

APPROACH TO SPINE IMAGING, INCLUDING DEGENERATIVE DISEASE AND TRAUMA

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The spine is a complex mechanical structure that houses and protects the spinal cord and nerve roots. Unlike the immobile cranium, the spine is capable of multidirectional movement, including flexion, extension, rotation, and lateral bending. Just as in any machine with moving parts, a risk of malfunction exists; in the spine it is most often the result of progressive degeneration of joints and bones. Bipedal animals, including humans, endure additional stress on the spine, particularly the lumbar spine, caused by axial weight bearing against gravity. The mechanical demand of weight bearing is further exacerbated by the high prevalence of obesity in many populations. Imaging of the spine is performed frequently, and accurate interpretation of the images demands a systematic approach.

Strategy for image analysis

Vertebral alignment	Count and label vertebrae, assess kyphosis, lordosis, scoliosis, and spondylolisthesis
Vertebral height and signal	Assess for compression fractures, masses, and pathologic marrow replacement
Disk height and signal	Assess for disk degeneration, bulging, herniation, and inflammation
Ligaments	Assess for nonlinearity, tears, hypertrophy, or inflammation
Paraspinal soft tissues	Assess for inflammation, masses, and muscle atrophy
Meninges	Assess for inflammation, nerve root clumping, and masses
Cord position	Assess for cord displacement
Cord caliber	Assess for focal or diffuse cord expansion or atrophy
Neural foramina	Assess for foraminal narrowing and nerve root compression, and for masses
Cord lesions	Assess whether cord abnormality is intrinsic or secondary to external compression, and whether regional cord involvement exists (ie, one tract, anterior/posterior/lateral/central)

Differential Diagnosis by Compartment

<u>Compartment</u>	<u>Differential Diagnosis</u>
Epidural	Lipoma, lipomatosis, abscess, hematoma, herniated disk, ligament hypertrophy, osteophytes, synovial and other cysts, metastases
Intradural extramedullary	Meningioma, ependymoma, CSF flow voids, dilated surface veins of a dural arteriovenous fistula, schwannoma, neurofibroma, sarcoidosis, meningitis, arachnoiditis, syringomyelia, metastases
Intramedullary	Glioma or astrocytoma, ependymoma, hemangioblastoma, cavernoma, arteriovenous malformation, demyelinating and autoimmune myelopathies, neurodegenerative disease including wallerian degeneration, spinal cord trauma, metabolic myelopathies, metastases

Unexpected Findings in Paraspinal Structures

<u>Region</u>	<u>Finding</u>
Throughout spine	Paraspinal muscle atrophy or hypertrophy, paraspinal fluid collections, soft tissue masses
Cervical spine	Thyroid nodule, goiter, vocal cord or cartilage asymmetry, lymphadenopathy, vascular atheromatosis and stenosis, lung apex pathology, pneumonia, pulmonary embolism, pleural effusion or mass
Thoracic spine	Aortic aneurysm or dissection, vascular atheromatosis and stenosis, pulmonary embolism, pleural effusion or mass, pneumonia or lung mass
Lumbosacral spine	Peritoneal or retroperitoneal mass, cyst or calcification, conceptus, dilated or obstructed bowel or bladder, free abdominal air or fluid, vascular atheromatosis and stenosis

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