

Images in Hospital Medicine

Acute Tension Pneumatocoele Due To Radiation Induced Osteonecrosis and Squamous Cell Cancer

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A 73-year-old man presented with intermittent unresponsiveness and fevers. He had extensive squamous cell carcinoma (SCC) of the scalp on the right, treatment of which had resulted in radiation-induced osteonecrosis ([Figure 1](#)). He had no neurologic deficits on admission. Non-contrasted head CT demonstrated vasogenic edema in the right frontal lobe. Seventy-two hours later, he developed acute left hemiparesis. Repeat head CT ([Figure 2](#)) demonstrated a new large air-filled cavity in the right frontal lobe with mass effect.

'Pneumocephalus' describes intracranial gas in any location. 'Tension pneumocephalus' refers to **subdural** gas which exerts a mass effect. **Intraparenchymal** air with mass effect is consistent with 'tension pneumatocele'.¹⁻³ The mechanisms of intracranial air under tension can include a one-way valve phenomenon wherein air can enter but cannot leave, or the inverted soda-bottle effect where air is sucked in to replace leaked CSF.^{1,2} Tension pneumocephalus has been described most commonly in the setting of cranio-facial fractures while tension pneumatocoeles are rarer.⁴ Two 3 mm bubbling holes were found on the patient's calvarium and this air intake opening was occluded by dressings. He was placed on 100% oxygen and underwent craniectomy, debridement of necrotic bone, drainage of an abscess, and reconstruction. He ultimately passed away after two months.

The patient had an acute tension pneumatocele, resulting from a calvarial bone defect and infection related to SCC. Clinicians should be mindful of this possibility when caring for patients with extensive scalp defects and neurologic symptoms.



Figure 1. Large Area of Exposed Calvarium

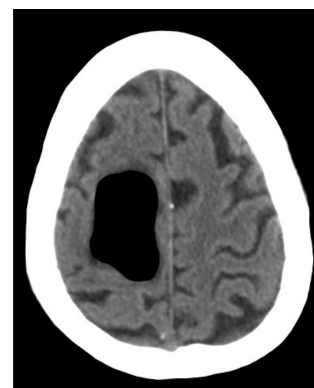


Figure 2. Large Air-filled Cavity in the Right Posterior Frontal Lobe with Mass Effect

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None

AUTHORSHIP

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REFERENCES

1. Cunqueiro A, Scheinfeld MH. Causes of pneumocephalus and when to be concerned about it. *Emerg Radiol.* 2018;25:331-340. [doi:10.1007/s10140-018-1595](https://doi.org/10.1007/s10140-018-1595)
2. Biju RD, Wu J, Hussain Z. Tension pneumocephalus after skull base surgery. A case report and review of literature. *J Clin Neurosci.* 2020;75:218-220.
3. Kankane VK, Gupta TK. Outcome of Posttraumatic Delayed Intracerebral Tension Pneumatocele: Prospective Study of Four Cases: Single Institutional Experience. *Asian J Neurosurg.* 2018;13(4):1087-1095. [doi:10.4103/ajns.ajns_226_17](https://doi.org/10.4103/ajns.ajns_226_17)
4. Sweni S, Senthilkumaran S, Balamurugan N, Thirumalaikolundusubramanian P. Tension pneumocephalus: a case report with review of the literature. *Emerg Radiol.* 2013;20(6):573-578. [doi:10.1007/s10140-013-1135-7](https://doi.org/10.1007/s10140-013-1135-7)