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Case Report

Air bubbles in the brain: retrograde venous gas embolism in the cavernous sinus ☆

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ABSTRACT

We present a rare case of cavernous sinuses air embolism occurring after peripheral venous catheterization. This 44-year-old lady followed for idiopathic thrombocytopenic purpura was referred to our service for vomiting and critical headaches after blood transfusion for her thrombocytopenia. Having been submitted to a brain computed tomography, this later showed air bubbles in bilateral cavernous sinuses related to cavernous sinuses gas embolism. This condition, which remains purely unusual could be fatal, where the ultimate importance that the radiologists and clinicians to be fully aware of.

Introduction

Cavernous sinus air embolism could be the consequence of a cranial trauma, surgery, or infection. Similarly, it could be iatrogenic via an intravenous access [1]. Here, we report a case that took place after blood transfusion through a peripheral intravenous line.

Case report

A woman patient aged 44 followed for idiopathic thrombocytopenic purpura, with no previous history of trauma or cranial surgery, presented intense and sudden vomiting and headaches. The patient has already received a transfusion for an episode of thrombocytopenia. Judging from her physical examination, she was apyrexial, conscious, and well oriented with normal neurologic and systemic examination. The patient had a peripheral venous catheter, her metabolic status was normal and she benefited of antiemetic treatment. In our department, a brain computed tomography (CT) was realized in order to rule out subarachnoid hemorrhage. The brain parenchyma was normal, but intracranial bubbles of air density were detected inside both cavernous sinuses (Fig. 1). No fracture of the vault or the base of the skull was made possible to identify by means of meticulous bone window examination. Going back to the literature on this particular aspect, it seemed like this was secondary to venous catheterization

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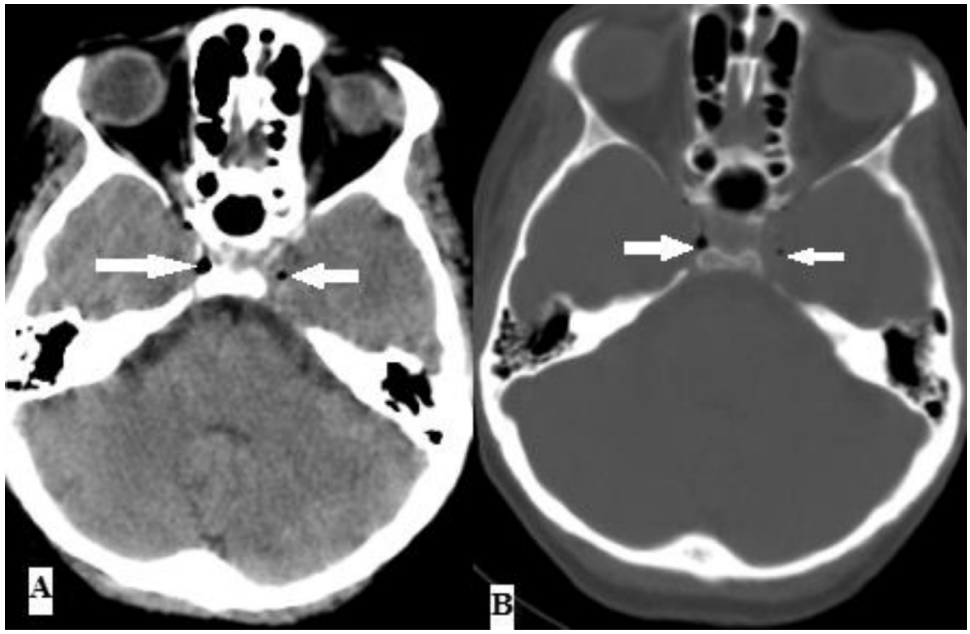

Fig. 1 – Nonenhanced brain CT showing air bubbles in the bilateral cavernous sinuses (Arrow) on the parenchymal (A) and bone window (B).

rather than any pathological condition and conservative approach was advised. In the follow-up a few days later, the case study patient was symptom-free.

Discussion

Curnes et al (1987) was the first who reported imaging of air in the cavernous sinus in a patient where this condition was related to septic cavernous sinus thrombosis [2]. A review of literature shows that embolism is habitually associated with infection, trauma, and surgery [2,3]. It's quite rare when a retrograde air embolism causes intracranial venous gas that takes place after disconnection, ablation or handling a central or peripheral venous catheter given that the latter was not frequently described [4]. Generally, cerebral air embolism (CAE) includes arterial and venous gas embolism. In fact, a venous gas embolism is less common than the arterial one, and therefore less discerned. Noticeably, there is an emphasis on the simpler pathophysiology of the more frequent arterial embolism, which can be an outcome of either paradoxical embolization or entrance of air inside the arteries or pulmonary veins, due to several mechanisms. Mainly, permeable oval foramen, opening of right/left intrapulmonary shunts, or forcing of the pulmonary filter [5,6]. In harmony with literature according to venous embolism, our case shows that air most probably migrated along the arm, traversed the right subclavian vein, and arrived into the internal jugular vein depending on a cranial course. Once the air is in the internal jugular vein, it traverses the inferior petrosal sinus ending up in the cavernous sinus [7]. Patients with gas embolism may not reveal symptoms, whereas they could present with headache, nausea, vomiting, dizziness, or seizures. As literature shows, its prognosis remains poor [8,9].

On the basis of cranial CT, cavernous sinuses air embolism could be easily proven. Brain CT can detect bubbles which are highly appreciated with CT bone windows. They appear extremely dark with Hounsfield coefficient of −1000. In magnetic resonance imaging, air shows as low signal intensity on T1- and T2-weighted image, but it may bring an artefact on gradient echo sequence (GRE) as T2*, because of its paramagnetic character [10–12]. However, susceptibility artefacts are not presented by SWAN image (GRE MR Technique) [11,12].

Conclusion

Gas embolism is a thoroughly unusual complication that could be evoked in case that a skull fracture is lacking. A retrograde venous embolism, which clinicians and radiologists should be conscious of, should be taken into account when a venous catheter –central or peripheral – has lately been dealt with and the topography of the air on imaging is in conformity with the venous gas.

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