

Radiculopathies caused by spontaneous pneumorrhachis: two case reports and review of literature

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Abstract

Pneumorrhachis, defined as the presence of intraspinal air, is a rare radiographic finding. It is mostly caused by traumatic and iatrogenic etiologies such as pneumothoraces or pneumomediastinum. Spontaneous pneumorrhachis attributable to degenerative disc disease is an exceptional condition. We report two cases of radiculopathy caused by spontaneous pneumorrhachis.

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Key clinical message:

Pneumorrhachis is a rare condition of low back pain. It is usually asymptomatic and secondary to trauma. Spontaneous pneumorrhachis is scarce.

Abstract:

Pneumorrhachis, defined as the presence of intraspinal air, is a rare radiographic finding. It is mostly caused by traumatic and iatrogenic etiologies such as pneumothoraces or pneumomediastinum. Spontaneous pneumorrhachis attributable to degenerative disc disease is an exceptional condition. We report two cases of radiculopathy caused by spontaneous pneumorrhachis.

Keywords:

Pneumorrhachis - intraspinal gas – gas-containing herniation - vacuum phenomenon – radiculopathy - lumbar nerve root compression

Introduction:

Pneumorrhachis is a rare phenomenon defined as the presence of intraspinal air. It can be caused by various etiologies, mainly trauma and medical procedures such as spine surgery or epidural anesthesia. Less common causes of pneumorrhachis include spinal infection, tumoral, or degenerative disc diseases. It is usually an

asymptomatic and incidental imaging finding. However, it can seldom lead to radicular or spinal nerve compression [1].

We report herein two cases of spontaneous pneumorrhachis due to degenerative disc disease and discuss the mechanism, diagnosis, and management of this rare condition.

Case 1:

A 78-year-old woman presented with a 1-year history of progressive low back mechanical pain associated with low right limb paraesthesia. She has no history of trauma or spinal surgery. The lumbar spine range of motion was limited (Schober's test = 10mm) and the Leri test was positive. The neuromuscular examination was unremarkable. Biochemical investigations were normal.

The plain X-ray of the spine showed disc space narrowing at L4-L5 and L5-S1. Computed tomography (CT) visualized a degenerated L4-L5 disc with a vacuum phenomenon as well as a moderate protrusion at L5-S1 space. A gas bubble was noticed in the right lateral recess at L4-L5 with probable evidence of right L4 root compression (Fig 1).

The patient was treated conservatively with analgesics combined with spine rehabilitation.

Case 2:

A 61-year-old, retired sheet metal worker, with chronic low back pain presented with a 2-month history of left sciatica that irradiated to the foot in the L5 dermatome. Past medical history was unremarkable. There was no paraesthesia, weakness, or bowel or bladder dysfunction. Physical examination demonstrated a full range of motion. Motor and sensory functions were normal and the straight leg-raising test was positive in the left. Biological tests were normal.

Radiographs showed degenerative changes in the lumbar spine. CT scans demonstrated a foraminal disc protrusion with intradiscal gas compressing the left L5 nerve root (Fig 2). The patient improved on conservative management or symptomatic treatment.

Discussion:

In addition to trauma causes, other air sources may be found as epidural infection with gas-producing organisms, air introduction via lumbar puncture, or spinal surgery. Relatively rare, the presence of epidural gas in the degenerative spine was reported in a few cases of literature, secondary to vacuum phenomenon.

The vacuum phenomenon is a radiological finding defined as the presence of gaseous collection in the intervertebral disc space resulting from the movement of the spine, especially extension and traction [2]. It is a common finding that has been detected or reported in 46% of patients aged over 40 years [3].

The intradiscal gas diffuses from the extra-cellular fluid into areas of subatmospheric pressure and it cannot be reabsorbed because the degenerated disc is avascular. Some authors have discussed the role of disc aging in the genesis of the gas [2, 4]. This would be due to dehydration and the decrease in the proportion of proteins in the disc [5]. The gas is composed of 90-92% nitrogen along with oxygen, carbon dioxide, and other trace gases [2, 6].

The vacuum phenomenon has been mostly observed in L5-S1 disc with decreasing frequency at a higher lumbar level [7].

Whereas the vacuum phenomenon is a common finding, the presence of gaseous collection within the spinal canal is unusual. The gas formation is often associated with a disc herniation such as in our second case, but it can also be found free within the spinal canal as in the first case [8, 9].

In most previous cases, the gas-containing cyst has been noticed at the level of an intervertebral disc with a vacuum phenomenon [10]. This suggests that the gas originated from the intervertebral disc.

Interestingly, the gas can migrate to the spinal canal within a degenerated nucleus pulposus, resulting in a gas-containing disc herniation. Otherwise, the gas that fills the disc is expelled in the spinal canal by a “valve-pump” mechanism through ruptures in the annulus fibrosus and collects under pressure within a fibrous capsule or a pseudo-capsule [6].

The histological study of a few cases of free gas noticed that the gas cyst was surrounded by the posterior longitudinal ligament (PLL). This suggests that air coming from the disc was trapped between the PLL and the bone. Furthermore, no recurrence has been observed after the PLL removal [11, 12]. Damierre et al. reported the case wherein gas aspiration was failed due to the persistence of pseudo capsules. Surgical removal of membrane proved identical PLL tissue of capsule and improved patient pain [11].

Mostly asymptomatic, only a few cases of intraspinal gas can cause compressive radiculopathy. The clinical features are similar to those of common sciatica. Moreover, we can notice an exacerbation of the pain at the change of positions reflecting the free movements of the air in the epidural space [13]. Furthermore, only a few cases reported severe neurological symptoms. These symptoms ranged from lower extremity paresthesia to paralysis. An acute cauda equina syndrome and cervical myelopathy have been reported [14, 15].

On standard spine x-rays, we often notice degenerative modifications of the spine and sometimes a vacuum phenomenon [13].

CT scan is currently the imaging tool of choice to diagnosis pneumorrhachis. The typical finding includes degenerative modifications of the spine with a vacuum phenomenon and, at the same level, the intraspinal gas collection with a density from -200 to -900 Hounsfield units [16]. On MRI, gas is seen in low signal on the T1 and T2 weighted sequences [16].

For the management of intraspinal gas, most authors recommend conservative therapy including bed rest, analgesics, non-steroidal anti-inflammatory drugs, myorelaxant drugs, and epidural glucocorticoid injections [16]. Intraspinal gas may disappear spontaneously [17, 18]. In our cases, we noticed an improvement without using invasive procedures.

Some authors reported the efficacy of the CT guided aspiration of the gas cyst [19, 20]. However, in some cases, intraspinal gas recurred with a relapse of the radicular syndrome [10, 11]. Indeed, this procedure does not modify the local environment, and the origin of the air remains.

Surgery is the preferred treatment for patients who failed to respond to conservative therapy. The procedure combines gas evacuation with a disc curettage to prevent recurrence [12, 21–25].

Conclusion:

Pneumorrhachis caused by degenerative disc disease is a rare condition that can rarely lead to a radicular syndrome. Its prevalence increases with age and it may be due to two mechanisms: a gas-containing disc herniation or an intraspinal free gas. CT scan is the preferred imaging technique. The treatment is conservative at first. CT guided needle aspiration can be suggested despite the risk of relapse. Surgery remains the treatment of choice in case of neurological signs or recurrence under conservative treatment.

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none declared.

consent for publication has been obtained from the two patients

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Fig1: Spinal CT scan: Sagittal (a), axial (b,c) showing a vacuum disc phenomenon and moderate protrusion at L5-S1 space. A gas bubble was noticed in the right lateral recess at L4-L5 with probable evidence of right L4 root compression

Fig 2: Spinal CT scan axial showing foraminal disc protrusion with intradiscal gas compressing the left L5 nerve root

Authors contributions:

HF, KM, DBN and WT: analyzed and interpreted the patient data and provided advice for treatment. DK ensured the clinical follow-up of the patient. LBA wrote the manuscript; and all authors: read, revised, and approved the final manuscript.

CONFLICT OF INTEREST None declared



