Spinal Cord Tumors

Margaret Hollar, D.O.

Spinal Cord Tumors

- Extradural
- Intradural extramedullary
- Intramedullary

Spinal Cord Tumors

- Benign tumors
- Cysts, and other benign tumorlike masses
- Malignant tumors
- Metastases

Extradural tumors, cysts and tumorlike masses

- Occur outside the spinal dura
- Typically arise from the osseous spine, intervertebral discs and adjacent soft tissues
- Imaging hallmarks - focal displacement of the thecal sac away from the mass

Extradural

- Benign tumors
  - Hemangioma
  - Osteoid osteoma
  - Osteochondroma

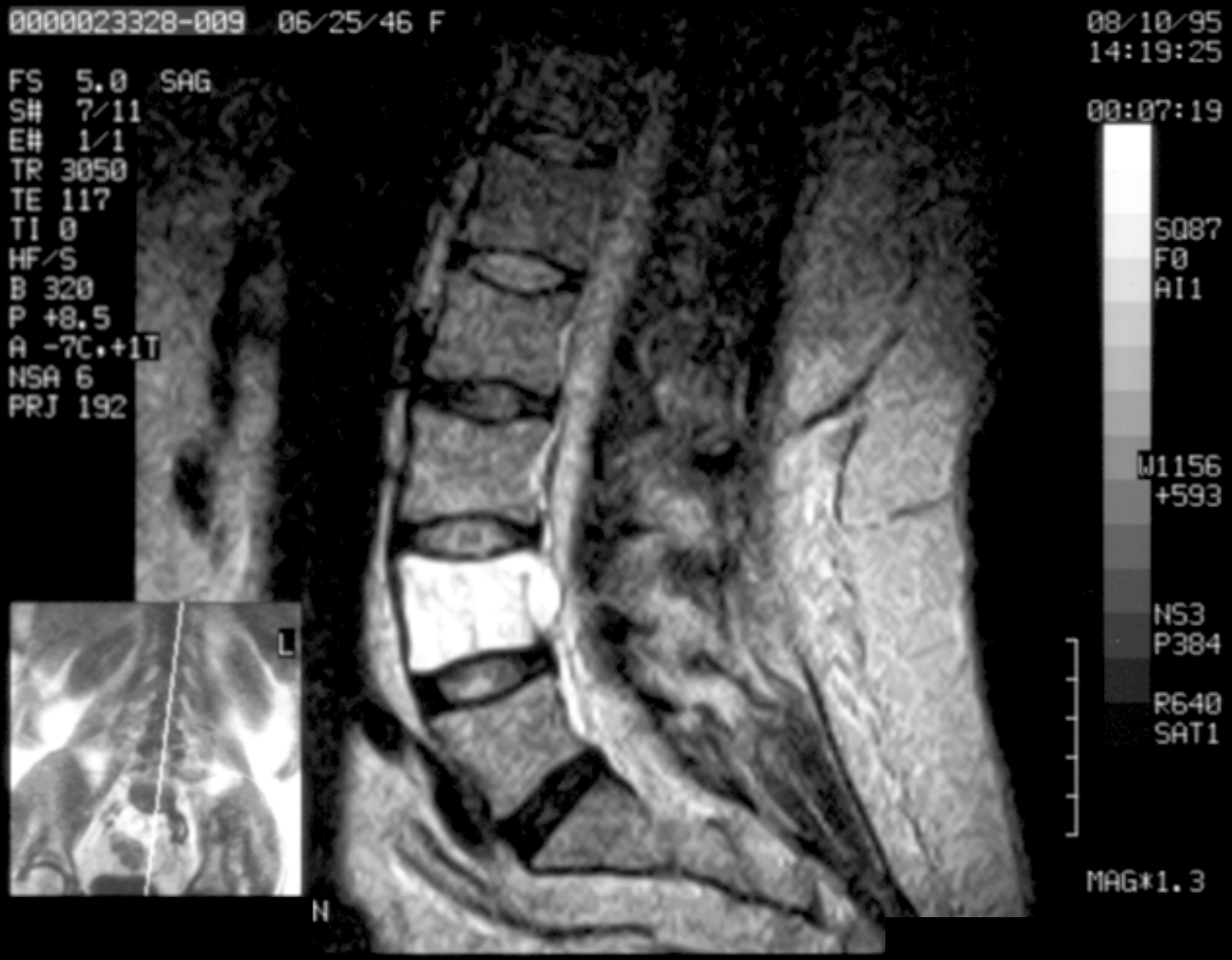
Hemangioma

- Slow-growing benign primary neoplasms of capillary, cavernous or venous origin
- The most common benign spinal neoplasm
- Most epidural hemangiomas occur secondarily as extensions of expanding intraosseous lesions.
- Most are asymptomatic and discovered incidentally

Hemangioma - imaging findings

- MRI - Most are round, well-defined vertebral body lesion that are high signal on both T1 and T2 WI
- CT - lucent lesions with typical “polka dot” densities representing coarsened vertical trabeculae
- Plain films - lytic foci with honeycomb trabeculation or thick vertical striations

Hemangioma



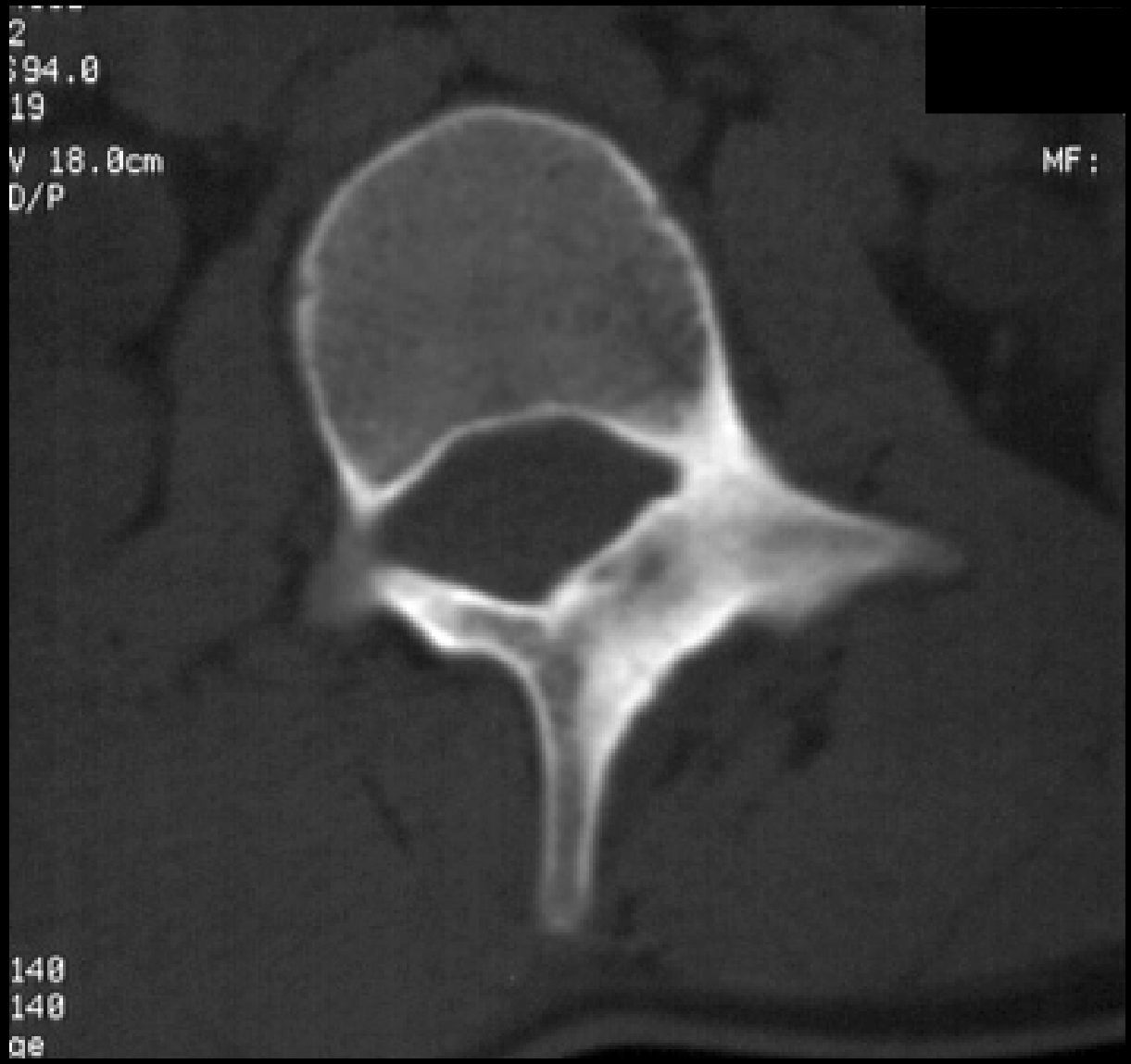
Osteoid osteoma

- Benign skeletal neoplasm that has a central nidus of interlacing osteoid and woven bone
- Sharply demarcated and surrounded by varying degrees of ostoesclerosis
- Nidus usually < 1.5 cm
- 10% occur in the spine - the usual site is the neural arch
- Pain is the presenting symptom in over 95%

Osteoid osteoma - imaging findings

- MRI - varying signal, nidus typically low to intermediate signal on both T1 and T2 WI
- CT - dense sclerosis surrounding a lytic lesion that may have a central calcific nidus
- Bone scintigraphy - focal activity on both immediate and delayed images

Osteoid osteoma



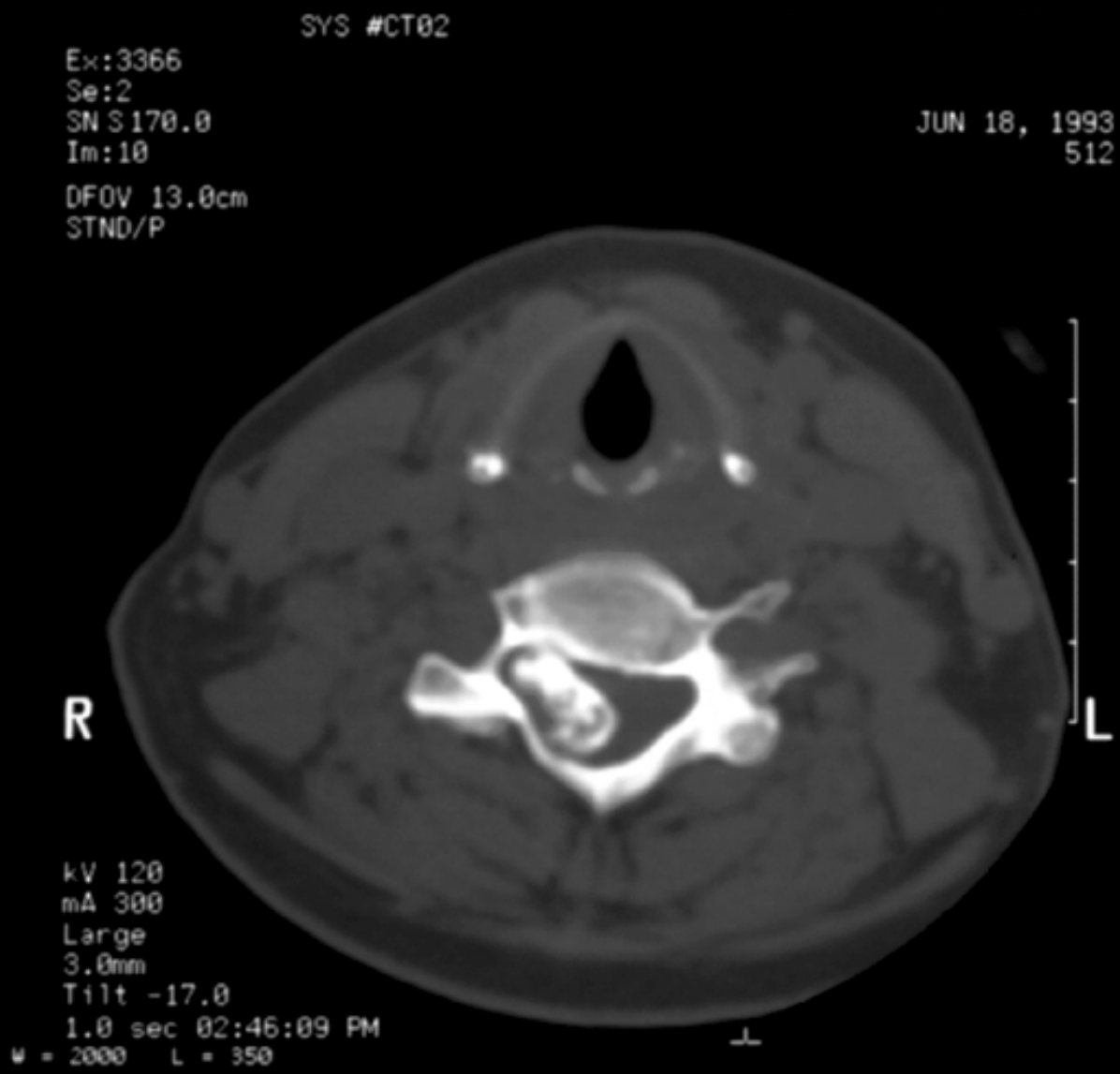
Osteochondroma

- Arises through lateral displacement of epiphyseal growth cartilage. Results in a bony excrescence with cartilaginous-covered cortex and a medullary cavity
- Common lesions - 8 to 9% of all primary bone tumors and > 1/3 of benign tumors
- 1- 4% arise in the spine - spinous or transverse process most common location

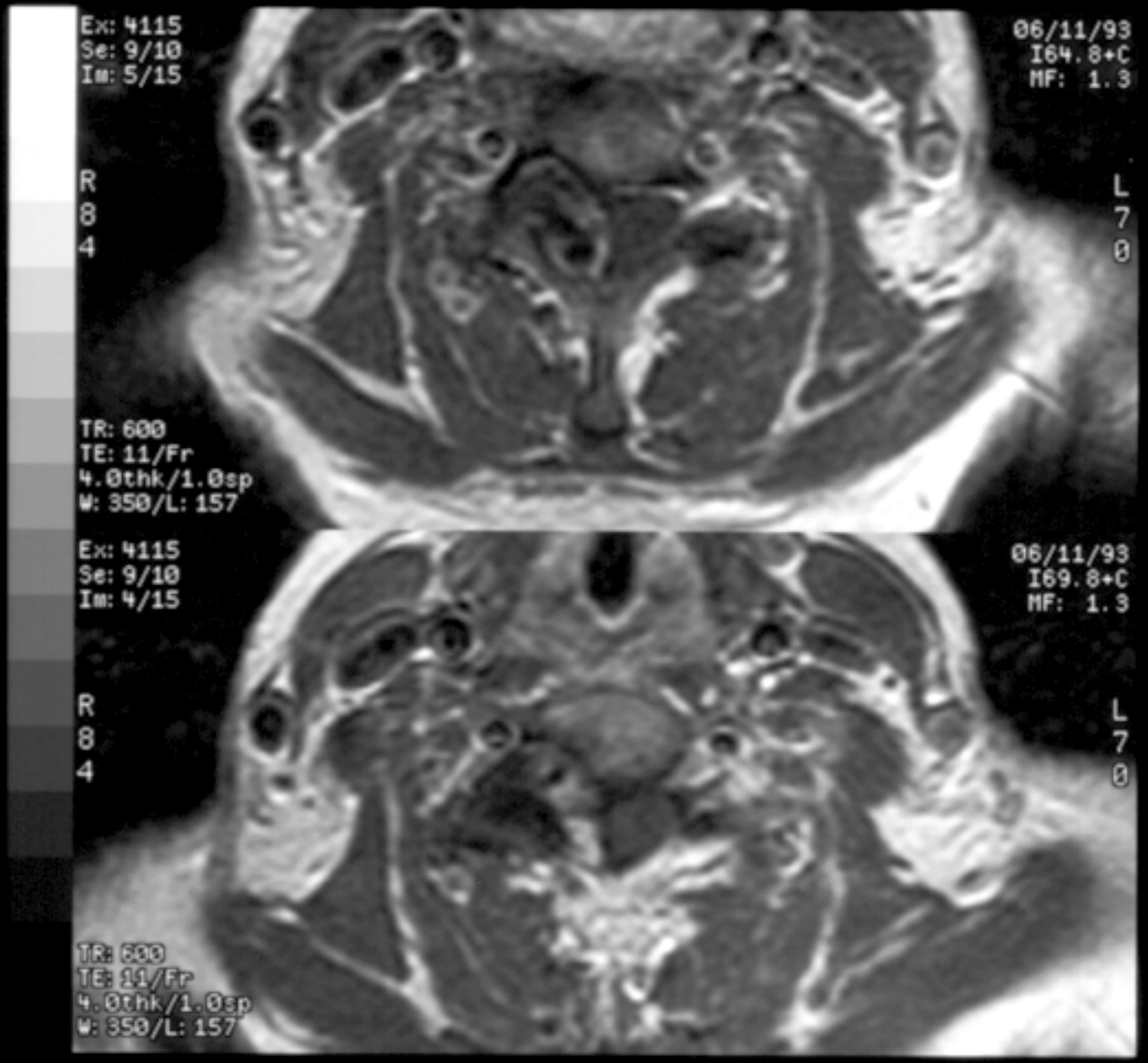
Osteochondroma - imaging findings

- MRI - mixed signal on both T1 and T2 WI
- CT - the cortex of the parent bone flares into the cortex of the osteochondroma, with which it is contiguous. The cartilaginous cap often contains calcifications.
- Plain films - A sessile or pedunculated bonelike projection

Osteochondroma



Osteochondroma



Extradural

- Cysts and other benign tumorlike masses
  - Eosinophilic granuloma
  - Epidural lipomatosis
  - Nonneoplastic cysts
    - synovial cysts
    - arachnoid cysts

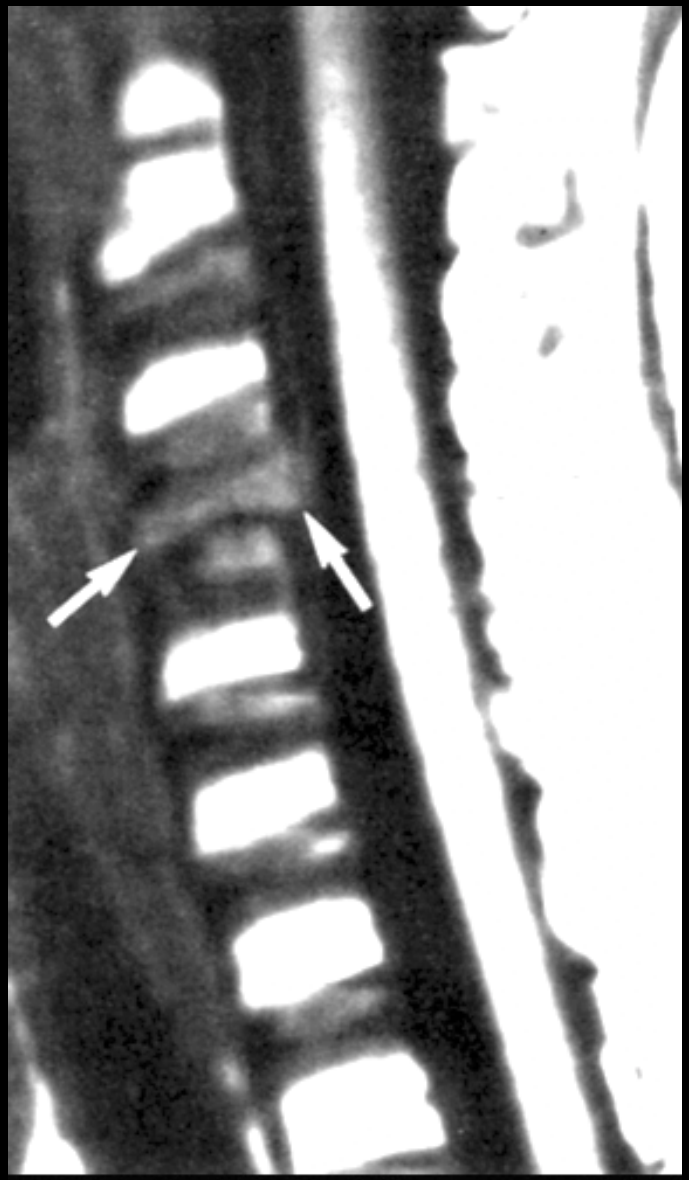
Eosinophilic granuloma

- A benign nonneoplastic disorder
- EG in the spine is seen as a lytic lesion without surrounding sclerosis
- A classic cause of a single collapsed vertebral body
- Very rare over 30 years of age

Eosinophilic granuloma - imaging findings

- MRI - Typically hyperintense on T2 WI, signal on T2 WI is variable, strongly enhances
- CT and Plain films - lytic lesions or collapse of the vertebral body (so-called vertebra plana)

Eosinophilic granuloma



Osborn, A.G.; Diagnostic Neuroradiology; Mosby 1994.

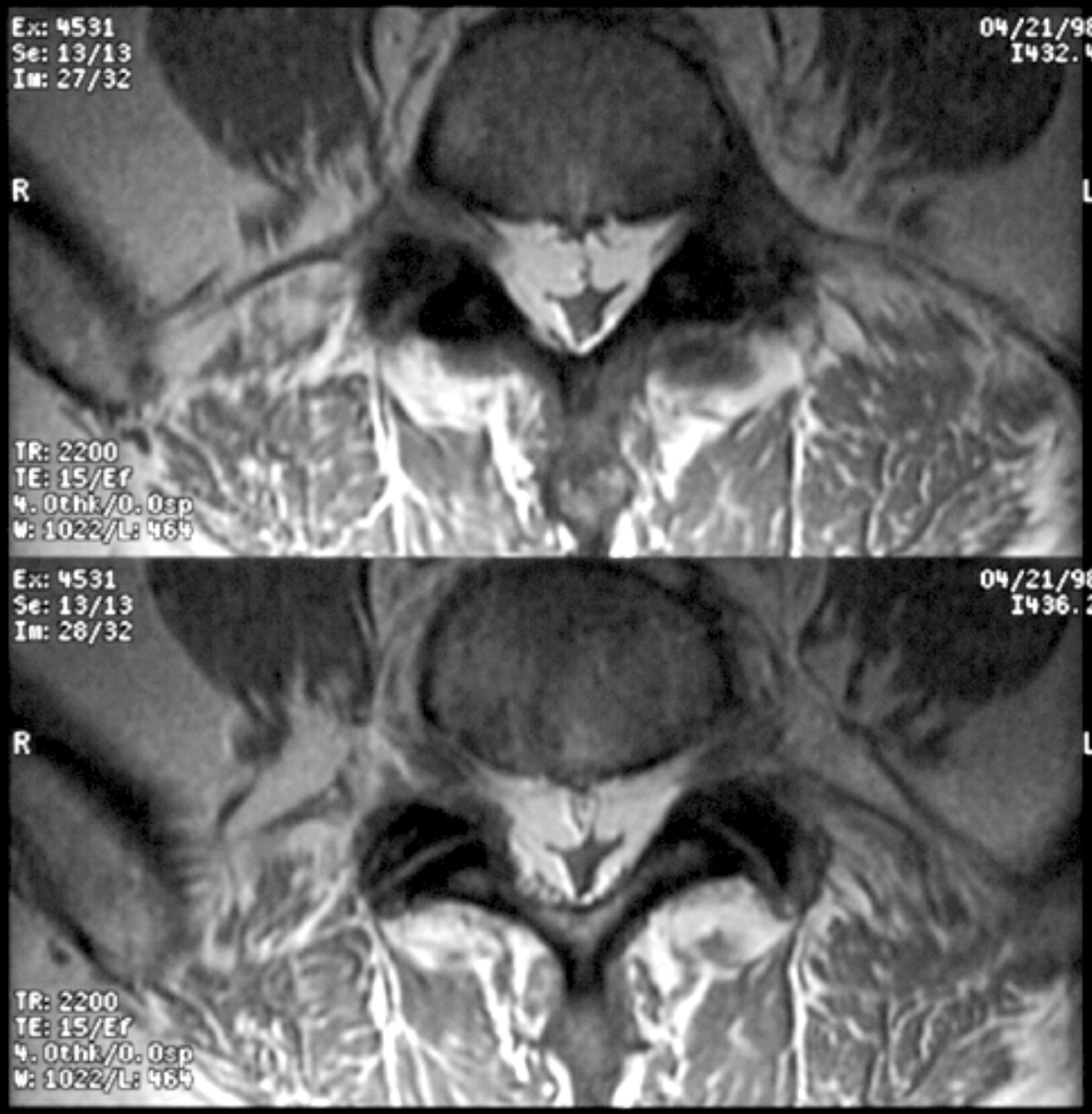
Epidural lipomatosis

- Excessive deposition of unencapsulated fat in the epidural space
- Most symptomatic cases are associated with chronic steroid use
- Most common in the thoracic spine
- Weakness and back pain are the most common symptoms

Epidural lipomatosis - imaging findings

- MRI and CT - increased extradural fat and diminished subarachnoid space

Lipomatosis



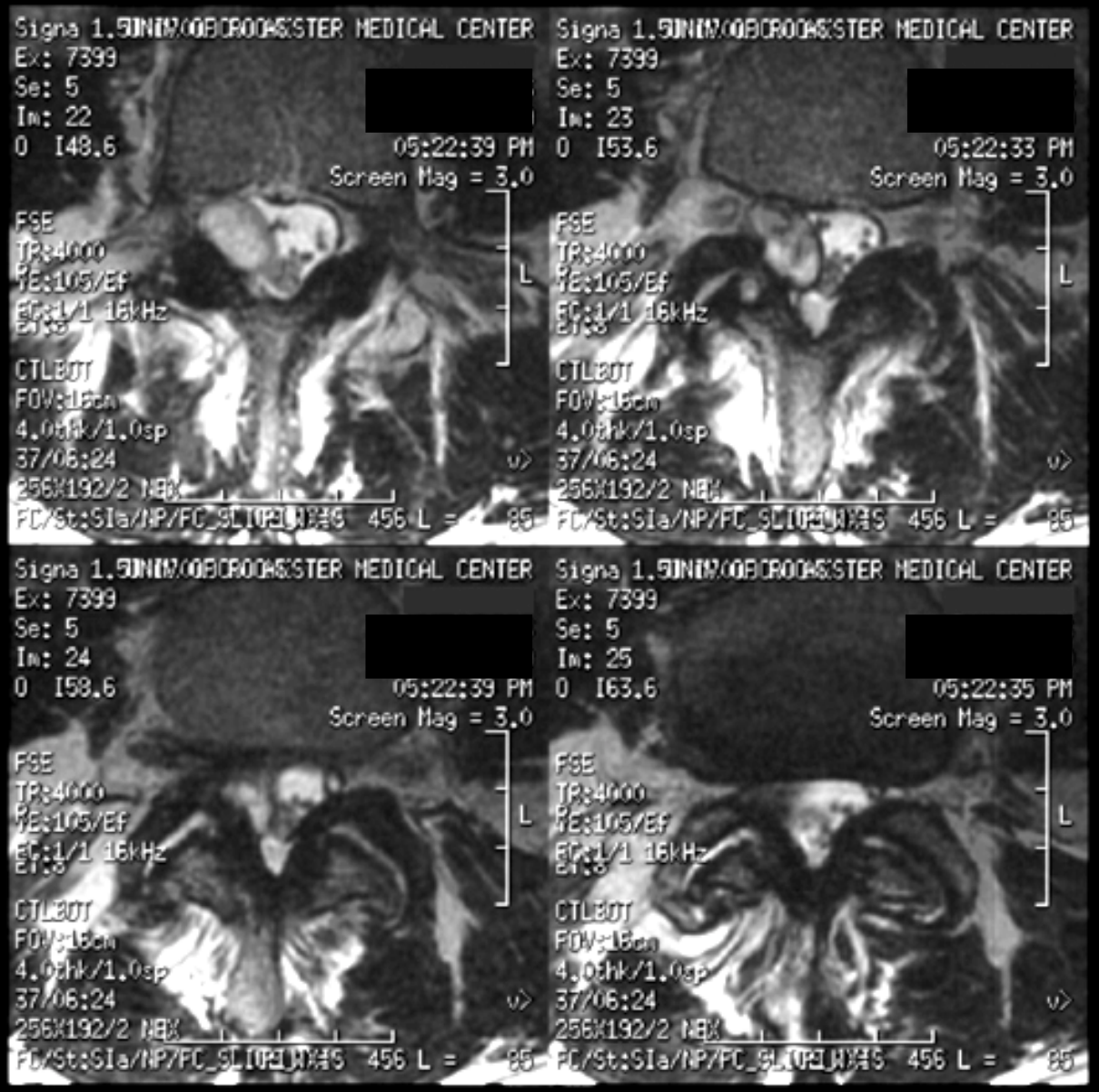
Synovial cyst

- Rare
- Nearly always associated with facet degenerative disease

Synovial cyst - imaging findings

- MRI - variable signal - cysts can contain cystic or solid material
- CT - varies from hypo- to hyperdense compared to adjacent ligamentum flavum. Changes associated with facet joint degeneration are also seen.

Synovial cyst



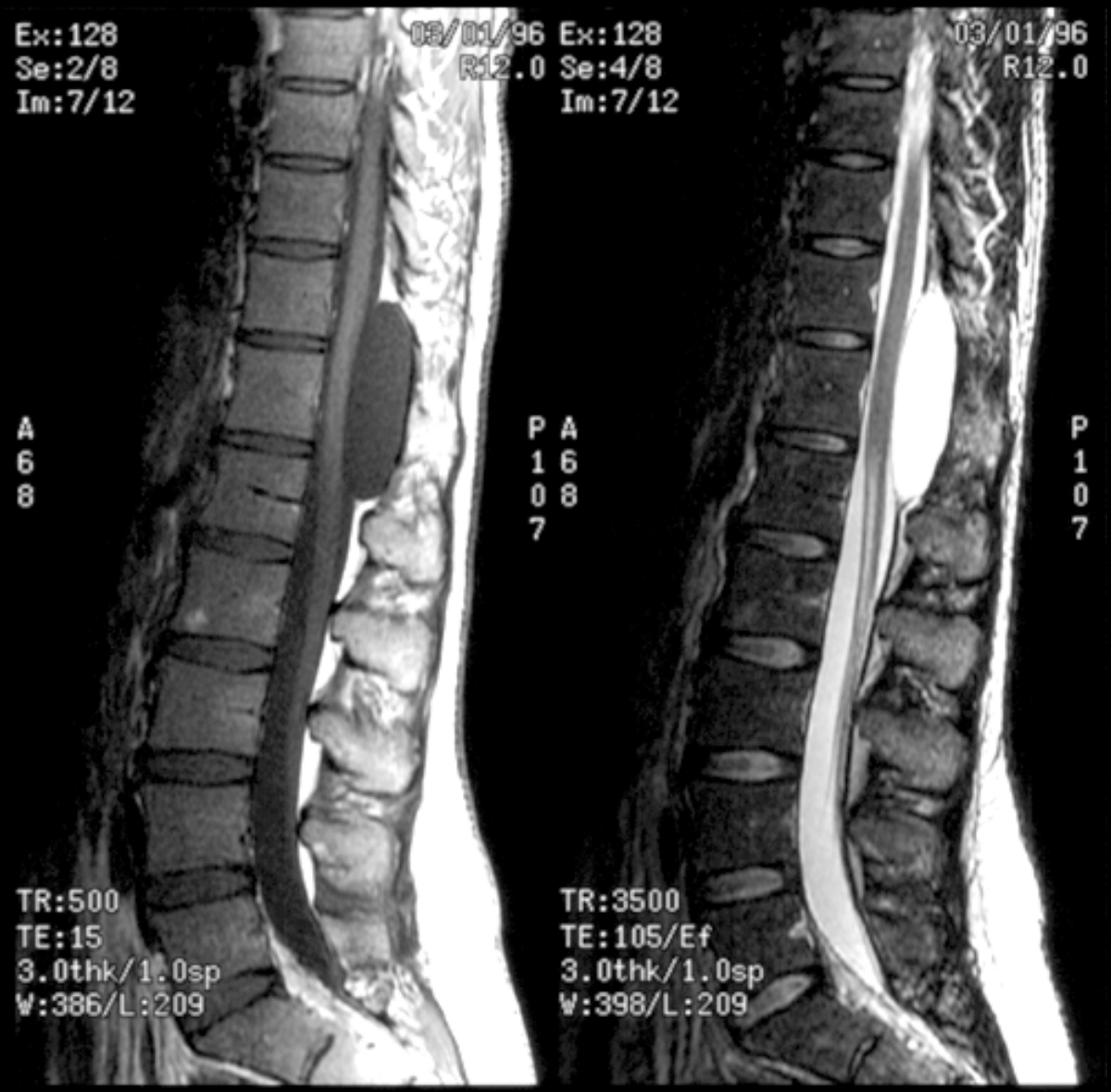
Extradural arachnoid cyst

- CSF-filled outpouchings of arachnoid that protrude through a dural defect
- 2/3 occur in the mid to lower thoracic spine
- Painless progression of either flaccid or spastic para- or quadriparesis is typical

Arachnoid cyst - imaging findings

- MRI - long-segment CSF-equivalent extradural mass that causes spinal cord compression
- CT - secondary bony changes include widened interpedicular distance, scalloping of vertebral bodies or pedicle thinning and erosion

Arachnoid cyst



Extradural

- Malignant tumors
  - Chordoma
  - Lymphoma
  - Sarcoma
    - Osteosarcoma
    - Chondrosarcoma
    - Multiple myeloma

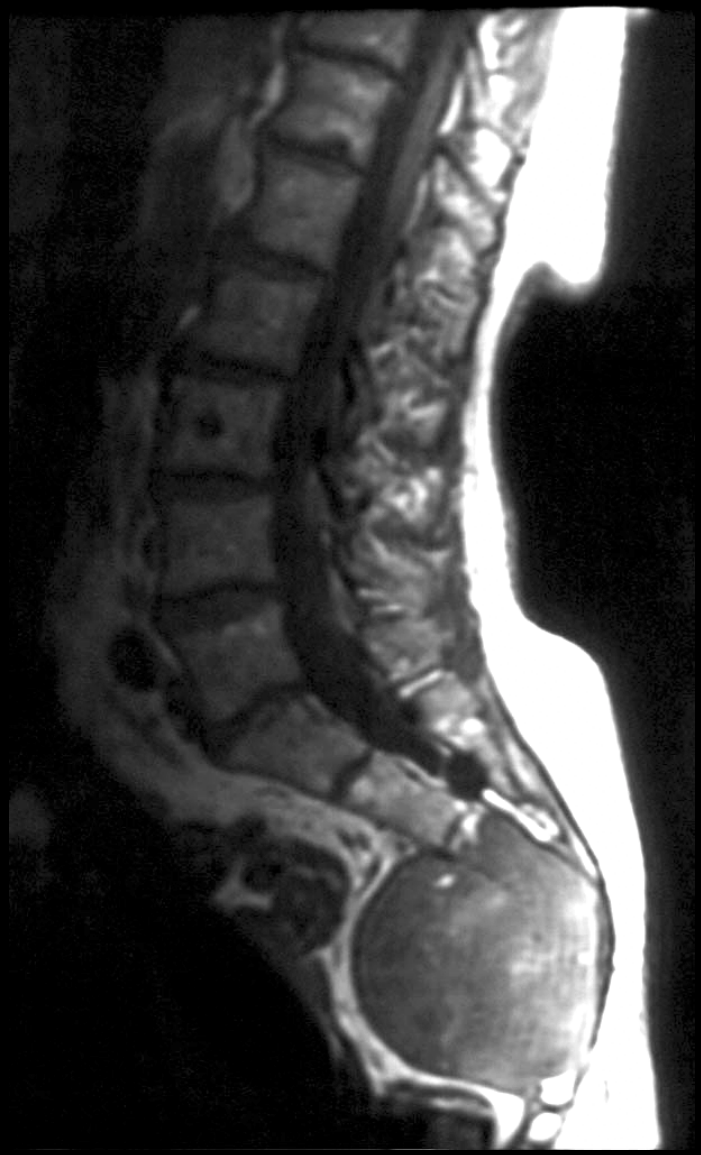
Chordoma

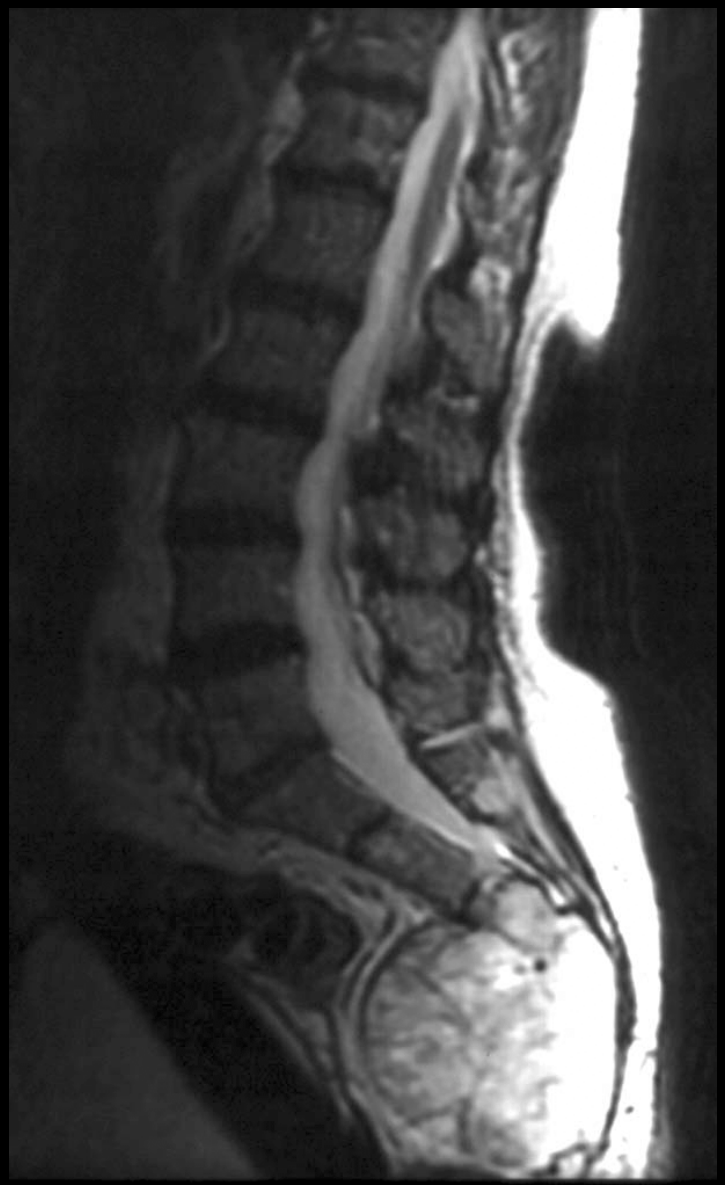
- Originate from intraosseous notochordal remnants
- Grossly - locally invasive, lobulated, gelatinous-appearing masses
- Typically, although not invariably, arise in the midline of the spinal column at any location from clivus to the coccyx

Chordoma - imaging findings

- MRI - inhomogeneous, predominately low signal on T1 WI and equal or exceed CSF on PD and T2 WI. Enhancement varies
- CT - a lytic, destructive skull base or sacral lesion. Mixed solid and cystic components are frequent. Calcification in 30 - 70%

Chordoma





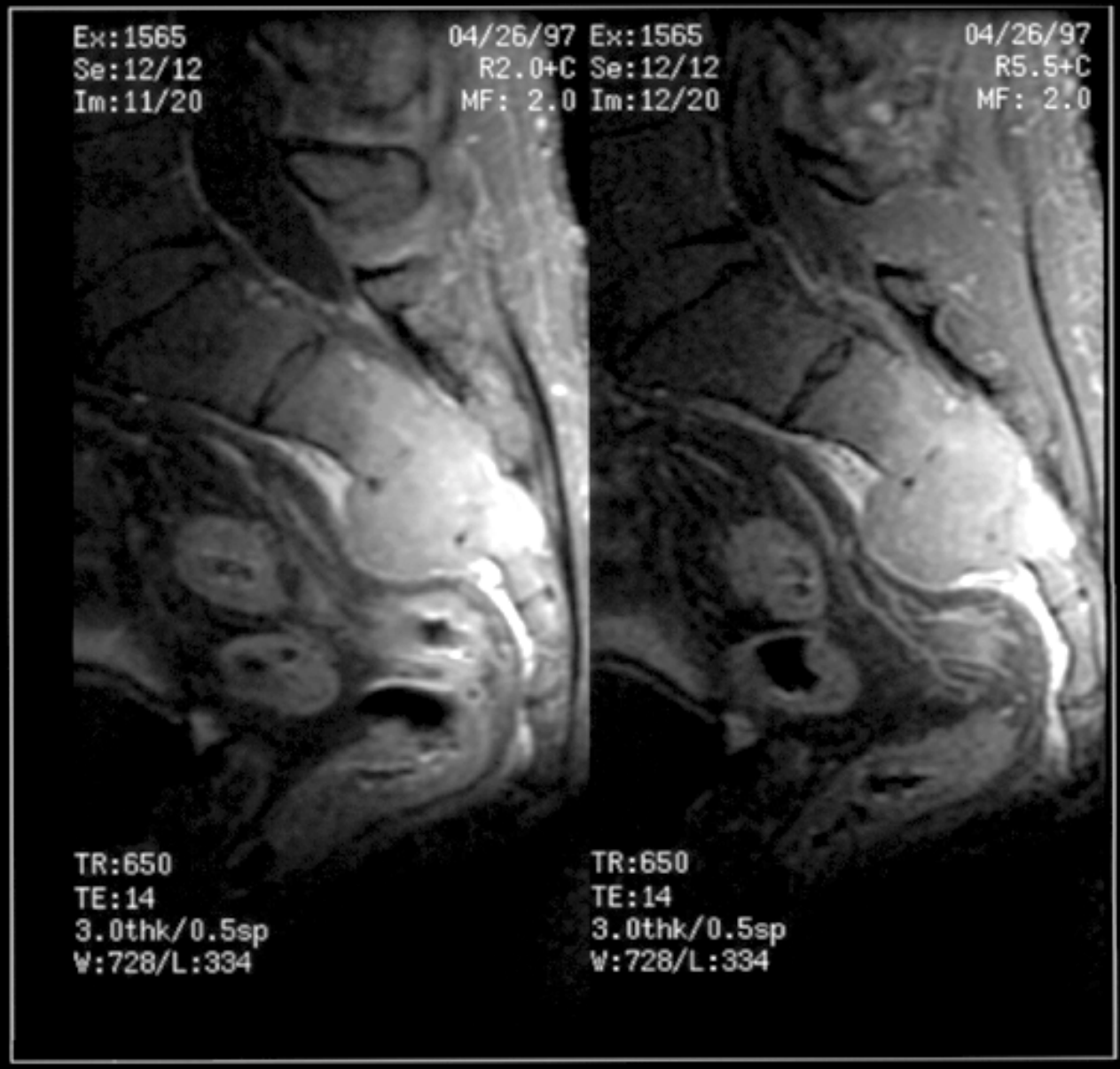
Lymphoma

- Non-Hodgkin accounts for < 85%
- Mean age 58 years
- Strong male predominance

Lymphoma - imaging findings

- MRI - typically hypointense on T1 and inhomogeneously hyperintense on T2 WI. Epidural extension and cord compression is best seen on MR scans
- CT - nonspecific, bone destruction and hyperostosis

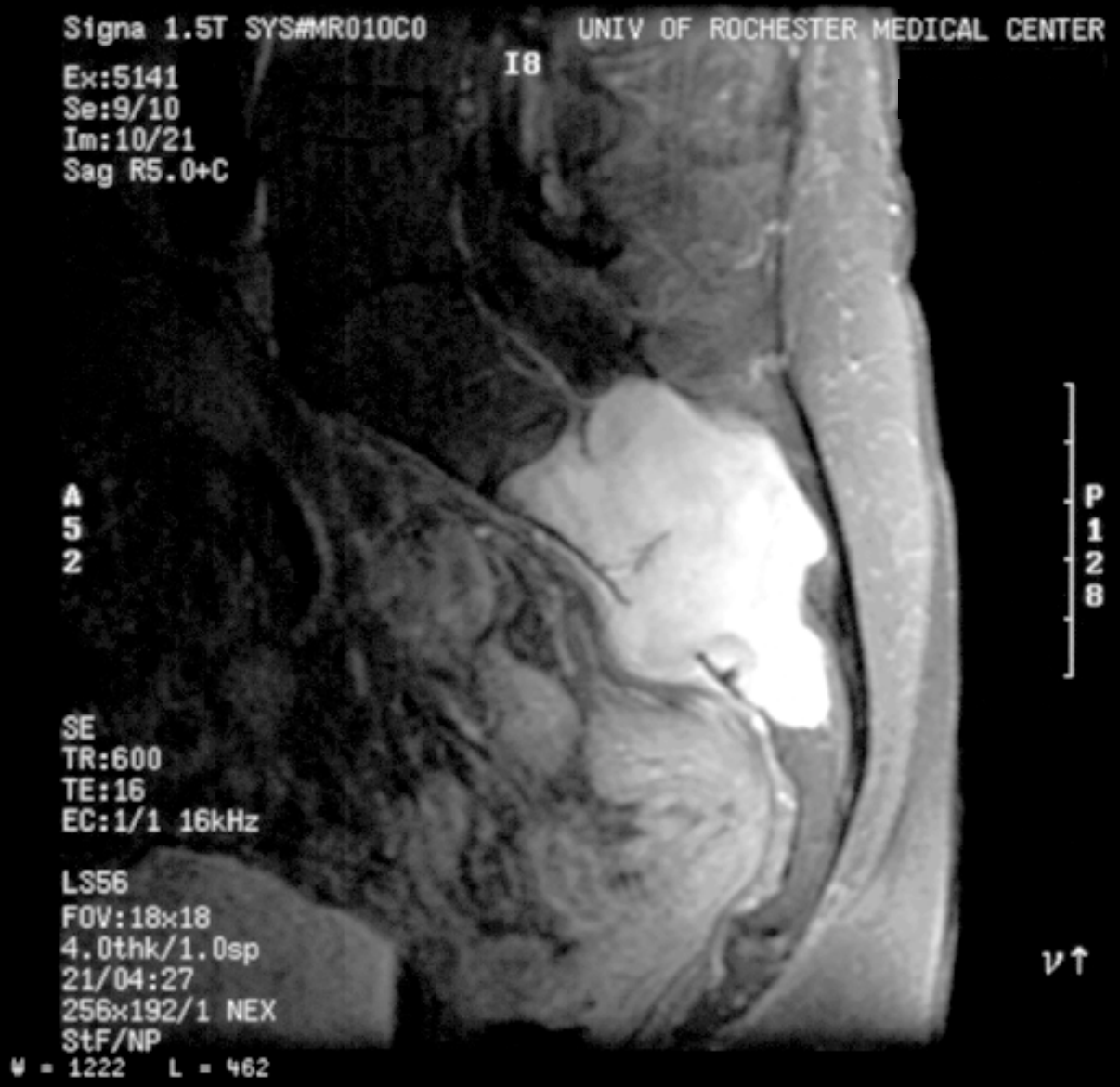
Lymphoma



Osteosarcoma

- Account for 20% of all sarcomas but rarely affect the spine
- Occur with increased frequency in previously irradiated bone or in patients with Paget disease
- Imaging - mixed osteolytic and sclerotic changes with matrix calcification

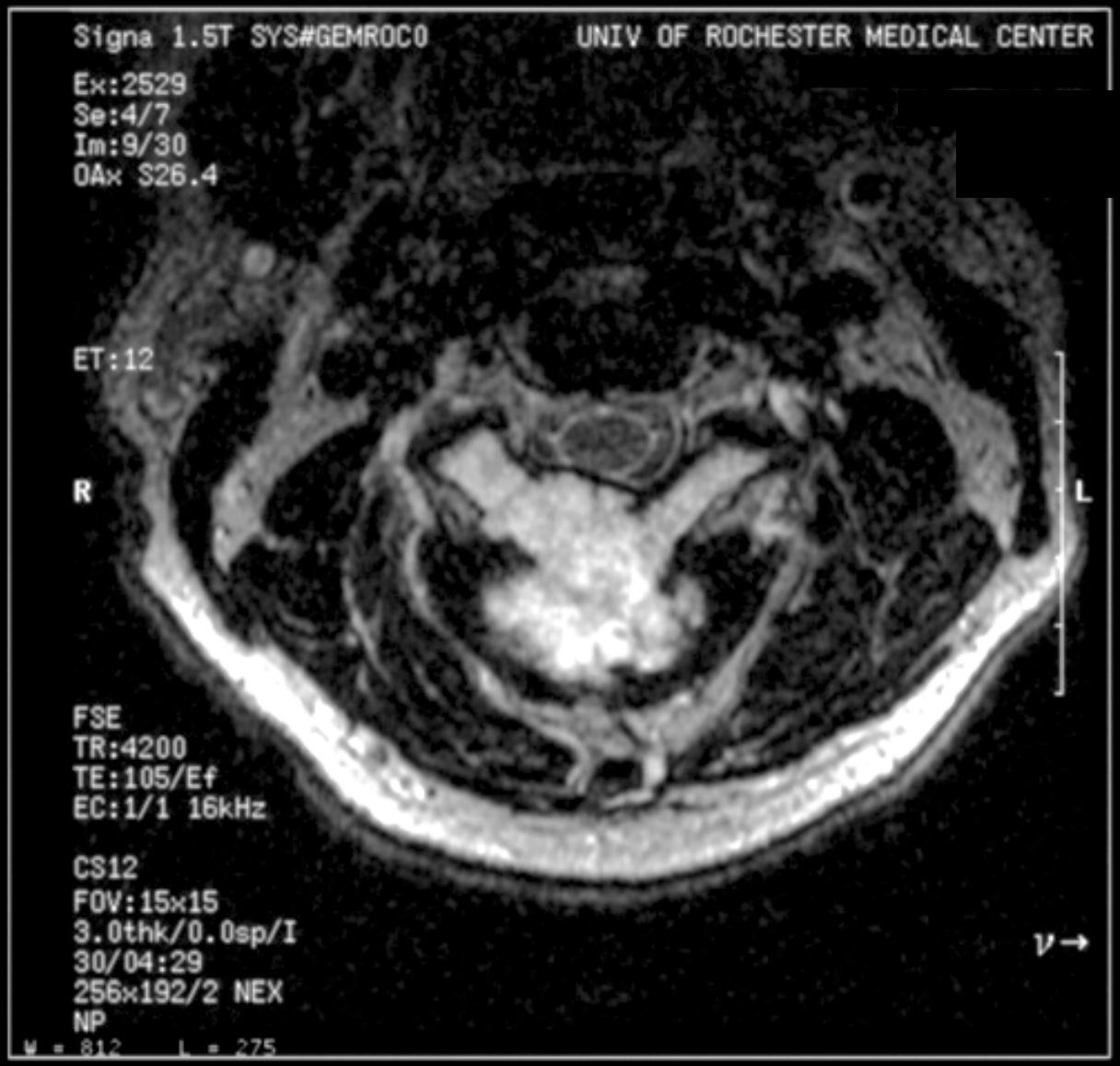
Osteosarcoma



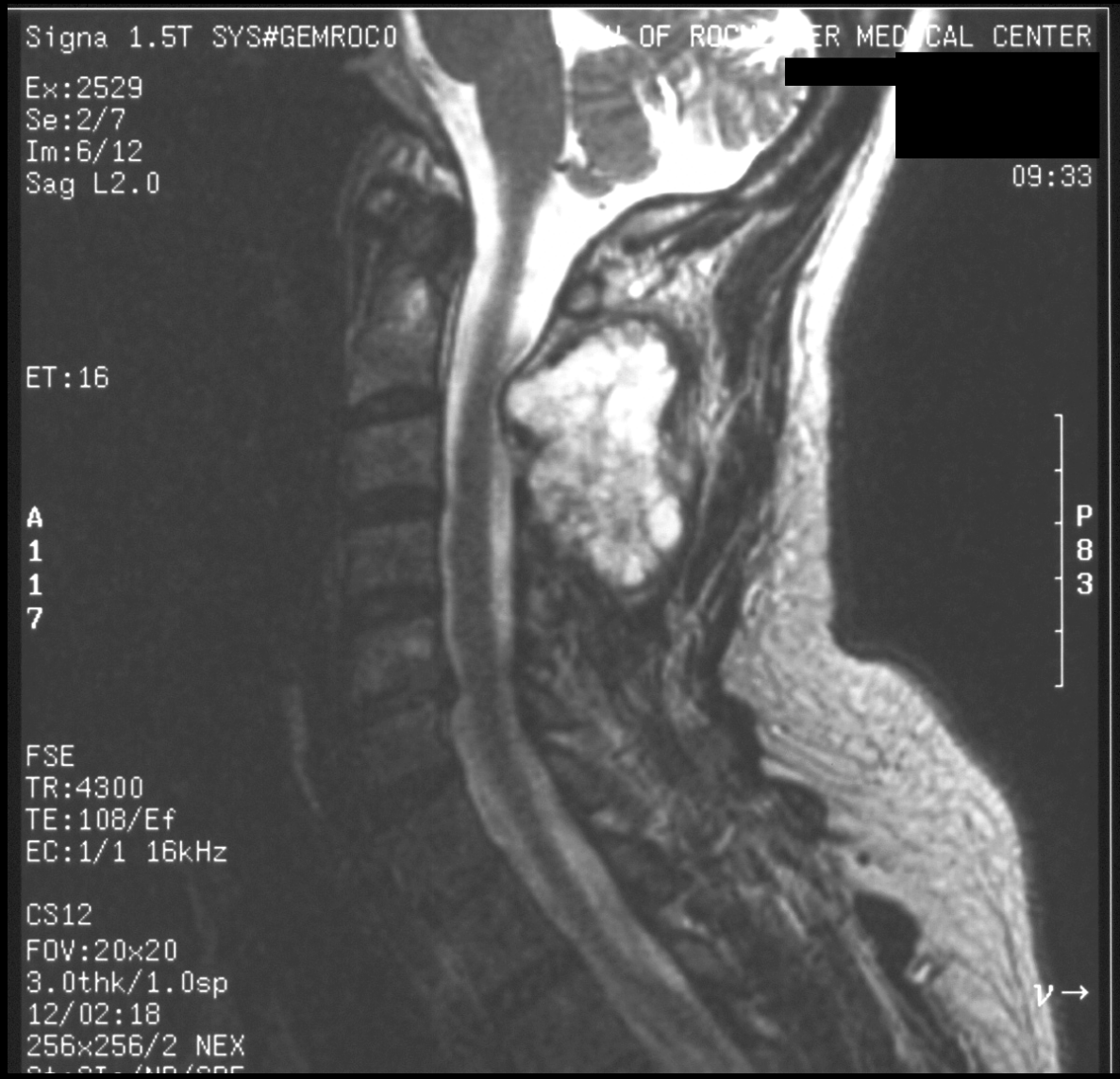
Chondrosarcoma

- Half as frequent as osteosarcoma
- May arise from malignant degeneration of solitary osteochondromas or hereditary multiple exostoses
- Imaging - lytic lesions with sclerotic margins and variable matrix calcification occurring in rings and arcs
- Associated soft tissue masses are common

Chondrosarcoma



Chondrosarcoma



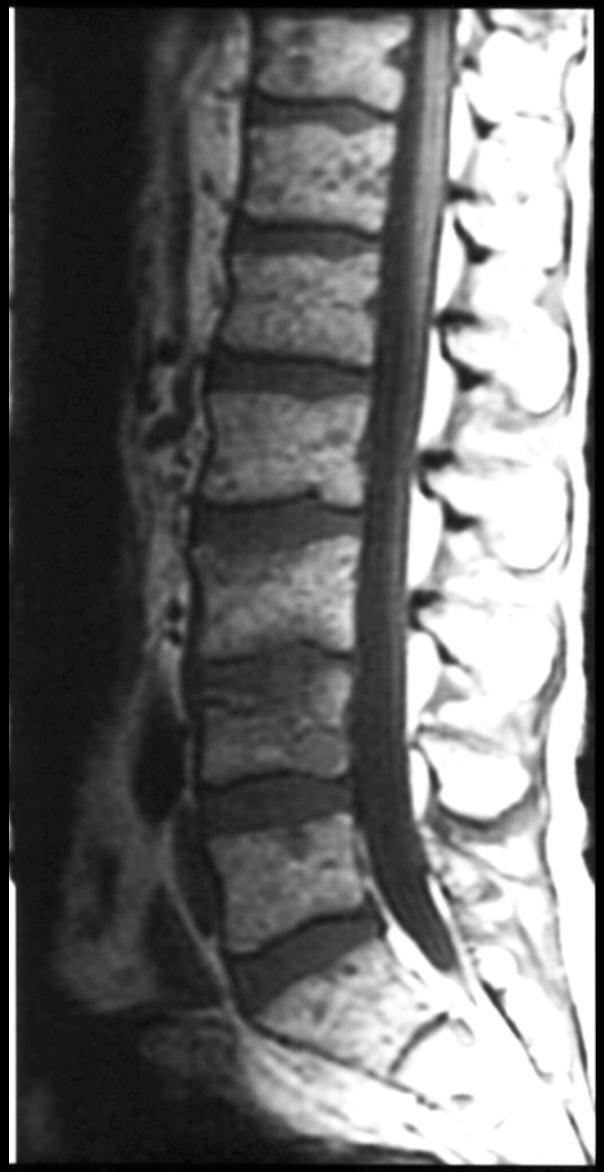
Multiple myeloma

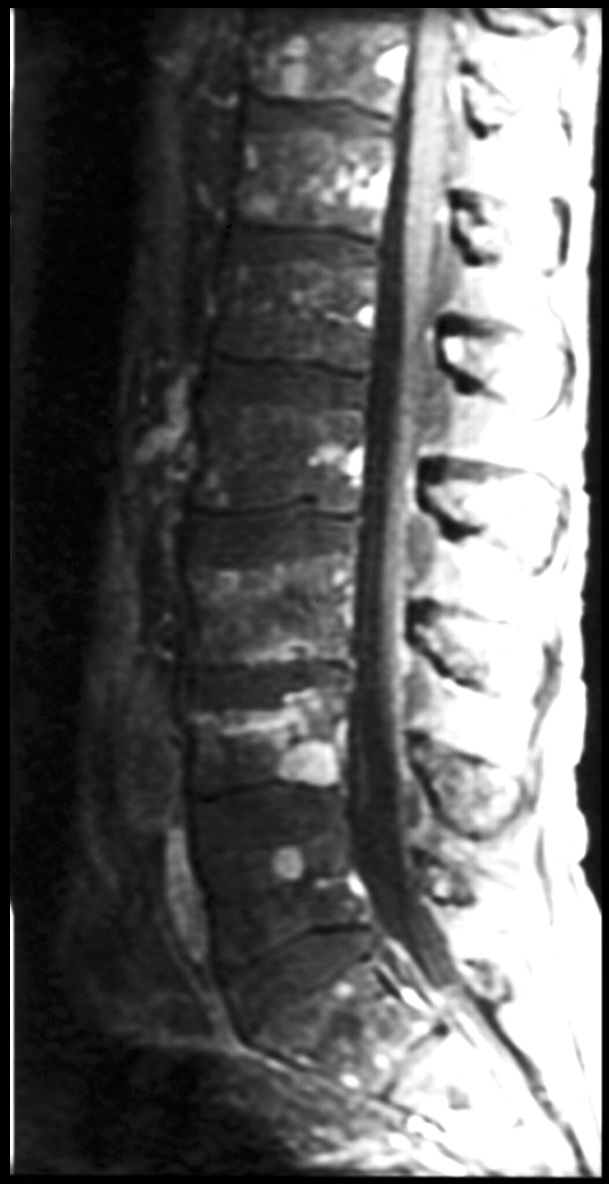
- Monoclonal proliferation of malignant plasma cells that affects the bone marrow
- The spine is the most common location

Multiple myeloma - imaging findings

- MRI - Signal varies, most lesions are hypointense to adjacent marrow and iso- to slightly hyperintense compared to muscle on T1WI. Typically hyperintense on T2WI
- Plain films and CT - Focal or diffuse lytic lesions

Multiple myeloma





Extradural

- Metastatic disease

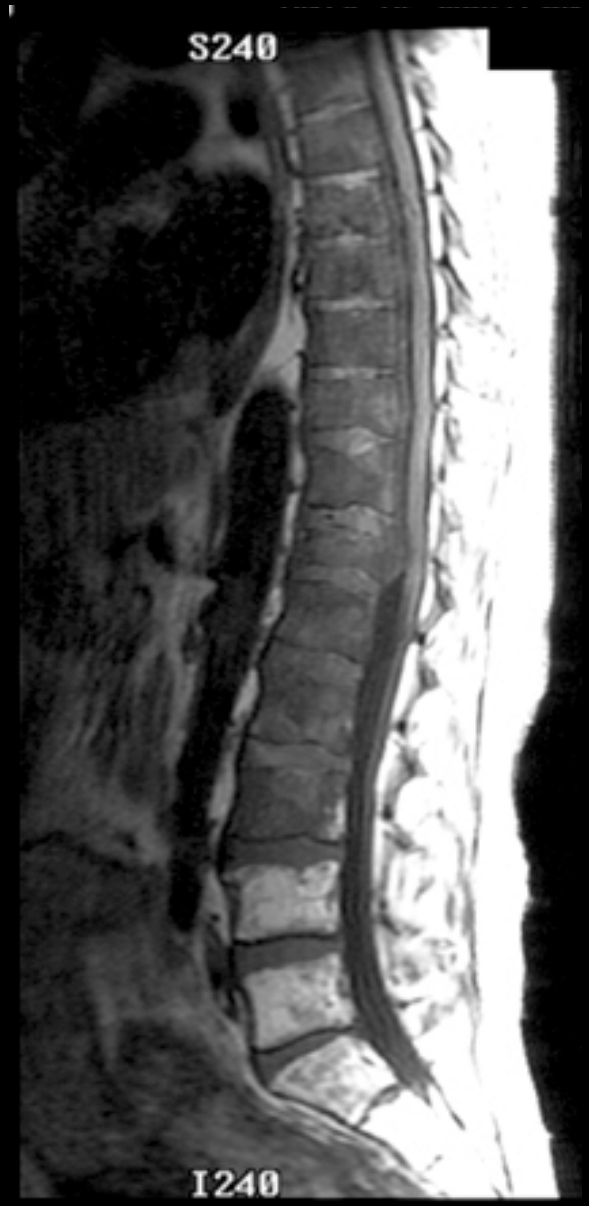
Metastatic disease

- By far the most common extradural malignant neoplasm
- In adults, 1/2 of spine metastasis with epidural spinal cord compression arise from breast, lung or prostate cancer
- In adults, the initial site is the vertebral body, usually the posterior aspect

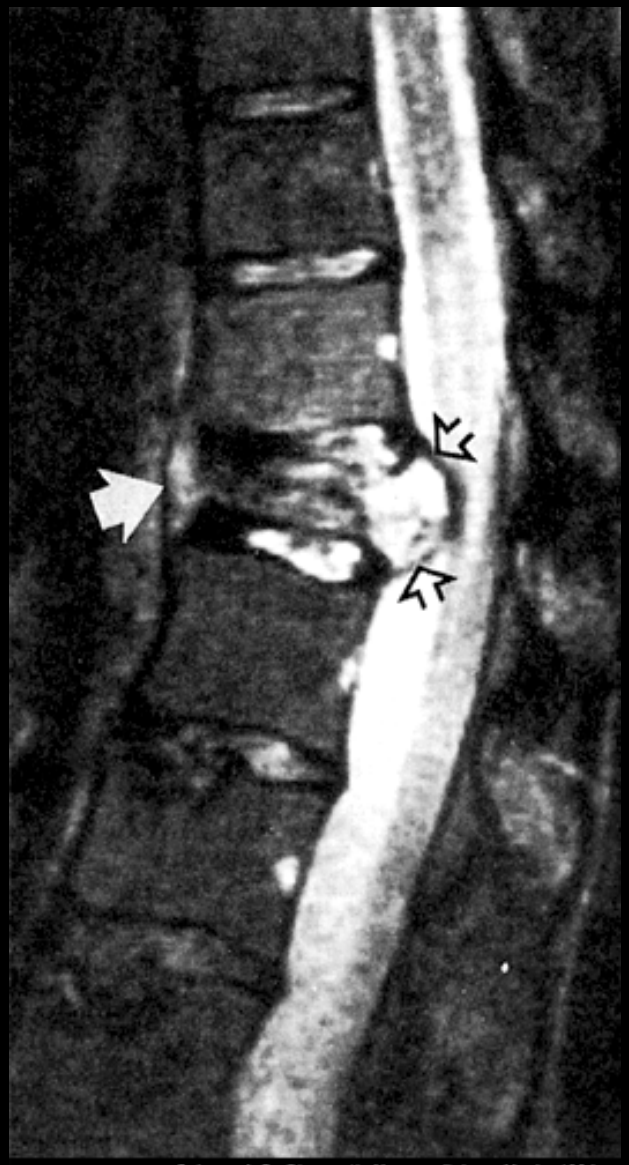
Metastatic disease - imaging findings

- MRI - very sensitive in detecting vertebral metastases. The most common pattern is multifocal lytic lesions characterized by low signal on T1- and high signal on T2WI
- CT - readily defines lytic or blastic lesions
- Scintigraphy - very sensitive, although nonspecific, in detecting bony metastasis

Extradural metastases



Extradural metastasis



Osborn, A.G.; Diagnostic Neuroradiology; Mosby 1994.

Intradural extramedullary tumors, cysts and tumorlike masses

- Arise inside the dura but outside the spinal cord

Intradural extramedullary

- Benign tumors
  - Meningioma
  - Nerve sheath tumors
    - Schwannoma
    - Neurofibroma

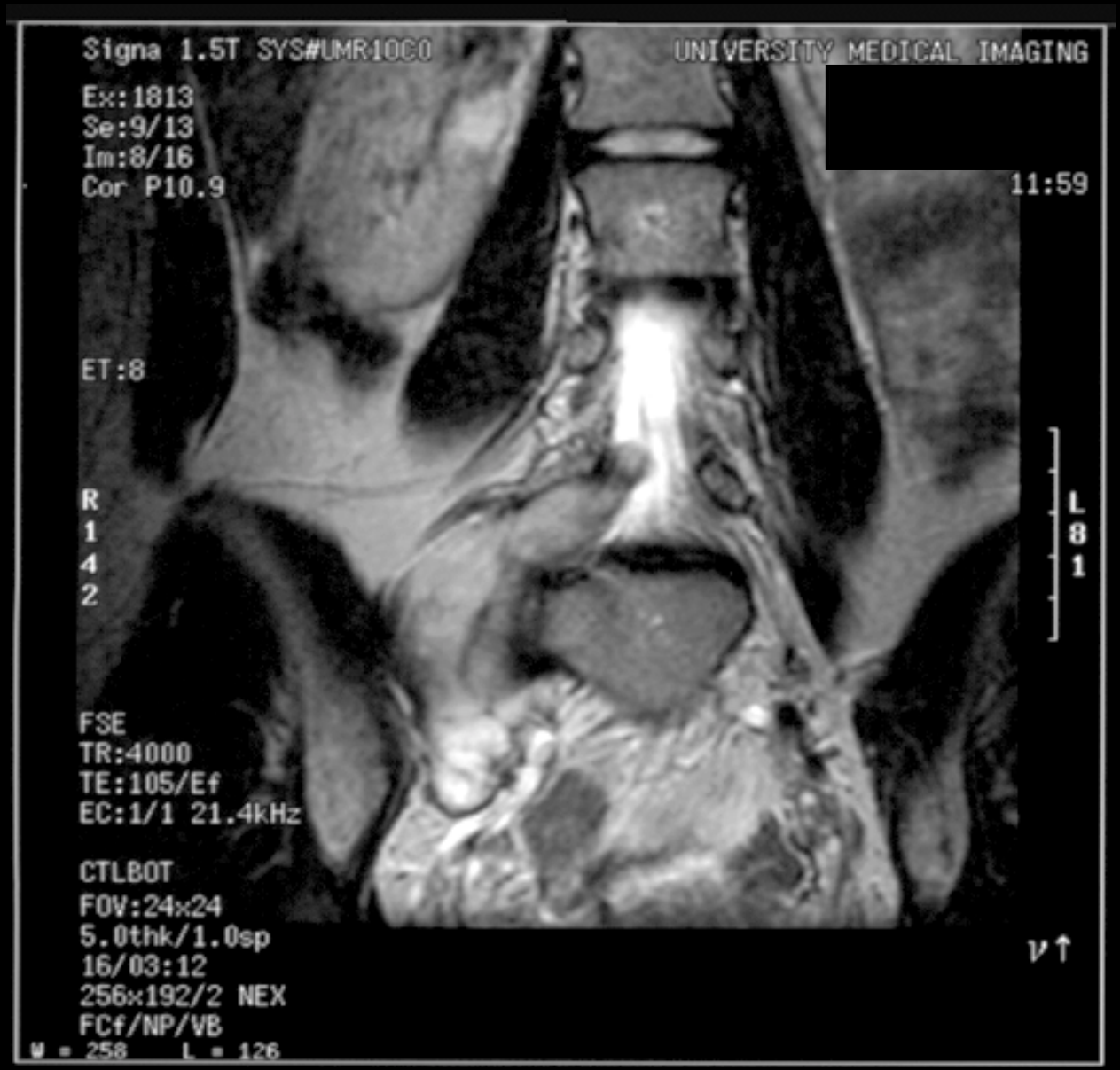
Nerve sheath tumors - Schwannomas and Neurofibromas

- Schwannomas - lobulated, grossly encapulated, well-circumscribed round or oval lesions. Arise eccentrically from their parent nerve.
- Neurofibromas - unencapsulated, fusiform, less well-delineated lesions. Usually cannot be dissected from the parent nerve.
- Most common intradural extramedullary tumors
- Most arise from dorsal sensory roots

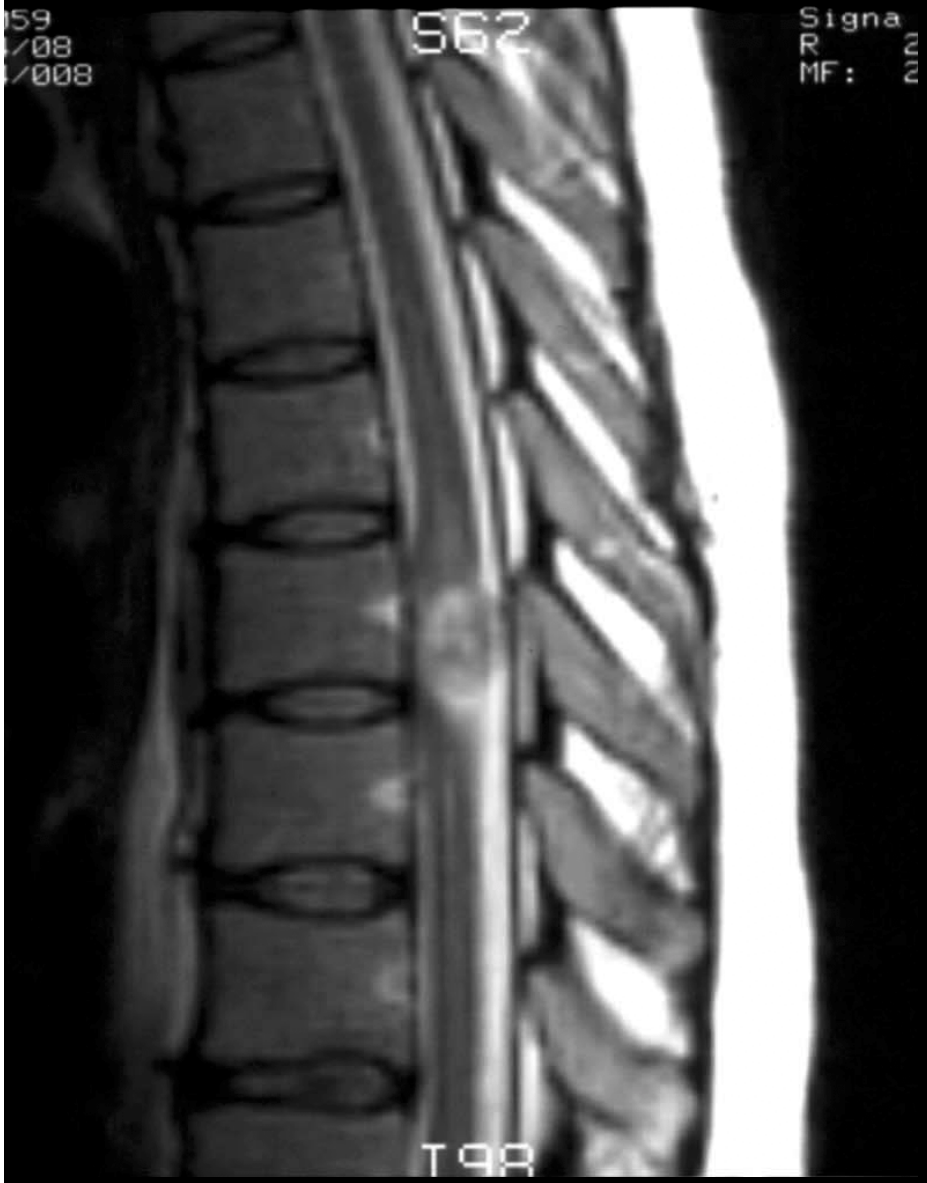
Nerve sheath tumors - imaging findings

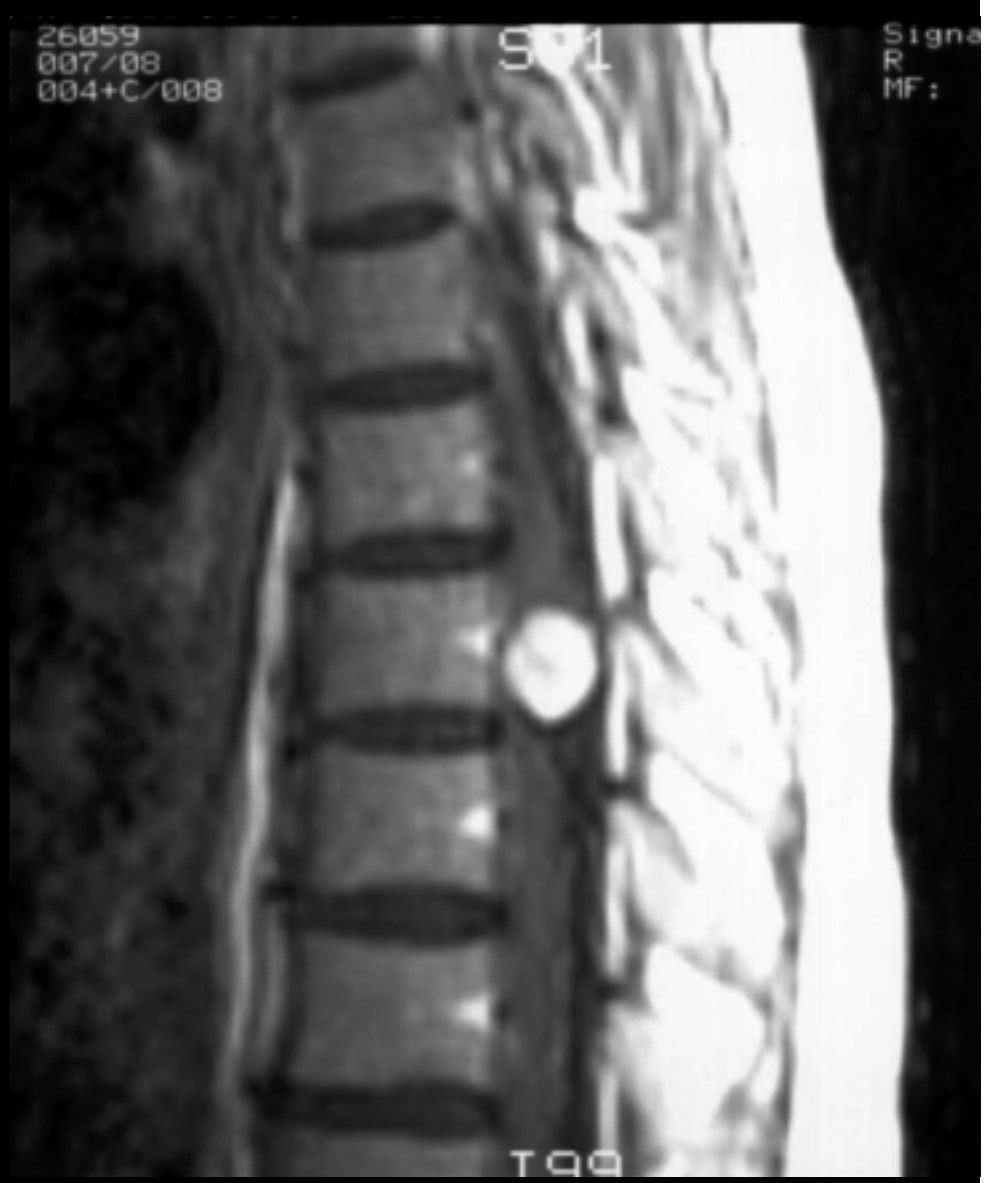
- MRI - findings vary. Most are isointense compared to the spinal cordon T1WI and hyperintense on T2WI, nearly all enhance
- CT - show bone erosion, density varies from hypo- to slightly hyperdense.
- Plain film - most common are pedicle erosions and enlarged neural foramen

Neurofibroma



Schwannoma





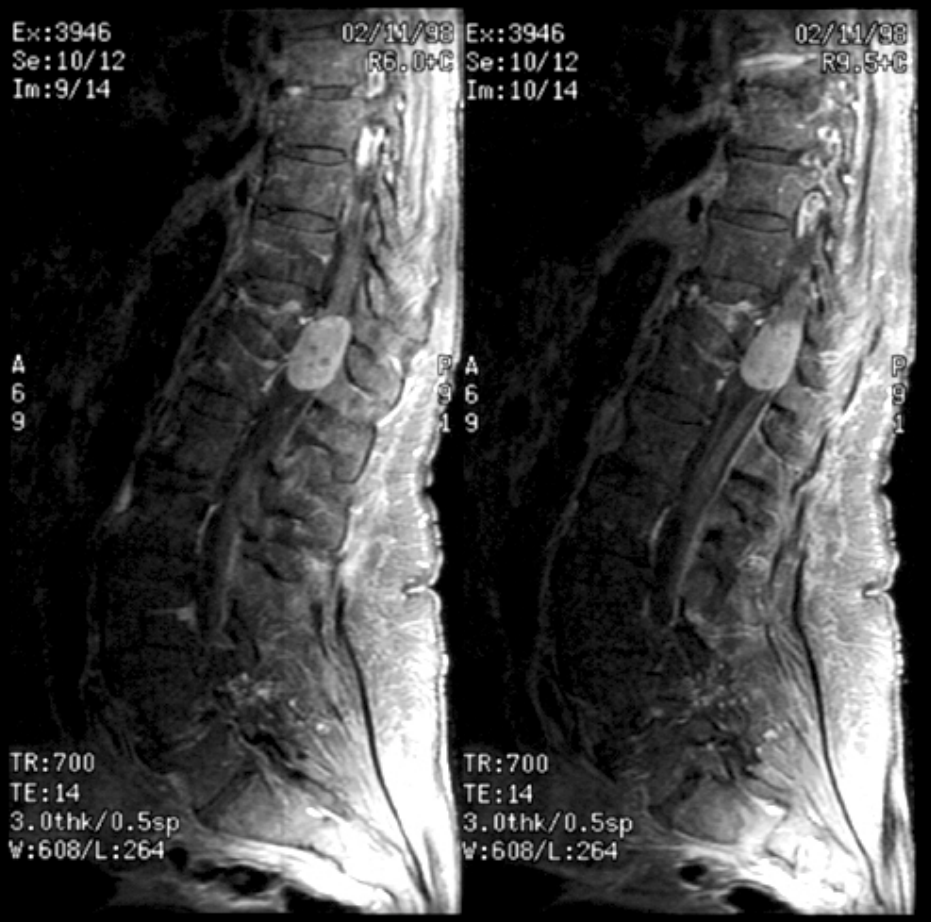
Meningioma

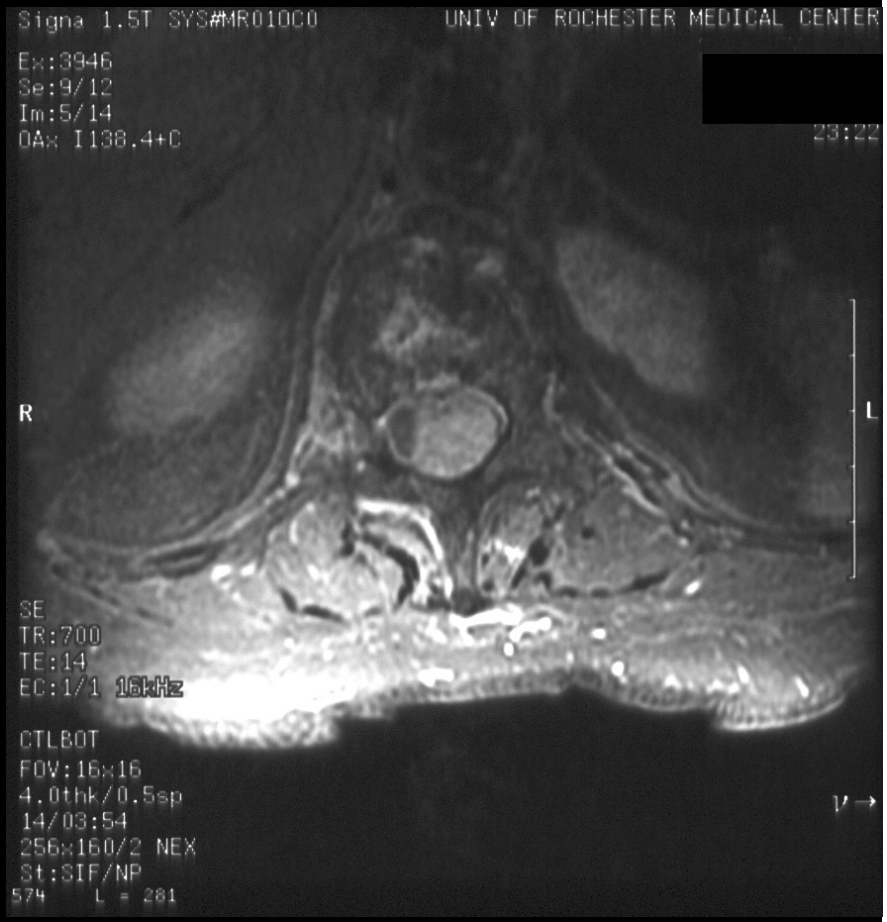
- Typically benign, slow growing tumors. Aggressive tumors and malignant degeneration are extremely rare.
- Second only to nerve sheath tumors in frequency
- Thoracic spine most common site

Meningioma - imaging findings

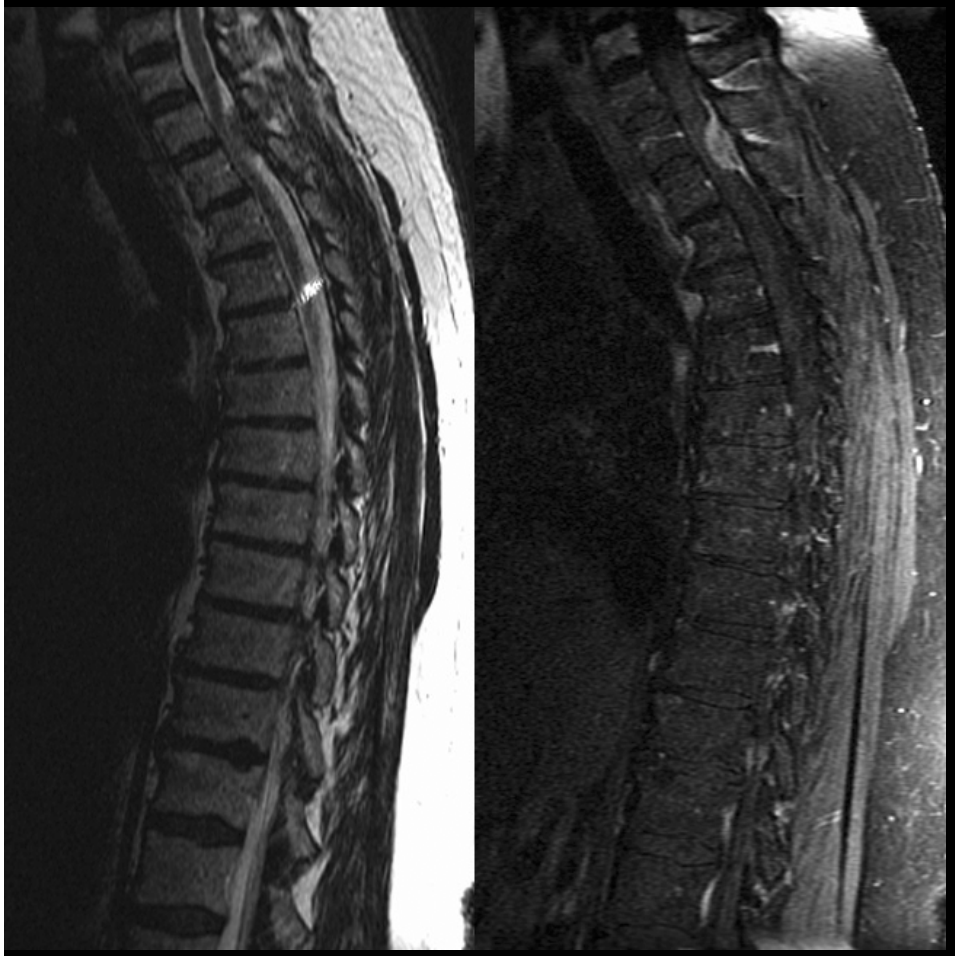
- MRI - most are isointense with the spinal cord on both T1- and T2WI, moderately enhance. Most have a broad-based dural attachment
- CT - May show an extradural or "dumbbell" mass that is iso- or moderately hyperdense compared to muscle
- Plain films - usually normal

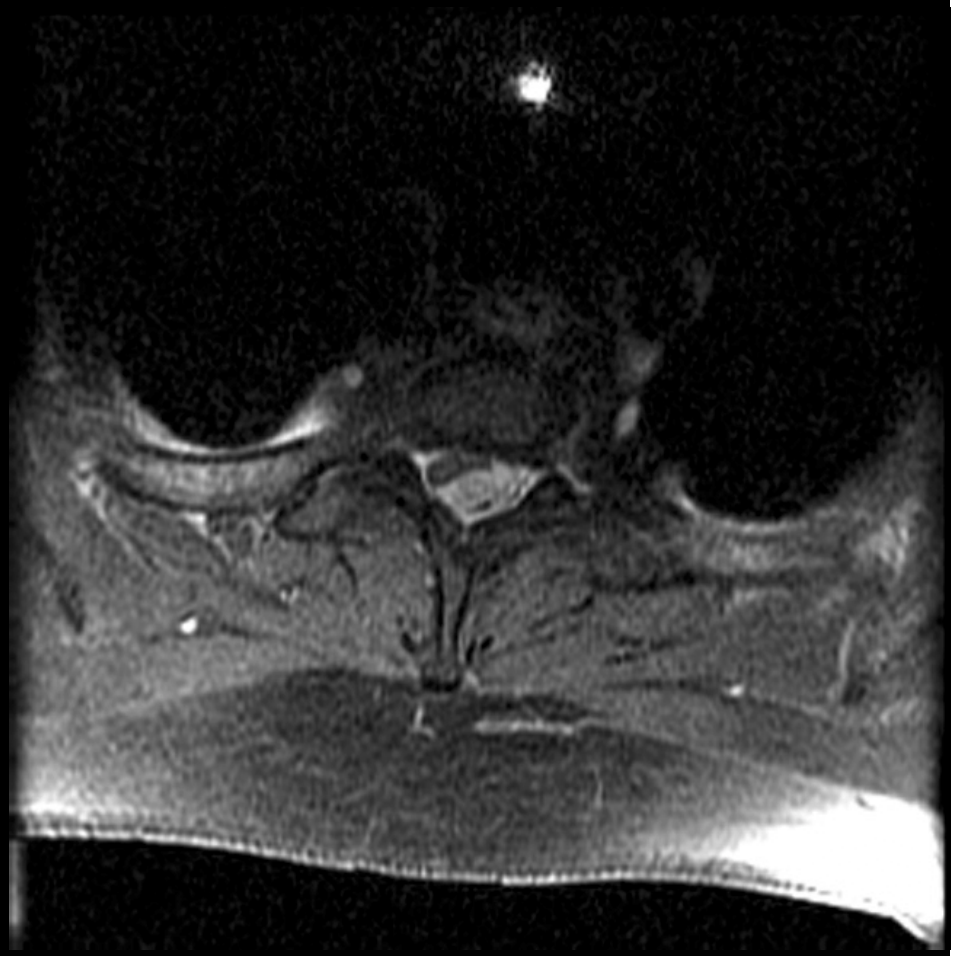
Meningioma





Meningioma





Intradural extramedullary

- Cysts and other benign tumorlike masses
  - Epidermoid
  - Dermoid

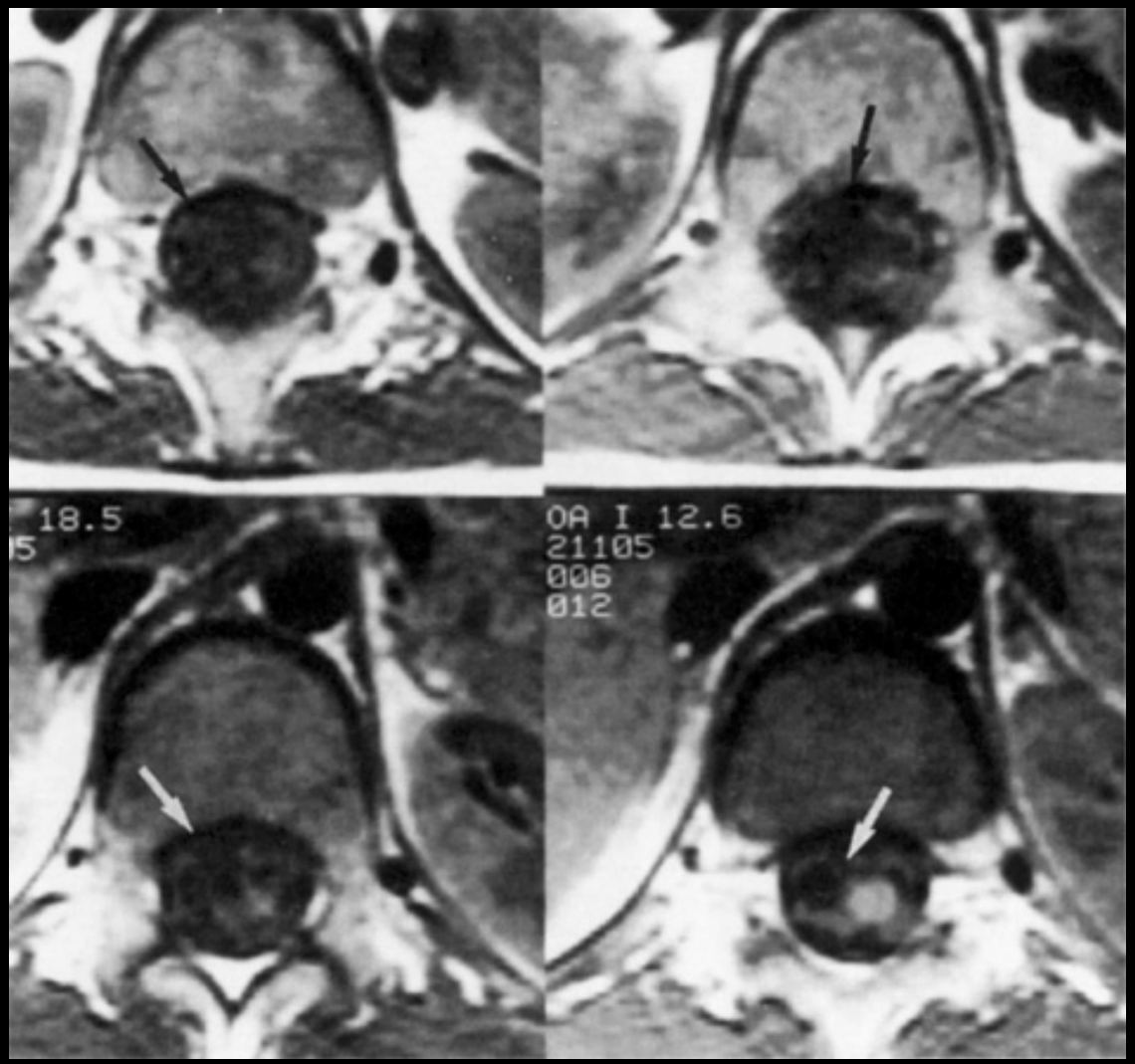
Epidermoid

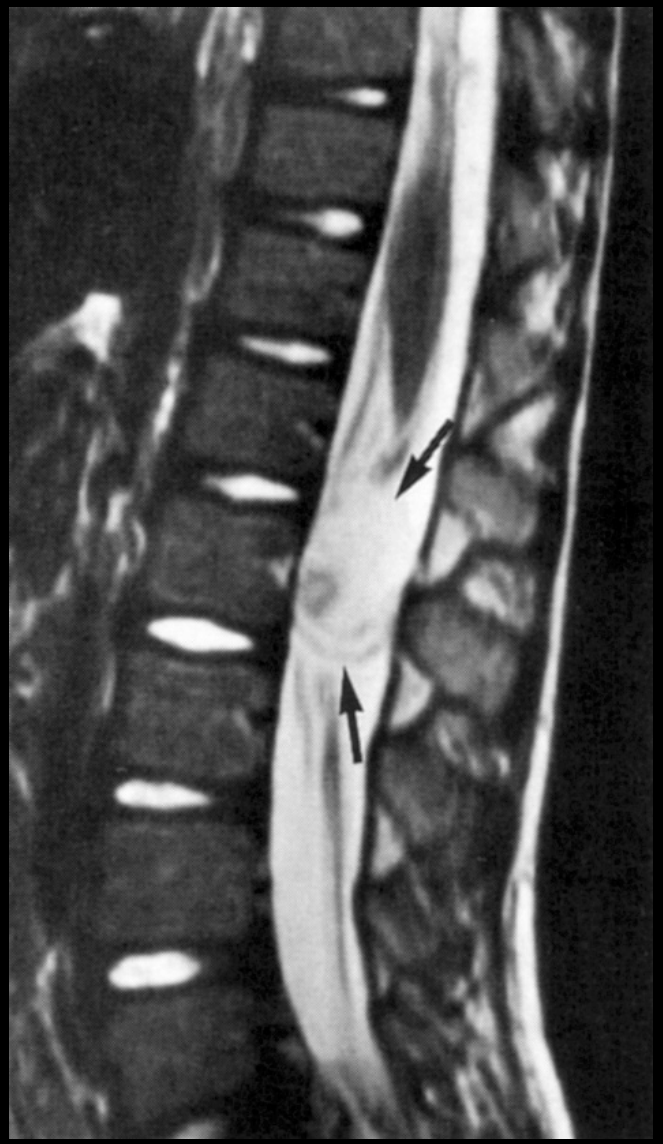
- Uncommon - can be congenital or acquired
- Acquired are considered a late complication of lumbar puncture. Epidermal elements are implanted into the spinal canal and grow slowly.
- Time interval between LP and tumor diagnosis ranges from 1 to more than 20 years

Epidermoid - imaging findings

- Variable - congenital often have associated epidermal defects such as spina bifida and hemivertebrae, acquired lack osseous abnormalities
- MR - varies but typically iso- to slightly hyperintense compared to CSF on all sequences
- Congenital usually at the conus, acquired usually in the lower lumbar region

Epidermoid

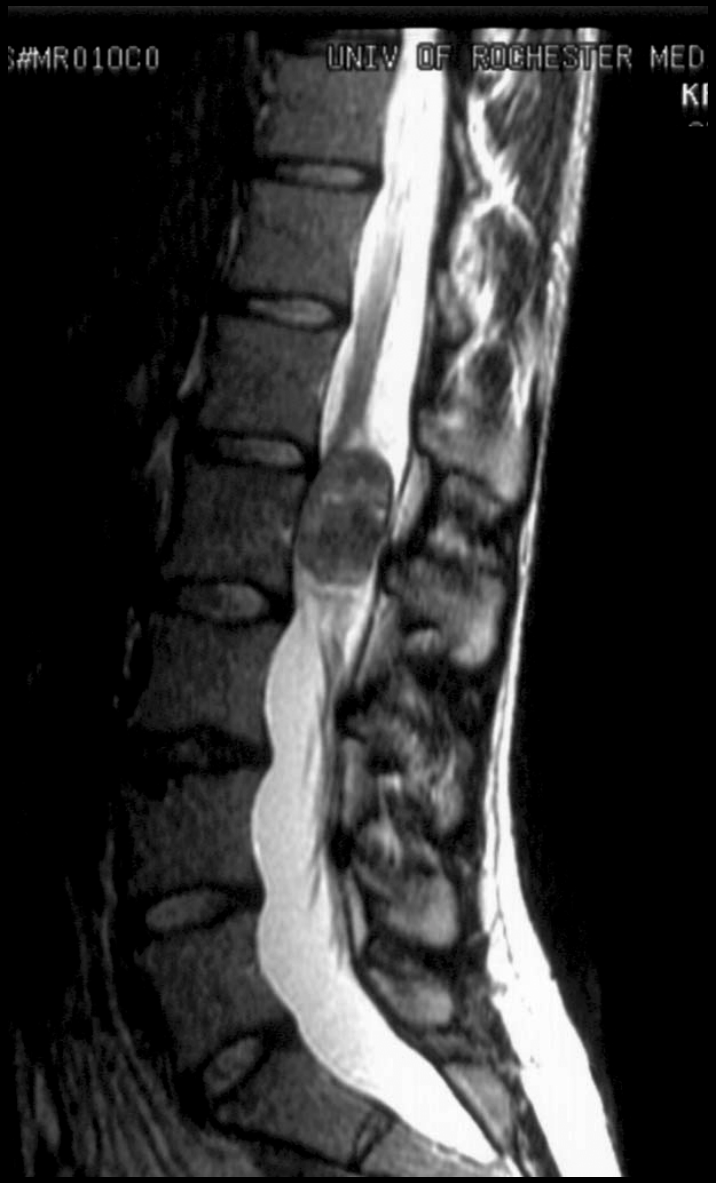


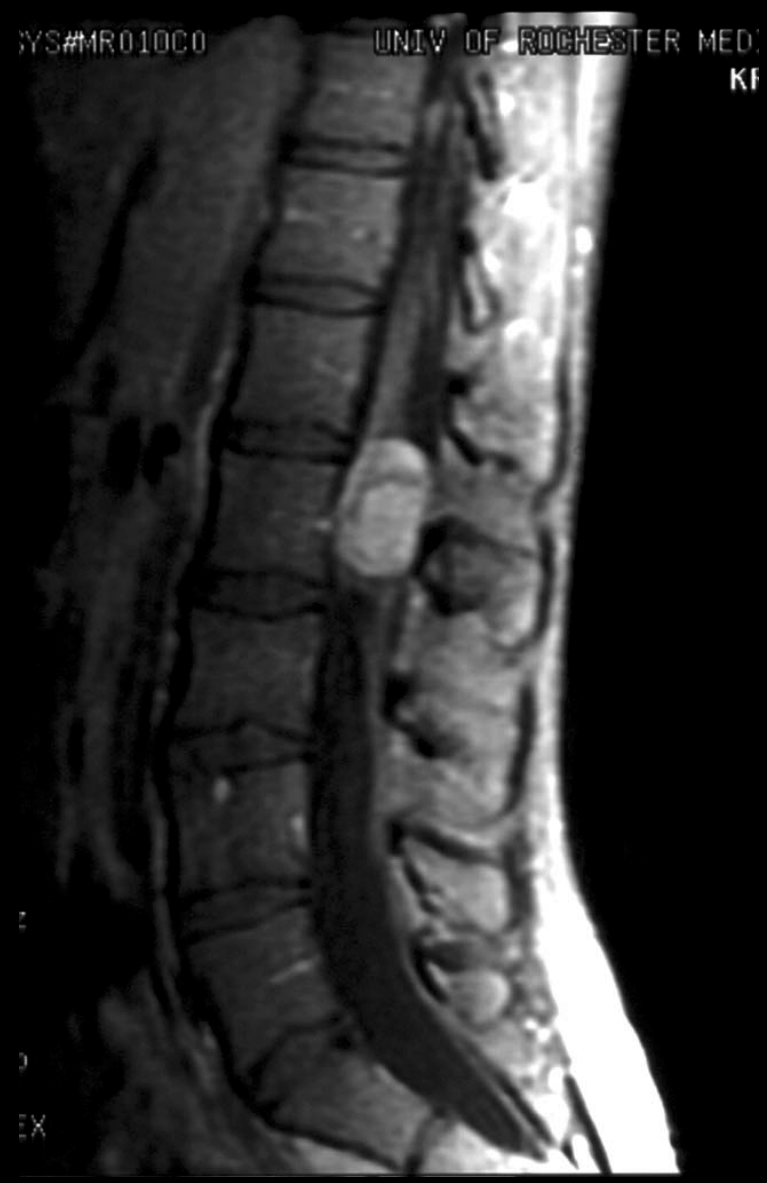


Dermoid cyst

- Considered one of the congenital midline cystic tumors
- Originate from epithelial inclusions within the neural groove
- 1/2 intramedullary and 1/2 intradural extramedullary
- Imaging - Variable but usually resemble fat

Dermoid





Intradural extramedullary

- Metastases

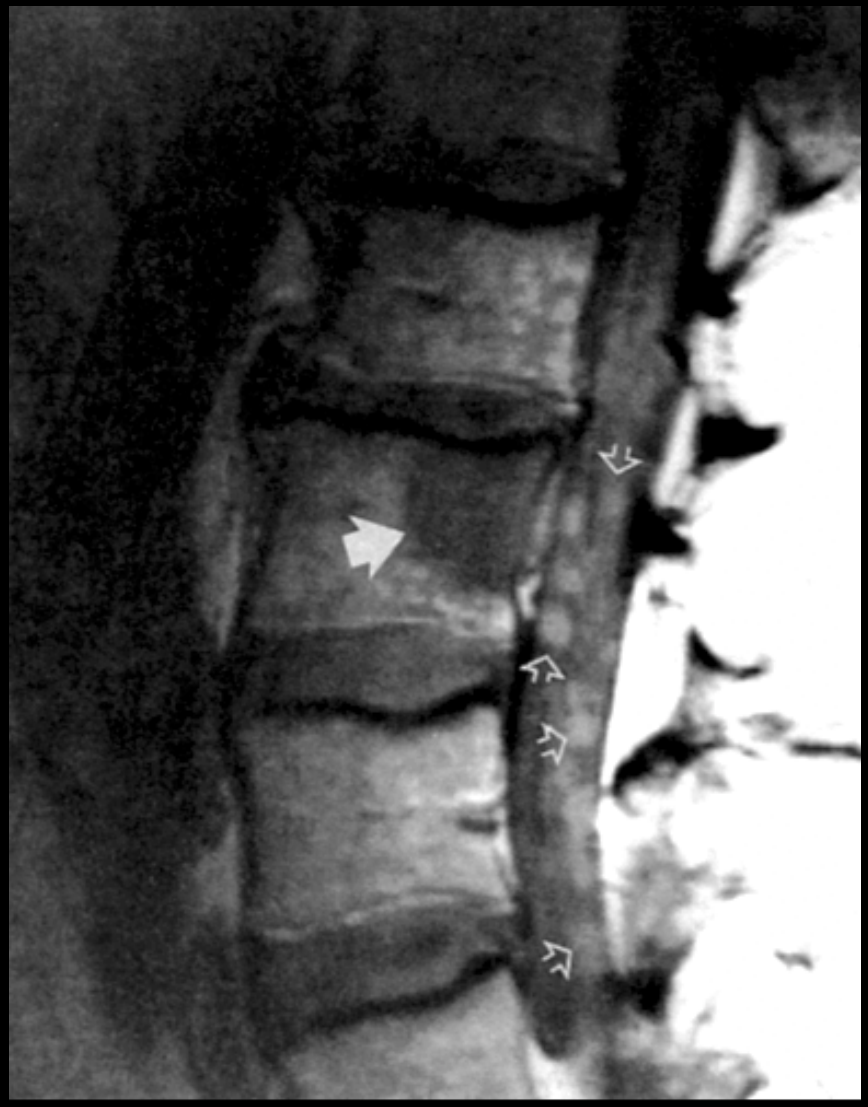
Metastatic disease

- Metastases in the spinal subarachnoid space can arise from CNS and non-CNS sources
- Disseminated spinal leptomeningeal metastatic tumor is rare
- The lumbosacral space is the most common site
- Multiple lesions are common and vary from sheetlike infiltration to nodular deposition

Metastatic disease - imaging findings

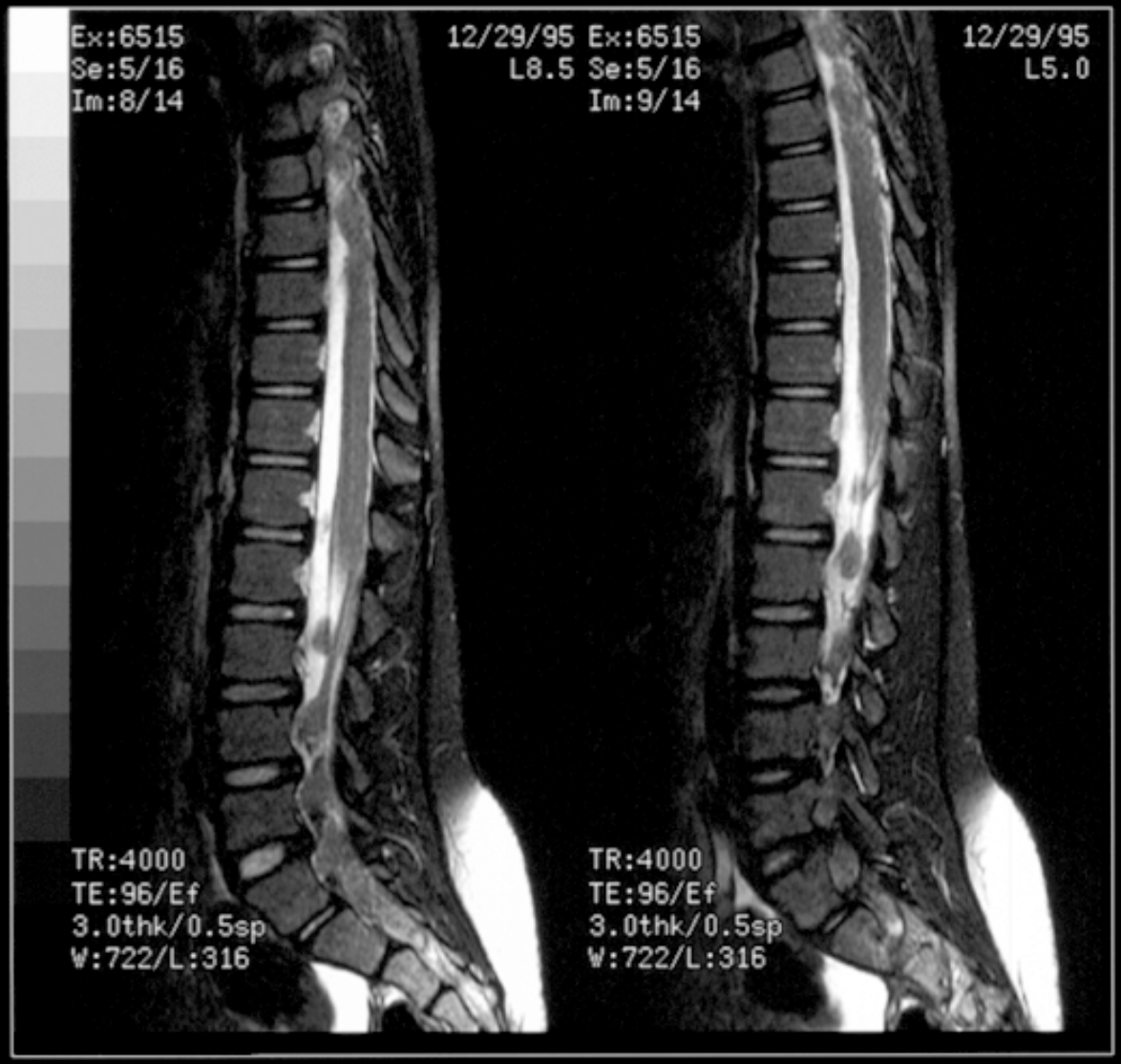
- MRI - may be normal without contrast, enhancement is usually dramatic even in small lesions
- CT - 4 patterns: nodular or plaquelike deposits, focal discrete lumbosacral mass, clumping and crowding of thickened nerve roots and root sleeve obliteration

Intradural extramedullary metastases



Osborn, A.G.; Diagnostic Neuroradiology; Mosby 1994.

Intradural extramedullary metastases



Intramedullary tumors,cysts and tumorlike masses

- Lesions of the spinal cord
- Most are malignant neoplasms
- 90-95% are gliomas - >95% of the gliomas are ependymomas and low grade astrocytomas

Intramedullary

- Benign tumors - very rare

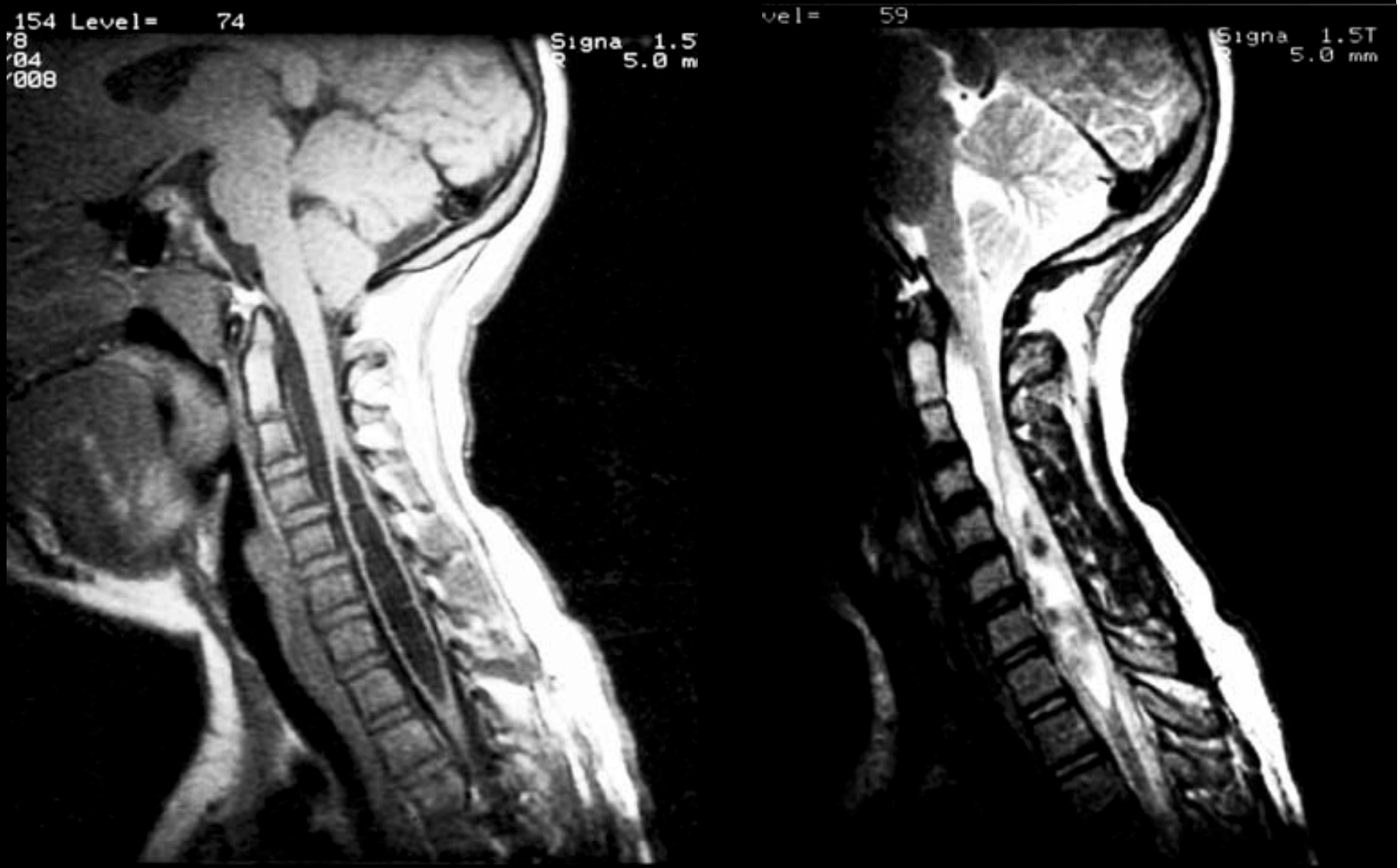
Intramedullary

- Cysts and tumorlike masses
  - Syringohydromyelia
  - Multiple Sclerosis
  - Transverse myelitis

Syringohydromyelia (syrinx)

- Any pathologic CSF-containing cord cavity
- Can mimic spinal cord tumors
- Imaging - focal or diffuse cord expansion
  MRI - cystic area with hypointensity on T1WI and hyperintensity on T2WI, no enhancement
  CT- distinct area of decreased density in the spinal cord, no enhancement

Syringohydromyelia (syrinx)



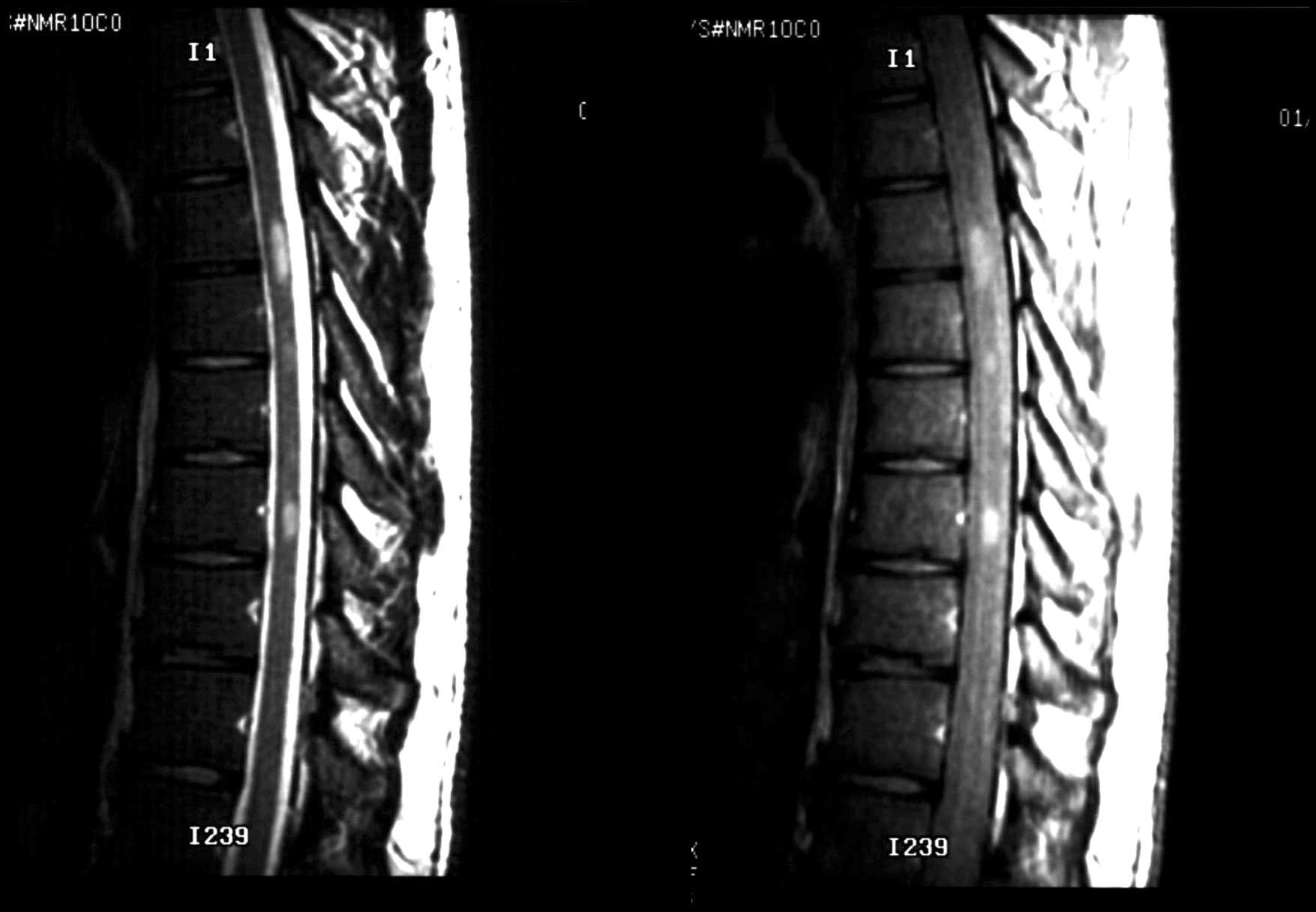
Multiple Sclerosis

- Spinal cord may be the earliest effected site
- Plaques occur preferentially in the dorsolateral cord and do not respect boundaries between gray and white matter
- Distinct female predominance
- Early, there is a distinct predilection for the cervical cord. In later stages, plaques are evenly distributed.

Multiple Sclerosis - imaging findings

- MRI - the most common finding on T2WI is one or more elongated, poorly marginated, hyperintense intramedullary lesions, particularly if focal or generalized cord atrophy is identified on T1WI. Acute lesions may have mass effect and enhance following contrast.

Multiple Sclerosis



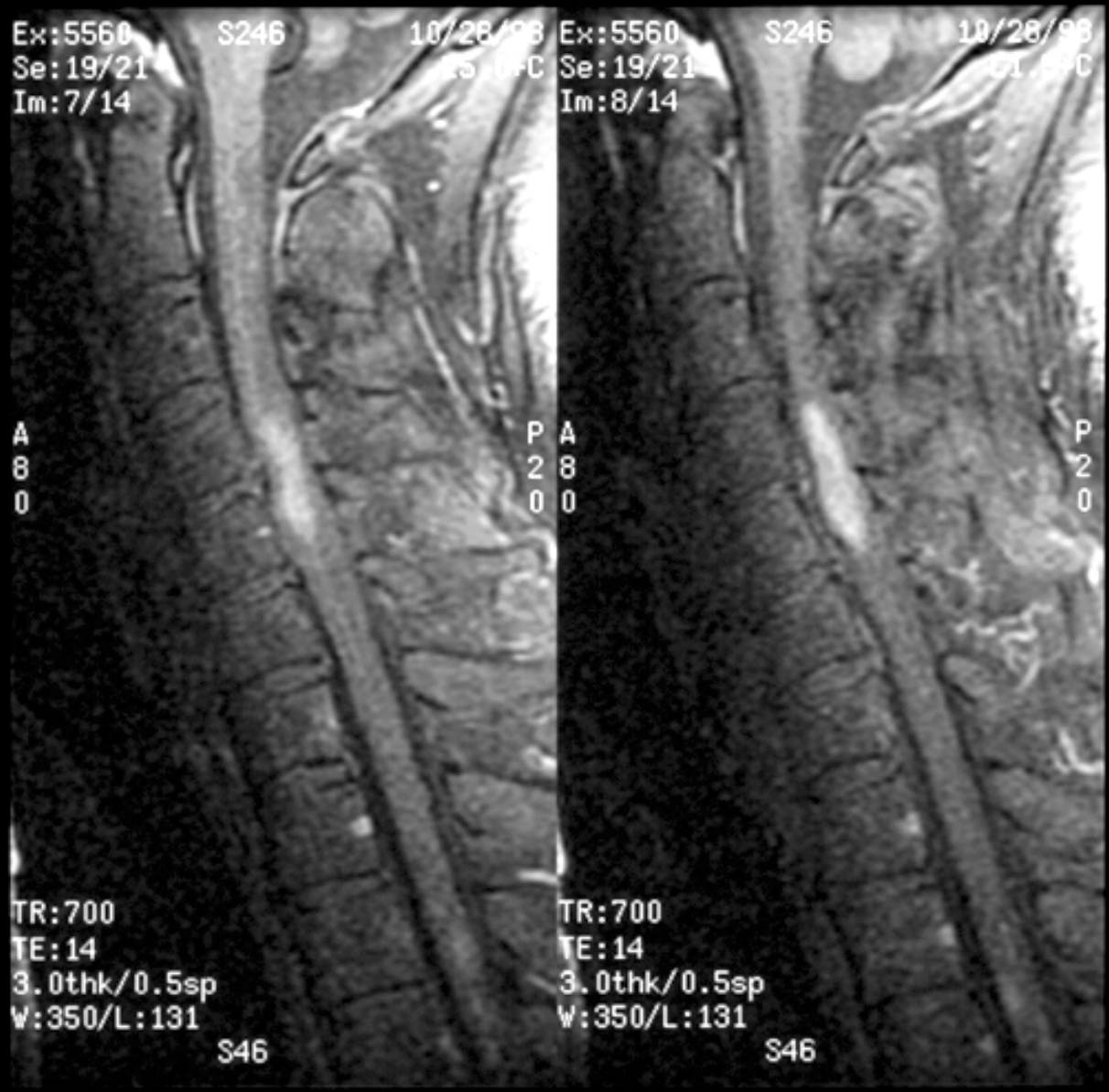
Transverse myelitis

- Also called acute transverse myelopathy
- Not a true disease but a clinical syndrome with diverse causes
- Slight predilection for the thoracic cord. Multilevel involvement is typical

Transverse myelitis - imaging findings

- The major role in imaging is the define a treatable cause that can mimic TM
- MRI - normal in 1/2 the cases in the acute phase and nonspecific in the remainder. Focal cord enlargement on T1- and poorly delineated hyperintensities on T2WI are the most common findings. Enhancement occurs in some cases

Transverse Myelitis



Intramedullary

- Malignant tumors
  - Ependymoma
  - Astrocytoma
  - Hemangioblastoma

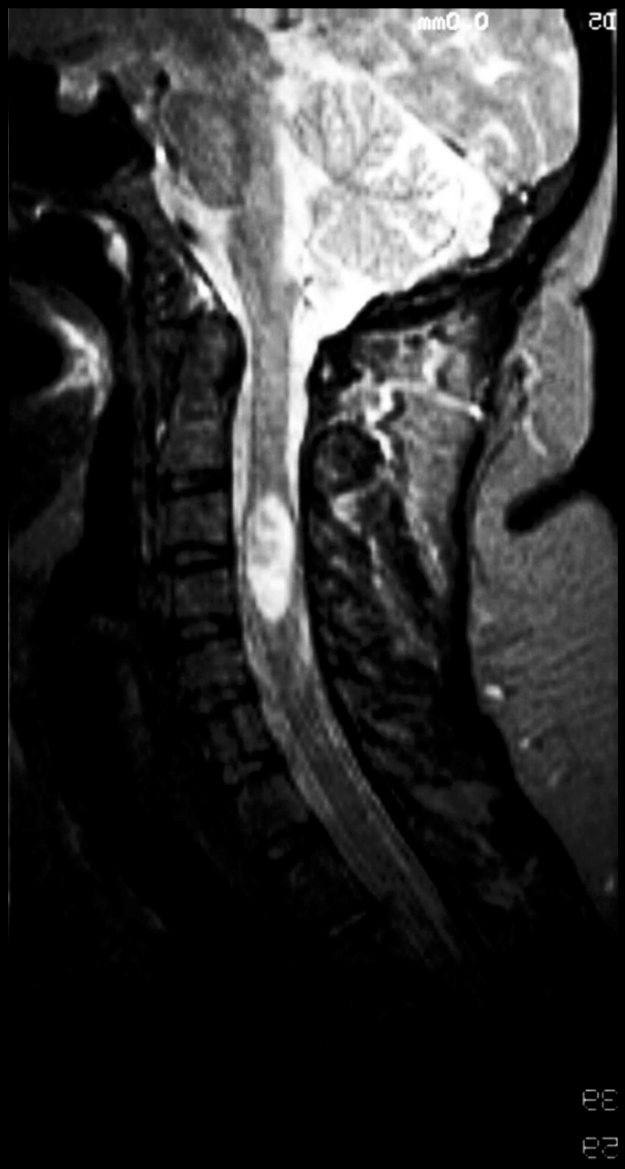
Ependymomas

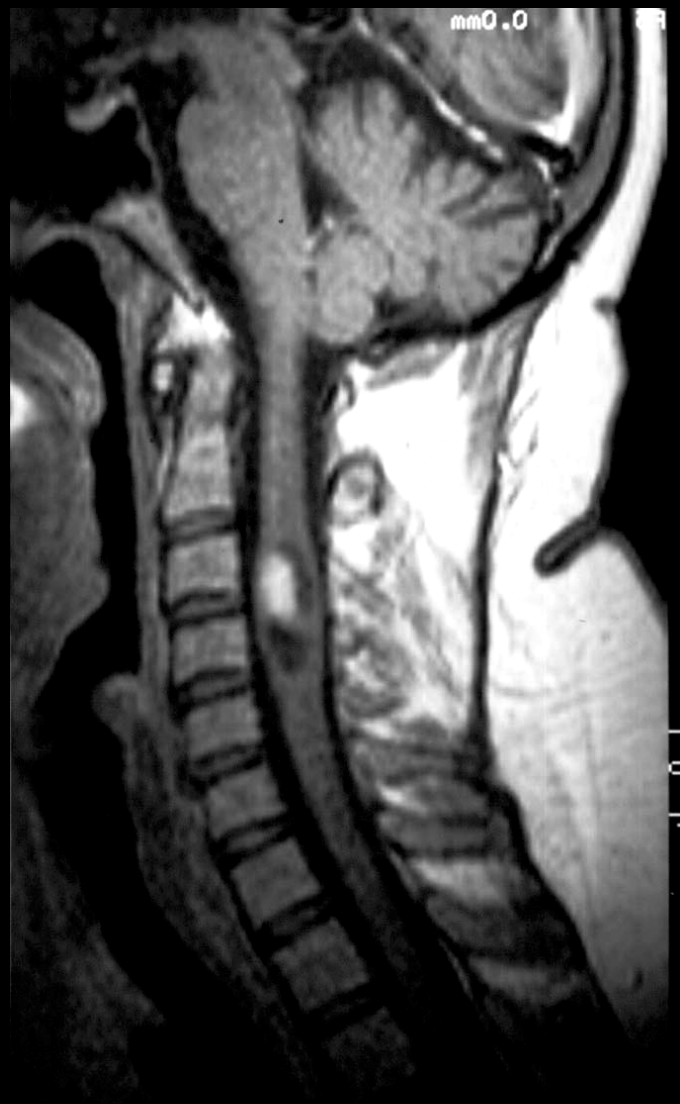
- Arise from ependymal cells lining the central canal. Intramedullary are typically cellular ependymomas
- Cystic degeneration occurs in most cases and hemorrhage is common
- Symmetric cord expansion is typical
- The most common intramedullary tumor in adults - 60% of glial spinal tumors

Ependymoma - imaging findings

- MRI - shows a widened cord or filum terminale mass. Most are isointense compared to cord on T1WI and hyperintense on T2WI. Hypointensity at the tumor margin is suggestive of ependymoma. Nearly all strongly enhance
- CT and plain films- May show nonspecific canal widening or bone destruction

Ependymoma





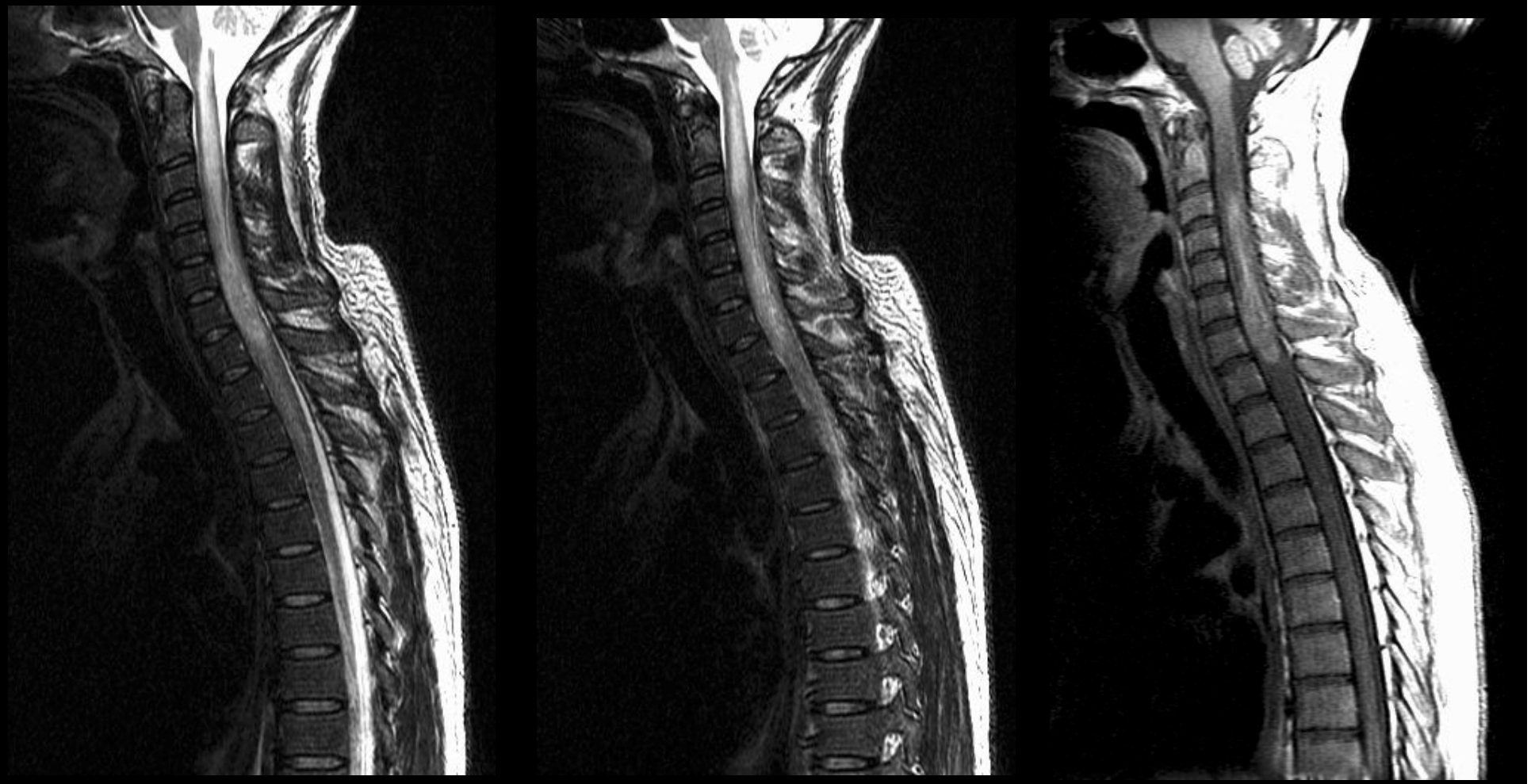
Astrocytoma

- Most are low-grade tumors
- Intratumoral cyst formation and associated syrinx are common
- 30% of spinal cord gliomas, the most common cord tumor in children
- Cervical spine most common
- Cause of back pain, painful scoliosis in children

Astrocytoma - imaging findings

- MRI - iso- to slightly hypointense on T1WI and hyperintense on T2WI, essentially all enhance. Tumor, syrinx and cysts can be delineated.
- CT - may show a widened canal
- Plain films - often normal or show only a mild scoliosis

Astrocytoma



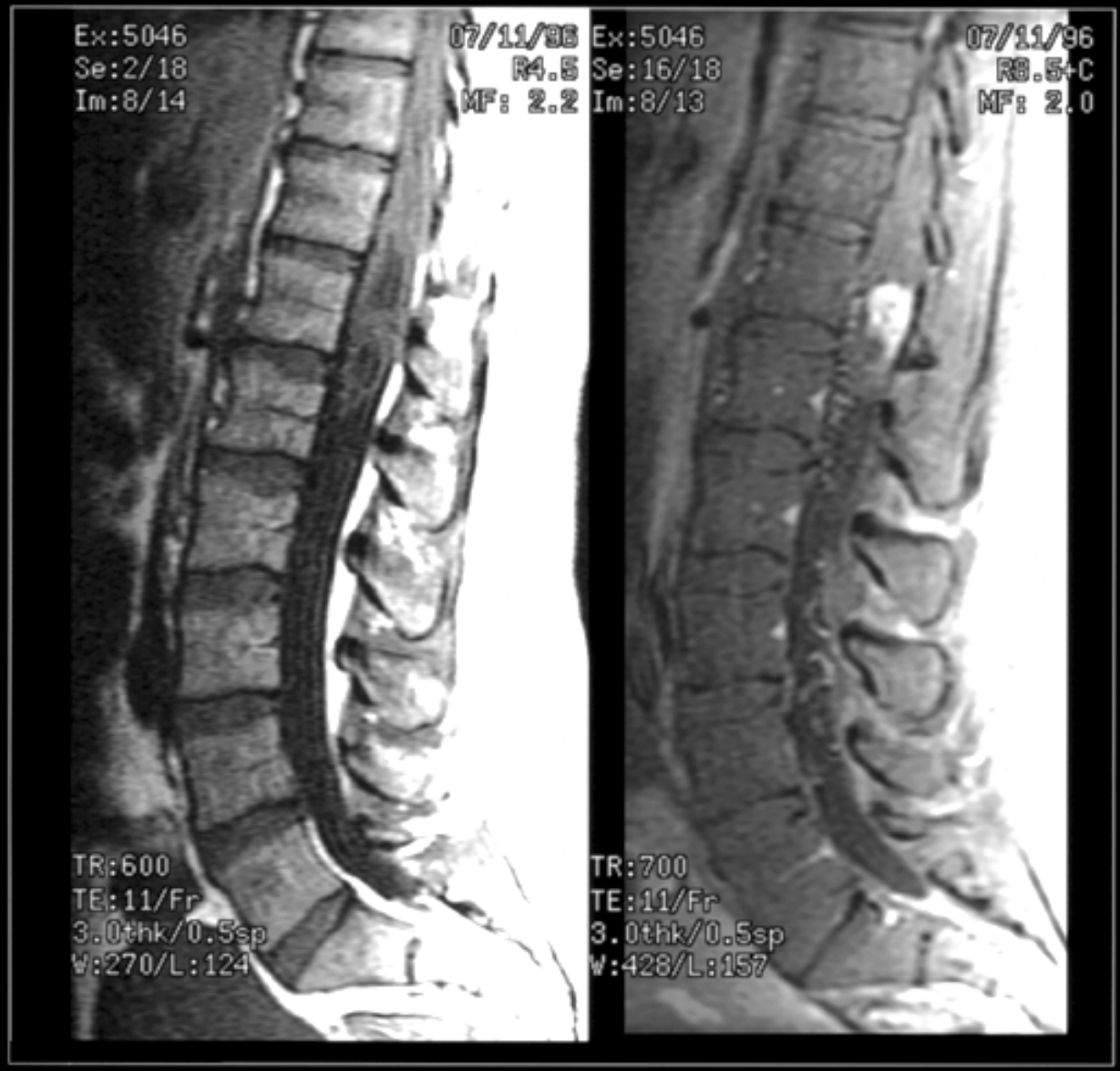
Hemangioblastoma

- Rare tumors that typically have a highly vascular nodule with an extensive cyst that diffusely enlarges the cord
- Sensory changes, typically impaired proprioception is the most common presenting symptom
- 1/3 with spinal cord hemangioblastoma have von Hippel-Lindau syndrome

Hemangioblastoma - imaging findings

- MRI - often demonstrates diffuse cord expansion with hyperintensity on T2WI and flow voids. Cyst formation or syrinx is common. Tumor nodule strongly enhances.
- Angiography - a highly vascular mass with dense, prolonged tumor stain and prominent draining vessels

Hemangioblastoma



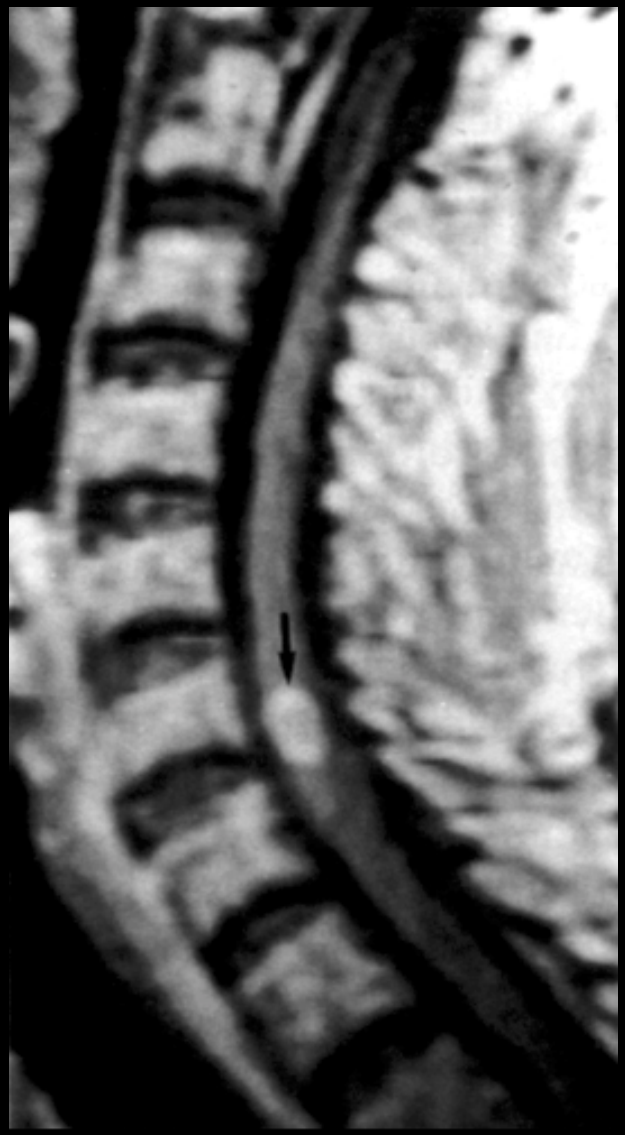
Intramedullary

- Metastases

Metastases

- Intramedullary metastases are rare
- Common primary malignancies are breast and lung carcinomas, lymphoma, leukemia and malignant melanoma
- Imaging - thin rim of enhancement along the cord surface on postcontrast T1WI. Focal nodular pial and intraparenchymal lesions occur but are less common

Intradural metastasis



Osborn, A.G.; Diagnostic Neuroradiology; Mosby 1994.

Spinal Cord Tumors

presented by:

Margaret Hollar, D.O.

developed for the web by:

URMC Radiology Graphics