Iatrogenic Cerebral Venous Air Embolism: a case report

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Background

Cerebral Venous Air Embolism (CVAE) is a rare phenomenon, which results from retrograde rise of air in the systemic venous circulation (Fig.1)[1], usually in the context of central venous catheter (CVC) placement or removal, trauma, or surgery[2].
Treatment typically involves supportive care, but there is growing evidence on the use of Hyperbaric Oxygen Therapy (HBOT) within the first 4-6hrs after neurological symptoms onset[3]. HBOT compresses air bubbles and delivers high dose of oxygen to ischemic brain tissue. Preventive myringotomy should be performed in intubated patients[4,5], to avoid complications including ear barotrauma.

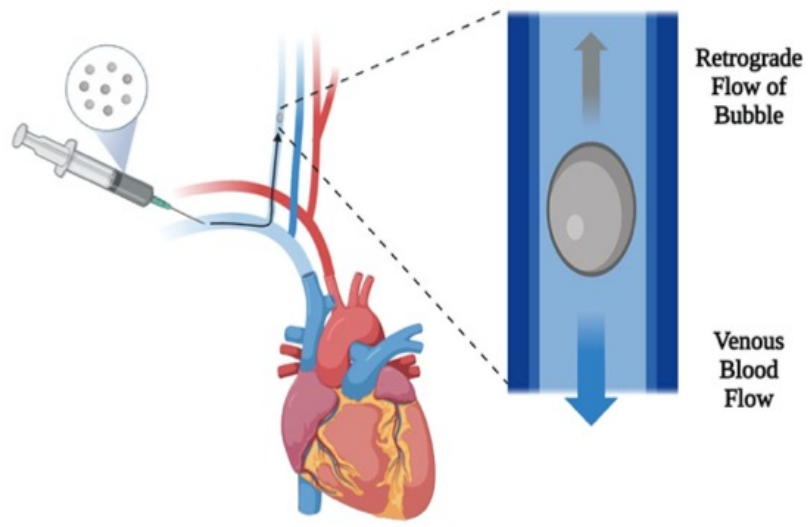

Fig.1 Bubbles that stay in the venous circulation may proceed retrogradely towards the head, causing cerebral venous air embolism. This can lead to mental status change, seizure, focal neurological deficit, and shock.

Case Report

An 82-year-old woman, undergoing rehabilitation therapy after hip surgery, was admitted in the Emergency Department (ED) for syncope and loss of consciousness. She was intubated due to persistent coma (GCS8:V1,E4,M3) with stable hemodynamic and respiratory/metabolic profiles (HR 100bpm, BP 130/80mmHg, pH 7.37, $PaCO_2$ 42.7mmHg, O_2Sat 96%, Lactate 2.2mmol/l). A small wound suggested the presence of previous jugular CVC insertion.

Brain CT-scan with angiography (CTA) (Fig.2a-b) showed air bubbles in the venous system of the telencephalon and diencephalon, without skull fractures, and small gaseous components likely to be related to the previous CVC.

The Fraction inspired of Oxygen was up titrated to 100% O2-therapy and she underwent HBOT after bilateral preventive myringotomy in 10hrs after the acute event. Brain CT-scan (Fig.2c), performed at the end of the treatment, showed complete reabsorption of the gas emboli.

DW-MRI performed 5 days since the index event (Fig.2d) revealed areas of hypoxic-ischemic injury.
She underwent percutaneous tracheostomy and discharged from ICU after 21 days from hospital to nursing-home accommodation with severe neurological impairment. She was tested with the following scores: Cerebral Performance Categories Scale 4 and Modified Rankin Scale 5.

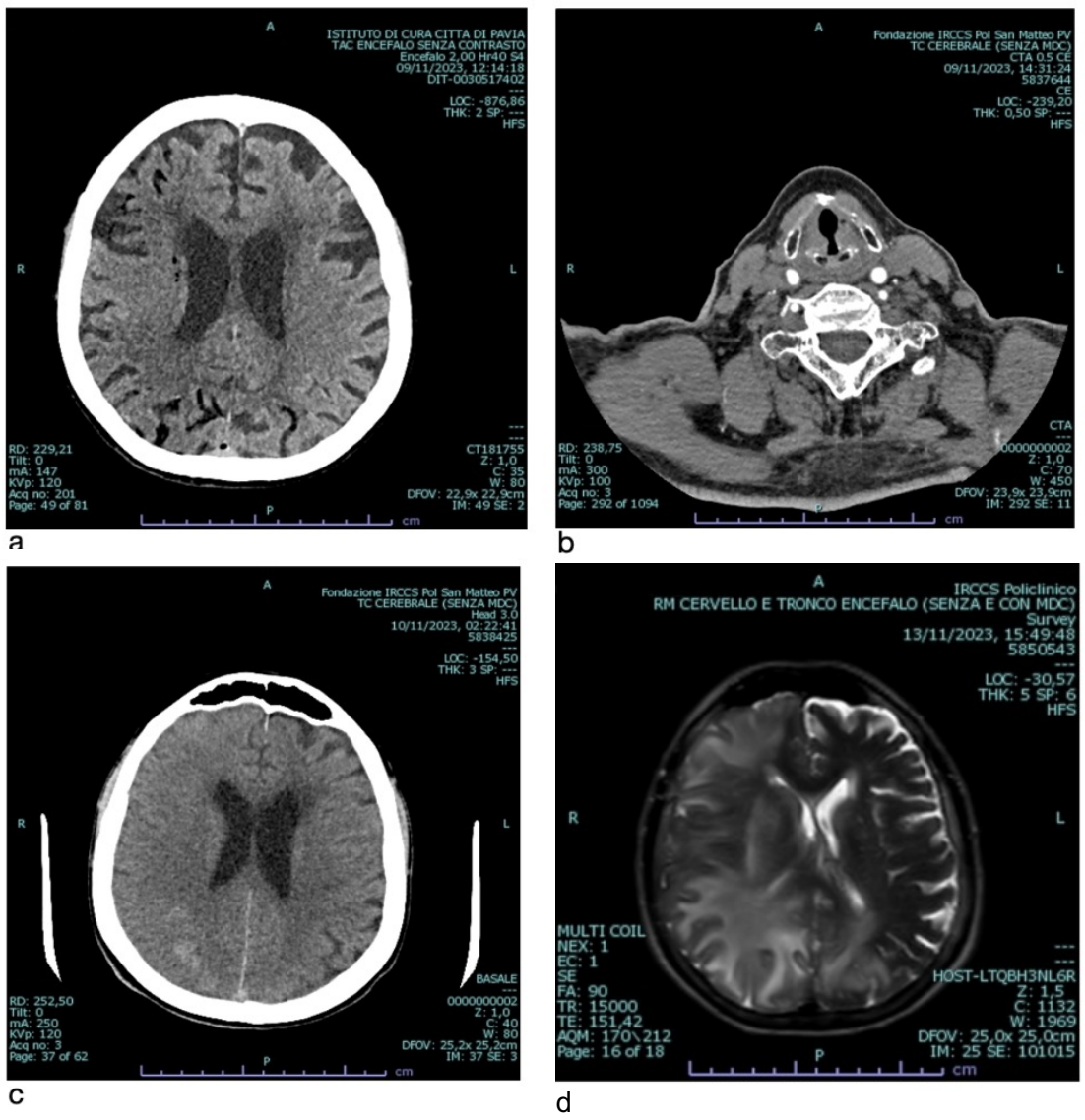

Fig. 2 (a) Axial CT-scans without contrast and (b) CT angiography (CTA) before treatment;
(c) Brain CT-scan after treatment. (d) DW-MRI Extended signal alteration located in the right fronto-parieto-occipital, involving both the cortex and the subcortical, deep, and periventricular white matter.

Conclusions

CVAE is a rare complication potentially leading to dismal neurological outcome. HBOT plays a key role in bubble volume reduction. Therefore, it should be performed promptly, considering the time needed for surgical myringotomy.

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