Radiology of Brain & Spine Diseases

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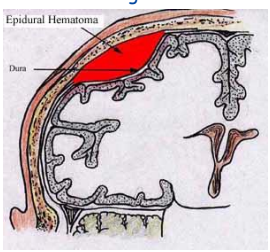
Head trauma

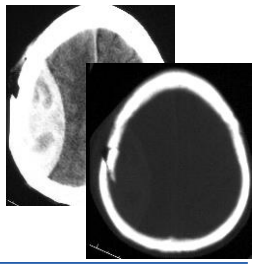
- A major cause of death & fatal morbidity in young adults (15-24 ages)
- M/F: 2-3/1
- Imaging
  - Severity of trauma
  - Treatment options
  - Fast & effective
- CT is first choice of modality
  - Acute hematoma
  - Fractures
- MRI
  - DAI, SAH, temporal
  - Vascular injury
- DSA
  - Dissection
  - Pseudoaneurysm, AVF

Epidural hematoma

Fractures
A. meningea media

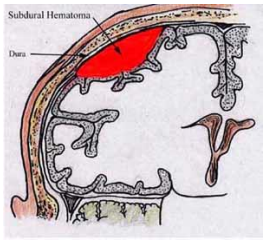


Between tabula & dura
Within sutures



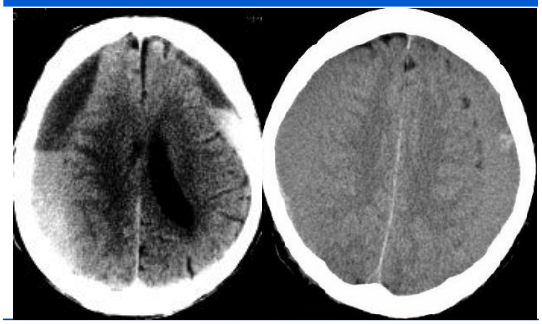
Subdural hematoma

Ruptrure of briding veins due to trauma



Between dura & arachnoid
Beyond sutures

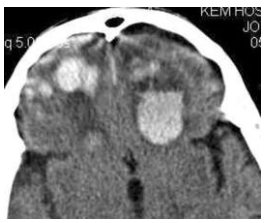
Subdural hematoma



Hemorrhagic contusion

Petechial hemorrhage

Frontal & temporal lobes

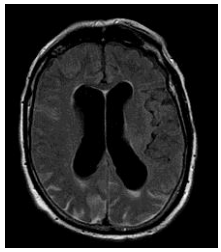


BAD PROGNOSIS

Subarachnoid hemorrhage

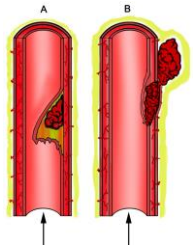
Aneurysmal rupture

Between arachnoid & pia

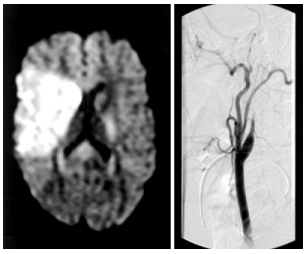


Dissection

Subendothelial hemorhage



Carotid-vertebral arteries

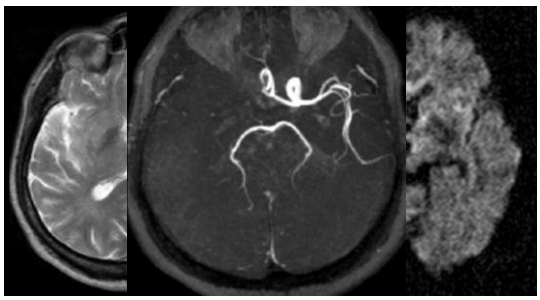


Stroke

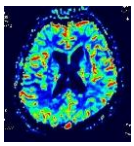
Functional impairment due to corruption of blood flow

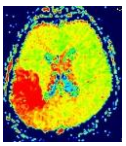
Emboli, thrombosis, hemorrhage

Acute infarction



Penumbra

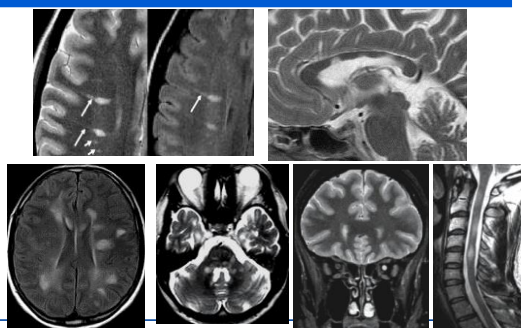




White matter diseases

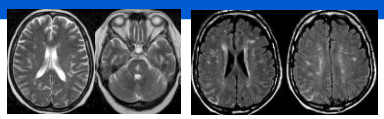
- Increased T1/T2 time
  - Axonal degeneration
  - Inflammation
  - Edema
  - Gliozis
  - DDx is not possible
- Dysmyelinating diseases
  - Oligodendrocyte dysfunction
  - Congenital/hereditary
- Demyelinating diseases
  - Myelin breakdown
  - Autoimmunity ?
  - Acquired

Multiple sklerosis



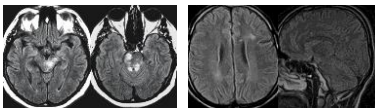
Vasculitis

SLE



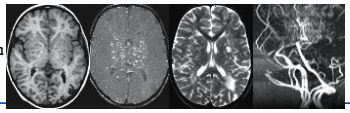
Sarcoidosis

Behçet



Sjogren

Moya-moya

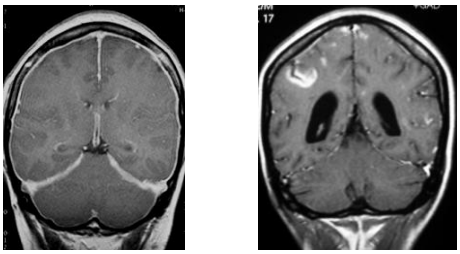


14

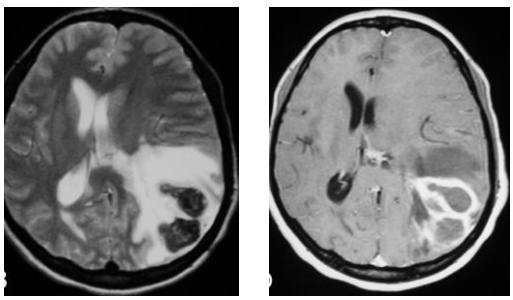
Meningitis

Infection of leptomeninx

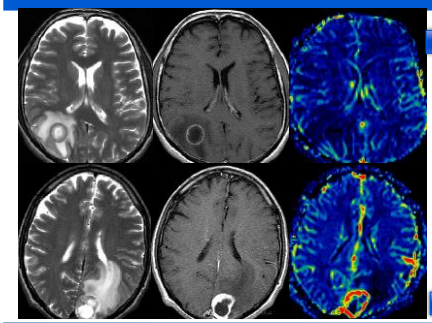
Bacteria, TB, Prion, Virus



Abscess



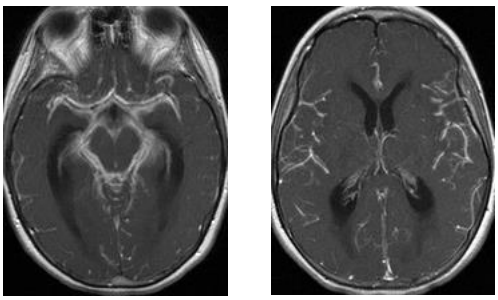
Abscess vs Metastasis



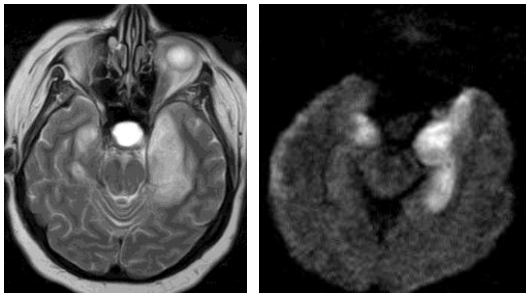
Bacterial abscess

RCC metastasis

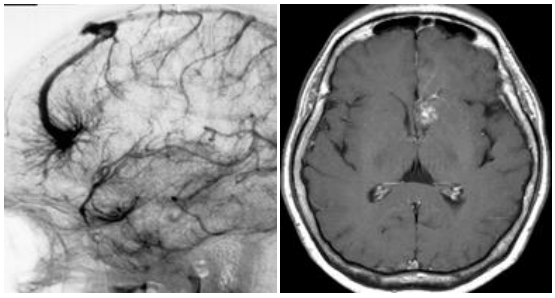
TB



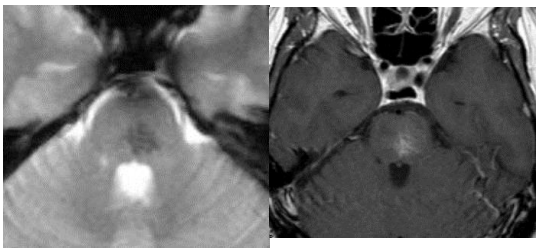
HSV encephalitis



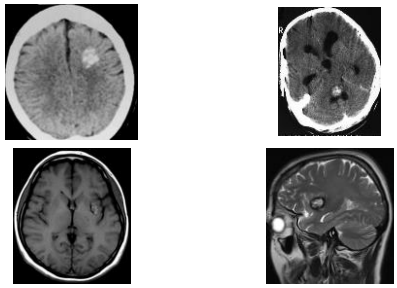
Developmental venous anomaly



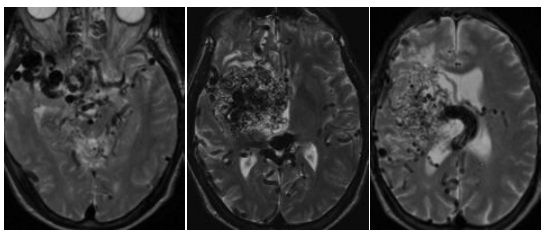
Capillary telengiectasy



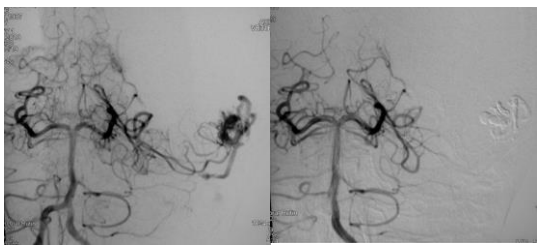
Cavernous hemangioma



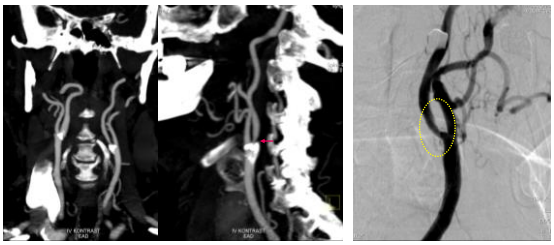
AVM



AVM Embolization

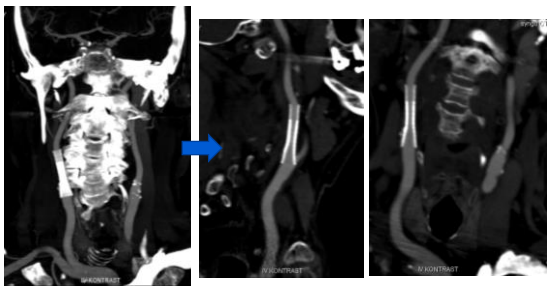


Carotid AS disease

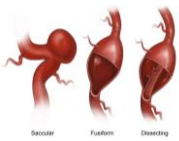


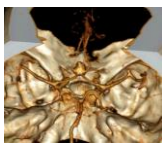
25

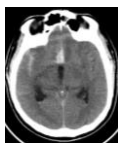
Stent evaluation

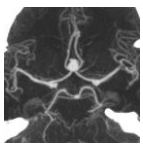


Anevrizma

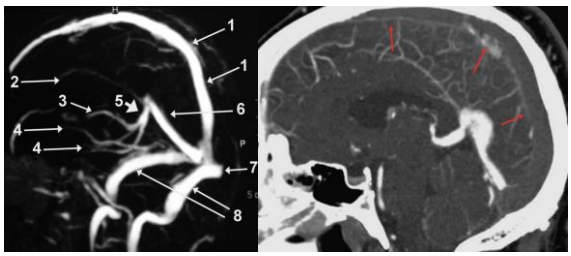




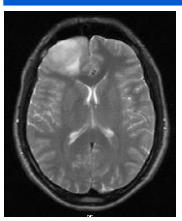


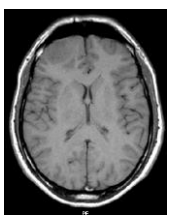


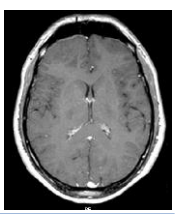
Venous sinus occlusion



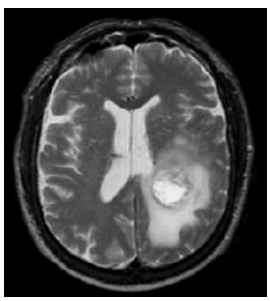
LGG

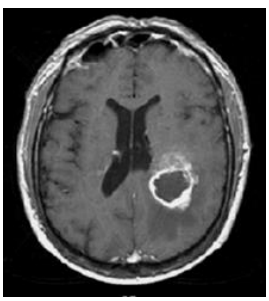




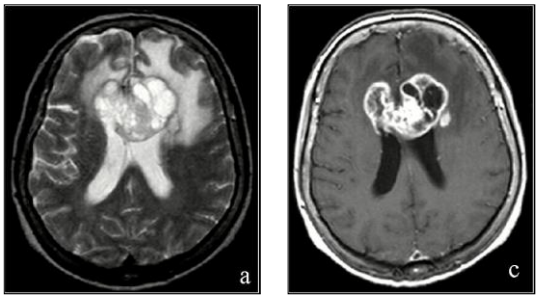


HGG

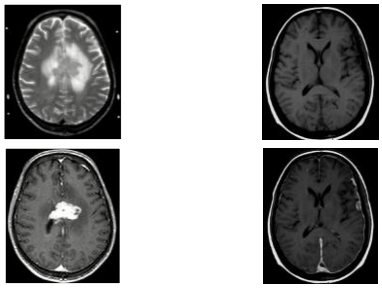




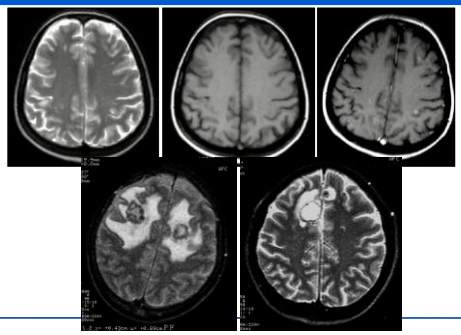
GBM



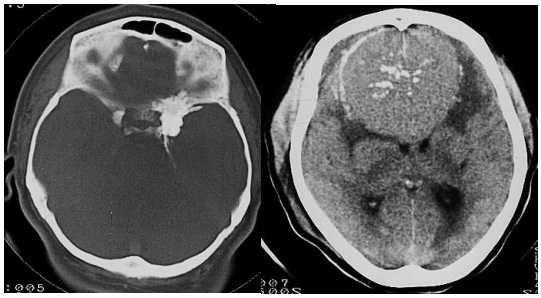
Lymphoma



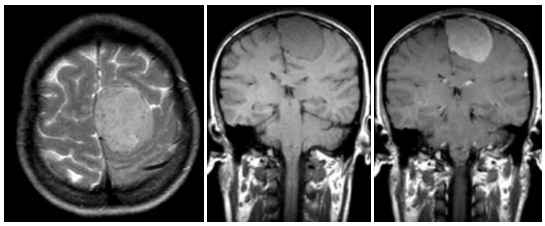
Metastasis



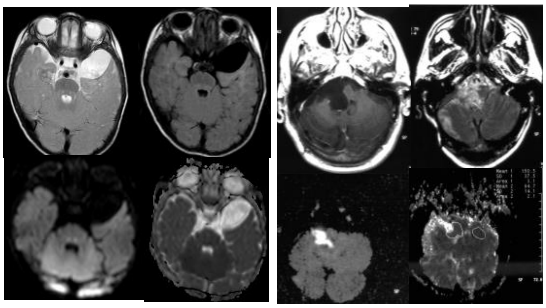
Meningioma



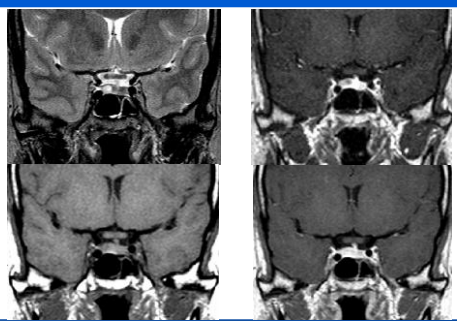
Meningioma



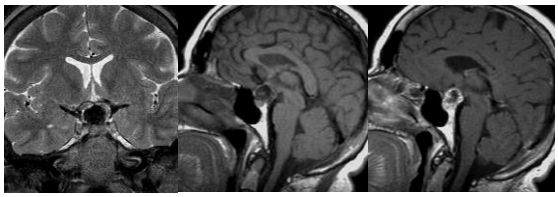
Arachnoid cyst Epidermoid cyst



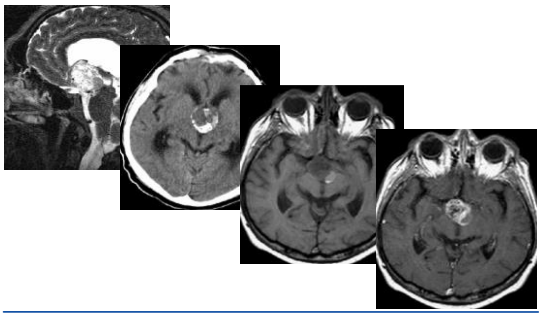
Microadenoma



Macroadenoma



Craniopharyngeoma



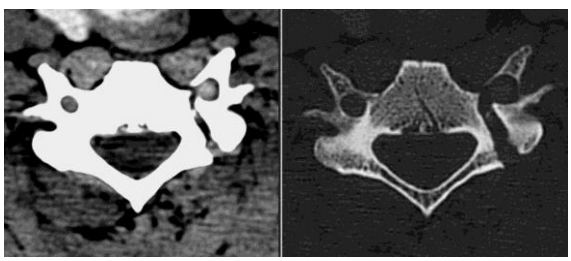
Spine Pathology

- Trauma
- Degenerative disease
- Tumors and other masses
- Inflammation and infection
- Vascular disorders
- Congenital anomalies

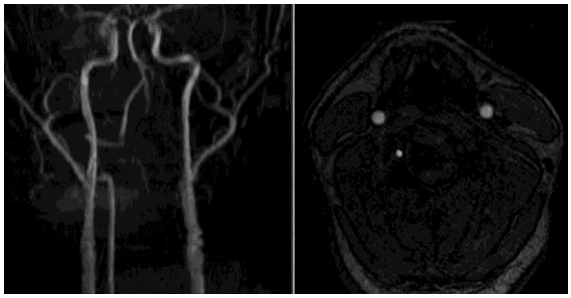
3D Reconstruction

Acquire images axially…

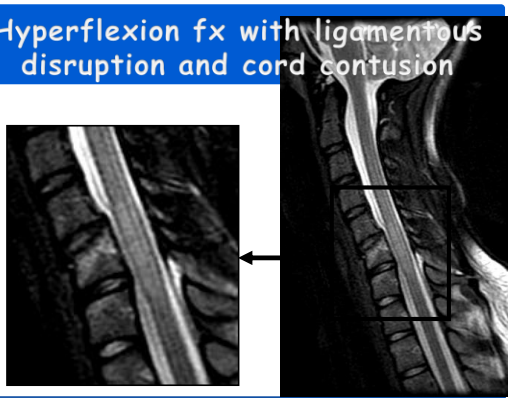
…reconstruct sagittal / coronal



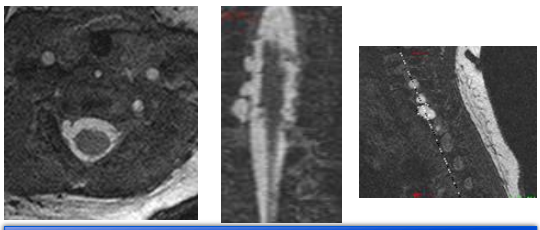
Vertebral Artery Dissection Occlusion due to C6 Fracture



Hyperflexion fx with ligamentous disruption and cord contusion

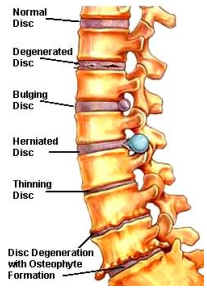


Nerve root avulsion

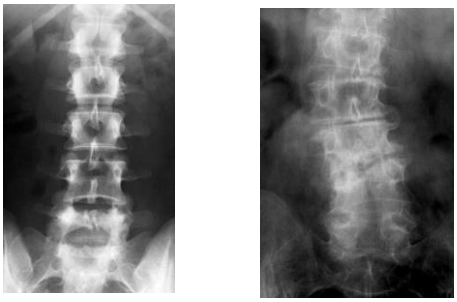


Axial Coronal Sagittal

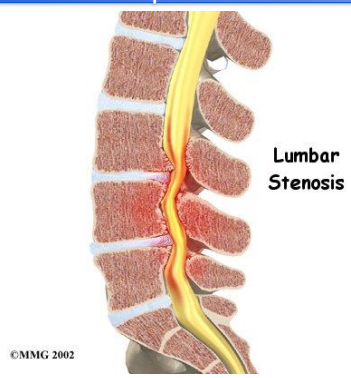
Degenerative Disc Disease



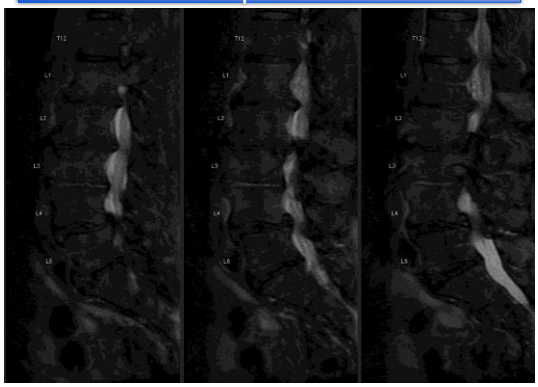
Degenerative Disc Disease



Lumbar Spinal Stenosis

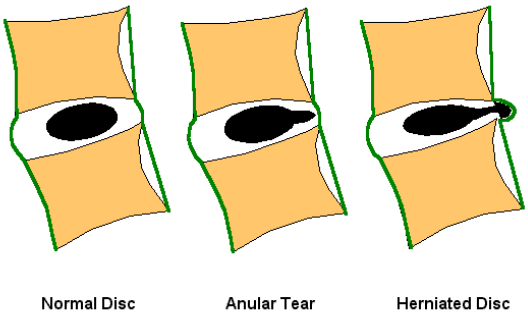


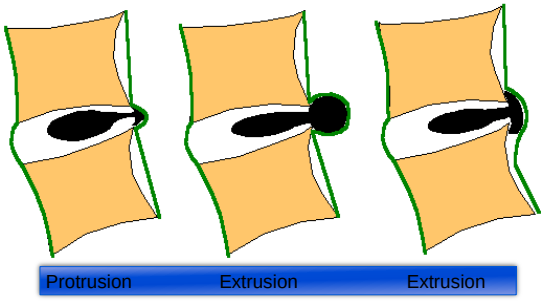
Lumbar Spinal Stenosis



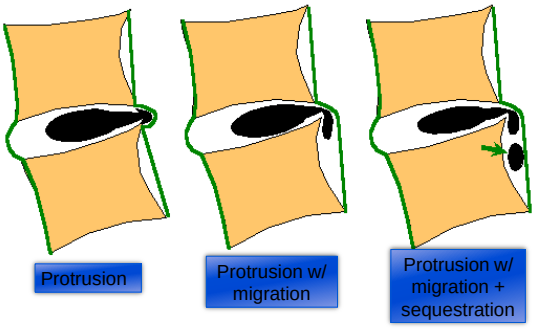
MRI – Herniated Disc Levels

- 85-95% at L4-L5, L5-S1
- 5-8% at L3-L4
- 2% at L2-L3
- 1% at L1-L2, T12-L1
- Cervical: most common C4-C7
- Thoracic: 15% in asymptomatic pts. at multiple levels, not often symptomatic



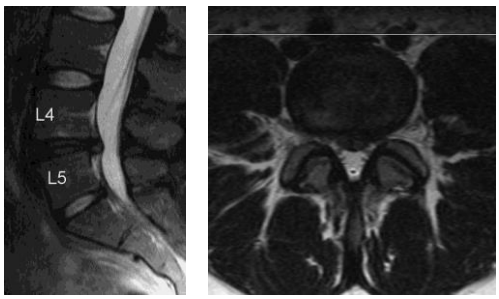


Adapted from: "Nomenclature and Classification of Lumbar Disc Pathology: Recommendations of the Combined Task Forces of the North American Spine Society, American Society of Spine Radiology, and American Society of Neuroradiology." 2001.

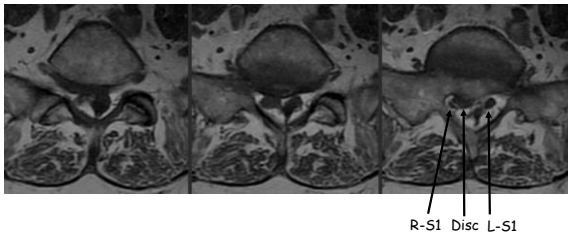


Adapted from: "Nomenclature and Classification of Lumbar Disc Pathology: Recommendations of the Combined Task Forces of the North American Spine Society, American Society of Spine Radiology, and American Society of Neuroradiology." 2001.

Central Disc Protrusion

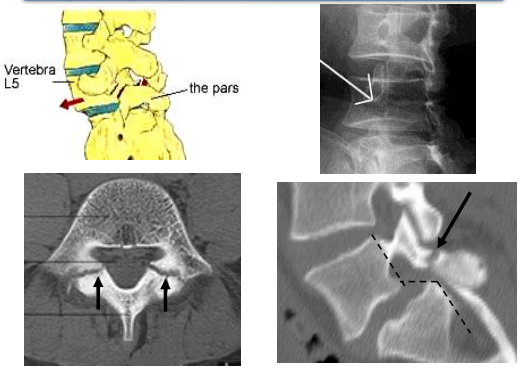


L5-S1 Disc Extrusion Into Lateral Recess with Impingement of R S1 Nerve Root



Schmorl's Nodes

Spondylolysis / Spondylolisthesis



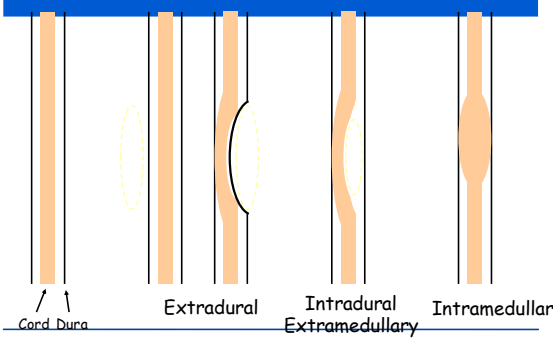
Confusing "Spondy-" Terminology

- Spondylosis = "spondylosis deformans" = degenerative spine
- Spondylitis = inflamed spine (e.g. ankylosing, pyogenic, etc.)
- Spondylolysis = chronic fracture of pars interarticularis with nonunion ("pars defect")
- Spondylolisthesis = anterior slippage of vertebra typically resulting from bilateral pars defects
- Pseudospondylolisthesis = "degenerative spondylolisthesis" (spondylolisthesis resulting from degenerative disease rather than pars defects)

Classification of Spinal Lesions

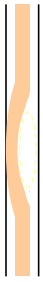
- Extradural = outside the thecal sac (including vertebral bone lesions)
- Intradural / extramedullary = within thecal sac but outside cord
- Intramedullary = within cord

Classification of Spinal Lesions

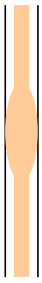


Extradural: Vertebral Body Tumor

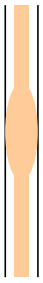
Intradural Extramedullary: Meningioma



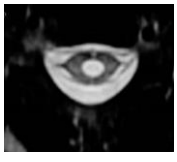
Intramedullary: Astrocytoma



Intramedullary: Cavernoma



Intramedullary: Syringohydromyelia



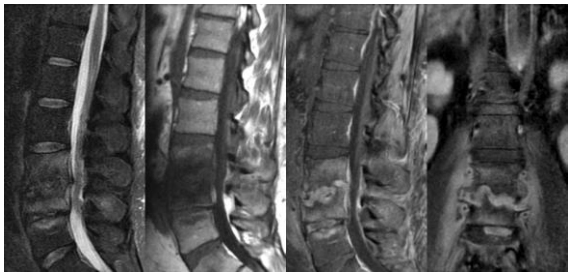
Confusing "Syrinx" Terminology

- Hydromyelia: Fluid accumulation/dilatation within central canal, therefore lined by ependyma
- Syringomyelia: Cavitary lesion within cord parenchyma, of any cause (there are many). Located adjacent to central canal, therefore not lined by ependyma
- Syringohydromyelia: Term used for either of the above, since the two may overlap and cannot be discriminated on imaging
- Hydrosyringomyelia: Same as syringohydromyelia
- Syrinx: Common term for the cavity in all of the above

Infectious Spondylitis / Diskitis

- Common chain of events (bacterial spondylitis):
  - Hematogenous seeding of subchondral VB
  - Spread to disc and adjacent VB
  - Spread into epidural space → epidural abscess
  - Spread into paraspinal tissues → psoas abscess
  - May lead to cord abscess

Infectious Spondylitis / Diskitis



T2 T1 T1+C

Transverse Myelitis

- Inflamed cord of uncertain cause
  - Viral infections
  - Immune reactions
  - Idiopathic
- Myelopathy progressing over hours to weeks
- DDX: MS, glioma, infarction

Multiple Sclerosis