

Disorders of CSF Spaces

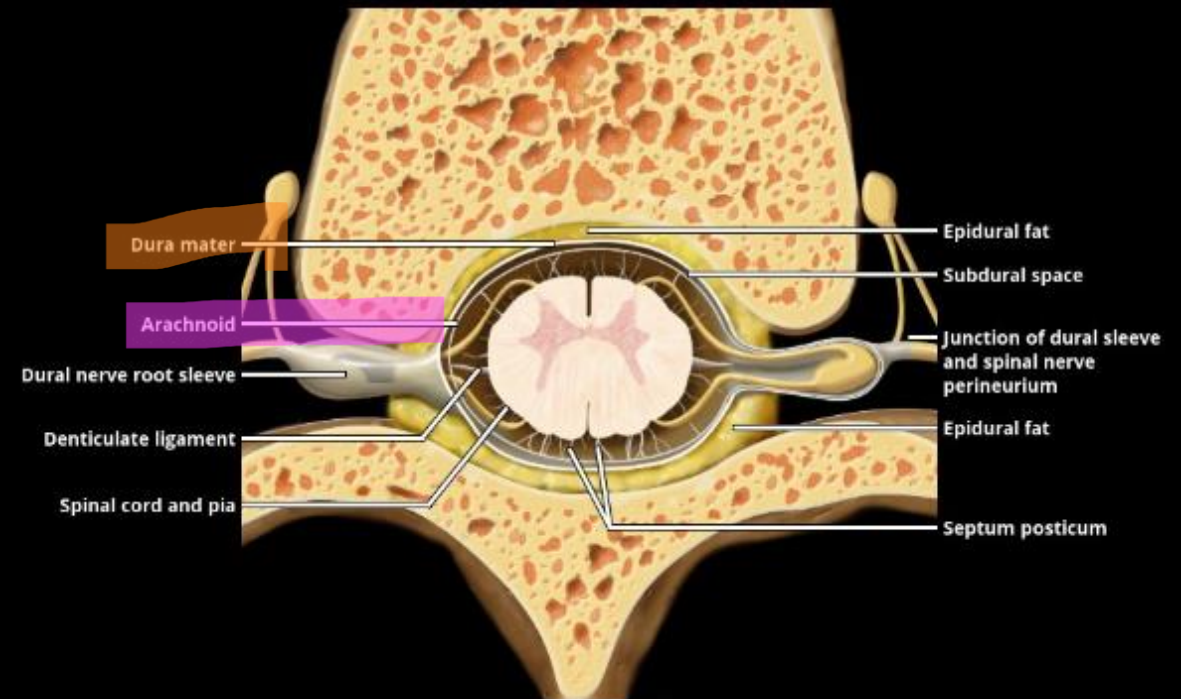
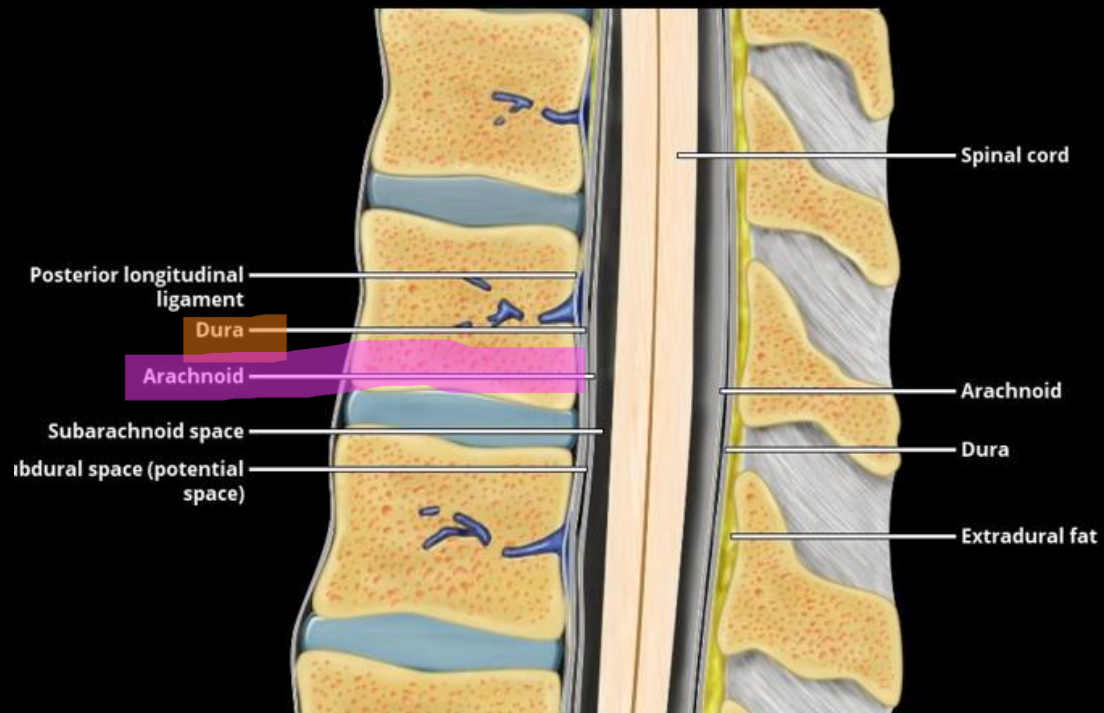
Vee Prattipati M.D.

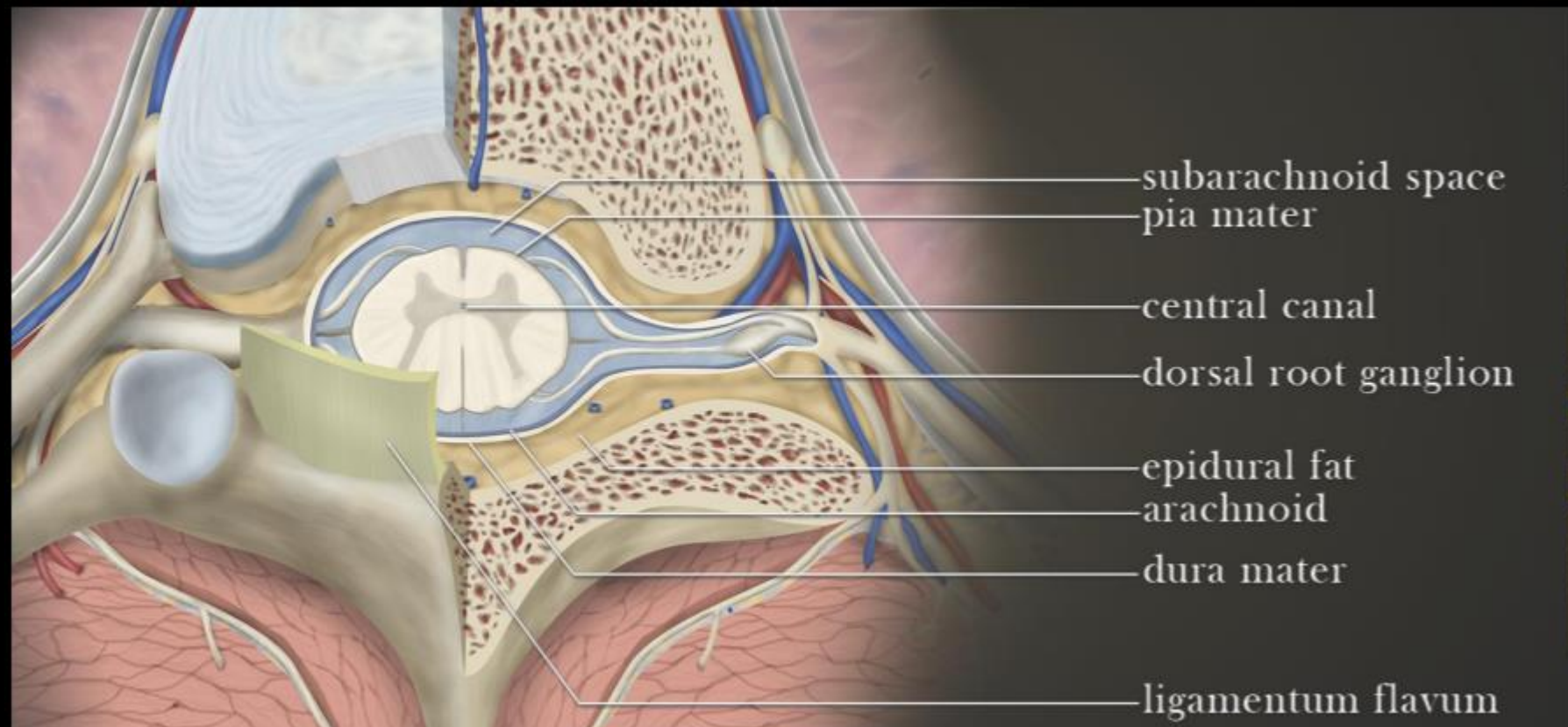
University of Alabama at Birmingham

Overview

- Anatomy of meninges and familiarize about spaces
- Lesions of epidural and subdural spaces
- Intracranial hypotension

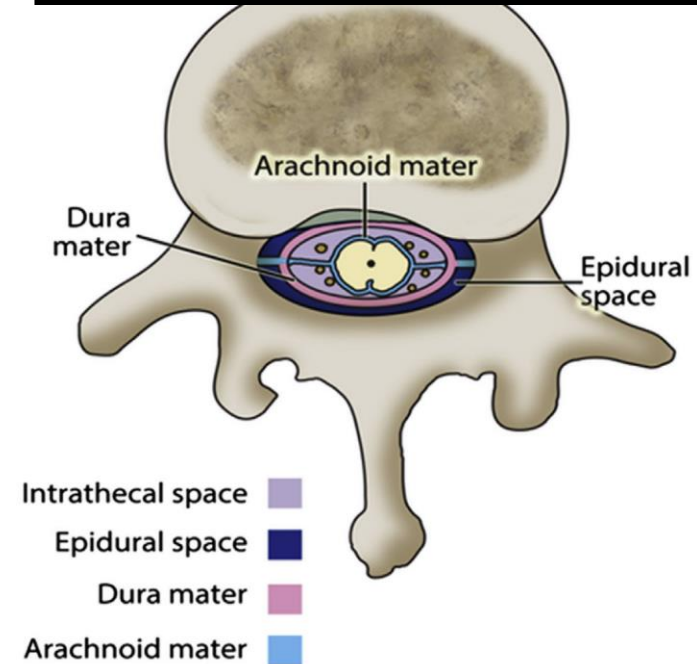
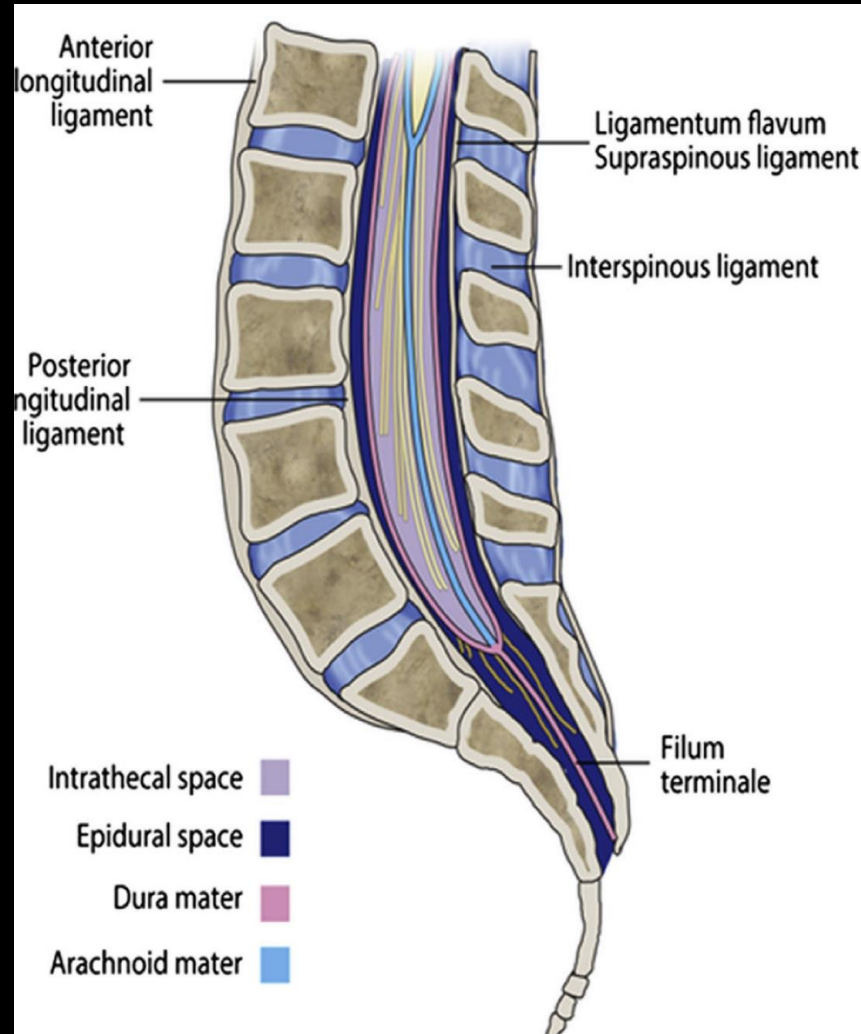
Meninges and Anatomy



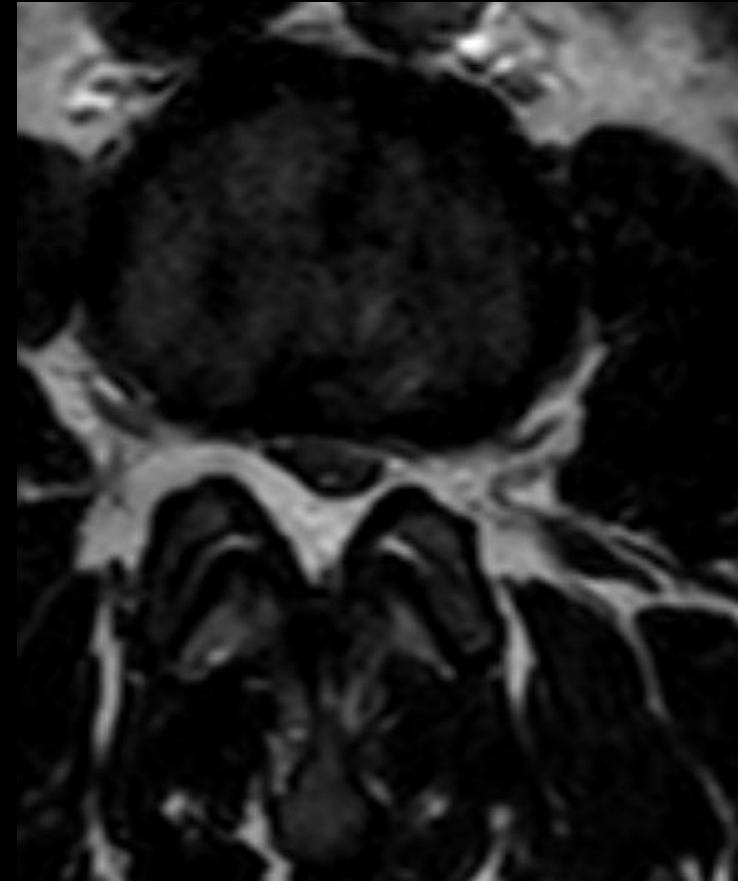
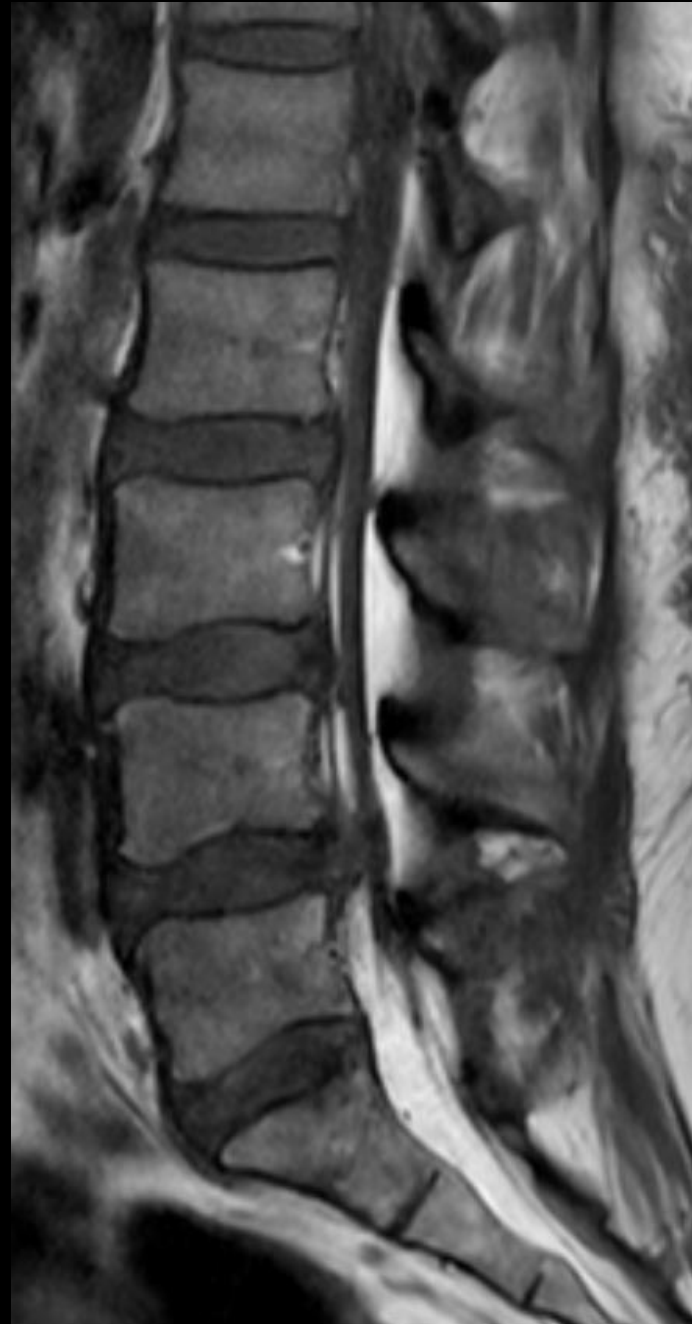


- Localization of the lesion helps in differential diagnosis
- Epidural collection vs. Subdural collections

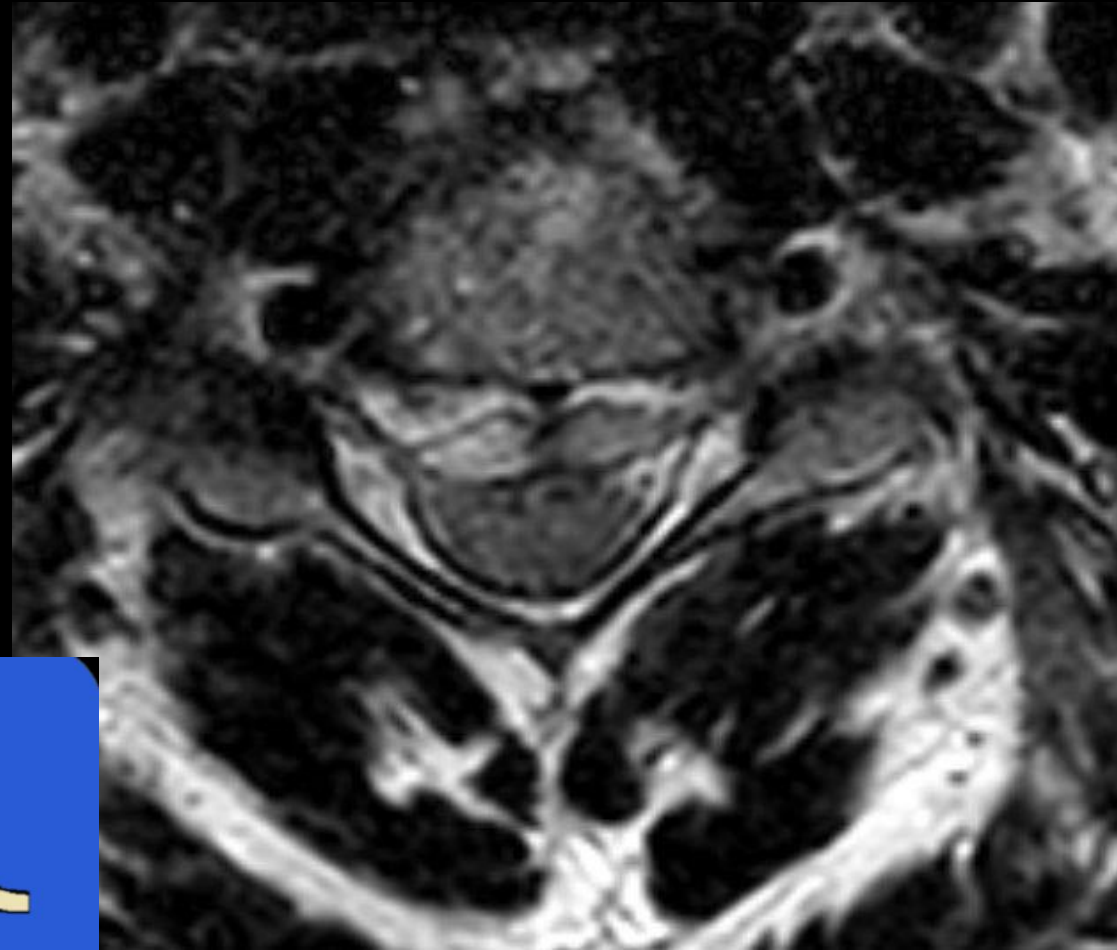
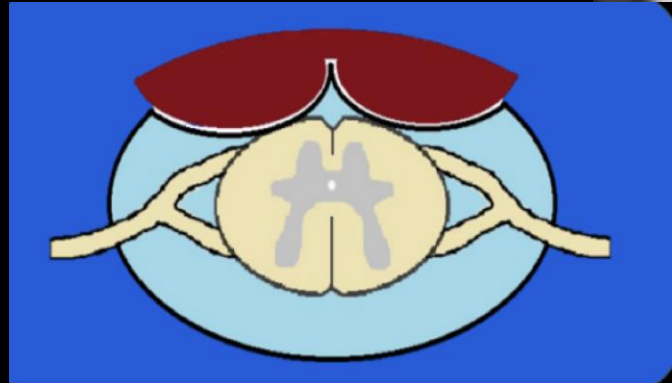
- Epidural space
- Subdural space
- Subarchnoid space

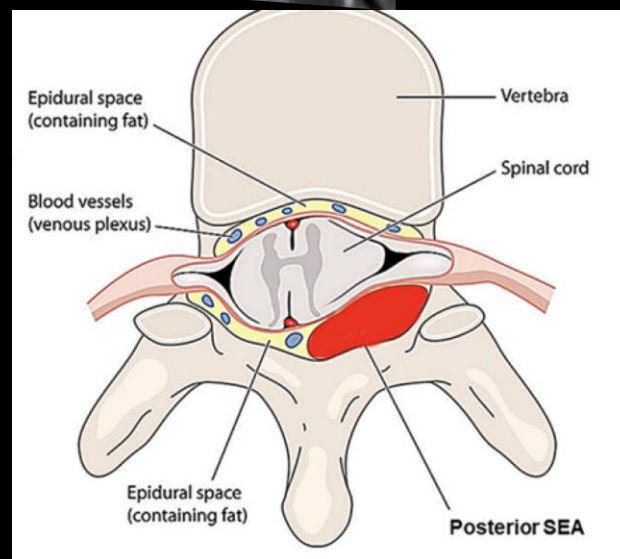
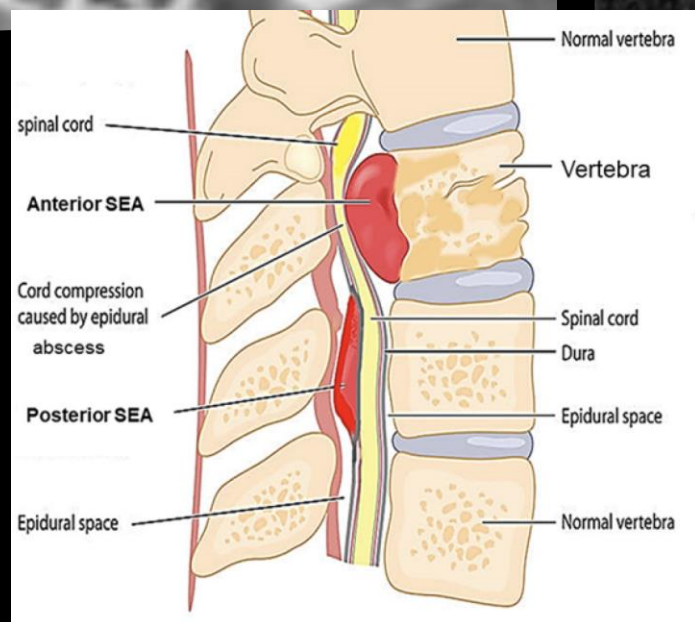
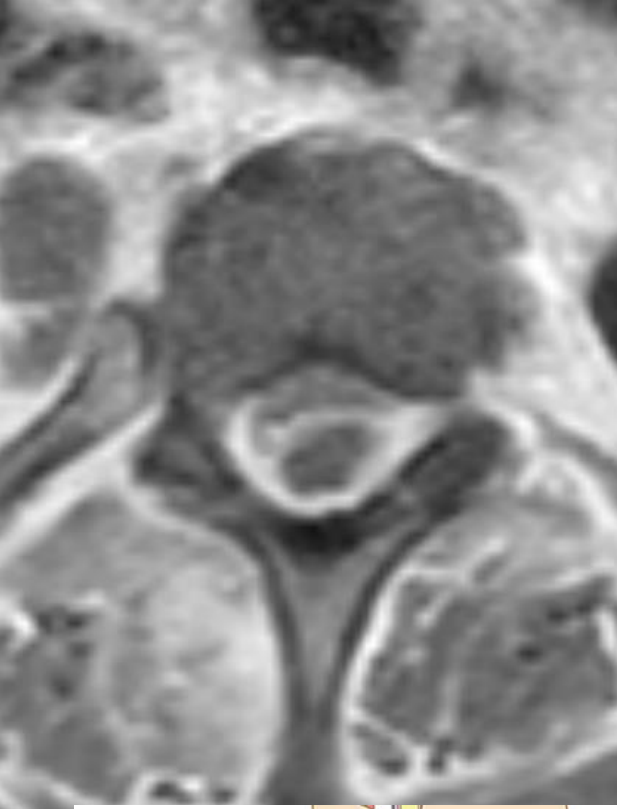


- Epidural space
- Subdural space
- Subarchnoid space



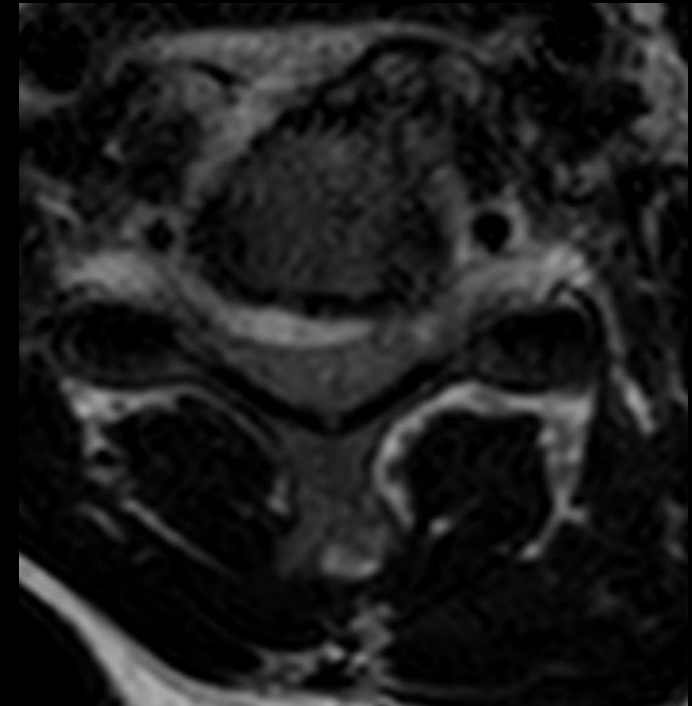
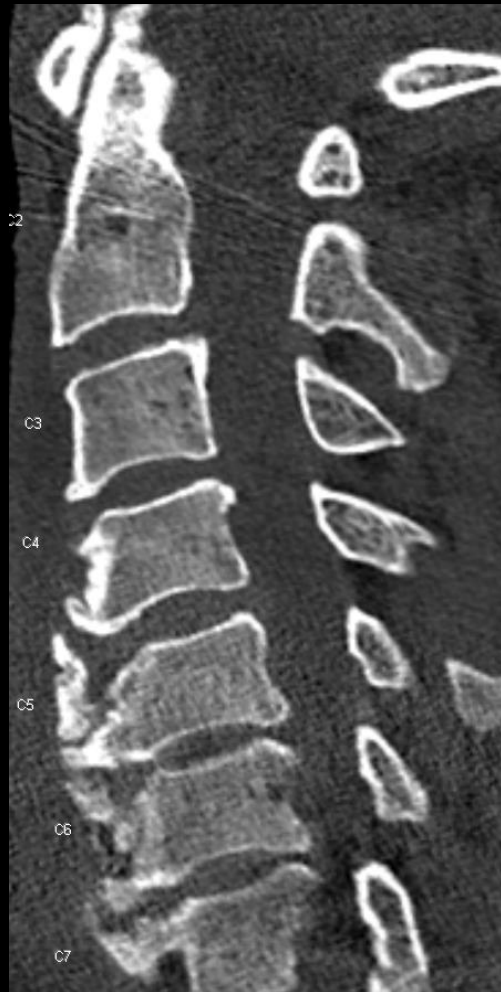
Epidural hematoma



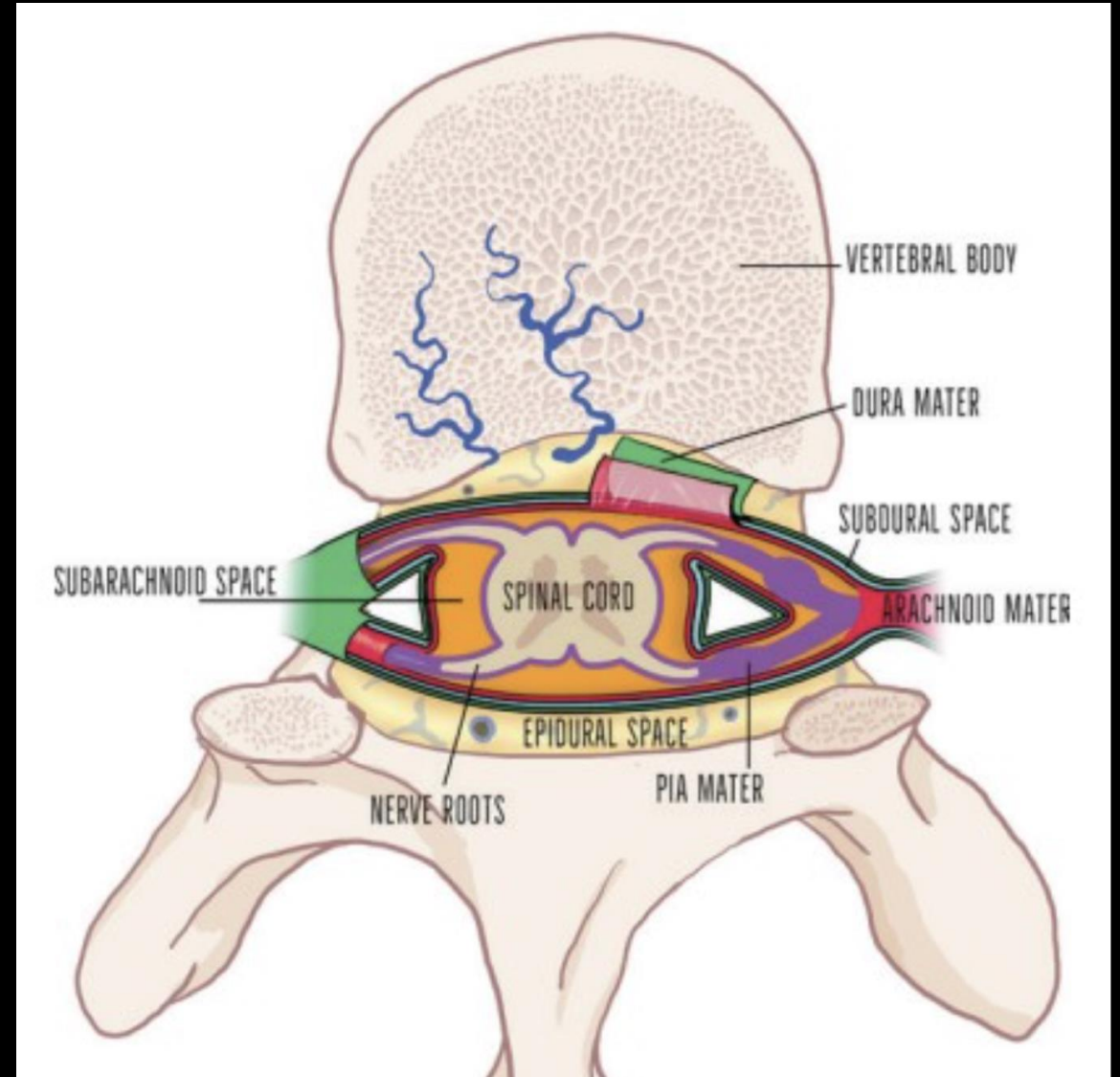


• Epidural Abscess

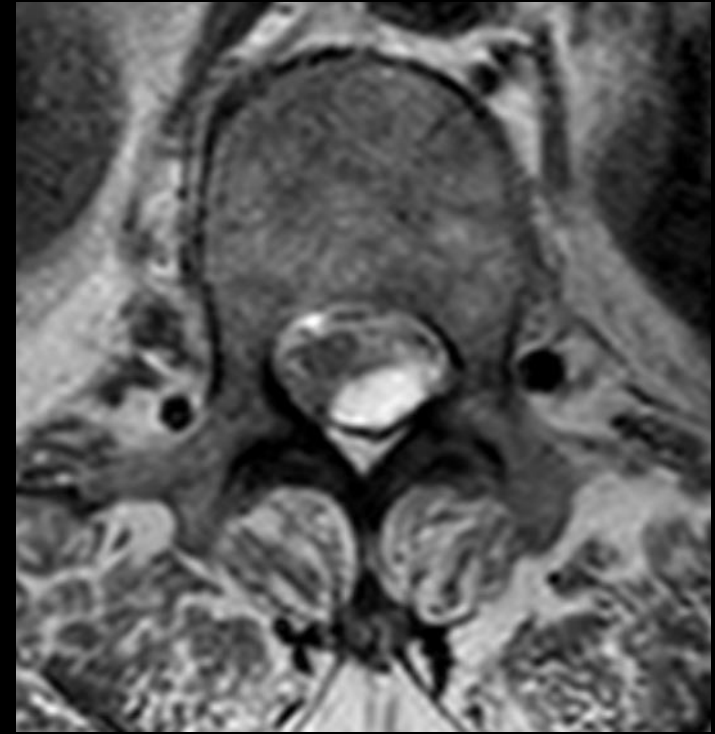
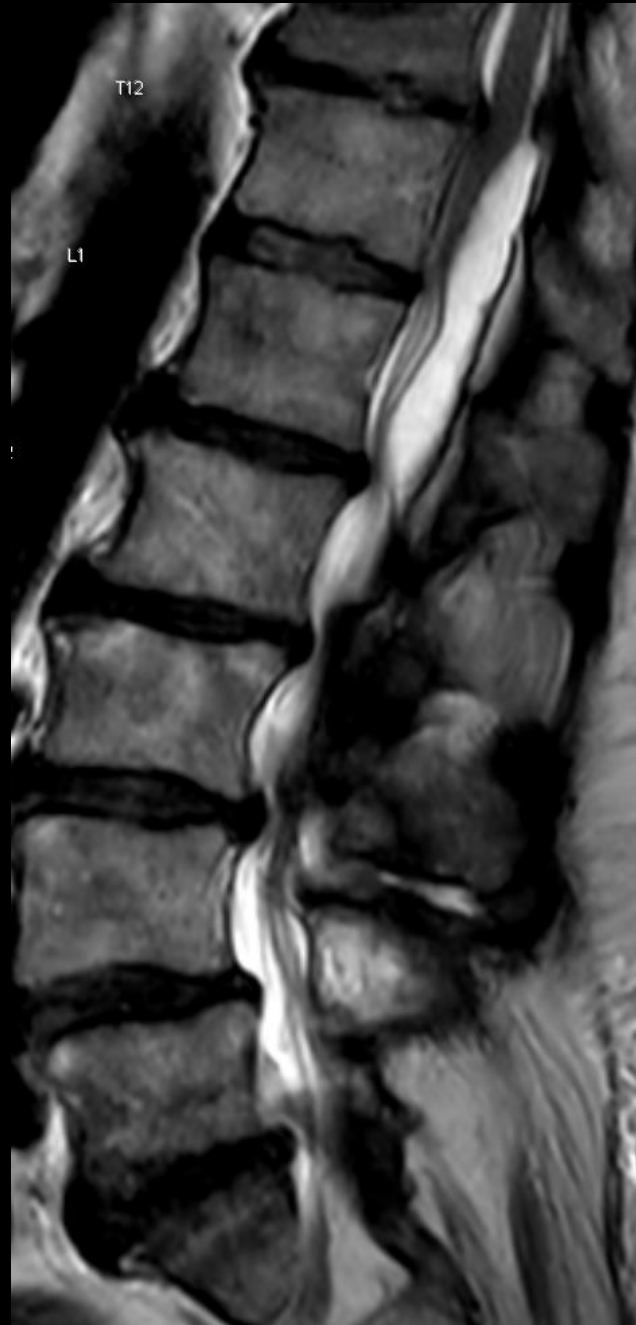
48 yo male with lower extremity weakness



- Epidural space
- Subdural space
- Subarchnoid space



- Epidural space
- Subdural space
- Subarchnoid space



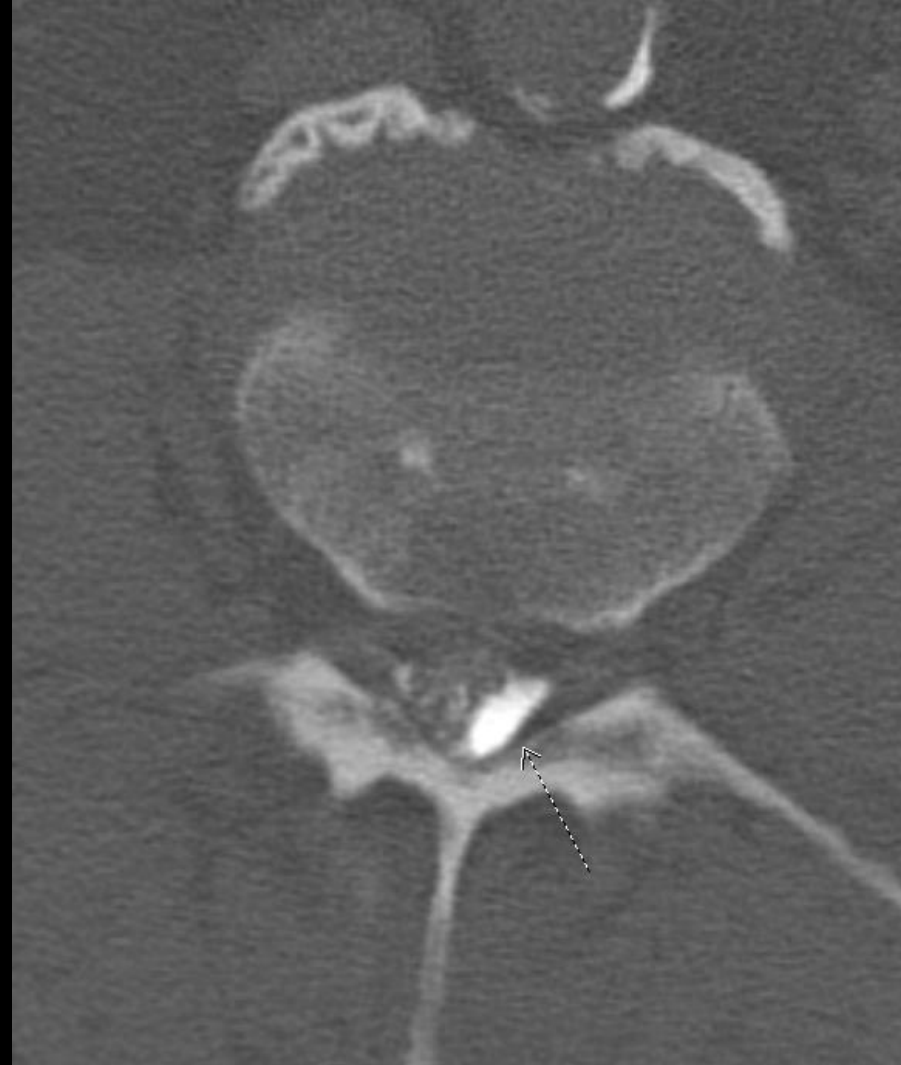
Subdural hematoma

- Clumped or loculated masses of hemorrhage
 - Etiology:
 - Trauma
 - Bleeding disorder
 - Neoplasm
 - AVM
 - Post op
 - spontaneous

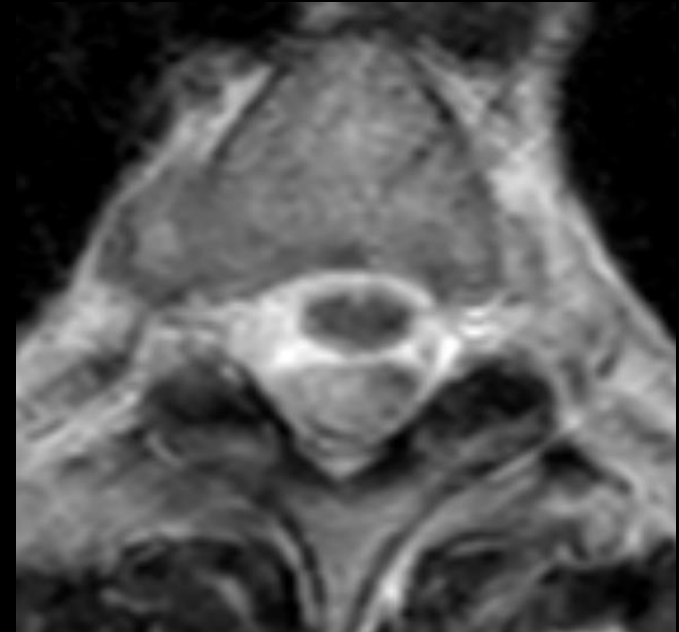
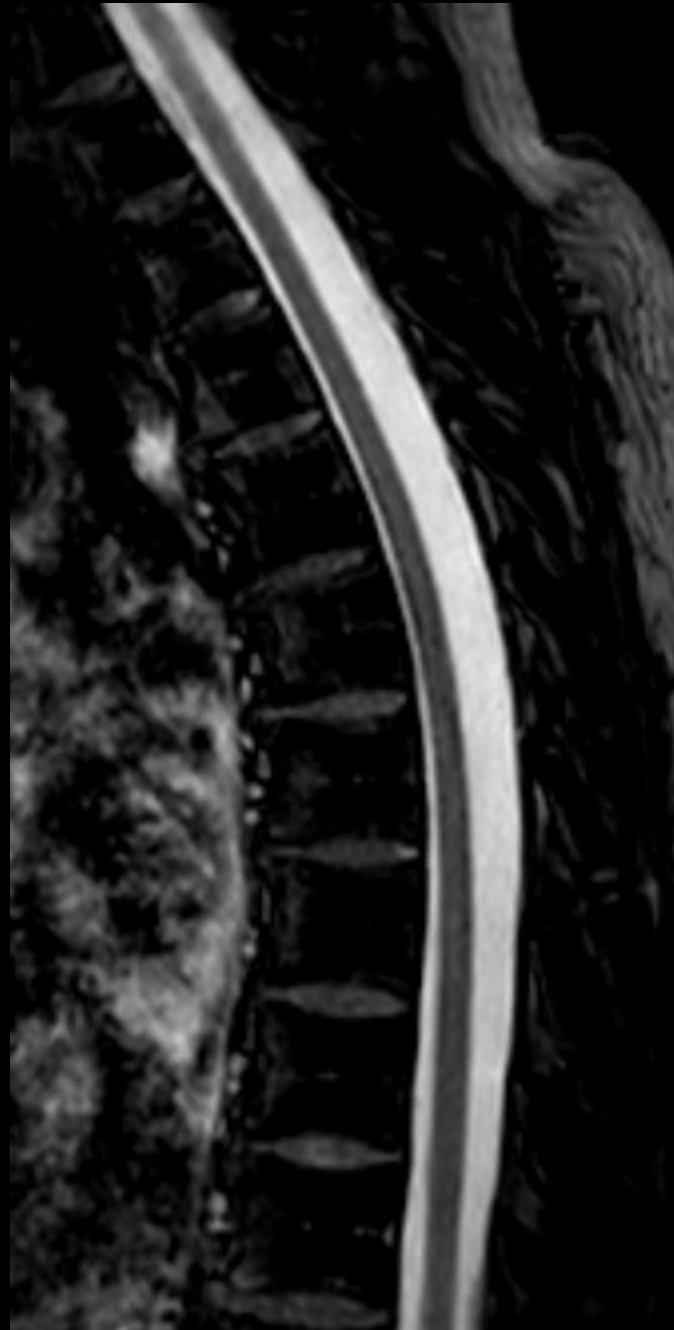


Mercedes-Benz sign

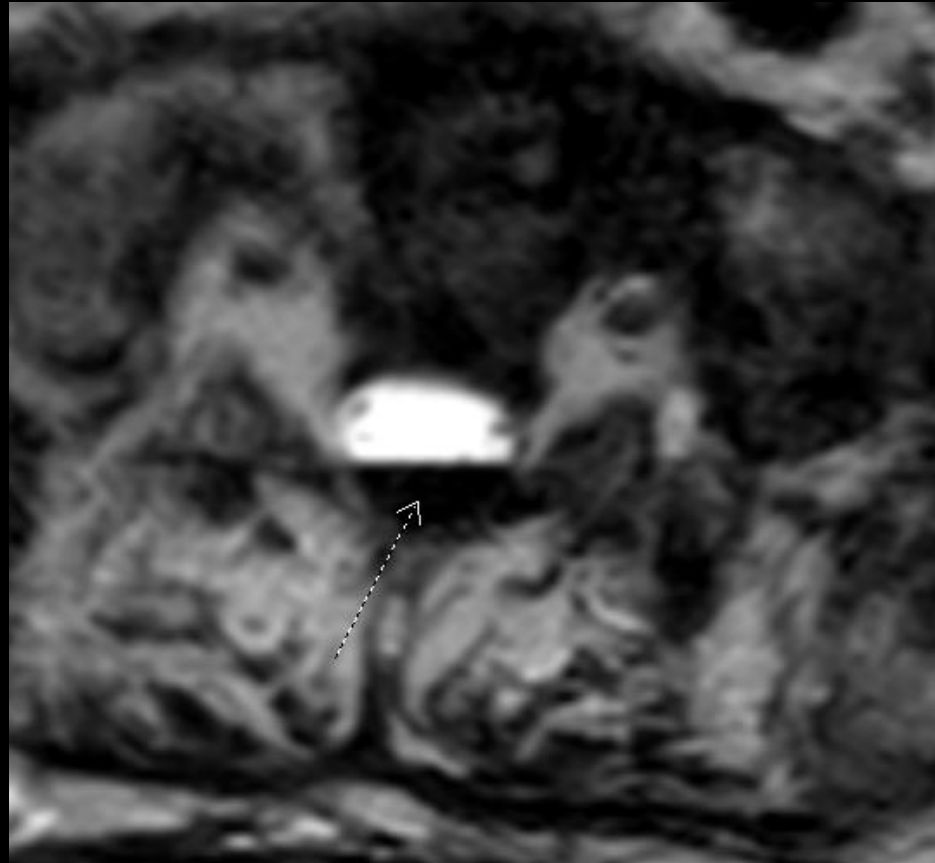
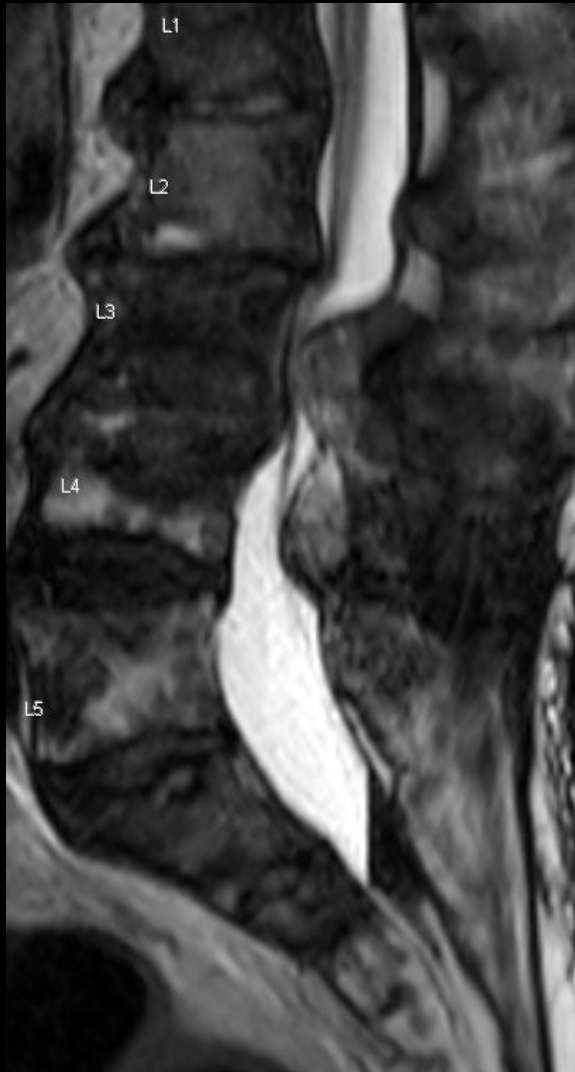
Subdural contrast injection

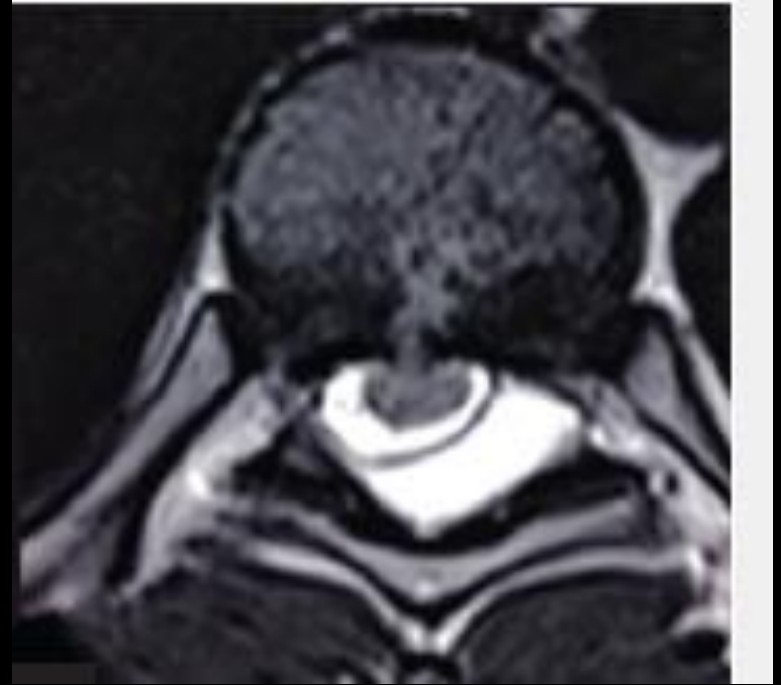


- Epidural space
- Subdural space
- Subarachnoid space

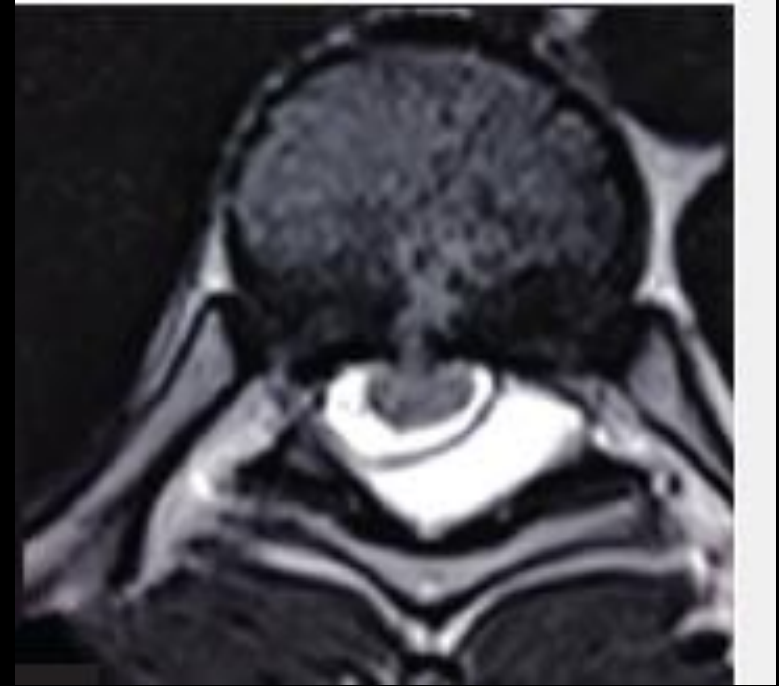


Spinal SAH





Extradural spinal arachnoid cyst



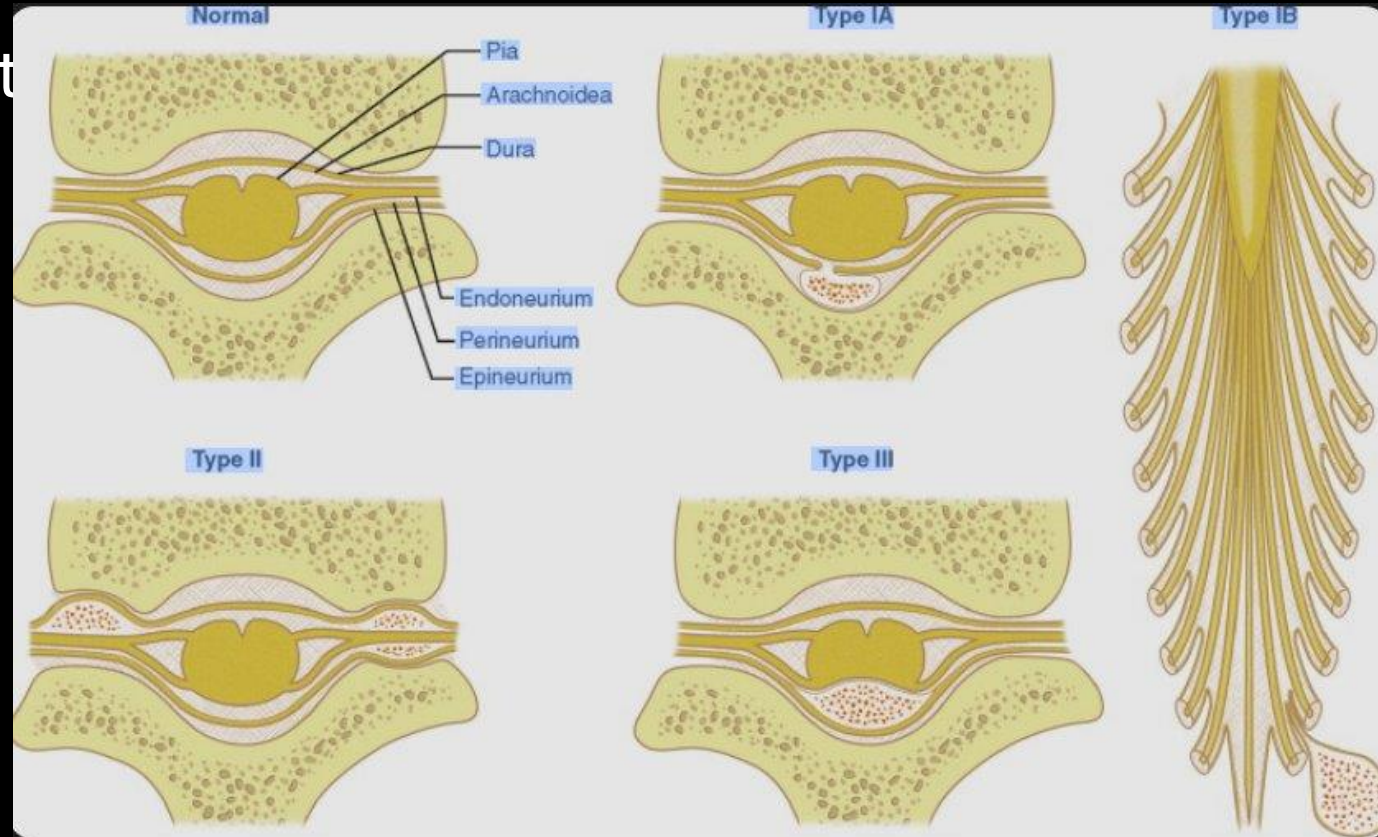
Meningeal cysts(MC)

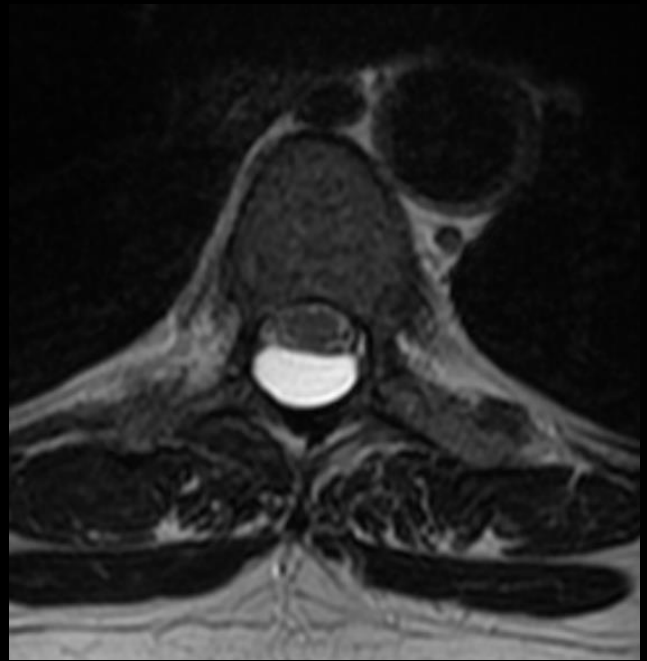
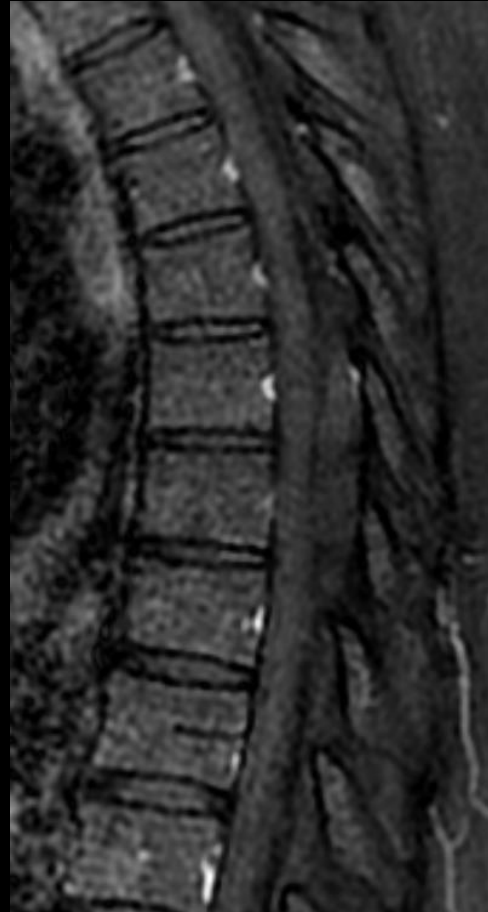
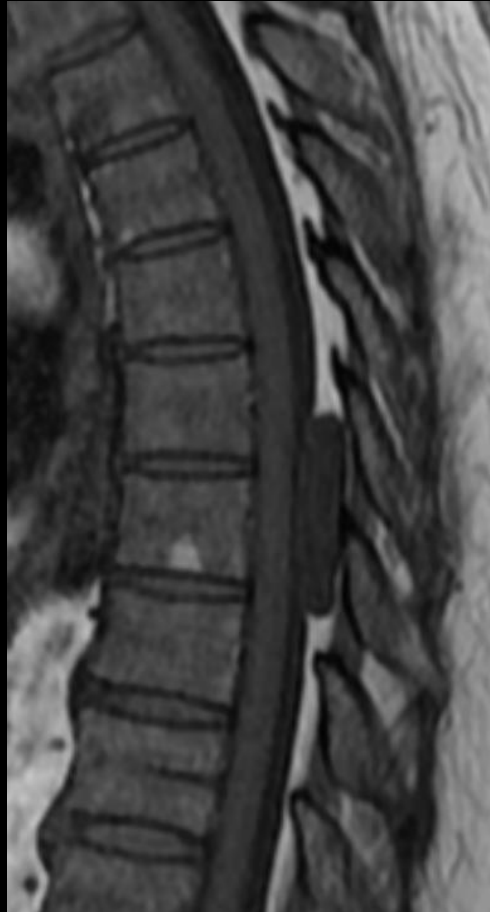
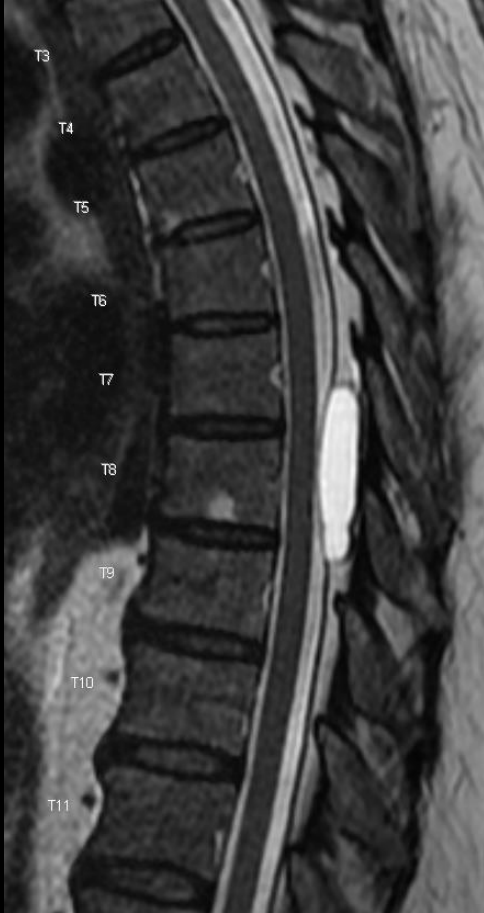
- Type I : Extradural MC without neural tissue

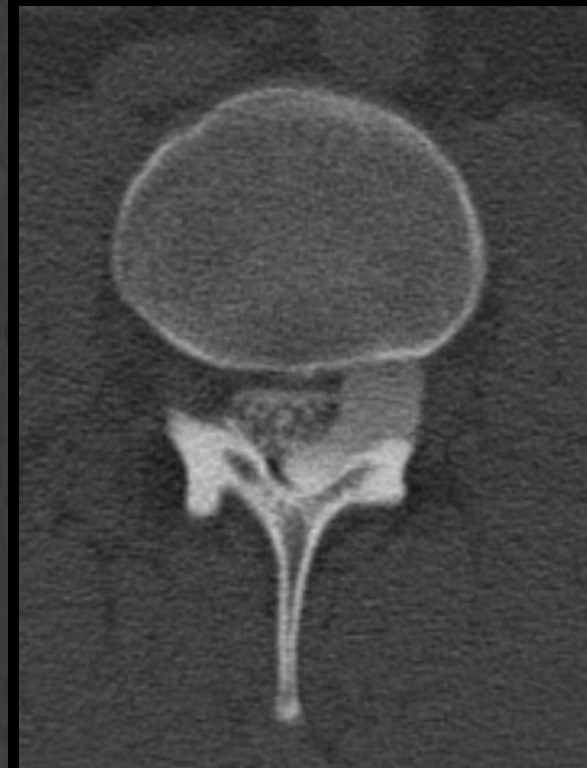
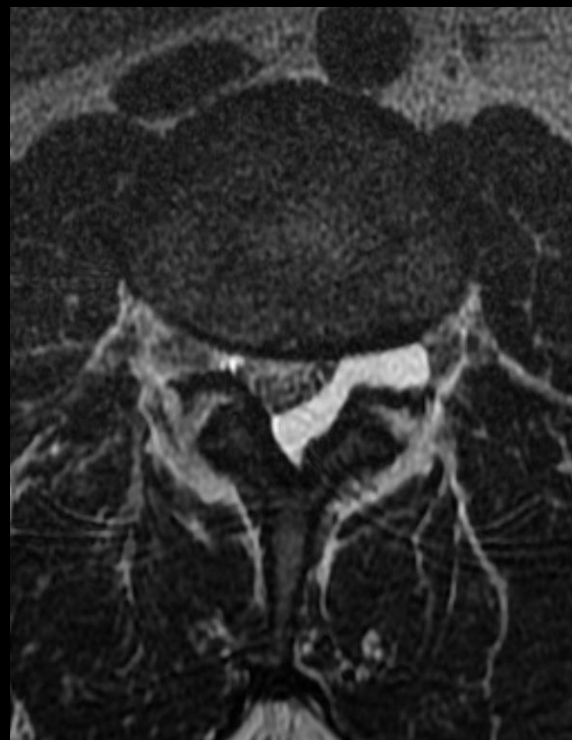
IA: extradural spinal arachnoid

IB: sacral meningocele

- Type II: Extradural MC with neural tissue
- Type III: Intradural MC



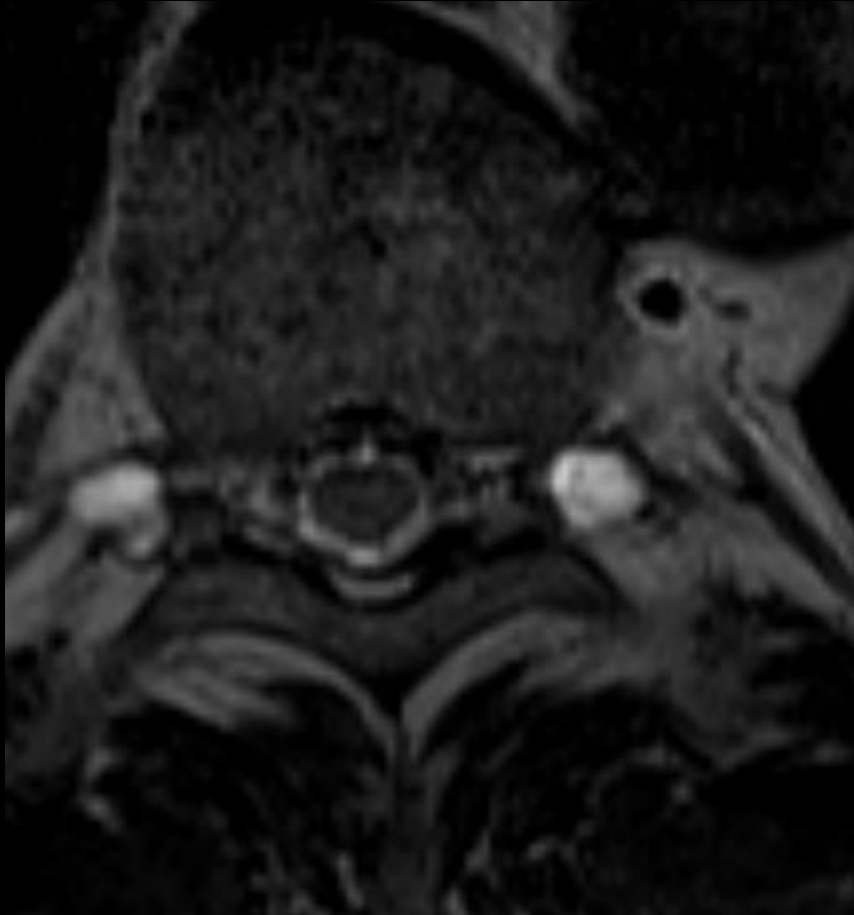




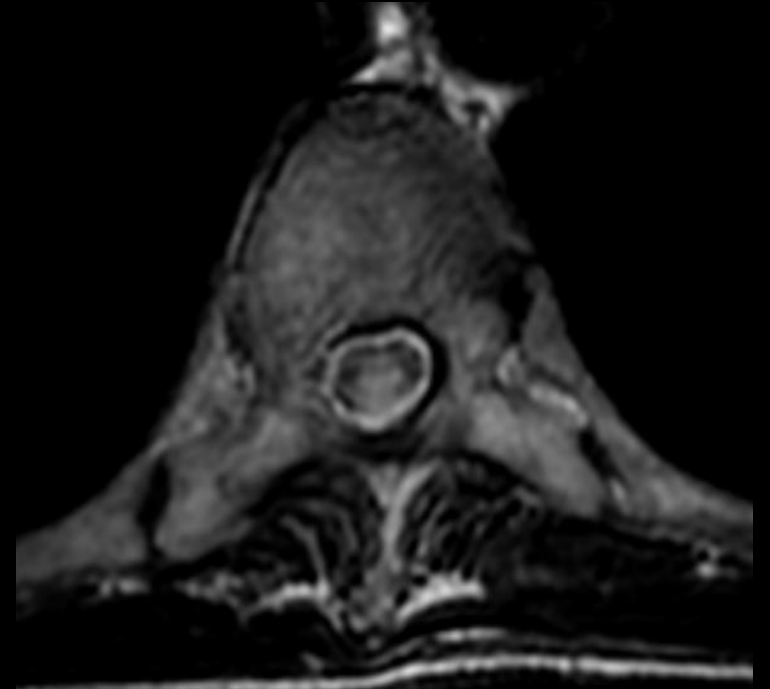
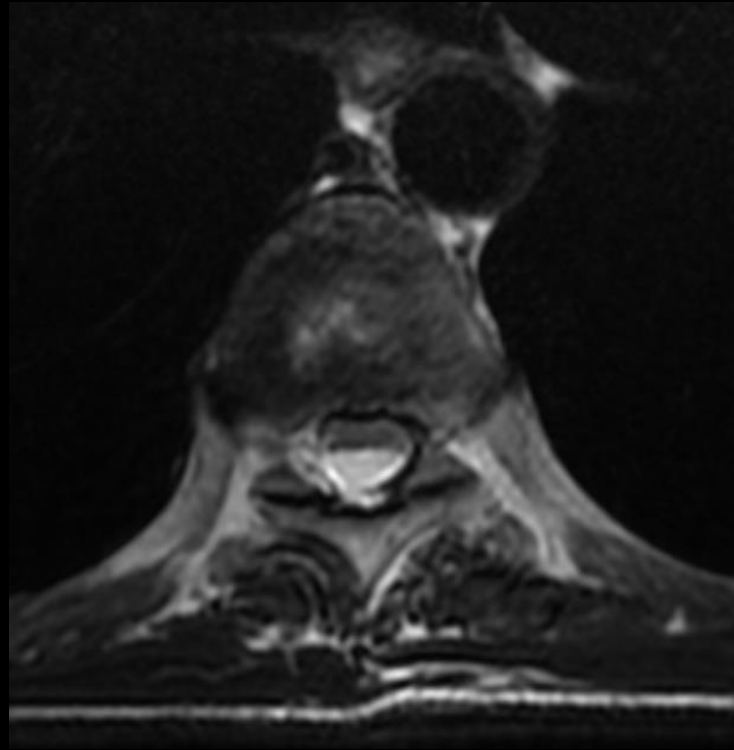
Cystic sacral lesion: Type IB meningeal cyst



Type II meningeal cyst



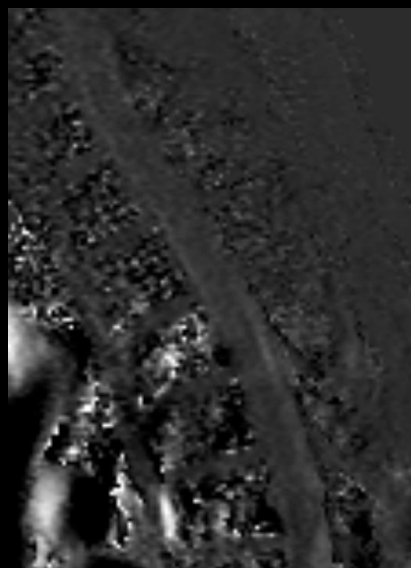
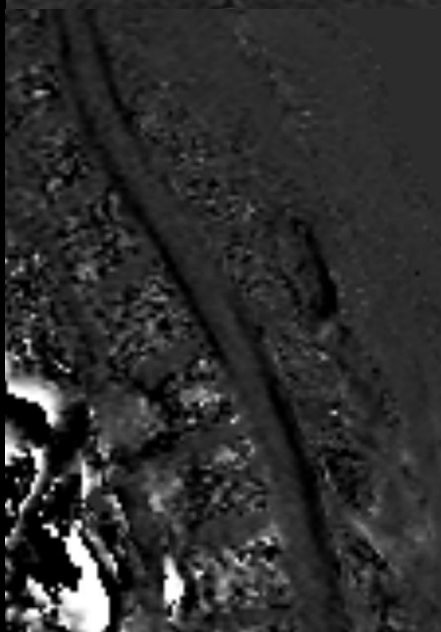
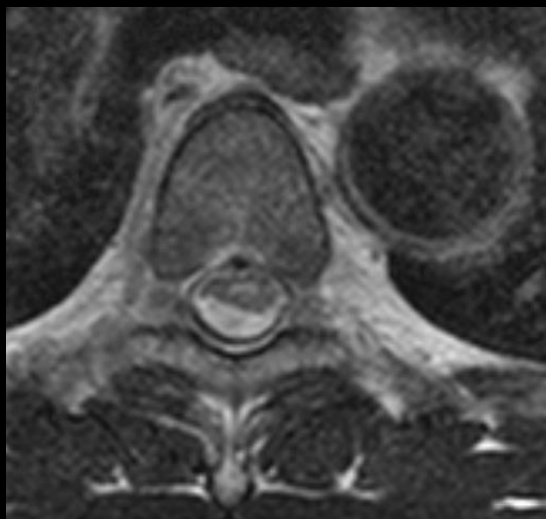
Intradural meningeal cyst

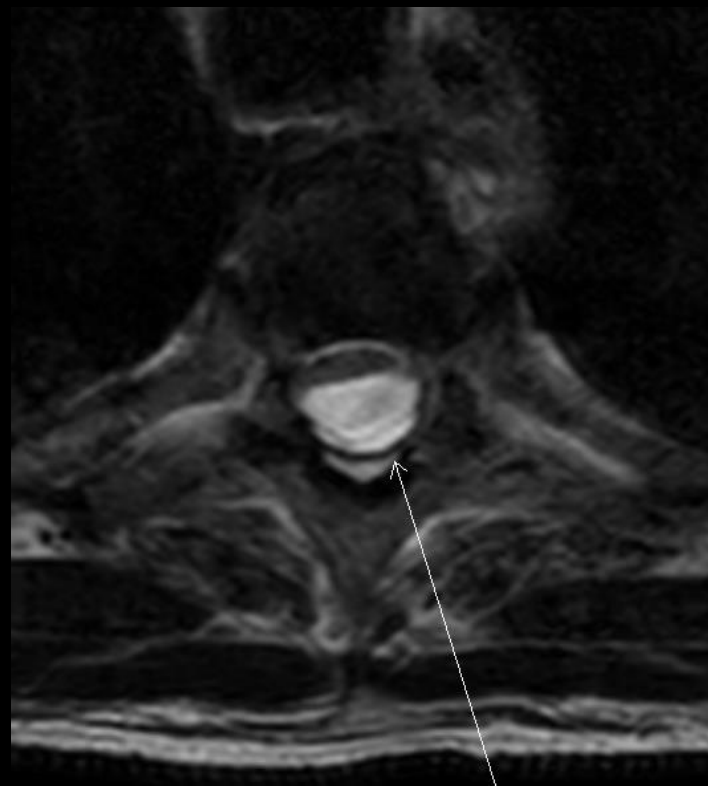




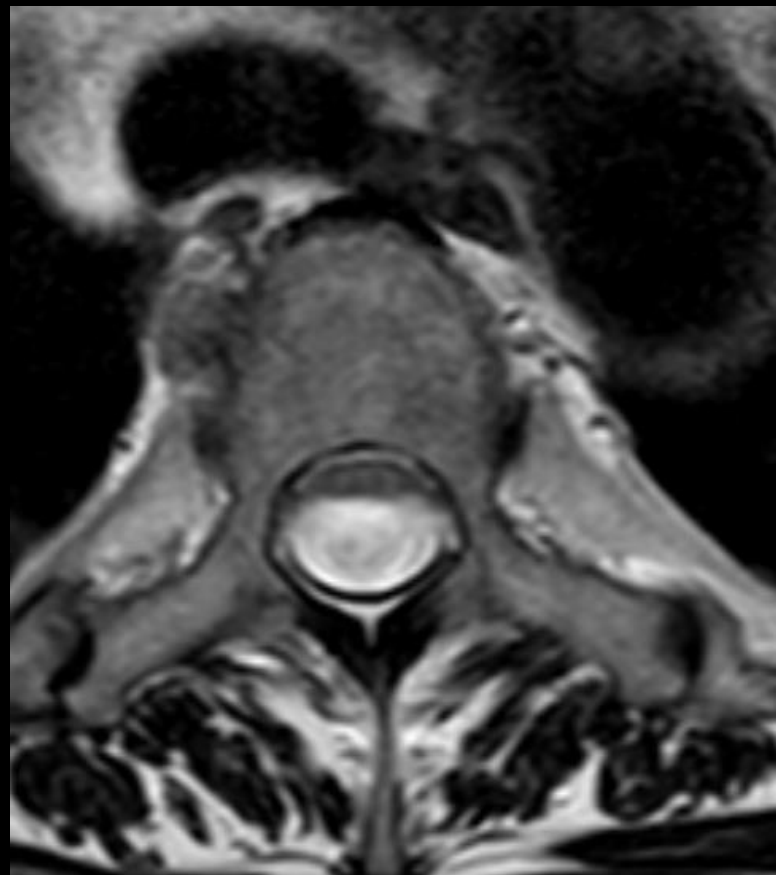
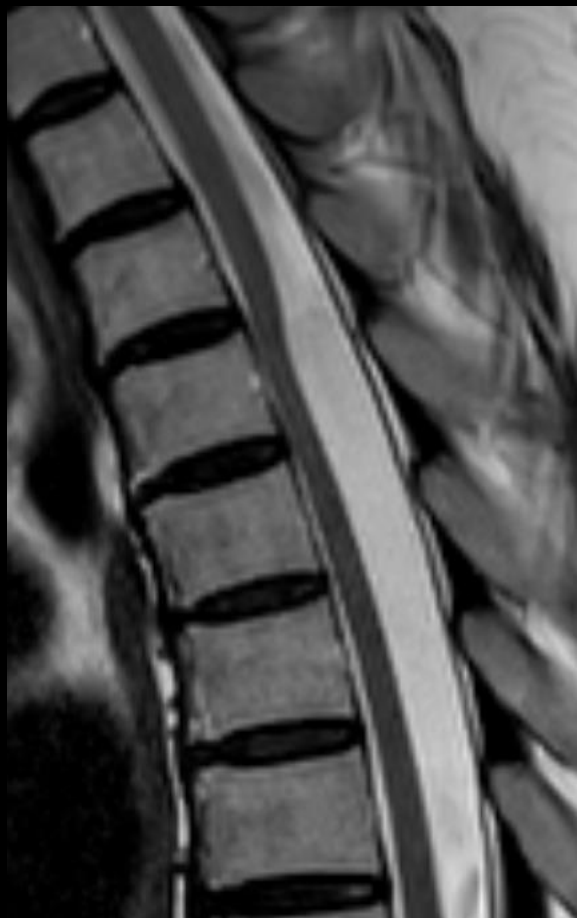
Intradural arachnoid cyst

- CSF signal intensity with mass effect on dorsum of the cord
- No wall delineation
- Imaging diagnosis
- Slowly progressive myelopathy
- Partial filling during CT myelogram





Arachnoid web



- Thick bands of arachnoid membrane along the dorsal cord margin
- ?sequela of arachnoiditis
- Treatment: surgery

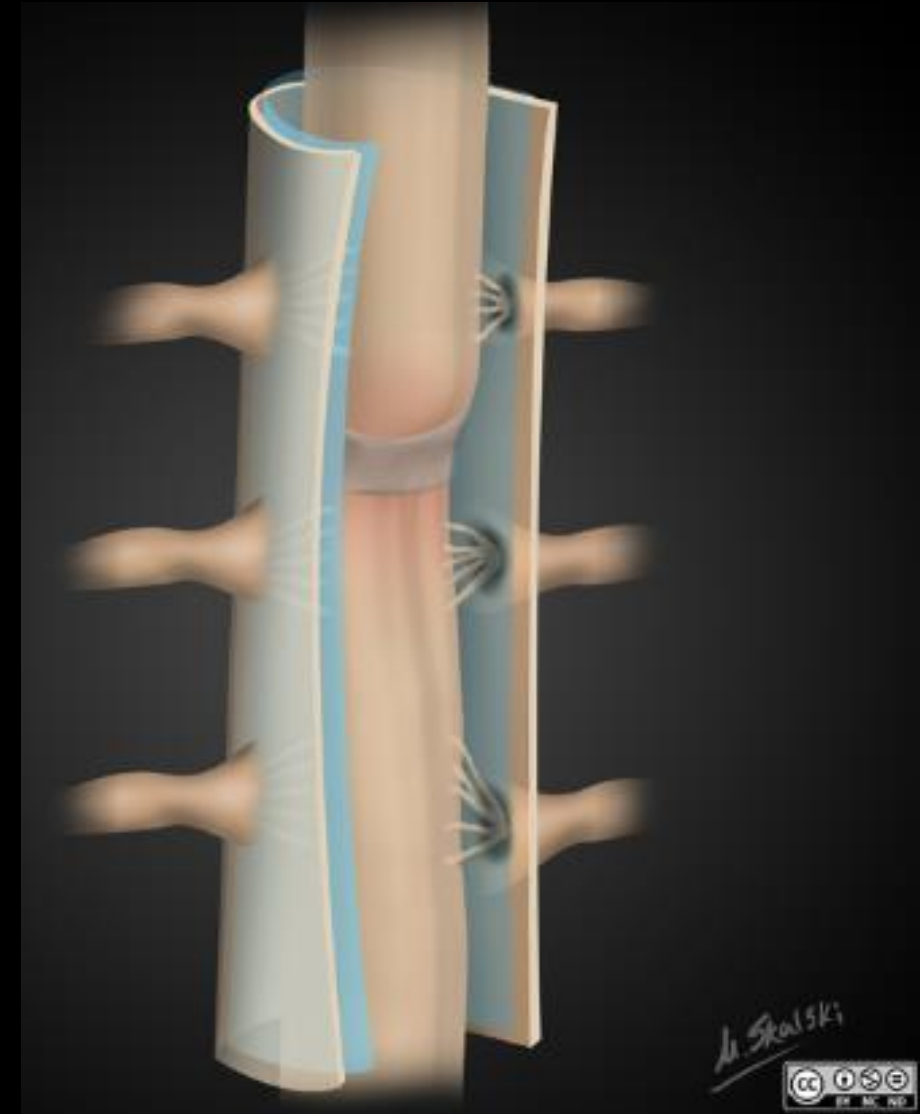
Dorsal Thoracic Arachnoid Web and the “Scalpel Sign”: A Distinct Clinical-Radiologic Entity

M.A. Reardon, P. Raghavan, K. Carpenter-Bailey, S. Mukherjee, J.S. Smith, J.A. Matsumoto, C.-P. Yen,
M.E. Shaffrey, R.R. Lee, C.I. Shaffrey, and M. Wintermark

AJNR Am J Neuroradiol 34:1104–10

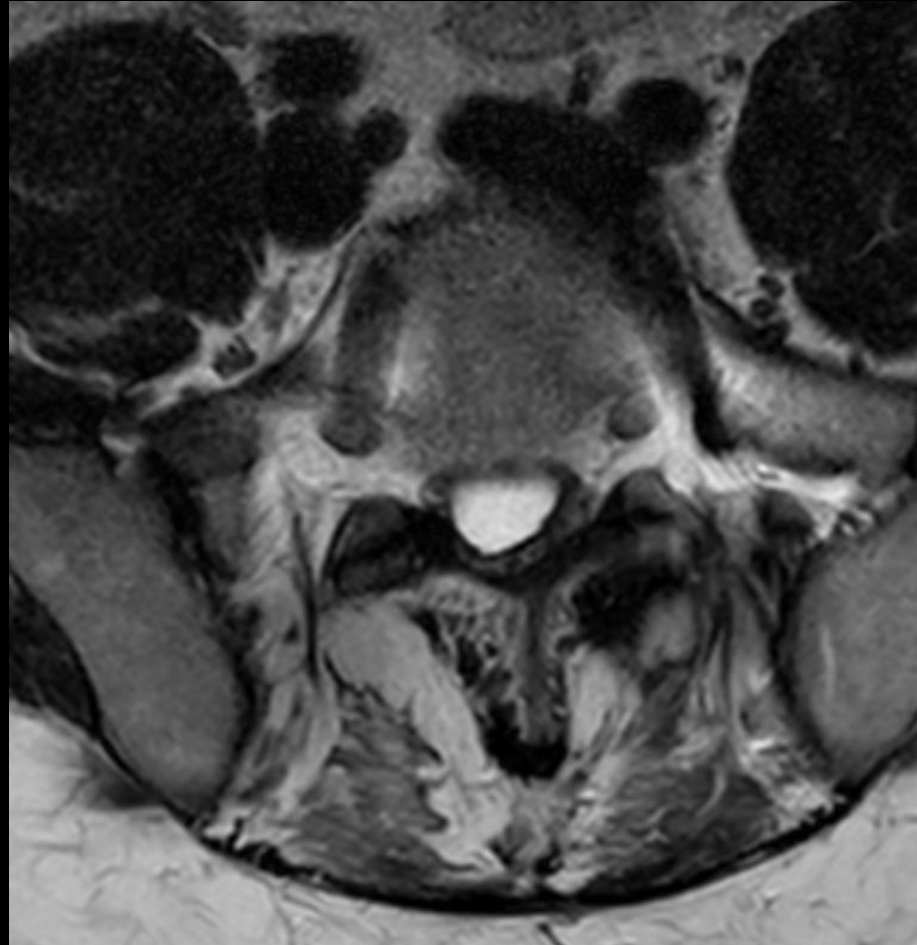
ABSTRACT

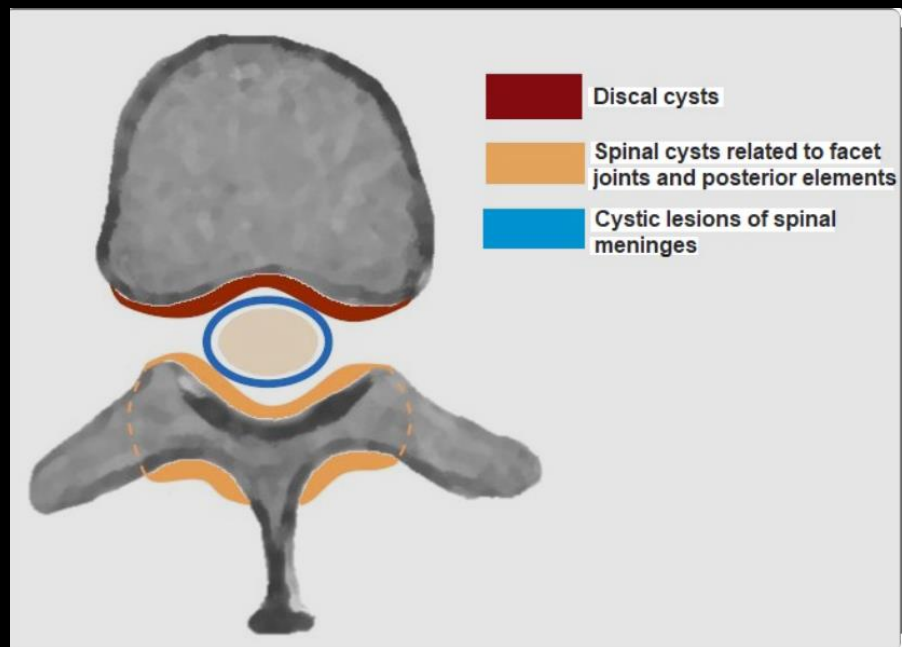
SUMMARY: Arachnoid webs are intradural extramedullary bands of arachnoid tissue that can extend to the pial surface of the spinal cord, causing a focal dorsal indentation of the cord. These webs tend to occur in the upper thoracic spine and may produce a characteristic deformity of the cord that we term the “scalpel sign.” We describe 14 patients whose imaging studies demonstrated the scalpel sign. Ten of 13 patients who underwent MR imaging demonstrated T2WI cord signal-intensity changes, and 7 of these patients also demonstrated syringomyelia adjacent to the level of indentation. Seven patients underwent surgery, with 5 demonstrating an arachnoid web as the cause of the dorsal indentation demonstrated on preoperative imaging. Although the webs themselves are rarely demonstrated on imaging, we propose that the scalpel sign is a reliable indicator of their presence and should prompt consideration of surgical lysis, which is potentially curative.



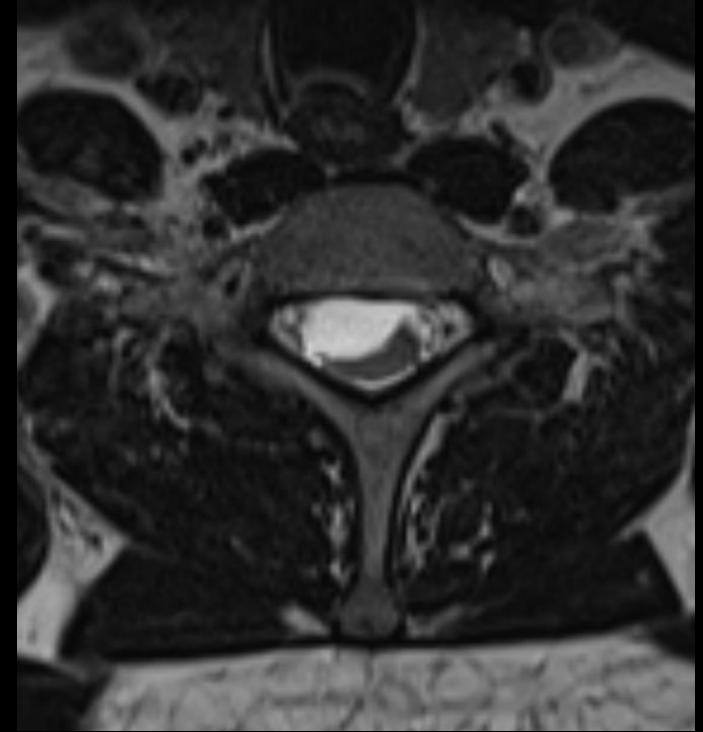
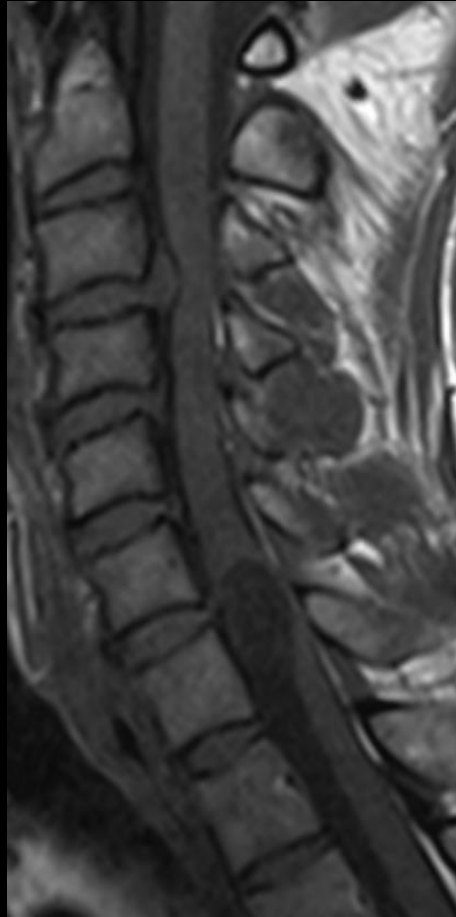
Radiopaedia

Intradural arachnoid cyst



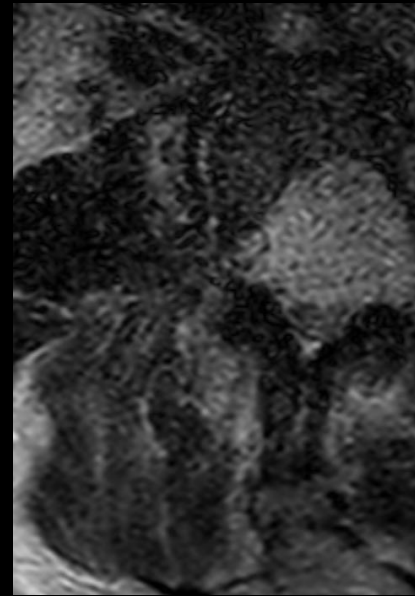


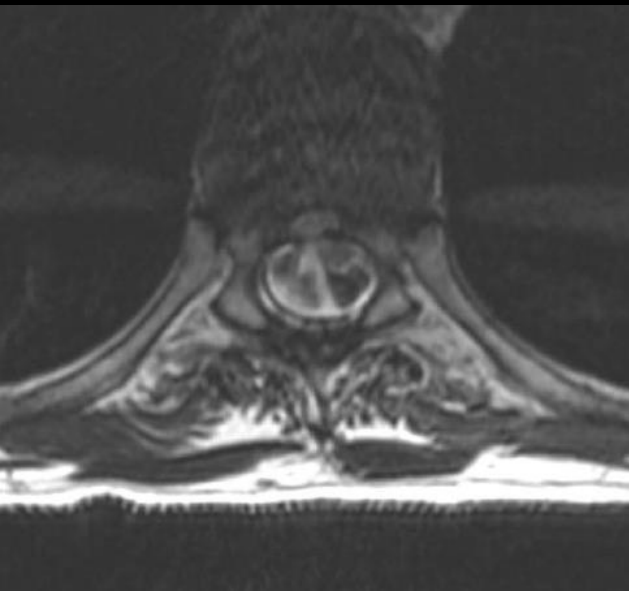
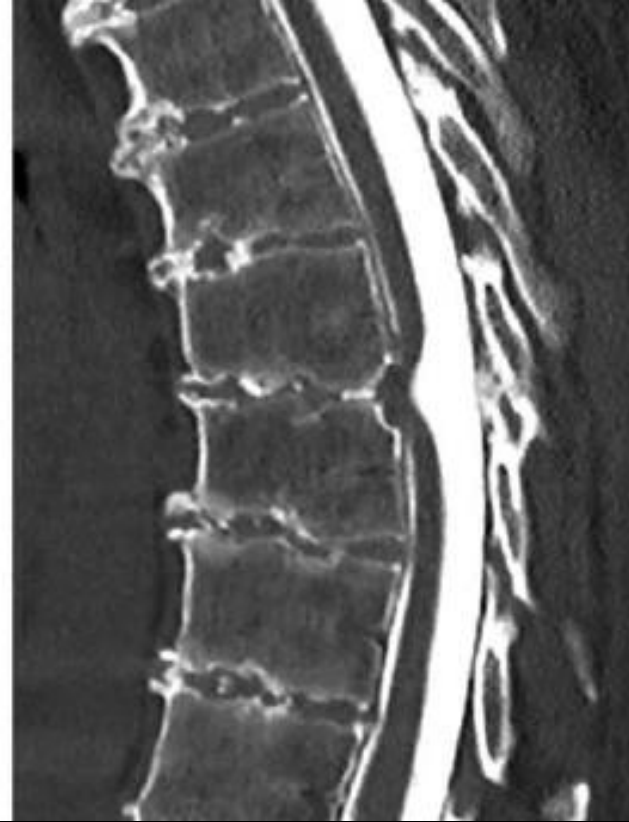
Neuroenteric cyst



Dural ectasia

- NF1
- Rheumatological
- Marfan's
- Ehlers-Danlos syn
- Acromegaly
- Trauma/surgery





Spinal cord herniation

Operative Neurosurgery 24:268–275, 2023

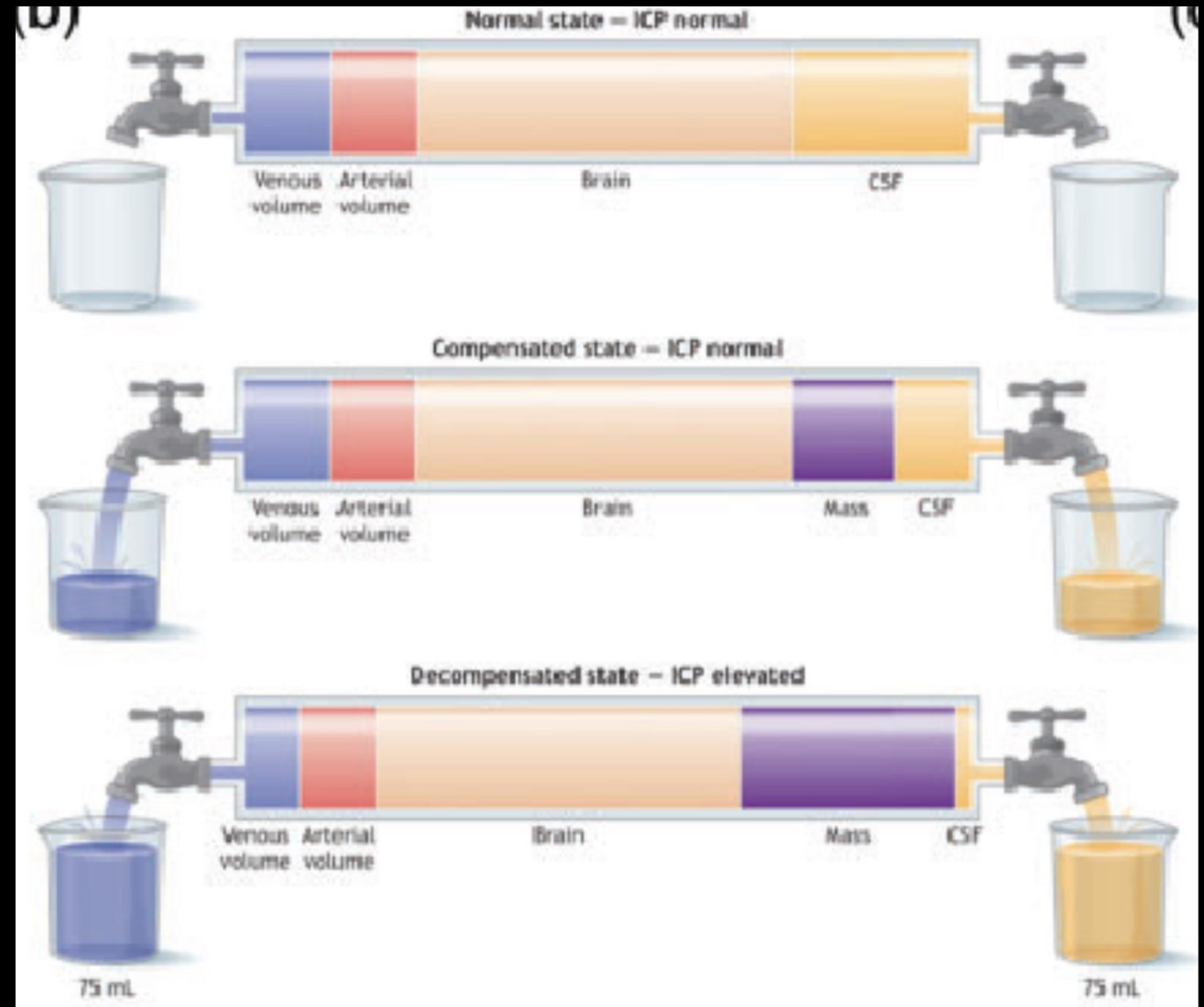
Spinal cord herniation

- Important cause of progressive myelopathy
- Location: T4-T7.
- Cord protruding through ventral dural defect
- MRI findings:
 - Kinked or “C” shaped cord
 - Enlarged dorsal CSF space
 - Spinal cord is pulled forward rather than pushed posteriorly



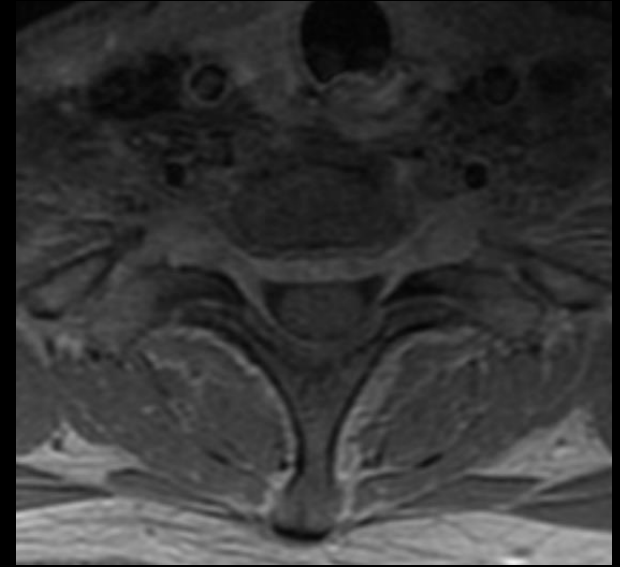
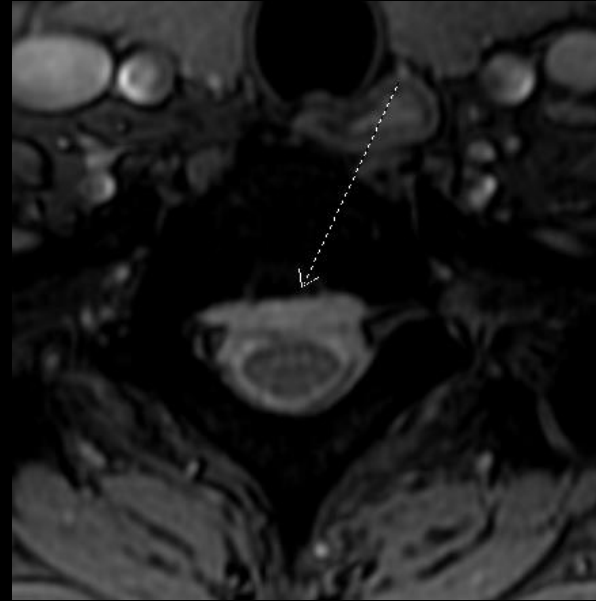
Monroe-Kelly Doctrine

- Core concept:
 - Cranial vault is rigid and fixed
 - Total cranial volume: brain + blood + CSF
 - Increase in one compartment offset by decrease in another

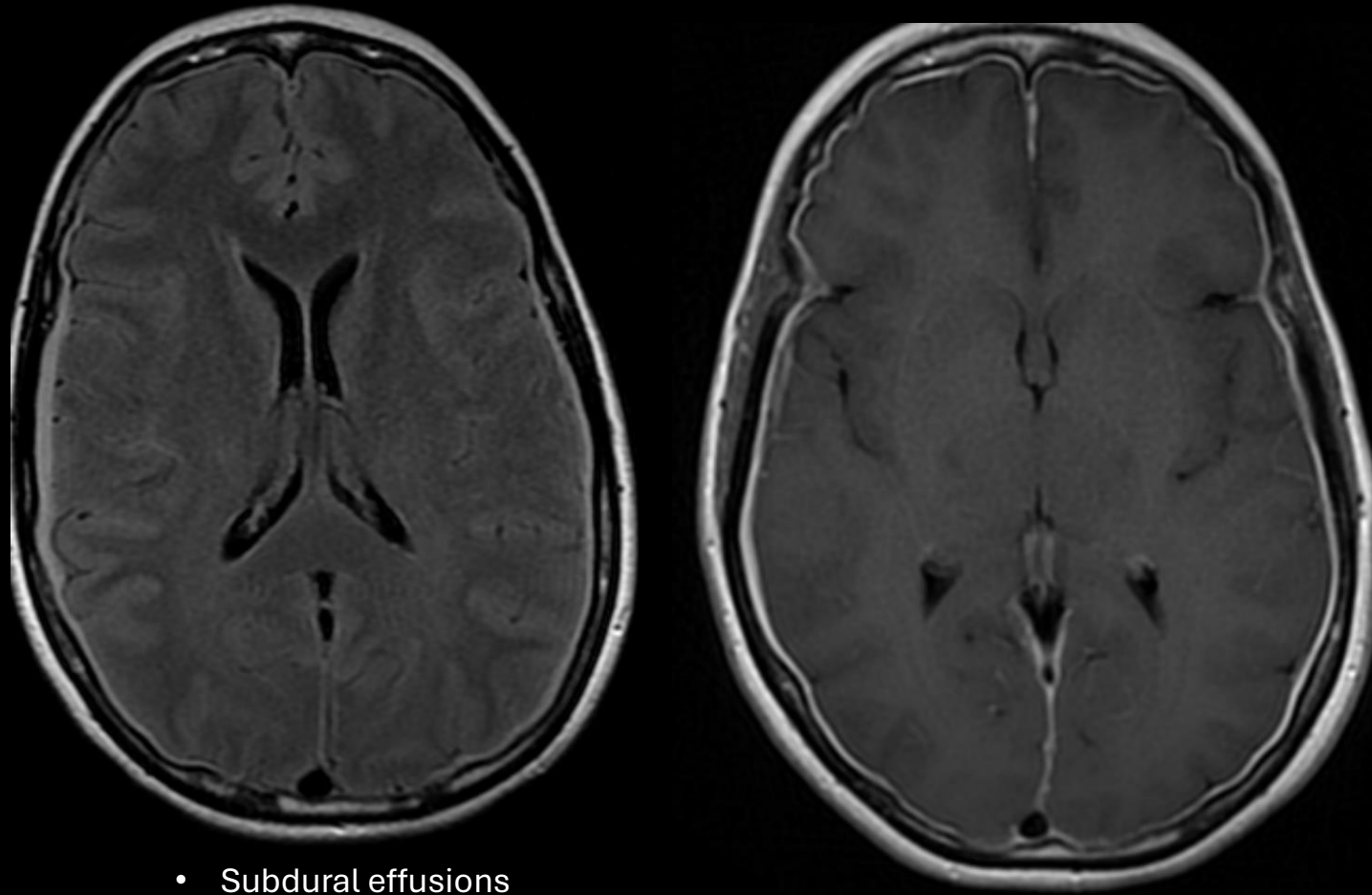


Spontaneous intracranial hypotension

- Highly disabling orthostatic headache
- Orthostatic quality attenuate over time
- 20% have normal MRI
- Whole spine MRI
- Low CSF pressure(<6cm H₂O)
- Dynamic myelogram



SIH

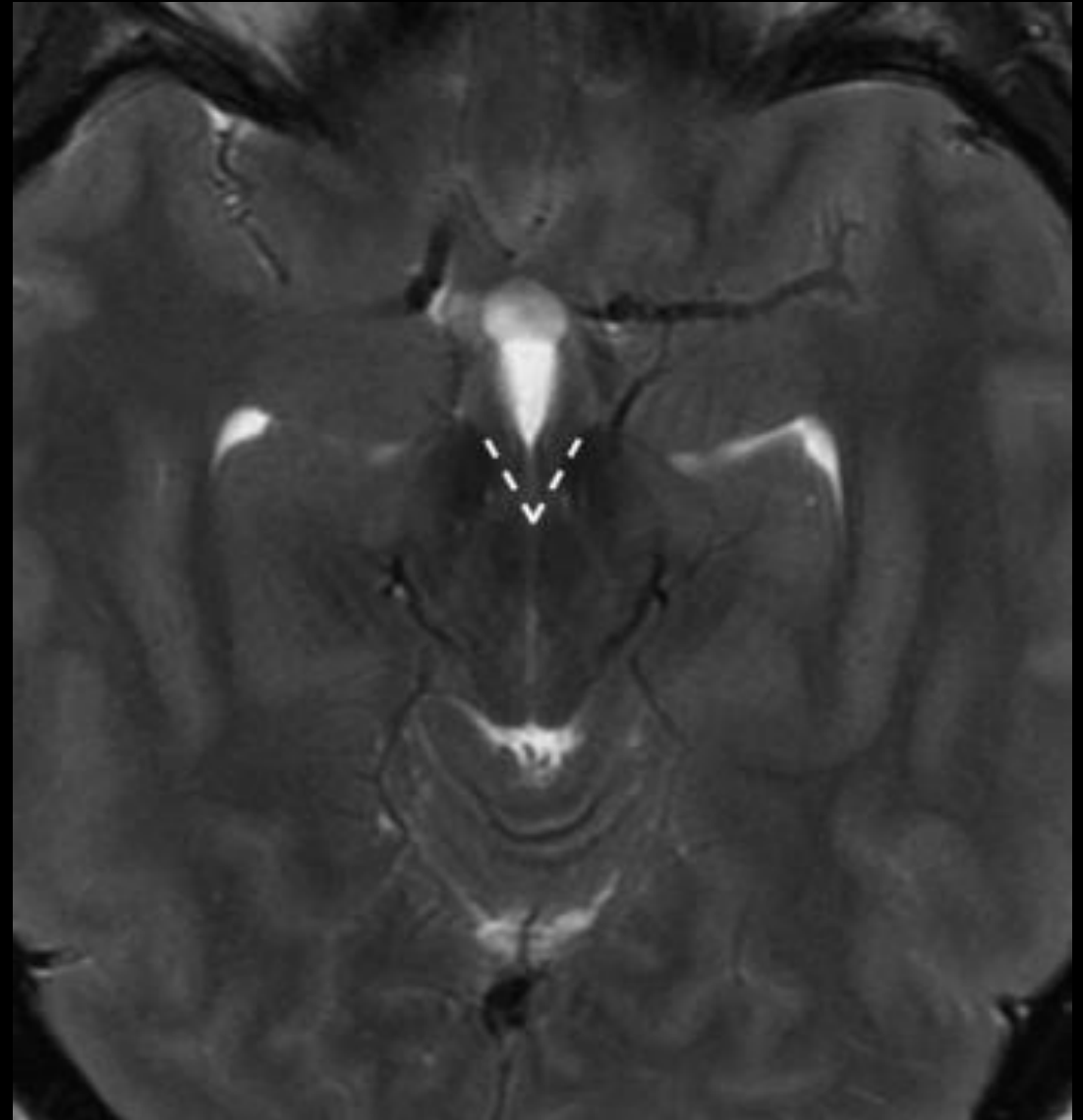


- Subdural effusions
- Enhancement of pachymeninges
- Engorgement of dural venous sinuses
- Pituitary enlargement
- Sinking of the hindbrain.



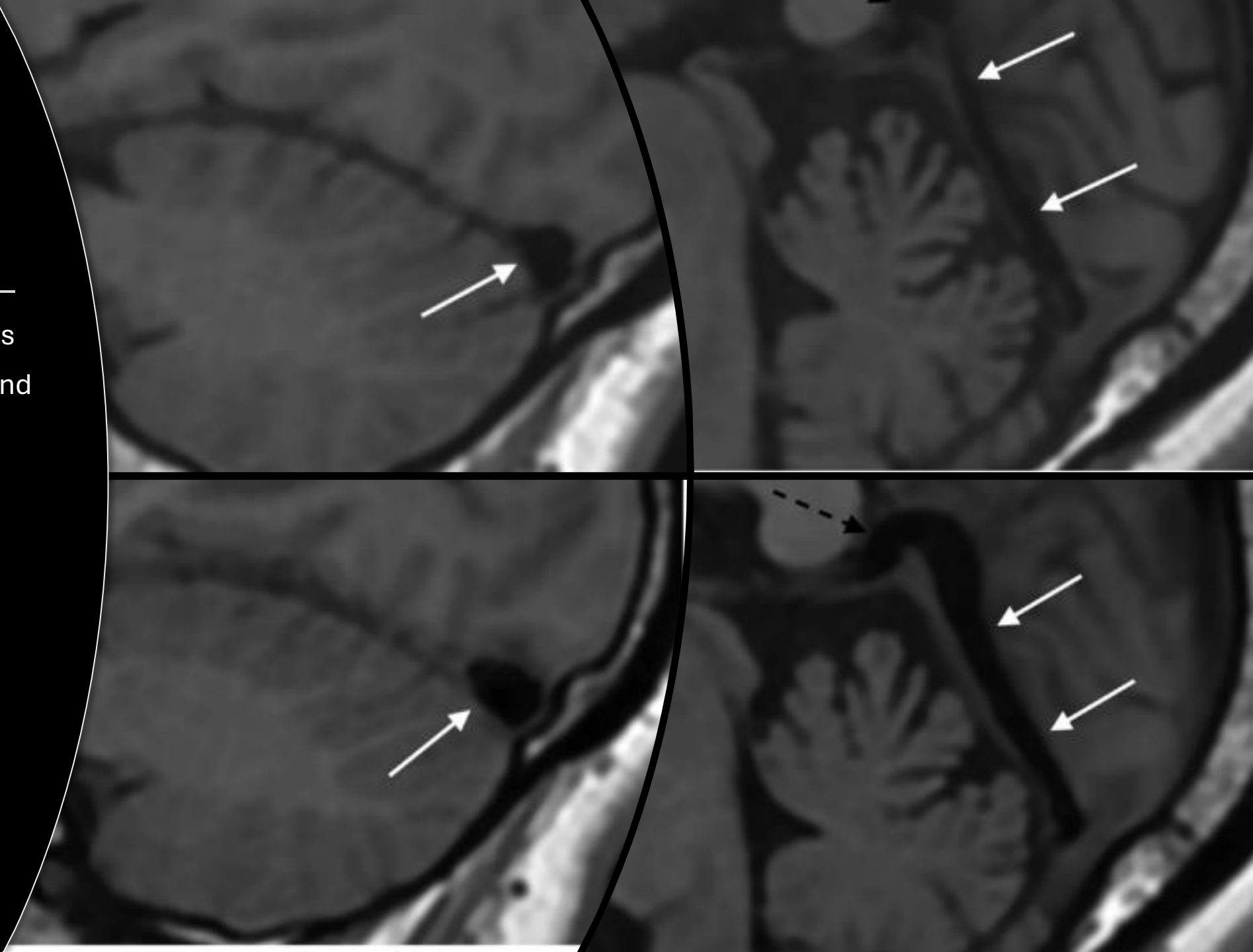
Flattening of anterior pons
Narrowing of prepontine cistern
Decreased distance of ponto-
mamillary distance

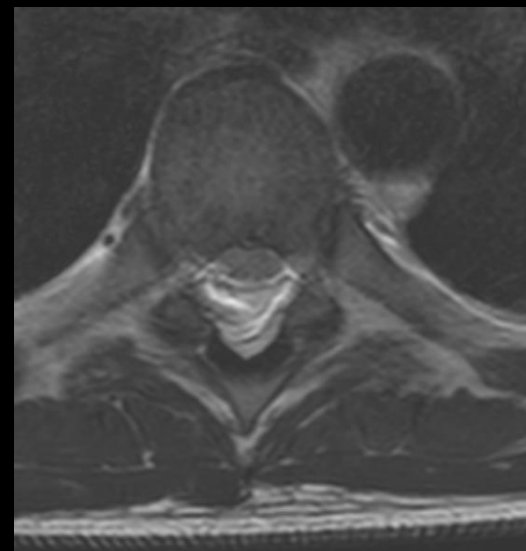
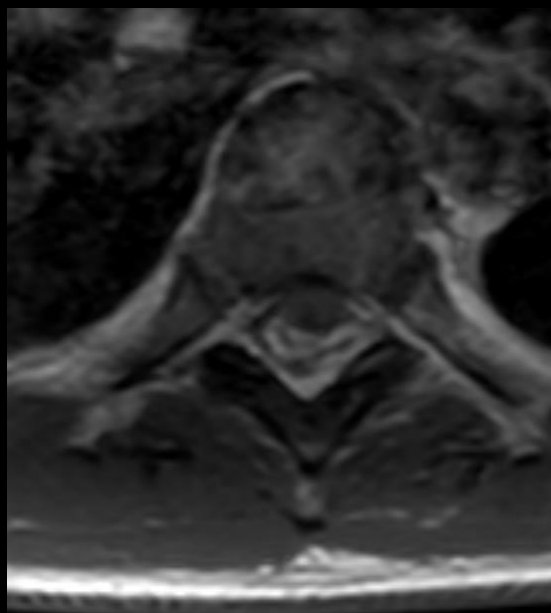
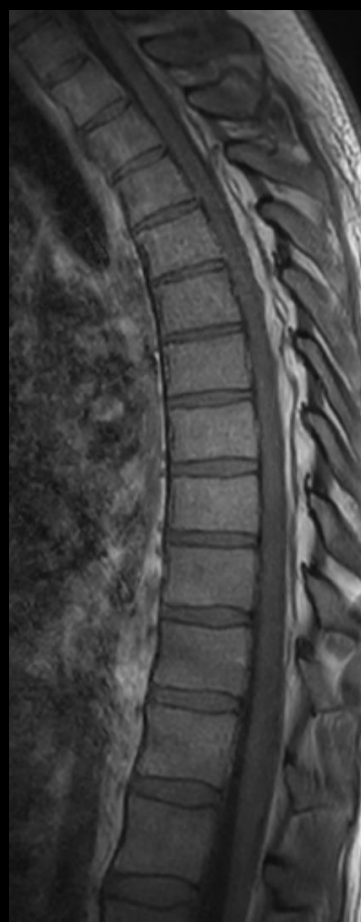
- Narrowing of interpeduncular cistern
- Effacement of perimesencephalic cisterns

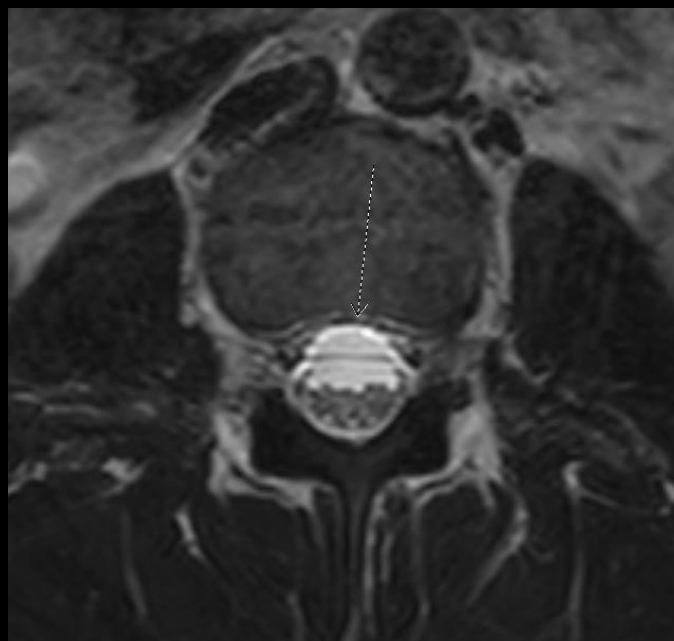


Venous distension

- Distended transverse sinus
- Prominent Vein of Galen and straight sinus

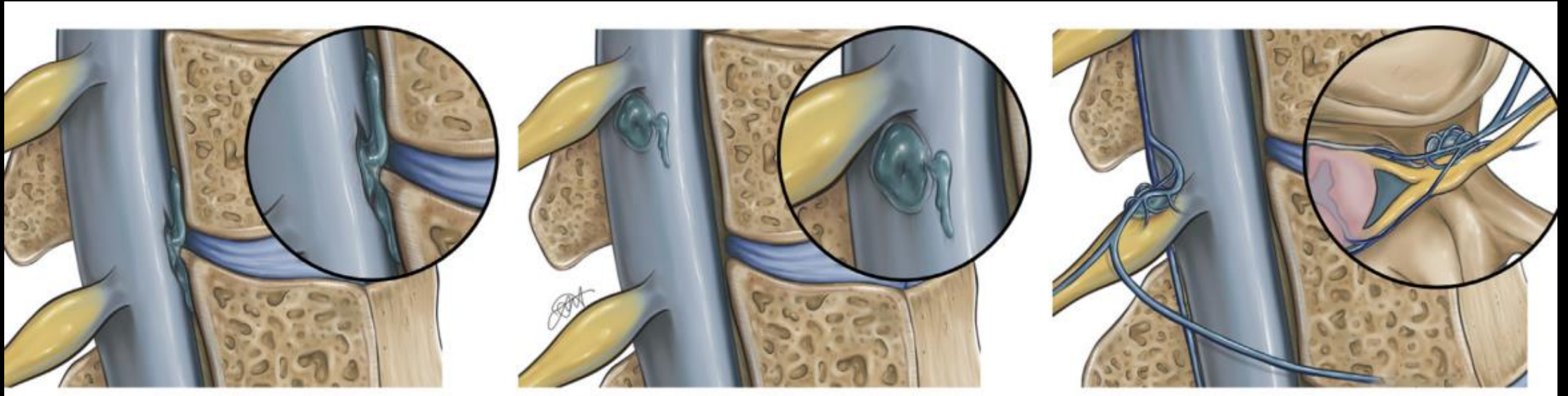






Causes of CSF leak

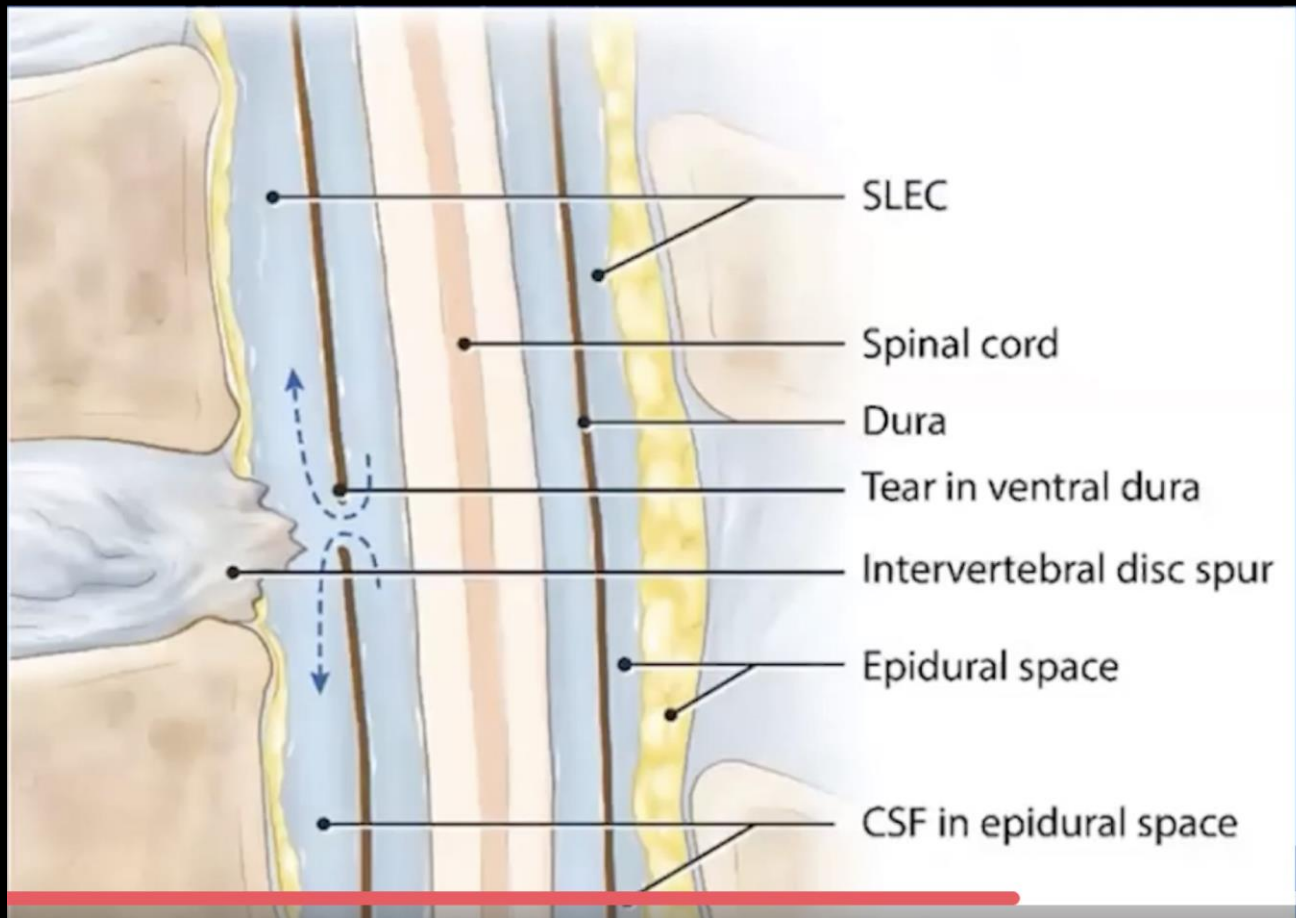
L. Carlton Jones et al. / Clinical Radiology 77 (2022) e181



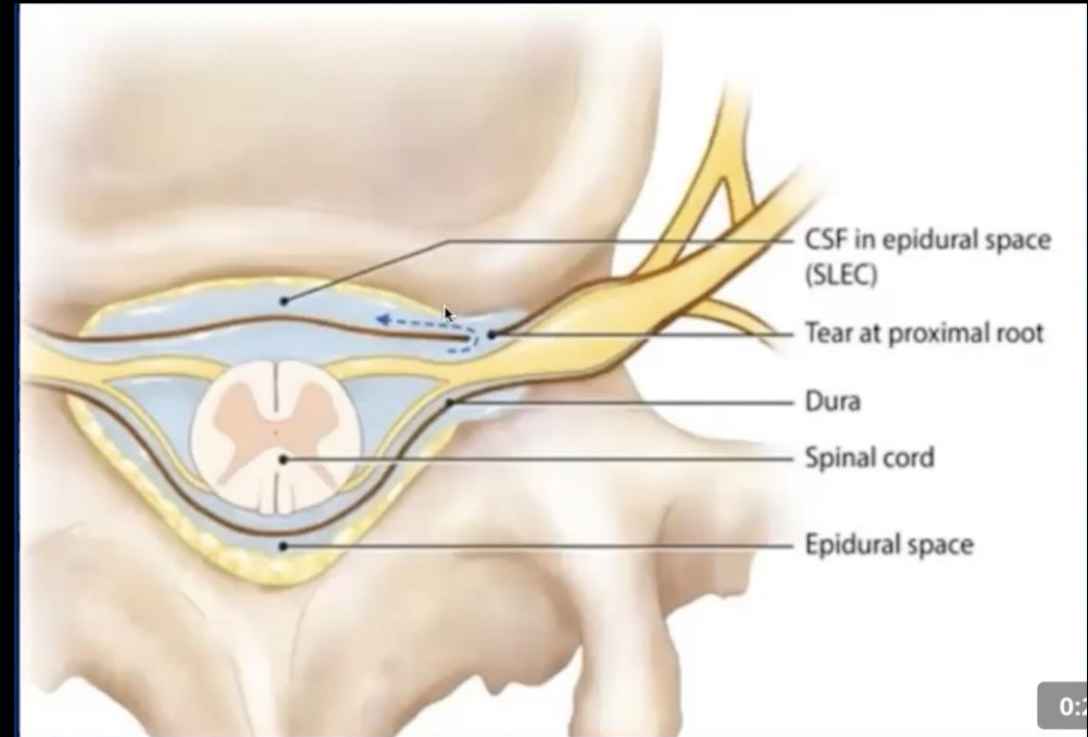
Microspur

Meningeal diverticulum

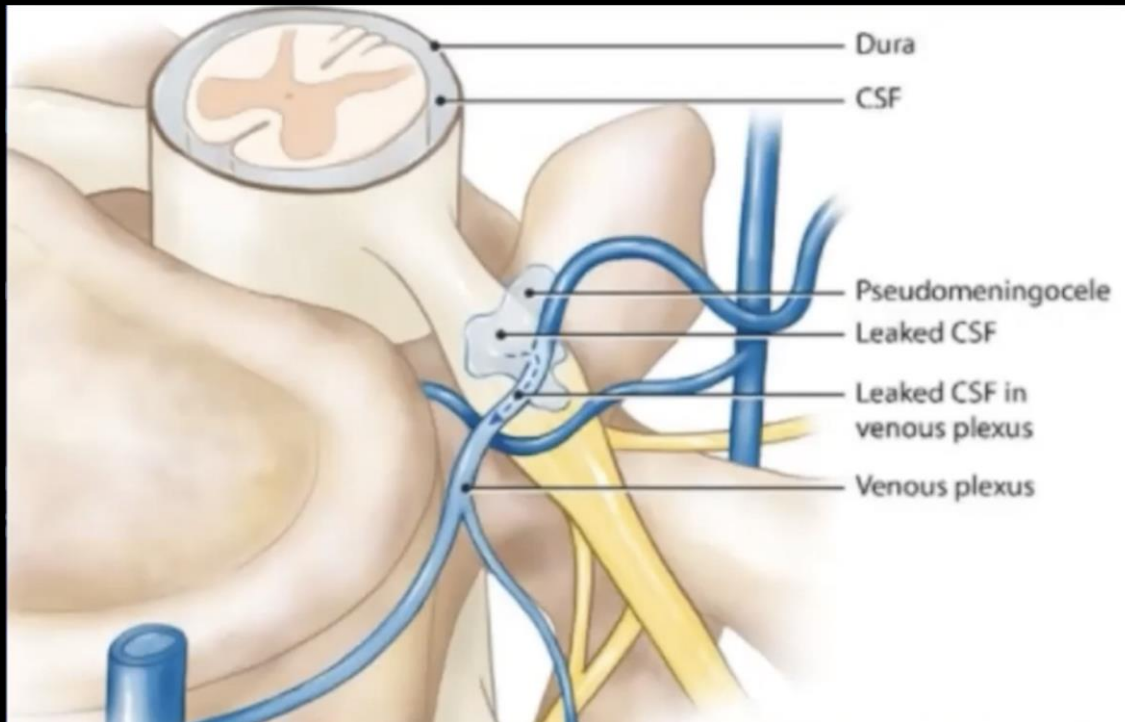
CSF-Venous fistula



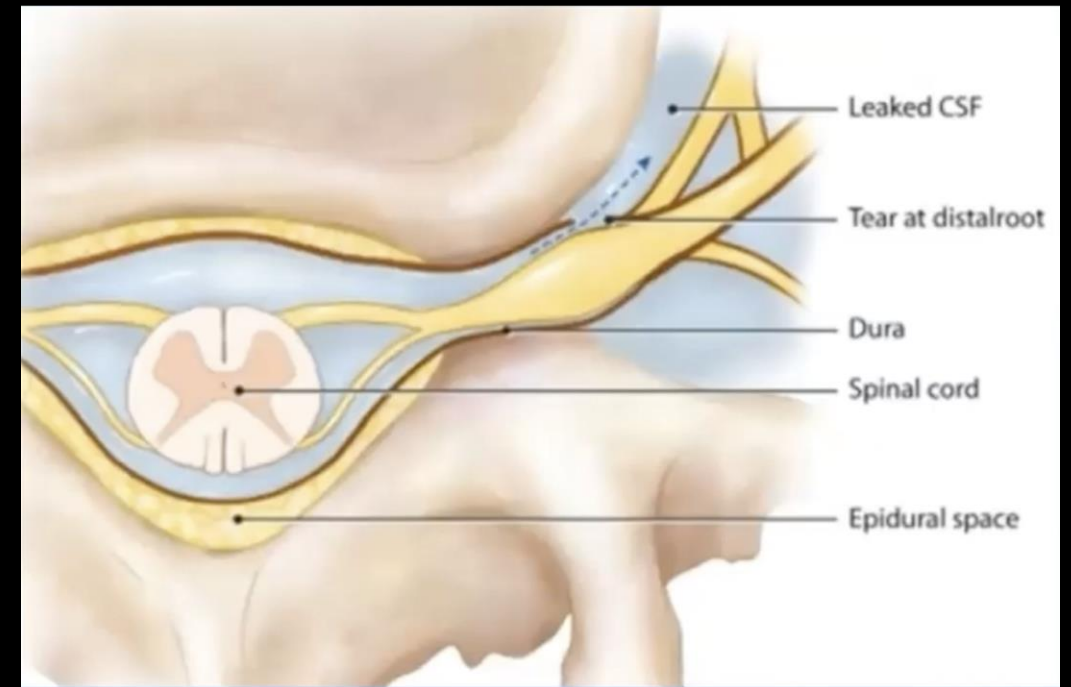
Ventral leak



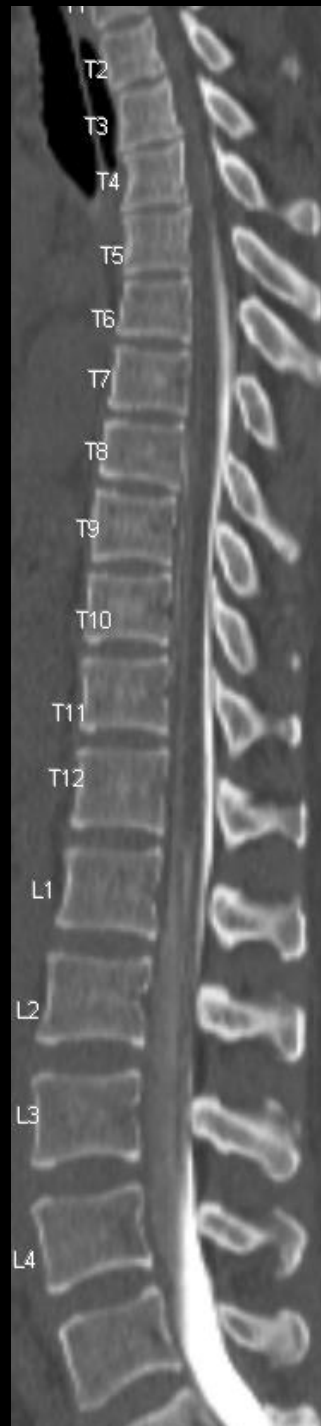
Lateral leak

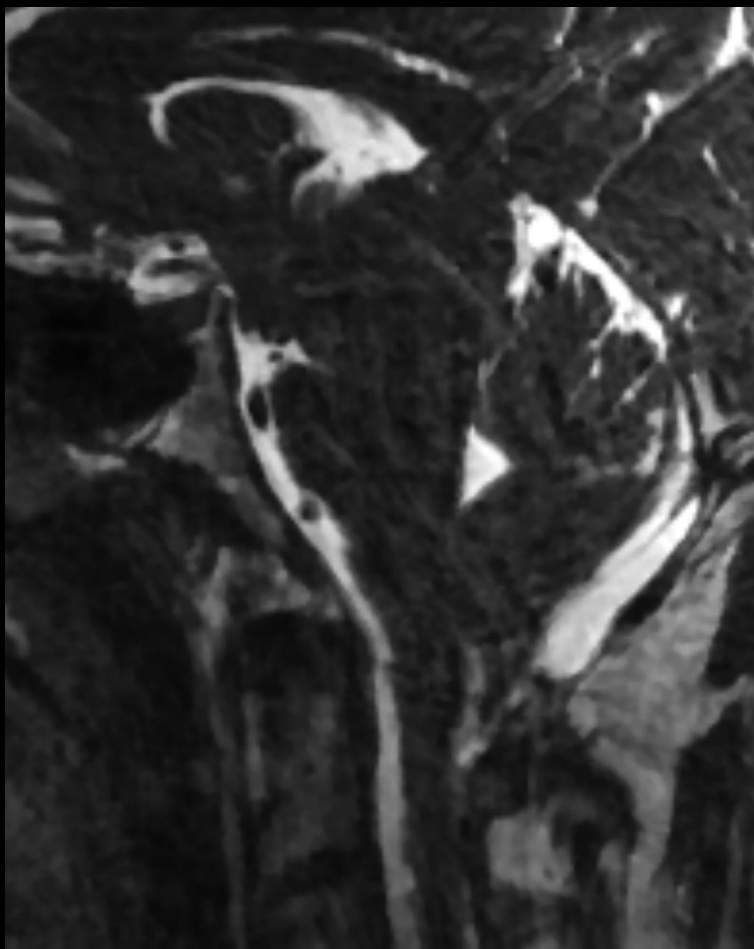
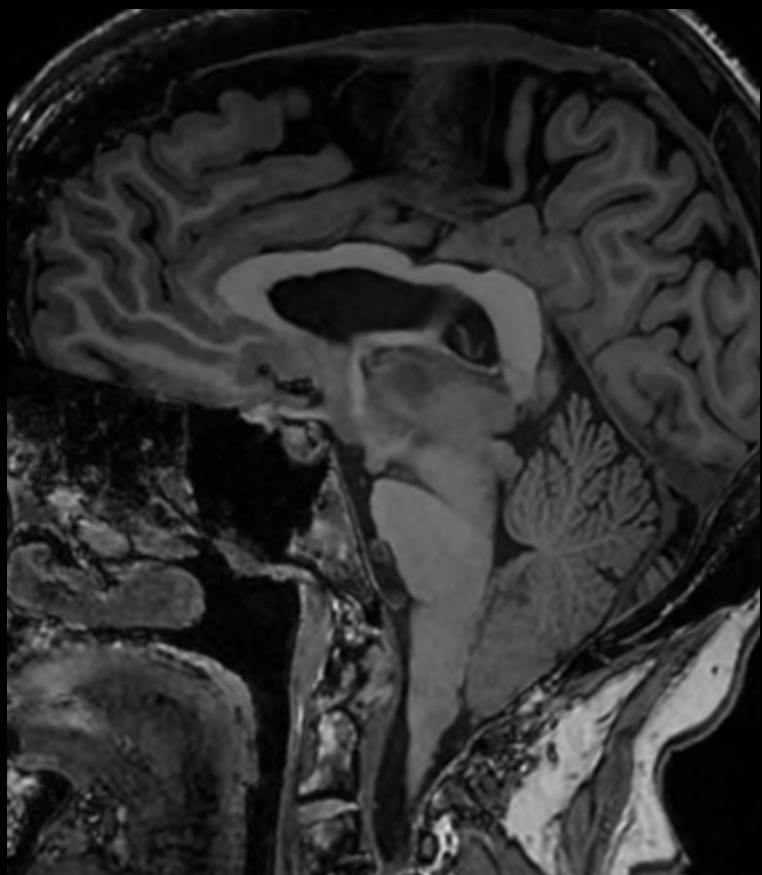


CSF-Venous fistula



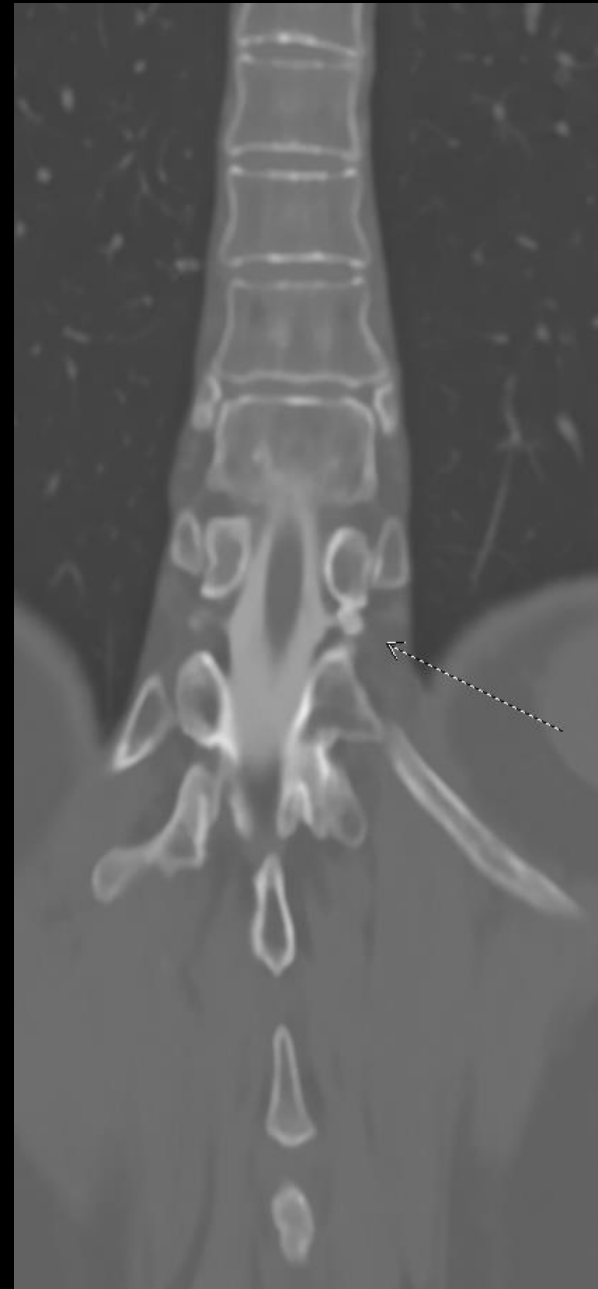
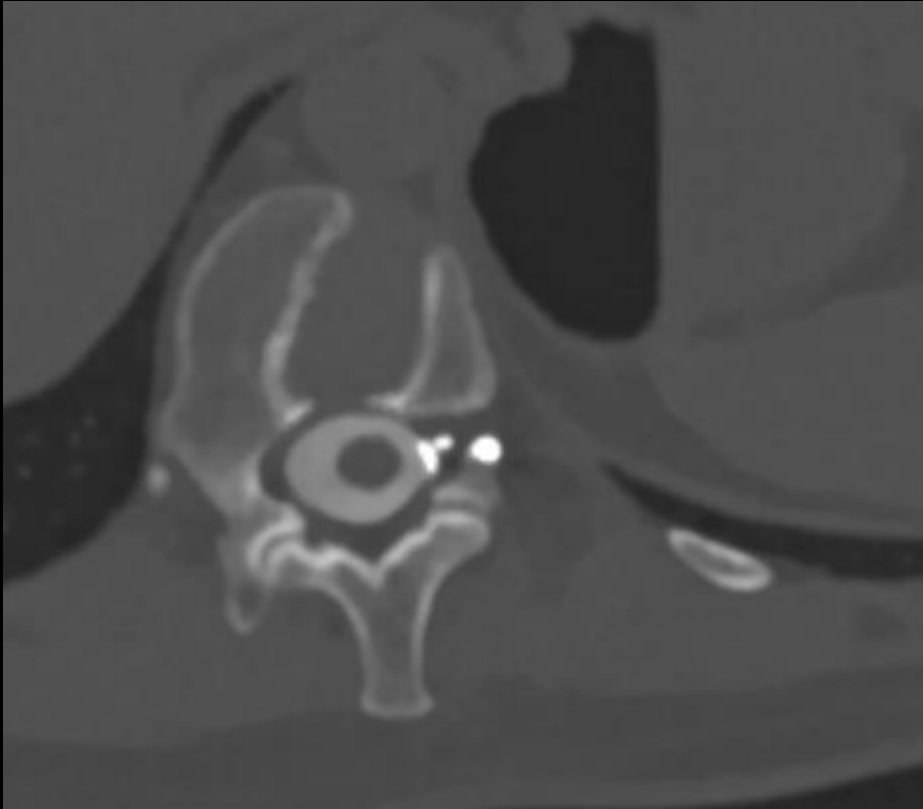
Nerve root sleeve leak

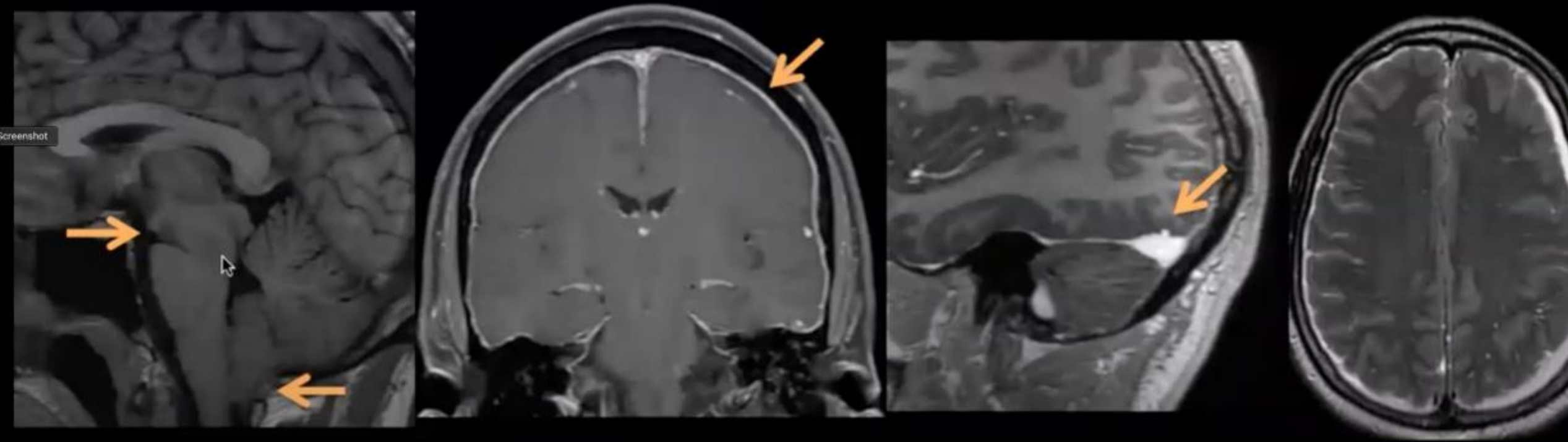






CSF-Venous fistula





Major (2 points)

Pachymeningeal enhancement

Venous sinus engorgement

Suprasellar cistern effacement - 4mm or less

Minor (1 point)

Subdural collections

Prepontine cistern effacement - 5mm or less

Mamillopontine distance 6.5mm or less

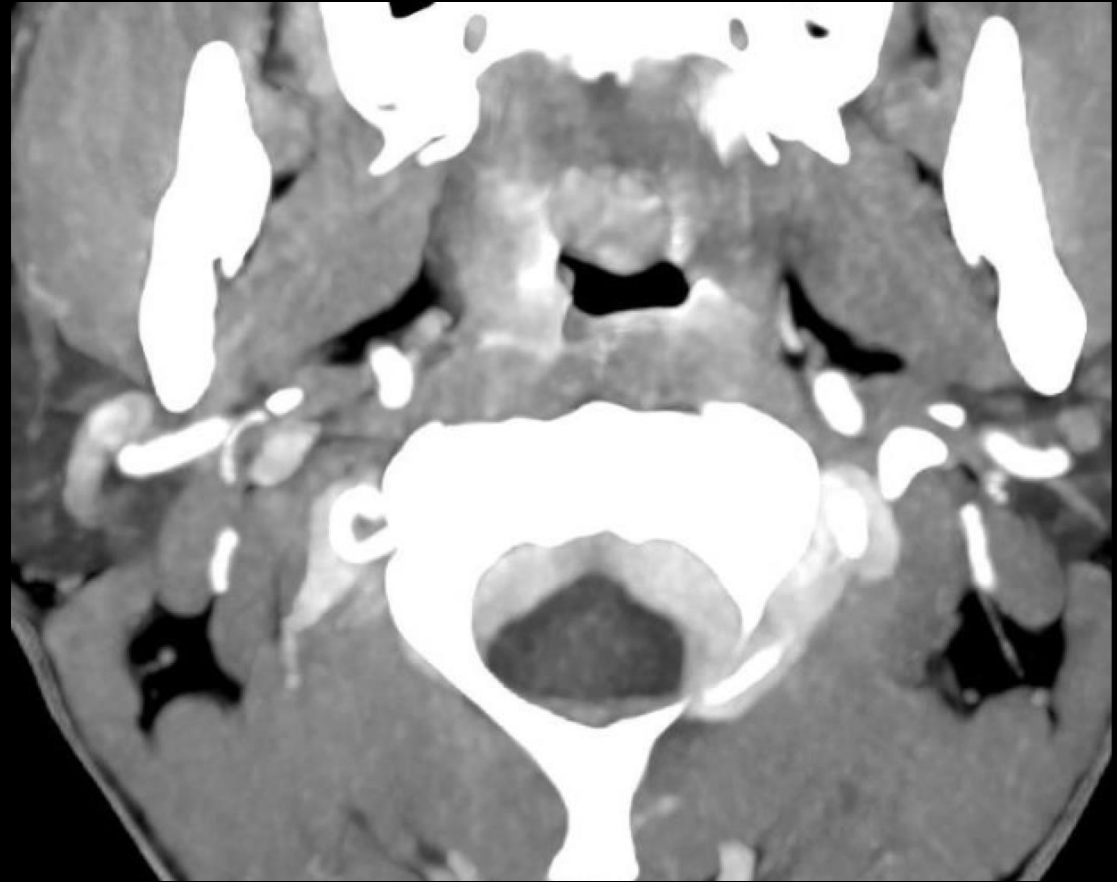
Bern/Dobrocky score

Dobrocky et al. JAMA Neurology 2019

Points	Probability
5 or more	High
3-4	Intermediate
0-2	Low

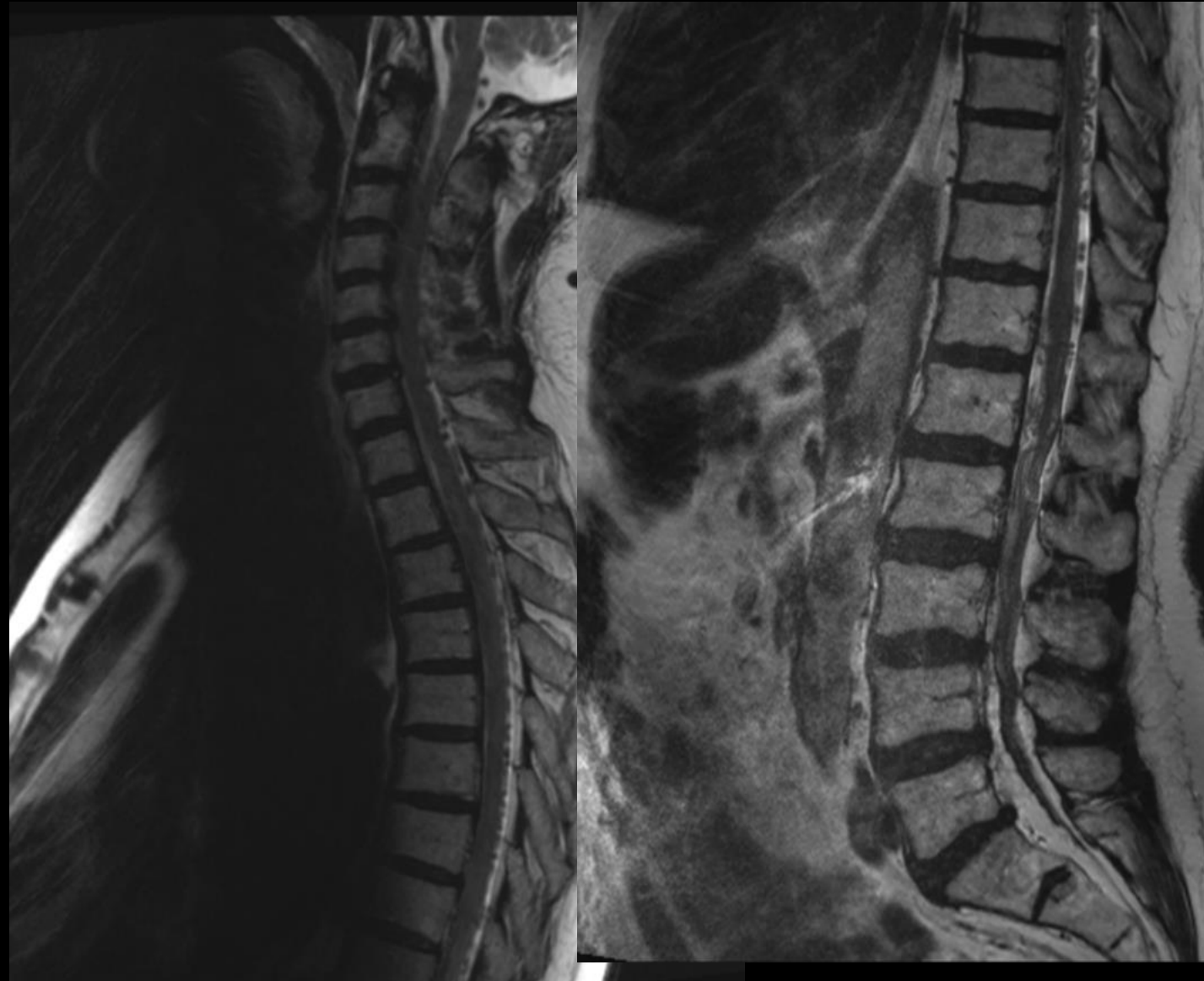
Likelihood of positive spinal imaging result – identify patients who may benefit from dynamic myelography

Anterior epidural engorgement

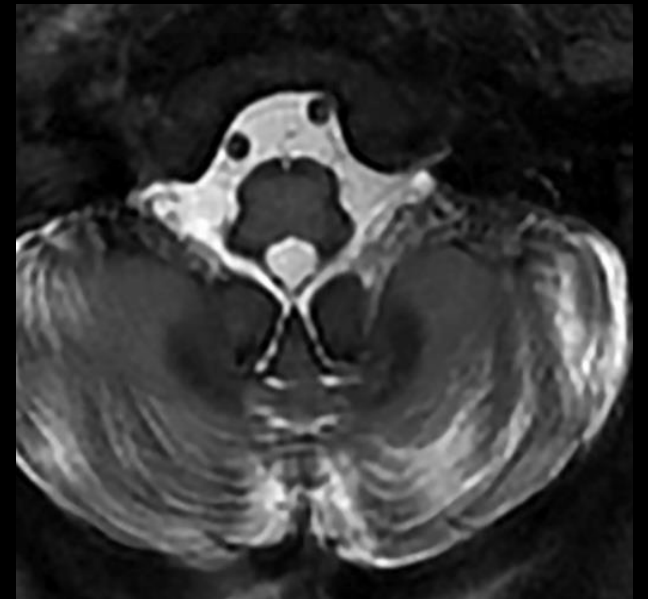
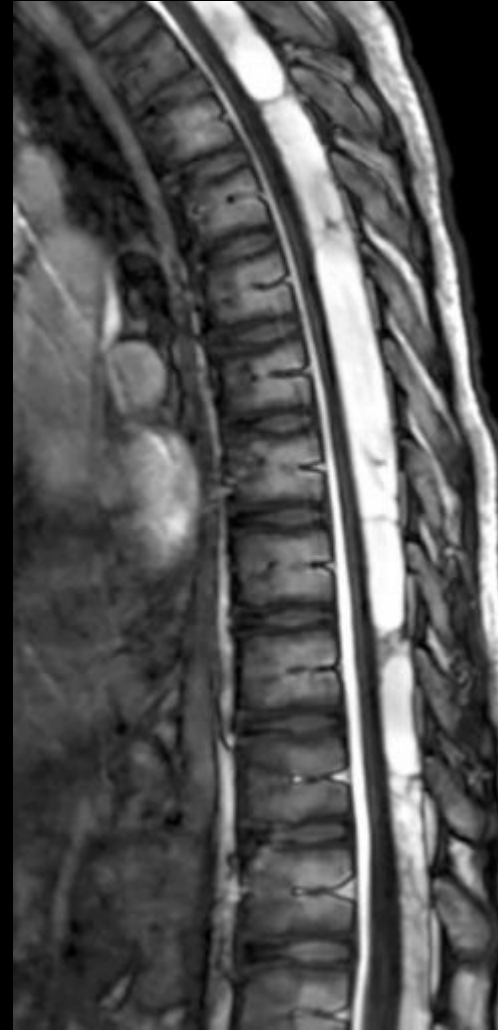
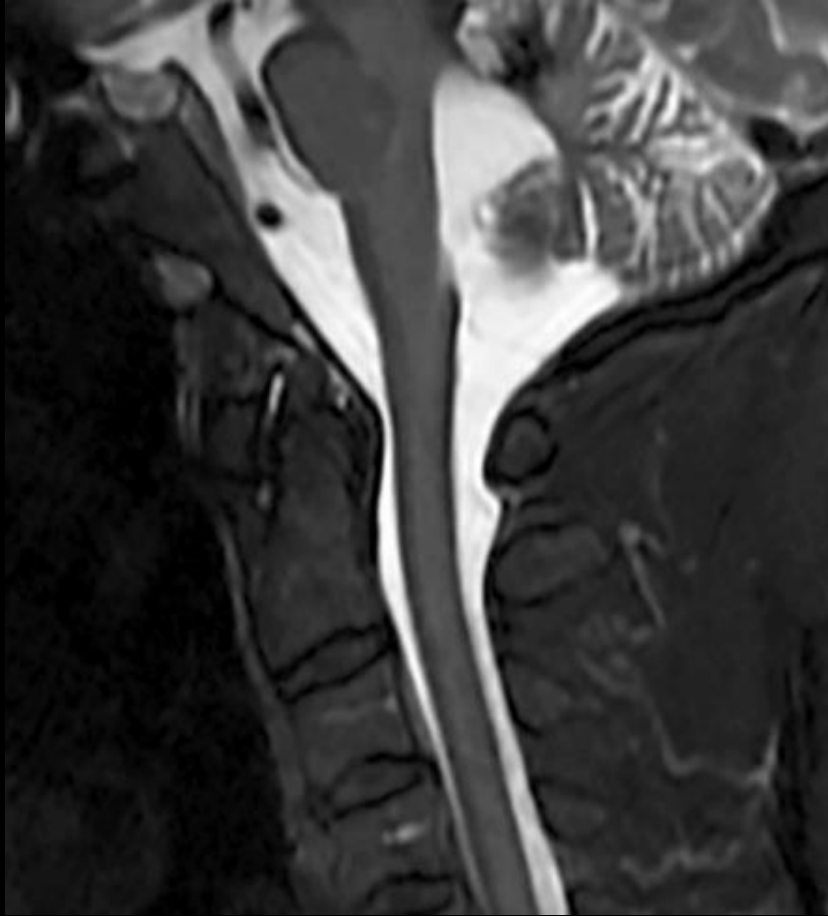


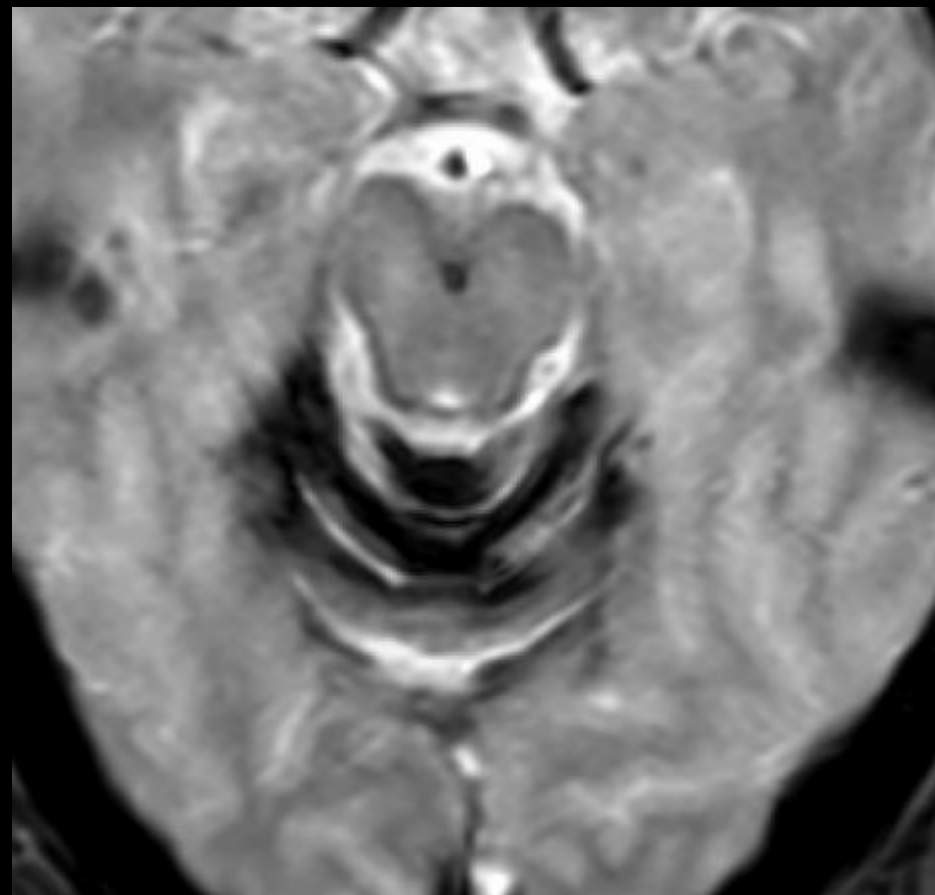
CSF hypotension

- Mimics sdAVF
- CSF hypotension can cause the venous congestion.
- MRA is helpful . Venous opacification is identified during early arterial phase in fistula in contrast venous opacification occurs during venous phase in CSF hypotension.

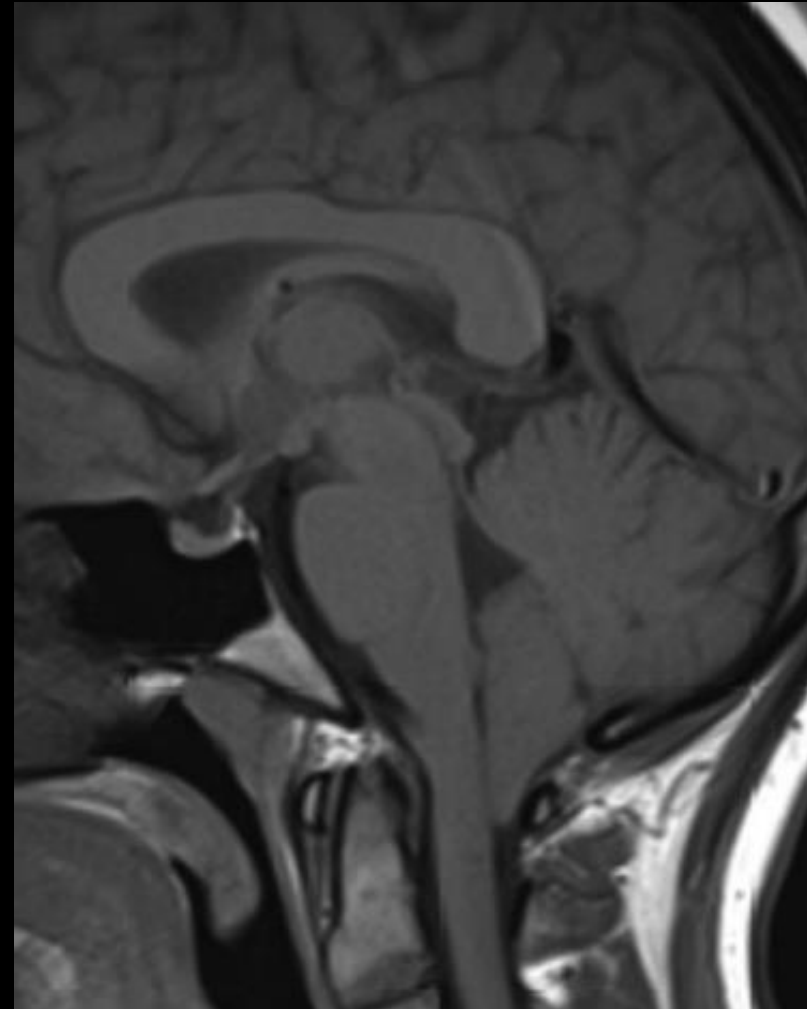
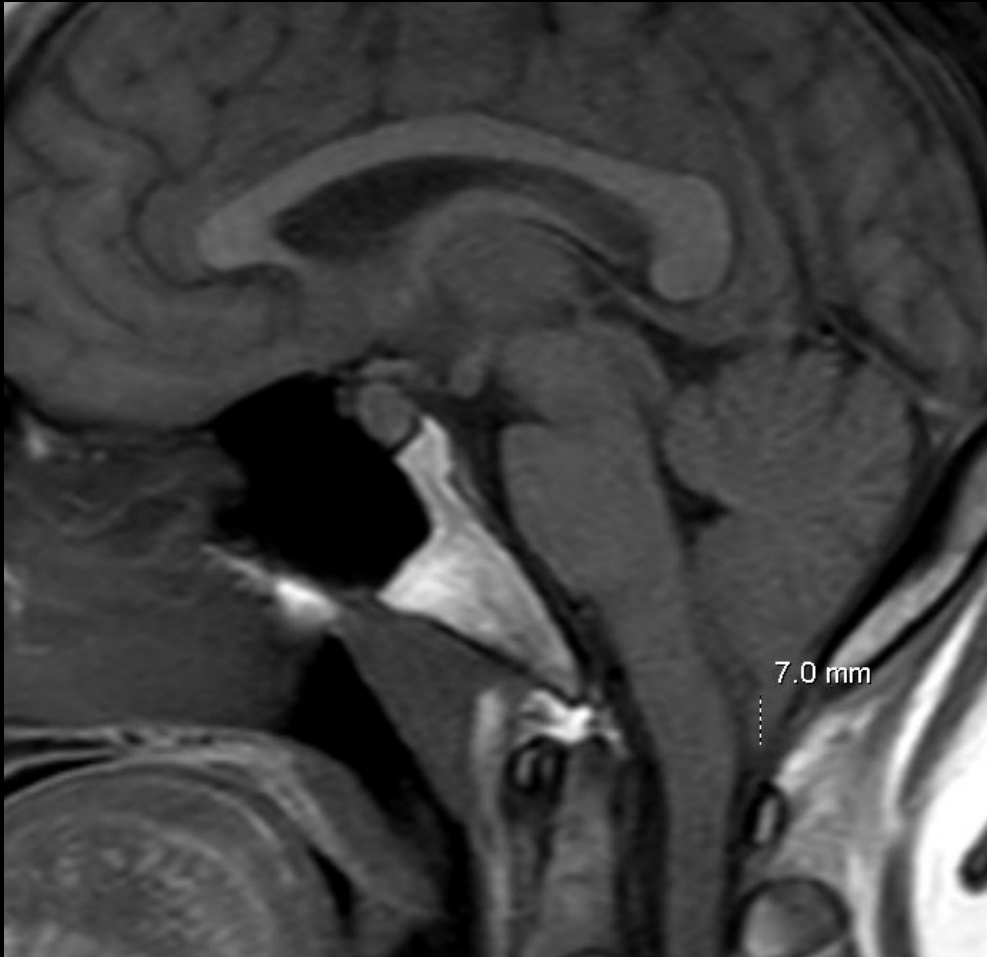


Superficial siderosis



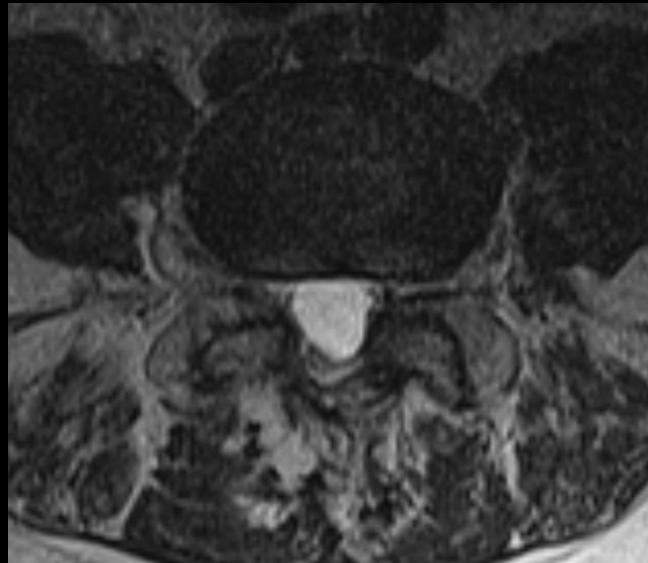


Quiz



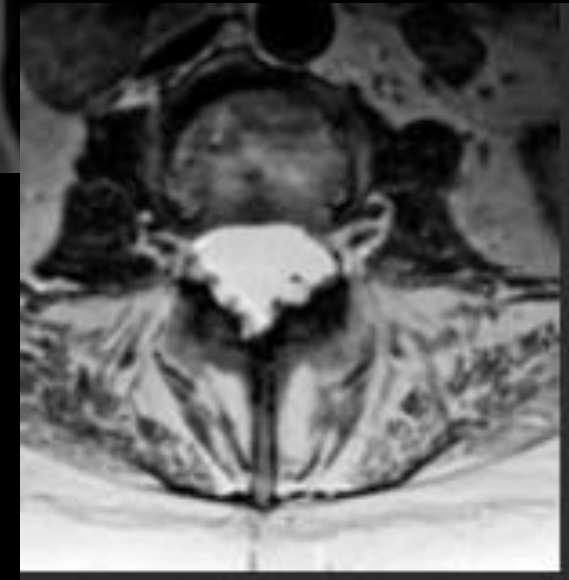
Arachnoiditis

- Persistent inflammation of the arachnoid-granulomatous reaction
- Nerve root atrophy
- CSF flow disruption(syrinx)



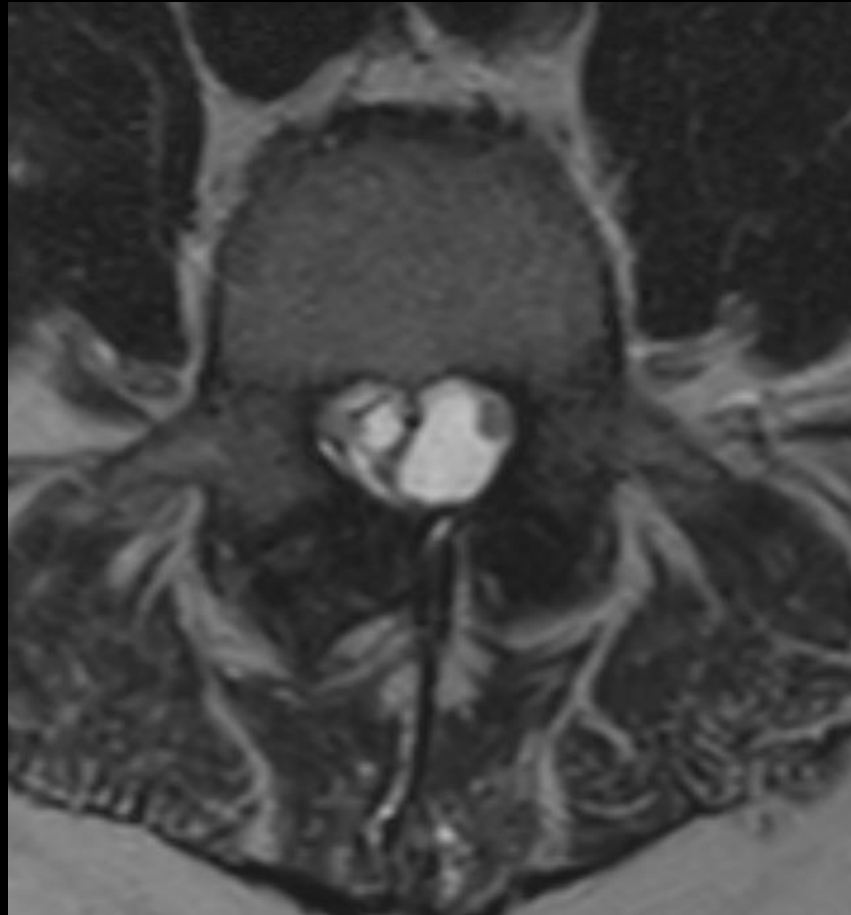
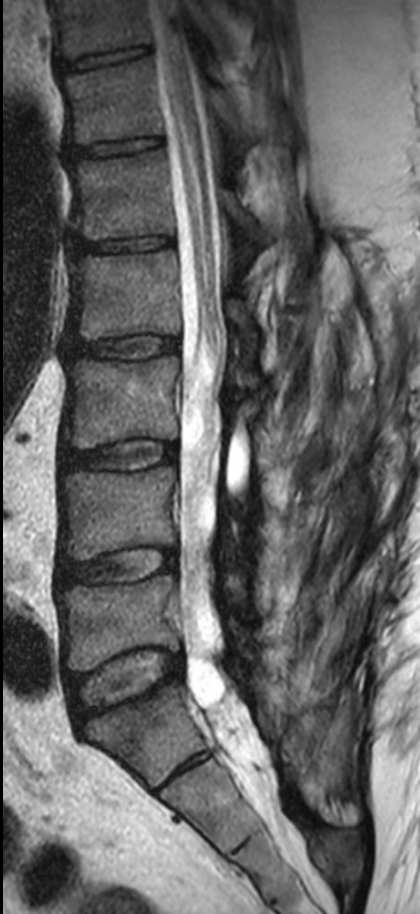
Arachnoiditis

- Chronic, insidious, debilitating
- Imaging: clumped or peripheral adhered to dura(empty sac sign)
- Pseudo mass on myelogram
- Arachnoiditis ossificans

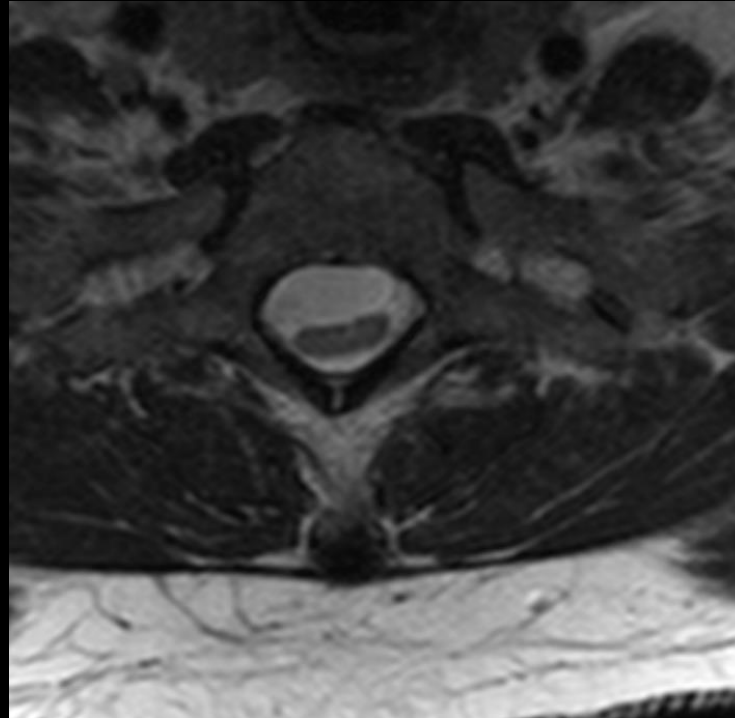


Pseudo mass appearance

Arachnoid adhesions



Dural adhesions



One year after

Thank you!

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