Charles D. Collard, M.D., Editor

Tension Pneumocephalus

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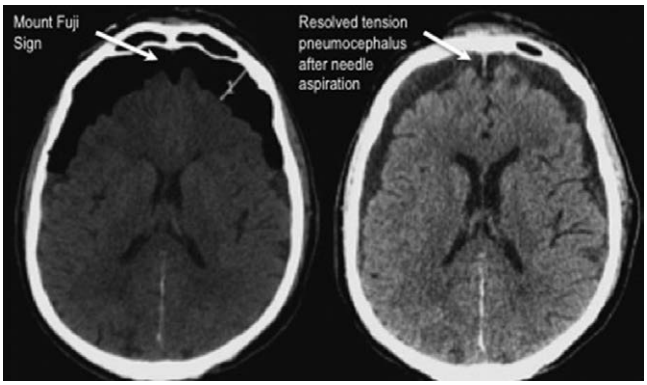

BENIGN pneumocephalus commonly occurs in the early postoperative period after neurosurgery.[1] Tension pneumocephalus, an uncommon but serious complication, occurs with entry of air through a dural defect and subsequent air expansion in the subdural, epidural, intraventricular, or intraparenchymal spaces due to a ball-valve mechanism.[1,2]

Clinical presentations related to the mass effect include headache, deterioration in consciousness, seizures, focal neurologic deficits, Cushing response, and cardiac arrest. Computed tomography imaging reveals mass effect on the ventricular system and the classic "Mount Fuji" sign, with subdural free air compressing the frontal lobes and widening the interhemispheric fissure, simulating the silhouette of Mount Fuji.[2] Correlation of the imaging features of tension pneumocephalus with signs of increased intracranial pressure allows for correct diagnosis of a neurosurgical emergency compared to the benign variety of postsurgical pneumocephalus.

Treatment includes needle aspiration, drilling of burr holes, craniotomy, ventriculostomy, and closure of dural defects. Anesthetic implications in patients with tension pneumocephalus include: (1) avoidance of nitrous oxide, as the blood–gas partition coefficient of nitrous oxide is 34 times greater than that of nitrogen, allowing nitrous oxide to diffuse into the cranial vault faster than the nitrogen/air can exit; (2) avoidance of hyperventilation, which can lead to decreased cerebral blood flow causing enlargement of the subdural space potentially entraining additional air; and (3) avoidance of high airway pressures during ventilation, because increased intrathoracic pressure impedes cerebral venous return, further increasing intracranial pressure. Additionally, normobaric hyperoxia with 100% inspired oxygen facilitates faster resorption of pneumocephalus.[3]

Competing Interests

The authors declare no competing interests.

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References

1. Singh M, Vasudeva VS, Rios Diaz AJ, Dunn IF, Caterson EJ: Intraoperative development of tension pneumocephalus in a patient undergoing repair of a cranial-dural defect under nitrous oxide anesthesia. J Surg Tech Case Rep 2015; 7:20–2
2. Michel SJ: The Mount Fuji sign. Radiology 2004; 232:449–50
3. Hong B, Biertz F, Raab P, Scheinichen D, Ertl P, Grosshennig A, Nakamura M, Hermann EJ, Lang JM, Lanfermann H, Krauss JK: Normobaric hyperoxia for treatment of pneumocephalus after posterior fossa surgery in the semisitting position: A prospective randomized controlled trial. PLoS One 2015; 10:e0125710

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