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CASE REPORT
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# Traumatic Pneumorrhachis

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We present two cases of traumatic pneumorrhachis that is defined as air within the spinal canal. It is also known as pneumosaccus, intraspinal pneumocele, aerorachia, pneumomyelogram, or simply intraspinal air. Only few cases have been reported in the literature, and a review of the literature has exposed only 35 cases in epidural type and 18 cases in subarachnoid type. (J Kor Neurotraumatol Soc 2007;3:113-115)

**KEY WORDS**: Pneumorrhachis · Spinal canal.

## Introduction

Traumatic pneumorrhachis has been rare but known complication of skull base fracture, and it can be classified into the epidural and subarachnoid type according to the location of the air and the former is more commonly reported.

## Case Report

### Case 1 (traumatic epidural pneumorrhachis)

An 8-year-old child was sent to the hospital due to a traffic accident. He overturned by a bus on his bicycle. Chest X-ray shows hazziness of both lung fields suggesting lung contusion and post traumatic scoliosis due to T5-6 locked facet with widening of 5th and 6th intercostal space. In emergency room, patient's mental status was alert with a Glasgow Coma Score (GCS) of 15/15 and motor weakness was not checked. Computerized Tomography (CT) scan showed air lucency in dorsal part of spinal canal in cervical spine (Figure 1A). CT scan of thoracic spine at level of T5-6 demonstrated hematoma in spinal canal with extensive air density and costovertebral fracture at the level of 6th thoracic spine. Lung CT scan showed right rib fractures (3rd to 5th), lung contusion, subcutaneous emphysema and right-sided pneumothorax (Figure 1B). Patient also had temporal bone fracture, ear bleeding, facial palsy (House-Brackmann grade IV) at right side. Some pneumocephalus and thin subdural hematoma were also seen at initial brain CT scan, which disappeared in two days after injury.

### Case 2 (mixed type of traumatic pneumorrhachis)

A 46-year-old male was involved in a traffic accident while riding a motorcycle. When he arrived at our emergency department he was unconscious with a GCS of 3/15, he had no self-respiration and blood pressure was not checked. Physical examination revealed a severe scalp swelling on left parietal area, left side ear bleeding and ecchymosis on both periorbital areas. Initial chest X-ray showed a right-sided hemothorax and pneumothorax. Brain CT scan demonstrated extensive air densities filling the basal subarachnoid cistern with traumatic subarachnoid hemorrhage (Figure 2A). Closer examination of the film revealed a thin air density band at the anterior border of the cervical canal. A cervical CT scan showed long air lucency in sagittal CT image (Figure 2B) and both the epidural and subarachnoid pneumorrhachis (Figure 2C, D, respectively). The patient was kept on the Intensive Care Unit and treated conservatively, however he died soon thereafter.

## Discussion

Since Gordon et al. used the term "pneumomyelogram" for the first time to describe free air surrounding the dura mater spinalis in 1977,[4] there have been a few reports on

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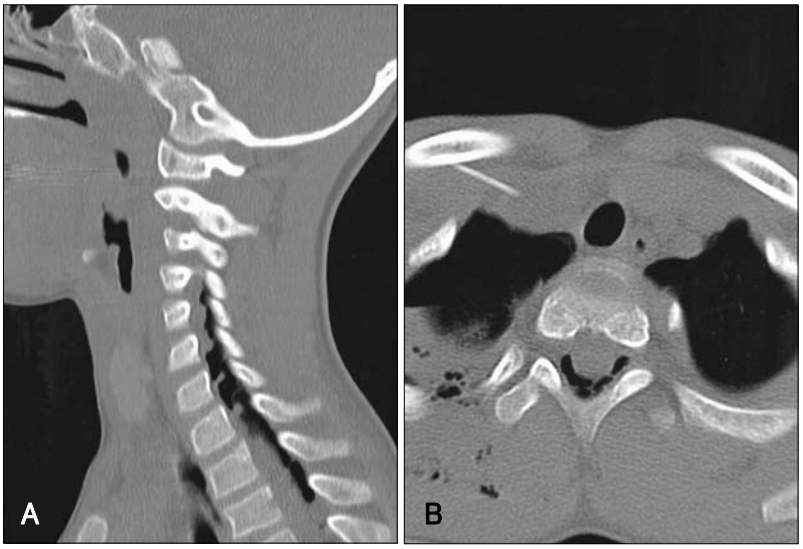


**FIGURE 1.** CT scan showing extensive air density in cervicothoracic spinal canal. A: Sagittal CT image of cervical spine shows air in the dorsal part of spinal canal. B: Axial CT image at level of T2 shows air in epidural space in the spinal canal and hemothorax and lung contusion accompanied by pneumothorax.

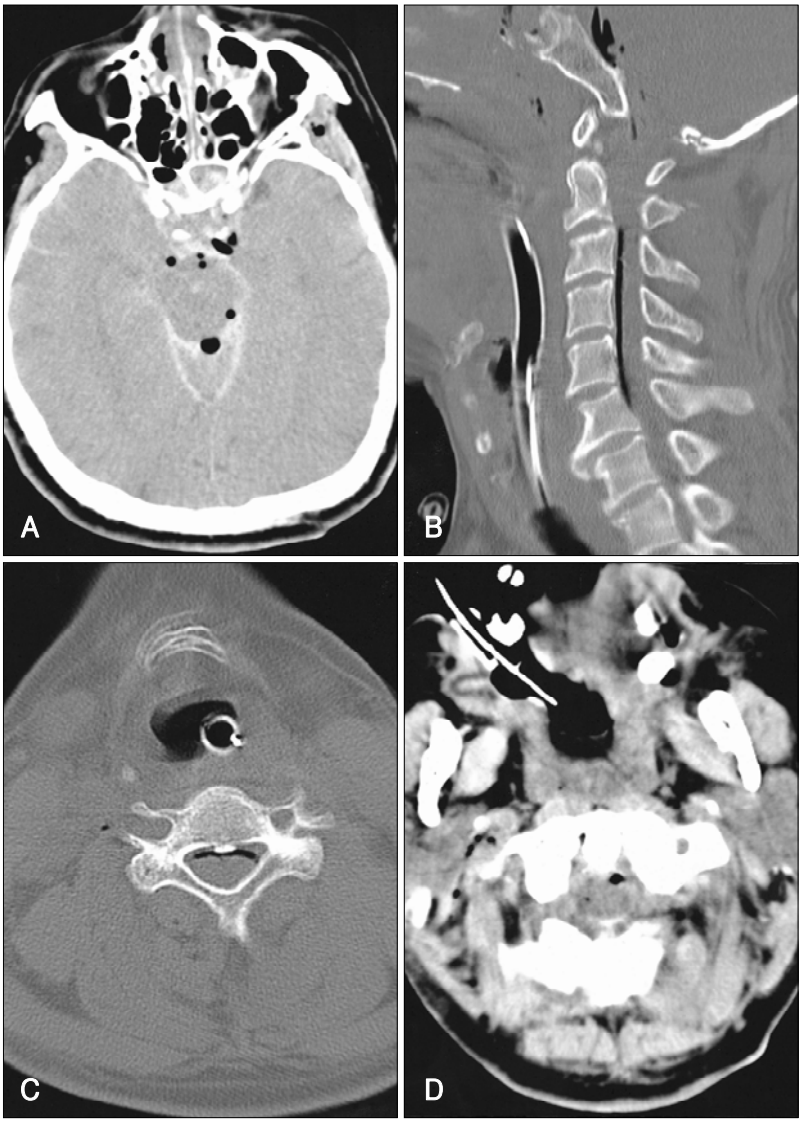


**FIGURE 2.** CT scan showing air density in skull base and cervical spinal canal. A: Brain CT image demonstrates multiple pneumocephalus in subarachnoid space, skull base fractures and traumatic subarachnoid hemorrhage. B: Sagittal CT scan of cervical spine shows air in the ventral part of spinal canal. C: Axial CT image at level of C5 shows air in epidural space in the spinal canal. D: Axial CT image at level of C1 shows focal air density in subarachnoid space.

pneumorrhachis. To our knowledge, the term "pneumorrhachis" was used by Newbold et al. to define their cases with air in spinal canal at the cervical level.[8] There are many causes of pneumorrhachis reported in the literature, and these can be generally classified into traumatic, nontraumatic,[1,5] and iatrogenic.[6,7] Among the causes of pneumorrhachis, traumatic pneumorrhachis is exceedingly rare, and in the English language medical literature, only 35 reported cases of pneumorrhachis involving air in the epidural and subarachnoid spaces have been defined.[3,9] In general, pneumorrhachis is best demonstrated on CT scanning but may also be seen on MRI scanning or cervical plain radiography. The presence of air in the epidural space and subarachnoid space should be distinguished. According to the previous literature,[10] the differential diagnosis between the two types of pneumorrhachis may be difficult to distinguish where the air is, even with CT scanning. However, in our cases, the shape and the location of air density could make it easy to know where the air is. Most traumatic epidural pneumorrhachis have a different clinical consequence compared to traumatic subarachnoid pneumorrhachis.

According to the review article of Goh et al.,[3] the former by itself is most often benign and self-limited, whereas the latter may be complicated by tension pneumocephalus[2] and meningitis.[11] In our case of epidural type, spontaneous resolution of epidural air was noted. However, in the case of mixed type, the patient accompanied with skull base fracture was dead.

Traumatic subarachnoid pneumorrhachis is often associated with more deadly damages such as skull base fractures, thoracic spine fractures and pneumocephalus, therefore spine surgeons should always be aware of the potential complications such as tension pneumocephalus, meningitis. Goh et al. reviewed 18 cases of traumatic subarachnoid pneumorrhachis,[3] but close examination of the previous literatures revealed that most of the cases had air density mainly in epidural space and a small amount of air in subarachnoid space. Actually, our two cases were typical epidural traumatic pneumorrhachis and mixed type of traumatic pneumorrhachis with a small amount air in subarachnoid space, respectively. Because of the rareness and the different pathogenesis and aetiologies, the management guideline of the pneumorrhachis has not exist. Although the air itself is not harmful and absorbed spontaneously, it is necessary to treated. For higher risk of possible meningitis, demonstrable cerebrospinal fluid leakage, especially in patient with subarachnoid pneumorrhachis, may have to be repaired surgically or treated by a temporary lumbar spinal catheter.

## Conclusion

Contrary to previous reports, the differential diagnosis between air in the epidural and subarachnoid space is not so difficult with the help of high resolution CT. These two types are usually accompanied by each other and traumatic subarachnoid pneumorrhachis is very uncommon than expected. Since Traumatic pneumorrhachis is accompanied by underlying severe trauma, meticulous evaluation is needed to find concomitant injuries, and spine surgeons should pay careful attention to prevent meningitis and tension pneumocephalus.

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