Answer: b. Tension pneumocephalus

**Explanation:** Tension pneumocephalus occurs when air accumulates rapidly within the cranial cavity resulting in mass effect. It has been reported as a consequence of non-invasive ventilation following head trauma and neurosurgery.\(^1\) Left untreated, brain herniation may develop necessitating neurosurgical intervention.\(^2\)

Pneumocephalus in the setting of chronic sinusitis is documented in the literature.\(^2\) Thinning and disruption of the left sphenoid sinus wall is evident in Fig. 2. The process of bone thinning may be hastened in patients with recurrent or chronic sinusitis, which this patient experienced. The application of non-invasive positive airway pressure ventilation (NPPV) possibly resulted in tension pneumocephalus.

Following recognition of the tension pneumocephalus, NPPV was discontinued followed by intubation and mechanical ventilation. A Burr hole procedure for emergent decompression of the patient’s tension pneumocephalus was performed. Unfortunately, sepsis developed and his mental status did not improve. Given his older age and co-morbid health conditions, his family limited care and the patient passed on the 7\(^{th}\) hospital day.

Although NPPV is an effective and safe method of respiratory support, it is not without its risks. Since pneumocephalus is an uncommon complication of sinus disease, there is no obvious contraindication to NPPV for typical sinusitis patients.\(^2\) In the uncommon instances where patients require respiratory support and have known sinus disruption, NPPV should be cautiously considered.
References:


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Figure Legend:

Fig 1. Non-contrast head CT displayed in bone algorithm demonstrates bilateral sphenoid sinus opacification with air-fluid levels (white arrowheads), a finding consistent with acute sinusitis.

Fig 2. Non-contrast sinus CT displayed in bone algorithm demonstrates focal defect along the posterior wall of the left sphenoid sinus (white arrowhead). Pneumocephalus is noted (white arrows)