CASE REPORT – OPEN ACCESS

International Journal of Surgery Case Reports 31 (2017) 145–149

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Traumatic tension pneumocephalus: Two case reports

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ARTICLE INFO

Article history:
Received 3 November 2016
Received in revised form 16 January 2017
Accepted 16 January 2017
Available online 18 January 2017

Keywords:
Head trauma
Tension pneumocephalus
Cerebrospinal fluid leak
Rhinorrhea

ABSTRACT

INTRODUCTION: Traumatic pneumocephalus rarely evolves into tension pneumocephalus. It can be devastating if not recognized and treated promptly.
CASE PRESENTATION: We presented two cases of post-traumatic tension pneumocephalus. A 30- year old male pedestrian hit by a car presented with right frontal bone fracture extending to right frontal sinuses. He developed pneumocephalus involving all ventricles and subdural space and extending down to foramen magnum with tight basal cistern. The patient was managed conservatively. During the hospital course, he developed cerebrospinal fluid leak from the facial fractures and meningitis. After complete recovery, the patient was discharged home in a good health condition. The second case was a 43- year old lady driver who involved in a motor vehicle crash and presented with comminuted fracture of the right frontal bone, right parietal extra-axial hemorrhage. She developed pnemocephalus involving the bilateral frontal lobes, mainly on the left side with extension to the left lateral ventricle. Pneumocephalus was also noted in the pre-pontine cistern. The patient had rhinorrhea during the hospital course. The patient underwent wound debridement, intracranial pressure monitoring, and repair of her globe and advancement flap for right facial injury.
CONCLUSIONS: These are two rare cases with posttraumatic tension pneumocephalus treated conservatively with a favorable outcome. Early diagnosis of tension pneumocephalus is a crucial step to facilitate early recovery; however, the associated injuries need attention as they could influence the hospital course.

1. Introduction

Pneumocephalus is known as intracerebral aerocele or pneumatocele due to a collection of air in the cranial cavity [1–5]. It could complicate head trauma in 3.9–9.7% of cases and it commonly occurs after supratentorial craniotomy as well [6–9]. The accumulation of intracranial air can be acute (<72 h) or delayed (≥72 h) [10–12]. As a rule, intracranial collection of air is benign and asymptomatic condition. Tension pneumocephalus occurs when intracranial air causes intracranial hypertension and then it causes a mass-effect with neurological deterioration. However, transformation of pneumocephalus into tension pneumocephalus is a rare event [13–15].

The presence of intracranial air indicates the presence of an open communication and should be considered as a form of cerebrospinal fluid (CSF) fistula. Air enters the intracranial space after dura tears even without direct brain laceration. This air flows "upstream" along the normal CSF pathways [16–21]. It is a serious complication and a neurosurgical emergency may be required especially when associated with clinical deterioration. Pneumocephalus could increase the risk of developing meningitis [22–25]. We report two cases of significant tension pneumocephalus following traumatic head injury. This work has been reported in line with the consensus-based surgical case report (SCARE) guidelines [26].

2. Case presentation

Case 1: A 30-year old male pedestrian hit by a car presented to the trauma resuscitation unit (TRU) with a Glasgow Coma Scale (GCS) score of 15, stable vital signs, multiple facial lacerations, tenderness over the chest wall, abdominal wall ecchymosis and right upper limb weakness.

Computerized tomography (CT) imaging of head showed right frontal and occipital lobe hemorrhagic contusions with surrounding mild edema causing effacement of the overlying cortical sulci. Right frontal bone fracture was extending to right frontal sinuses.

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http://dx.doi.org/10.1016/j.ijscr.2017.01.038

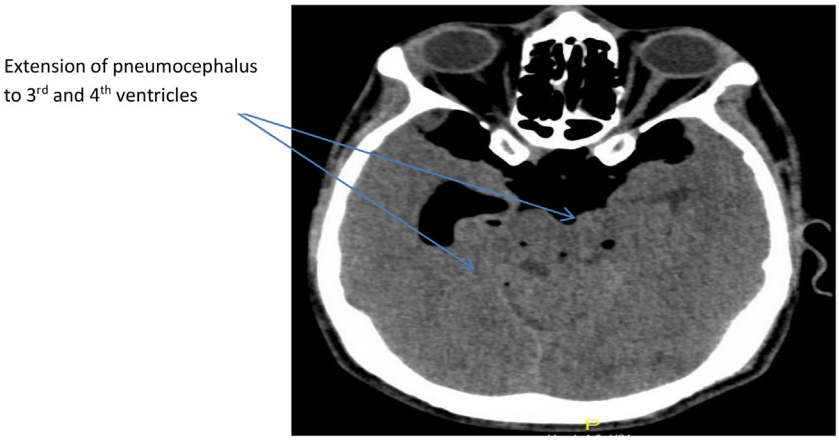

Fig. 1. Extension of pneumocephalus to 3rd and 4th ventricles (case 1).

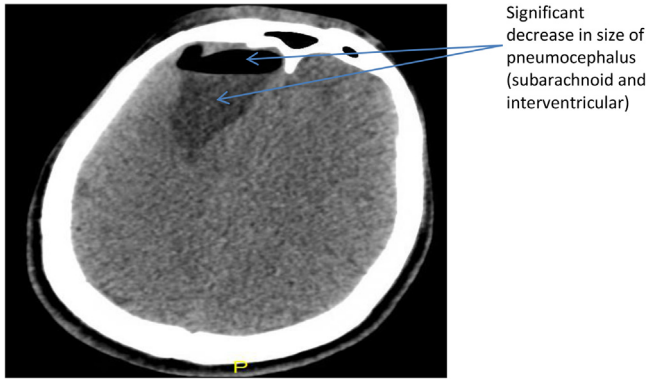

Fig. 2. Significant decrease in size of pneumocephalus (subarachnoid and interventricular) (case 1).

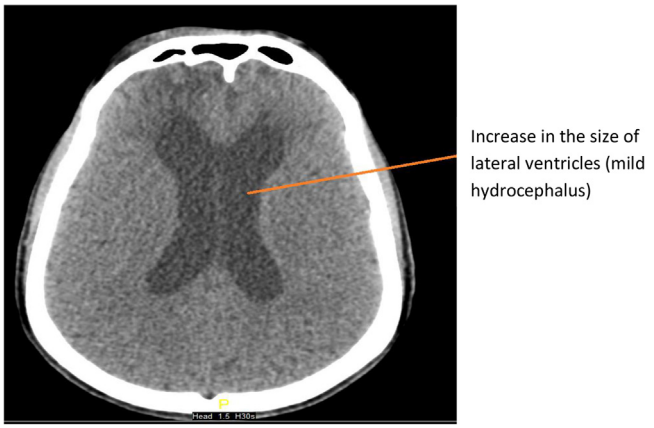

Fig. 3. Increase in the size of lateral ventricles (mild hydrocephalus) (case 1).

Multiple facial bone fractures were characterized by bilateral orbital roof fracture, comminuted fracture of the left maxillary sinus with almost complete fluid opacification and associated air loculi in maxillary, ethmoid, and sphenoid sinuses, mastoid air cells, left temporal bone fracture extending to skull base, and nasal bone fracture. Asymmetry between the atlanto-odontoid joint spaces was noted denoting joint spine instability (Figs. 1 and 2).

Cervical spine and shoulder Magnetic resonance imaging (MRI) showed atlantoaxial sublaxation, multilevel cervical disc protrusion with spinal cord indentation and contusions as well as right brachial plexuses injury. Fracture of right 8–10 ribs, fracture of left 7th rib, grade III hepatic injury, right adrenal hematoma and right ulnar fracture were also noted. Patient was managed conservatively by a multidisciplinary team including experts from trauma, neurosurgery, maxillofacial, orthopedic and plastic surgery.

Follow up CT scan on the 3rd and 6th day to evaluate the intracranial injury showed no significant changes compared to admission CT scan of head except for the regression of hyper dense brain hemorrhagic contusions.

On 1 day 13, the patient was transferred to rehabilitation unit in a good health condition for weakness of right upper limb. On day 18, he developed severe headache along with neck pain and vomiting. Physical examination showed that the patient was vitally stable and was afebrile. Urgent CT head showed newly developed extensive pneumocephalus dissecting its way to the extra axial CSF spaces with right frontal air loculus averaging 4.6 × 3.9 cm maximal dimensions. Pneumocephalus involved all ventricles and subdural space and was extending down to foramen magnum with tight basal cistern. Frontal air sinus might be the site of CSF leakage, development of pneumocephalus and air within the ventricular system and slight midline shift to the left side.

Patient was admitted to trauma intensive care unit (TICU) as an emergency case of tension pneumocephalus. He was kept in flat position with 100% oxygen supplement via oxygen mask for four days. On the 2nd and 4th days, follow up head CT scans showed significant decrease in the size of pneumocephalus. Repeat CT scan of the head showed an increase in the size of the ventricles (Fig. 3) with a slight hypo-density in the right frontal area.

A lumbar puncture was done with an initial reading of 27 mmHg, followed by an improvement in the clinical condition. Broad-spectrum antibiotics were commenced for a total duration of 28 days for meningitis. Lumbar puncture was repeated with a low opening pressure. The patient dramatically improved after completing the antibiotic course.

A repeated head CT scan before discharge showed no increase in the ventricles size compared to the previous CT scans. The patient was completely asymptomatic and discharged home in a good general health condition.

Case 2: A 43-years old lady driver involved in a motor vehicle collision causing severe head and facial injuries. She had right forehead open fracture with a globe rupture. The GCS was low (4–8) and the patient was intubated.

Imaging studies showed comminuted fractures of the right frontal bone with multiple bone fragments reaching the right ventricle. Fracture lines extended to the left frontal and right parietal bone. Subarachnoid hemorrhage was noted along the sulci of the both cerebral hemisphere. Blood density was noted in the fourth ventricle with an evidence of right parietal extra-axial