

Case Report

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Pneumorrhachis and Paraspinal Air with Vacuum Disc : Case Report and Literature Review

Air within the spinal canal called pneumorrhachis has been seen rarely. We report a case showing multiple air pockets in the paraspinal and epidural space with vacuum disc and review pathogenesis and treatment of pneumorrhachis.

KEY WORDS : Intervertebral disc · Air · Spine.

INTRODUCTION

Air within the spinal canal called pneumorrhachis has been reported rarely. Most cases of pneumorrhachis have been developed by medical procedures, trauma, pneumothorax or pneumomediastinum^{4,6-8,10}. We report a case with spontaneous pneumorrhachis and suggested a possible explanation for the mechanism of pneumorrhachis.

CASE REPORT

A 64-year-old man presented with low back pain, radiating pain of left lateral thigh and dorsiflexion weakness of left big toe. Right foot dorsiflexion weakness was noted for two years after tibia and ankle fracture. His back and radiating pain were aggravated since three weeks prior to admission. Neurological examination revealed left big toe dorsiflexion weakness (G. IV+). Computed tomography (CT) demonstrated a diffuse bulging vacuum disc with ossification of annulus and multiple air pockets in spinal canal at L5-S1 (Fig. 1A), in right neural foramen at L5-S1 (Fig. 1B) and in left psoas muscle at L4-5 (Fig. 1C). Sagittal reformatted images showed linear air track connecting disc to epidural space at L5-S1 level (Fig. 1D, 2B). Additional findings were not seen on magnetic resonance imaging (MRI) performed at the same time. Free disc fragment extended into the thecal sac was not detected on CT and MR images. Patient was recommended for surgery. He refused the operation and underwent selective L5 nerve block instead. Seventeen days later, there a slight improvement of radiating pain and no improvement of motor weakness. Follow-up CT images showed no interval change of multiple air pockets in amount and location as compared with initial images.

Two months later, motor weakness and leg pain showed

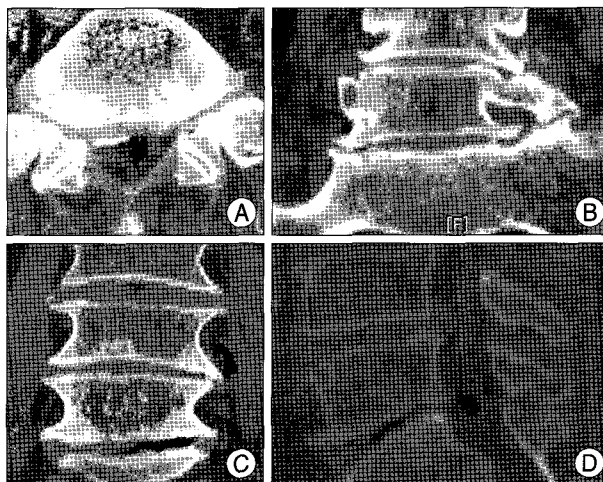


Fig. 1. A : Axial lumbar computed tomography (CT) demonstrated an air pocket in the spinal canal with bulging disc and ossification of annulus at 5th Lumbar to 1st sacral disc space. B : Vacuum of right L5-S1 foramen, eccentric small amount of intradiscal air and degenerative osteophyte were seen in coronal reconstructed CT. C : Air pocket of left psoas muscle, eccentric location of small amount of intradiscal air at L4-5 disc space and degenerative osteophyte were seen in coronal reconstructed CT. D : Sagittal reformatted images showed the linear track of vacuum adjacent to upper endplate through the intervertebral disc to epidural space at L5-S1.

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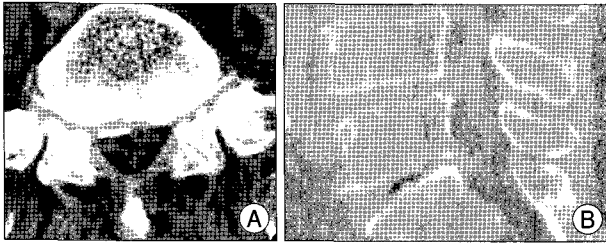


Fig. 2. Follow up computed tomography two months later. A : Pneumorrhachis almost disappeared at L5-S1 spinal canal in axial computed tomography. B : Pathway of pneumorrhachis from disc to spinal canal was more obvious than previous study.

substantial improvement. Follow-up CT images revealed nearly complete disappearance of air in spinal canal, interval decrease in amount of air in the foramen and psoas muscle (Fig. 2A, B).

DISCUSSION

Pathogenesis of spontaneous pneumorrhachis

Spontaneous pneumorrhachis is a phenomenon of intraspinal air without medical procedures, trauma, and other diseases (such as pneumothorax or pneumomediastinum). Many authors postulated that pneumorrhachis was originated from vacuum disc degeneration^{1,2,4-6}.

Coulier⁴ reported the pathogenesis of pneumorrhachis : the gas collected in the clefts of a long-standing diseased disc is expelled by a "valvepump mechanism" or "ballvalve effect" through a weak spot or rent in the annulus fibrosus.

While vacuum within the disc was a relatively common radiological finding, seen in almost 50% of spine computed tomography examinations over 40 years^{4,8}, spontaneous pneumorrhachis was rare. In general, the vacuum within the disc could not be easily expelled out, because the disc was so strong (could resist more than 4000N and stronger in posterior regions) and stronger with degeneration⁹.

Coulier⁴ reported that as disc degeneration was progressed, dislocation of the central portion of the disc produces clefts that progressively extend peripherally first affecting the inner and then the outer fibers of the annulus fibrosus. In our opinion, intradiscal gas accumulation and repeated microtrauma to make erosive defects in the endplates or detachment of annulus were important to development of pneumorrhachis. Several authors reported that a marginal vacuum in the disc meant a crack in the peripheral fibers of the annulus fibrosus^{4,6}. Only through this crack by detachment of annulus or endplate, vacuum within the disc could be expelled to the canal. In our case, all the extradiscal air propagated from the intradiscal vacuum adjacent to endplate with osteophyte of annulus (Fig. 1B, C, D, 2B). The linear track of vacuum adjacent to upper endplate was seen at Fig. 1D, 2B.

If there is sufficient pressure gradient produced by motion

of the spine, intradiscal air could be expelled out from any direction according to biomechanical force into intraspinal, foraminal space and psoas muscle as in our case.

Treatment

Most authors recommend conservative treatment for the intraspinal gas⁵. In our case, pneumorrhachis was almost disappeared without any treatment. Spontaneous pneumorrhachis may cause aggravation of the neurological symptom of other pathologic conditions (in our case, spinal stenosis). Fortunately, both pain and neurological deficit were improved after supportive care and intervention in our case. Thus, except severe neurological deficit such as motor weakness, conservative management would be a preferred treatment of pneumorrhachis.

Bosser et al.³ reported the CT guided aspiration of pneumorrhachis. In his case, epidural gas recurred, and subsequently removed by surgical treatment. The aspiration was an incomplete treatment, because origin of the air was remained. If there is neurological deficit or frequent recurrence, operation should be performed. Because of possibility of recurrence after surgical treatment should aim for complete removal of disc and vacuum.

CONCLUSION

Spontaneous pneumorrhachis is a rare phenomenon. In our opinion, intradiscal gas accumulation and repeated microtrauma are responsible for erosive defects in the endplates or detachment of annulus in development of pneumorrhachis.

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