

Symptomatic pneumocephalus following difficult epidural catheter placement treated with hyperbaric oxygen therapy

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Background

Pneumocephalus following epidural catheter placement is a rare but feared complication. Less than 1% of patients develop symptoms. Depending on the volume and location of air entrained, symptoms range from headaches, to brain herniation, and strokes. The classic treatment involves application of 100% oxygen via non-rebreather masks. In severe cases, ventricular shunt placement and hyperbaric oxygen have been reported.

We present a healthy 29-year-old female with a history of obesity (BMI 40) who developed symptomatic pneumocephalus following three difficult attempts at epidural catheter placement using loss of resistance techniques to saline. The patient went on to have an uneventful vaginal delivery. However, two hours postpartum, she developed decreased grip strength in her left hand prompting a rapid response and stroke workup.

Objectives

The objectives of this case report are the following. First, to review the presenting signs and symptoms of pneumocephalus. Second, to perform a literature search for the most up-to-date treatment modalities. Third, to present hyperbaric oxygen therapy as a more rapid, cost effective, and less invasive technique used to treat tension pneumocephalus.

Methods

Procedure

Following the rapid response call, the decision was made to obtain computed tomography imaging given the patients decreased grip strength. A multidisciplinary conversation between the anesthesia provider, the on call intensivist, and the infectious disease consultant who had hyperbaric oxygen therapy privileges, prompted swift call to action.

The patient was transported to the hyperbaric oxygen chamber where the atmospheric pressure was slowly raised to 3 ATM. After 20 minutes, she became diaphoretic and anxious, so the pressure was decreased to 2.5 ATM where she remained for 30 minutes. She then complained of tingling in her face and extremities at which point in time the hyperbaric oxygen treatment was discontinued due to fear of developing oxygen toxicity.

Results

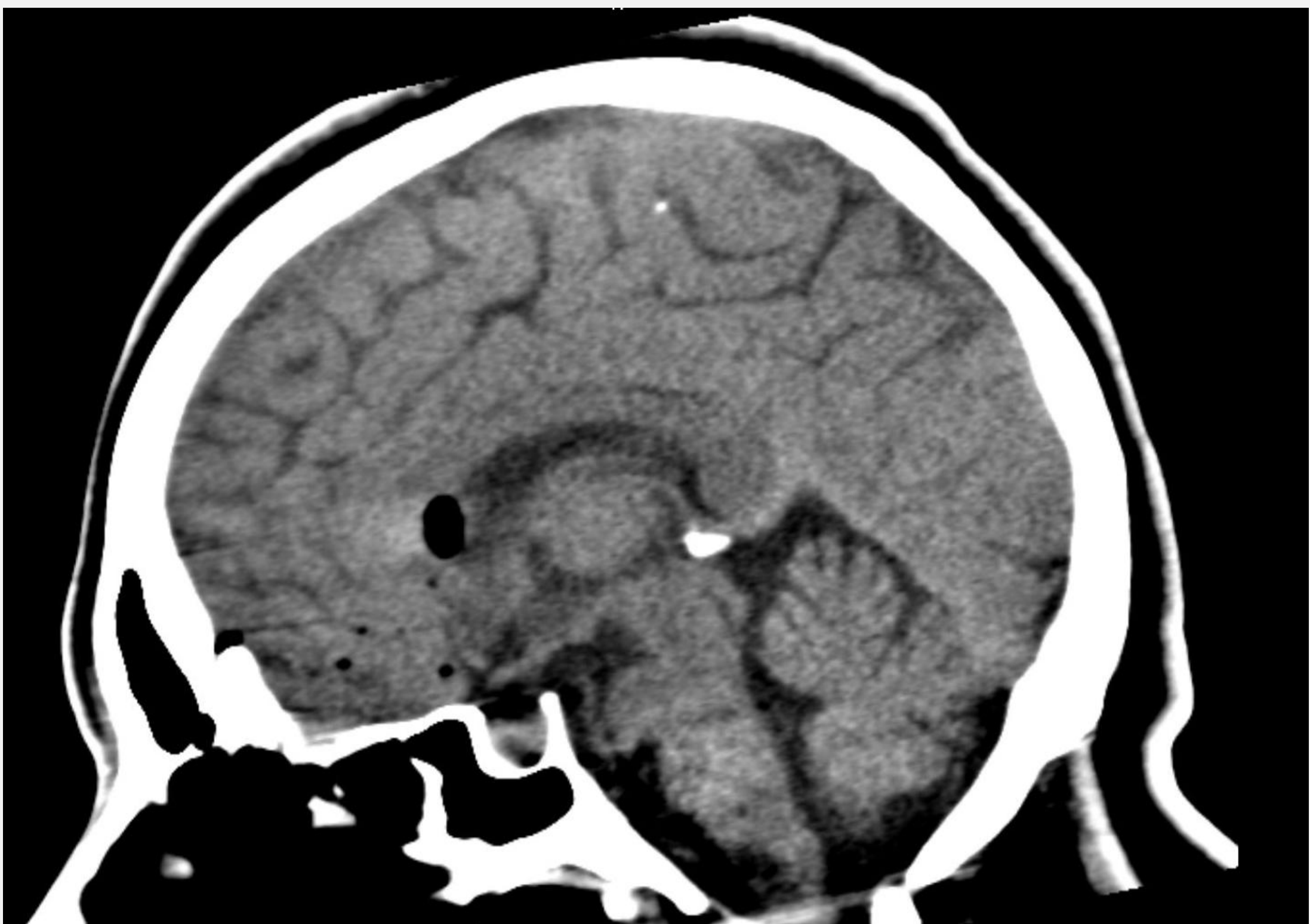


Figure 1: Air entrained in the lateral ventricle



Figure 2: Air entrained in the thoracic epidural space

Results

Computed tomography imaging revealed air entrained with both lateral ventricles, cervical, thoracic, and lumbar subdural spaces. Following one hyperbaric oxygen treatment session, the patient had complete recovery of left arm strength and was discharged the following day with no long term sequelae.

Conclusions

Most cases of symptomatic pneumocephalus present as headaches treated with 100% oxygen via non-rebreather masks. Tension pneumocephalus on the other hand, warrants rapid evacuation via ventricular drain placement. Hyperbaric oxygen therapy is an alternative, less invasive alternative.

Hyperbaric oxygen therapy works by increasing the oxygen pressure and tension in the bloodstream, thereby forcing nitrogen molecules out of air occupying spaces and replacing them with oxygen, decreasing the volume. Three mechanisms have been proposed to describe the development of pneumocephalus following epidural catheter placement, but none have been proven. Case reports involving the use of hyperbaric oxygen therapy on pneumocephalus are scarce. Paiva and colleagues compared the decrease in gas bubble size in subdural versus subarachnoid air, but additional studies are needed to further investigate the use of hyperbaric oxygen as a treatment modality for pneumocephalus.

References

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