

# IMAGING OF SPINAL INFECTIONS AND INFLAMMATION

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Many infectious and inflammatory processes affect the spine including the bony spinal column, meninges, and spinal cord. Because of often nonspecific clues in history, physical examination, and laboratories, imaging is a key part of the diagnostic algorithm. We will review some of the more common inflammatory diseases affecting the spine and discuss strategies to distinguish from competing diagnoses.

- I. Infections of spinal column:
  - a. Vertebral osteomyelitis and discitis: Typically occurs in adults imaged for progressive back pain with or without fever with risk factors of bacteremia, injection drug use, or endocarditis. MRI of the spine is the most sensitive test (estimated at 97%) for osteomyelitis associated characteristically with (1) blurring of the margins of disc space and vertebral body on T1 imaging, (2) hyperintensity in T2 sequences of disc and adjacent vertebral body, and (3) enhancement with intravenous contrast. Plain radiographs are insensitive, and CT scans are used either to guide intervention or in patients who cannot get MRI. PET scan is highly sensitive for chronic osteomyelitis and excludes the diagnosis if normal.
  - b. Epidural abscess: Usually in adults with bacteremia or with epidural catheters. Most spinal epidural abscesses (infection between the dura and vertebral wall) are located in the thoracolumbar region. MRI is the most sensitive imaging modality showing T2 hyperintense extradural fluid collection with gadolinium enhancement surrounding a necrotic core.
- II. Infectious myelitis:
  - a. HIV-associated myelopathy: Usually presents in patients with advanced HIV. This entity is a collection of diseases ranging from HIV-associated vacuolar myelopathy to HIV myelitis to rarely described HIV-associated motor neuron disease. Most common MR abnormality is cord atrophy with or without intrinsic cord signal abnormality. Patients can have clinical HIV myelopathy with normal MRI of spine.
  - b. Human T-Cell Lymphocytic Virus (HTLV): The virus infects human beings in two strains: HTLV-I and HTLV-II. Myelopathy is more common with HTLV-I infection presenting as tropical spastic paraparesis. MRI of spine commonly shows atrophy but can also show focal T2 hyperintense lesions. MRI of brain often shows subclinical periventricular lesions.
  - c. Varicella Zoster Virus (VZV) myelopathy: Can occur with or without preceding shingles outbreak. MRI shows T2 hyperintense lesions central cord lesion with variable enhancement.
  - d. West Nile Virus (WNV) myelitis: In the United States, presents as acute flaccid paralysis in the summer to early fall. MRI shows T2 hyperintense signal in the ventral spinal cord with patchy enhancement. There is often enhancement of the conus and lumbosacral nerve roots.
- III. Inflammation of spinal column
  - a. Rheumatoid arthritis: Symptomatic cervical spine involvement typically occurs with advanced peripheral disease. Can present as atlanto-axial subluxation, superior migration of the dens (known as cranial settling), and subaxial subluxation. Sensitivity of spinal column disease increases from x-ray to CT scan to MRI, in which disease can be seen in 70% of patients. However, only a minority will be symptomatic and require intervention.
  - b. Ankylosing spondylitis: Inflammatory arthropathy presenting often in young men with back pain. In conventional radiographs, erosion and blurring of the joint space of the sacroiliac joint is an early finding. In the spine, bone spurs form and eventually bridge with disease progression forming the "bamboo spine." MRI is more sensitive for disease and can show inflammatory arthropathy even when conventional radiographs are normal. Aside from the changes seen on x-ray, MRI additionally shows juxta-articular bone marrow edema via T2 hyperintensity and active inflammation via enhancement.
- IV. Inflammatory myelopathy:
  - a. Multiple Sclerosis: An early relapsing-remitting and late progressive demyelinating disease. MRI is the most sensitive technique for imaging lesions. More than 80% of patients with multiple sclerosis will accrue spinal cords lesion predominantly though not exclusively in the cervical cord.

- On conventional MRI, circumscribed lesions less than three vertebral segments predominantly affect the dorsal and lateral columns. Lesions are T2 hyperintense and, during acute relapses, are contrast enhancing. Over time, there is cord atrophy even in apparently normal appearing white matter. Spinal cord atrophy does not correlate well with T2 lesion burden.
- b. Neuromyelitis Optica (NMO): A relapsing-remitting disease causing myelitis, optic neuritis, brainstem lesions, and other cerebral hemispheric lesions associated with antibodies against Aquaporin-4 water channel. In acute attacks, MRI of spine shows longitudinal (>3 vertebral segment) central cord lesion with cord expansion and associated gadolinium enhancement. In chronic cases, there is longitudinal spinal cord atrophy.
  - c. Sarcoidosis: Granulomatous disease affecting the spinal cord often causing longitudinal myelitis (>3 segments). Although MRI appearance can appear similar to NMO, some distinguishing features are dorsal cord subpial gadolinium enhancement and persistent enhancement for more than two months.

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