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Case Report

Pneumocephalus following sneeze suppression ☆☆☆

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ABSTRACT

Pneumocephalus is defined as air in the intracranial space. It is commonly caused by traumatic skull fractures and is diagnosed by head plain computer tomography. Treatment involves initial stabilization of vital signs and surgical intervention if symptoms do not resolve. We report a unique case of pneumocephalus following sneeze suppression.

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Introduction

Pneumocephalus refers to the presence of air in the intracranial space. The air may be present extra-axially in the epidural, subdural, or subarachnoid spaces or axially in the brain parenchyma or ventricles. It may arise after trauma, iatrogenically, or spontaneously [1]. Pneumocephalus is typically classified based on time of onset. Acute cases occur within 72 hours, whereas delayed cases occur after 72 hours [2]. Simple pneumocephalus does not cause increases in intracranial pressures, whereas tension pneumocephalus does cause an increase in intracranial pressure, with potential life-threatening compression of the brainstem [3]. Tension pneumoventricle

is one such life-threatening presentation, where air accumulates inside the ventricles and compresses vital respiratory center [4]. While the most common traumatic causes of pneumocephalus involve skull fractures from external forces, this case describes a unique situation where the cause is a sneeze suppression, leading to a rupture of the olfactory bulb.

Case report

A 72-year-old female presented to the emergency room complaining of severe headache and rhinorrhea for a few days. The patient denies any trauma or falls, and vitals were stable.

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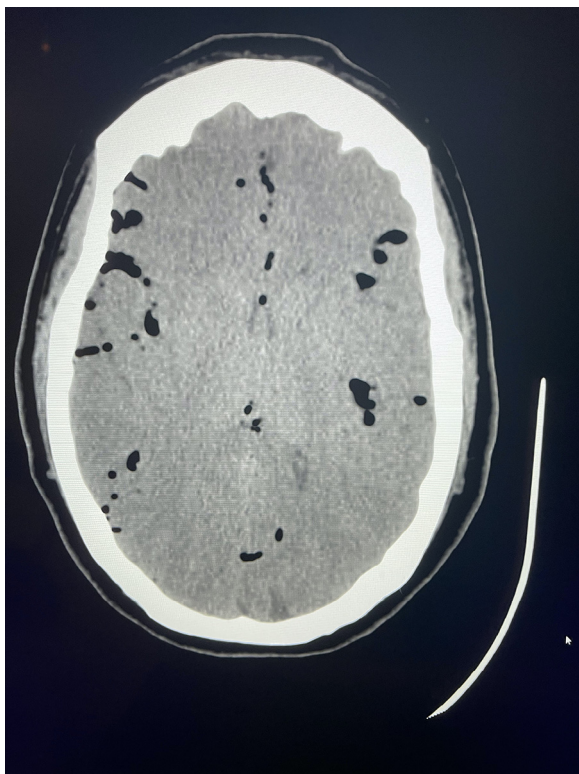


Fig. 1 – CT of the head confirming diagnosis of pneumocephalus.



Fig. 2 – CT of the head with arrow demarcating olfactory bulb rupture.

She reported onset of symptoms following sneeze suppression a few days ago. Computer tomography (CT) head without contrast was ordered to rule out hemorrhagic stroke. Imaging demonstrated pneumocephalus (Fig. 1) and rupture of the olfactory bulb (Fig. 2). The patient was scheduled for emergent surgical repair with neurosurgery. She subsequently underwent burr hole creation with dural defect repair. The patient was educated post-operatively on the dangers of sneeze sup-

pression, as the level of force is life threatening and may cause recurrence of pneumocephalus.

Discussion

Pneumocephalus is when air is present in the intracranial space. It is more commonly found following external trauma to the skull and no other case describes pneumocephalus following sneeze suppression.

Head plain CT is the gold standard for initial imaging to identify pneumocephalus. Skull x-rays have been used in the past, but they are not as sensitive and only detect greater than 2 milliliters of air. CTs, on the other hand, may detect as little as 0.55 mL of air. Two distinct signs seen on CT are characteristic of pneumocephalus. First, is the Mount Fuji sign, which is seen when air accumulates in the frontal region, causing separation of the 2 frontal bones. When seen, this is diagnostic of tension pneumocephalus. Second, is the air bubble sign, which is formed by multiple air bubbles in the cisterns. Brain magnetic resonance imaging has been used, but is not effective, as air may easily be mistaken for flow voids or blood as they are all dark on all sequences. Therefore, CTs continue to be the imaging modality of choice [5].

Initial treatment of pneumocephalus focuses on conservative management, which involves stabilizing vital signs by following Advanced Trauma Life Support protocol, which involves rest, symptomatic management, and oxygen therapy [6]. Most cases resolve with appropriate management. Surgical intervention may be considered if the patient remains symptomatic or has tension pneumoventricle. The surgery is done by advancing a needle through a burr hole and aspirating the air with a syringe. In cases such as this, where the pneumocephalus was not postoperative, a burr hole is created, and a subdural drain is connected to an underwater seal. The dural defect is then closed [7]. In this case, the olfactory bulb defect required repair. Even with severe cases, prognosis is good, if surgery is done when appropriate.

Patient consent

The authors obtained informed consent from the patient whose case was discussed in this report.

REFERENCES

- [1] M Das J, Bajaj J. Pneumocephalus. StatPearls, Treasure Island, FL: StatPearls Publishing; 2022. [Internet] Available from: <https://www.ncbi.nlm.nih.gov/books/NBK535412>.
- [2] Álvarez-Holzapfel MJ, Aibar Durán JÁ, Brió Sanagustin S, de Quintana-Schmidt C. Diffuse pneumocephalus after lumbar stab wound. *An Pediatr (Engl Ed)* 2019;90(1):63–4.
- [3] Pillai P, Sharma R, MacKenzie L, Reilly EF, Beery PR, Papadimos TJ, et al. Traumatic tension pneumocephalus—two cases and comprehensive review of literature. *Int J Crit Illn Jng Sci* 2017;7(1):58–64.

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- [4] Shaikh N, Chanda A, Hassan J, Al-Kubaisi A, Momin U, Alyafai A. Tension pneumoventricle: reversible cause for aphasia. *Qatar Med J* 2021;2021(1):15.
- [5] Karavelioglu E, Eser O, Haktanir A. Pneumocephalus and pneumorrhachis after spinal surgery: case report and review of the literature. *Neurol Med Chir (Tokyo)* 2014;54(5):405–407.
- [6] Castedo J, Ferreira AP, Camacho Ó. Hyperbaric oxygen therapy in the treatment of pneumocephalus associated with epidural block: case report. *Braz J Anesthesiol* 2021;71(3):29.
- [7] Ishiwata Y, Fujitsu K, Sekino T, Fujino H, Kubokura T, Tsubone K, et al. Subdural tension pneumocephalus following surgery for chronic subdural hematoma. *J Neurosurg* 1988;68(1):58–61.