CLINICAL CASE - TEST YOURSELF | Musculoskeletal imaging

Lower back pain in a 50-year-old diabetic patient- an early CT sign not to be missed

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SUBMISSION: 10/09/24 | ACCEPTANCE: 19/10/24

PART A

A 50-year-old male with a past medical history of hypertension and diabetes presented with severe lower back pain for the past seven days that worsened in the last two days. He was noted to be tachycardic, with a heart rate of 135. He was febrile with a body temperature of 38.2°C. His laboratory results showed neutrophilic leukocytosis (20,700 cells/μL) and an elevated C-reactive protein (223). Investigation in the emergency department included lumbar spine radiographs and a CT to exclude the presence of a pathologic fracture. Lumbar spine radiographs were unremarkable. The patient was admitted to the medical intensive care unit with a primary diagnosis of sepsis while he also underwent an MRI of the spine the following day.

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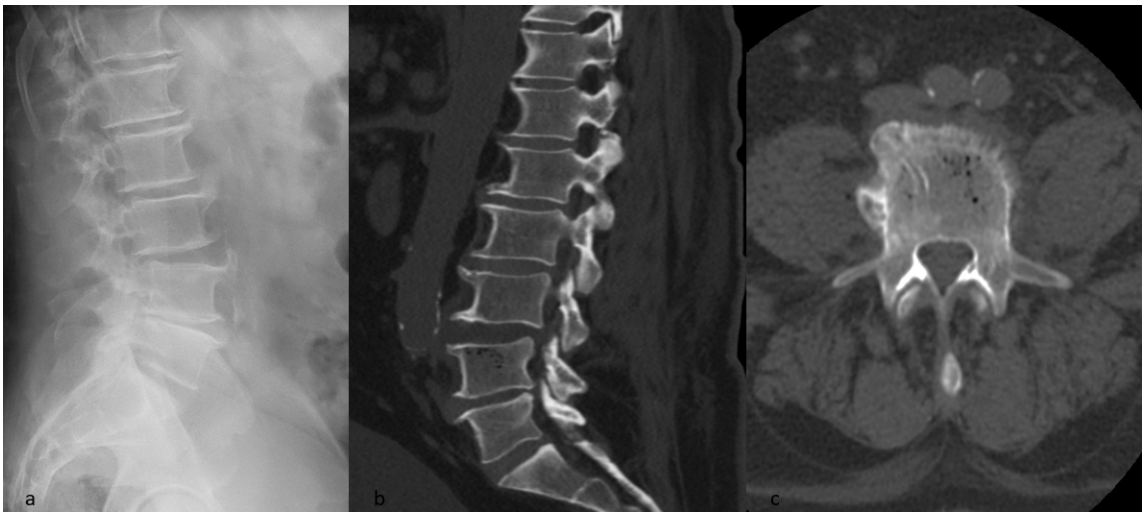

Figure 1a,b,c

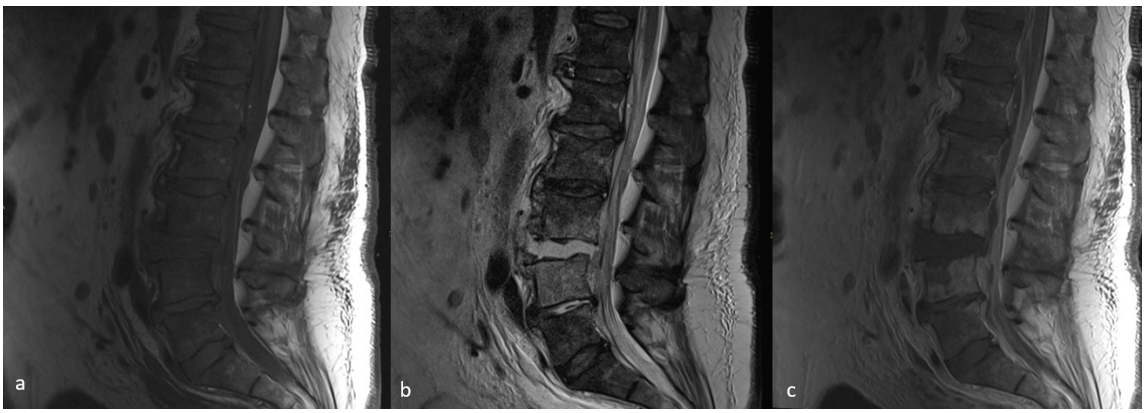

Figure 2a,b,c

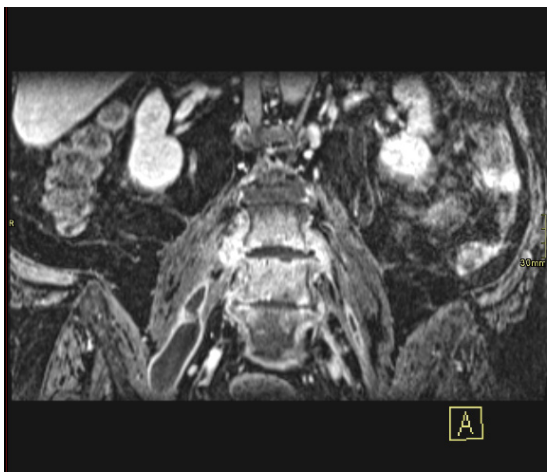

Figure 3

PART B

Diagnosis: Emphysematous spondylodiscitis caused by Enterococcus spp.

We report the imaging findings and histopathology of a rare case of emphysematous osteomyelitis of the spine. While there are many cases of pyogenic osteomyelitis of the spine in patients with diabetes, only a few document osteomyelitis caused by gas-forming organisms.

Lumbar x-ray was unremarkable (Fig1a). CT scan of the lumbar spine showed multiple bubbles of air within the L4 vertebral body (blue arrow) with an extension of gas into the right psoas muscle (black arrow) (Fig1b,c). Subsequently, the patient underwent an MRI which revealed the presence of altered signal intensities on T1 and T2 weighted images mainly involving L3, L4 vertebral bodies and the adjacent disc and to a lesser extent the L5 vertebral bodies, with associated prevertebral and bilateral paravertebral small collections extending to involve bilateral upper psoas muscles (Fig.2 a,b,c). Furthermore, T1 post-contrast revealed an epidural collection extending in the anterior epidural space of the lumbar spine (Fig.3). Blood cultures of the patient revealed Enterococcus spp. as a source of bacteremia.

Intraosseous gas was initially described as an indicator of osteomyelitis in 1981 [1]. In the axial skeleton, its presence is typically attributed to noninfectious causes; such as degeneration, trauma, osteonecrosis, or malignancies [2]. However, the likelihood of osteomyelitis increases when extensive intravertebral gas, bone edema, and adjacent collections are observed, as seen in our case [3]. The majority of reported cases of emphysematous osteomyelitis in the English literature involve a single microbial agent. Hematogenous spread is the primary cause of monomicrobial infections, while contiguous spread is common in polymicrobial infections [3]. Diabetes mellitus is frequently associated with this condition. The causative organisms often include anaerobes or members of the Enterobacteriaceae family [3]. Our case, characterized by hematogenous spread and a lack of infection source or prior surgery, can be classified as spontaneous.

Imaging plays a crucial role in the diagnosis of emphysematous spondylodiscitis. Radiographs have low sensitivity and specificity, which limits their effectiveness in detecting bone loss. In cases of pyogenic spondylitis, changes may not be visible on plain radiographs until 2 to 8 weeks after the onset of symptoms, and images can appear normal for several weeks post-infection. Detecting bone loss requires a significant reduction of 30% to 40% in the bone matrix, which can take more than 2 weeks, particularly during acute infections [4]. As the disease progresses, visible changes may include nonspecific osteopenic alterations (demineralization) in the subchondral layer, erosive and blurred margins of the endplates, reduced intervertebral space, paravertebral soft tissue masses, deformities, and noticeable soft tissue swelling [4]. CT is more effective than radiographs for detecting bone changes earlier. Although it can appear normal in the first three weeks, it can later reveal erosive changes in the vertebral endplates, Ill-defined reactive sclerosis or osteopenia, hypodensity of the disc, and soft tissue swelling around the vertebral body. Contrast-enhanced MRI is the preferred imaging technique for diagnosing spinal infections. Spondylodiscitis leads to inflammatory exudate replacing normal marrow with white blood cells and increased blood flow, resulting in specific MRI signal changes. These are typically seen as hypo- or isointense T1 signals and hyperintense T2 signals in the subchondral end plates and the disc, often starting in the anterior portion of the vertebral body and potentially affecting multiple spinal segments. Bone erosions of the endplates are also observed, and contrast enhancement can show various patterns, including diffuse, patchy, clumped, or linear enhancement along the endplate [4]. After the administration of intravenous contrast, enhancement of the subchondral bone or vertebral body may be identified while also the disc might show diffuse enhancement. In some cases, an abscess within the disc or bone can be observed. Differential diagnoses of pyogenic spondylodiscitis include tuberculous spondylodiscitis, Modic type I endplate changes, and vertebral metastases.

In cases where intraosseous gas is detected, particularly in the extra-axial skeleton and vertebrae (as 40% of cases involve vertebral lesions), emphysematous osteomyelitis should be considered [1]. Pyogenic osteomyelitis of the

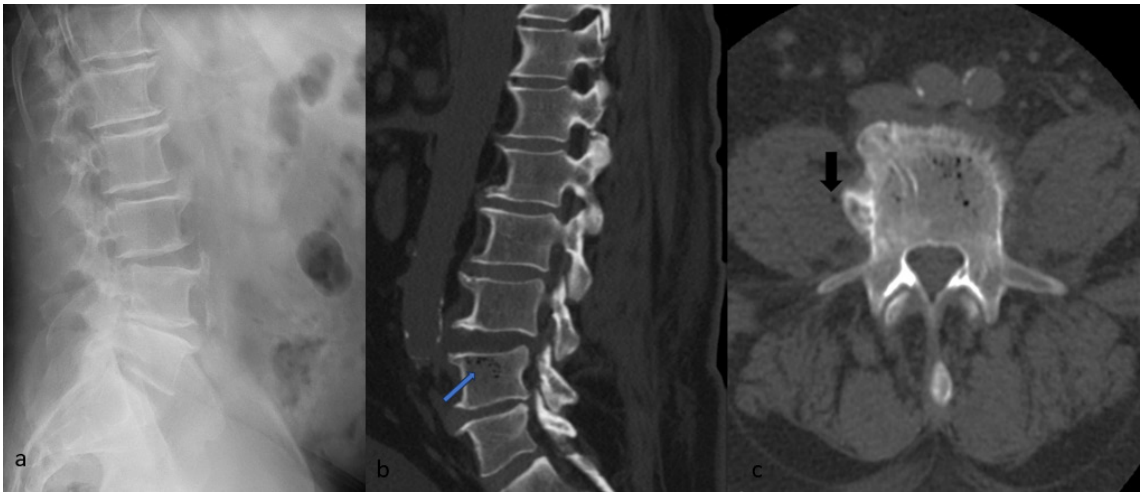

Figure 1a,b,c: Lumbar x-ray was unremarkable (a). CT scan of the lumbar spine showed multiple bubbles of air within the L4 vertebral body (blue arrow) with an extension of gas into the right psoas muscle (black arrow) (Fig1b,c).

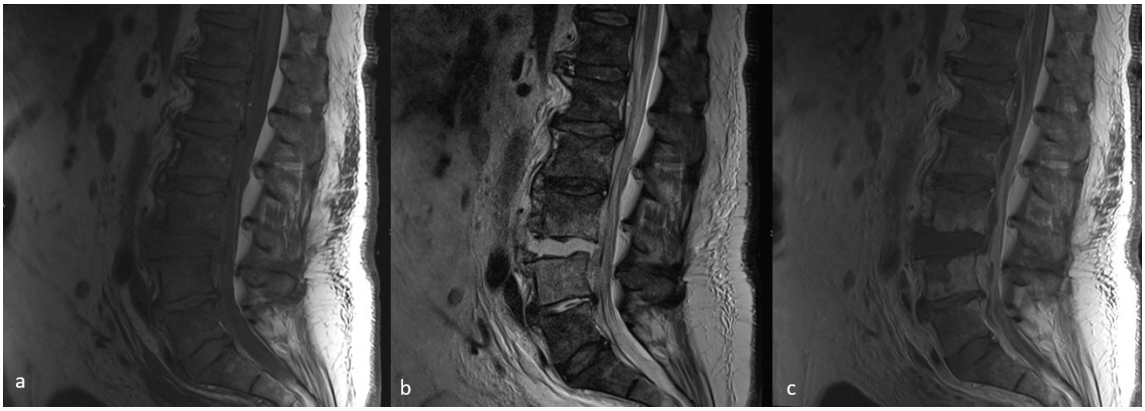

Figure 2a,b,c: altered signal intensities on T1 and T2 weighted images mainly involving L3, L4 vertebral bodies and the adjacent disc and to a lesser extent the L5 vertebral bodies, with associated prevertebral small collections.

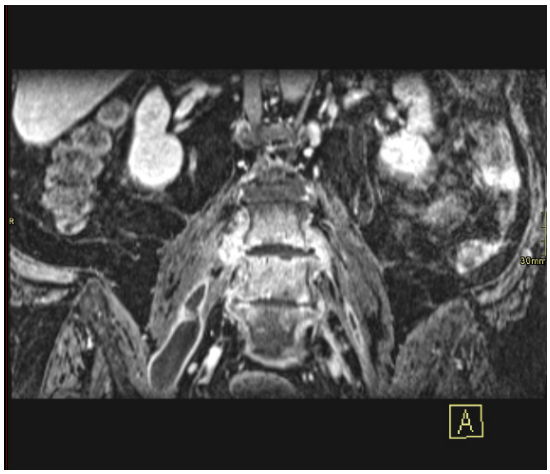

Figure 3: T1 post-contrast revealed an epidural collection extending in the anterior epidural space of the lumbar spine.

spine should be included in the differential diagnosis for patients with diabetes presenting with low back pain, especially if intravertebral air is present, warranting an aggressive treatment approach. Any delay in diagnosis and treatment may lead to a worsened outcome. MRI is the preferred investigation for evaluating vertebral infections, with reported sensitivity and specificity of 96% and 93%, respectively [1,5]. The causative organism could be identified from the lesion itself in one case, as blood cultures are positive in only one-third of patients with spinal infections [6]. Given the significant morbidity and mortality associated with emphysematous osteomyelitis of the spine, aggressive management involving antibiotics and surgery is recommended [3].

Conclusion

The detection of intraosseous gas in the vertebra on CT scans in diabetic patients with back pain should raise suspicion and aid in the early diagnosis of this life-threatening condition, especially when plain radiographs may not reveal small amounts of intraosseous gas. With this teaching case, we underscore the significance of CT in the recognition of intraosseous and paraspinal gas facilitating early and accurate diagnosis of this entity. **R**

KEY WORDS spondylodiscitis, emphysematous, osteomyelitis, intraosseous gas, MRI

References

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Ready - Made Citation

Christina Aslanidi, Athanasios Papatheodorou. Lower back pain in a 50-year-old diabetic patient- an early CT sign not to be missed. *Hell J Radiol* 2024; 9(4): 46-51.