



Visual Case Discussion

An unusual case of pneumocephalus after cardiac arrest in Qatar ICU facility

Phool Iqbal^{*}, Arunkumar Venkatesan, Ahmed Lutfi Mohamad Abdussalam*Medicine Critical Care department, Hamad Medical Corporation, Doha, Qatar/Weill Cornell Medical College-Qatar*

ARTICLE INFO

Keywords:

Pneumocephalus
Intracerebral air
Cardiac arrest

1. Visual case discussion

A 43 years old lady with good functional status, past medical history of myasthenia gravis since the age of 15 years, status post thymectomy complicated with laryngeal nerve injury and on tracheostomy tube, renal vein thrombosis due to the anti-phospholipid syndrome, and on anticoagulation with warfarin, came to the hospital with a history of drowsiness from 3 to 4 h at home which was not her baseline. There was no history of trauma, fall or alcohol use. Her GCS on arrival was 5/15. She underwent urgent CT brain and was found to have a subdural hematoma. Her baseline investigations revealed supratherapeutic INR of 10 and was given urgent fresh frozen plasma for correction. She did not have any other significant bleeding. She was kept under ICU for monitoring as per the neurosurgery plan. However, her hospital stay was complicated with sudden desaturation and three times respiratory arrests, each brief duration and lasting less than a minute. Further investigations, including urgent CT brain, later MRI brain, and evaluation of her tracheostomy tube via bronchoscopy, were remarkable for pneumocephalus as shown in Figs. 1 and 2 and a granulation tissue obstructing the airways during respiration, respectively. ENT team was consulted and replaced the tracheostomy tube with a longer length to bypass the granulation tissue. Radiologist opinion regarding the unexpected CT brain finding was taken and suggested possible iatrogenic causes like a lumbar puncture or septic emboli. However, echocardiographic studies were unremarkable for any valvular disease or vegetation. Blood cultures were negative for any sepsis as well. Her pneumocephalus was managed conservatively with follow up of her GCS and serial CT scan as required. However, the patient did not improve and passed away in the next 72 h.

2. Discussion

Pneumocephalus, also known as air in the brain, can occur due to either ball valve mechanism, which means the existence of an extracranial positive pressure source, or inverted soda bottle/Siphon effect, meaning a persistent negative intracranial pressure gradient from the source.¹ It is commonly attributed to trauma, infections such as chronic otitis media, sinusitis, or iatrogenic causes like lumbar puncture, hyperbaric chamber treatment, post ENT procedures such as paranasal sinus surgery, nasal septum resection, or nasal polypectomy, and cranial or spinal surgeries.² CT scan brain is the initial gold standard diagnostic modality for pneumocephalus.³ Various treatment modalities has been mentioned in the literature that includes, conservative management with Fowler positioning of the patient at 30°, avoiding coughing or sneezing (Valsalva maneuver), adequate analgesia and osmotic diuretics. Other anecdotal management options such as, hyperbaric oxygenation or supplemental oxygenation therapy through nasal cannula/face mask leading to reabsorption of the air, drilling burr holes, needle aspiration and closure of the bony defect if present are also reported.² But currently there is no standard therapy and mainly depends on the patient clinical condition, neurological status and severity of the pneumocephalus on imaging. Our patient had granulation tissue obstructing the airways with subsequent respiratory arrest creating a high intracranial pressure due to the ball valve mechanism as a possible cause of pneumocephalus. Other possible cause may include CPR associated injury to pulmonary vessels, permitted air to the pulmonary veins reaching the systemic circulation and subsequently the brain.⁴ She did not have any brain trauma or surgery preceding pneumocephalus, and sepsis workup including transthoracic echocardiography was

^{*} Corresponding author.E-mail address: dr.phooliqbal89@gmail.com (P. Iqbal).<https://doi.org/10.1016/j.visj.2022.101448>

Received 28 January 2022; Received in revised form 21 June 2022; Accepted 21 June 2022

Available online 29 June 2022

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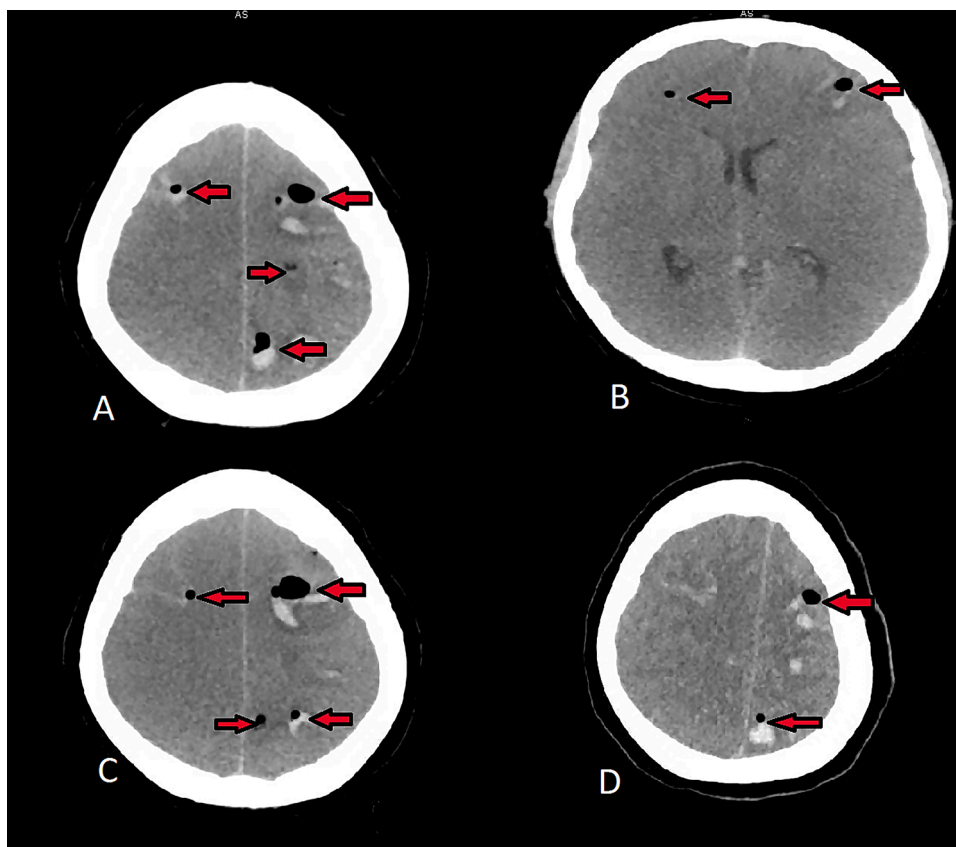


Fig. 1. CT head: Remarkable for multiple air pockets in the brain parenchyma with no air fluid levels.

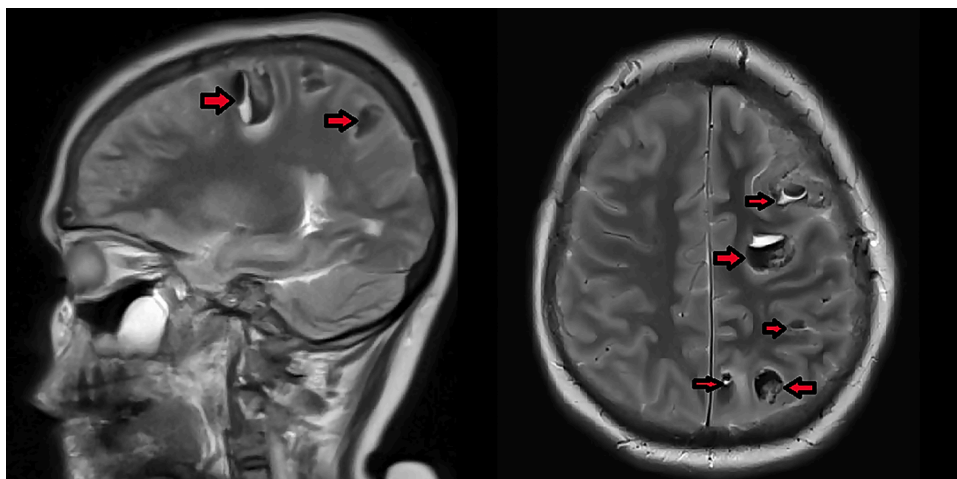


Fig. 2. MRI brain: Multiple intra-parenchymal air pockets in the brain, remarkable for pneumocephalus.

unremarkable for any valvular vegetations.

Authors and their contributions

Dr. Phool Iqbal, MD: Case identification, manuscript writing, editing and literature review.

Dr. Arun Venkatesan, MD: Case management, manuscript editing and writing.

Dr. Ahmed Lutfie Mohamad Abdussalam, MD: Case management, diagnostic approach, supervisor

Credit author statement

The author encloses herewith a manuscript entitled "An unusual case of Pneumocephalus after cardiac arrest in Qatar ICU facility" for publication in a prestigious journal "The Visual Journal of Emergency Medicine." This case highlights the significance of a rare entity and mandates a clinical analytical approach and prompt management for optimal patient care.

The Corresponding author of this manuscript is Dr. Phool Iqbal and the authors' contribution as mentioned below with their responsibility in the research.

Approval from the institutional research body

The manuscript completed the review process by the medical research council of Hamad Medical Corporation, using their online platform "www.abhath.hamad.qa".

Data availability

Authors confirm that all relevant data or information are included in the article and is available via open access platform of this journal.

Declaration of Competing Interest

The authors certify that they have no conflict of interest and no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

Acknowledgments

Qatar National Library funded the publication of this manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.visj.2022.101448](https://doi.org/10.1016/j.visj.2022.101448).

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