Images in clinical medicine

Crit Care Shock (2022) 25:217-220

# Acute neurological deterioration and tension pneumocephalus associated with CPAP use after skull base surgery

*Tariq Janjua[1], Luis Rafael Moscote-Salazar[2]*

One of the key treatments for obstructive sleep apnea (OSA), the initiation of nocturnal continuous positive airway pressure (CPAP), is the treatment of choice. (1) The use of CPAP is indicated after ruling out any anatomical abnormalities. The use of CPAP can improve gas exchange in the alveolocapillary membrane and decreases the work of breathing by keeping the upper airway open. Chronic CPAP users may be at risk of complications when undergoing skull-based surgery. (2) Our objective is to present a case of a patient who developed pneumocephalus following skull base meningioma resection.

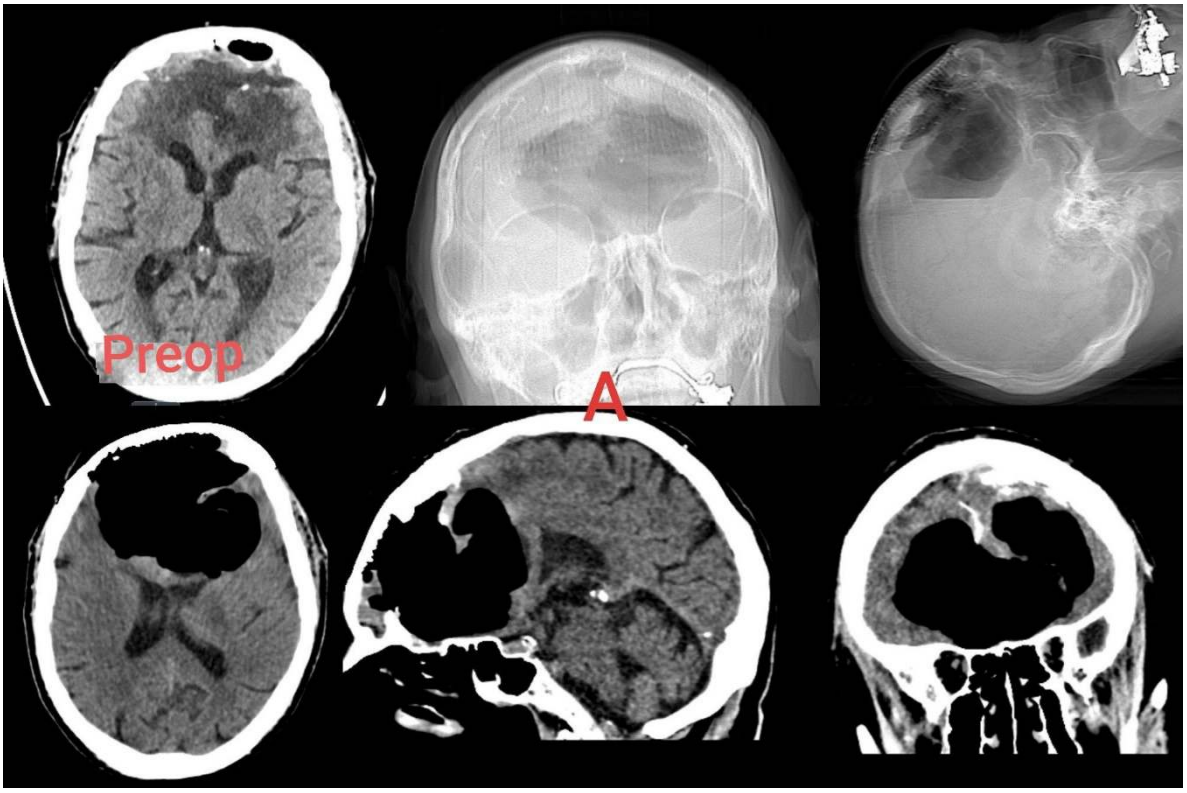
A 60-year patient underwent an elective skull base frontal meningioma removal. **Figure 1A** is the postoperative image with the first top image shown from the preoperative for comparison. He was admitted to the Neurocritical Care Unit for an overnight stay. The next day he was transferred to the regular neurosurgical floor and sent home on the third day. Four weeks later, he visited his primary care provider for a follow-up. He was cleared by his doctor to use CPAP at 13 cmH2O pressure for his established diagnosis of OSA. He presented to the Emergency Department with confusion after three days. Computerized tomography (CT) images then showed tension pneumocephalus with the posterior wall of the frontal sinus opening up (**Figure 1A**). He was admitted to the Neurocritical Care Unit. Initial management started with a 100% O2 non-rebreathing mask (NRM) and keeping the head of the bed in a flat position. Repeat CT the next day showed a cerebral spinal fluid level on the left side (**Figure 1B**). An otolaryngology consult was obtained for corrective surgery through a nasal approach. His surgery was planned, and on the third day of his admission, his CT (**Figure 1C**) showed the air was tracked out of the craniotomy to the scalp area. All this time, he was awake and stable. Before a surgical correction, a lumbar puncture was done to confirm any infection. The results came back negative for any active infection by cell counts and gram stains. He successfully underwent nasal approach fixation and was discharged without any neurological deficit.

Acute neurological deterioration is a rare complication of skull base surgery. The development of postoperative tension pneumocephalus associated with tumor surgery has been described in transsphenoidal surgeries. (3) Neurological impairment associated with skull surgery and a tension pneumocephalus is a condition that requires close intensive care management and occasionally timely neurosurgical intervention. Immediate imaging studies and assessment by the neurosurgeon are mandatory. (4) Kopelovich et al. recommended waiting six weeks after dural repair to reinitiate CPAP or bilevel positive airway pressure (BIPAP). (5) Both respiratory modalities require a nasal mask to provide positive airway pressure. Even after stopping CPAP, the air continues to accumulate in this particular patient, leading to air tracking out of the craniotomy site. This case study provides a learning point of the need for suspected tension pneumocephalus in patients with skull-based surgery and acute neurological deterioration.

[1.] Department of Critical Care Medicine, Physician Regional Medical Center, Naples, FL, USA
[2.] Colombian Clinical Research Group in Neurocritical Care, Bogota, Colombia

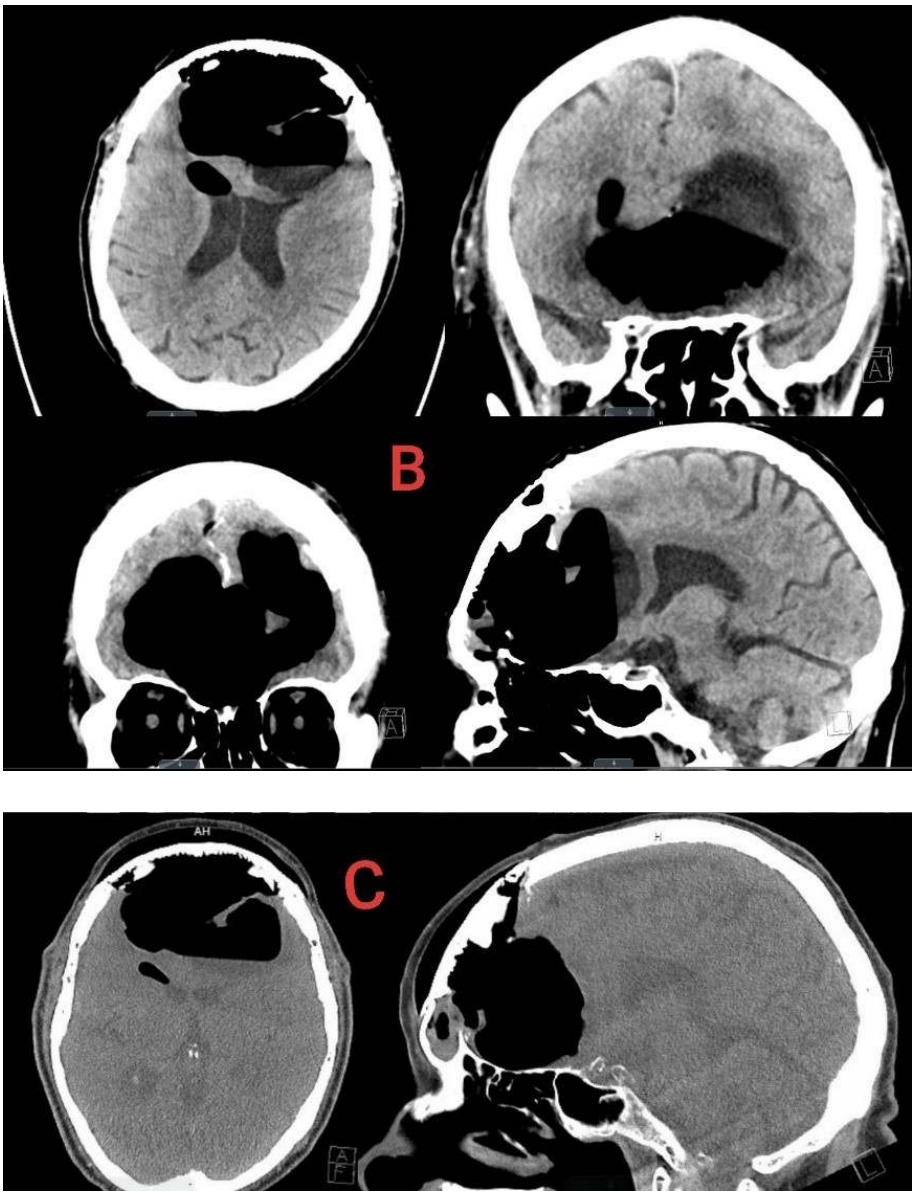
**Address for correspondence**:
Dr. Luis Rafael Moscote-Salazar
Colombian Clinical Research Group in Neurocritical Care, Bogota, Colombia
Email: rafaelmoscote21@gmail.com

**Figure 1A**. Computerized tomography scan showing postoperative tension pneumocephalus after three days of use of CPAP. The top left image is the preoperative image




Legend: CPAP=continuous positive airway pressure.

**Figures 1B and 1C**. Follow-up computerized tomography showing air tracking into subgaleal space through craniotomy site



## References


1. Haba-Rubio J, Petitpierre NJ, Cornette F, Tobback N, Vat S, Giallourou T, et al. Oscillating Positive Airway Pressure Versus CPAP for the Treatment of Obstructive Sleep Apnea. Front Med (Lausanne) 2015;2:29.
2. Chung SA, Yuan H, Chung F. A systemic review of obstructive sleep apnea and its implications for anesthesiologists. Anesth Analg 2008;107:1543-63.
3. Yin C, Chen BY. Tension pneumocephalus from skull base surgery: A case report and review of the literature. Surg Neurol Int 2018; 9:128.
4. Sweni S, Senthilkumaran S, Balamurugan N, Thirumalaikolundusubramanian P. Tension pneumocephalus: A case report with review of literature. Emerg Radiol 2013;20:573-8.
5. Kopelovich JC, de la Garza GO, Greenlee JDW, Graham SM, Udeh CI, O'Brien EK. Pneumocephalus with BiPAP use after transsphenoidal surgery. J Clin Anesth 2012;24:415-8.