



A RARE CASE OF IATROGENIC TENSION PNEUMOCEPHALUS

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ABSTRACT

Background: Pneumocephalus is a common complication of craniotomies. Since it has little or no clinical significance, it usually requires no treatment. However, tension pneumocephalus could also be associated with raised intracranial pressure and neurological deterioration. This emergency requires immediate radical approach to achieve surgical decompression.

Objectives: To create awareness that the onset of post craniotomy tension pneumocephalus may be delayed and also to show that the radiological appearance may deviate from the classical Mount Fuji model.

Case Description: A pituitary mass was successfully removed overseas from a 49-year-old man by transcranial approach. He improved, returned home and presented himself for clinical review on arrival without any significant complaint. The patient was brought back in coma two weeks later with blood pressure of 150/100 mmHg and aseptic CSF rhinorrhoea. The cranial CT scan showed marked dilatation of the lateral ventricles with obvious gas lucencies (Hounsfield unit = -1000HU).

Conclusion: High index of suspicion of tension pneumocephalus should be borne in mind in post operative reviews of craniotomy patients, as timely appropriate intervention is imperative.

Key words: Tension pneumocephalus, Craniotomies, CSF rhinorrhoea, Emergency.

INTRODUCTION

Pneumocephalus (otherwise called intracranial aerocele or pneumatocele) is the abnormal presence of air in the subarachnoid pathways, ventricles or the brain substance.¹ It could arise from many conditions with commonest being head trauma, followed by tumors, infections, hyperbaric oxygen therapy, as well as post surgical head procedures and lumbar puncture.²⁻⁶ It could rarely be spontaneous or resulting from scuba diving.⁷⁻⁸ When the trapped intracranial air is increasing in quantity, it results in mass effect, referred to as tension pneumocephalus (TP).⁸⁻¹¹ Although most

intracranial surgeries are complicated by various degrees of pneumocephalus, complication by tension pneumocephalus is very rare.¹¹ The initial presentation may be asymptomatic or vague and the commonest presenting complaint is headache.¹¹ The diagnosis is frequently unsuspected unless when associated with CSF rhinorrhea and symptoms of increased intracranial pressure.^{12,13} Delayed or missed diagnosis of tension pneumocephalus could lead to progressive brain compression with deteriorating sensorium and mental status, herniation of the brain, and consequently, death of the patient.¹¹

It can be extra-axial or intra-axial depending on the underlying cause.¹⁴⁻¹⁶

We report a case of delayed post-surgical tension pneumocephalus in an unconscious patient who recovered fully following emergent surgical intervention.

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Case Report

BB is a 49-year-old man who was brought to the emergency room on 15th April, 2017 because of sudden loss of consciousness following complaints of headache, nausea and nasal discharge of a few hours duration. He had been evaluated three months earlier in a private hospital for recurrent headache and vomiting.

The brain MRI performed at that time revealed a multilobulated T1 and T2 isointense sellar mass with moderate uniform enhancement on post contrast images (Figs.1). The mass extended from the sella to the suprasellar region with mass effects. A radiological diagnosis of pituitary adenoma was made and the patient promptly went abroad for surgery.

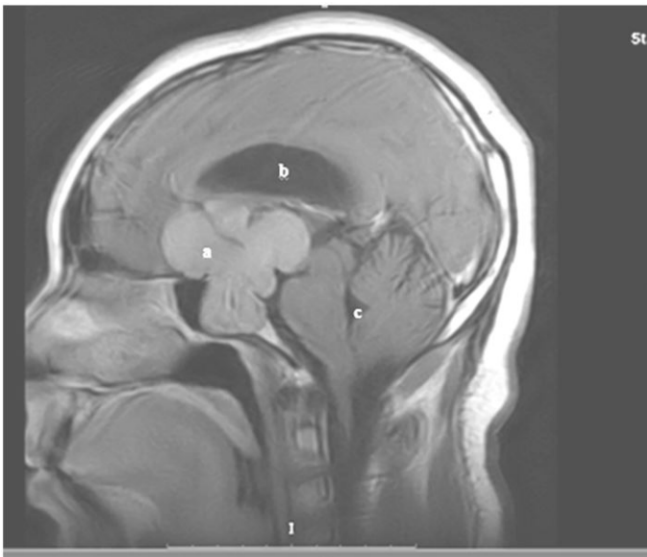


Fig.1: Sagittal T1W+C MR image of the brain showing a lobulated homogeneously enhancing pituitary mass (a) and dilated lateral ventricle (b), with normal 4th ventricle (c)

The mass was successfully removed by transcranial approach. He improved, returned home and was reviewed two weeks before the onset of the present illness. At the time of post operative review, he had no significant complaint. However, the details of the surgical procedure performed abroad and the findings were not available.

On presentation, the patient was anicteric and afebrile. The Glasgow coma score (GCS) was 8. The blood pressure was 150/100 mmHg, temperature was 37.2 degree Centigrade, respiratory rate was 28/minute and pulse rate was 96bpm.

Laboratory investigations confirmed the nasal discharge to be aseptic CSF rhinorrhoea.

The cranial CT scan showed marked dilatation of the lateral ventricles with obvious gas lucencies (Hounsfield unit = -1000HU). The findings became more evident on reformatted CT scans at various levels (Fig. 2). Well pneumatized mastoid, sphenoid, and ethmoid air cells and air sinuses, were also observed.



Fig.2: Post-surgical cranial coronal CT showing a defect (notched arrow) in the skull base (possibly the route through which air from the sphenoid sinus entered the cranial cavity).



Fig. 3: Post-decompensatory frontal skull x-ray showing shunt lines (white arrow)

The bone window and other images demonstrated defects in the skull base which enabled direct communication between the spheno-ethmoidal sinuses and the intracranial cavity. A radiological diagnosis of tension pneumocephalus was made.

The patient had craniotomy and a ventriculo-peritoneal (VP) shunt was inserted with good post surgical outcome. The post surgery skull x-ray films showed decompressed ventricles with VP shunt tubes in -situ (Fig. 3). The patient was discharged ten days post surgery and remained symptom free. He is still being followed up in the clinic.

DISCUSSION

The term pneumocephalus encompasses acute or delayed accumulation of air in any of the intracranial compartments and the location of air in the index case is mainly intraventricular.^{17,18} Pneumocephalus developed in the index case either by creation of negative intracranial pressure as a result of excessive CSF loss or the ball valve mechanism.¹⁸ Probably, a deflection of a previously intact flap of tissue led to leakage of cerebrospinal fluid and replacement by air causing increased intracranial pressure, mass effect and the compression of the lobes as seen in Figures 2. With CSF flow out of the cranium, compensatory air enters to equalize the pressure.^{11,12} The presence of only air in the ventricles suggests that the pressure of the air is greater than that of the surface tension of cerebrospinal fluid.¹⁸ Irrespective of the mechanism, the increased pressure led to extra-axial mass effect which culminated in the loss of consciousness, high blood pressure and low indices in the Glasgow coma scale at presentation.

The diagnosis of tension pneumocephalus is difficult, as the symptoms and mechanism of injury mimic those associated with intracranial hemorrhage.^{22/18} When pneumocephalus is suspected, CT can play a vital role in determining the precise location of the gas collection, its relationship to the basal skull fracture site or air sinuses, whether the air bubbles were single or multiple and the degree of mass effect on the brain.^{19,20,21} It is also evident on plain skull x-rays and this is important in centers where CT and/or MRI scans are not available. The radiological findings in the case presented deviates significantly from the common radiological features of tension pneumocephalus on the CT scan such as the Mount

Fuji sign, described by a group of Japanese neurosurgeons in which the two frontal poles are surrounded and separated by air and this not seen in any patient with non-tension pneumocephalus.^{20,22} It also appears different from the other usual finding on CT scan, like the presence of multiple small air bubbles scattered through several cisterns ("air bubble sign") and the bilateral compression of frontal lobe by subdural air collection without the characteristic separation of frontal lobe the "peaking sign".^{20,23}

Although fat can be confused with air on CT since both appear very hypodense on routine brain windows, air will have a very low density (-1000HU) while fat is of much higher density (-60-120HU). MRI is not as sensitive as CT in the investigation of pneumocephalus because there is no objective density measurement. Furthermore, air will appear completely black on all sequences; hence can be mistaken for chronic blood products, dense bones or flow voids.^{13/11}

The treatment of pneumocephalus generally depends in part upon the type as well as its aetiology and severity.¹¹ In the vast majority of post operative pneumocephalus, (a common finding in many post-craniotomy patients), serial radiological investigations with conservative management is commonly used. Supplemental oxygen increases the rate of absorption of pneumocephalus.⁵ However, in cases of tension pneumocephalus, like the index case, it is a neurosurgical emergency and open or endoscopic repair to achieve surgical decompression.¹⁹ Adjunct therapies includes supine positioning, antibiotics and analgesia.^{8,9} Avoidance of contributing factors, high index of suspicion, and confirmation with neuroimaging are important in attenuating mortality and morbidity. Injuries associated with a pneumatocele or a single intracranial air bubble, have a good prognosis, as do frontobasal lesions. Injuries associated with multiple air bubbles have a bad prognosis.²⁴

CONCLUSION

Delayed tension pneumocephalus, a rare neurosurgical emergency, in which radiology was fundamental to accurate diagnosis and institution of appropriate treatment, is presented. It requires a high index of suspicion for timely diagnosis. Prompt evaluation and emergent operative intervention prevents morbidity and mortality.

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