sphenoid encephalocele due to adjacent anatomical structures. The limitations of CT scans in detecting soft tissue abnormalities could be mitigated through the utilization of MRI, offering a more nuanced evaluation.

4. Conclusion

This case highlights the importance of a thorough and comprehensive evaluation in patients presenting with focal seizures following head trauma. The rare combination of temporal lobe encephalomalacia, sphenoid sinus encephalocele, and focal seizure disorder underscores the necessity of considering a broad differential diagnosis when faced with complex neurological symptoms. The misdiagnosis of encephalocele as a sinus mucocele emphasizes the limitations of initial imaging techniques, particularly CT scans, in detecting soft tissue abnormalities. This underscores the critical role of advanced imaging, such as MRI, in confirming diagnoses and guiding appropriate treatment strategies.

A multidisciplinary approach involving neurology, neurosurgery, and otolaryngology is essential for managing such cases effectively. Given the clinical challenges associated with these rare malformations, prompt and accurate diagnosis, along with individualized treatment, can significantly improve patient

outcomes. The case also reinforces the importance of considering congenital or post-traumatic structural abnormalities when treating patients with refractory seizures, particularly in the context of head trauma.

5. Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to privacy and ethical considerations but are available from the corresponding author upon reasonable request.

6. Ethical Statement

Sumatera Medical Journal (SUMEJ) is a peer-reviewed electronic internationaljournal. This statement clarifies ethical behavior of all parties involved in the act of publishing an article in Sumatera Medical Journal (SUMEJ), including the authors, the chief editor, the Editorial Board, the peer-reviewer and the publisher (TALENTA Publisher UniversitasSumatera Utara). This statement is based on COPE's Best Practice Guidelines for Journal Editors.

7. Author Contributions

All authors contributed to the design and implementation of this case report, data analysis, and finalizing the manuscript.

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10. Conflict of Interest

Authors declares no conflict of interest.

References

[1] Wind JJ, Caputy AJ, and Roberti F. Spontaneous encephaloceles of the temporal lobe. Neurosurg Focus. 2008;25(6). doi: 10.3171/FOC.2008.25.12.E11.

[2] Bahgat M, Bahgat Y, and Bahgat A. Sphenoid sinus mucocele. BMJ Case Rep. 2012. doi: 10.1136/bcr-2012-007130.

[3] Mioni G, Grondin S, and Stablum F. Temporal dysfunction in traumatic brain injury patients: Primary or secondary impairment?. Frontiers in Human Neuroscience. 2014;8(1). doi: 10.3389/fnhum.2014.00269.

[4] Karaman E, Isildak H, Yilmaz M, Enver O, and Albayram S. Encephalomalacia in the frontal lobe: Complication of the endoscopic sinus surgery. Journal of Craniofacial Surgery. 2011;22(6). doi: 10.1097/SCS.0b013e318231e511.

[5] Tirumandas M, et al. Nasal encephaloceles: A review of etiology, pathophysiology, clinical presentations, diagnosis, treatment, and complications. Child's Nervous System. 2013;29(5). doi: 10.1007/s00381-012-1998-z.

[6] Wang T, Uddin A, Mobarakai N, Gilad R., Raden M, and Motivala S. Secondary encephalocele in an adult leading to subdural empyema. IDCases. 2020;1. doi: 10.1016/j.idcr.2020.e00916.

[7] Rai R, Iwanaga J, Loukas M, Oskouian RJ, and Tubbs RS. Brain Herniation Through the Cribriform Plate: Review and Comparison to Encephaloceles in the Same Region" Cureus. 2018. doi: 10.7759/cureus.2961.

[8] Lee JC, Park SK, Jang DK, and Han YM. Isolated sphenoid sinus mucocele presenting as third nerve palsy. J Korean Neurosurg Soc. 2010;48(4). doi: 10.3340/jkns.2010.48.4.360.

[9] Kechagias E, Georgakoulias N, Ioakimidou C, Kyriazi S, Kontogeorgos G, and Seretis A. Giant Intradural Mucocele in a Patient with Adult Onset Seizures. Case Rep Neurol. 2019;1 2009, doi: 10.1159/000227265.

[10] Peral Cagigal B, Barrientos Lezcano J, Floriano Blanco R, García Cantera JM, main base Sánchez C, and Verrier HA. Frontal sinus mucocele with intracranial and intraorbital extension. Med Oral Patol Oral Cir Bucal. 2006;11(6).

[11] Morone PJ, et al. Temporal Lobe Encephaloceles: A Potentially Curable Cause of Seizures. Otology and Neurotology. 2015;36(8). doi: 10.1097/MAO.0000000000000825.
[12] Agladioglu K, Ardic FN, Tumkaya F, and Bir F. MRI and CT imaging of an intrasphenoidal encephalocele: A case report. Pol J Radiol. 2014;79(1). doi: 10.12659/PJR.890795.
[13] Perugini S, et al. Mucoceles in the paranasal sinuses involving the orbit: CT signs in 43 cases. Neuroradiology. 1982;23(3). doi: 10.1007/BF00347556.
[14] Rehman L, Farooq G, and Bukhari I. Neurosurgical interventions for occipital encephalocele. Asian J Neurosurg. 2018;13(2). doi: 10.4103/1793-5482.228549.
[15] Lee JA, Byun YJ, Nguyen SA, Schlosser RJ, and Gudis DA. Endonasal endoscopic surgery for pediatric anterior cranial fossa encephaloceles: A systematic review. International Journal of Pediatric Otorhinolaryngology. 2020;132. doi: 10.1016/j.ijporl.2020.109919.
[16] Campbell ZM, Hyer JM, Lauzon S, Bonilha L, Spampinato MV, and Yazdani M. Detection and characteristics of temporal encephaloceles in patients with refractory epilepsy. American Journal of Neuroradiology. 2018;39(8). doi: 10.3174/ajnr.A5704.