

Case Report

Tension Pneumocephalus after Endoscopic Paranasal Sinus Surgery

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Abstract

Tension pneumocephalus (TP) which produces increased intracranial pressure and leads to neurological deterioration is a rare but life-threatening complication. A 59-year-old male patient who had undergone endoscopic sinus surgery was admitted to the emergency room with severe headache, nausea, and vomiting. Cranial computed tomography revealed pneumocephalus. Endoscopic surgery under general anesthesia was performed again, and a dural tear at the crista galli was identified and repaired using an autograft and fibrin glue. In same session, burr-hole drainage was also performed. He recovered after few days and was discharged. Therefore, following endoscopic sinus surgery, surgeons should be aware of the development of pneumocephalus, a rare but life-threatening complication.

Keywords: Ball-valve, inverted bottle, tension pneumocephalus, endoscopic sinus surgery

INTRODUCTION

Tension pneumocephalus (TP) is a rare but life-threatening complication. It could be commonly caused by air escaping into the intracranial space after head traumas or during some surgical managements, such posterior fossa surgeries in the sitting position, evacuation of a subdural hematoma, anesthesia with nitrous oxide, ventriculoperitoneal (V/P) shunt application, paranasal sinus surgery, and lumbar drainage (1, 2). This intracranial air sometimes causes increased intracranial pressure and leads to neurological deterioration (3).

In the present study, a patient with TP which occurred after endoscopic sinus surgery was reported.

CASE REPORT

A 59-year-old male patient was admitted to the emergency room with severe headache, nausea, and vomiting without rhinorrhea and neck stiffness. Endoscopic sinus surgery was performed for chronic rhinosinusitis 1 day previously. His medical history included cerebral stroke and hydrocephalus because of arachnoid villus injury caused by stroke which was treated with a V/P shunt 10 years ago. The patient's complete blood count values, biochemistry test results, and cardiac examinations were normal. Cerebral computed tomography (CT) revealed severe pneumocephalus, ventricular catheter of the V/P shunt, and a degraded area at the base of the skull (Figure 1).

He underwent endoscopic surgery under general anesthesia, and the dural tear located at the crista galli was identified and repaired using a subcutaneous abdominal fatty graft and application of fibrin glue (Tisseel kit 2 ml, Eczacıbaşı-Baxter, Turkey). To discharge accumulated air, burr hole drainage was performed at the left prefrontal area in the same session. It was performed on the left side because the V/P shunt was present on the right side. After surgical management, control CT showed that the pneumocephalus was significantly decreased (Figure 2).

Few days later, the patient did not experience headache, nausea, and vomiting and was discharged.

DISCUSSION

Because the nasal cavity and paranasal sinuses are very close to the base of the skull, bone defects and dural tears that may cause some intracranial complications (such as rhinorrhea, meningitis, vascular injury with subarachnoid hemorrhage, and optic nerve in-

Figure 1. CT scan obtained preoperatively reveals large pneumocephalus at the frontal lob (1a); ventriculoperitoneal shunt catheter (1b); and damaged anterior part of the skull-base (1c).

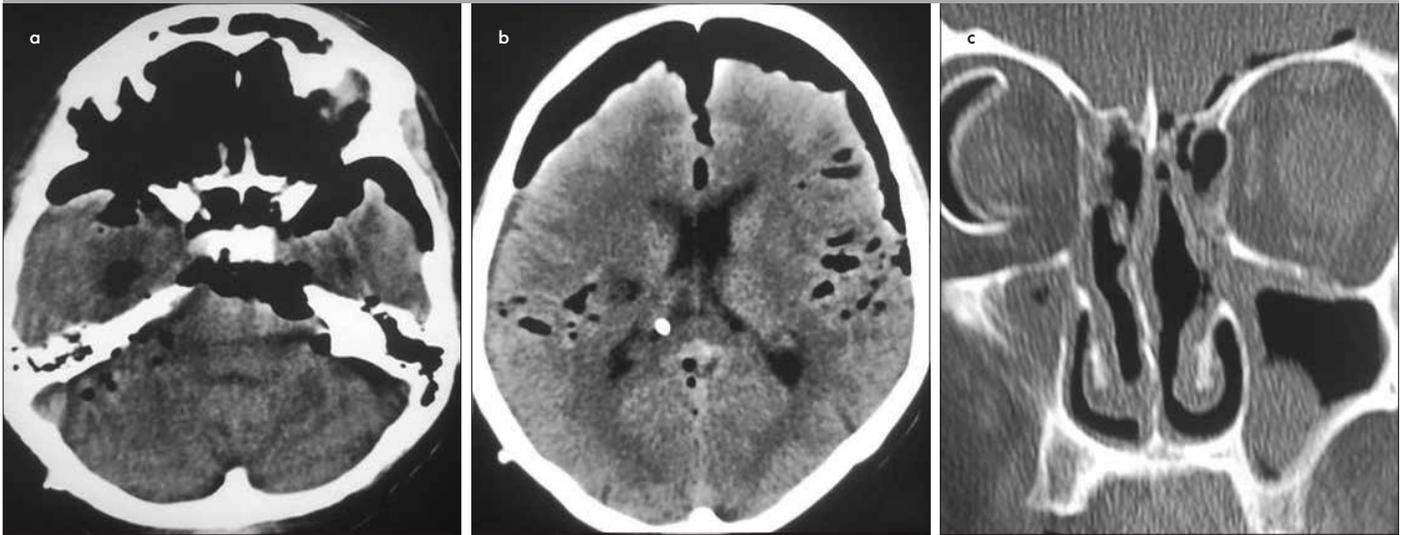
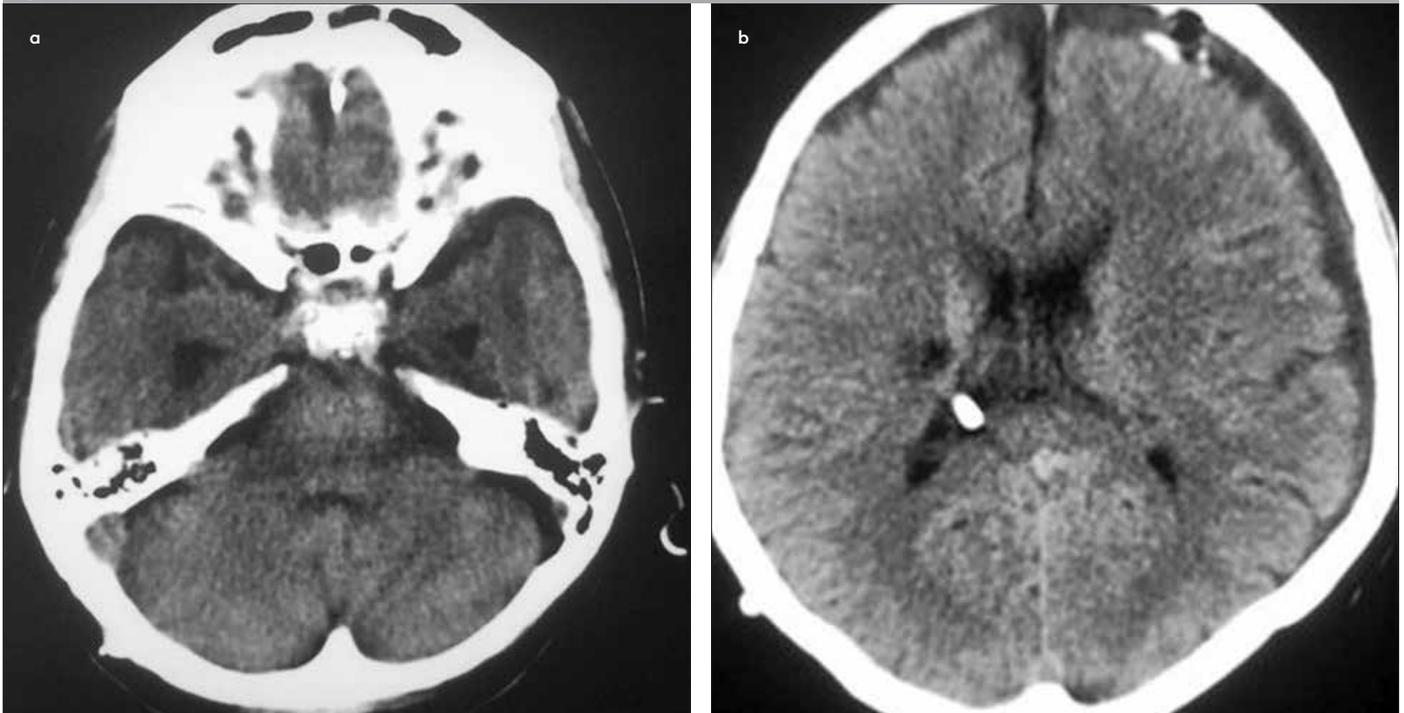


Figure 2. a,b. Postoperative CT scans shows the decreased pneumocephalus (2a, 2b).



jury) may occur during endoscopic paranasal sinus surgery (4). Pneumocephalus, which is often spontaneously absorbed without clinical manifestation or sometimes causes increased intracranial pressure with neurological deterioration (called as TP) may also occur after endoscopic paranasal sinus surgery. Two theories have been reported in literature for the development of TP: "ball-valve" and "inverted bottle" mechanisms (5, 6). In TP, air enters the intracranial space through cranial and dural defects, but does not exit; and deep inspiration, coughing, sneezing, positive pressure with a mask, or low intracranial pressure can increase the risk of the development of TP (7). In the patient in this study, it was thought that low intracranial pressure because of a functional V/P shunt as well as bony defect and dural tear in the base of the skull increased air accumulation in the intra-

cranial space by both "ball-valve" and "inverted bottle" mechanism. Our hypothesis on this subject was that the functional V/P shunt acted as an "inverted bottle," whereas the bony defect and dural tear acted as a "ball-valve." Additionally, we thought that these two mechanisms and particularly, a functional V/P shunt which leads to the low intracranial pressure prevented the formation of rhinorrhea in the patient in this study.

This pressure mechanism appears to have occurred in some cases as suggested by the chronological relationship between the use of the occurrence of the pneumocephalus. Theoretically, the influx of air into the cranial cavity is more important when the ventricular system is less compliant; the ventricles do not collapse when the ventricular cerebrospinal fluid is drained, which

facilitates air filling (8). Pneumocephalus in the presence of a shunt is also a well described complication in the literature. The underlying mechanisms is thought to be a combination of an excessively negative intracranial pressure generated by the shunt and the presence of a cranial-dural defect (9).

Clinical symptoms of TP are developed by increased air accumulation which leads to an increase in the intracranial pressure. Furthermore, increased air accumulation can act as an intracranial mass and lead to mental changes, headache, seizures, nerve paralysis, hypertension, or bradycardia by applying pressure on eloquent cerebral areas (5). Cranial CT is suggested to be the most valid radiological method for detecting pneumocephalus (10). In the patient in this study, clinical symptoms (headache, nausea, and vomiting without rhinorrhea) occurring after paranasal sinus surgery were strongly indicative of pneumocephalus, intracranial hemorrhage, or cranial stroke. As a matter of fact, cranial CT proved the development of TP.

Treatment of TP, which usually requires urgent intervention, should be done surgically. In literature, repair of the bony defect and dural tear is suggested to obtain definitive treatment of TP (5). Thus, in the patient in this study, bony defect and dural tear were endoscopically repaired using the subcutaneous fatty graft and by application of fibrin glue. During the same session, burr hole drainage was also performed to discharge the accumulated air. Consequently, postoperative cranial CT revealed that the pneumocephalus was completely recovered and few days later, the patient completely recovered from headache, nausea, and vomiting.

CONCLUSION

Following endoscopic sinus surgery, surgeons should be alert for pneumocephalus, which is rare but life-threatening complication.

Ethics Committee Approval: N/A.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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