Pneumorrhachis

David J. Lerner, M.D.[1], Nikitha Potturi, MS1[1], Nebiyu Beteselassie, M.D.[2], Bruce Lerner, M.D.[2]
[1]University of Missouri-Kansas City School of Medicine, Kansas City, MO
[2]Truman Medicine Center Kansas City, MO

Introduction

Pneumorrhachis (PR) is a rare imaging finding characterized by the presence of air (either intra- or extra-dural) within the spinal canal.[1] It can be associated with different etiologies, such as iatrogenic, traumatic, and non-traumatic. Pneumorrhachis is typically asymptomatic and resolves spontaneously, making it difficult to detect. The varied pathogenesis of PR can make it a diagnostic challenge. In addition, the incidence of symptomatic PR is very rare. Therefore, there are no standard guidelines for the management of PR. Its treatment typically is individualized and requires a multi-disciplinary approach.

Case Report

A pregnant 27-year-old female presented for delivery. She had normal prenatal labs and clinical course. An epidural was performed. Delivery was without complication. The patient complained of diffuse vague abdominal pain the next day and subsequent abdominal cross-sectional imaging was performed with multiple reformatted images. Normal post-delivery changes were visualized in the abdomen. Incidentally, multifocal areas of air within the spinal canal were seen (Figures 1 and 2). The patient was afebrile, denied back pain, and had no elevated white cell count. Based upon her clinical history and physical exam, the diagnosis of iatrogenic pneumorrhachis was made. Follow-up exam revealed resolution of intra-spinal air. She went home a few days later without problem.

Figure 1. Sagittal non-contrast CT shows multilevel foci of air within the spinal canal.

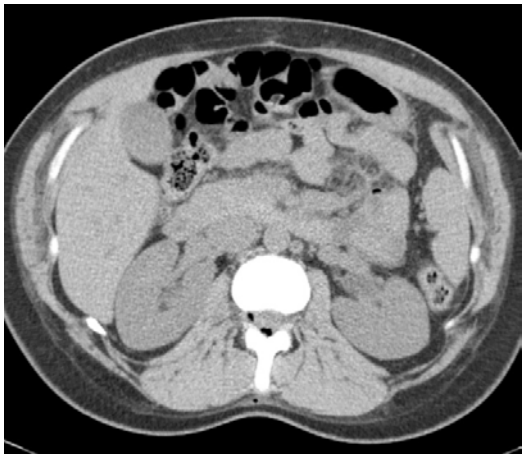

Figure 2. Axial non-contrast CT shows extradural intra-spinal air at one level. Subcutaneous focus of air is visualized in tract from the epidural injection.

Discussion

Pneumorrhachis is defined by the presence of air inside the spinal canal.[1] It is a rare radiological finding because it is typically asymptomatic and resolves itself. Therefore, it is usually discovered accidentally. PR can be caused by various non-traumatic, traumatic, and iatrogenic etiologies. The most common cause of PR is iatrogenic, typically through epidural injection because lightly pressurized air is used to find the epidural space. However, because iatrogenic PR is typically asymptomatic and spontaneously resolved, it is often difficult to detect, making this case more interesting. PR can be symptomatic in rare cases as a result of changes in intra-spinal pressure.

Pneumorrhachis generally is demonstrated best on computed tomography (CT) scanning, but magnetic resonance imaging or cervical plain radiography also may be used.[1] Typically, air either enters the epidural space or continues deeper into the subarachnoid space.[2] Because the specific location of the pneumorrhachis determines its clinical consequences, it is important to distinguish between the presence of air in the epidural or subarachnoid space.[2] Even with CT scanning, the difference may be difficult to distinguish. PR in the epidural space is typical and complete reabsorption occurs spontaneously. However, subarachnoid PR is more likely to be symptomatic. Subarachnoid PR often is caused by trauma or extensive surgical exposure of the spinal nerve root.[3]

Typically not a primary clinical diagnosis, PR is underdiagnosed and coincident with underlying injuries and diseases. It is common that PR is found in association with air distribution in other body cavities, such as pneumothorax, pneumomediastinum, or pneumopericardium.[4] Symptomatic PR can be associated with various symptoms due to changes in intra-spinal pressure, such as radicular pain and serious neurologic deficits. Because it typically is associated with traumas, PR is thought to increase morbidity and mortality.[5]

Epidural pneumorrhachis is typically asymptomatic. The intra-spinal air often is reabsorbed into the surrounding tissues. In some circumstances, subarachnoid PR intra-spinal air is not reabsorbed spontaneously and can be symptomatic. Due to the rarity of symptomatic PR, there are no standard guidelines for the treatment and management of PR. Treatment is often multidisciplinary because all contributing factors of PR must be addressed. Some possible treatments for PR are intravenous dexamethasone, air aspiration to decompress the epidural space, along with large doses of inspired oxygen to encourage the reabsorption of air from the subdural space.[6]

References

[1] Oertel MF, Korinth MC, Reinges MH, Krings T, Terbeck S, Gilsbach JM. Pathogenesis, diagnosis and management of pneumorrhachis. Eur Spine J 2006; 15(Suppl 17):636-643. PMID: 16835735.

[2] Place JN, Pezzuti RT. Clinical significance of traumatic pneumorrhachis. AJR Am J Roentgenol 1989; 153(3):655. PMID: 2763966.

[3] Bilsky MH, Downey RJ, Kaplitt MG, Elowitz EH, Rusch VW. Tension pneumocephalus resulting from iatrogenic subarachnoid-pleural fistulae: Report of three cases. Ann Thorac Surg 2001; 71(2): 455-457. PMID: 11235688.

[4] Drevelengas A, Kalaitzoglou I, Petridis A. Pneumorrhachis associated with spontaneous pneumomediastinum. Eur J Radiol 1994; 18(2):122-123. PMID: 8055982.

[5] Kapur A, Sandhu S. Epidural pneumatosis: Not necessarily benign. AJNR Am J Neuroradiol 1994; 15(1):195-196. PMID: 8141057.

[6] Oertel MF, Korinth MC, Reinges HT, Krings T, Terbeck S, Gilsbach JM. Pathogenesis, diagnosis and management of pneumorrhachis. Eur Spine J 2006; 15(Suppl 5):636-643.

Keywords: pneumorrhachis, epidural injections, iatrogenic disease, anesthesia, radiology