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Case Report

Rare incidence of tension pneumocephalus 2 months after repeat microvascular decompression

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ABSTRACT

Background: Tension pneumocephalus is a rare complication after intracranial procedures and craniotomy. We report a rare case of intraventricular and subdural tension pneumocephalus occurring 2 months after repeat right-sided microvascular decompression (MVD) for recurrent trigeminal neuralgia.

Case Description: The patient in this case was a 79-year-old woman who presented with acute-onset confusion, headaches, nausea, and vomiting. On computed tomography, substantial volumes of pneumocephalus in the fourth ventricle and subdural space at the site of the retrosigmoid exposure for the previous MVD were seen. She underwent emergent wound exploration, and no obvious dural defect or exposed mastoid air cells were identified. The dura was reopened, and the surgical site was copiously irrigated. Mastoid air cells were covered with ample amounts of bone wax, and the wound was closed. The patient recovered well postoperatively with complete resolution of the pneumocephalus by her 3-month follow-up evaluation.

Conclusion: It is important to assess for cerebrospinal fluid leakage and that air cells are sealed off before wound closure to prevent a pathway for air to egress into the surgical cavity and corridor.

Keywords: Cerebrospinal fluid leak, Complication, Microvascular decompression, Pneumocephalus, Retrosigmoid craniotomy

INTRODUCTION

Tension pneumocephalus is a potentially life-threatening complication due to entrapment of air in the intracranial space that usually occurs after a traumatic injury or intracranial surgery. Patients develop hydrocephalus and increased intracranial pressure and exhibit symptoms of confusion, declined level of consciousness, and other neurological deficits.[4] Tension pneumocephalus is an uncommon complication after a retrosigmoid craniectomy for a microvascular decompression (MVD) and even rarer to occur in a delayed manner without previous symptoms. We report a case of intraventricular and subdural pneumocephalus occurring 2 months after a second right-sided MVD for recurrent trigeminal neuralgia in a patient who presented acutely with confusion, severe headaches, nausea, and vomiting after a 2-month symptom-free period.

CASE DESCRIPTION

A 79-year-old woman with a medical history of a right cavernous carotid aneurysm treated with stent placement in 2013, an abdominal aortic aneurysm, and transient ischemic attacks initially presented to an outside clinic with severe right facial pain near the upper incisor. Aside from the facial pain, the patient was neurologically intact with no other deficits. After an extensive negative dental evaluation to exclude secondary causes of her facial pain, the patient was prescribed gabapentin by her neurologist, with no relief. After her facial pain was refractory to trials of additional agents such as benzocaine, the patient was evaluated at the neurosurgical clinic. She underwent a right MVD procedure after brain magnetic resonance imaging (MRI) revealed that the right superior cerebellar artery was adjacent and intertwined with the trigeminal nerve. The procedure was completed at our tertiary care center without any periprocedural complications, and the patient was seen at her 1-month follow-up appointment with complete resolution of her right facial pain.

Two years later, the patient represented to the neurosurgical clinic with recurrence of right trigeminal neuralgia. The pain was across the V2 and V3 distributions of the right face with associated lancinating, typical trigeminal periauricular pain triggered by talking and eating. After discussing treatment options including radiation, ablative therapies, and redo MVD, she chose to undergo repeat MVD, mainly due to the delayed effectiveness of radiation. The procedure was completed through the previous surgical corridor and was well tolerated and without periprocedural complications. At the patient's 1-month follow-up appointment, the trigeminal neuralgia had completely resolved, but she complained of the right facial numbness that affected her ability to chew and speak. Otherwise, she was doing well overall and was carrying out her daily activities without difficulty. The patient was recommended to follow-up again in 3 months and meanwhile obtain a nutrition and speech consultation for further recommendations regarding her facial numbness.

The patient had been doing well with slow improvement in her facial numbness until 1 month after her recent follow-up visit when she acutely presented to an outside hospital emergency department with confusion, severe headaches, nausea, and vomiting. She was transferred to our center. On initial evaluation, the patient was able to report that her facial pain was almost completely resolved but complained of a severe bifrontal headache. Aside from being disoriented to place and time, the patient was neurologically intact with respect to motor and sensory function. She did not have any recent trauma or other injuries and also denied any preceding symptoms in the days before her presentation. A noncontrast computed tomography (CT) scan of the head revealed significant volumes of air intraventricularly and in the subdural space, predominantly in the infratentorial space as well as small volumes in the inferior frontal spaces [Figure 1]. The patient was emergently transferred to our institution and taken for urgent exploration and redo-retrosigmoid craniotomy. The previous incision was opened and explored. On removal of the titanium mesh cranioplasty plate, no obvious cerebrospinal fluid (CSF) leaks or dural imperfections and perforations were visible. The dura was opened, and the subdural space was copiously irrigated with saline. DuraSeal (Integra LifeSciences, Princeton, NJ) was applied along the previous dural opening, and the mastoid air cells were generously covered with bone wax. Valsalva maneuvers were performed and verified that there were no CSF leakages. The procedure was completed without any complications, and the patient woke up well and was transferred to the intensive care unit. Postoperative noncontrast CT scan of the head demonstrated persistent tension pneumocephalus and associated mass effect and midline shift. The patient was placed on a 2 h on-off cycle of 100% oxygen on a nonrebreather mask. By postoperative day 2, there was gradual reduction of the air and decreased mass effect from the large collection of air in the fourth ventricle/posterior fossa [Figure 2]. She was discharged on postoperative day 4 and had recovered to her baseline neurological status.

The patient was seen in clinic at the 2-week follow-up and was found to have continued residual numbness in the right face but otherwise did not have other neurological deficits. At the 3-month follow-up, brain MRI demonstrated completely resolved pneumocephalus [Figure 3].

Written consent was obtained from the patient and health-care proxy for all procedures. Institutional Review Board approval was deemed unnecessary.

DISCUSSION

Supratentorial craniotomies carry a very high risk of clinically insignificant pneumocephalus postoperatively.[2] However, clinically relevant (tension) pneumocephalus is a rare complication of any craniotomy procedure, with only two reports in the literature.[3,4] When performing a retrosigmoid craniotomy for MVD, after a postauricular incision is made, the mastoid bone is drilled away to expose the underlying area of dura necessary to reach the retrosigmoid operative corridor. During the craniectomy, there is a risk of exposing and drilling into the mastoid air cells. At times during the craniotomy, a small microdefect with breaching of the mastoid air cells can occur that is not readily apparent during the case. This provides a route for air to enter into the operative cavity. Furthermore, obtaining a watertight dural closure after a retrosigmoid craniectomy can also prove to be difficult if the dura was torn or damaged during the craniotomy. When there is a pathway for a CSF

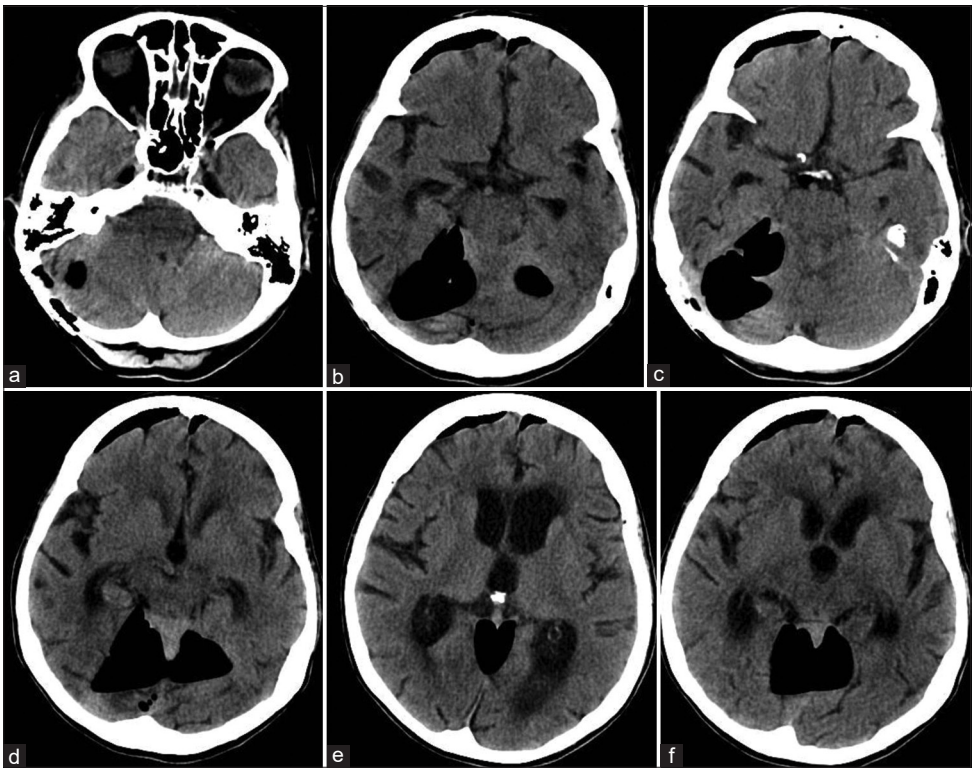

Figure 1: Tension pneumocephalus after repeat microvascular decompression. (a-f) Respectively, caudal to rostral serial computed tomography images of the head without contrast material obtained preoperatively showing significant pneumocephalus in the posterior fossa in the previous microvascular decompression surgical corridor as well as the bilateral inferior frontal areas.

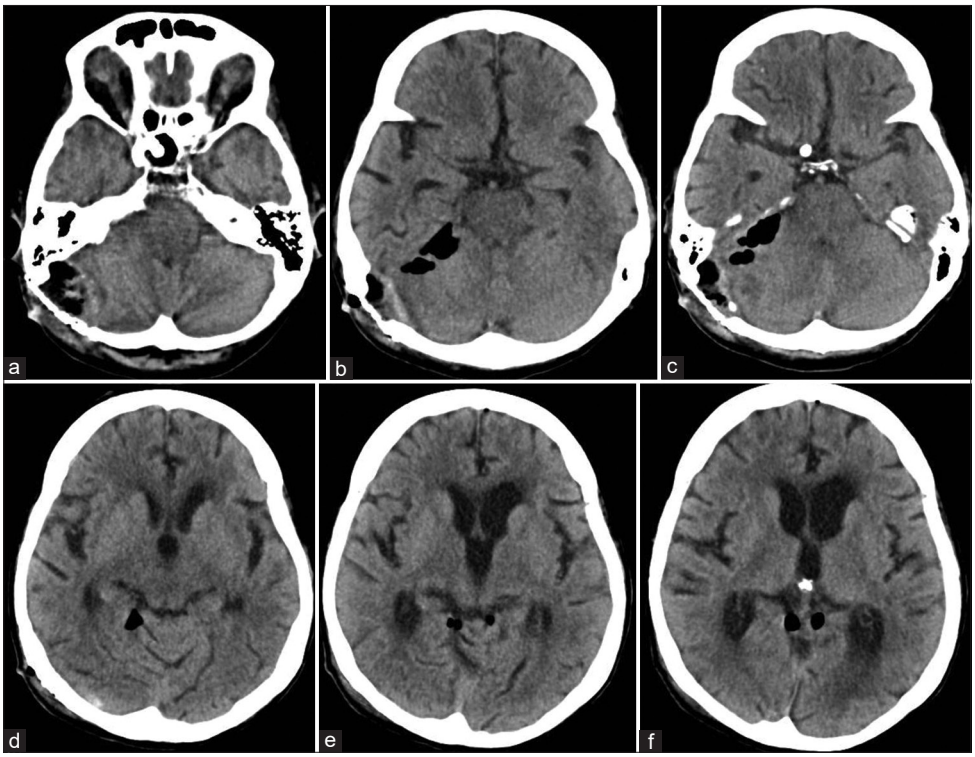

Figure 2: Postoperative day 2 CT scan of the head without contrast material. (a-f) Respectively, caudal to rostral serial images demonstrating mostly resolved pneumocephalus.

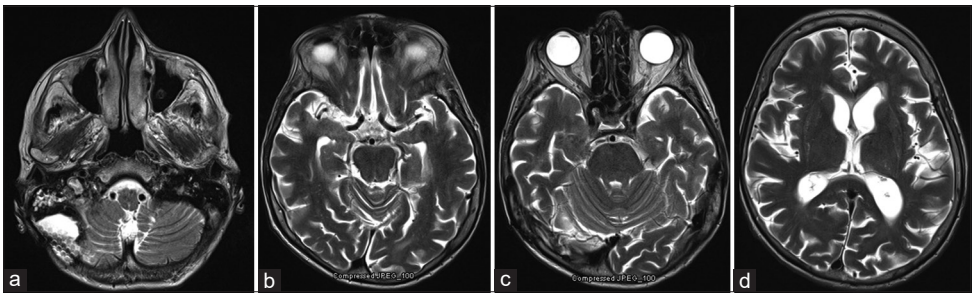

Figure 3: Three-month magnetic resonance images obtained at the time of the follow-up visit. (a-d) Respectively, caudal to rostral axial T2-weighted imaging sequence revealing resolved pneumocephalus.

leak to occur, no matter how small, the displaced CSF can be released with air if there is a channel in which air can enter into the epidural space, such as through the mastoid air cells. Placing ample amounts of bone wax around the borders of the craniectomy seal off possibly exposure holes of mastoid air cells, preventing egress of air into the craniotomy defect, and possible ingress through a small defect in the reclosed dura.[1] Taking this extra precaution may prevent a rare complication such as the tension pneumocephalus seen in our case.

Our patient likely had a small amount of mastoid air cells that were exposed and not adequately covered during the initial operation and closure. This had likely provided a route for air introduction into the postoperative cavity. Although there was verification of a watertight dural closure before the titanium mesh cranioplasty, there was likely a concomitant, small, dural opening that allowed air to progressively egress into the intracranial space. Small amounts of air likely accumulated overtime until a sufficient amount had aggregated and completely occupied the entire fourth ventricular space, causing hydrocephalus to occur and resulting in the patient's acute presentation of confusion, headaches, nausea, and vomiting. Ample rewaxing of the mastoid air cells and craniotomy boundaries sealed the exposed air cells, leading to resolution of the pneumocephalus.

CONCLUSION

Tension pneumocephalus is a rare complication that can occur after intracranial procedures and craniotomies. It is important to assess for CSF leakage and it is critical that air cells are sealed off before wound closure to prevent a pathway for air to egress into the surgical cavity and corridor.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

Potential conflicts of interest – Dr. Levy: Shareholder/Ownership interests: NeXtGen Biologics, RAPID Medical, Claret Medical, Cognition Medical, Imperative Care (formerly the Stroke Project), Rebound Therapeutics, StimMed, Three Rivers Medical; National Principal Investigator/Steering Committees: Medtronic (merged with Covidien Neurovascular) SWIFT Prime and SWIFT Direct Trials; Honoraria: Medtronic (training and lectures); Consultant: Claret Medical, GLG Consulting, Guidepoint Global, Imperative Care, Medtronic, Rebound, StimMed; Advisory Board: Stryker (AIS Clinical Advisory Board), NeXtGen Biologics, MEDX, Cognition Medical, Endostream Medical; Site Principal Investigator: CONFIDENCE study (MicroVention), STRATIS Study – Sub I (Medtronic).

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