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Case Report

Pneumorrhachis: A Rare Prognostic Lesson

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ABSTRACT

Objective: We present a case of poly-traumatic epidural pneumorrhachis of an 87-year-old gentleman who had unremarkable neurology on presentation. We give an overview of aetiology and indications for intervention in pneumorrhachis.

Background: Pneumorrhachis is the presence of air within the spinal canal, aetiologically it is widely variable though its observation in practice is rare.

Methods: Descriptive.

Results: We show figures illustrating CT images of pneumorrhachis at C3/4 level. The patient underwent progressive neurological deterioration over the course of four days on intensive care, and subsequently passed away.

Conclusion: The presence of pneumorrhachis is well known to be associated with poor prognosis, and in our case predicted his subsequent neurological decline despite initial presentation. The presence of pneumorrhachis also serves as an important clue for hidden injuries.

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Introduction

Pneumorrhachis is a rare radiological finding where air is present within the spinal canal. Pneumorrhachis can be subdivided into extradural or intradural, intradural air is often associated with more severe trauma and pneumocephalus [1]. Mechanisms by which pneumorrhachis can occur are categorized into traumatic, non-traumatic and iatrogenic. Patients mostly presents as asymptomatic, but may have pain, neurological deficits, or symptoms of intracranial or intraspinal hypertension [2].

Case Presentation

We present a case of epidural pneumorrhachis following trauma. Patient is an 87-year-old man with good functional baseline and no significant past medical history. The patient self-presented to the local hospital with confusion, retrograde amnesia, hypothermia and metabolic acidosis. Initial neurology on presentation: GCS 14, bilateral down-going plantars, moving all four limbs.

A CT was performed at the local hospital which showed pneumorrhachis at C3/4 level (see Figures 1-3), alongside multiple fractures and injuries of the thorax. The patient was then transferred under the care of spinal team to intensive care.



Figure 1: Axial CT scan through C-spine demonstrating pneumorrhachis.

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Figure 2: Coronal CT scan through C-spine demonstrating pneumorrhachis.



Figure 3: Sagittal CT scan through C-spine demonstrating pneumorrhachis.

Subsequent bloods showed acute kidney injury, acute liver injury, significant electrolyte disturbance and disseminated intravascular coagulation. Initial trauma CT showed C3/4 pneumorrhachis, unstable T8/9 fracture, sternal fracture, bilateral scapular fractures, bilateral pleural effusions and rib fractures with flail segment. Air was seen in the anterior mediastinum tracking to T8/9 disc space, and within the spinal canal at C3/4 level. MRI revealed unstable T8/9 fracture through the disc space and an epidural haematoma with no cord compression, the patient was listed for spinal fixation. The mechanism of trauma is not known. Next evening, patient's GCS had decreased to 12, power 4/5 all four limbs. A do-not-resuscitate form was put in place due to the severity of his injuries. On the fourth day after presentation, patient dropped his GCS to three, then passed away hours later.

Discussion

The most likely explanation for his decreased GCS is metabolic disturbance secondary to his trauma, and subsequent multi-organ failure caused by systemic inflammatory response. Intracranial injury was ruled out by three consecutive CTs. However, it is plausible the collection of

extradural air extended or mobilized into pneumocephalus, causing intracranial hypertension. A CT was not performed on the last day. The patient also suffered progressive respiratory failure, for which pneumorrhachis itself at C3/4 level could have contributed through compression of nerve roots supplying the diaphragm. Air entrance in this case is likely through the sternal fracture and fractured thoracic disc space.

The first case of pneumorrhachis was first described in 1977 by Gordon *et al.* [3]. Of traumatic causes, pneumothorax and pneumomediastinum are the most common causes. Of non-traumatic causes, numerous aetiologies include spontaneous pneumothoraces, pneumomediastinum from bronchiolitis, spontaneous surgical emphysema (Hamman syndrome), cardiopulmonary resuscitation. Some of the more intriguing causes include violent coughing or sneezing, regional necrotizing fasciitis, thoraco-arachnoid fistulas, foreign body inhalation, and post-radiotherapy changes [4-12]. Pneumorrhachis is usually managed conservatively, in cases where there is evidence of increased intraspinal or intracranial pressure, surgical decompression can be considered.

There have also been reported cases of use of IV dexamethasone, epidural air aspiration, trephination and oxygen therapy for treatment of pneumorrhachis [13-16]. The anaesthetist should be made aware of the presence of air, due to dangers of nitric oxide migrating into the spinal canal. CT is the imaging modality of choice as air is seen as marked contrast to CSF and the spinal canal [17]. Mostly the air is distributed in cervical and thoracic spine, as opposed to the lumbosacral spine, although largely positional. Skull trauma also often push air into the cervical canal due to head up and supine position of the patient. Air is more frequently present in the posterior canal, as soft tissue here are more loosely connected compared to the anterior canal.

We urge readers to remember the important prognostic lesson pneumorrhachis serves, as demonstrated by our case. It is also crucial to screen for concomitant hidden injuries whenever pneumorrhachis is seen and intervene when neurological signs of intracranial or intraspinal pressure is present.

Conflicts of Interest

None.

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