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Traumatic air in spinal canal (pneumorrhachis)

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Abstract

Background. Pneumorrhachis (PR) means the presence of air in the spinal canal; it is an exceptional, but important radiographic finding, which may be associated with different aetiologies and pathways of air entry into the spinal canal.
Case report. An 18-year-old male was admitted to hospital after a road traffic accident. He was conscious, with several abrasions and subcutaneous haematoma and emphysema on the left side, but no pneumothorax. Ultrasound of the abdomen showed a grade 2 splenic rupture with minimal bleeding. CT revealed no fractures but the presence of air in the spinal canal. The patient was placed on conservative treatment and discharged home without any complications or sequelae.
Discussion and conclusion. PR can be epidural or subdural, iatrogenic or traumatic. It is usually asymptomatic, but can be also associated with marked morbidity, especially when it is subdural in the cervical region. It can be regarded as a predictor of the severity of head injury. Pneumorrhachis does not usually require surgical intervention.

Key words: complications, pneumorrhachis; trauma,

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Pneumorrhachis, the presence of intra-spinal air, is a singular imaging finding of varying aetiology. In most cases, PR is asymptomatic but can also be symptomatic, either by itself or by its underlying pathology.

We present the case of pneumorrhachis accidentally detected in a patient after road traffic accident.

CASE REPORT

An 18-year-old male patient, involved in a road traffic accident, was brought to the Adan Hospital with the Glasgow Coma Score of 15; he was conscious, oriented, with no history of loss of consciousness or vomiting, no bleeding from the external orifices. His pupils were equal and reactive and no wounds on the head or neck were detected. The respiration and circulation was efficient. On admission, the physical examination revealed abrasions and subcutaneous haematomas with tissue emphysema, tenderness on the left thoracic side and in the left upper abdomen with rigidity and guarding. Emergency Echo showed the normal heart; chest X-ray confirmed surgical emphysema on the left side with no haemopnemothorax. The abdominal US scan disclosed the grade 2 splenic injury with a minimal amount of fluid. CT demonstrated no bone fractures, however, the presence of air in the spinal canal was detected (Fig. 1). Due to his stable and good general condition, the patient was kept under close observation and treated conservatively. The patient did not develop any complications and was soon discharged home.

DISCUSSION

The term pneumorrhachis was first coined in 1987 [1]. It can be descriptively classified as internal (intradural) and external (extradural). External PR by itself is usually innocuous, whereas internal traumatic PR is frequently associated with major trauma and considered a marker of severe injury [2]. Pneumorrhachis can also be divided into iatrogenic, traumatic and nontraumatic [2]. The location and distribution of air within the spinal canal depends on the site of air dissection, rate

of penetration, volume of intraspinal air, capacity of the intraspinal space, and patient's positioning. In external pneumorrhachis, the epidural air usually collects in the posterior epidural space, which is less resistant due to lesser amounts of the connective tissue, as compared with the rich vascular network present anteriorly [3].

PR is primarily diagnosed radiographically. X-ray may be helpful as an initial examination and to detect larger amounts of intraspinal air [2]. A linear lucency along the spinal canal on a lateral chest radiograph is considered a useful detection sign [3]. The diagnostic tool of choice is CT [4], yet in such a case, the differentiation between the intra- and extradural pneumorrhachis can be difficult.

Moreover, it is extremely important to differentiate intraspinal air from free intraspinal gas, collected in the course of degenerative, malignant, inflammatory and infectious diseases, produced by gas-forming organisms [4], which is likely to be infeasible on CT.

The presence of air in the intradural space is usually associated with a severe head injury [5]. Extradural air, on the other hand, is mostly connected with a penetrating injury; the patient's clinical condition is usually better and pneumocephalous is not observed. In most cases, it is located posteriorly in the spinal canal.

Pneumorrhachis is usually asymptomatic, reabsorbs spontaneously and is mostly managed conservatively. When symptomatic, the treatment should involve the associated injuries [6]. Occasionally, pneumorrhachis may results from spinal anaesthesia procedures [7].

In traumatic patients, the presence of gas within the spinal canal is an indication for determining the aetiology and possible pathway of air entry into the space. However, in the case described it was not effective. Due to the satisfactory general condition of our patient, he was successfully treated conservatively.

Posttraumatic pneumorrhachis is thought to be connected with increased morbidity and mortality rates. When associated with decreased intraspinal pressure, secondary to possible cerebrospinal fluid leakage, it is usually of a more benign character. However, when intraspinal air enters the craniospinal compartment with a one-way air valve mechanism, the gas is entrapped and might cause tension pneumorrhachis and pneumocephalus, which results in nervous tissue compression and requires intervention. Generally, prophylactic management with antibiotics is not recommended in cases of extradural pneumorrhachis and in patients with intradural pneumorrhachis without signs and symptoms of meningitis.

In the cases when general anaesthesia is required, the use of inhalational nitrous oxide is avoided because it induces the expansion of intracavitary gas volume and results in increased intracranial pressure, due to its diffusion into the air-filled space. Anaesthetic techniques such as IPPV with transient high concentration oxygen, are the methods of choice, preventing an increase in the volume of any intraspinal and intracranial air and simultaneously promoting faster reabsorption of air.

Fig 1. CT scan. Subcutaneous emphysema with intermuscular extension. Emphysema extends into the upper mediastinum and through the foramina C_{6-7} and C_7-Th_1 to the spinal canal where air foci are seen from C_5 to Th_1

Pneumorrhachis, especially the intradural one, is a rare entity and can be caused by a multitude of sources. It is usually self-limiting, yet the associated pathologies leading should be promptly diagnosed and adequately managed.

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