Discoververtebral lesions of the spine: infection or an imitation?

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Learning objectives

The purpose of our educational exhibit is to:

1. evaluate the anatomical details and vascularization of discovertebral junction.

2. review pathophysiology of spinal infection and describe Magnetic Resonance Imaging (MRI) findings.

3. establish a differential diagnosis to noninfectious diseases and degenerative disease.
Background

Anatomy of the adult vertebral body vascular network

Anatomy of discovertebral junction is complex, including components of anterior and posterior elements of the spine. The anterior elements include the intervertebral discs, Sharpey’s fibers, vertebral body, vertebral endplates and anterior and posterior longitudinal ligamentous complex. The posterior elements are made up of the facet joints and pars interarticularles, as well as the pedicles, lamina, transverse processes and spinous processes.

The anatomy of the adult vertebral body vascular network is important in understanding the typical pattern of infection. The arterial contribution to each vertebral body consist of paired segmental arteries that arise from vertebral arteries, the aorta or the iliac arteries. The vessel curves posterolaterally in front of the vertebral body and sends small branches into its marrow and multiple extraosseous anastomotic channels. In adulthood, the blood supply of the spine is of terminal type and arteries have end vessels at the superior and inferior endplates of the vertebral bodies whereas in childhood, the arterial network extends to intervertebral disc.

The vertebral columns is drained by networks of veins. These venous plexuses are formed by spinal veins along the vertebral column and include internal and external vertebral venous plexuses.

Pathophysiology of spinal infections

Infection of the spinal column or osteomyelitis of the spine is rare, and often recognized and treated too late. There are three main infection routes that may contribute to the development of spinal infection.

1. Hematogenous
2. Direct external bacterial inoculation
3. Extension from a contiguous infectious site

Haematogenous spread, and more often via arterial network than venous, is the most common source of infection, representing the 60-70% of adult osteomyelitis cases. The primary focus of infective change usually begins in the anterior subchondral region adjacent to the end plate where the blood supply is particularly evident. The subsequent spread of infection to the contiguous disc and vertebra creates the characteristic lesion of spondylodiscitis.
**Magnetic resonance imaging findings of infectious spondylitis**

The clinical presentation is often vague and nonspecific and the diagnosis should be supported by an imaging study, being MRI the most sensitive imaging test. The standard MRI examination should include axial and sagittal FSE T1-weighted (T1WI), T2-weighted (T2WI), short-tau inversion recovery (STIR) and fat-suppressed T1-weighted with gadolinium sequences.

The earliest signs of an infective process on MR imaging are low marrow signal on T1WI and high signal on fluid-sensitive images, related to oedema and hyperaemia, with enhancement of the involved vertebral bodies after contrast medium administration. Additionally, MR imaging is useful in identifying evidence of either paraspinal or epidural inflammatory tissue, peripheral enhancement of the infected disc and erosion or destruction of the vertebral endplates.
Findings and procedure details

Generally, high signal intensity and loss of the intranuclear cleft on T2WI are reliable findings of spondylodiscitis, but it is difficult to detect them in the early stage.

Some noninfectious diseases (Modic type I endplate change, acute Schmorl node, seronegative spondyloartropathies, Charcot arthropathy, tumoral and posttraumatic pathologies) may present with a similar radiological pattern.

The following is a list of typical spondylodiscitis findings and some non-infectious pathologies that mimic spinal infections studied in our center.

**Case 1 (Fig 1)**

A 52-year-old patient with methicillin-sensitive staphylococcus aureus bacteriemia (MSSA) developing back pain.

MRI showed increased signal intensity in sagittal STIR sequence in the L4-L5 disk. Sagittal T1-weighted contrast-enhanced fat-suppressed MR image showed enhancement of L5-S1 vertebral endplates related to inflammatory edema and also inflammatory changes in anterior epidural space.

The **diagnosis** was acute infectious spondylodiscitis.

**Case 2 (Fig 2, 3)**

A 79-year-old man with chronic back pain that was not improving after correct treatment.

MRI showed increased signal intensity in sagittal T2-weighted and STIR sequences in the L5-S1 disc. Sagittal T1-weighted MR image showed decreased signal intensity and STIR hyperintensity of the subchondral bone marrow adjacent to the L5-S1 intervertebral disk. Fat-suppressed, contrast-enhanced sagittal T1-weighted imaging showed marked paraspinal and anterior phlegmonous epidural enhancement.

The **diagnosis** was acute infectious spondylodiscitis.

**Case 3 (Fig 4, 5, 6)**
A 43-year-old man with history of Non-Hodgkin’s lymphoma started with fever and low back pain.

MRI showed diffuse low signal intensity of bone marrow in different sequences related to lymphoma infiltration. We also observed structural alterations and abnormal signal intensity of D11 vertebral body, with cystic lesion in the anterior margin. Fat-suppressed, contrast-enhanced sagittal T1-weighted imaging showed enhancement related to edema. In addition, CT scan confirmed osseus lesion with involvement of adjacent vertebral endplates.

The patient underwent bone biopsy and was diagnosed with non-Hodgkin’s lymphoma of the spine.

**Case 4 (Fig 7)**

A 77-year-old patient with stage IV renal cell carcinoma and history of low back pain.

MRI showed abnormally increased signal intensity in sagittal STIR sequence in the D7 vertebral body and pedicles, affecting also the inferior endplate of the D6. The disk height was markedly reduced and there was a contrast enhancement of pre and paravertebral soft tissue and little occupation of anterior epidural space.

The radiological diagnosis was spondylodiscitis or metastasis. The patient underwent bone biopsy and was diagnosed with metastasis of renal cell carcinoma.

**Case 5 (Fig 8)**

A 73-year-old female with history of low back pain during the past 3 months despite conservative management.

MRI showed loss of height with compression and irregularity in the superior endplate of L4 with bone marrow edema. The vertebral body height of L3 was preserved, nevertheless, showed the development of bone marrow edema.

The diagnosis was osteoporotic acute vertebral compression fractures.

**Case 6 (Fig 9)**

A 39-year-old man with history of loss of sphincter control.
MRI showed the loss of normal concavity of the vertebral body (square-shaped vertebral body) with marrow signal intensity changes in anterosuperior and anteroinferior parts of the vertebral endplates of D12, L1-L2 and L3. MRI demonstrated high signal intensity on T1- and T2-weighted images, related to Romanus lesion. In addition, MRI showed hyperintense signal of D10-11 and D11-12 disk in T2 and STIR sequences with bone marrow edema in adjacent vertebral endplates.

The **diagnosis** was Andersson lesion in ankylosing spondylitis.

**Case 7 (Fig 10, 11)**

A 60-year-old patient presented with low back pain and history of ankylosing spondylitis and "bamboo spine" with fusion of D11-12 vertebral bodies.

MRI showed abnormally increased signal intensity in sagittal STIR sequence in D11, D12 and L1 vertebral bodies and hyperintensity in the D12-L1 disk. In addition, CT scan revealed sclerosis in D11-D12 and L1 vertebral bodies and destruction of D11-D12 disk.

The patient underwent bone biopsy and was **diagnosed** with aseptic spondylodiscitis and vertebral pseudoarthrosis.

**Case 8**

A 77-year-old patient presented with lumbar radiculopathy with left L4 radicular pattern.

MRI showed an inferior L3 endplate fracture and band-like pattern subchondral edema and fluid sign, accompanied by pre and paravertebral edema. In addition, chronic vertebral compression fracture of L2 was demonstrated.

The **diagnosis** was acute osteoporotic vertebral fracture of L3 and traumatic discitis.
Fig. 1

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Fig. 12

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Conclusion

Infectious spondylitis involve the vertebral body and/or the intervertebral space.

Clinical presentation is generally vague and non-specific and MRI is considered imaging modality of choice.

Radiologists should become familiar with non-infectious pathologies that mimic these spinal infections.

Correlation of imaging features with clinical symptoms and laboratory test results should be sought.
References


