IMAGING of ACUTE MYELOPATHY

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MYELOPATHY = broad term referring any lesion of the spinal cord

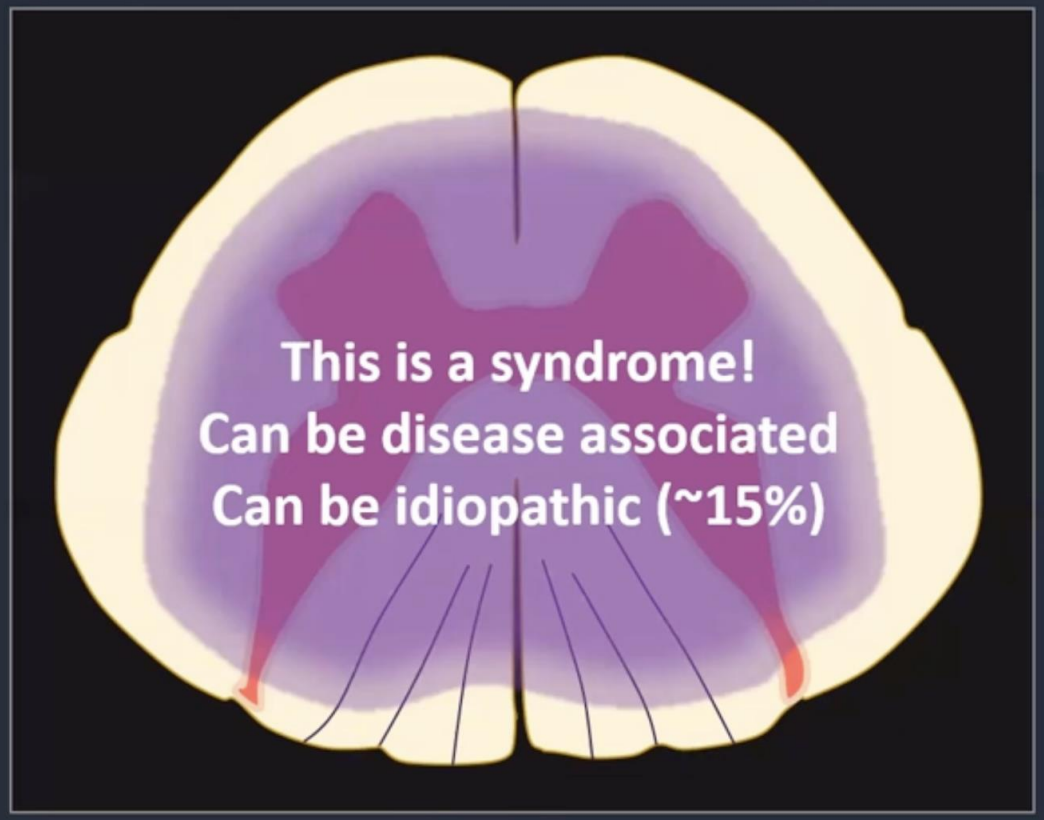
Time to reach maximum deficit

- **Acute myelopathy**: Symptoms progress to their worst within 21 days
- **Subacute myelopathy**: Symptoms progress over weeks to months
- **Chronic myelopathy**: Symptoms progress over months to years

Cause :

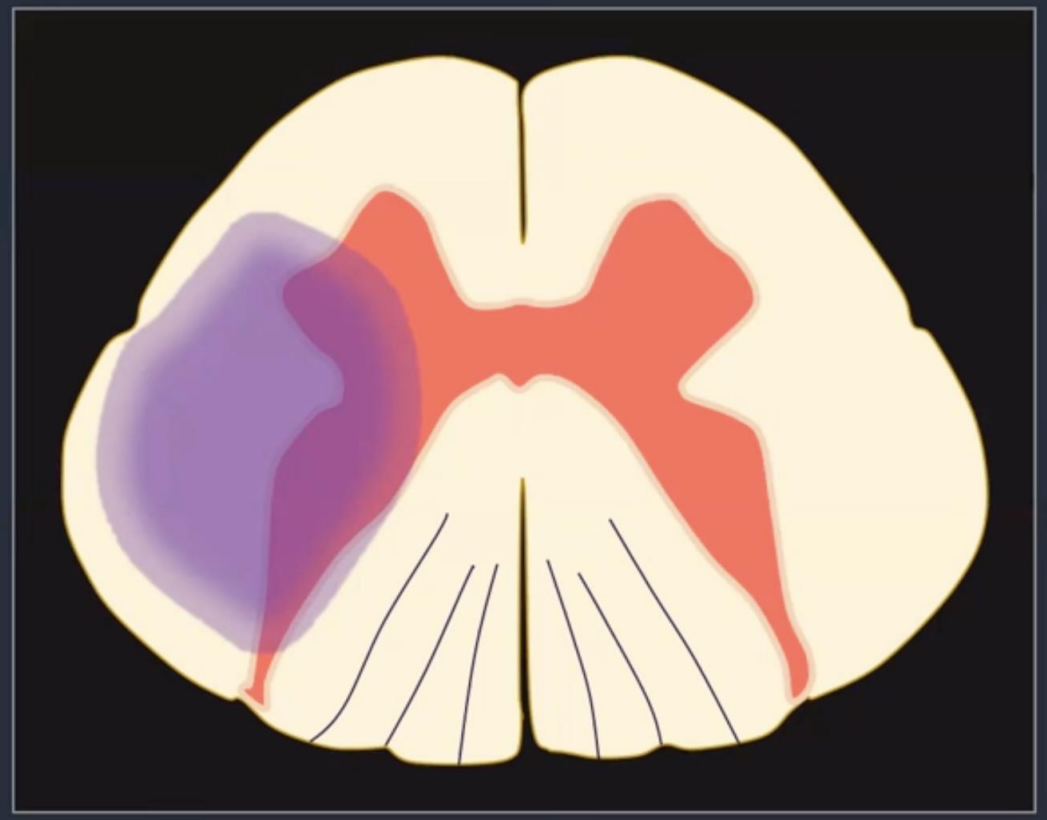
- **Traumatic myelopathy**
- **Non-traumatic myelopathy**: Caused by ischaemic, infectious, inflammatory, nutritional, or metabolic causes
- **Systemic disease**: Such as Sjögren's syndrome or systemic lupus erythematosus
- **Delayed radiation myelopathy (DRM)**
- **Spinal cord infarct (SCI)**

Acute transverse myelitis



Clinical presentation of acute myelitis in which **both halves of the spinal cord** are involved, resulting in bilateral sensory or motor changes

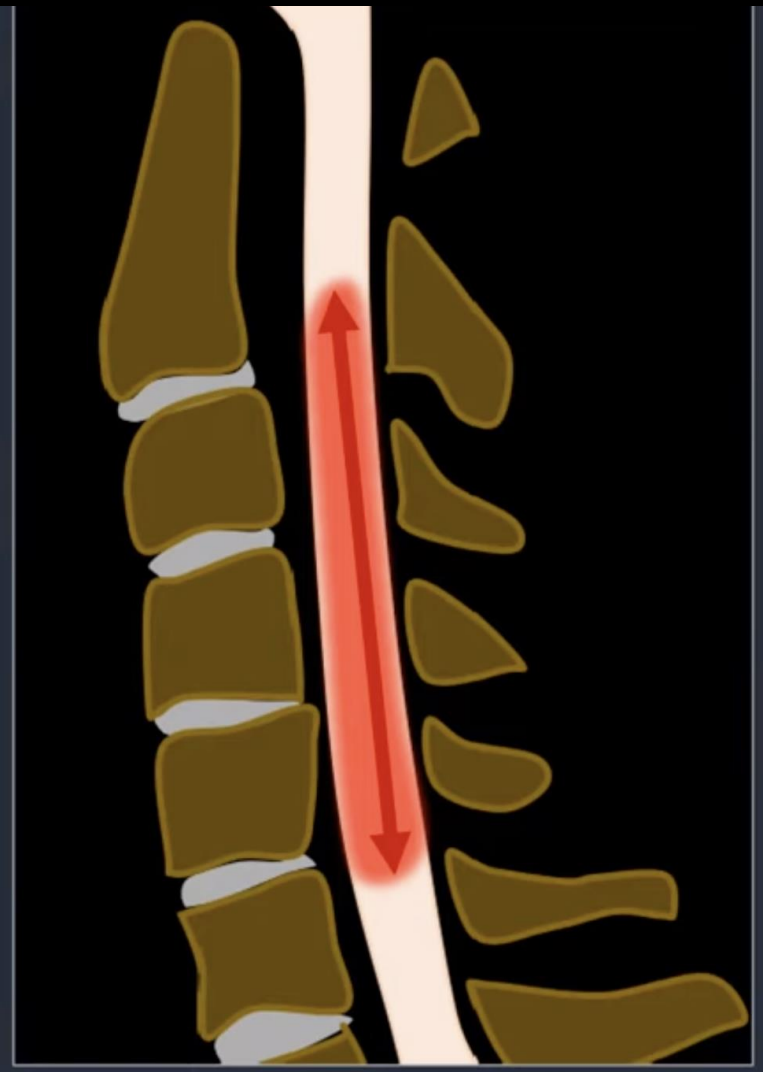
Acute partial myelitis



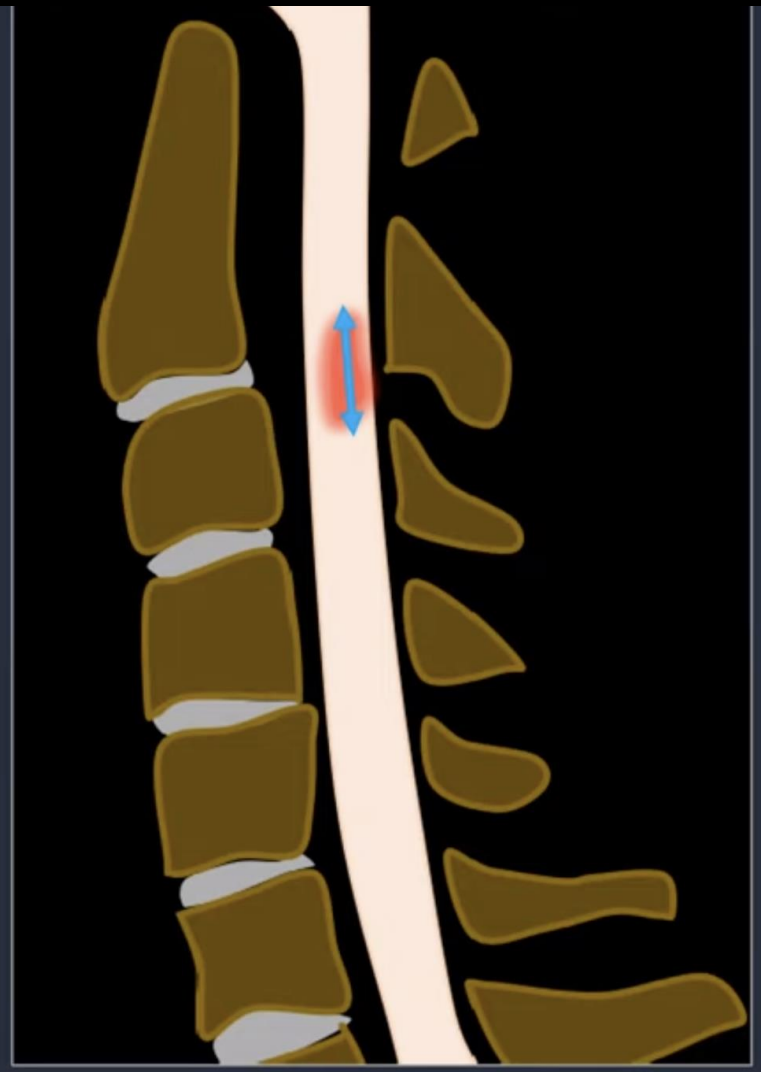
Myelitis limited to **one side of the spinal cord or one particular tract**; more commonly seen in specific diseases such as multiple sclerosis

* MYELITIS = spinal cord inflammation

≥ 3 vertebral segments



Longitudinally extensive myelitis



Short segment (extensive) myelitis

< 3 vertebral segments

Cause :
COMPRESSIVE

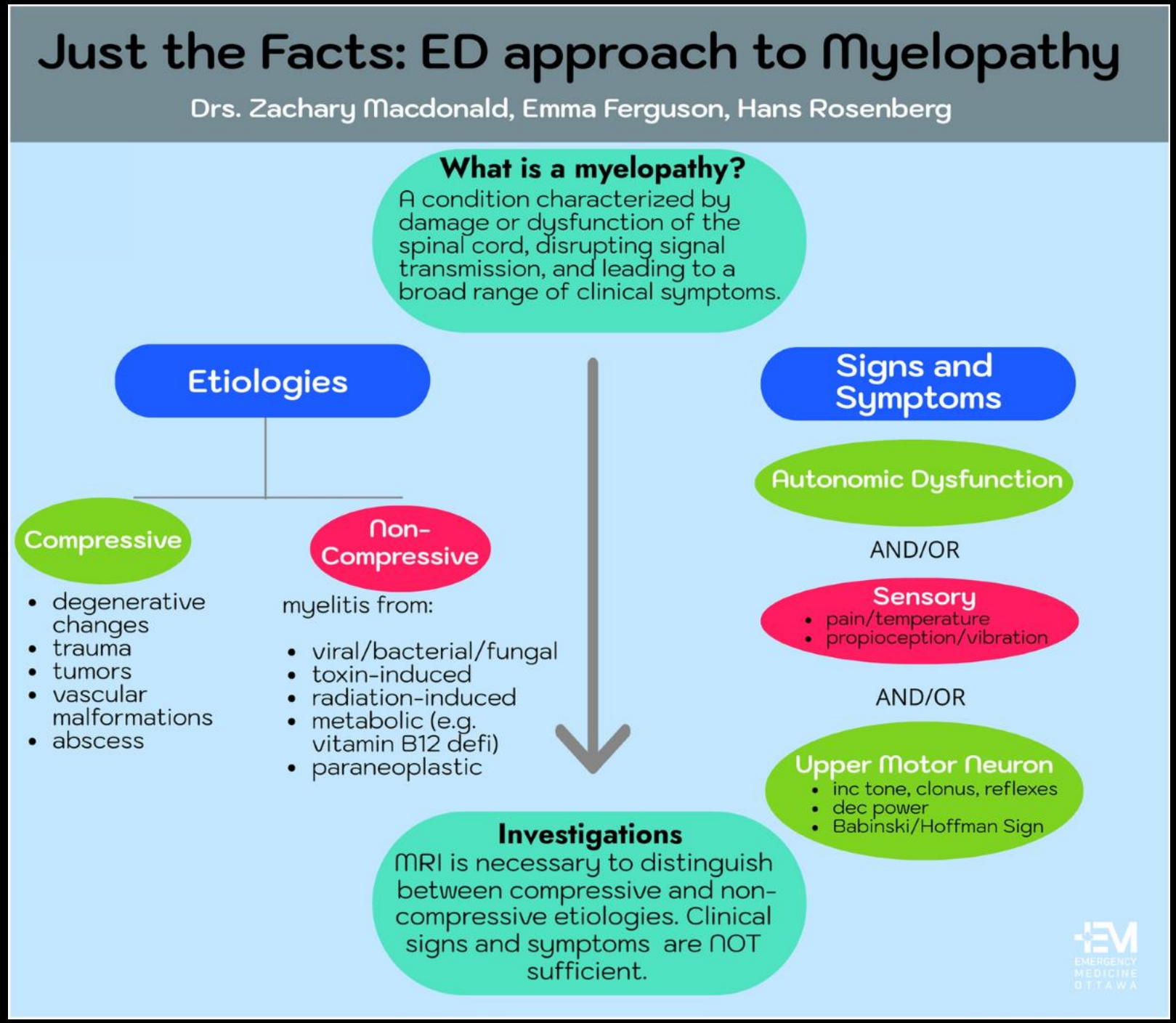
vs

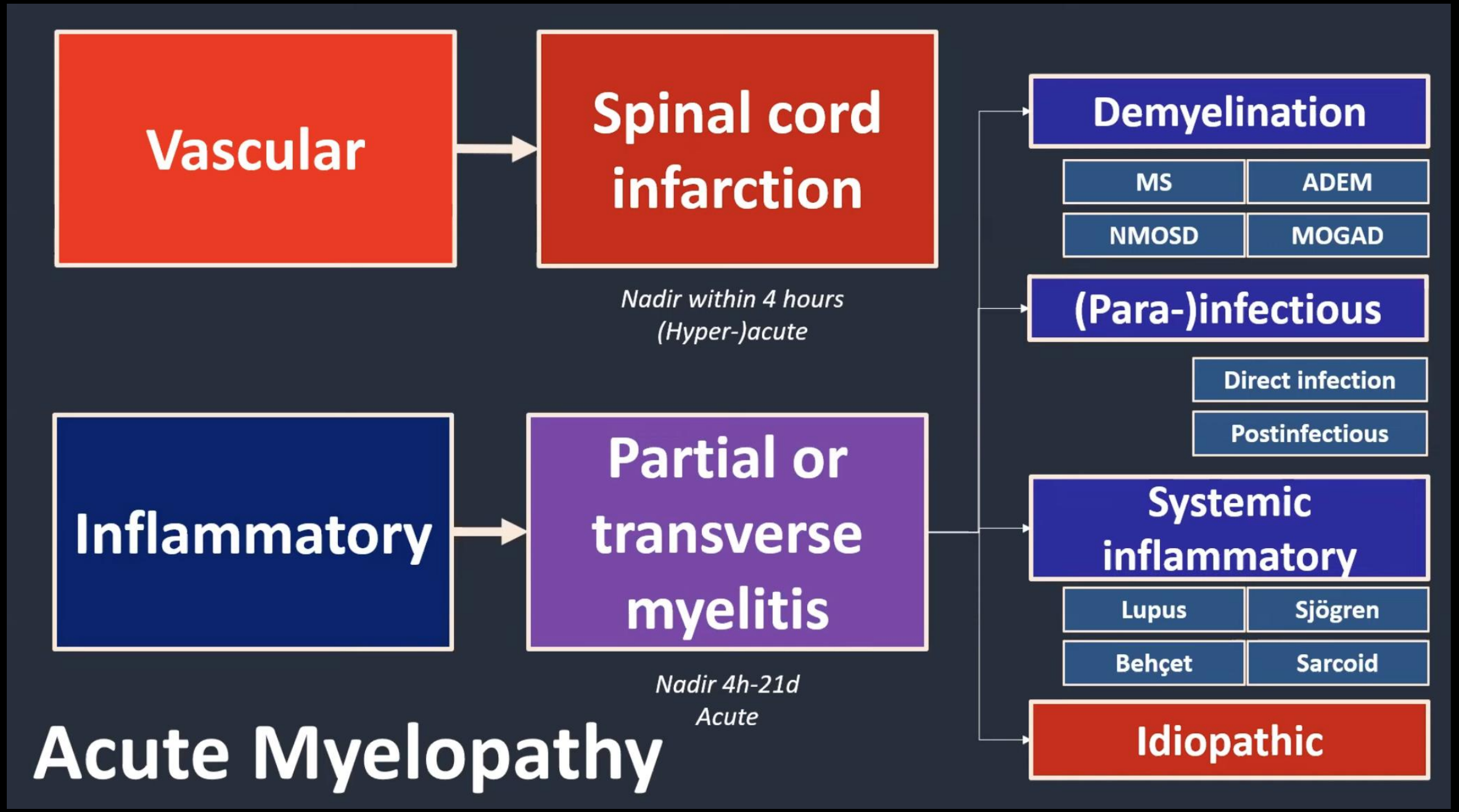
NON COMPRESSIVE

INFLAMMATORY

vs

NON INFLAMMATORY



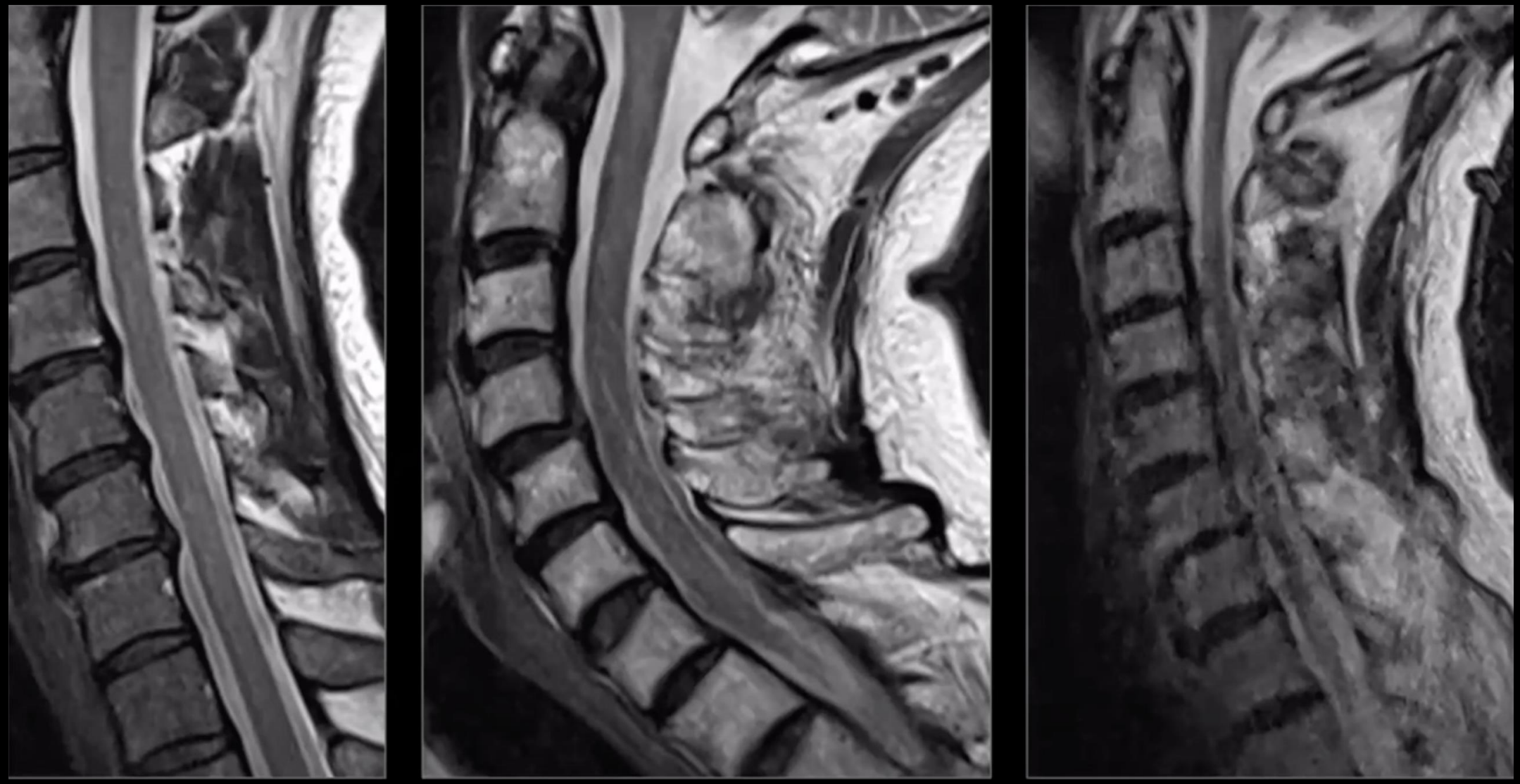

Vascular
Spinal cord infarction
Nadir within 4 hours
(Hyper-)acute
Inflammatory
Partial or transverse myelitis
Nadir 4h-21d
Acute
Demyelination
MS
ADEM
NMOSD
MOGAD
(Para-)infectious
Direct infection
Postinfectious
Systemic inflammatory
Lupus
Sjögren
Behçet
Sarcoid
Idiopathic
Acute Myelopathy

1. T2-hyperintensity: real or artifact ?

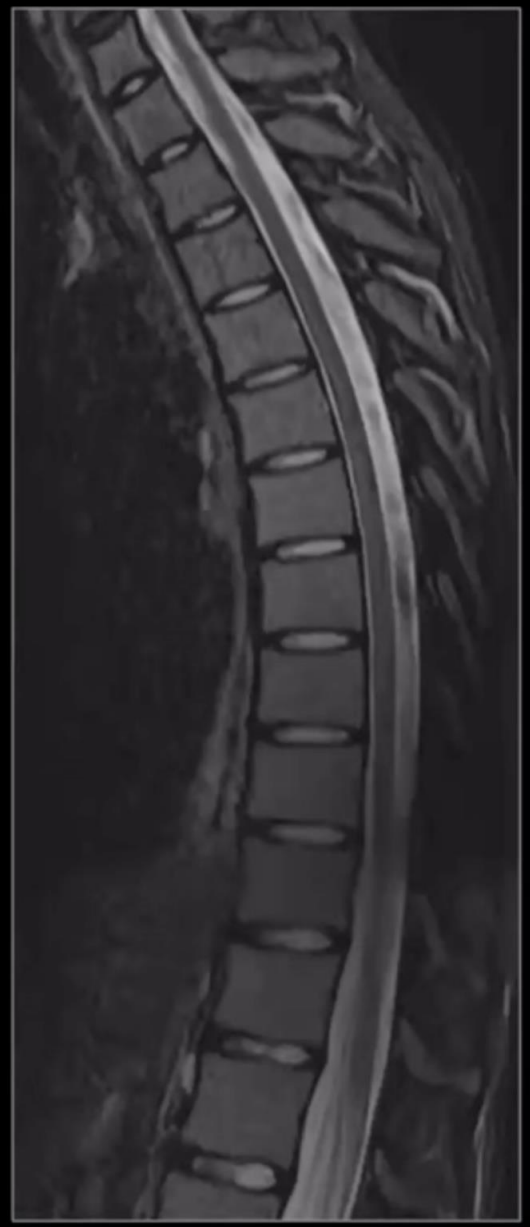
2. Is there any spinal cord compression ?

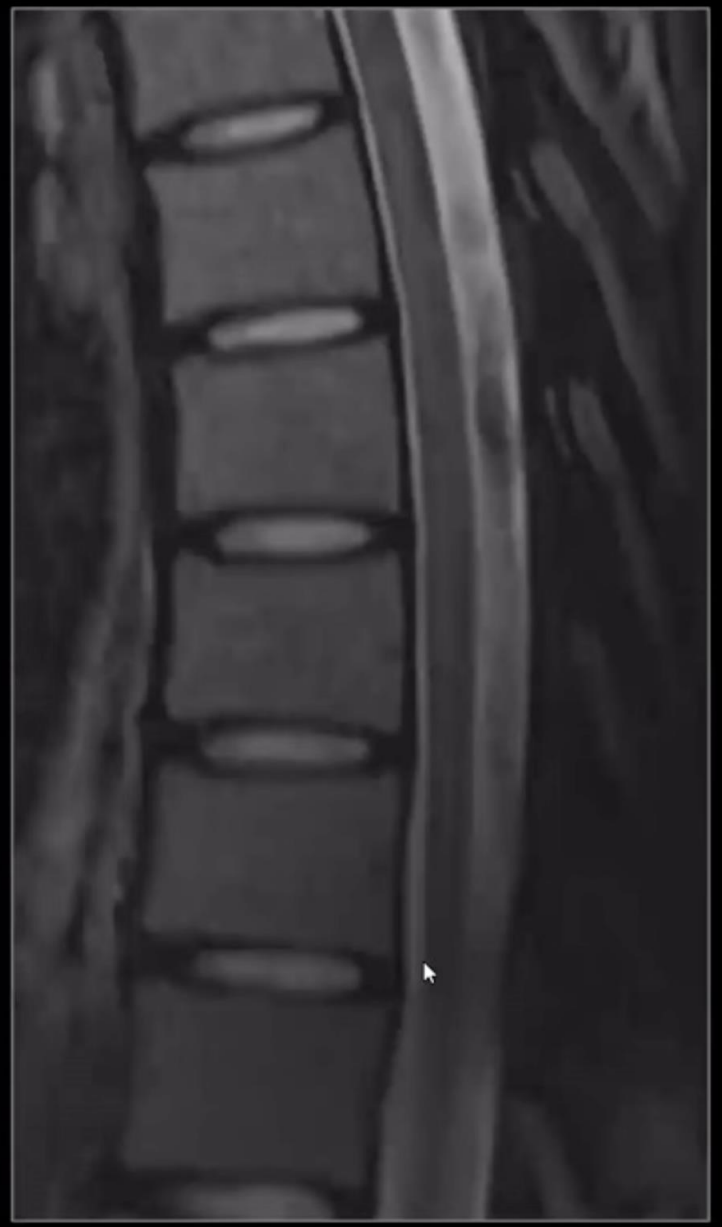
3. Acute or subacute/ chronic onset ?

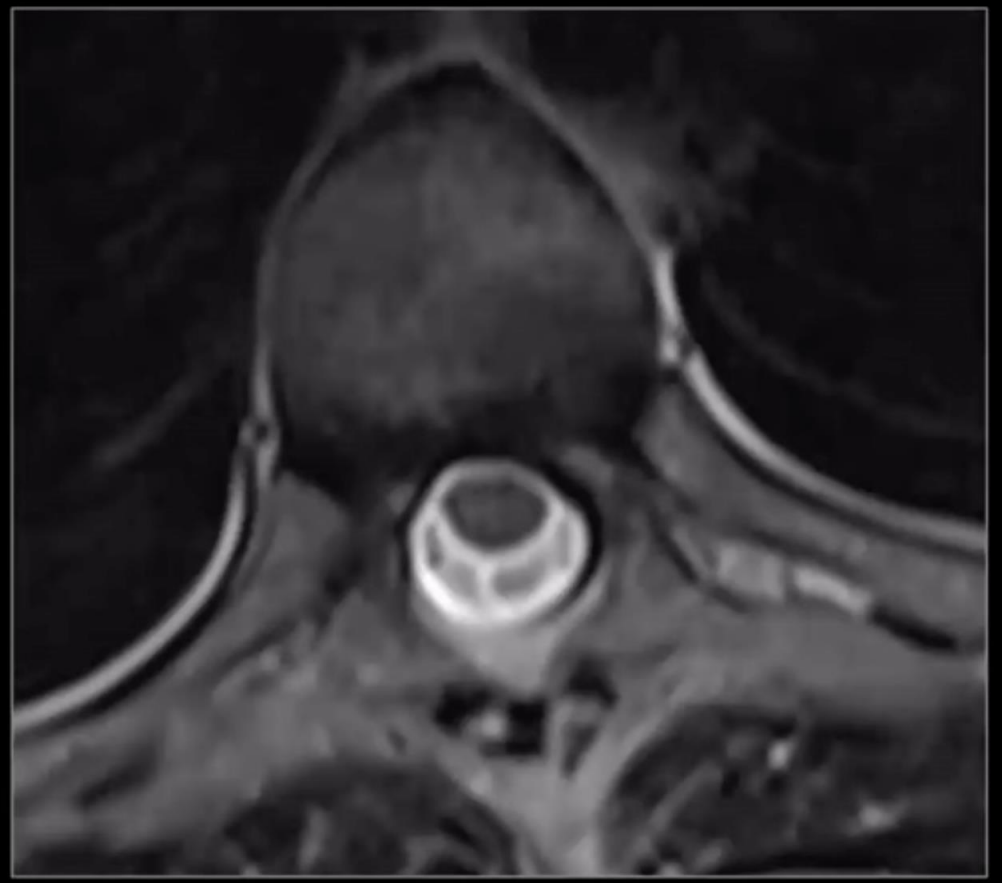
T2-hyperintensity: real or artifact ?



Spinal cord imaging prone to artifact – due to truncation/ gibs artifact (difference interface between CSF & spinal cord).



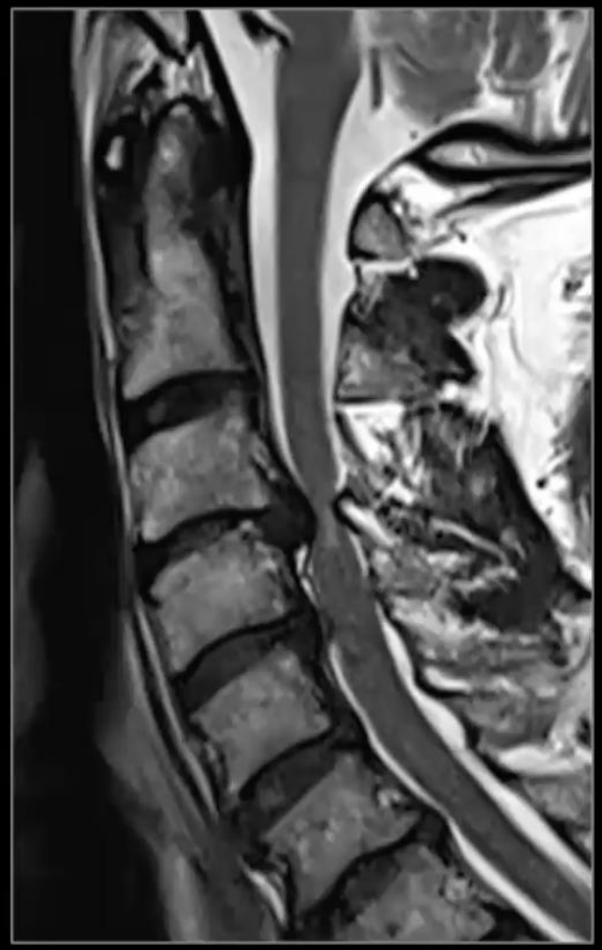




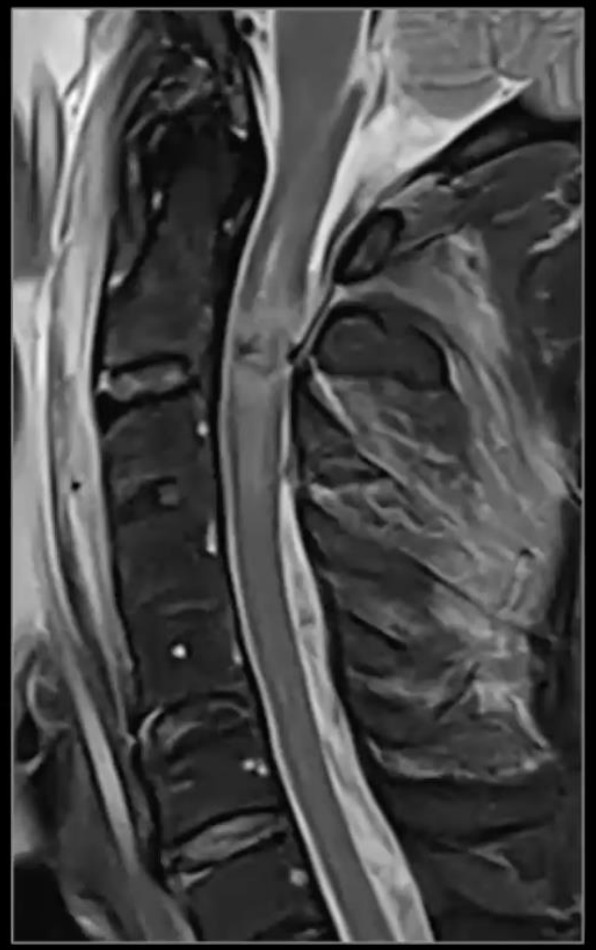
CSF-flow related artefacts

Is there any spinal cord compression ?

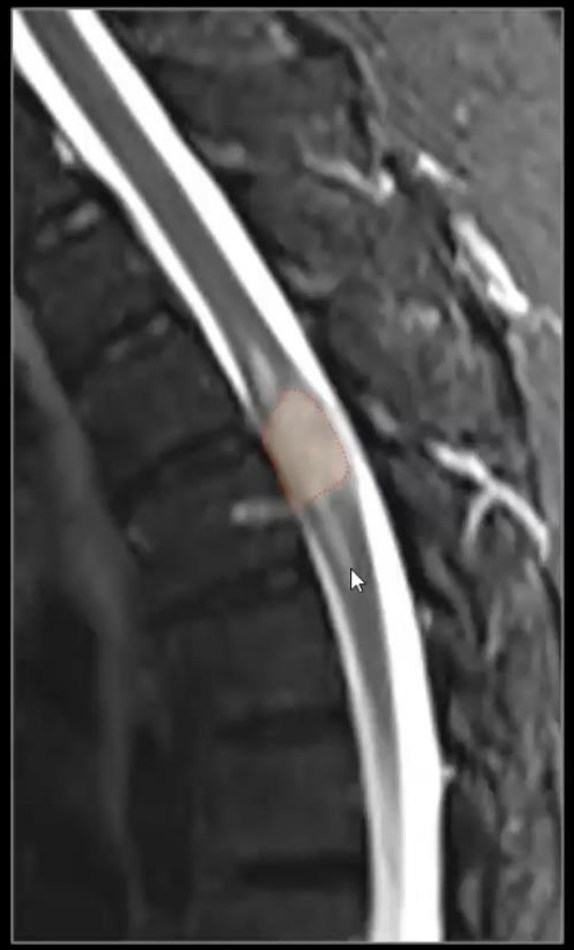
Compressive myelopathy



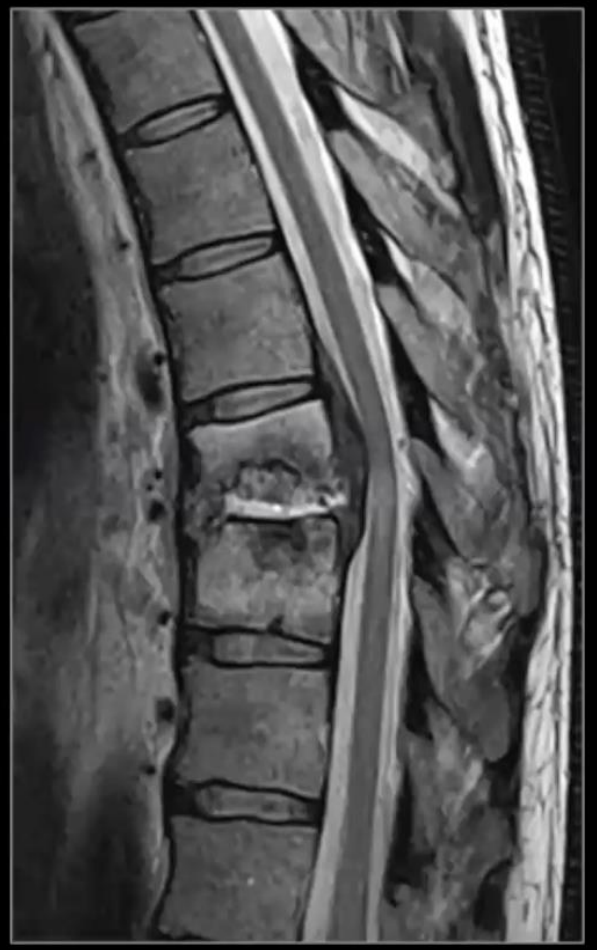
Spondylosis



Trauma

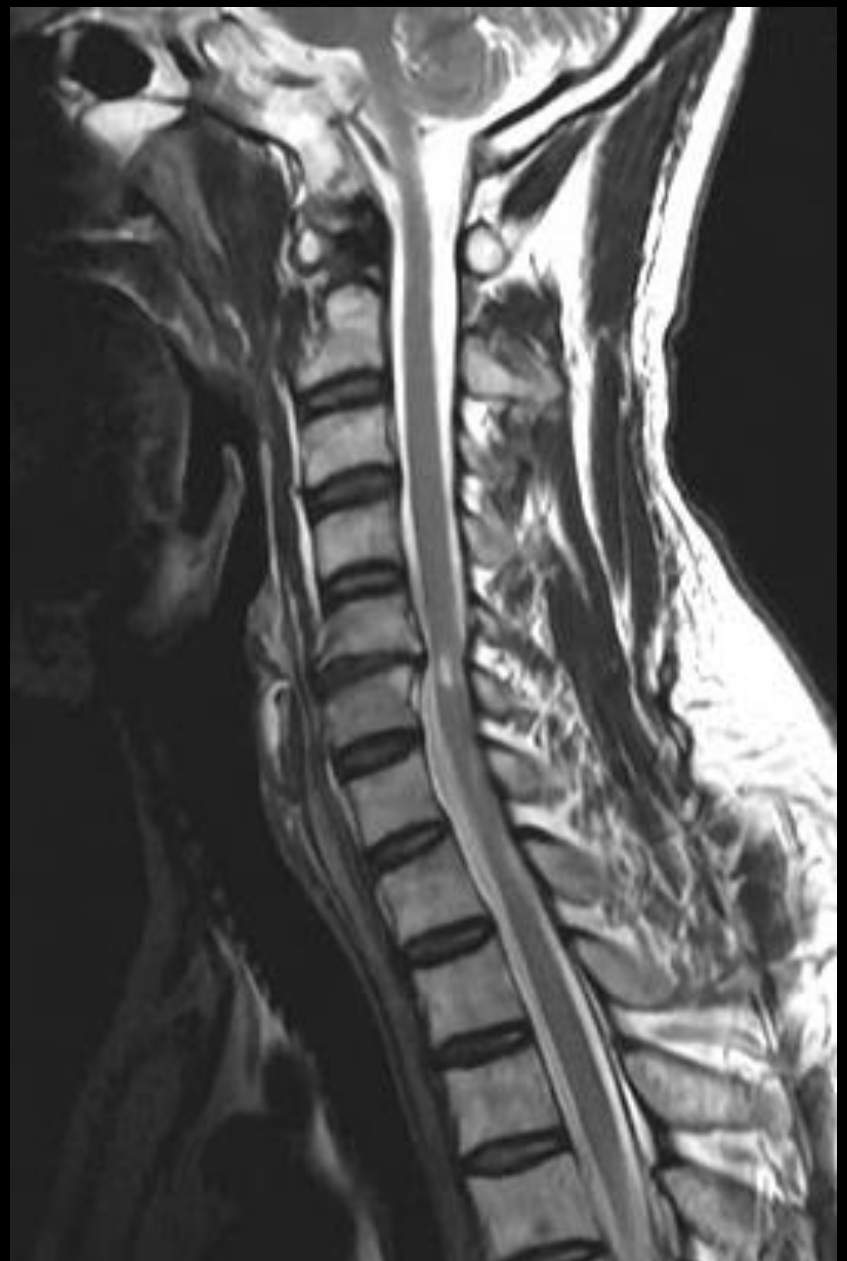


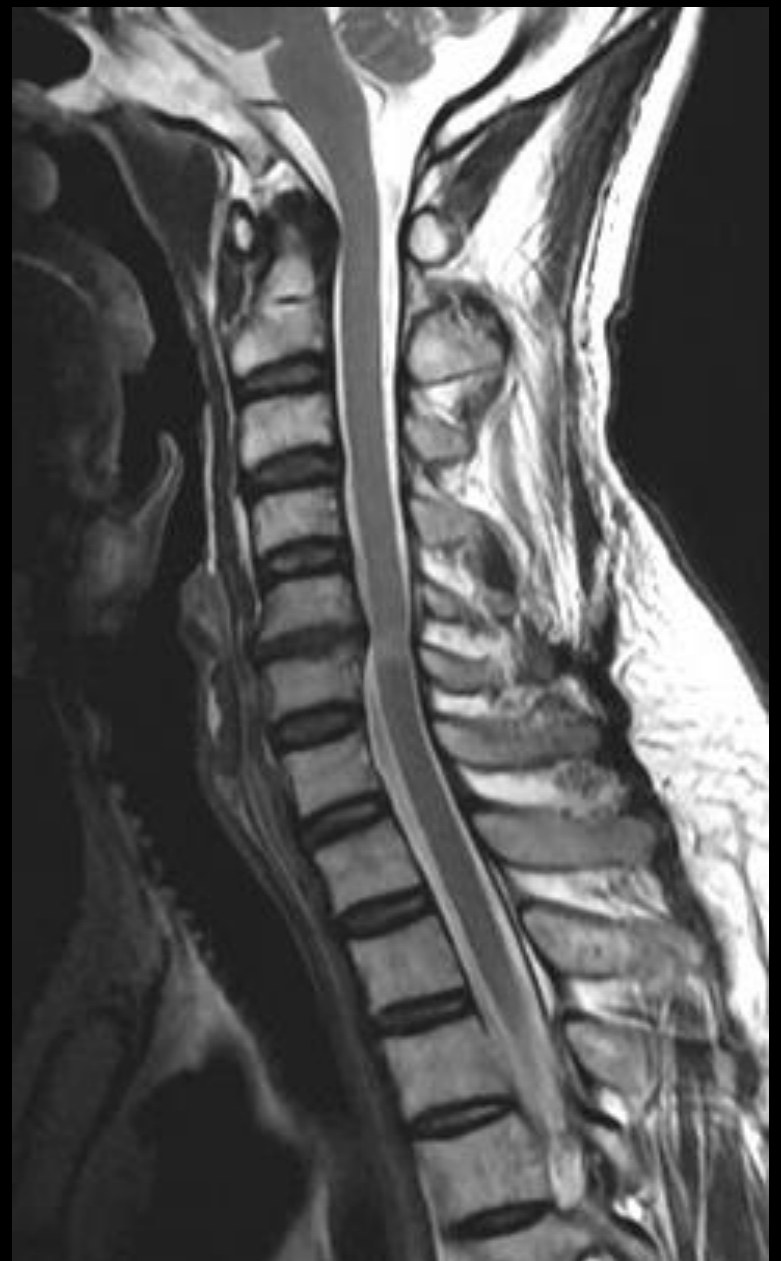
Tumor

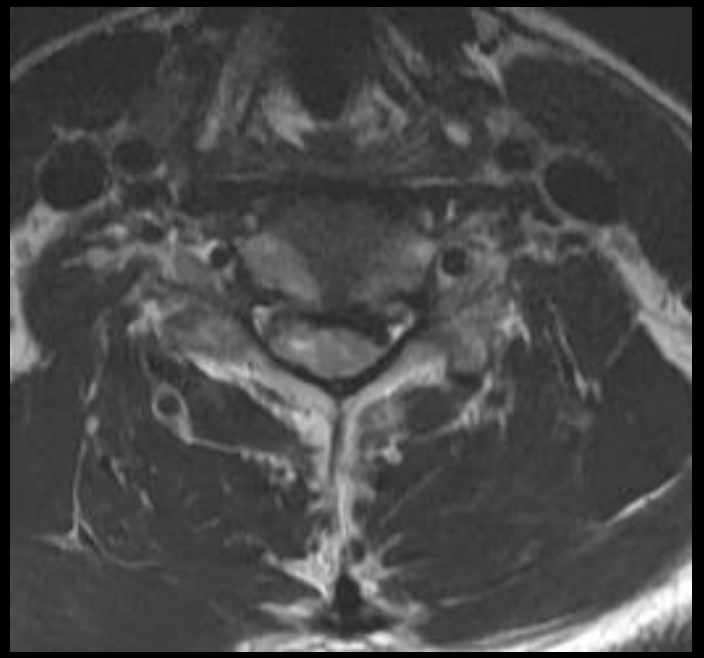


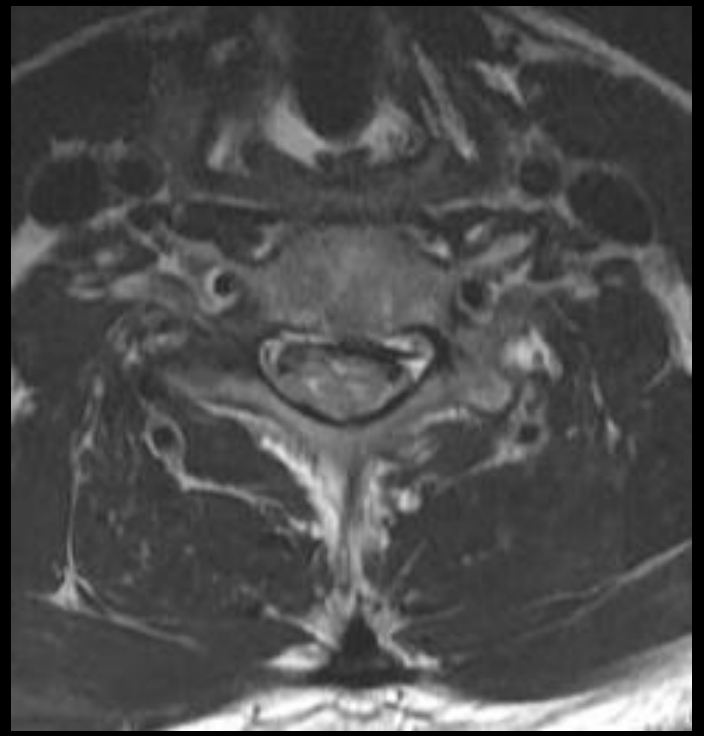
Other…

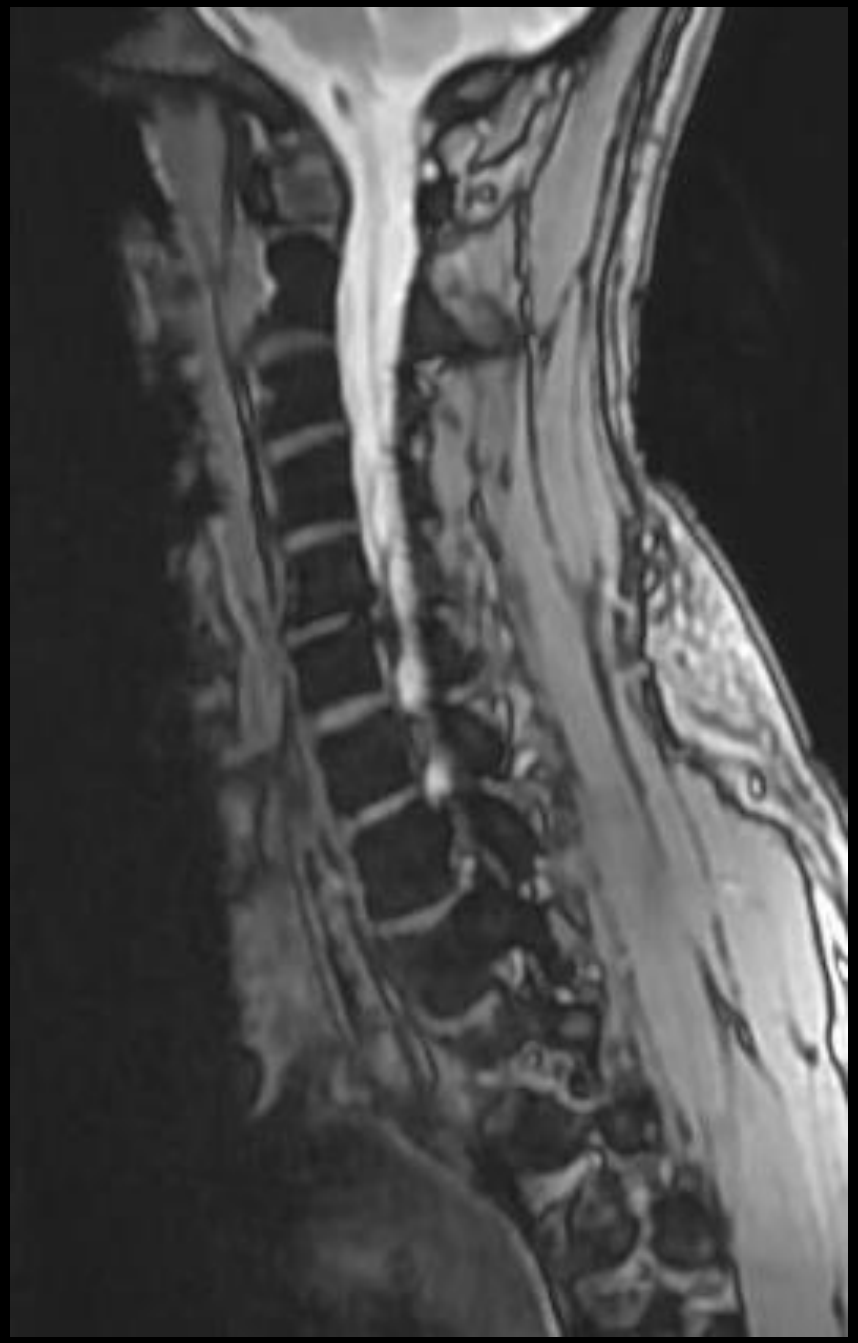
F, 50 y SPONDYLOSIS, WITH MYELOPATHY

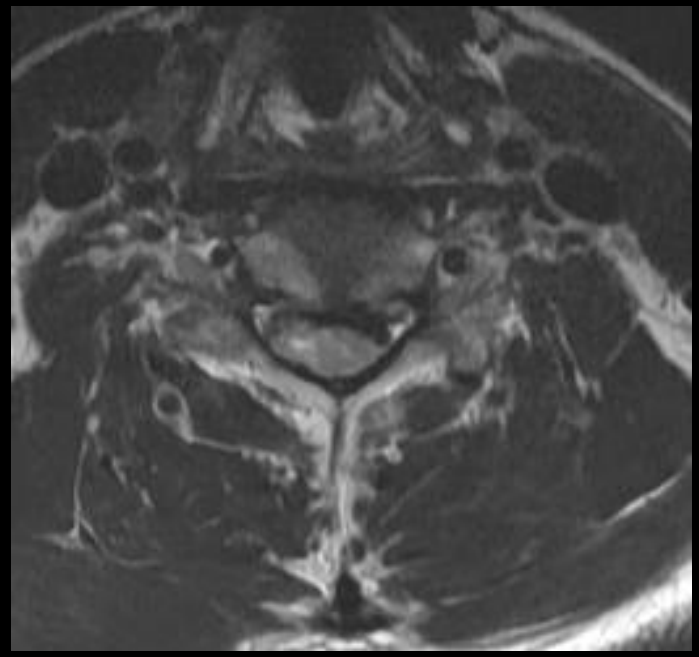


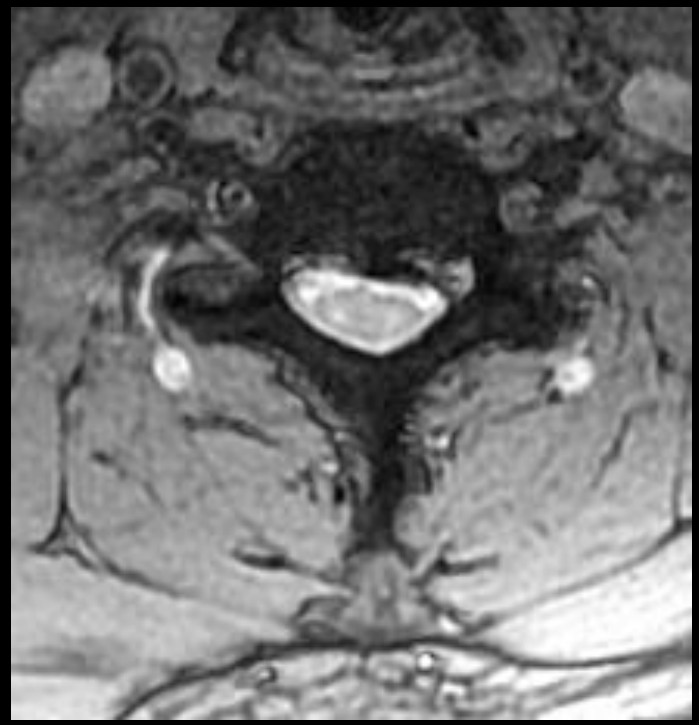






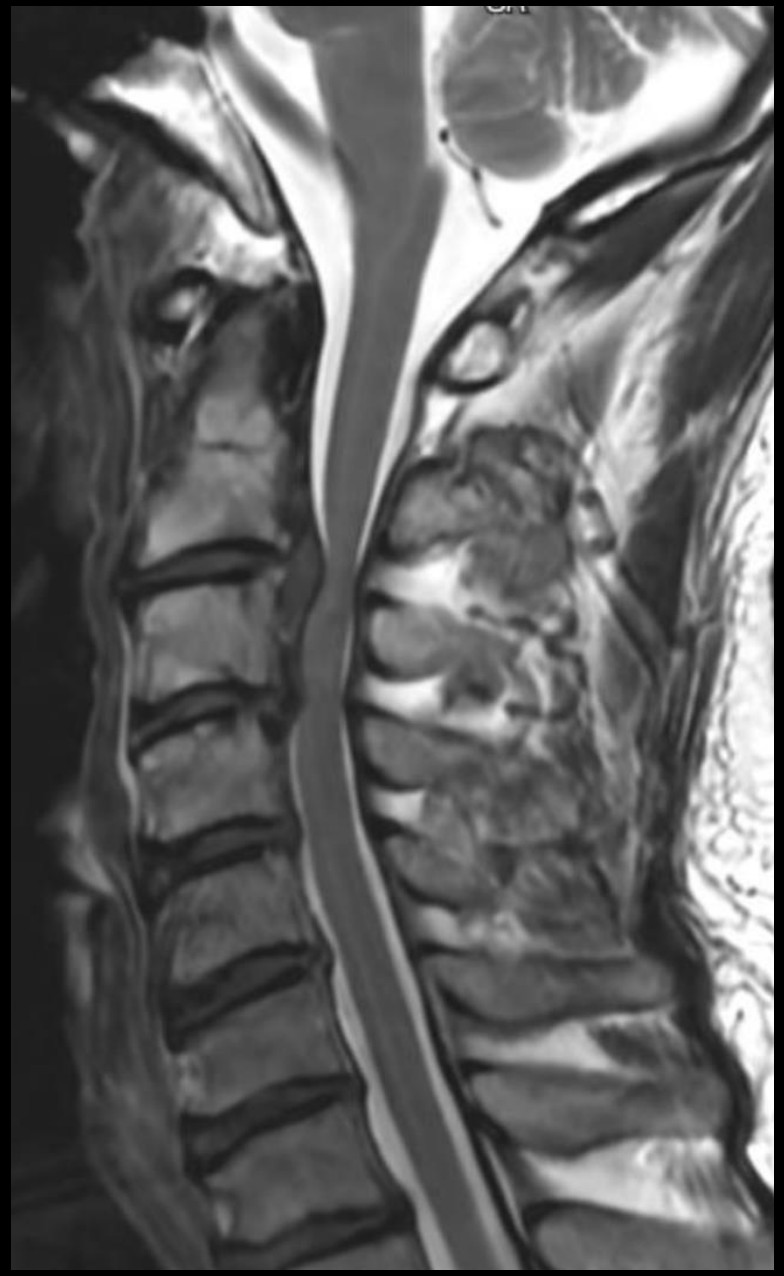


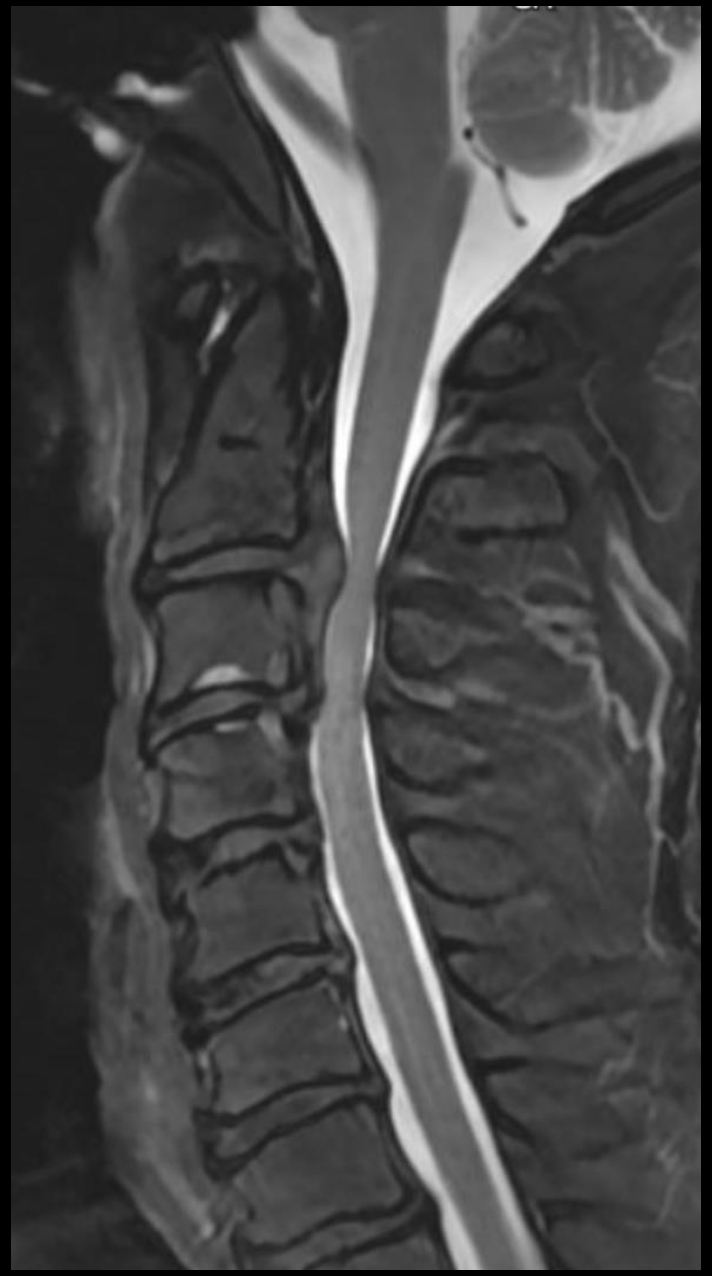


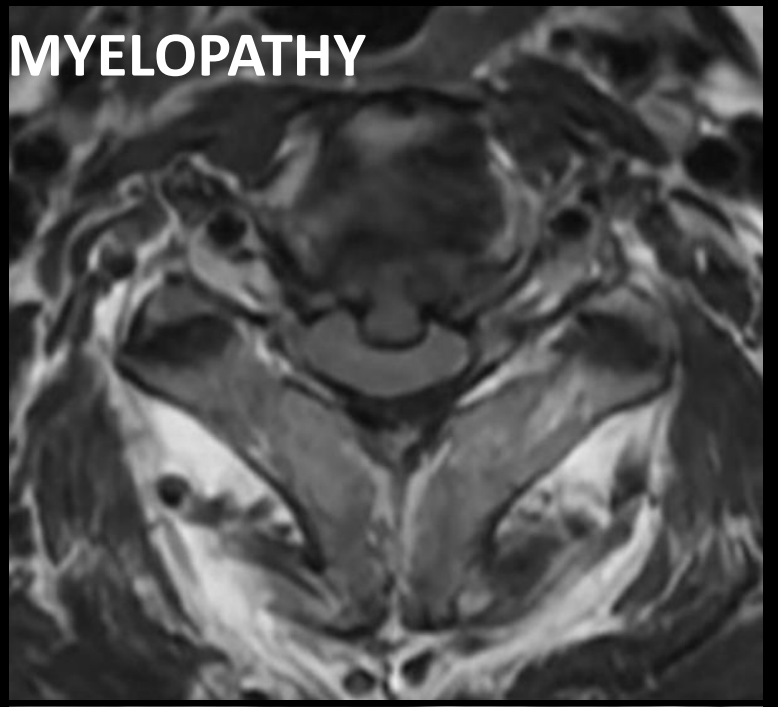


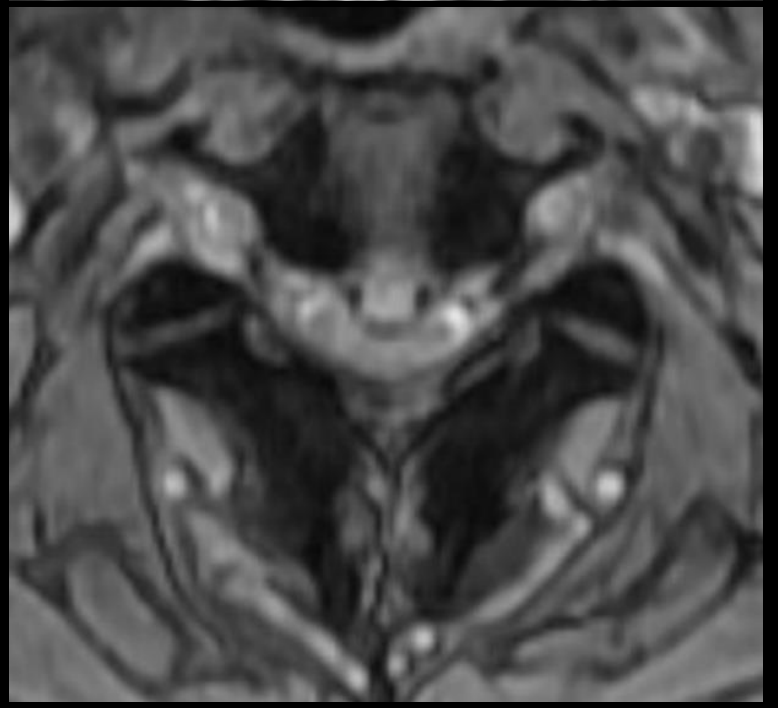
F, 50 y
OPLL WITH CORD COMPRESSION & MYELOPATHY

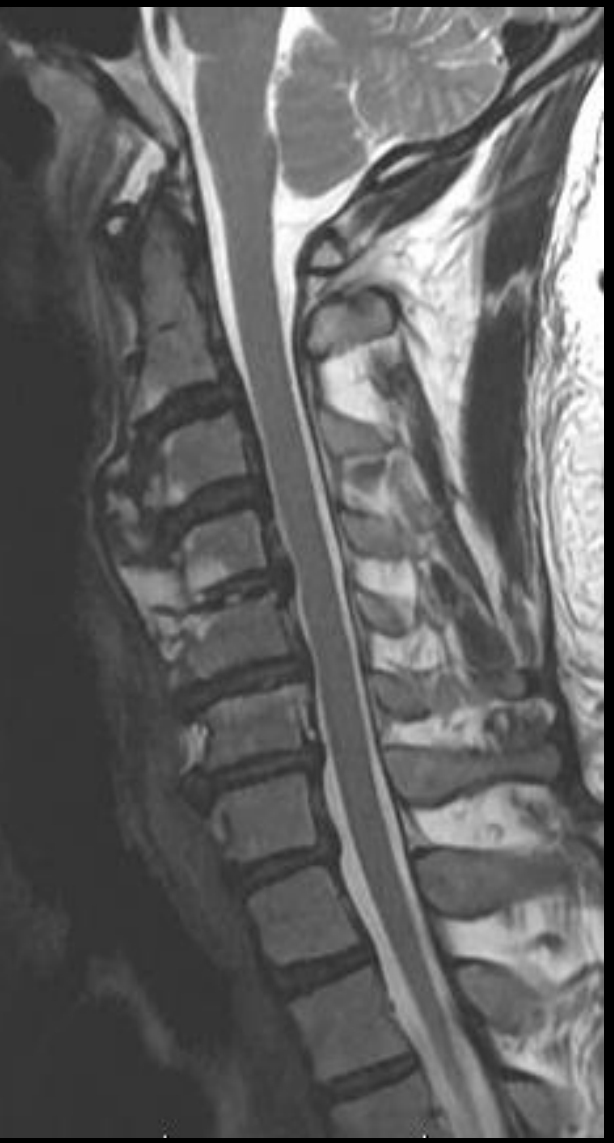
M, 54 y CENTRAL EXTRUSION DISC, with CORD COMPRESSION & MYELOPATHY

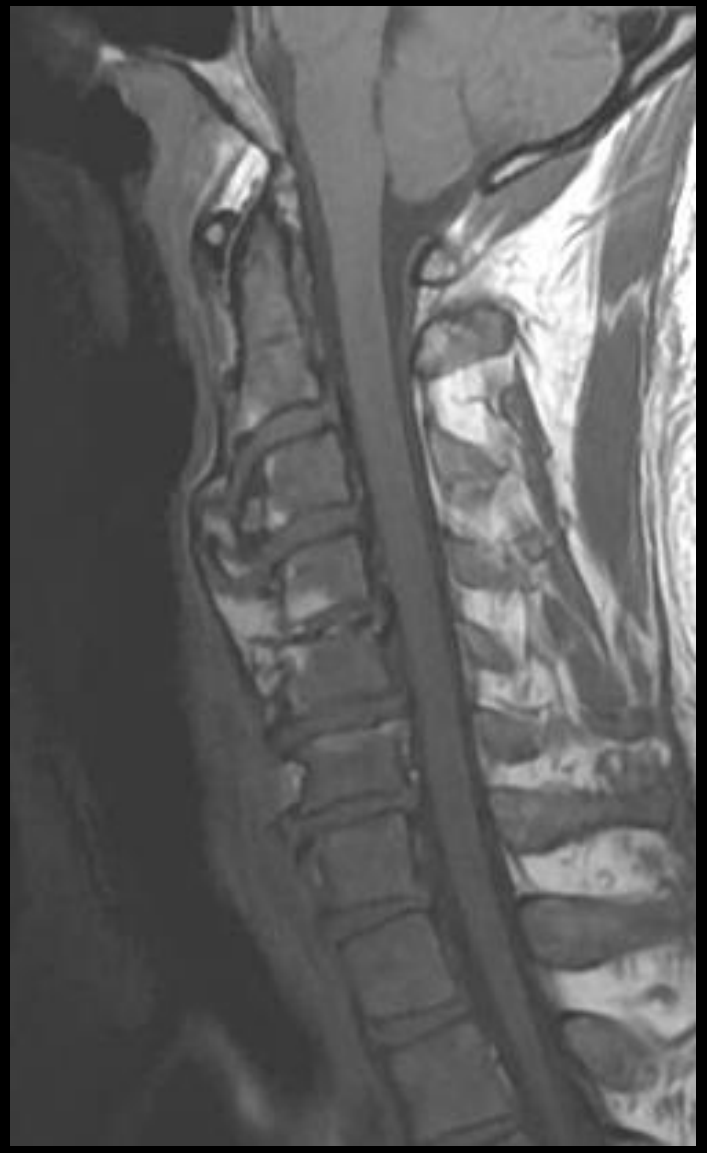


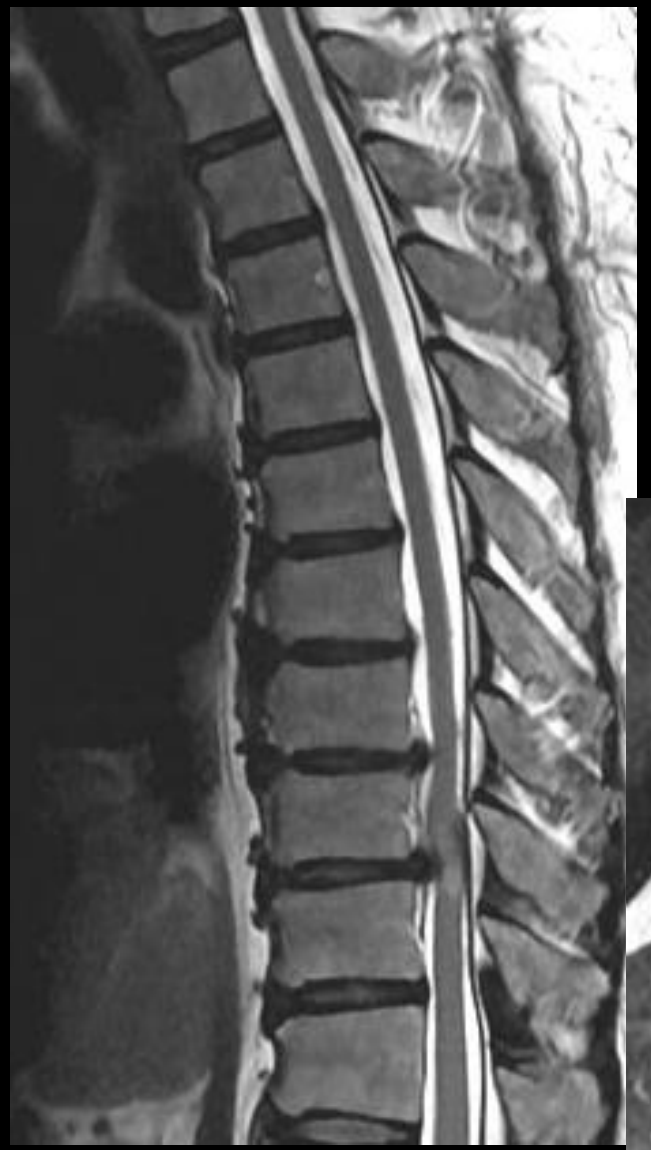


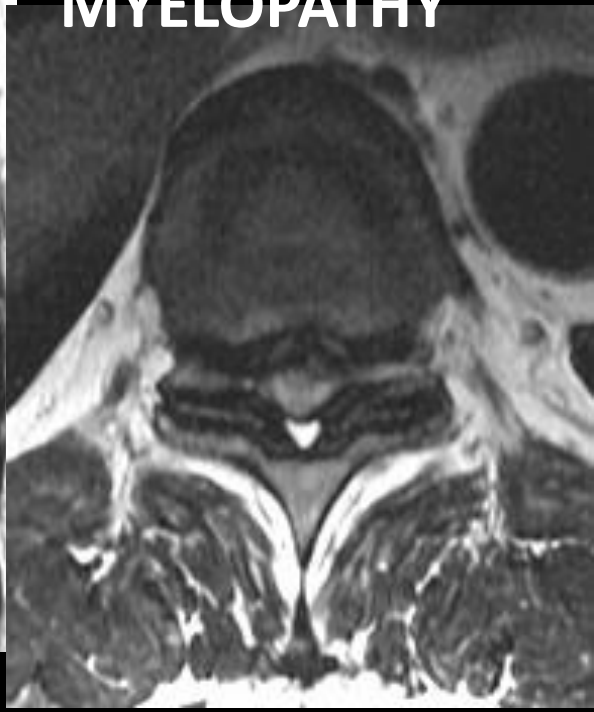




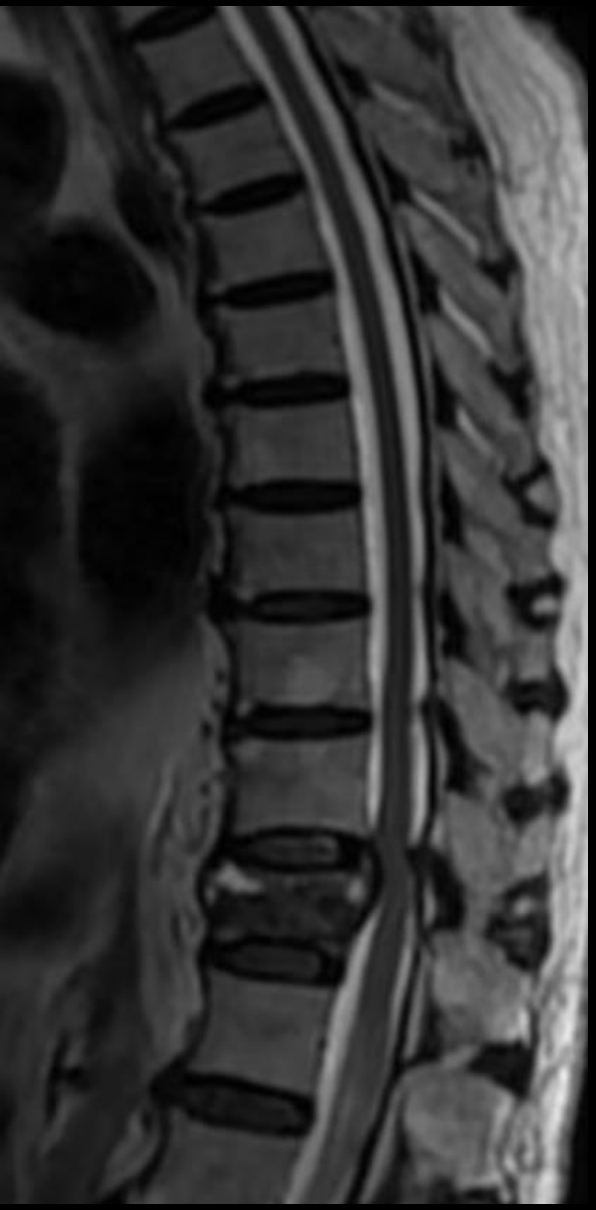


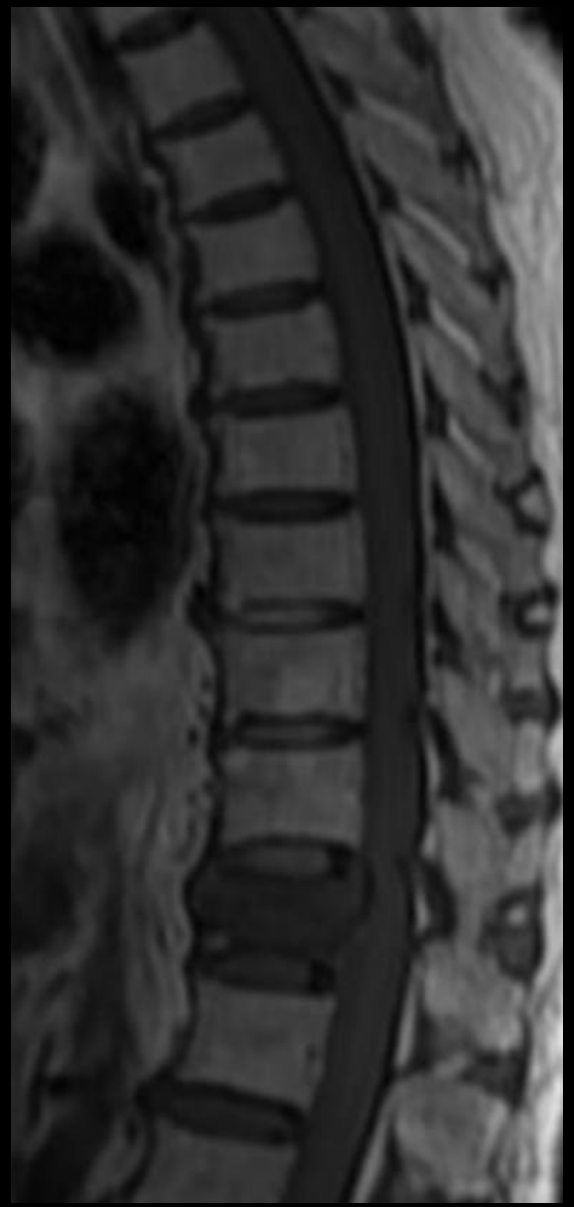


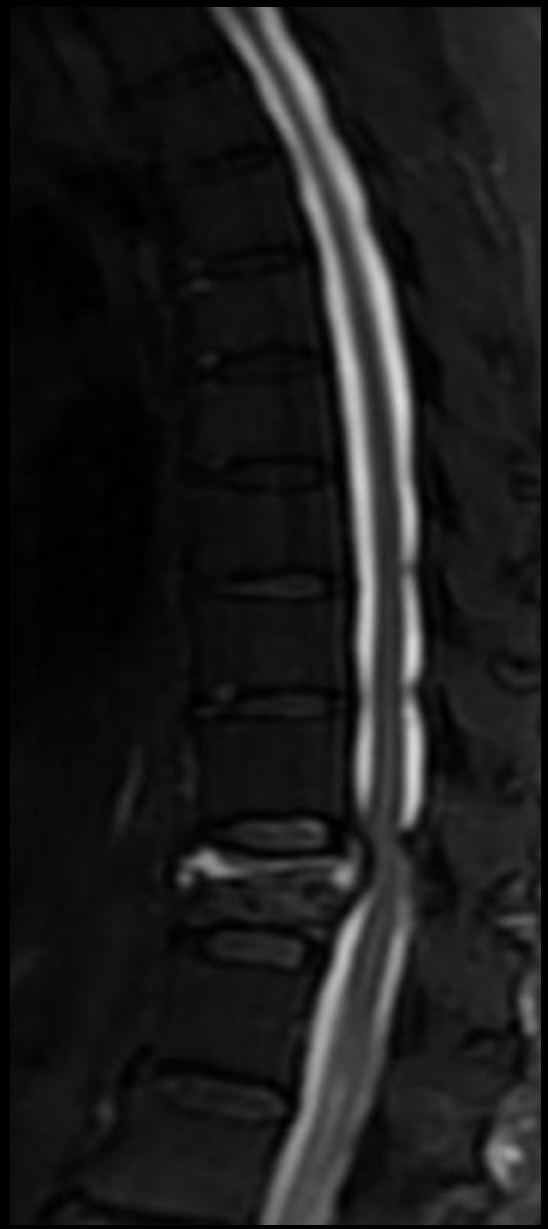




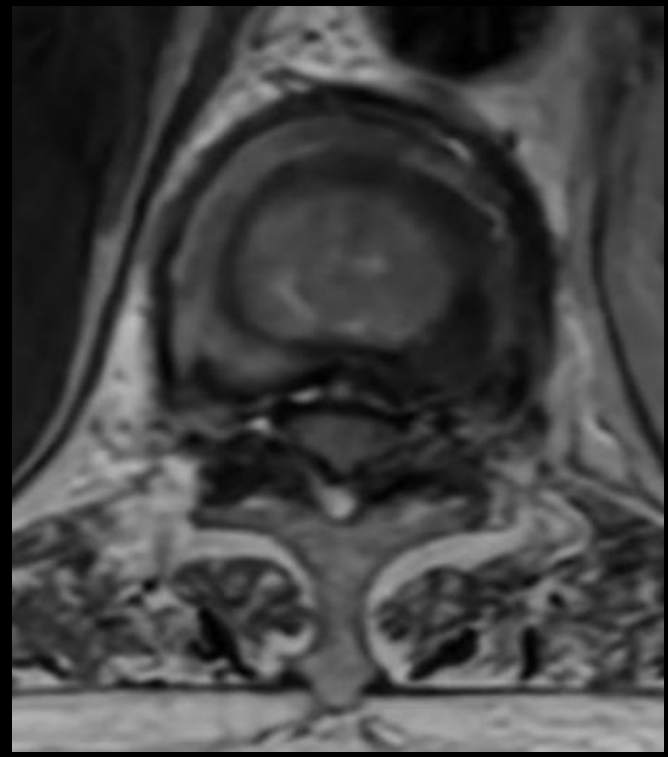
M, 60 y
DISH + HNP + OSSIFIED FLAVUM LIGAMENT, WITH CORD COMPRESSION & MYELOPATHY

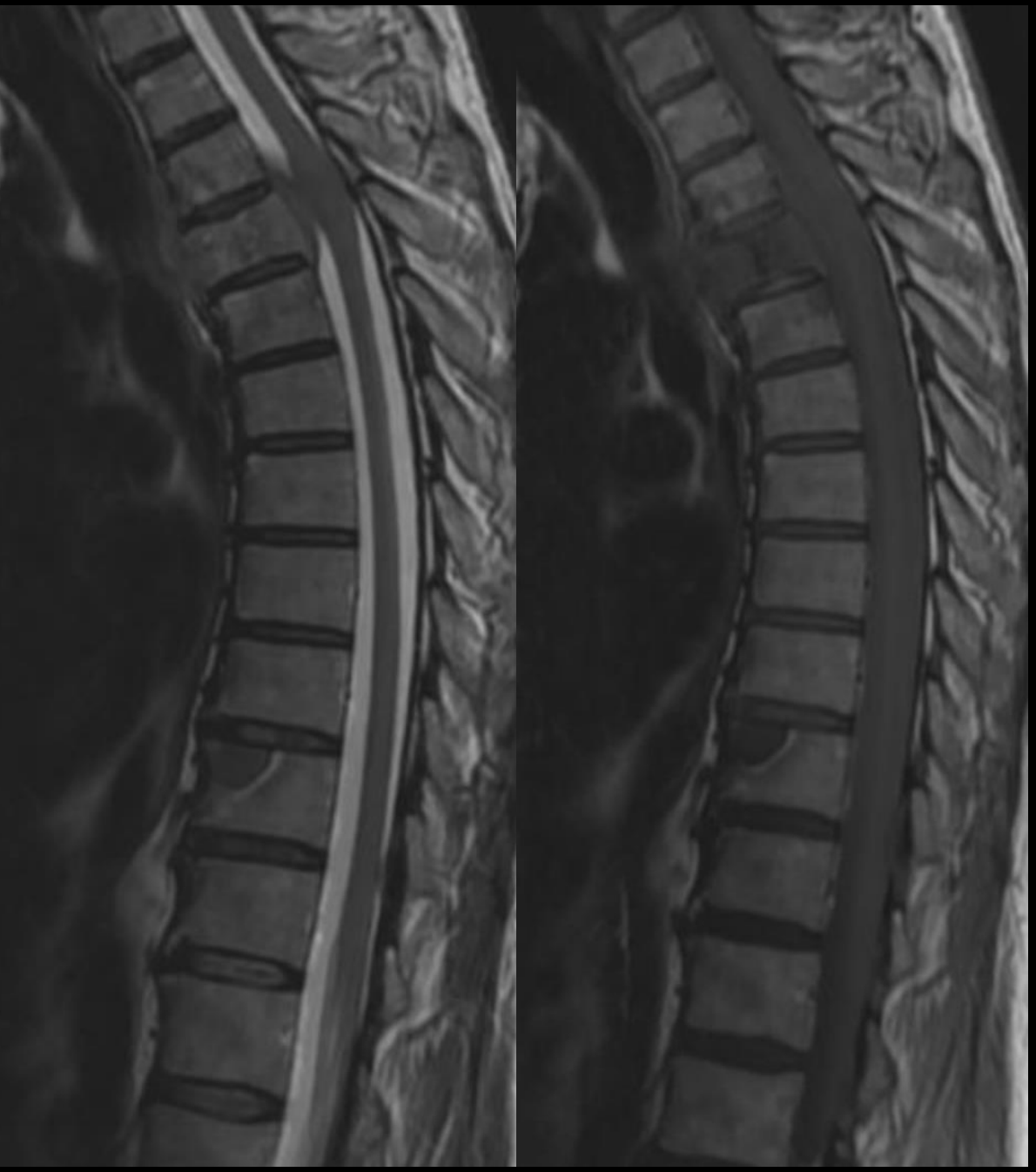


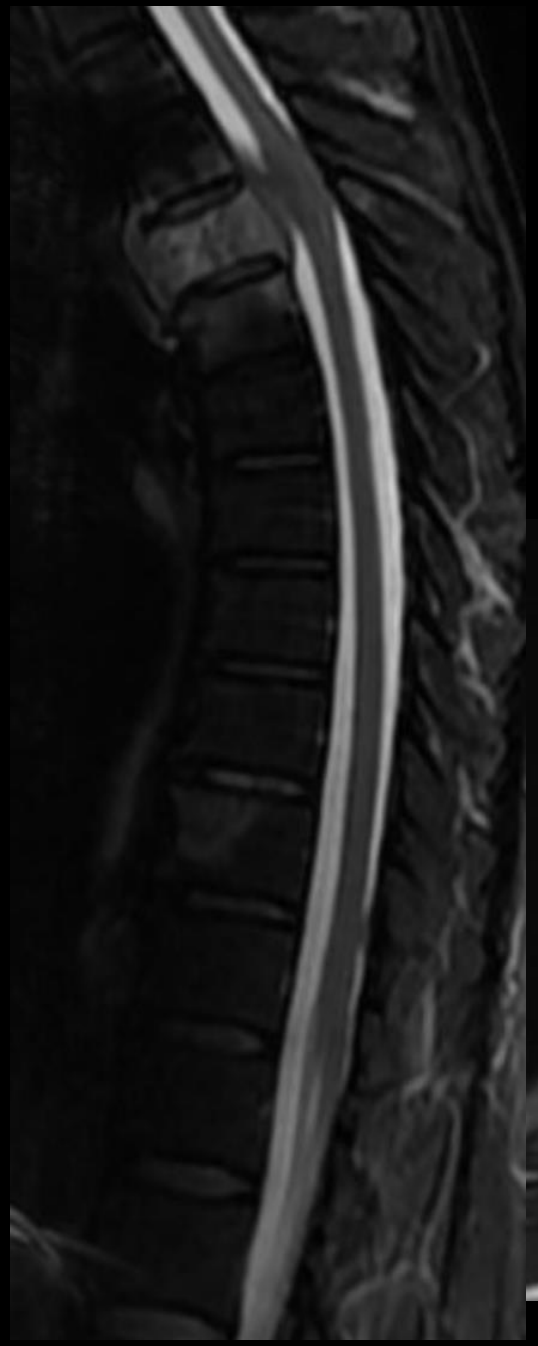




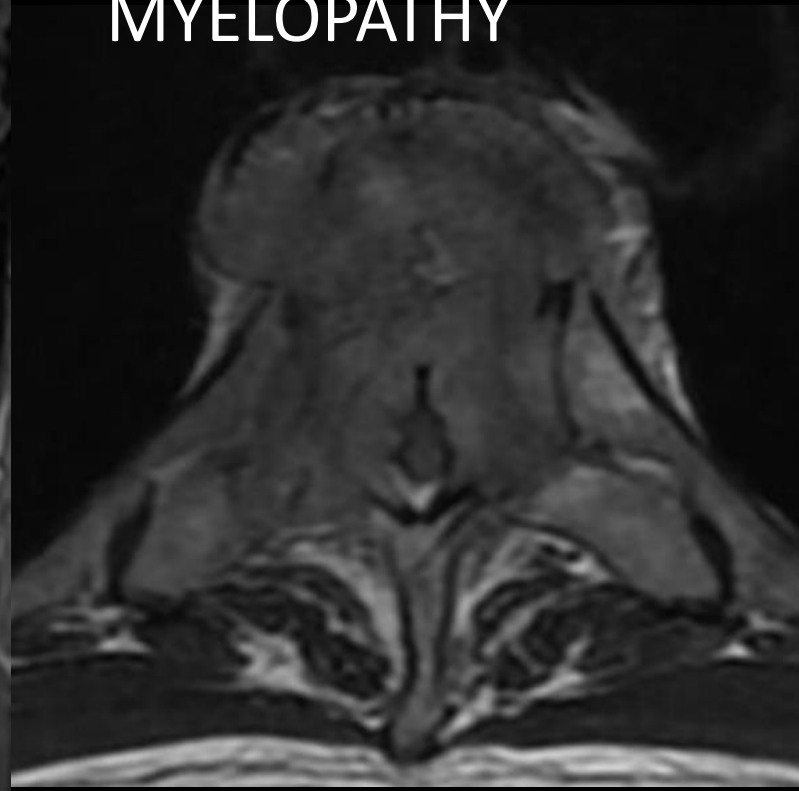
M, 40 y
RECENT BURST FRACTURE WITH CORD COMPRESSION & CORD EDEMA





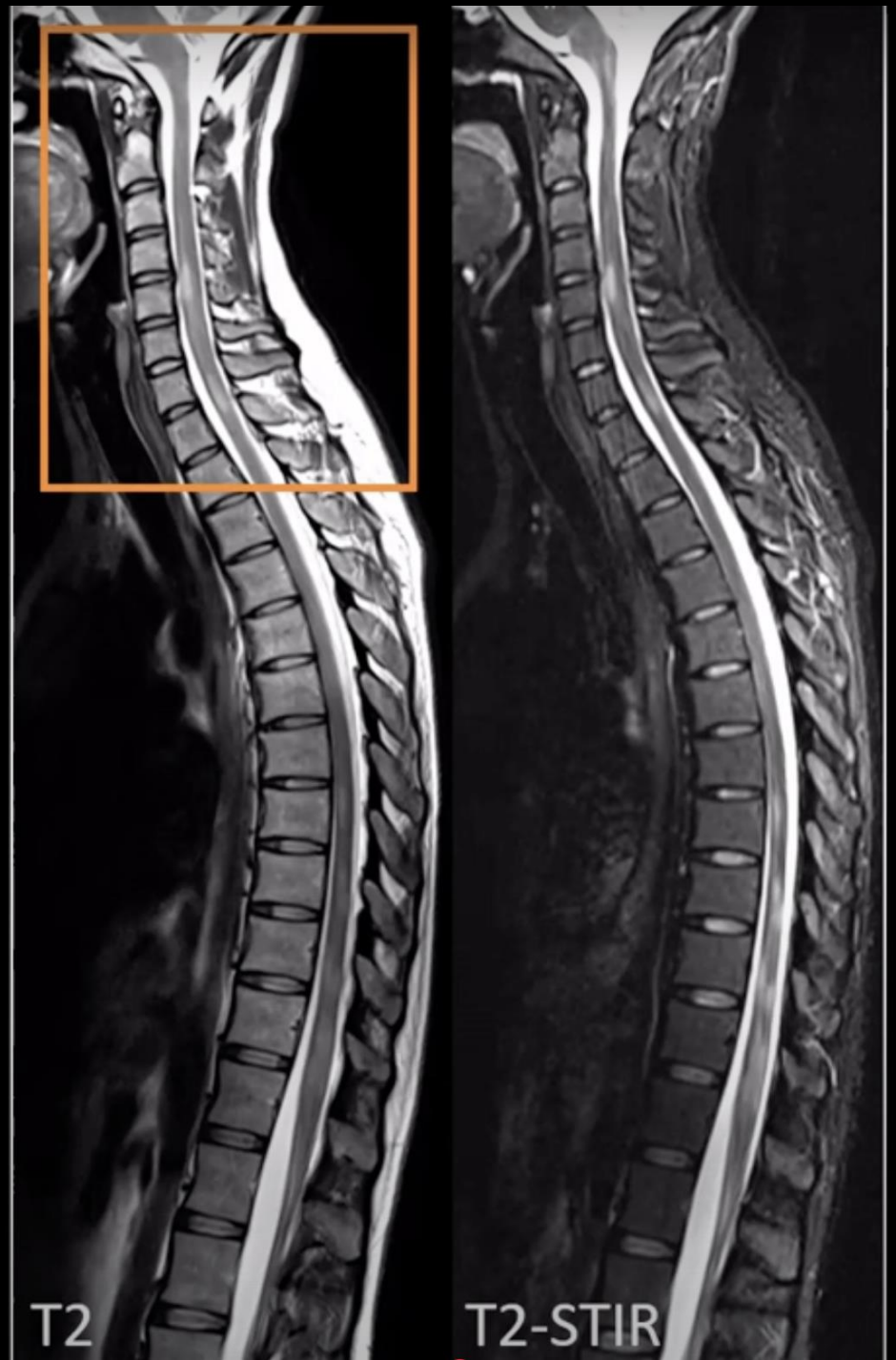


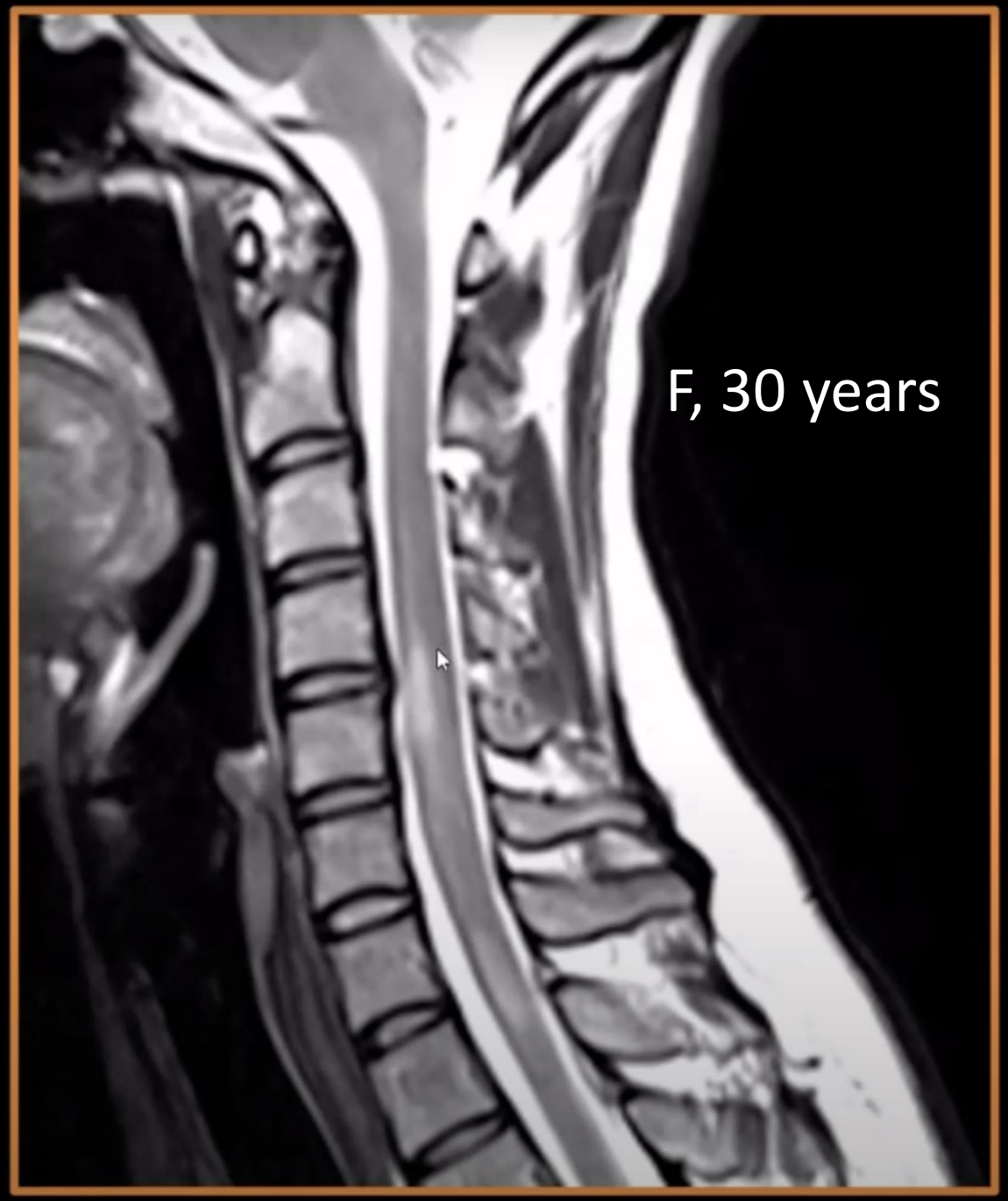
F, 67 y
METASTATIC BONE DISEASE with SEVERE CORD COMPRESSION & MYELOPATHY

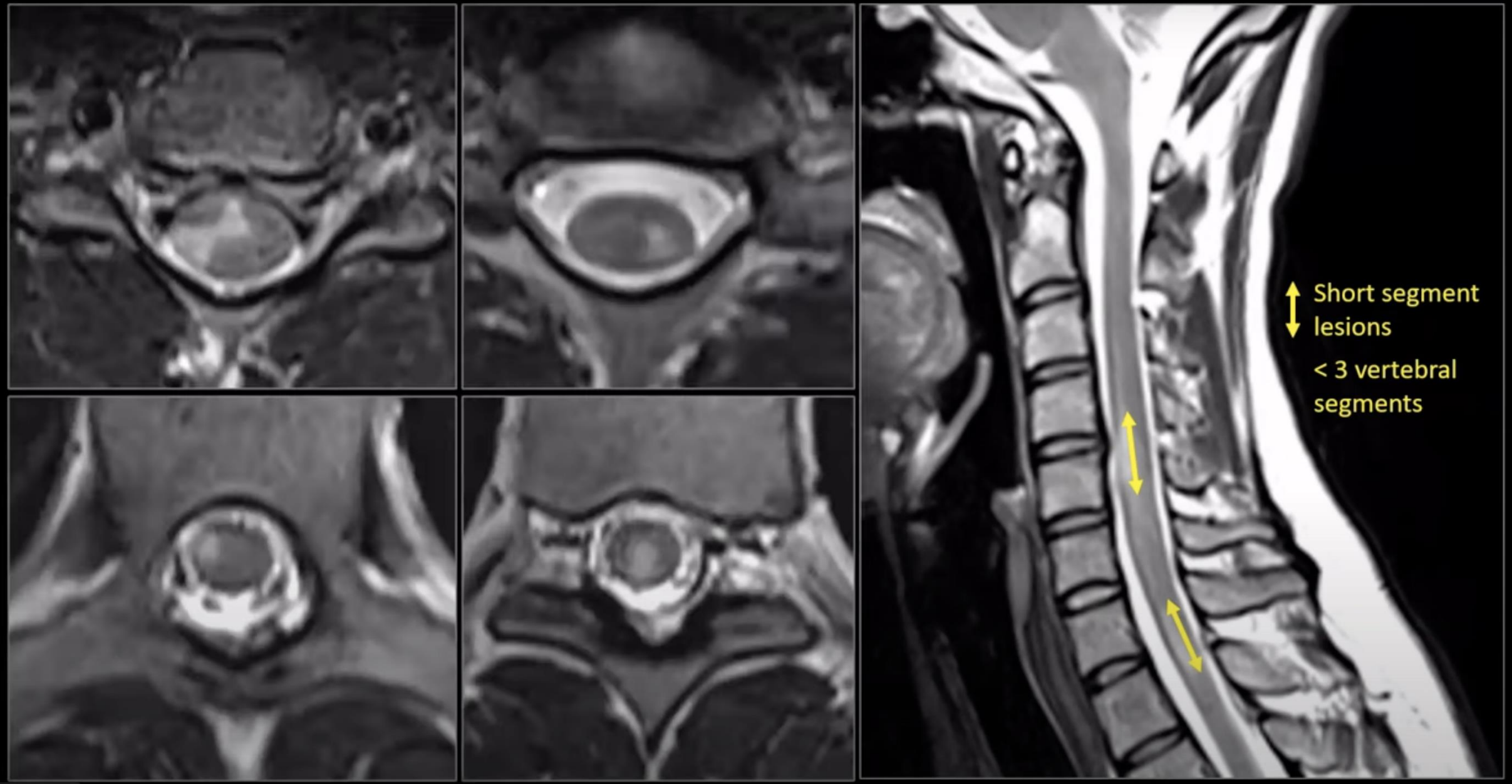


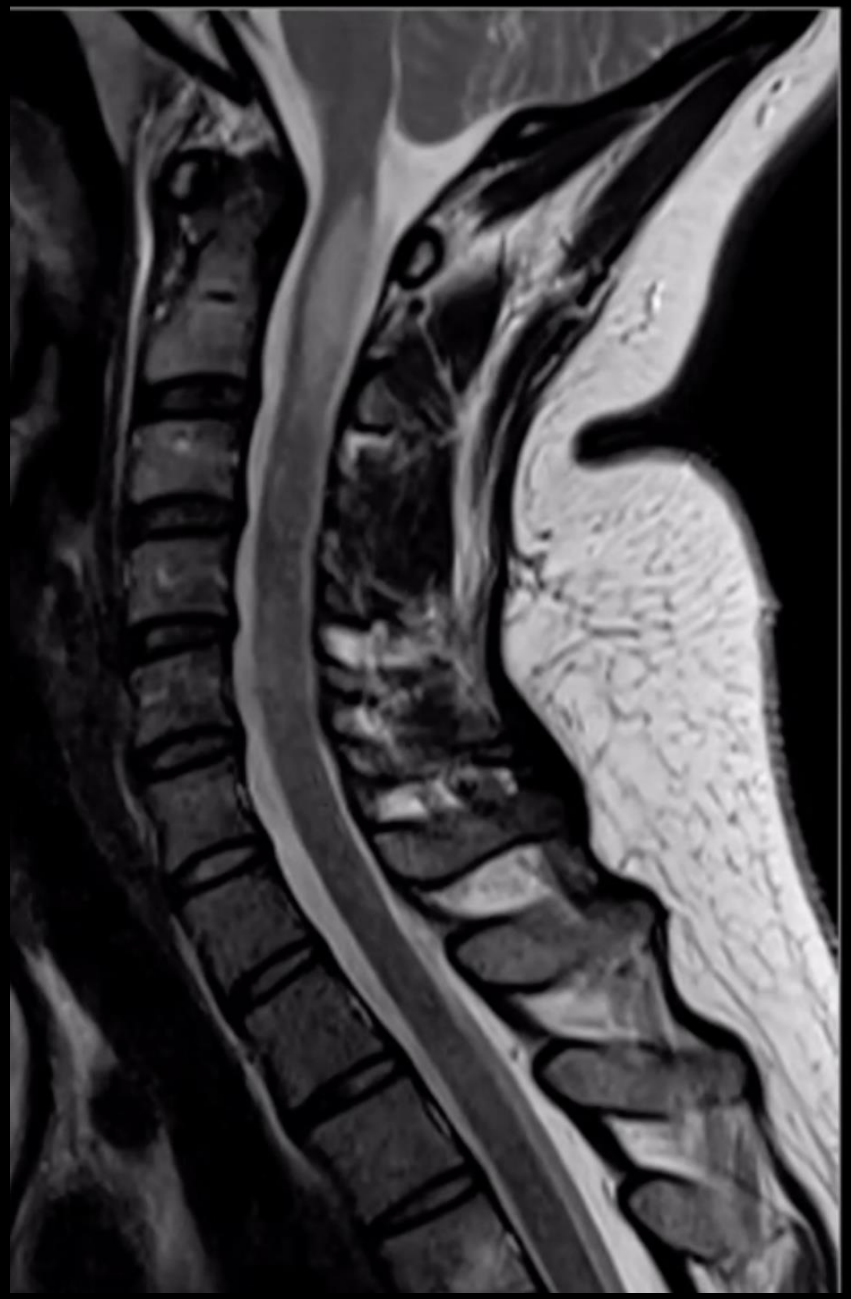
CASES

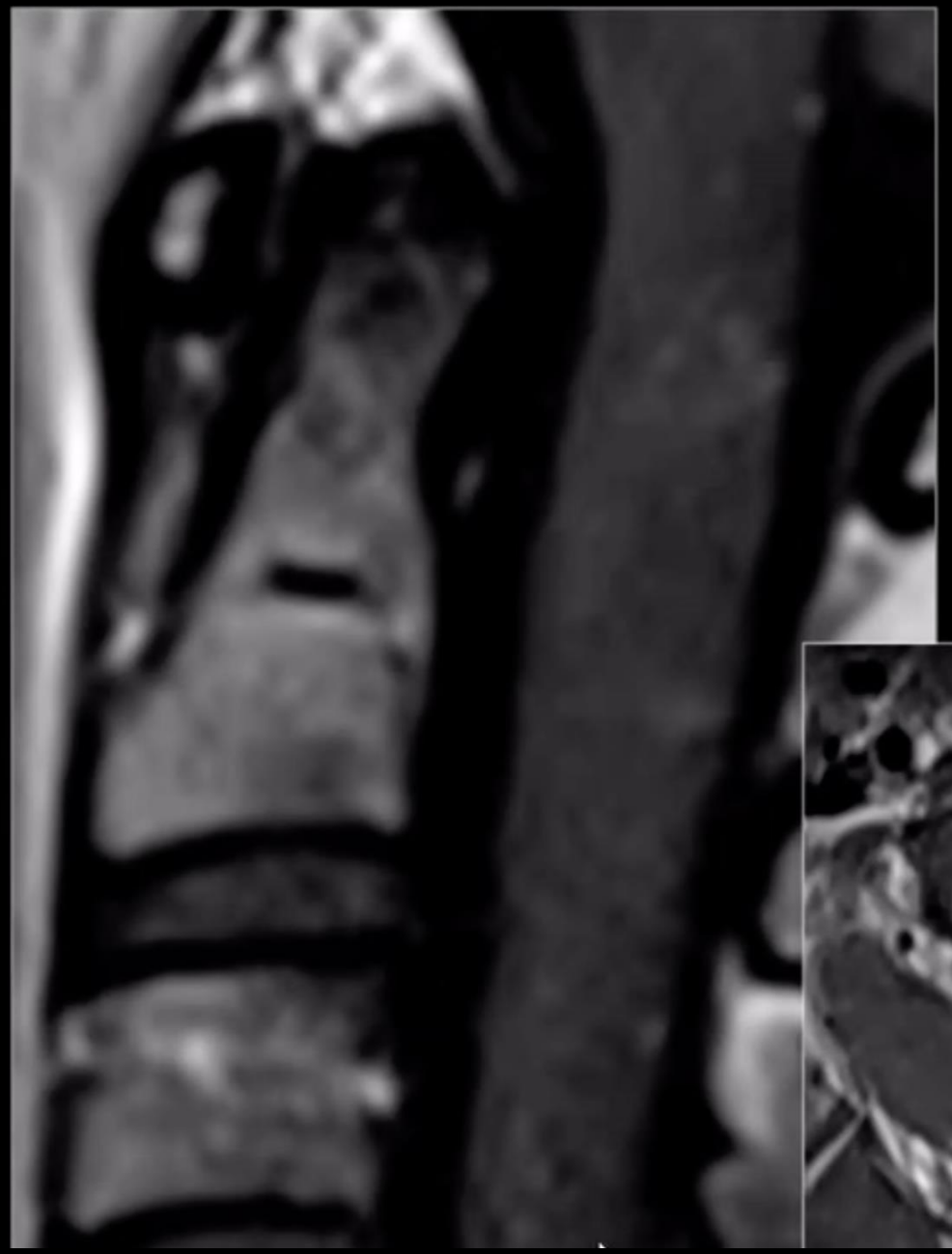
Acute Non Compressive Myelopathy


T2
T2-STIR

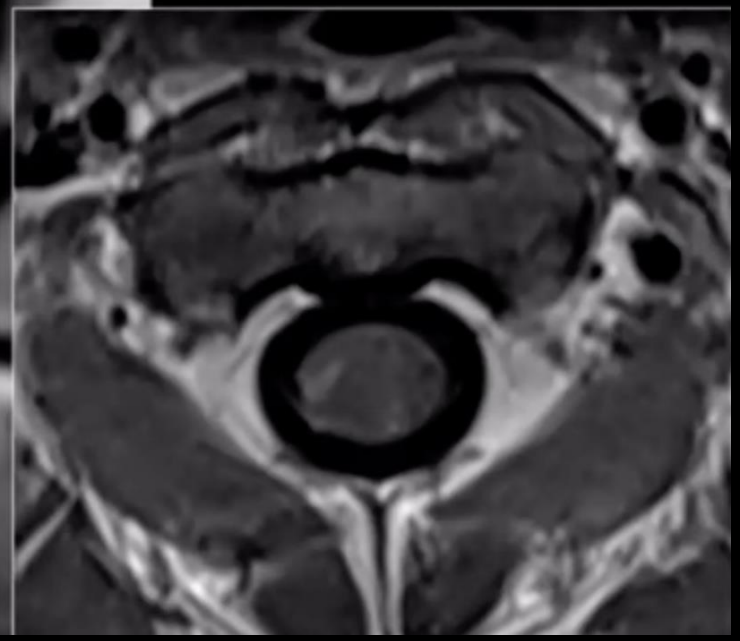

F, 30 years

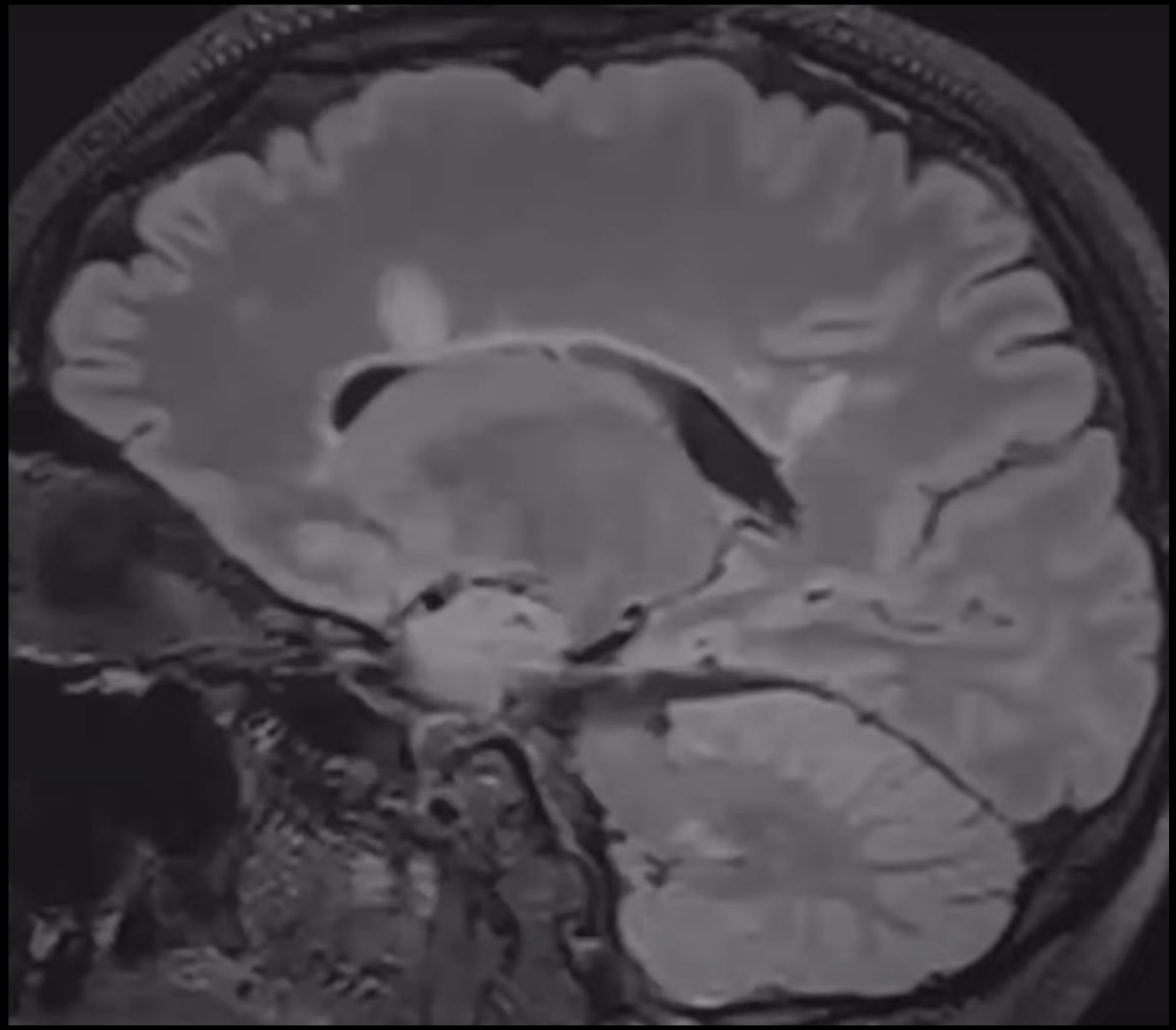

Short segment lesions
< 3 vertebral segments





Open Ring Enhancement





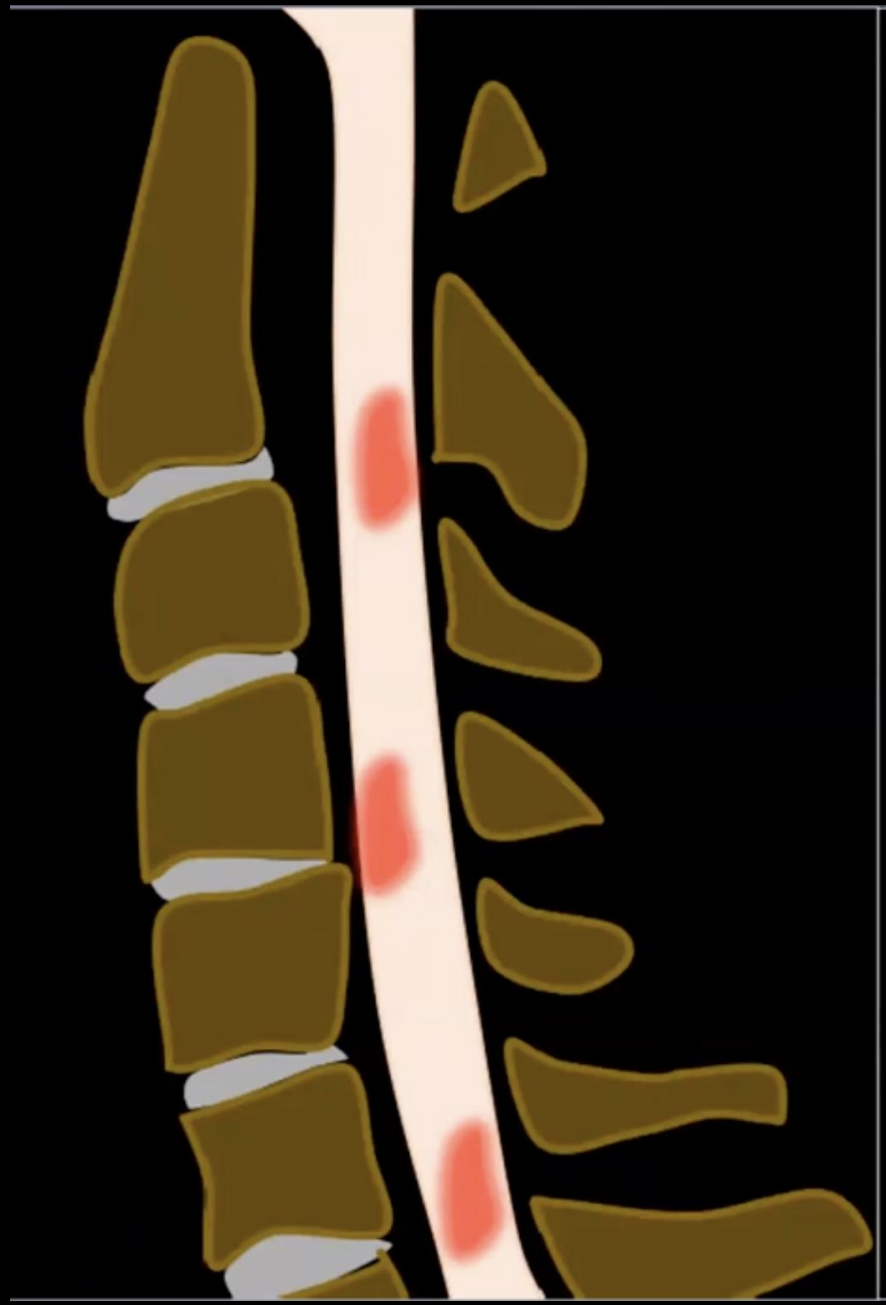
Multiple short segment spinal cord lesions --- do Brain MRI

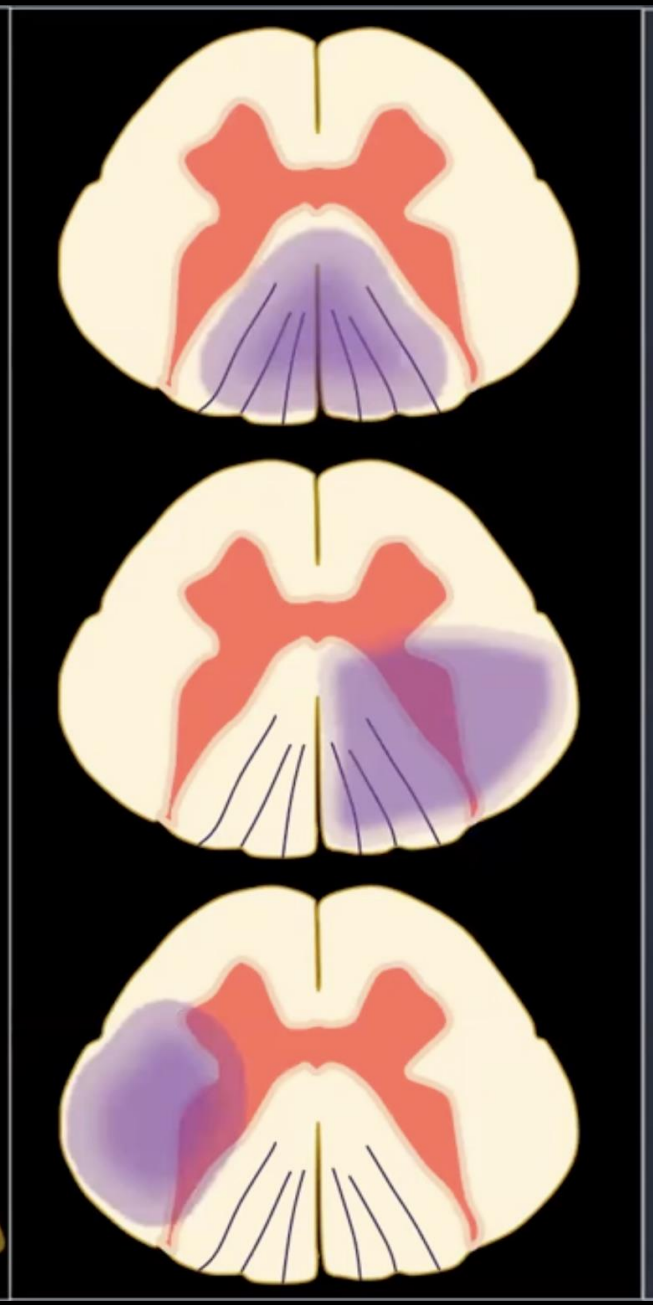
Ovoid lesions at Dawson’s finger

MULTIPLE SCLEROSIS

- 80-90% spinal cord affected
- 20 % only spinal cord lesion.

- Short segment lesions.
- Peripheral/ eccentric (lateral/ dorsal), can be wedge shaped
- Usually partial, but can be complete myelitis.
- Acute : enhancement (usually open ring) & spinal cord swelling.
- Chronic : atrophy





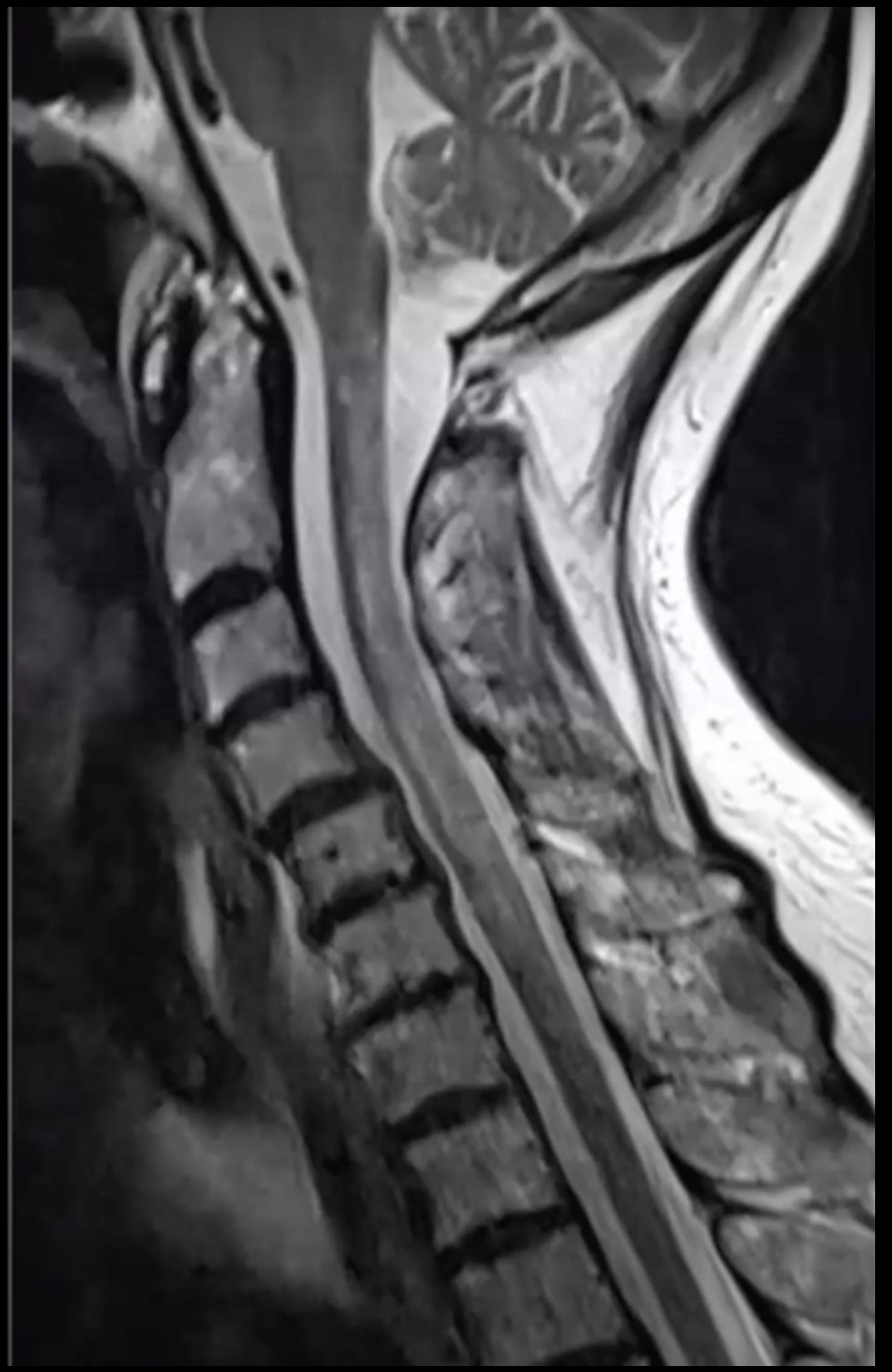
Spinal cord lesions MS

- Short segment
- Peripheral
  - (lateral)
  - (dorsal)
- Often triangular
- GD(+): open ring

Neuromyelitis optica spectrum disorder *(NMOSD)*

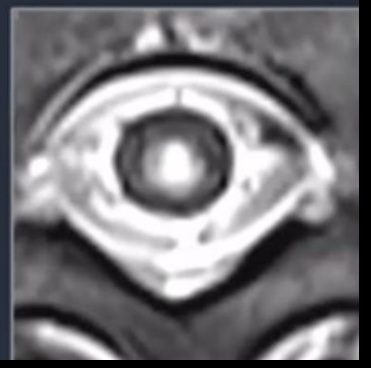
- Auto-immune inflammatory demyelinating CNS disorders
- Ab against AQP4-water channels

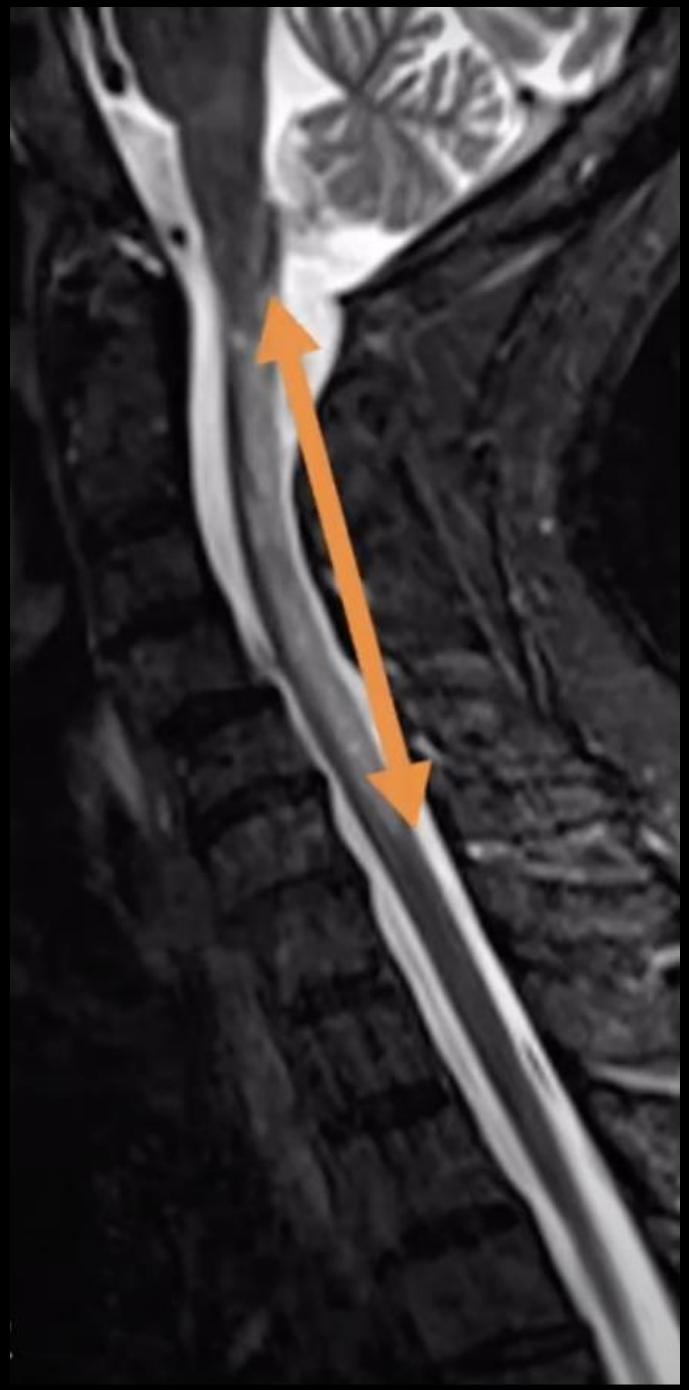
- Optic nerve: *Long segment, more posterior than in MS*
- Myelum lesions: *Long segment, central location*
- Brain lesions: *Periventricular (most AQP4 channels)*

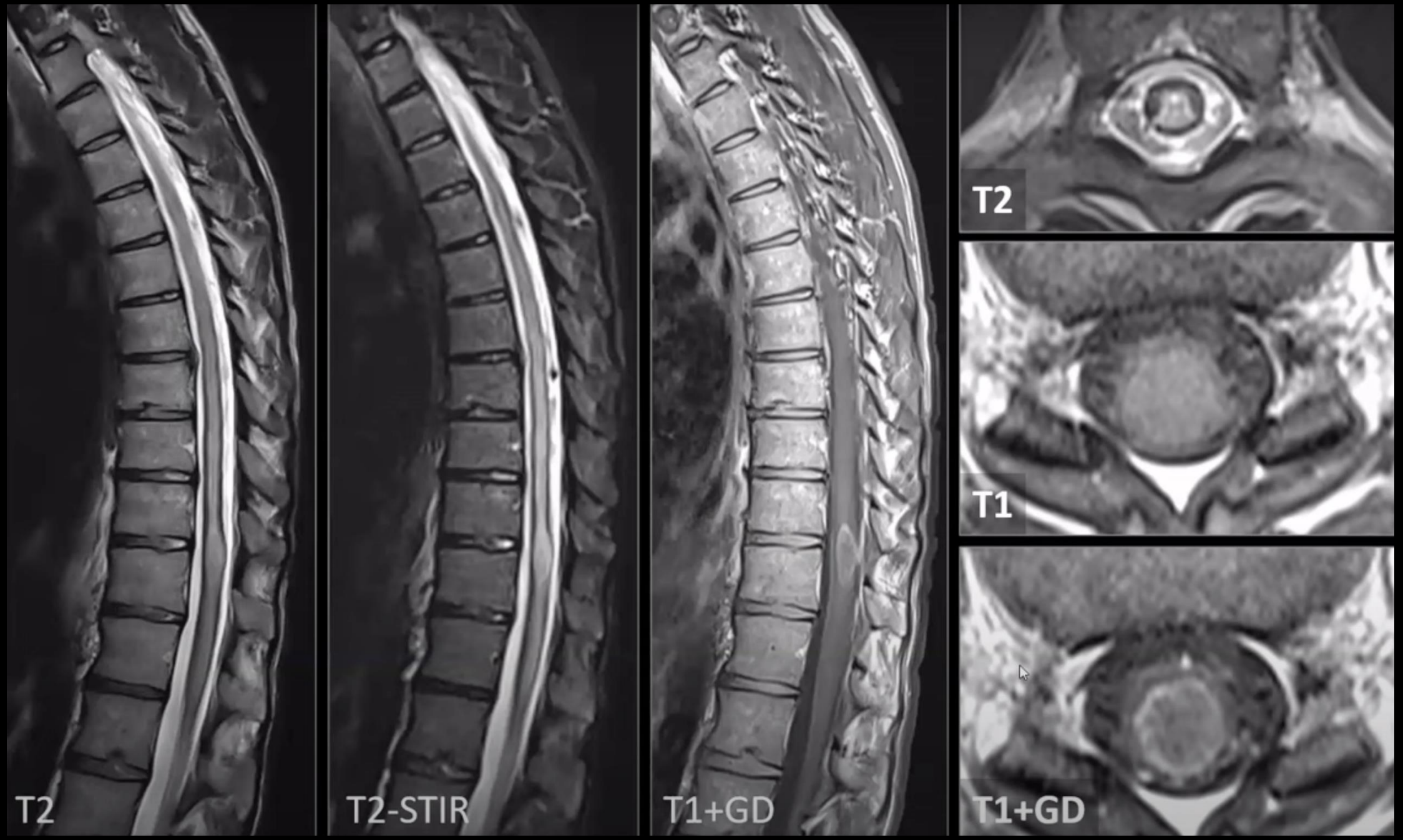


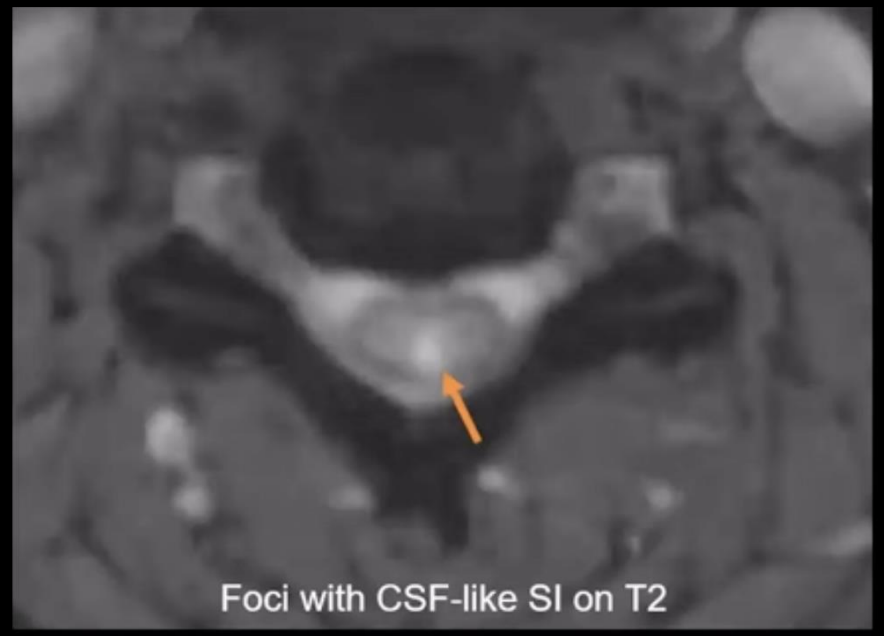
Neuromyelitis optica spectrum disorder *(NMOSD)*

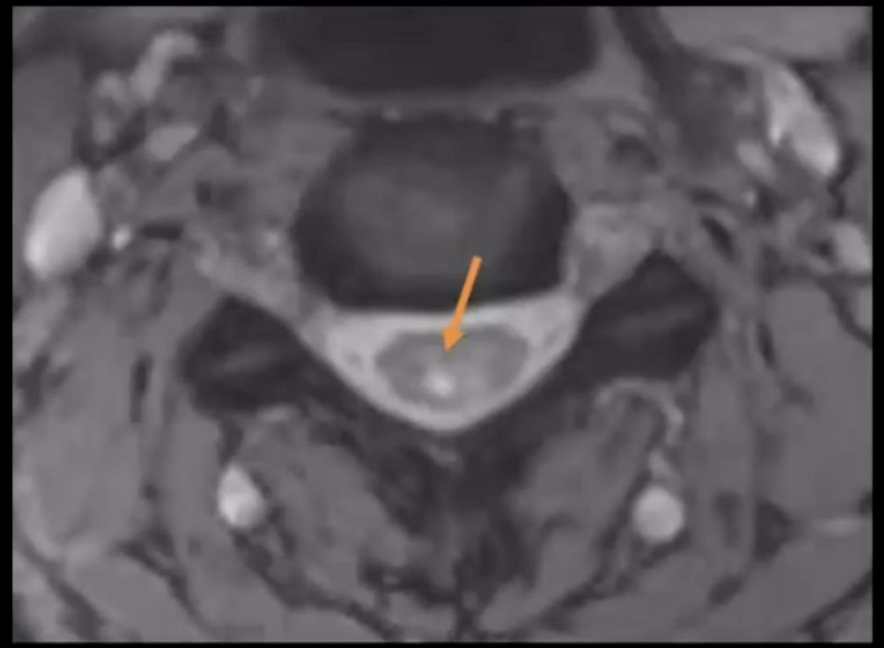
- **Long segment** (spanning ≥ 3 contiguous vertebral bodies
- **Central cord** / gray matter predominance





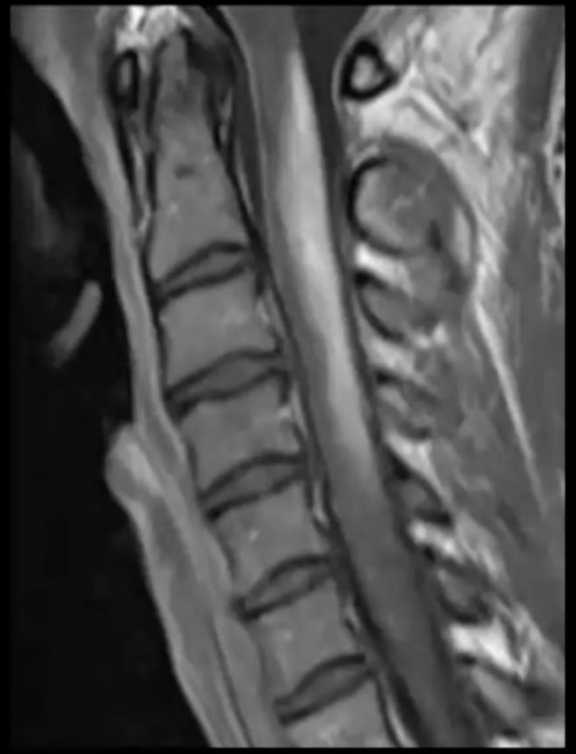

T2
T2-STIR
T1+GD
T2
T1
T1+GD

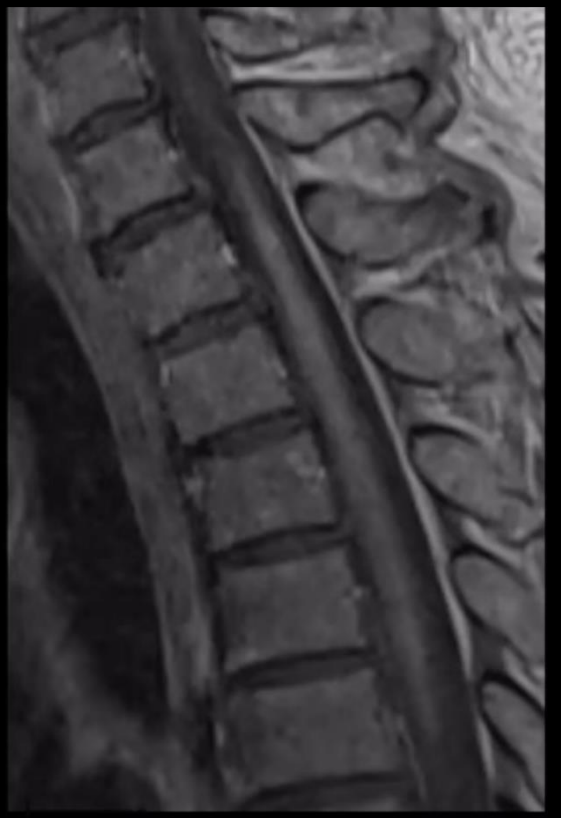




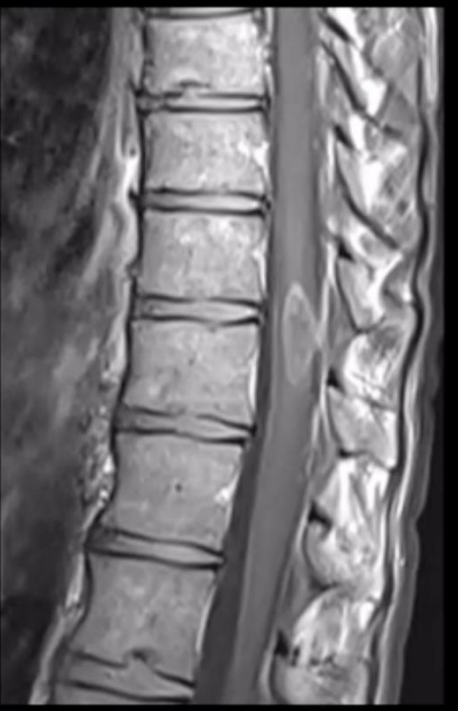
T2: Bright spotty lesions

Patchy cloud-like enhancement

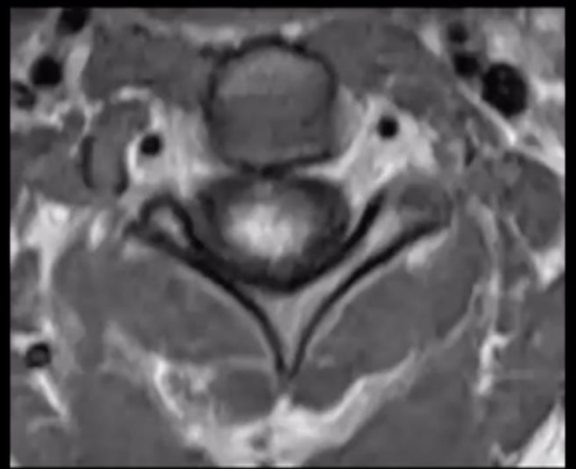


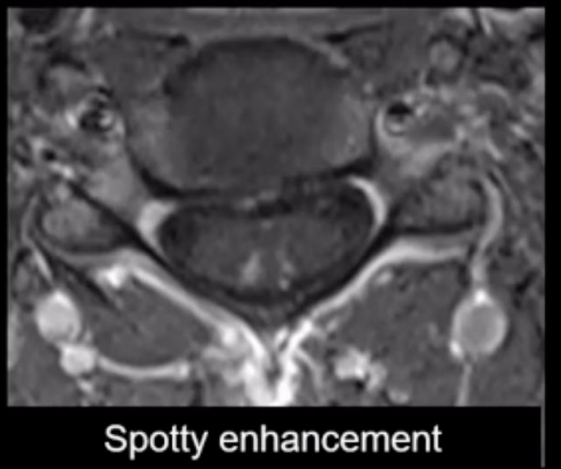


Ring- or lensshaped enhancement

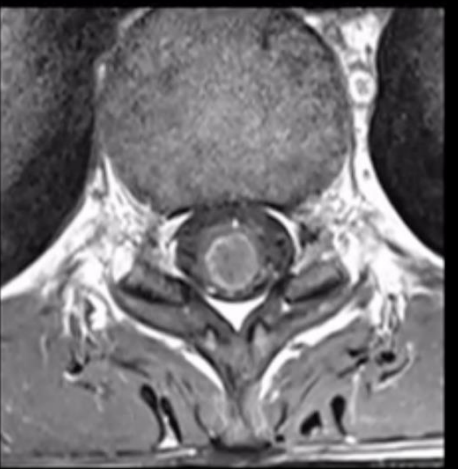


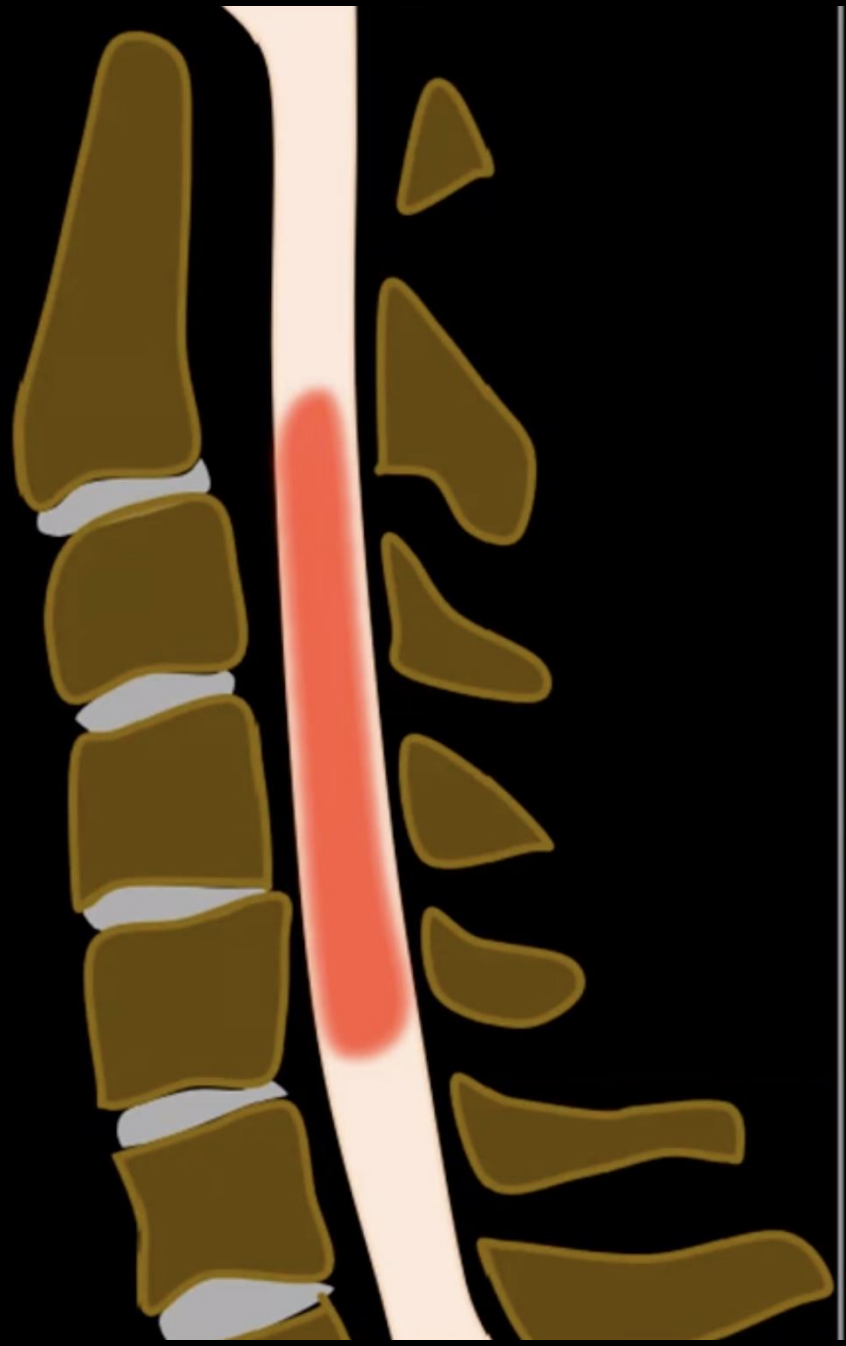
GD: Variable enhancement patterns

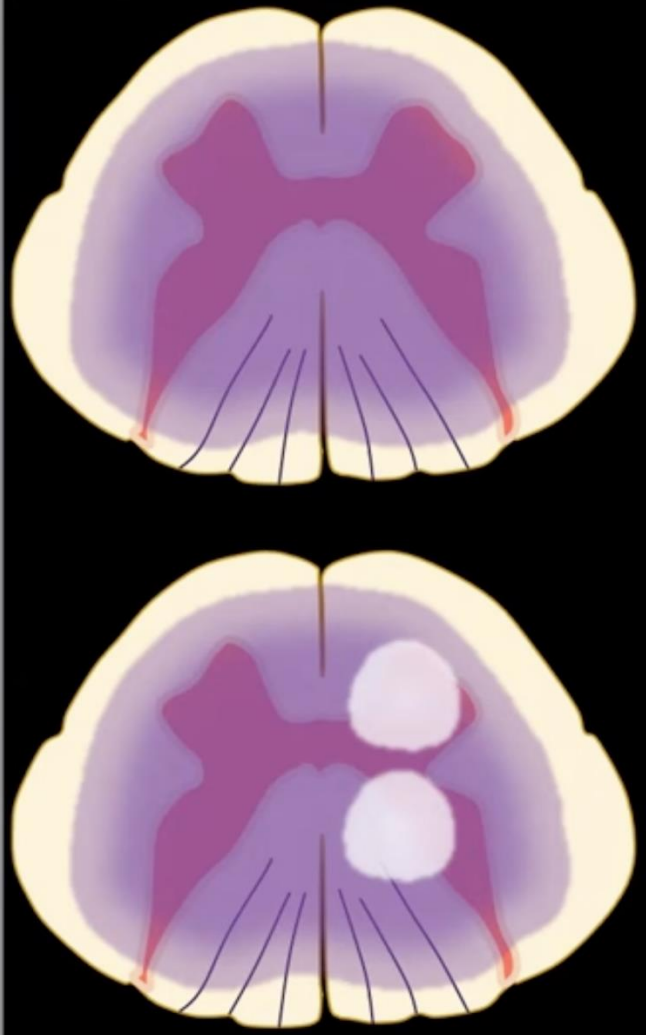




Spotty enhancement





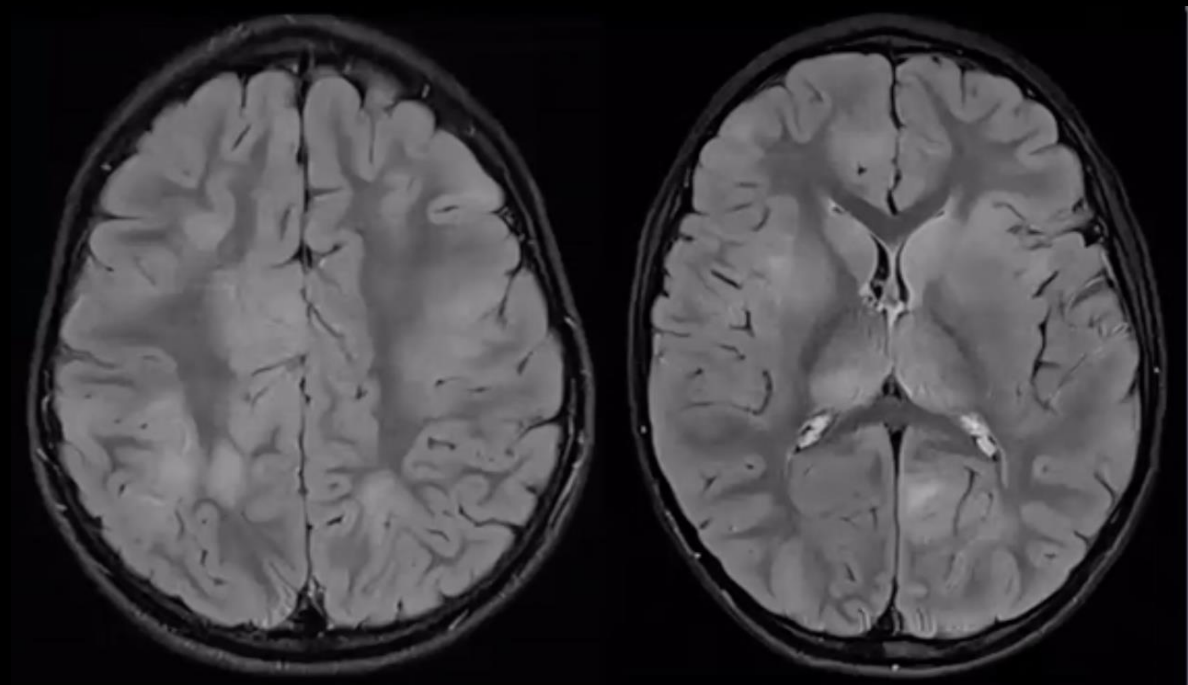
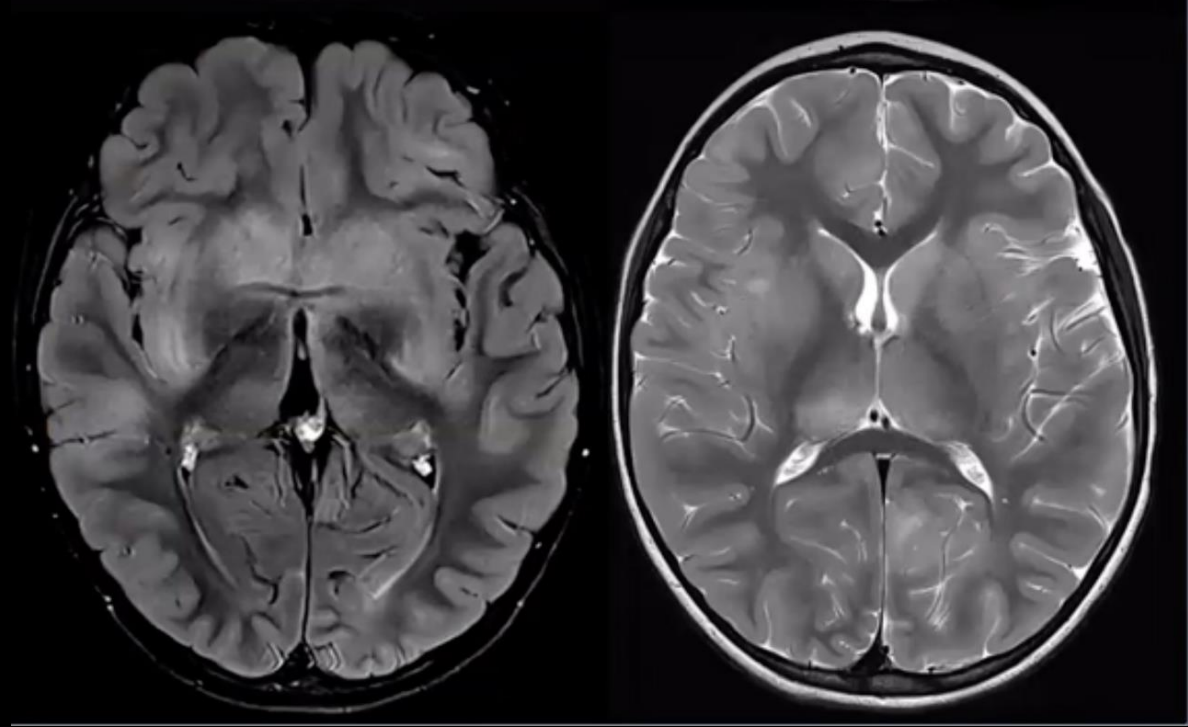
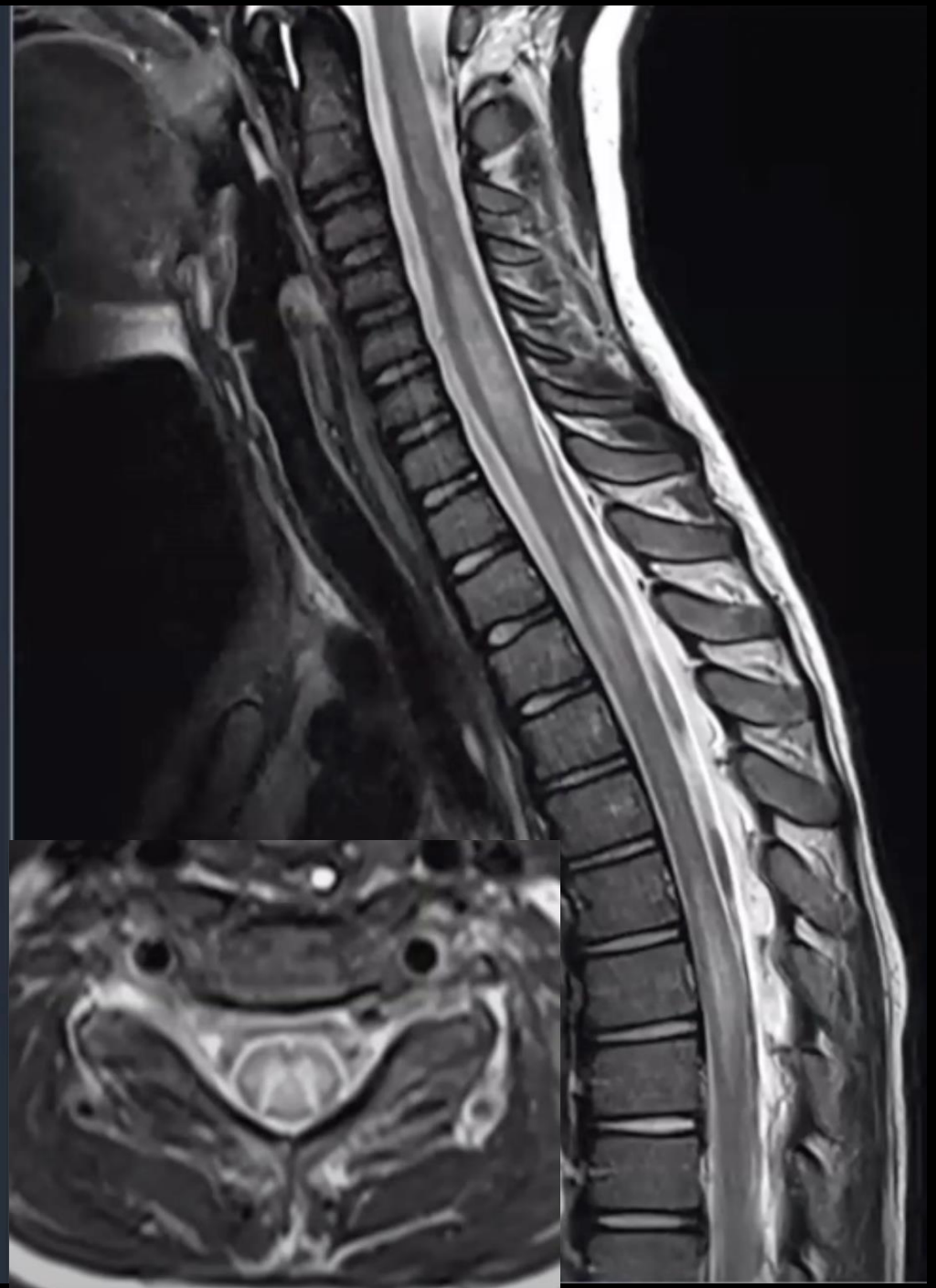


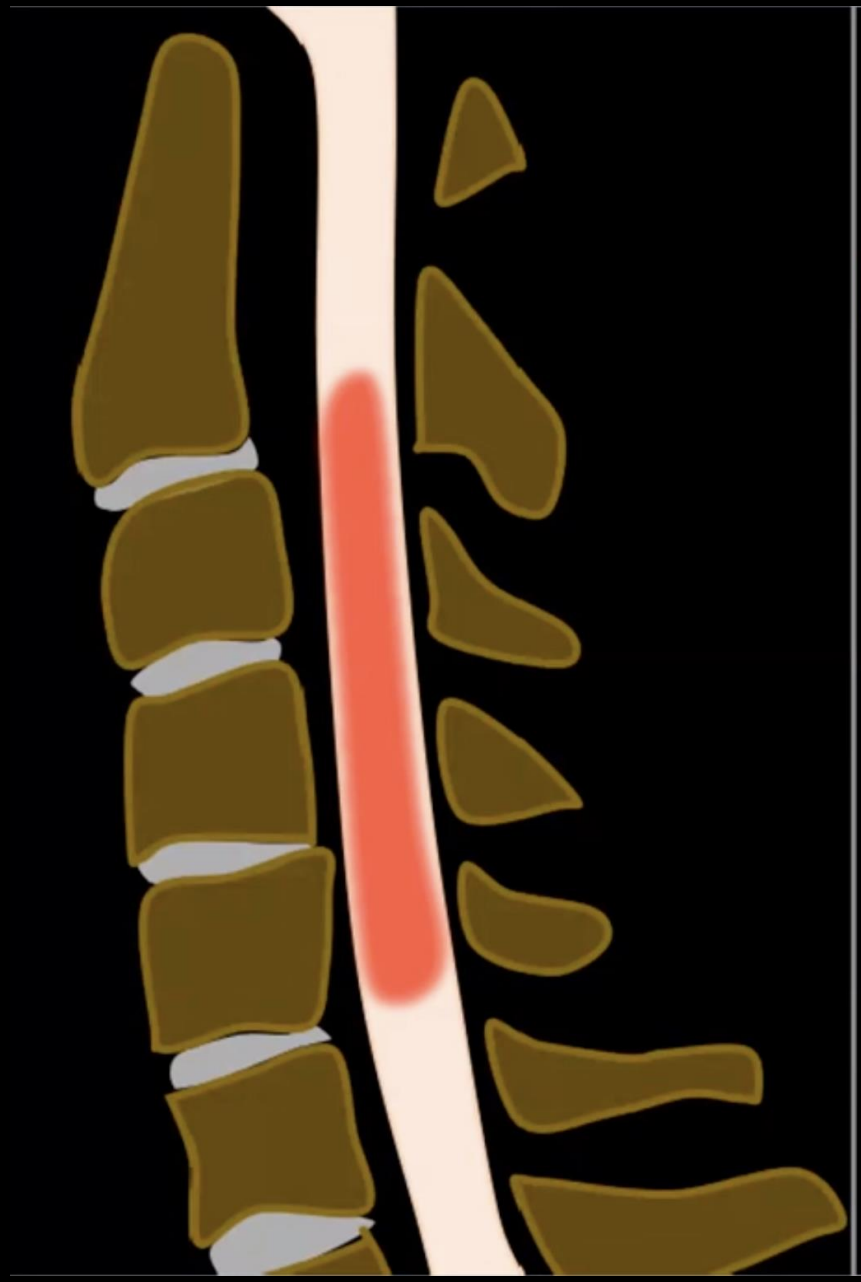
NMOSD

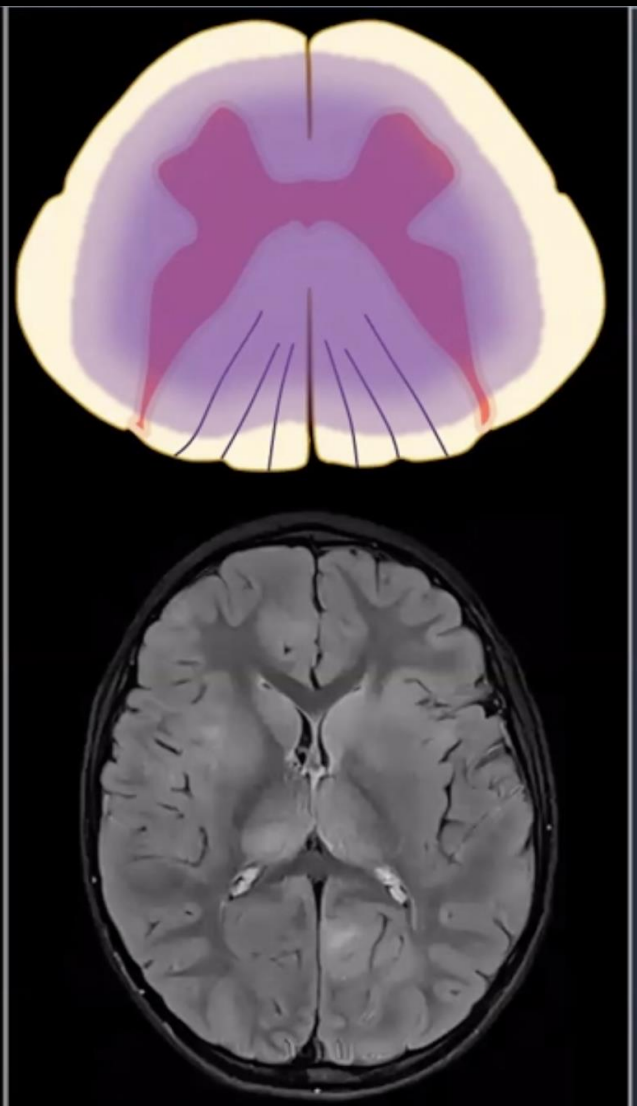
- Longitudinally extensive
- Transverse involvement
- Cervical > thoracic SC
- T2 bright spotty lesions
- GD(+): diverse

ADEM / ACUTE DISSEMINATED ENCEPALOMYELITIS

- Acute, monophasic demyelinating disease of the brain & the spinal cord.
- Typically following a prior (1-2 weeks) viral infection/ vaccination.
- Primary manifestation : encephalopathy.
- Spinal involvement : 25%
- Any age, majority in child





ADEM

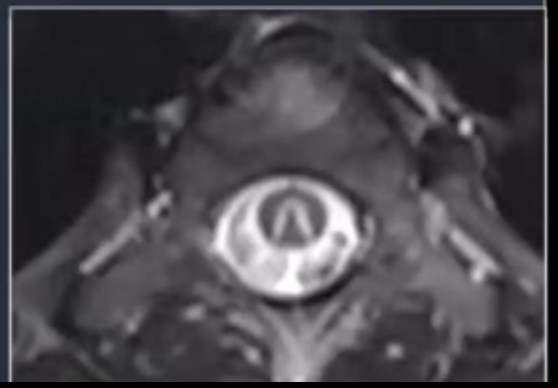
- Longitudinally extensive
- Transverse involvement
- No definining characteristics to differentiate from other LETMs
- GD(+): diverse
- Brain MRI: +++

MOGAD

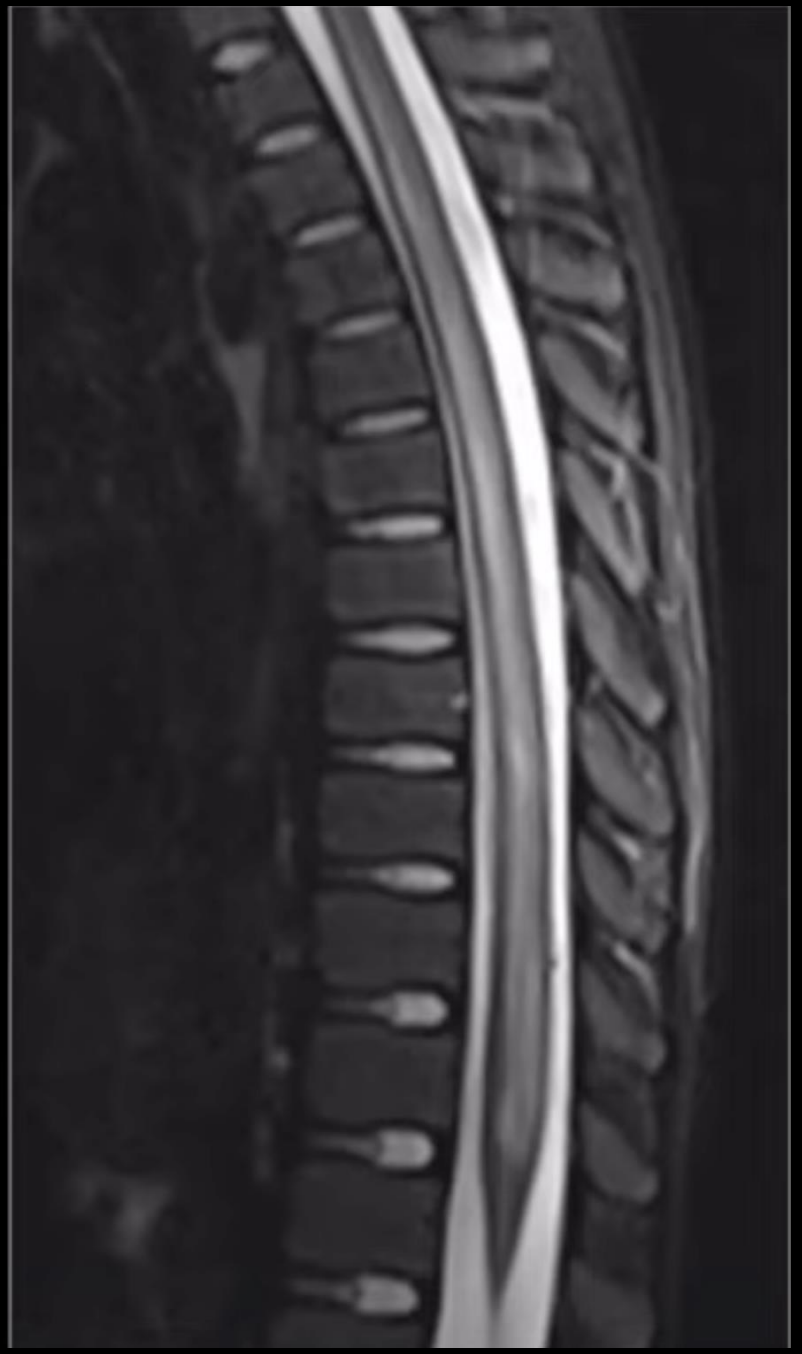
- **M**yelin **O**ligendrocyte **G**lycoprotein **A**ntiboby-associated **D**isease
- Group of inflammatory demyelin-ating disorders characterized by IgG antibodies to MOG

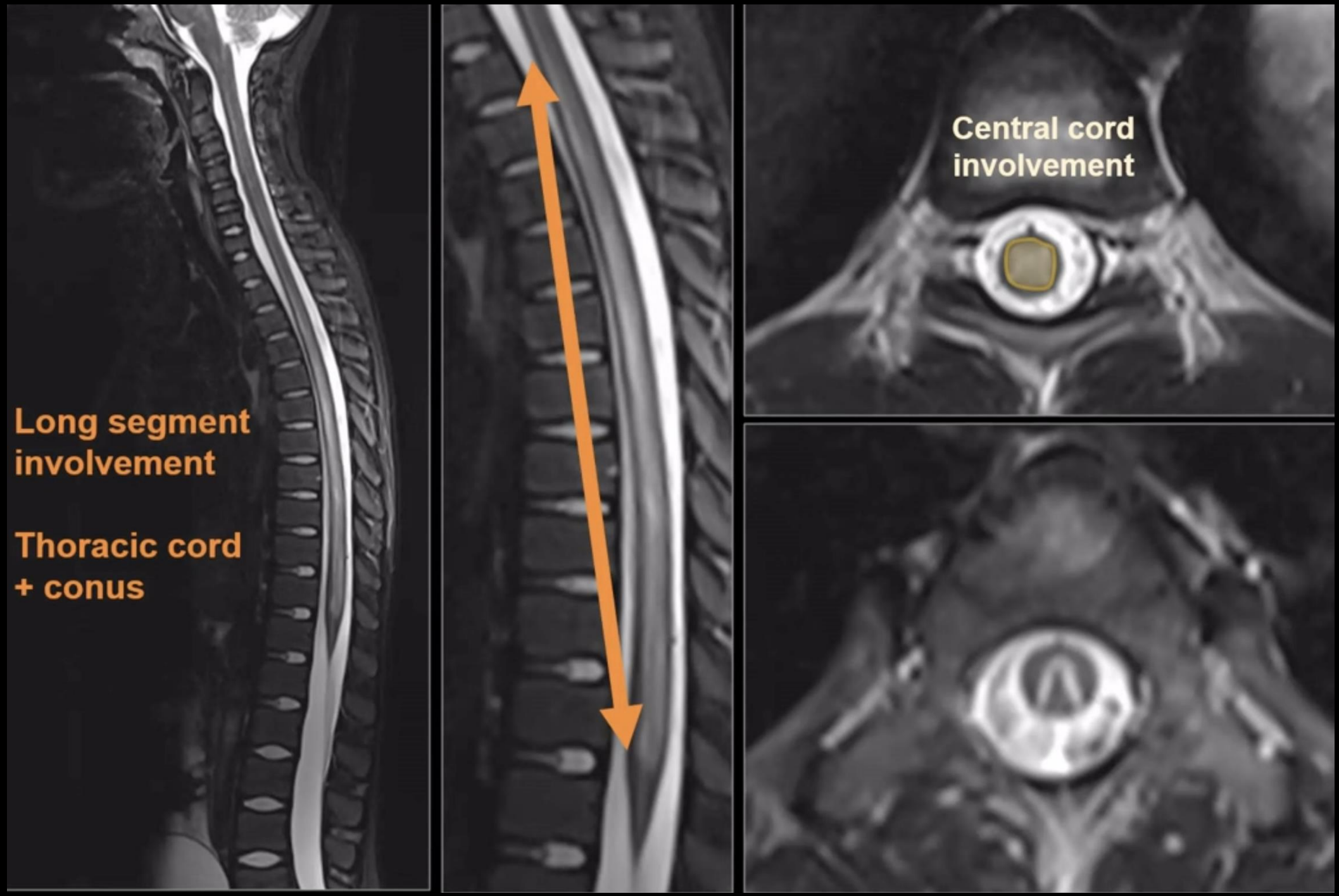
MOG-antibody associated disease (MOGAD)

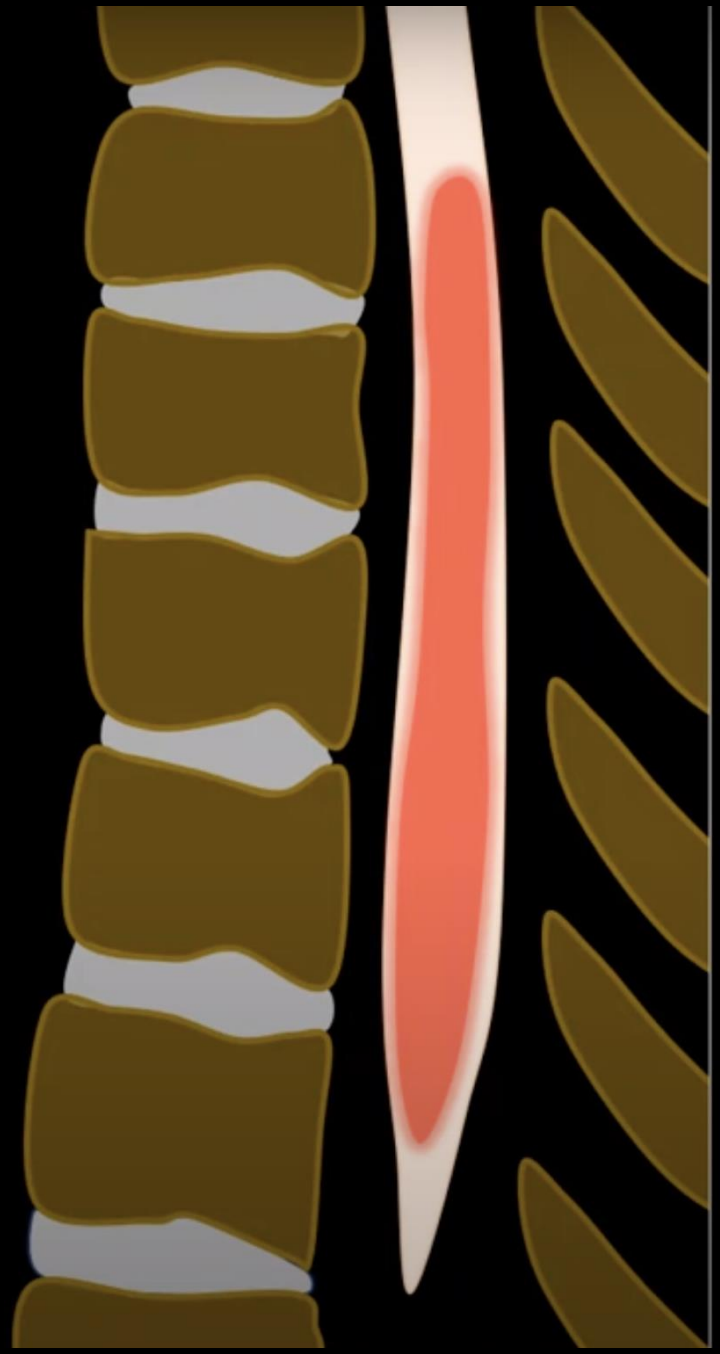
- **Long segment** (spanning ≥ 3 contiguous vertebral bodies
- **Central cord** / gray matter predominance

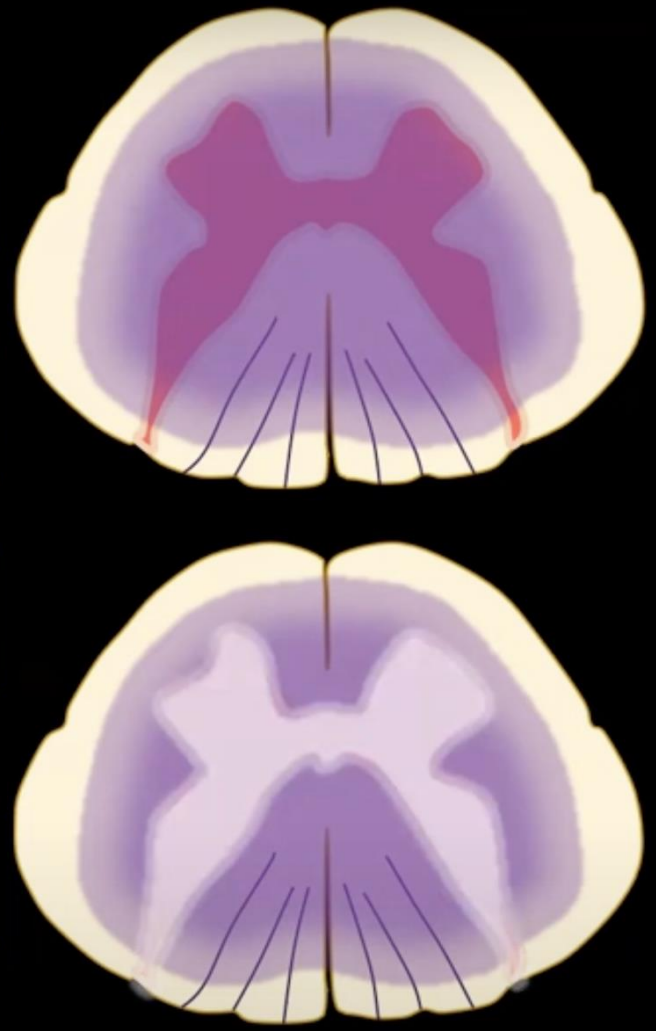


H-sign



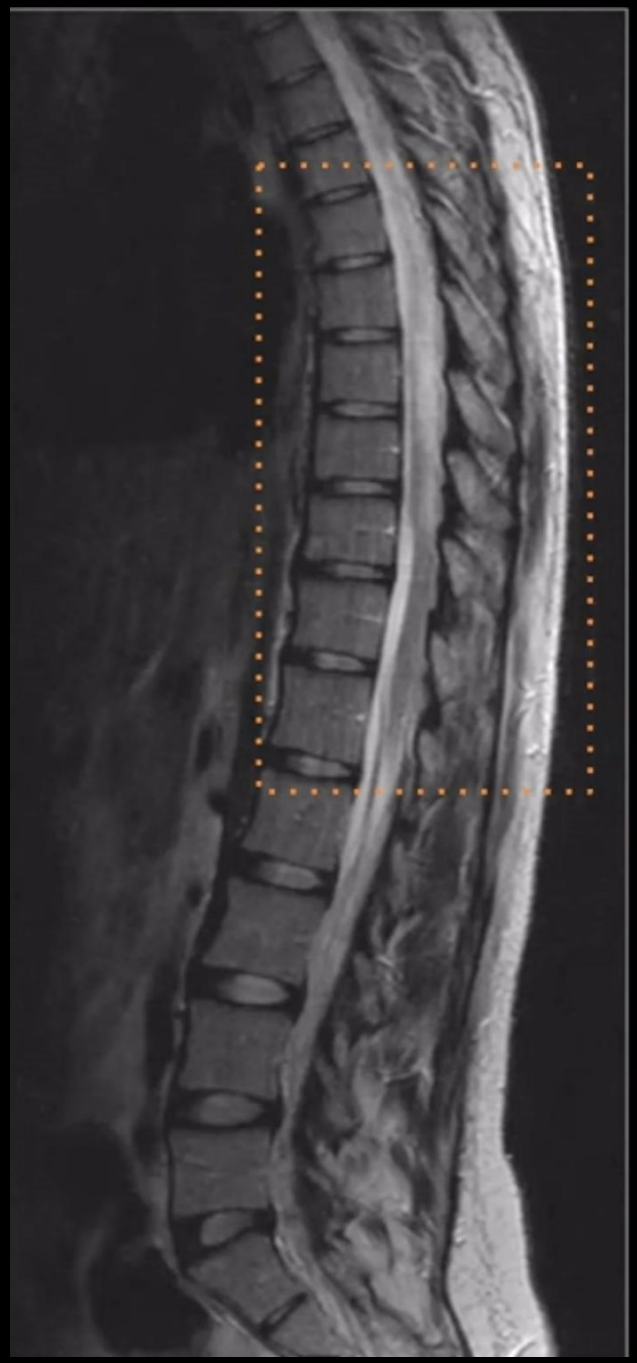

Long segment involvement
Thoracic cord + conus
Central cord involvement

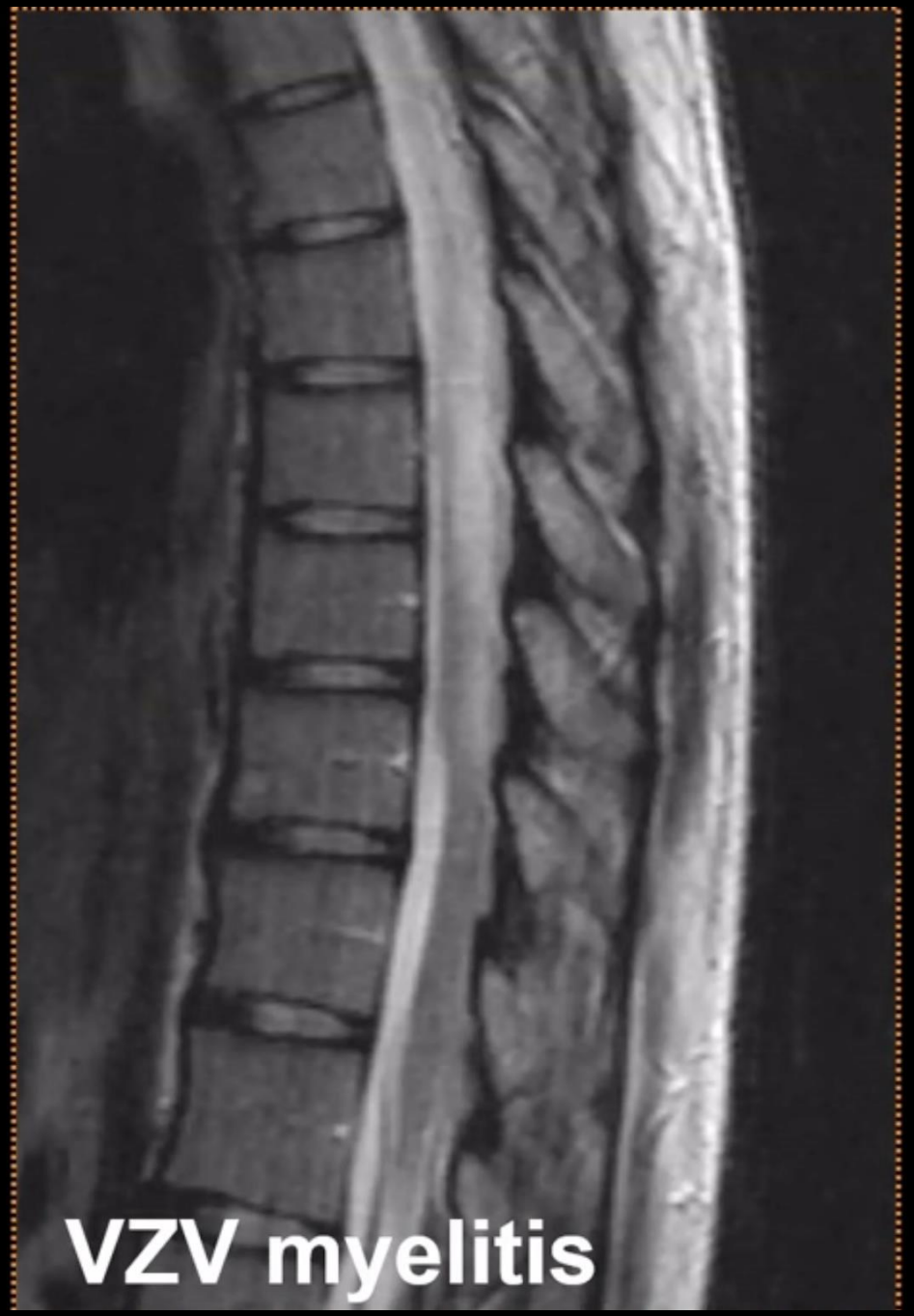




MOGAD

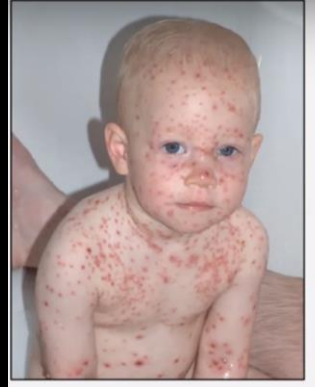
- Longitudinally extensive
- Transverse involvement
- Thoracic SC > cervical SC
- Conus
- H-sign





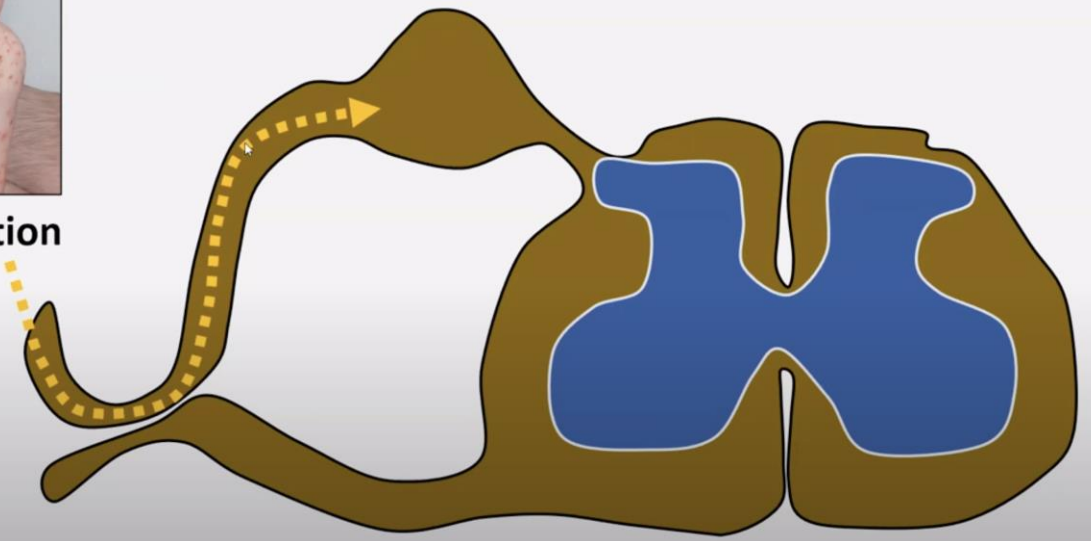
(Para-)infectious myelitis

- Direct infection of the spinal cord is uncommon
- Bacterial, viral, fungal, parasitic → mostly viral
- Herpesviruses (HSV, VZV) → remain dormant after primo-infection, can reactivate and extend into to the spinal cord causing myelitis
- Post- or para-infectious → auto-immune mediated following a (viral) infection alsewhere in the body *(~ADEM, but no brain lesions)*

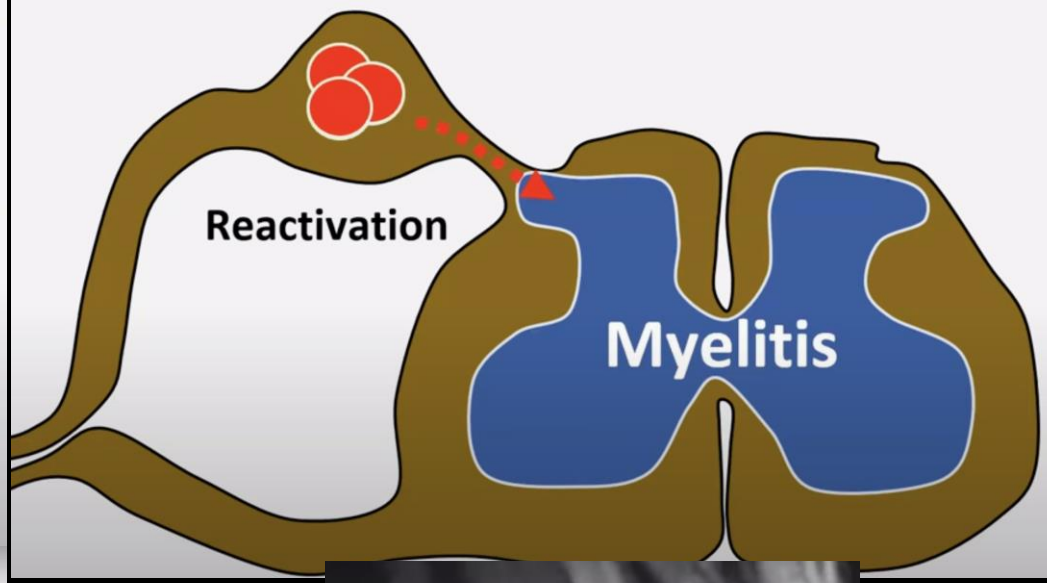


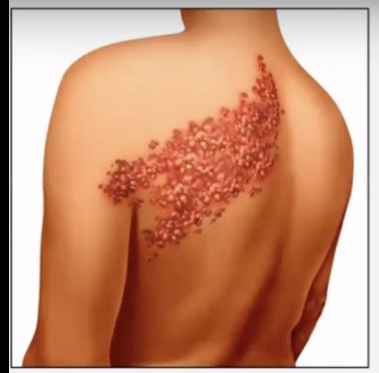
Primo infection

Chickenpox is generally a benign, selflimiting disease in children



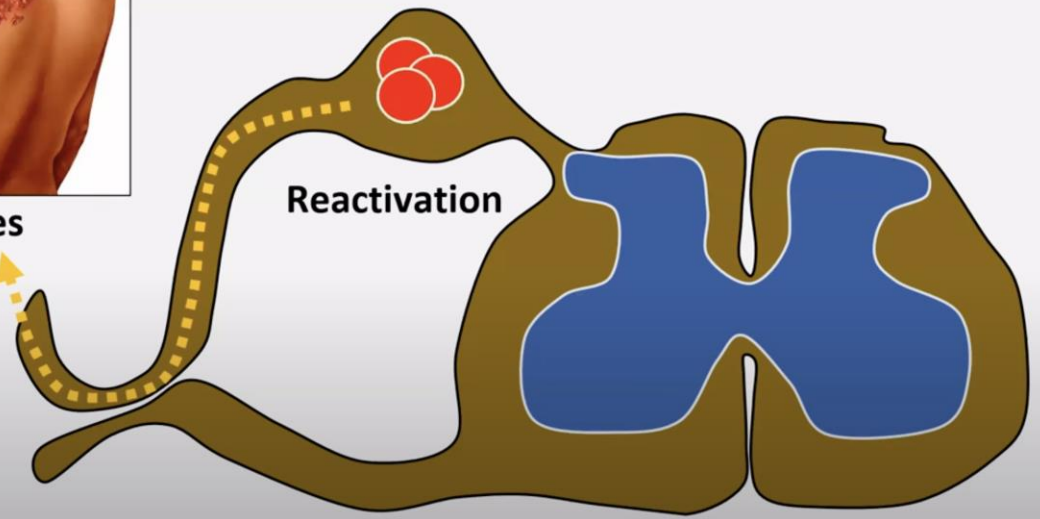
In cases of decreased immunity the virus reactivates → myelitis!

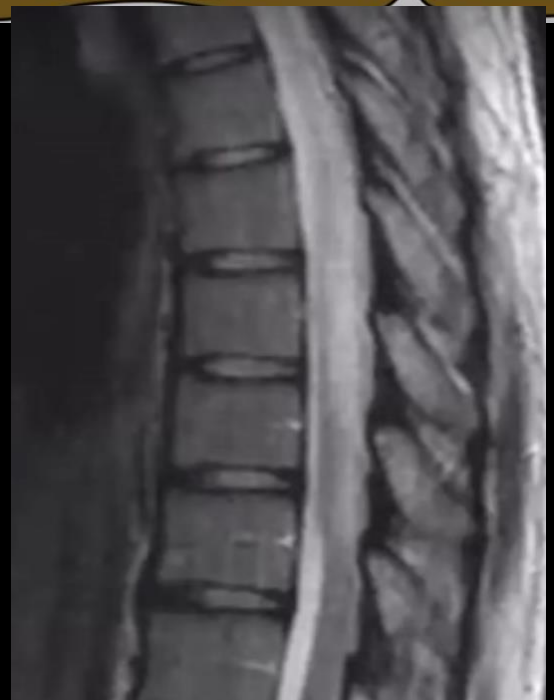




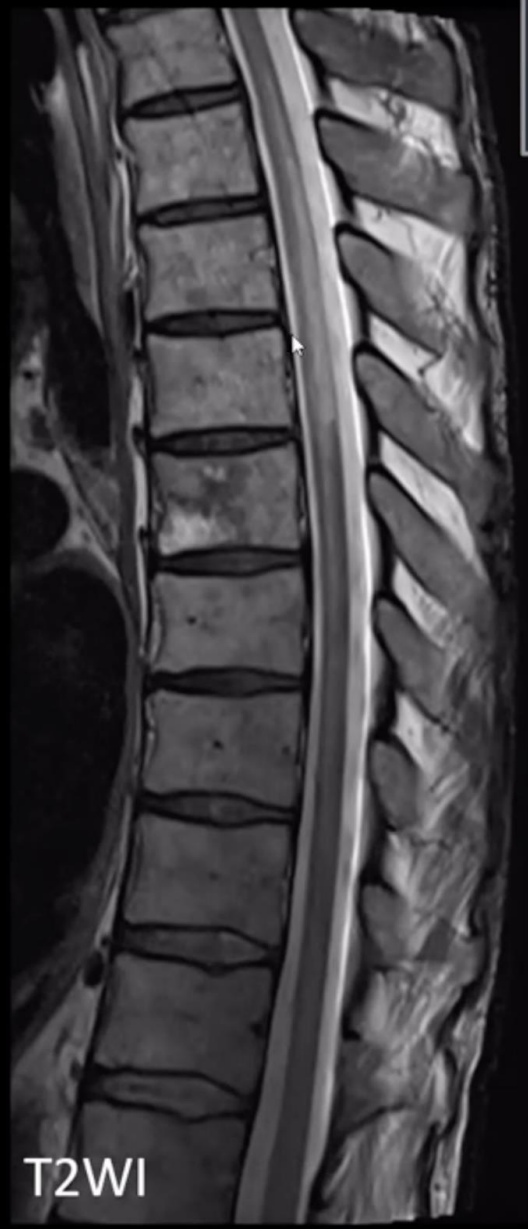
Shingles

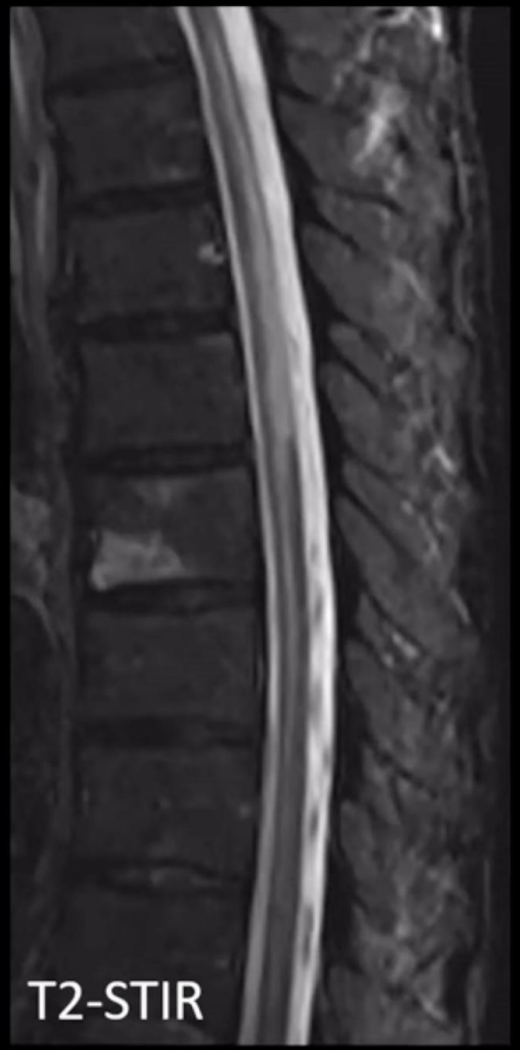
In cases of decreased immunity the virus reactivates → shingles!

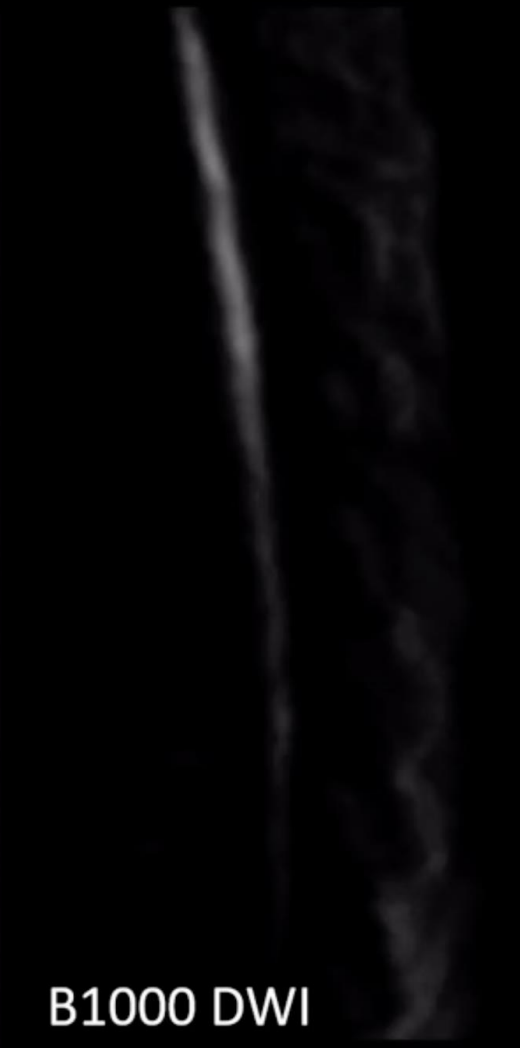


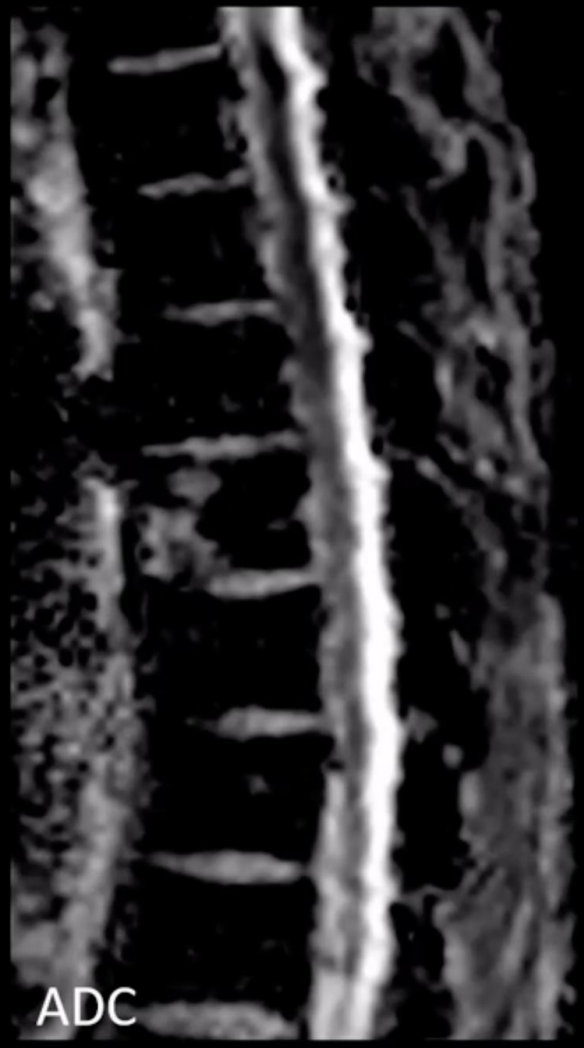


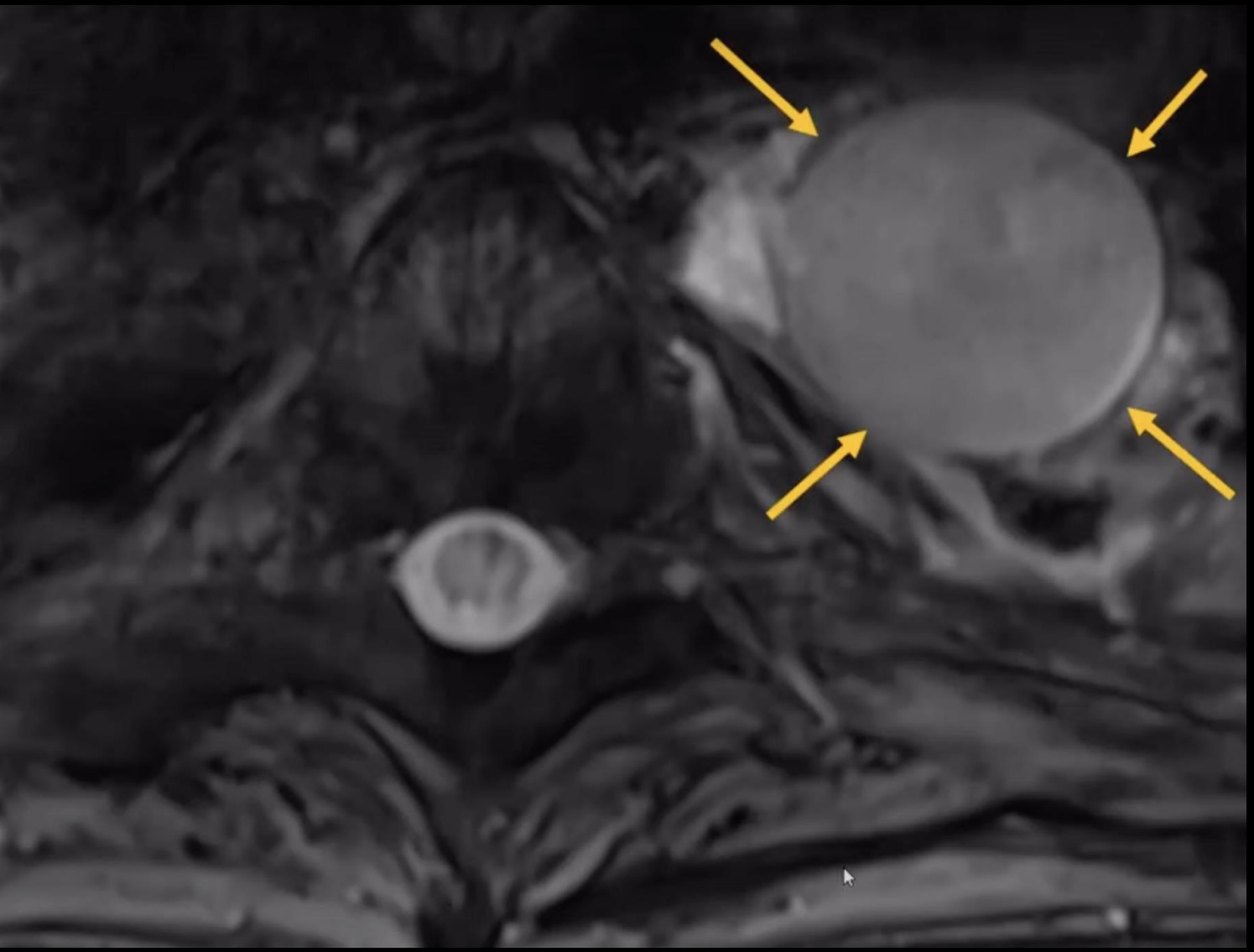
Spinal Cord Ischemic Infarction

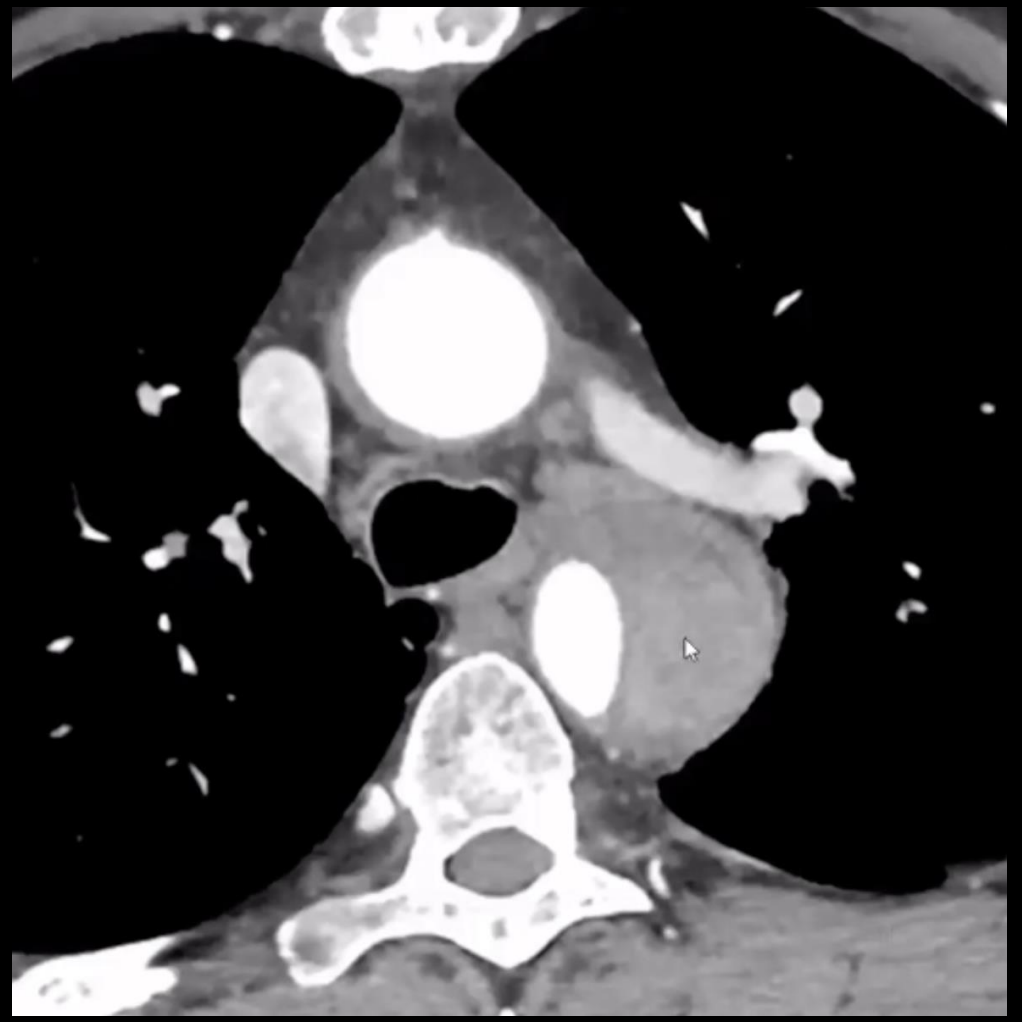


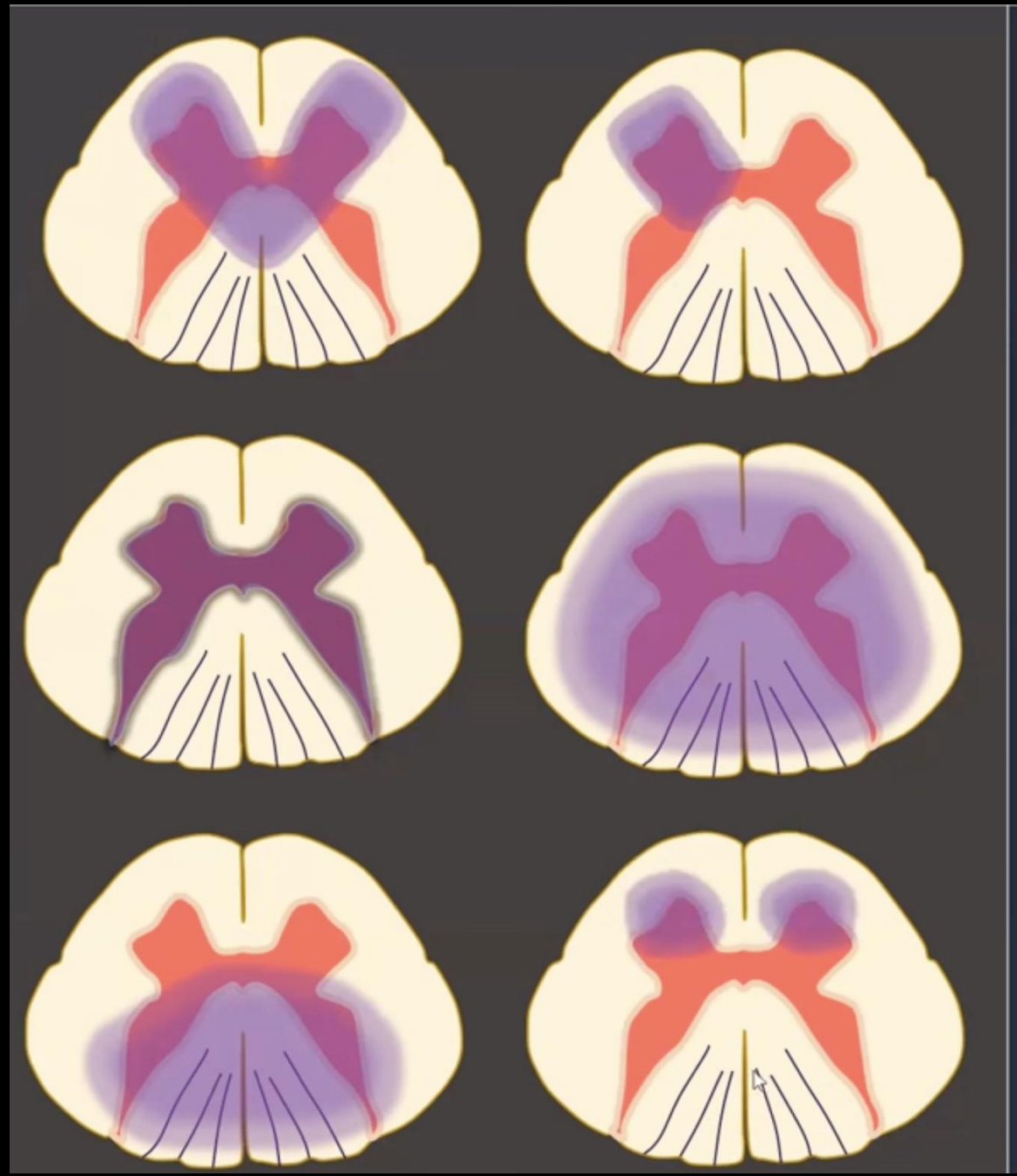






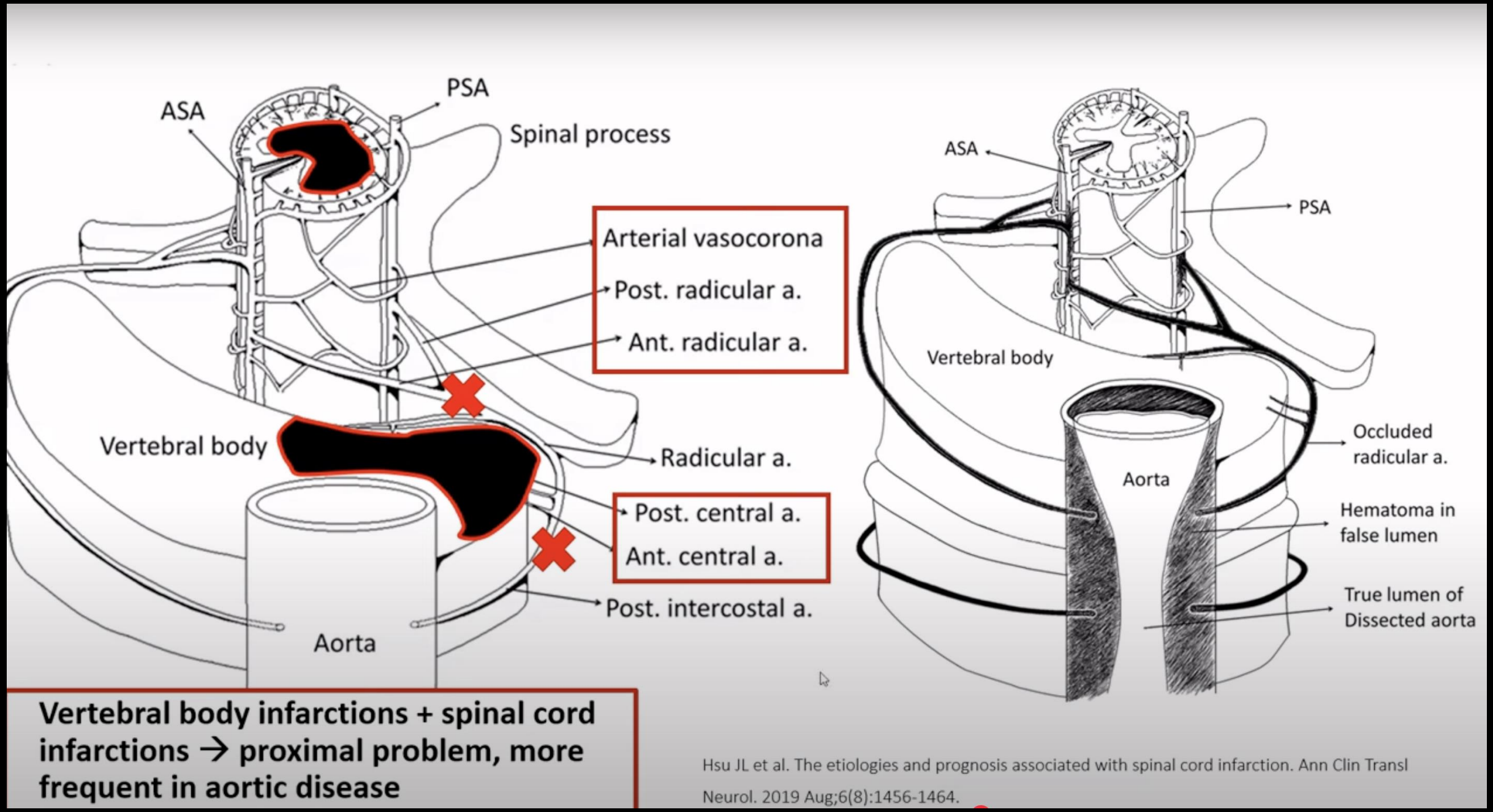






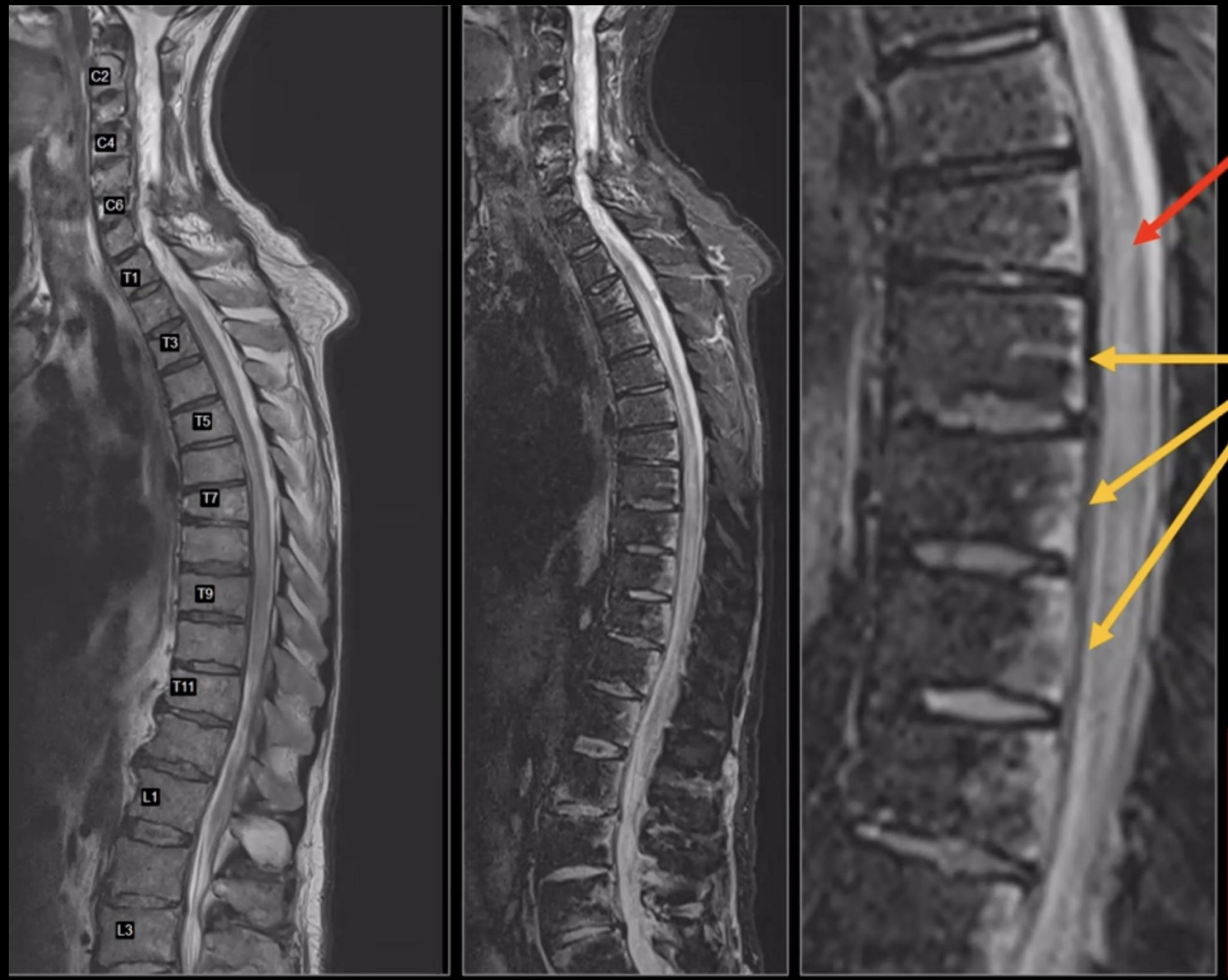
Spinal cord ischemic infarction

- **Rare: < 1% of all strokes**
  - Complex vascular supply
  - Numerous anastomoses & connections
- **Very heterogeneous etiology**
  - In the elderly: aortic disease
  - In younger patients: VA dissection
  - But also: drugs, cardial embolism, hypotension…
- **Most common in cervical & thoracic cord**
  - Cervical spinal cord (~40%)
  - Thoracic spinal cord (~40%)
- **Clinical:** rapid progression to nadir < 4h



Vertebral body infarctions + spinal cord infarctions → proximal problem, more frequent in aortic disease

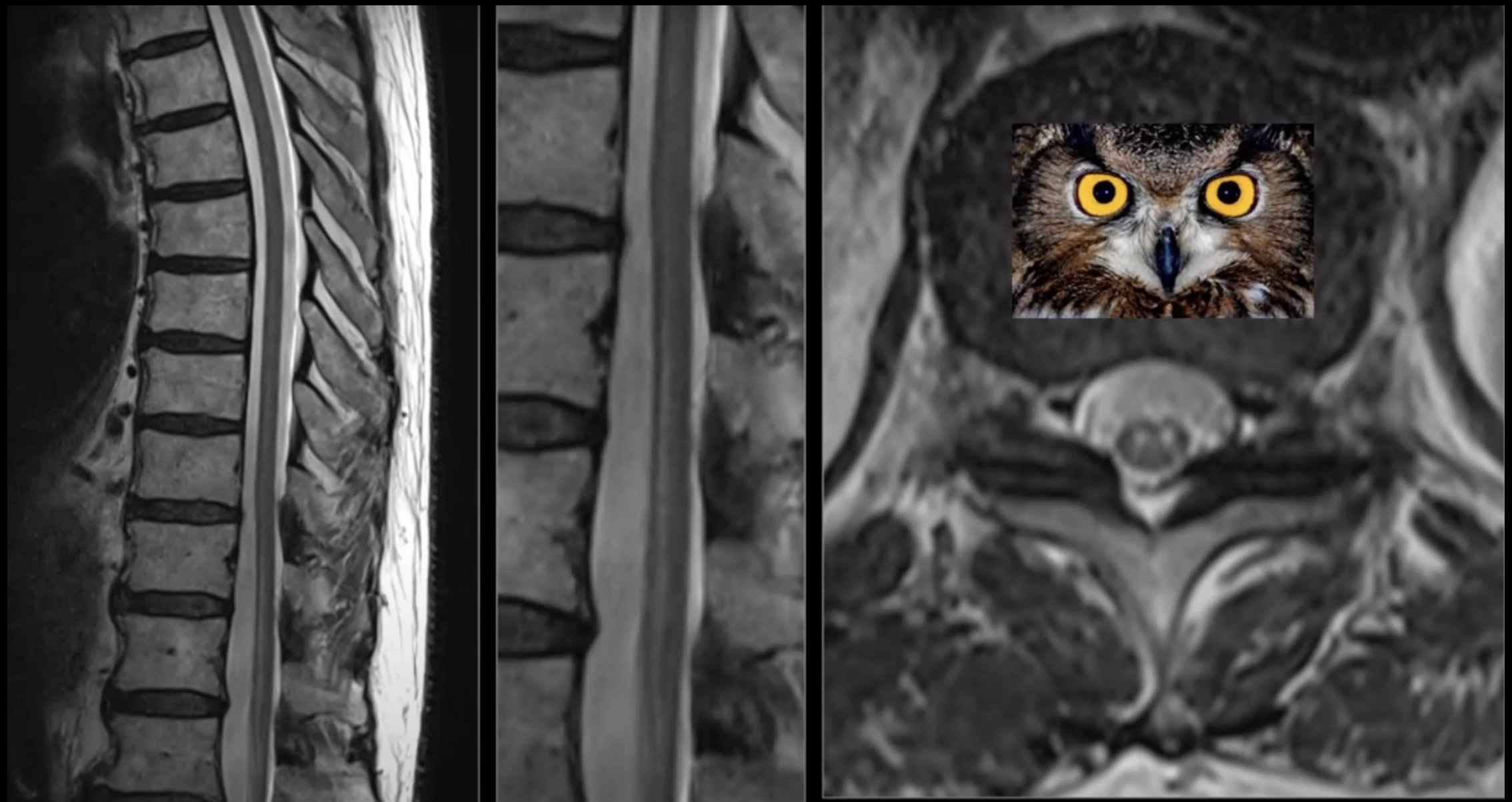
Hsu JL et al. The etiologies and prognosis associated with spinal cord infarction. Ann Clin Transl Neurol. 2019 Aug;6(8):1456-1464.



Diffusely swollen T2-hyperintense spinal cord

Foci of bone marrow edema posteriorly in the thoracic vertebra

Vertebral bony infarction is a confirmatory sign of suspected spinal ischemic infarction



TAKE HOME POINTS

- Make sure that intramedullar T2-hyperintensity is real.
- Compressive vs Non Compressive ?
- Acute vs subacute-chronic onset ?
- Acute non compressive myelopathy :

- vascular : spinal cord infarction (hyperacute-within 4 hours)
- Inflammatory : partial/ transverse myelitis (4 hours-21 days) -- demyelination (MS, NMOSD, ADEM, MOGAD); para-infectious (direct infection, post infectious); systemic inflammatory (Lupus, Sjorgen, Bechet, Sarcoid).

THANK YOU