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TRAUMA & EMERGENCY RADIOLOGY

Non-Traumatic Spinal Emergencies

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No disclosures

Overview

- Review common non-traumatic spinal emergencies
- Recognise compressive and non-compressive abnormalities that need immediate management
- Know key findings that are crucial to report

Quick word on imaging choice…

…MRI as soon as possible!

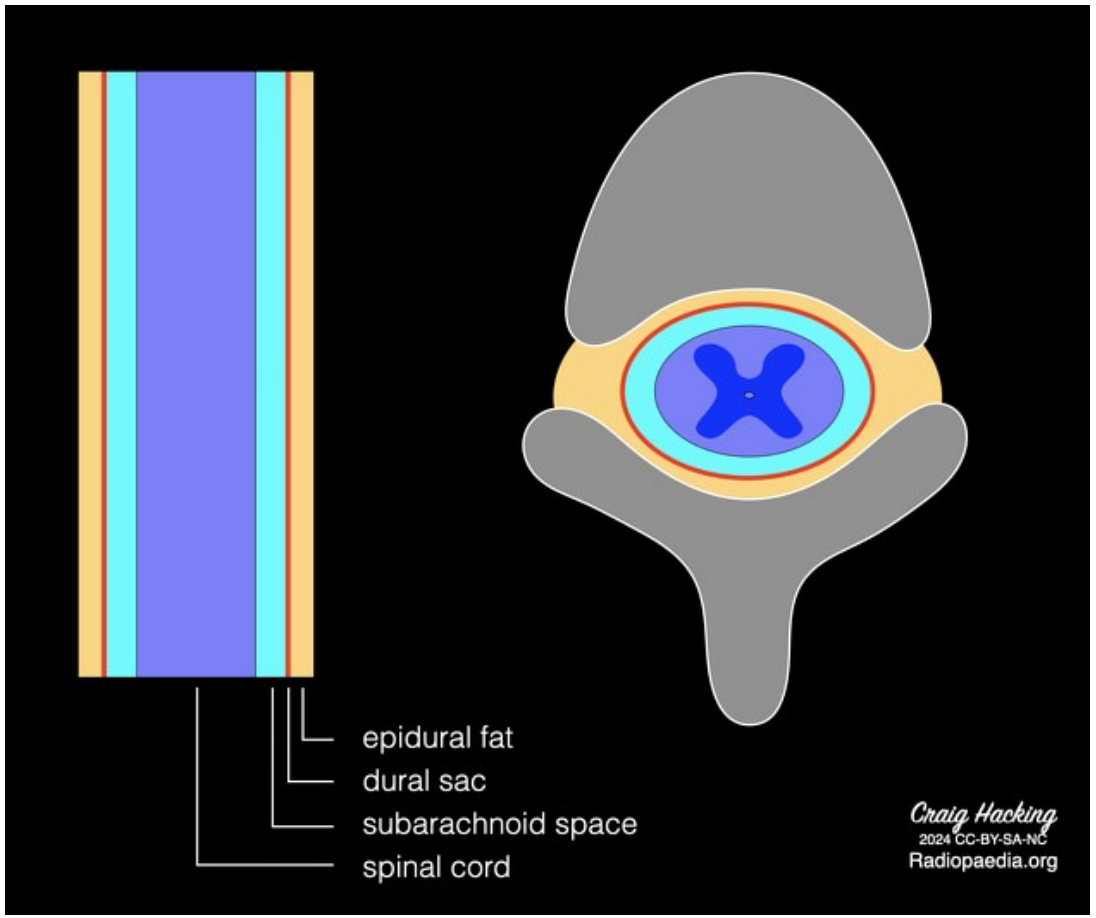
Presenting features

- Myelopathy
  - Signs and symptoms of cord dysfunction
- Acute onset, rapid decline in neurological function
- Pain
- Compressive aetiologies
- Non-compressive aetiologies
- Neurosurgical emergency
  - Avoid permanent neurological deficit

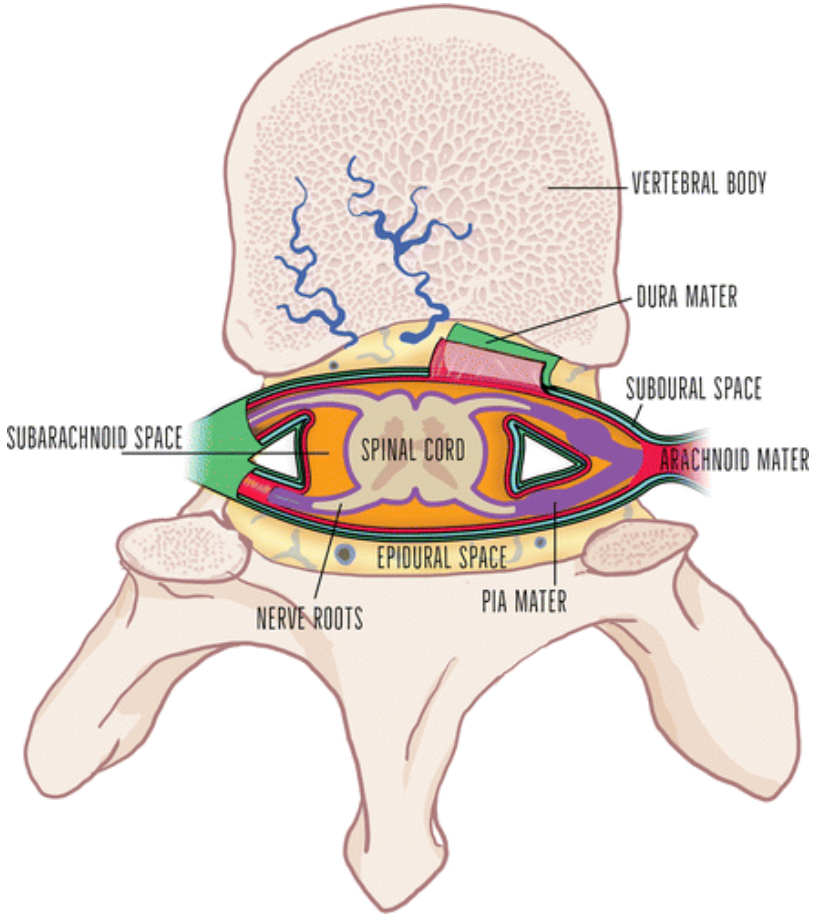
Scenario 1

Compressive

Spinal anatomy



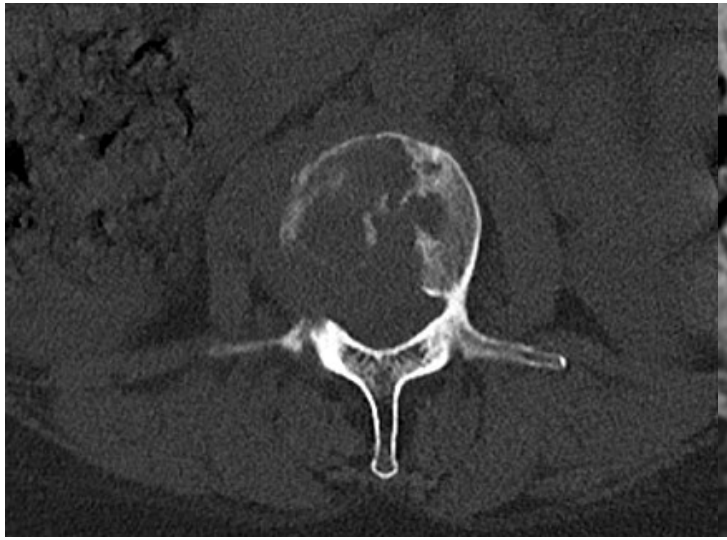
Hacking C, Spinal tumour location (illustrations). Case study, Radiopaedia.org
https://doi.org/10.53347/rID-200197

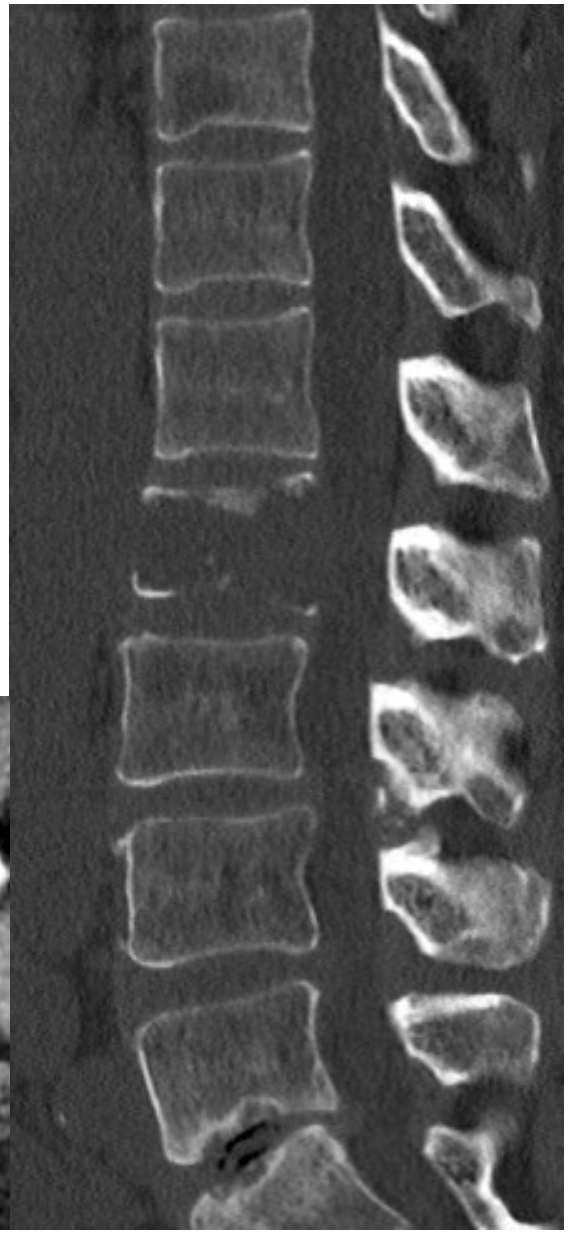


Spinal Hematomas: What a Radiologist Needs to Know
Jennifer L. Pierce, Joseph H. Donahue, Nicholas C. Nacey, Cody R. Quirk, Michael T. Perry, Nicholas Faulconer, Gene A. Falkowski, Michael D. Maldonado, Catherine A. Shaeffer, and Francis H. Shen. RadioGraphics 2018 38:5, 1516-1535

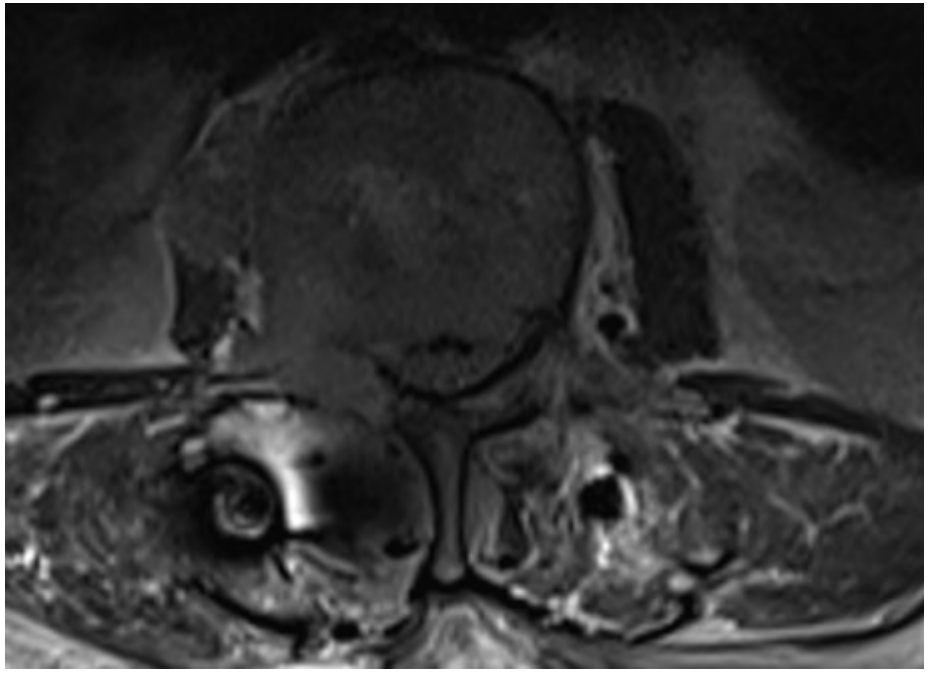
Known breast ca with back pain and progressive lower limb weakness.

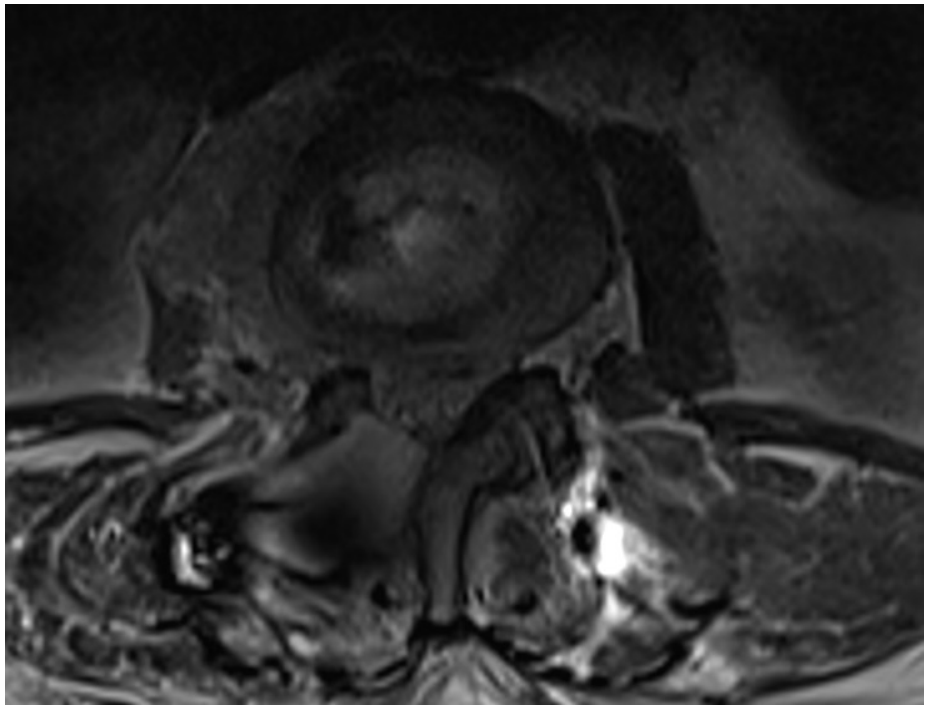
Lytic L2 lesion with soft tissue in epidural space -> cord compression! Smaller lucency T11.





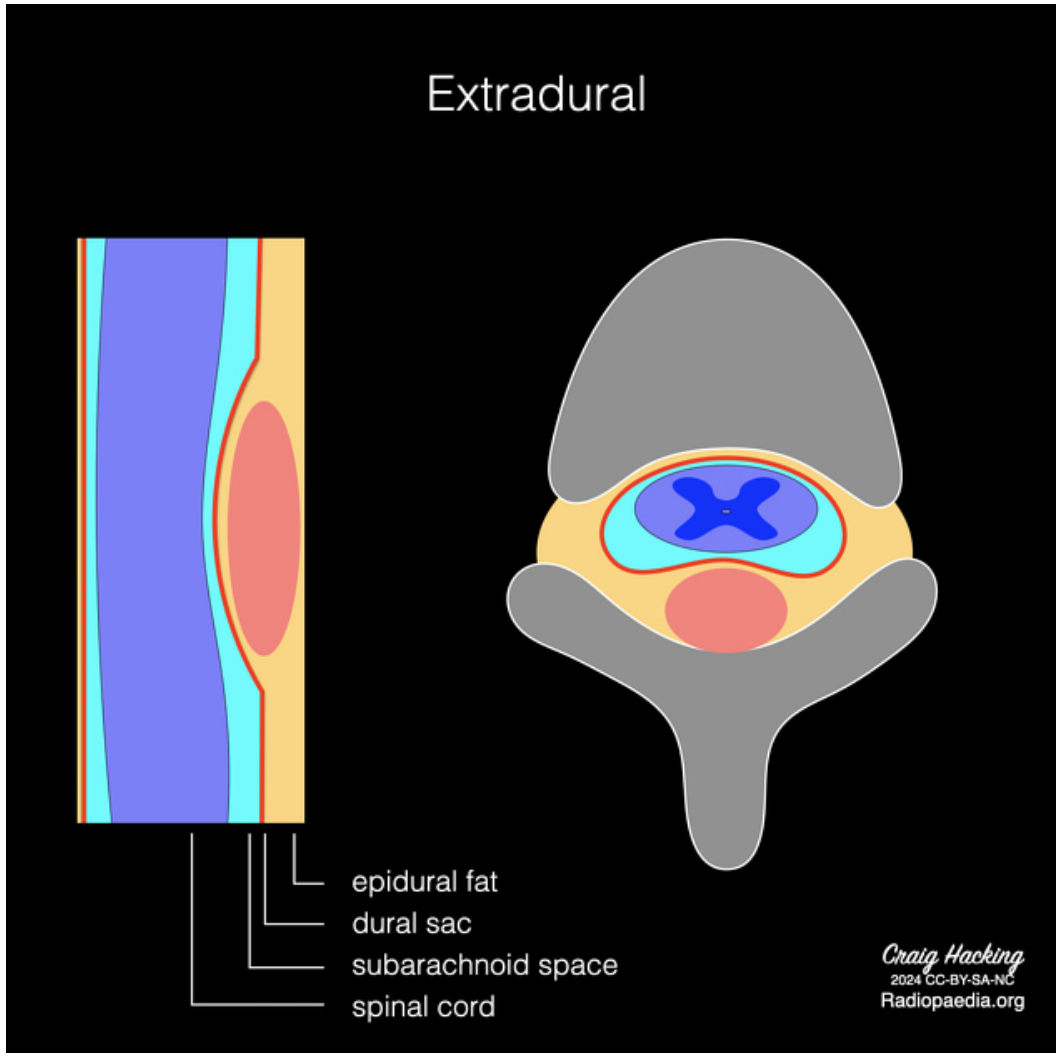
MRI showed multiple mets and cord compression – L2 decompressed and thoracolumbar spine stabilised.





Epidural / extradural compression

- Fat-containing space between dura mater and osseo-ligamentous structures.
- Venous plexus, lymphatics, small arteries and exiting spinal nerve roots
- Valve-less veins and gravity dependent (position, CSF pressure sensitive)
- Epidural fat effaced and dura displaced inward



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Epidural Spinal Cord Compression Scale

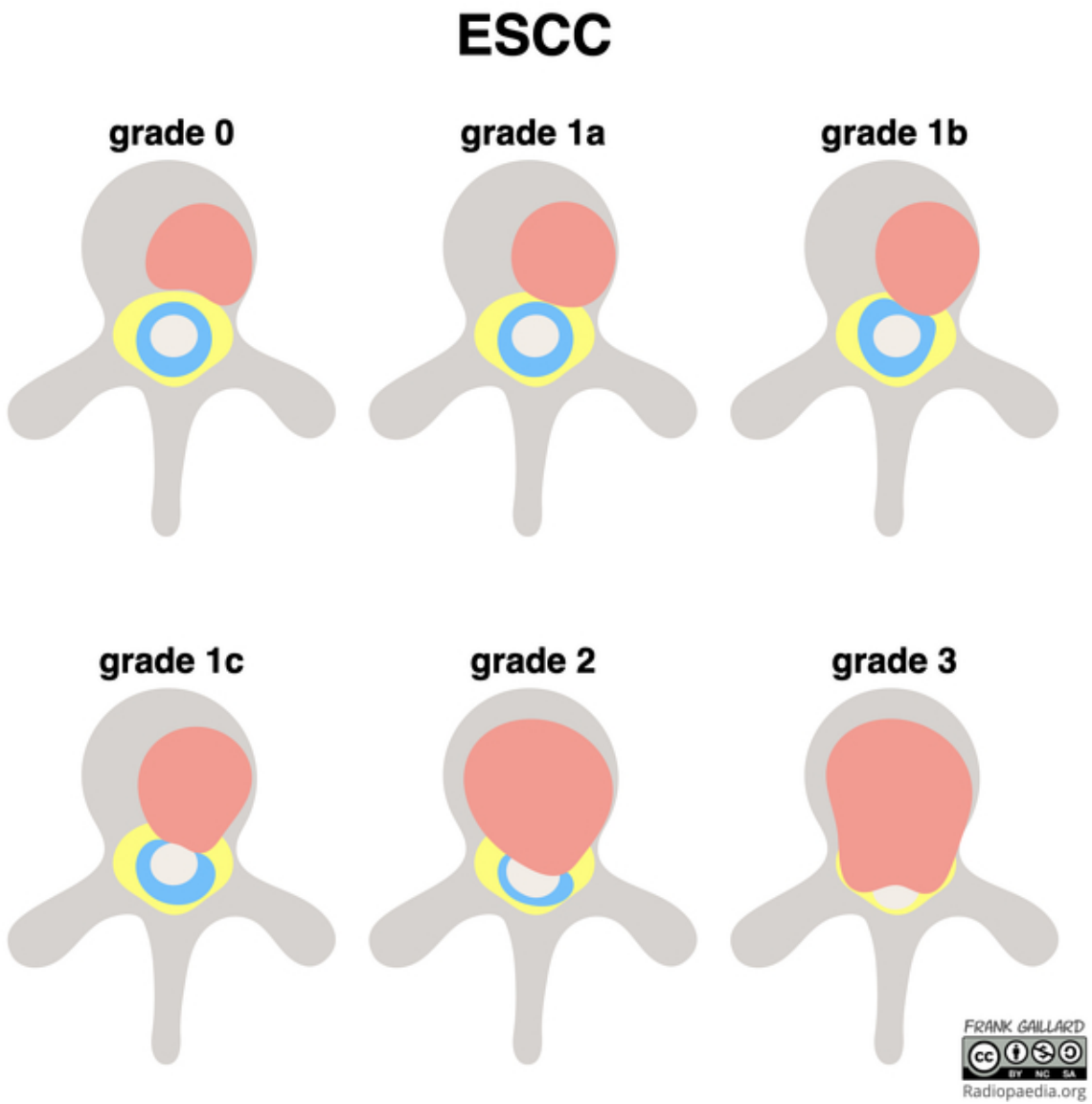
grade 0: bone-only disease

grade 1: epidural extension without cord compression

- **a:** epidural extension only (no deformation of the thecal sac)
- **b:** deformation of thecal sac, without spinal cord abutment
- **c:** deformation of the thecal sac, with spinal cord abutment

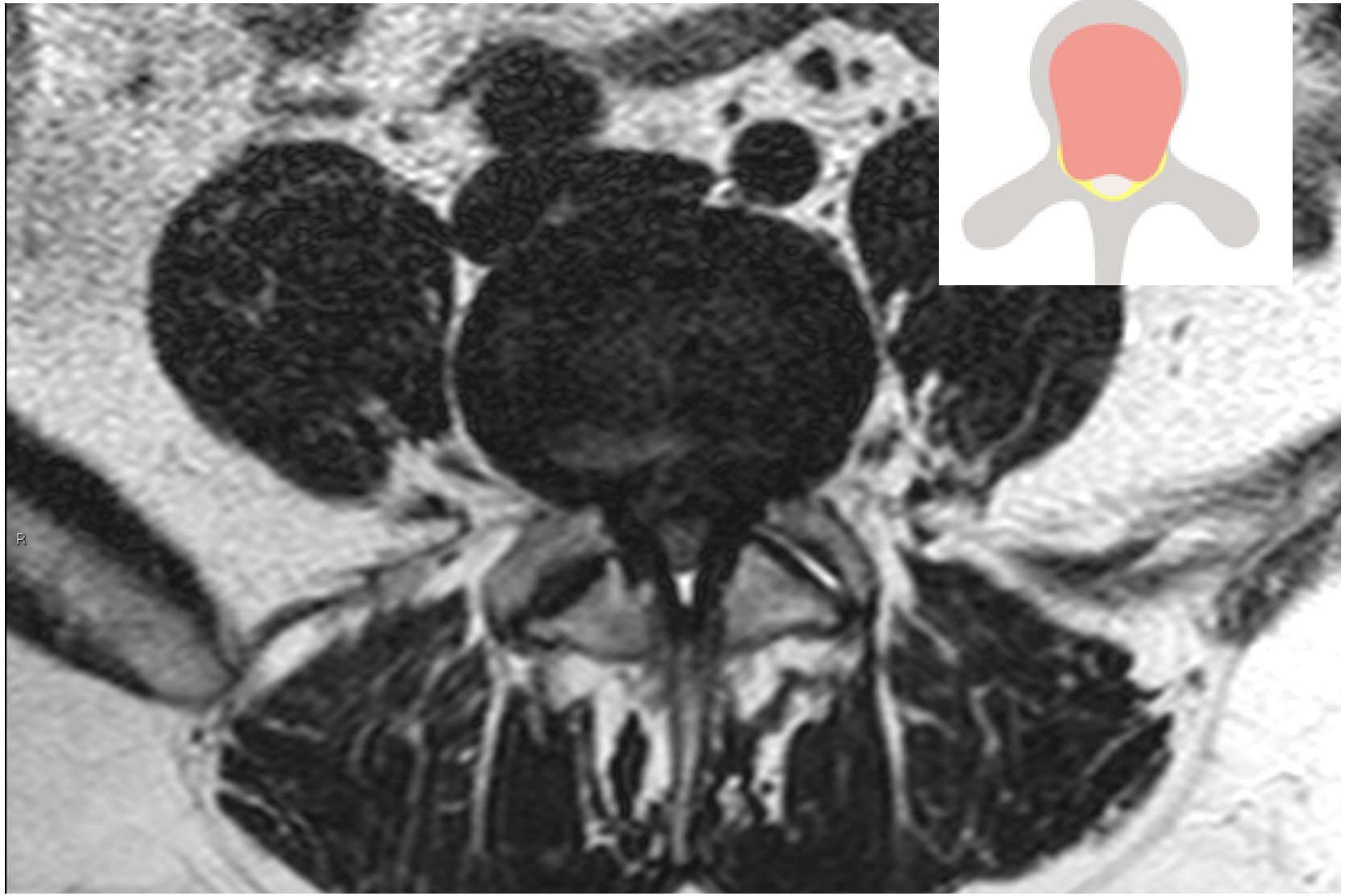
grade 2: spinal cord compression, with cerebrospinal fluid (CSF) visible around the cord

grade 3: spinal cord compression, no CSF visible around the cord



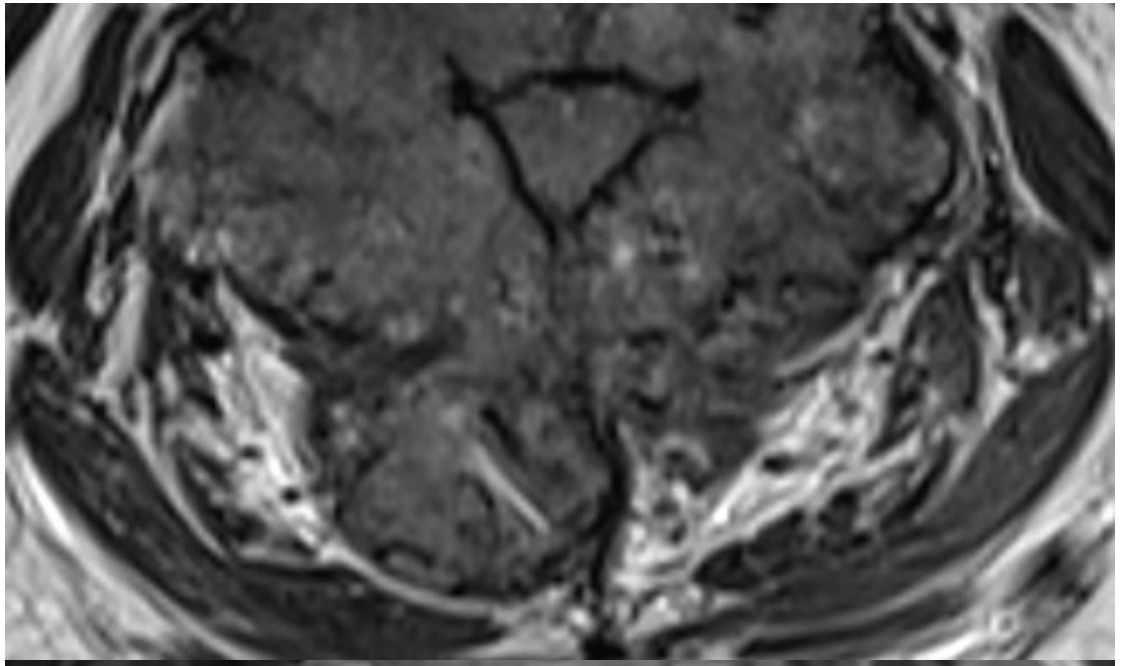
Gaillard F, Epidural spinal cord compression scale (illustration). Case study, Radiopaedia.org

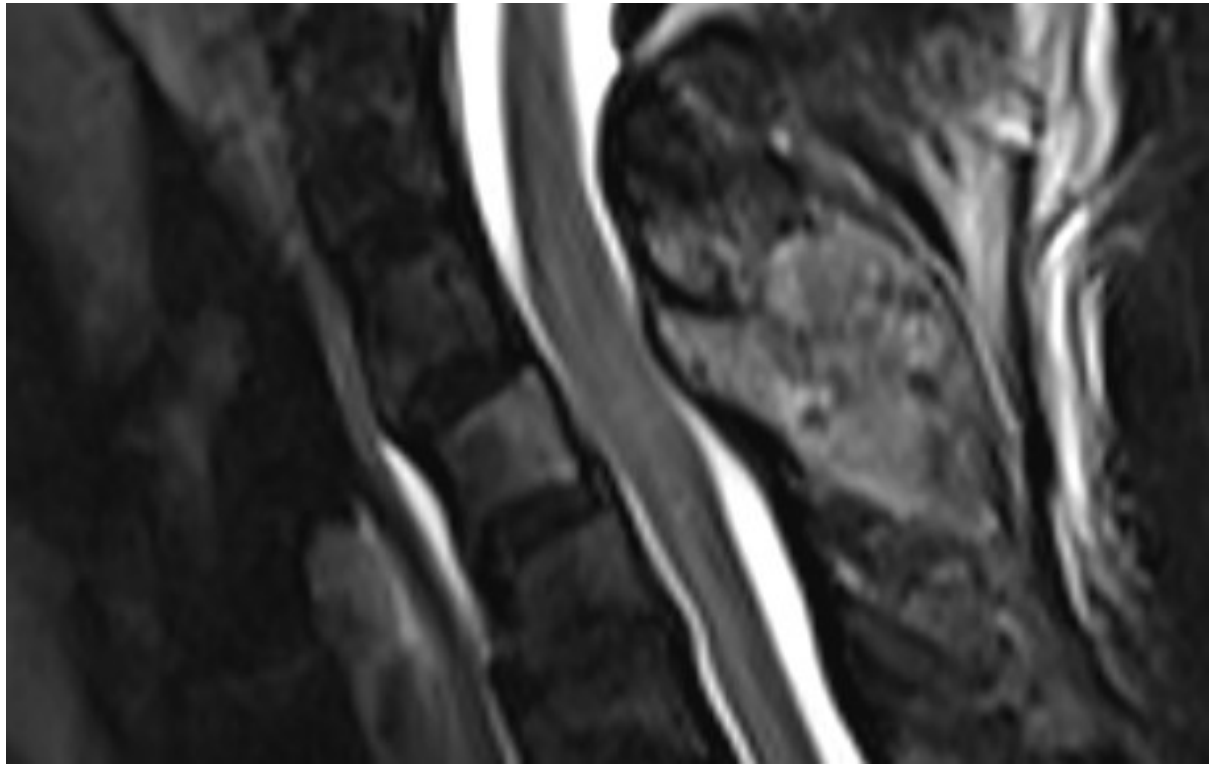
Companion case - epidural compression: disc bulge. Grade 3

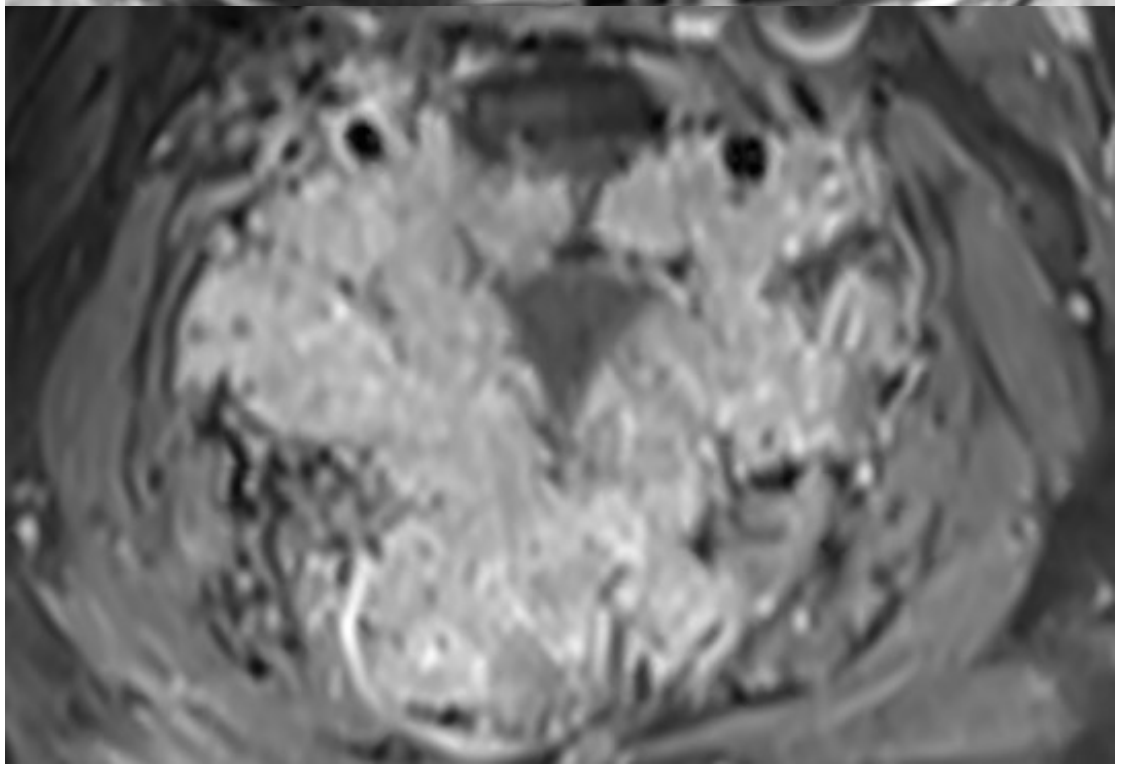


Companion case - epidural compression: renal mets - grade 3 compression.

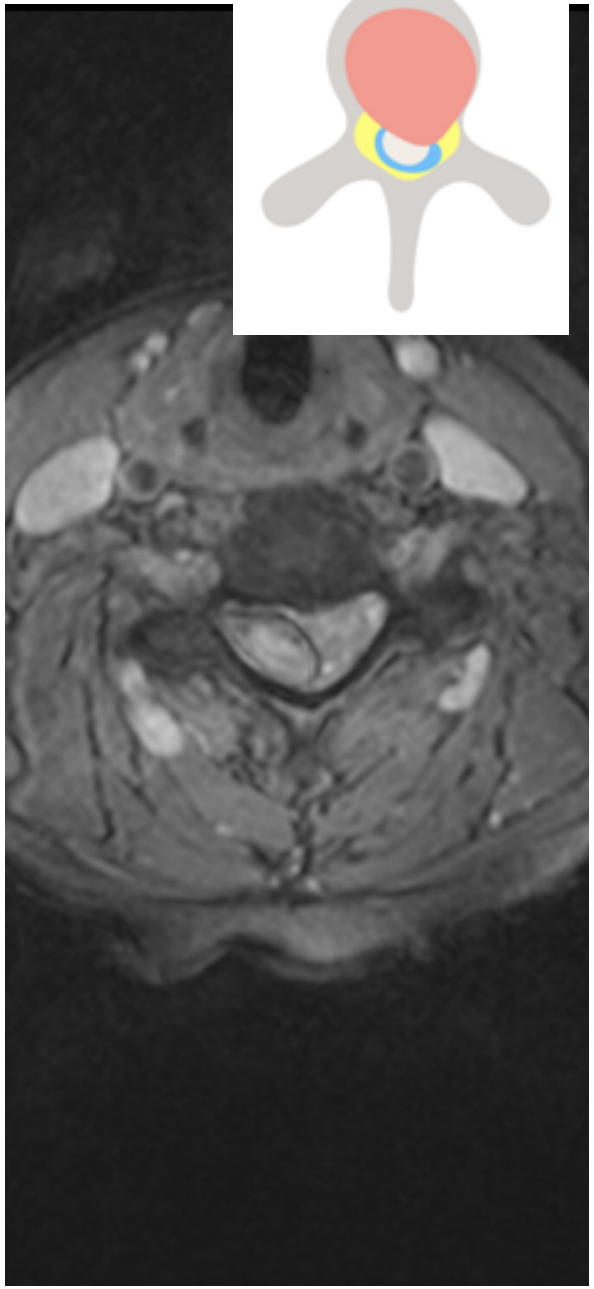
Cord signal change – T2 hyperintensity in acute setting -> oedema/ischaemia



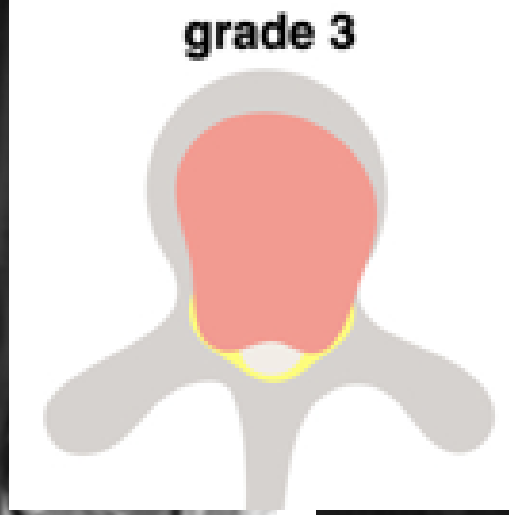


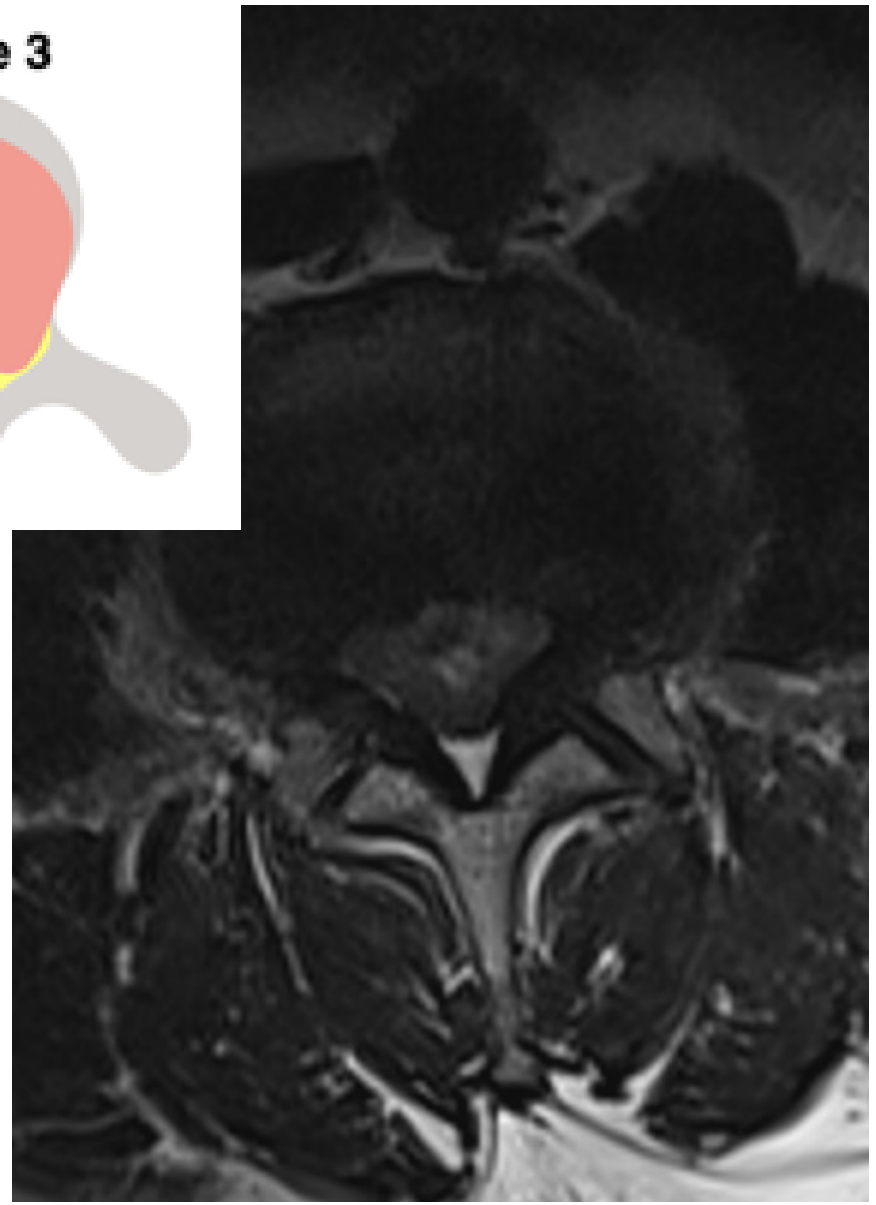


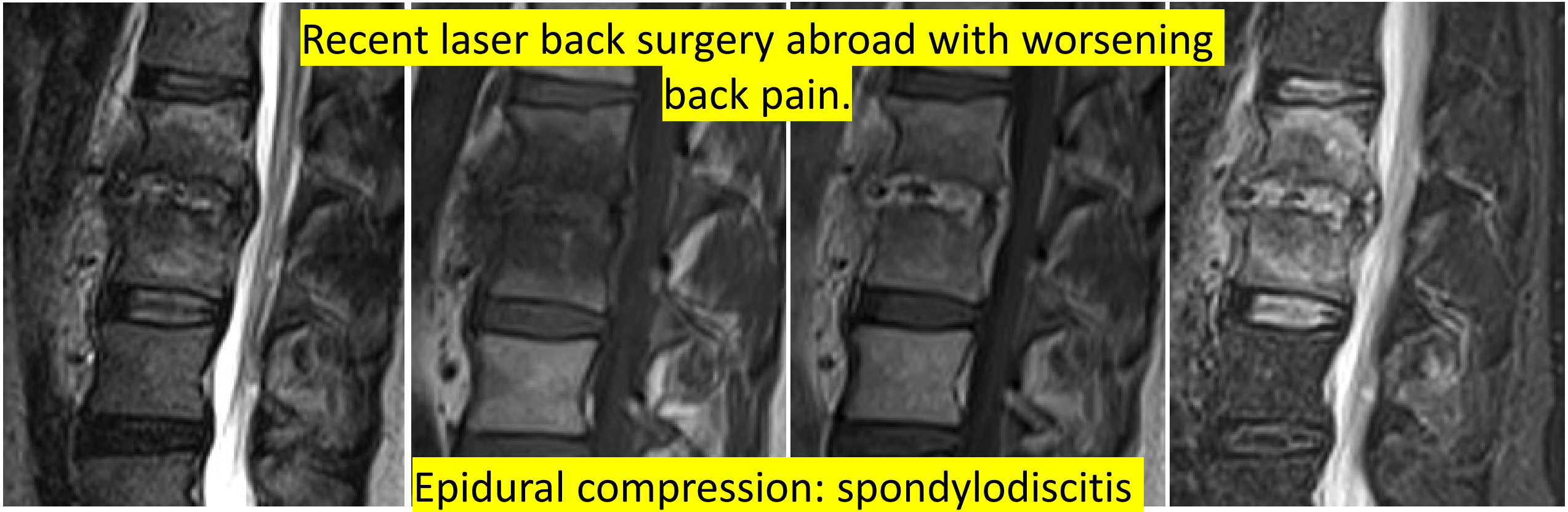
Companion case - epidural compression: epidural haematoma (T1 iso- mild hyperintense, deoxyHb peripherally on GRE sequence, no enhancement in pattern of abscess)



Companion case - epidural compression: epidural abscess

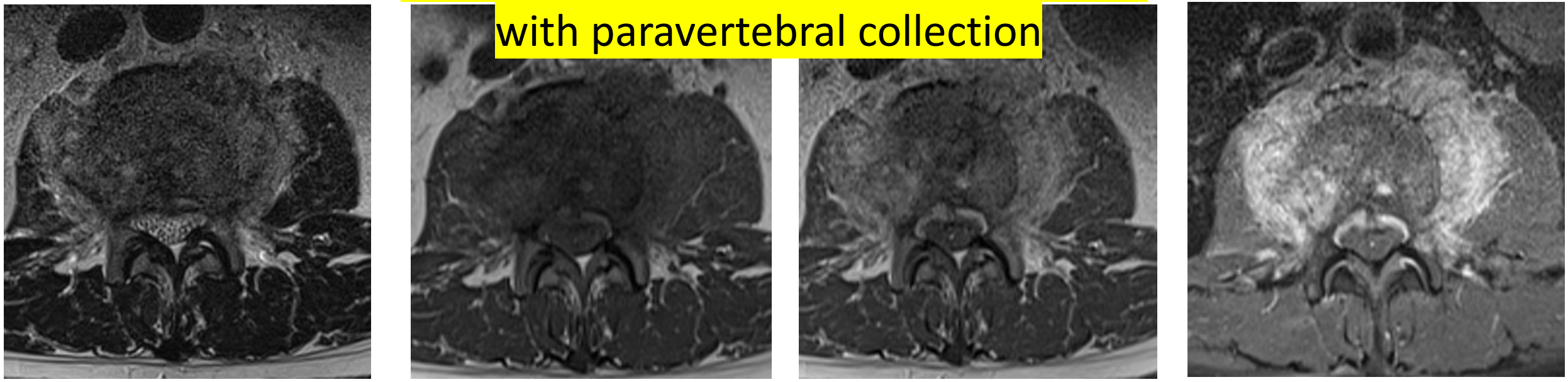






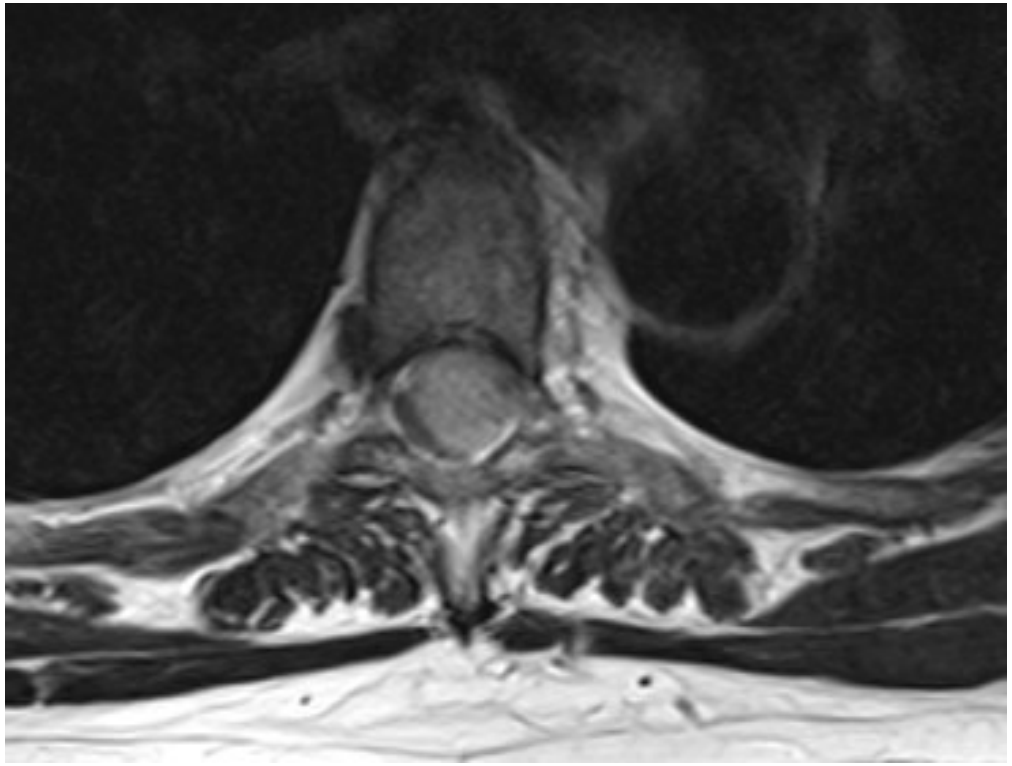
Recent laser back surgery abroad with worsening back pain.

Epidural compression: spondylodiscitis with paravertebral collection



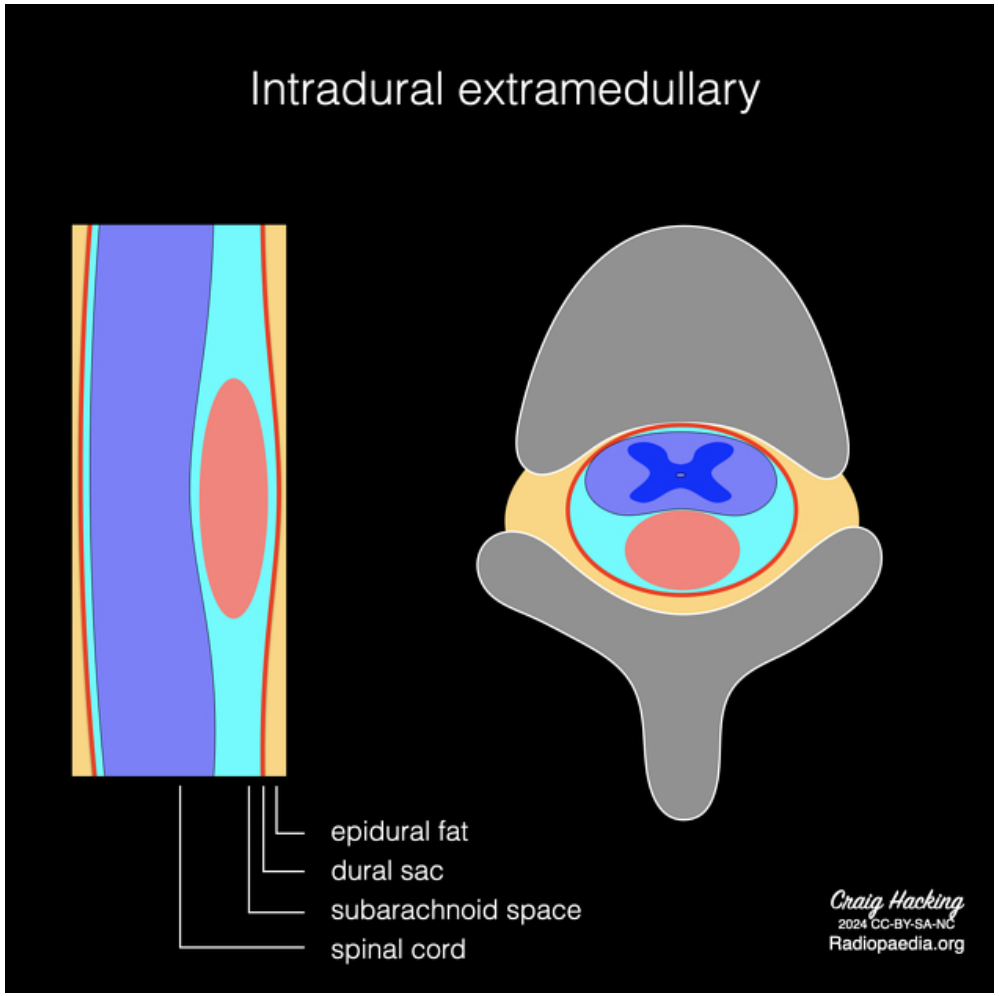
Progressive lower limb weakness.

Intradural/extramedullary compressive lesion: meningioma



Intradural / extramedullary compression

- Contains CSF, nerves, vessels and glial tissue
- Many spinal tumours are in this space (meningiomas, NST, leptomeningeal mets)
- Epidural fat preserved
- Dura not inwardly displaced
- Look for a CSF cleft separating cord from abnormality.



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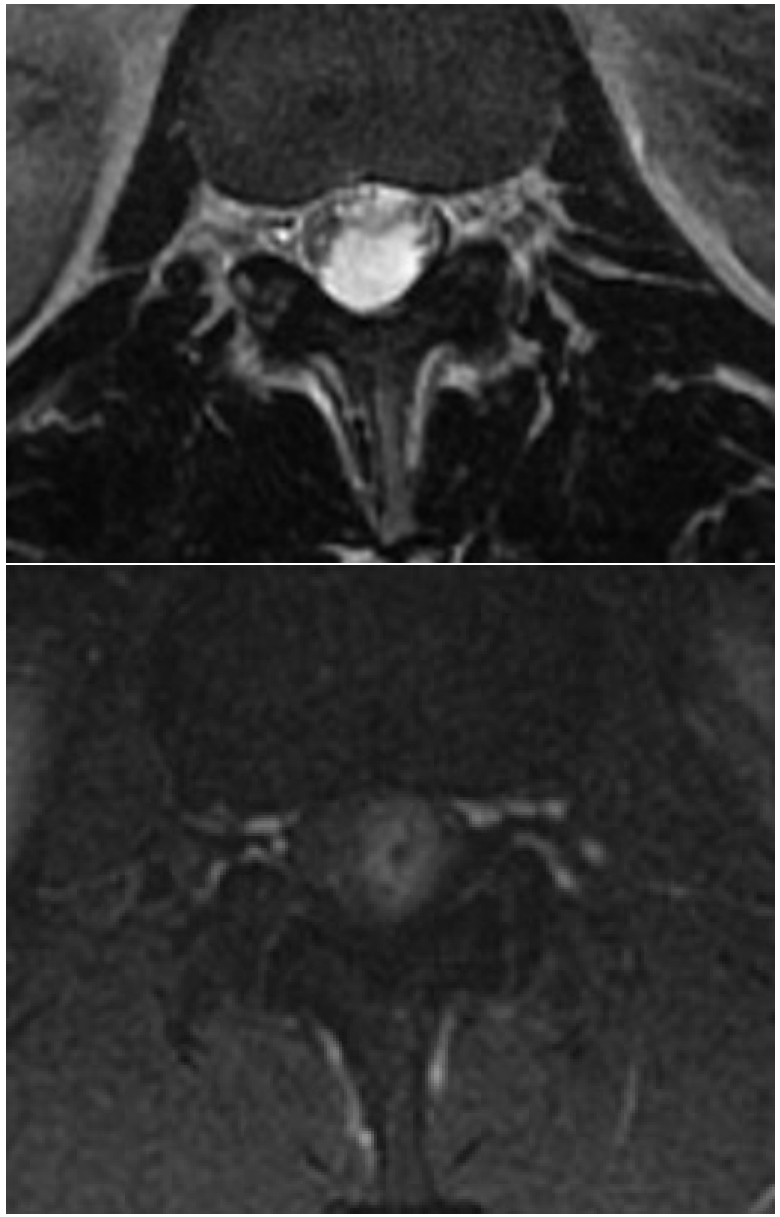
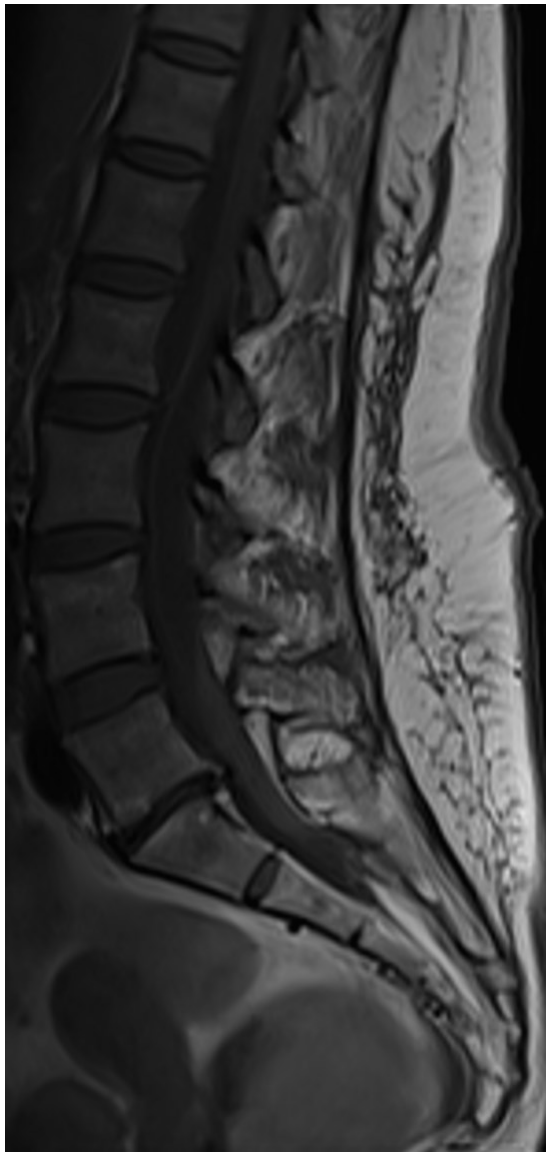
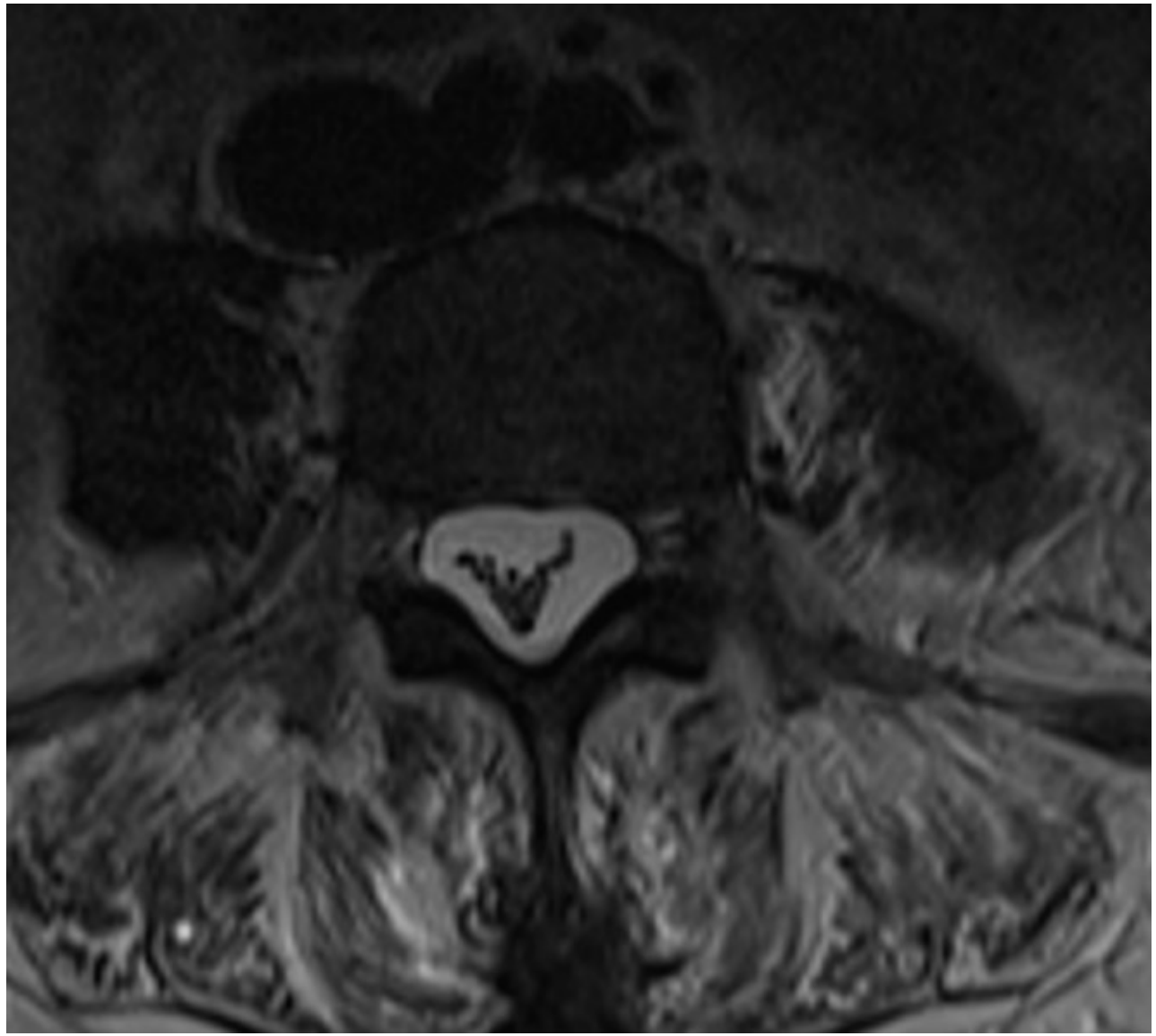
Companion case – intradural/ extramedullary lumbar schwannoma

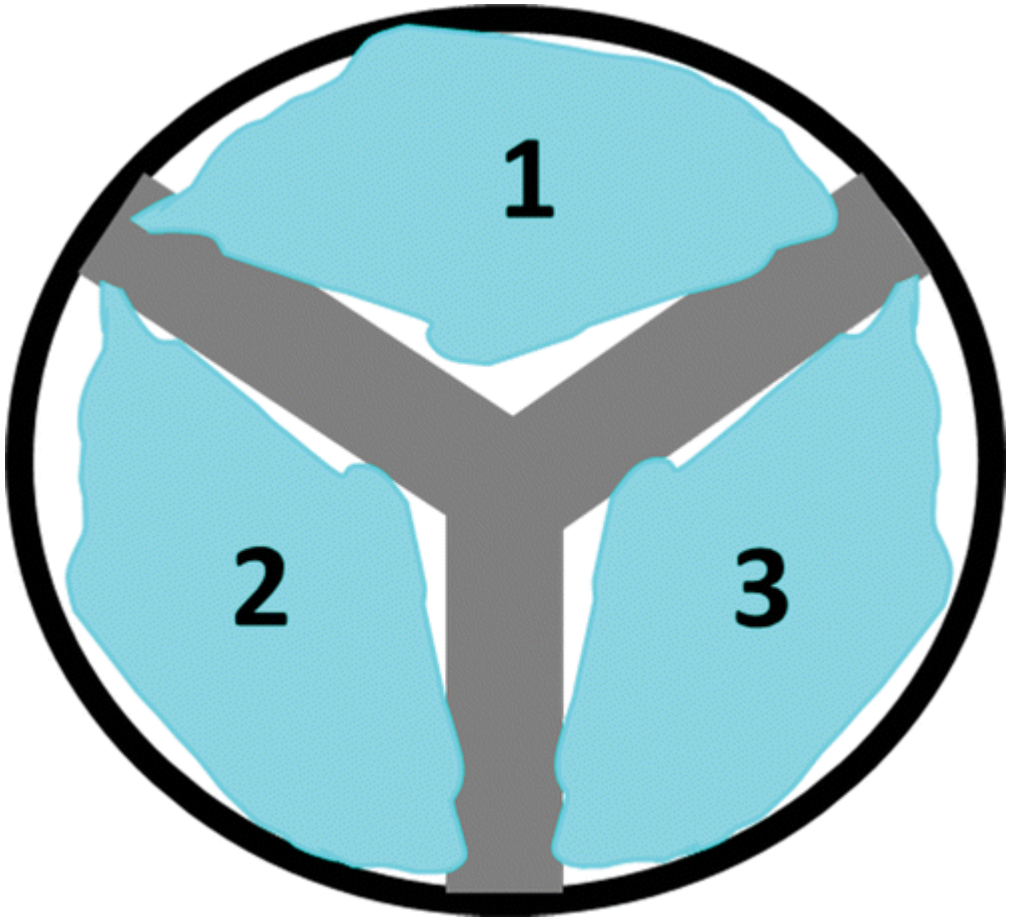


Subdural collection – post-LP





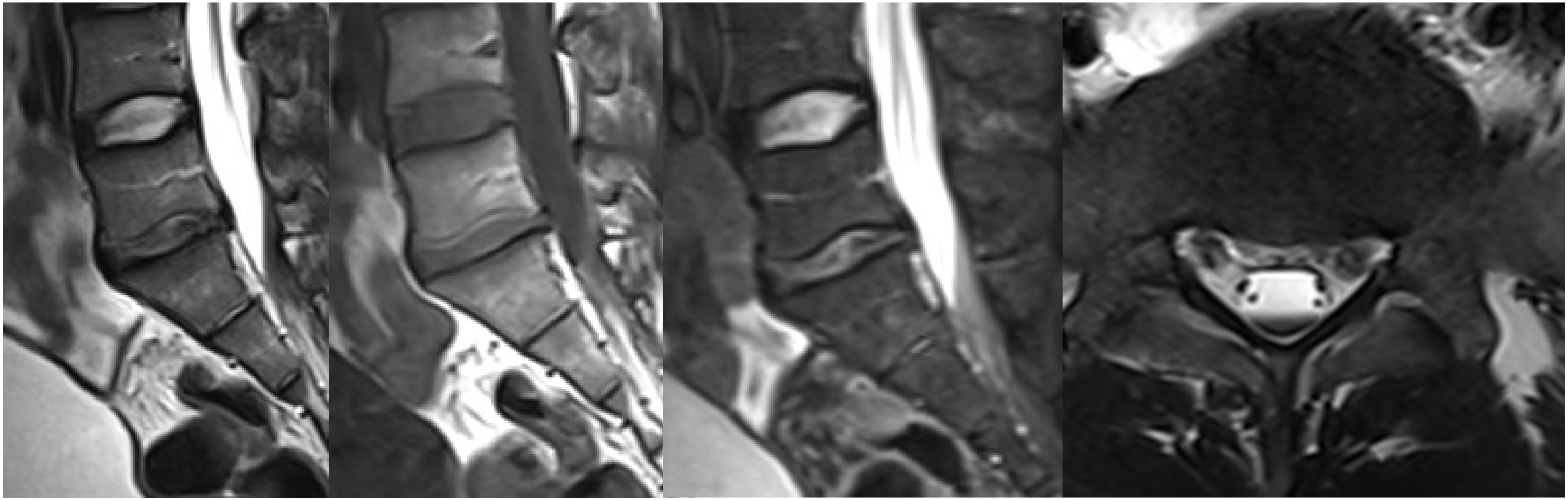
Inverted Mercedes Benz Sign



Potential space between arachnoid mater and dura mater. Lateral ligaments and midline dorsal septum limit spread of fluid - inverted Mercedes benz sign.

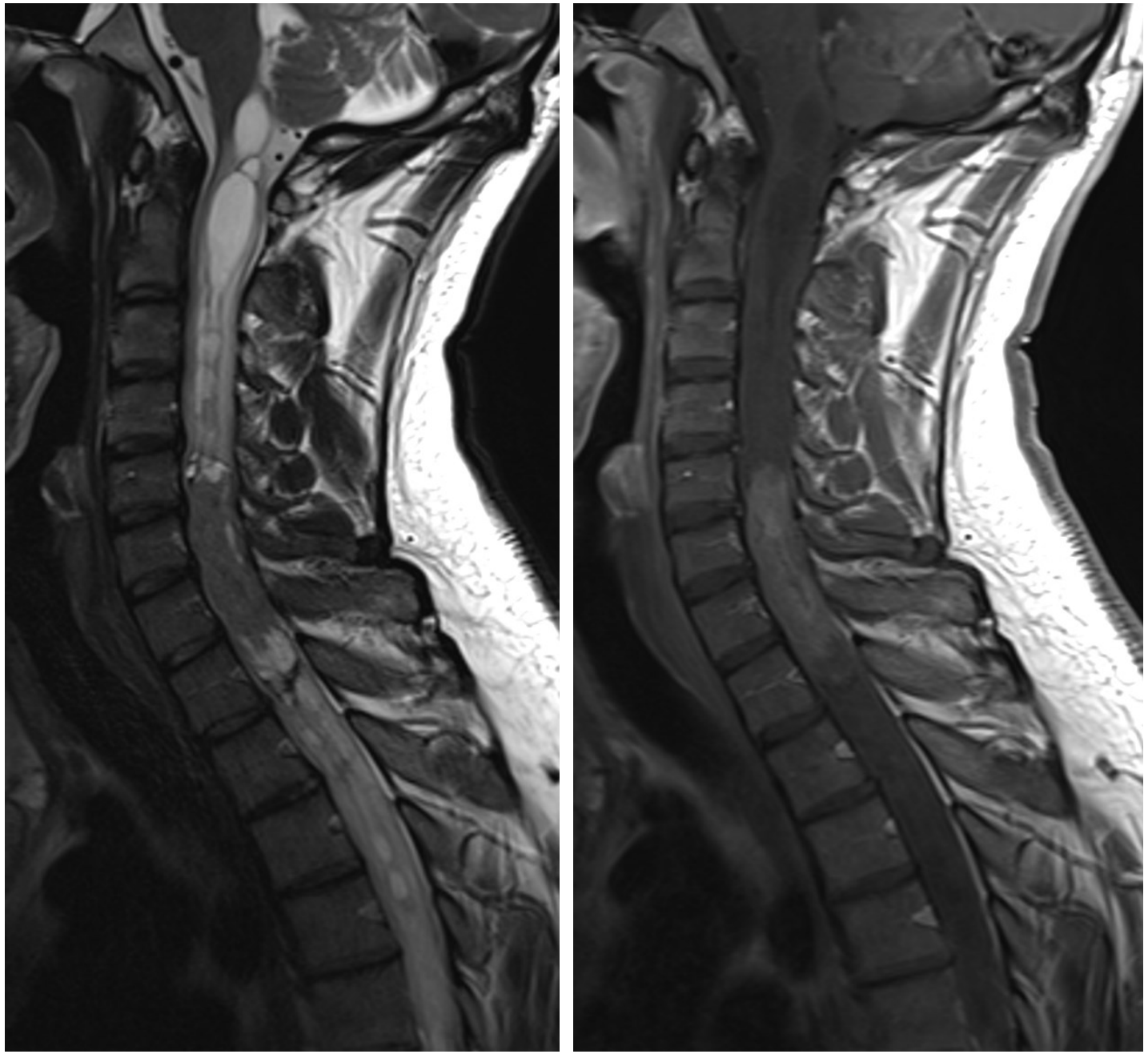
Spinal Hematomas: What a Radiologist Needs to Know. Jennifer L. Pierce, Joseph H. Donahue, Nicholas C. Nacey, Cody R. Quirk, Michael T. Perry, Nicholas Faulconer, Gene A. Falkowski, Michael D. Maldonado, Catherine A. Shaeffer, and Francis H. Shen. RadioGraphics 2018 38:5, 1516-1535

Subarachnoid haemorrhage



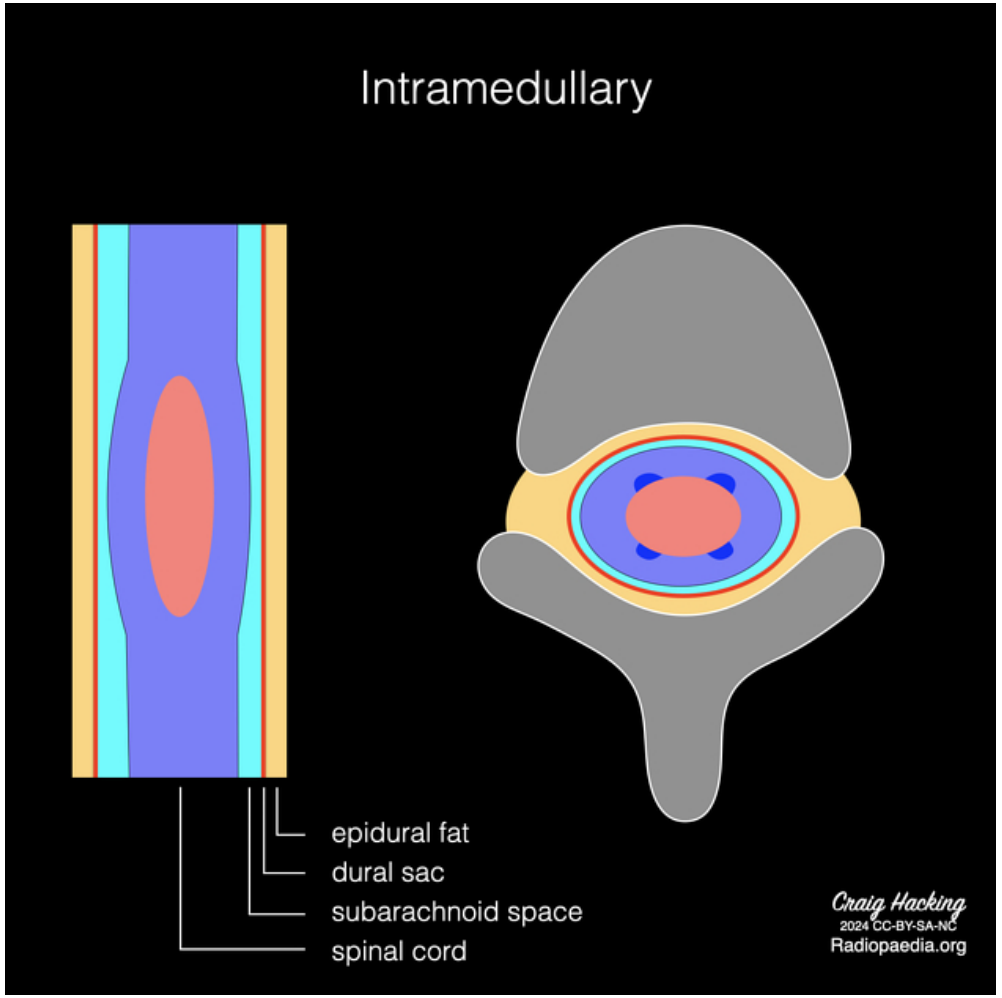
C5-T1 mass with oedema and syrinx above and below lesion

Cervical ependymoma



Intramedullary infiltration

- Cord substance
- Expands cords



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Cord / cauda equina compression or infiltration

- Neurosurgical emergency
  - decompression
- Constellation of signs and symptoms caused by compression of the cord or cauda equina.
- Features include
  - Rapidly progressing muscle weakness / power loss
  - Bilateral sciatica
  - Progressive neurological deficit
  - Bladder and/or bowel disturbance/incontinence
  - Reduced perineal sensation
  - Loss of sexual function
- Look for cord oedema

Can we screen?

- Confirm cord/cauda equina compression
  - aetiology (differential)
- CT
  - superior for bony anatomy, fast, cheap
  - Soft tissue windows (contraindications to MRI)
- MRI
  - superior for soft tissue anatomy (cord/cauda equina), aetiology
- Should be performed URGENTLY
  - Consider fast imaging protocols

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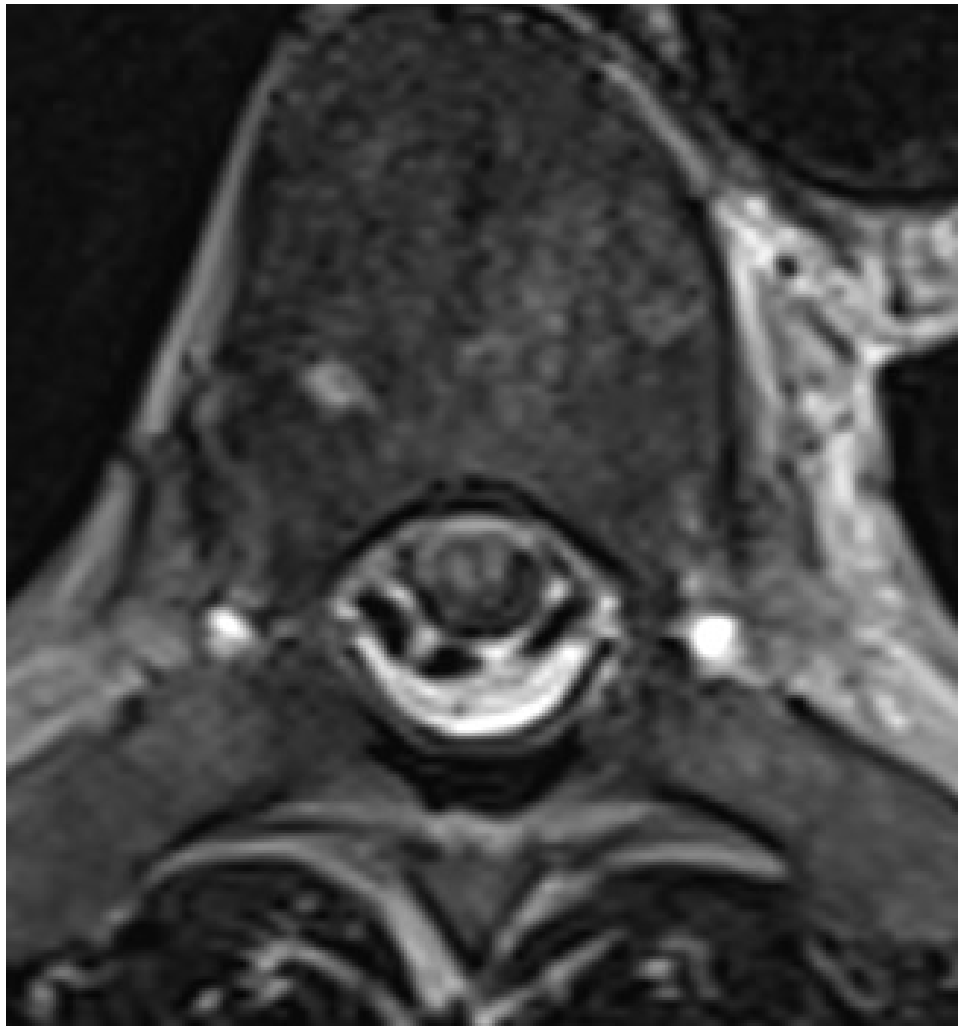
MRI provision for cauda equina syndrome

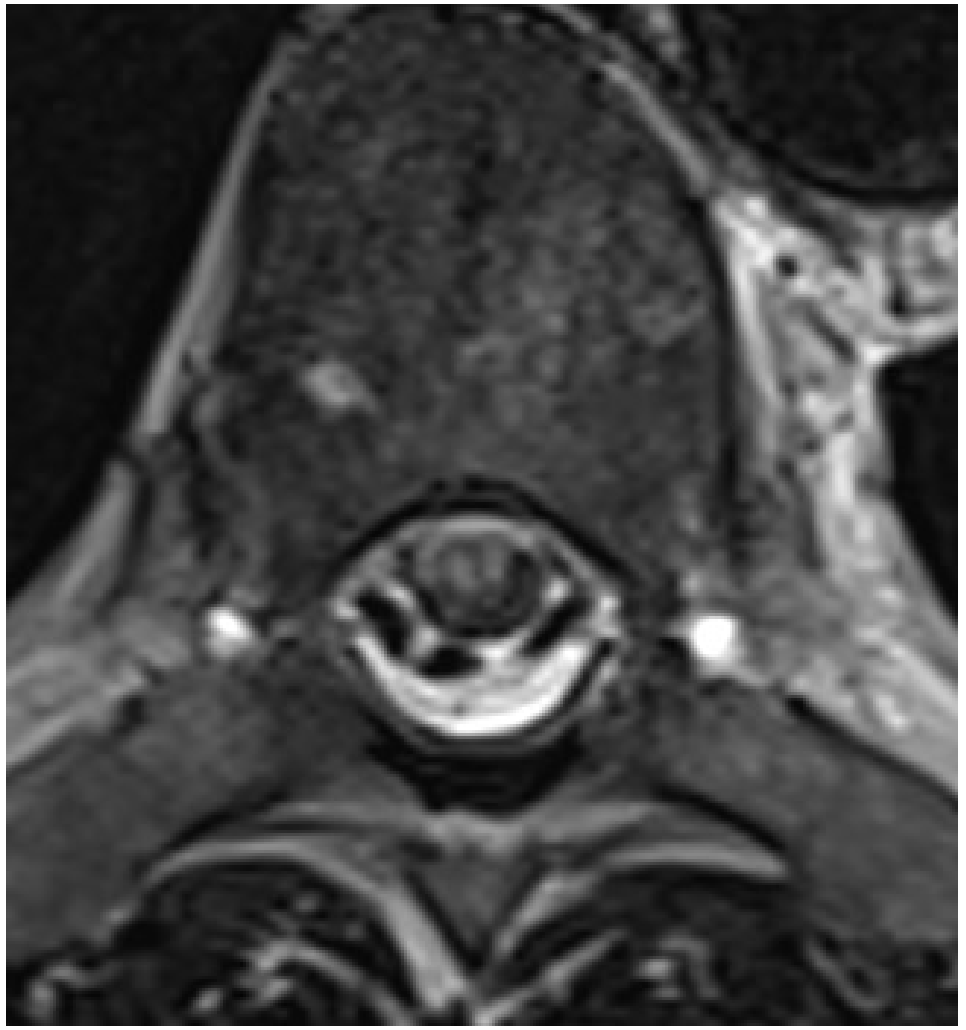
Scenario 2

Non-compressive

Acute back pain, right leg flaccid and left dissociated sensory loss at T7

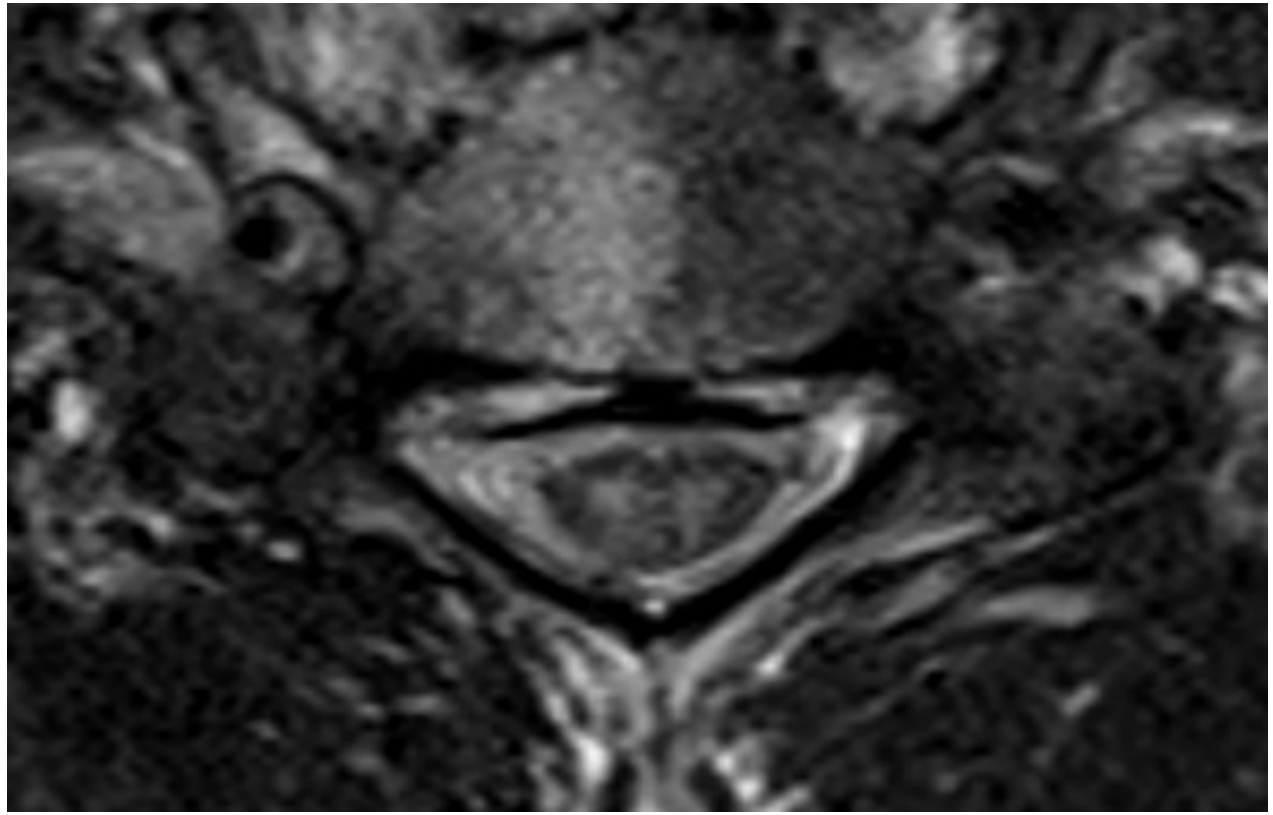


Acute back pain, right leg flaccid and left dissociated sensory loss at T7: cord infarct



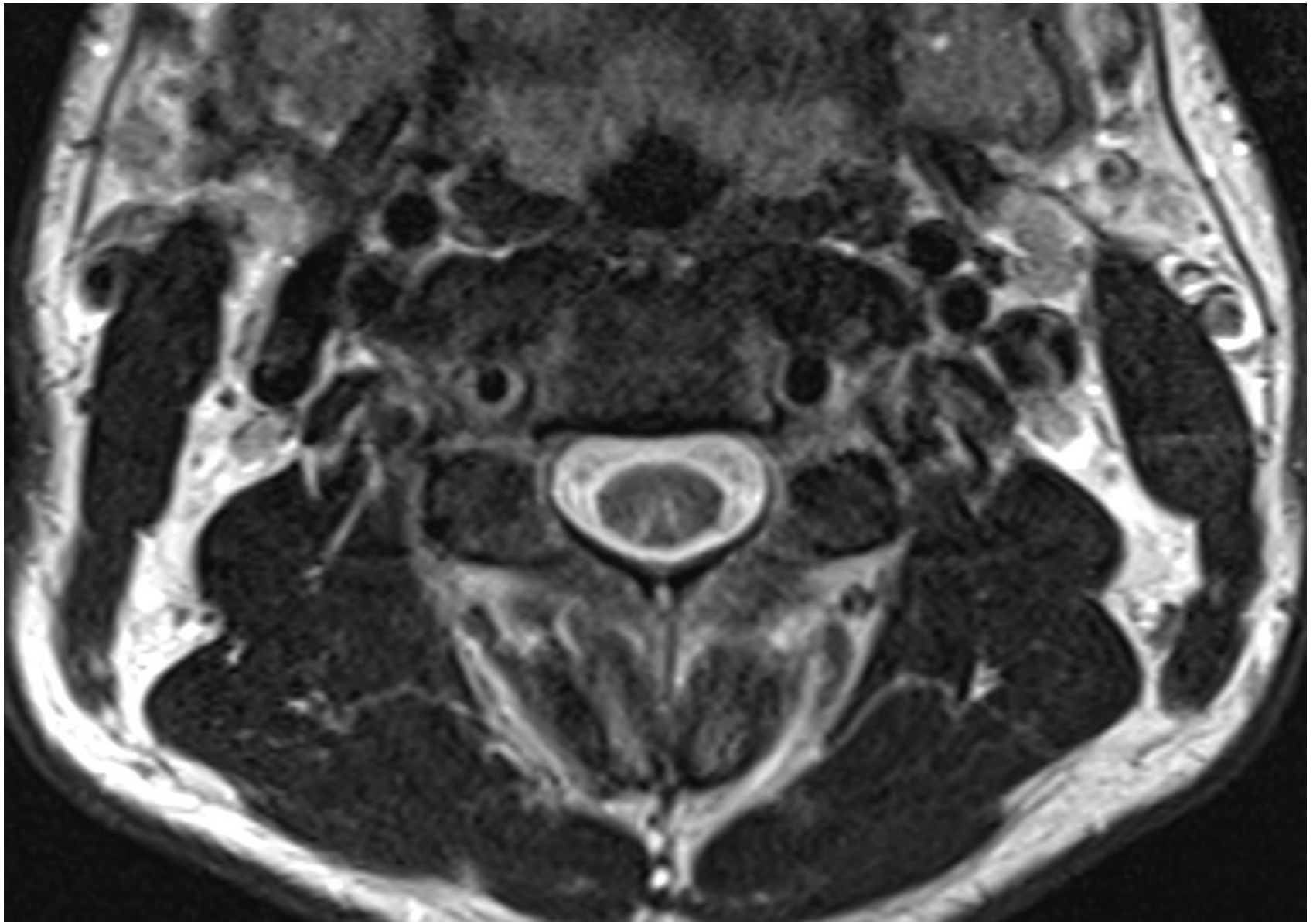
Cord infarct

- Acute onset symptoms:
  - Pain, focal neurology, paralysis
- Typically anterior (single artery)
- Anterior horn cell signal abnormality (snake-eyes, owl eyes)
- Differential – location can help
  - Posterior infarct (less common as 2 arteries)
  - Inflammatory/demyelinating – peripheral or central, short/long segment, can enhance
  - Hemi-cord syndromes (e.g. Brown-Sequard)



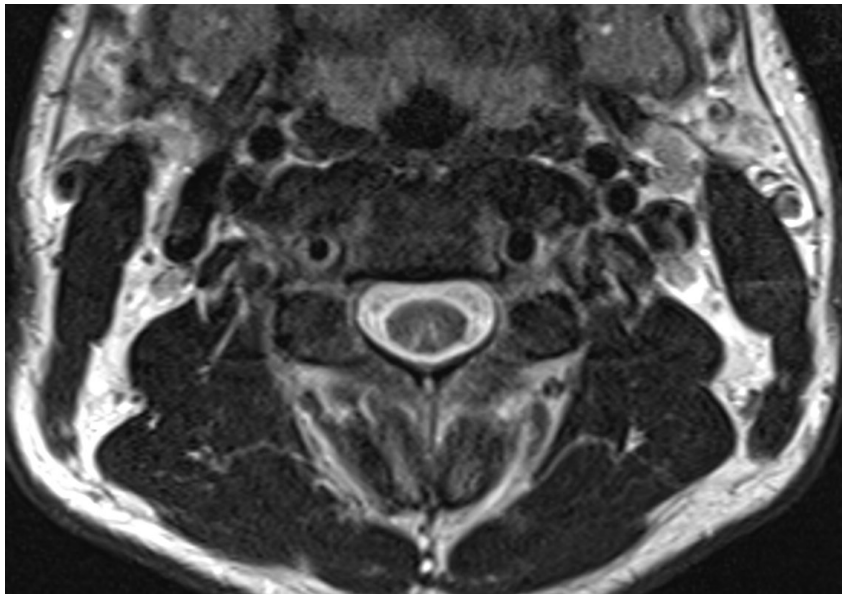
Acute sensory disturbance and paresthesia.

Subacute combined degeneration of the cord



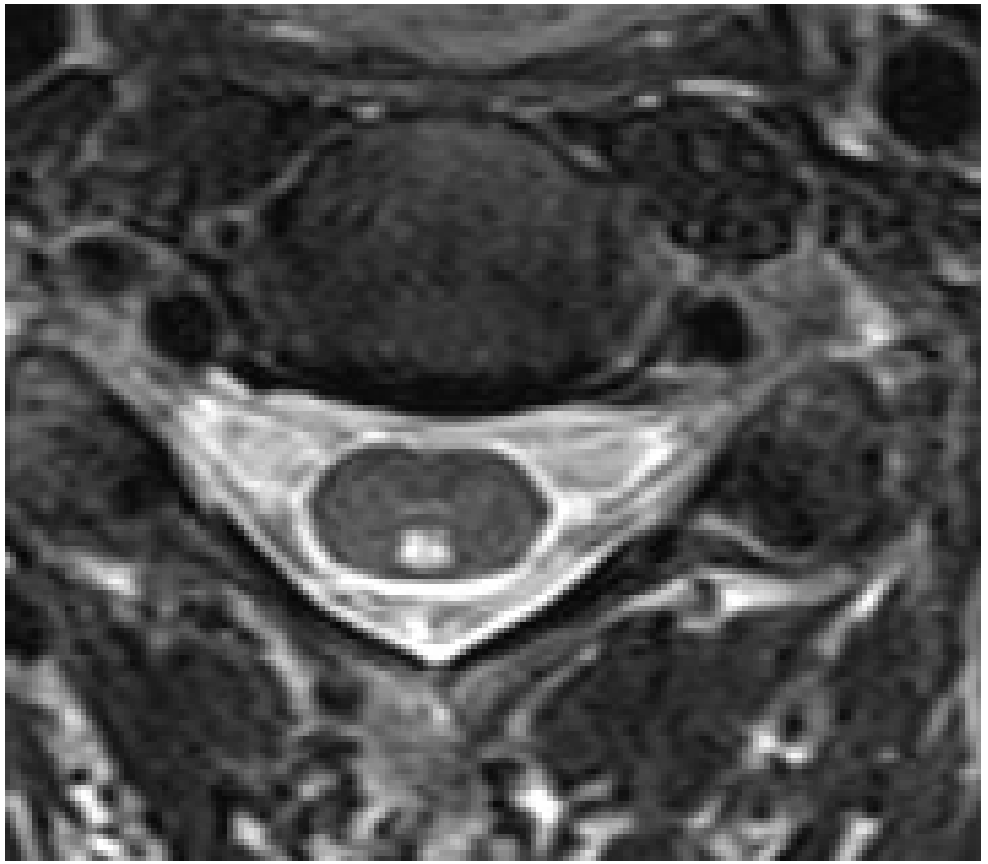
Subacute combined degeneration of cord

- B12 deficiency
- Affects posterior columns but in severe cases can extend to corticospinal tracts
- Inverted V appearance in cord



Bilateral upper limb weakness.

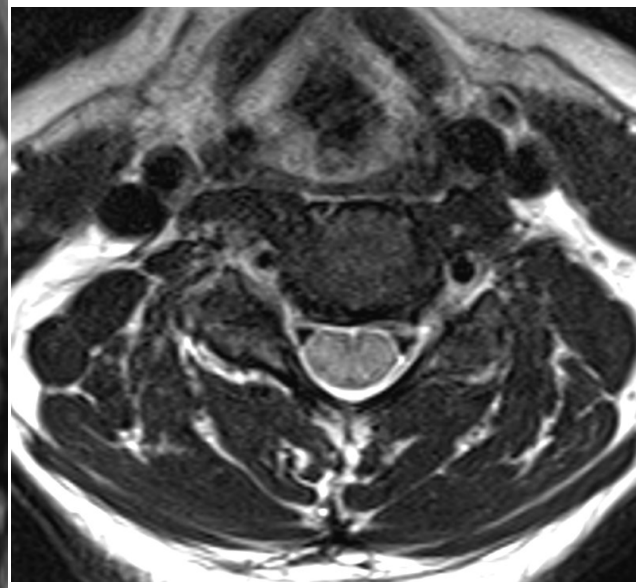
Longitudinally extensive transverse myelitis.

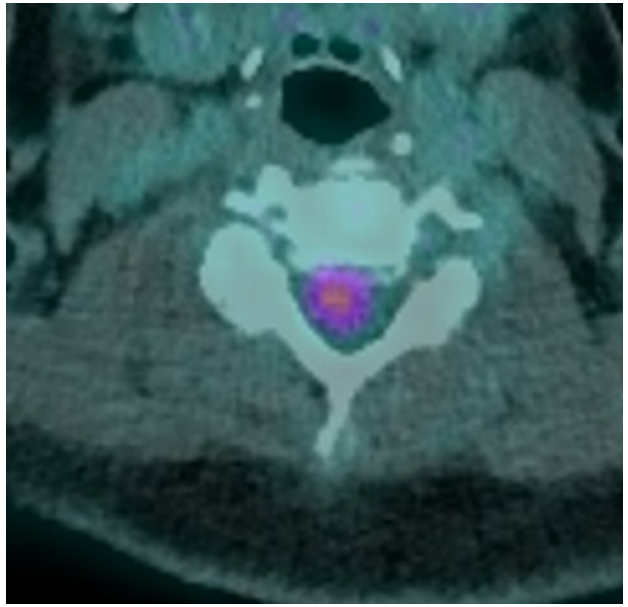


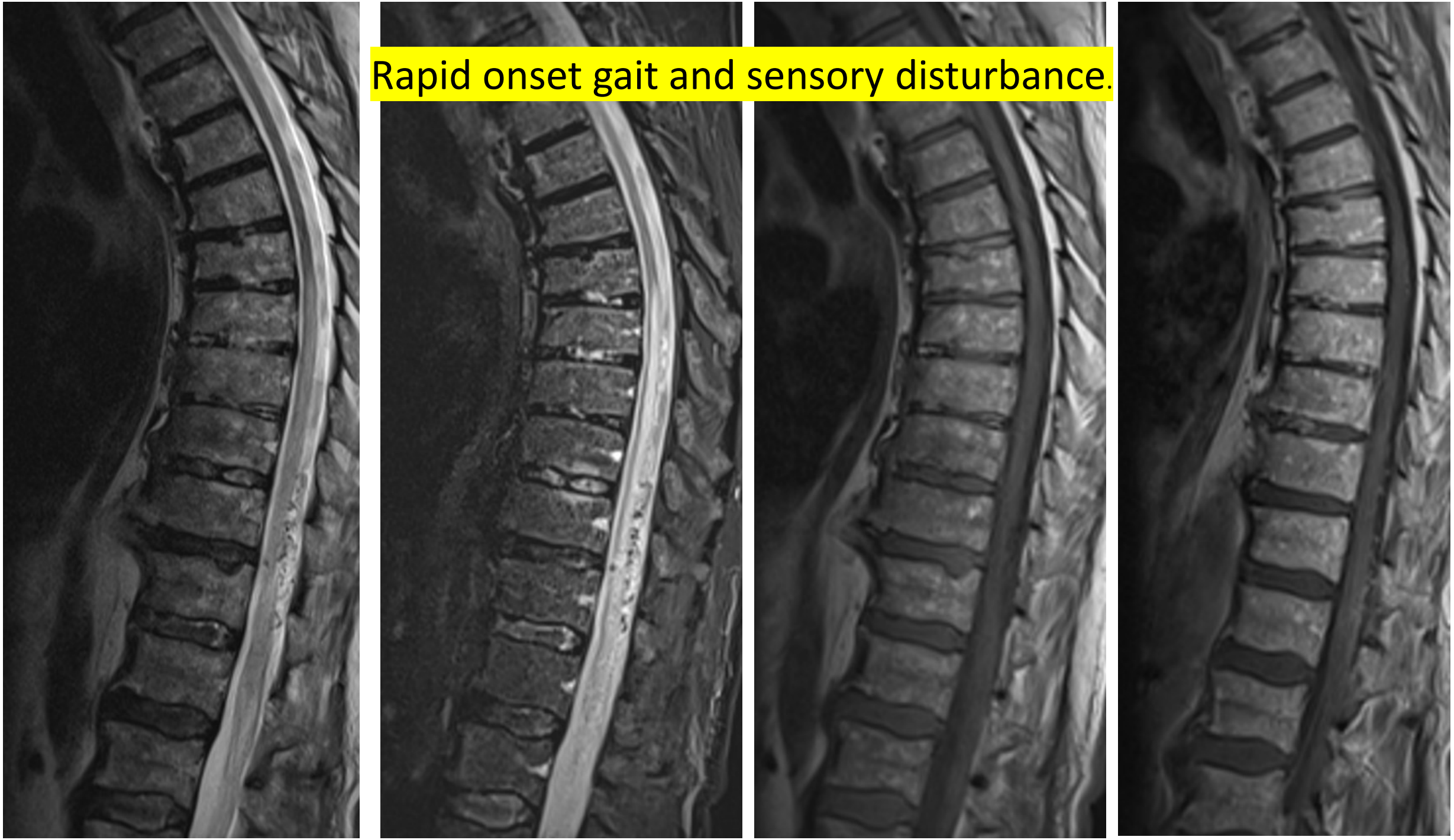
Progressive lower limb weakness, now flaccid paraparesis (power 0/5) with areflexia but sensory level at T4 and lower back pain.

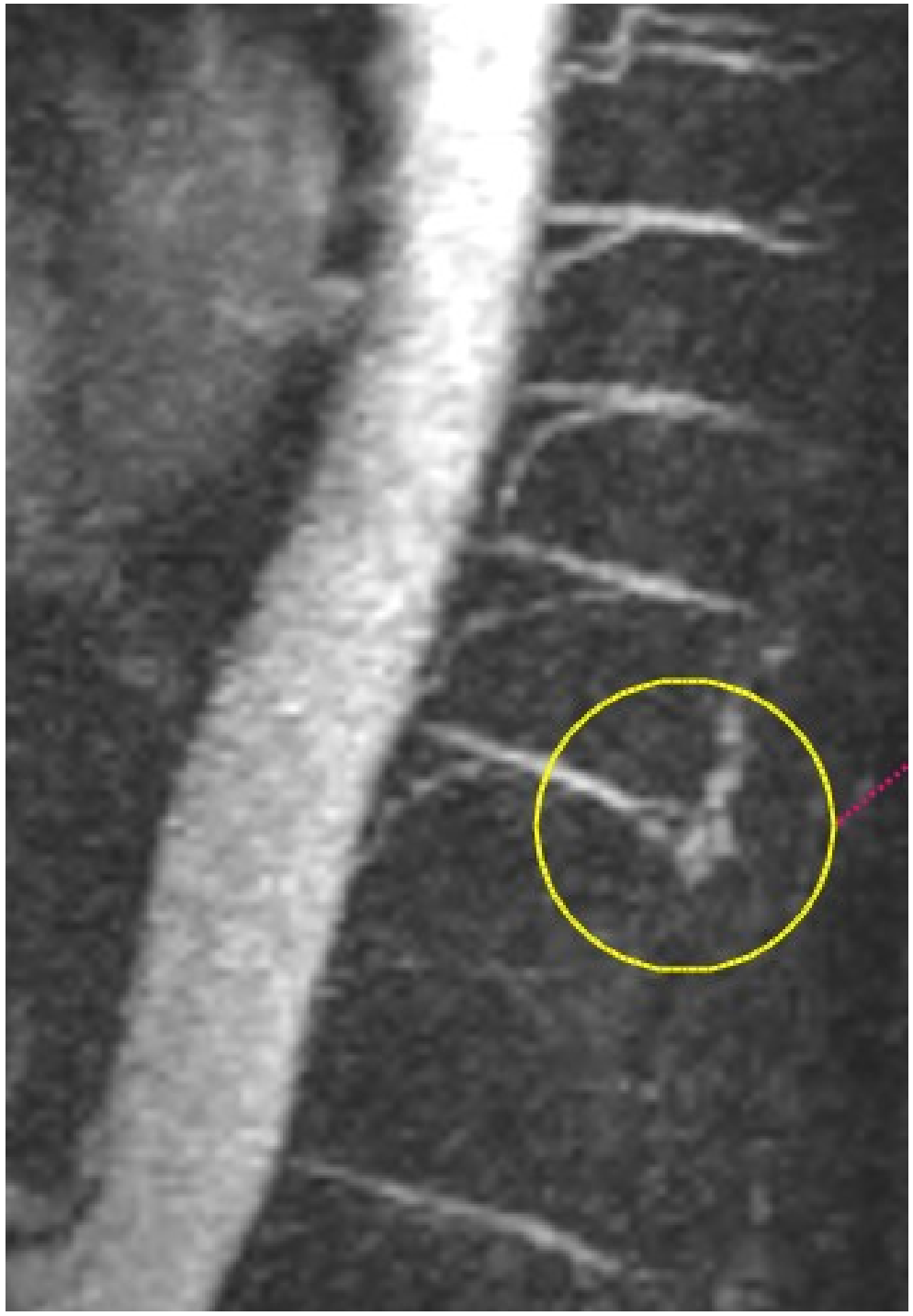
Longitudinally extensive cord signal change.

HTLV-1 myelopathy





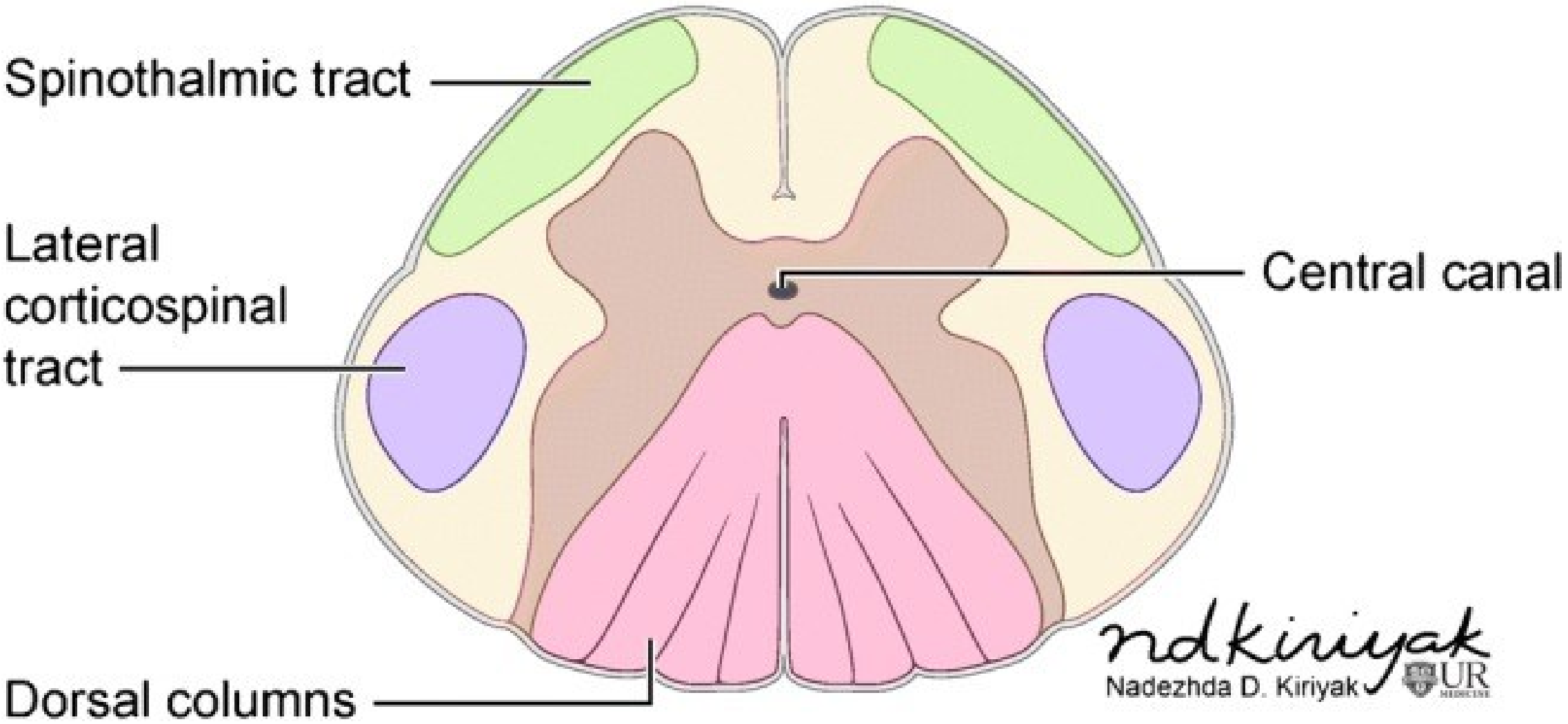

Rapid onset gait and sensory disturbance.



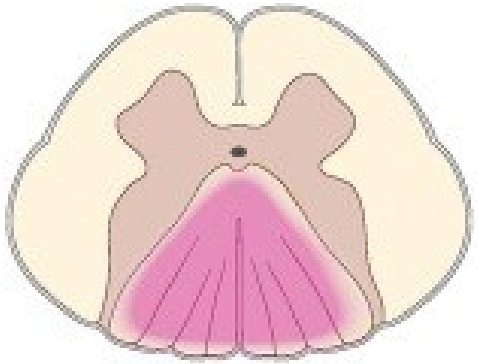
Spinal dAVF

- Anastomosis between feeding radicular arteries and draining cord veins
- Flow voids on surface of cord
- Medullary haemorrhage, venous congestion

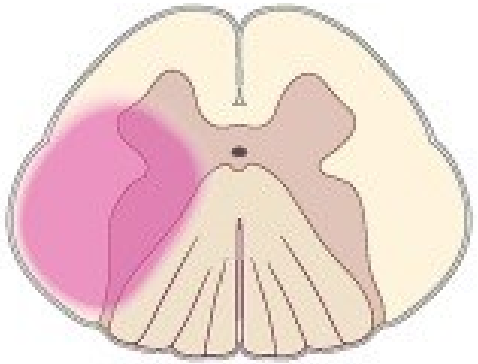
Cross Section of Spinal Cord



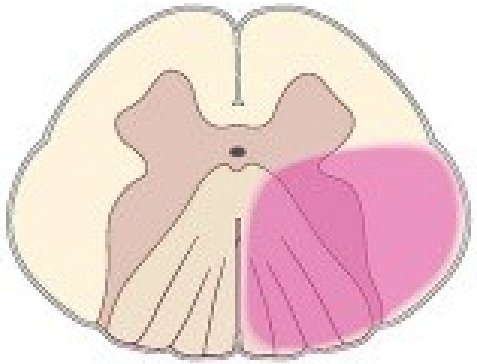
Mohajeri Moghaddam S, Bhatt AA. Location, length, and enhancement: systematic approach to differentiating intramedullary spinal cord lesions. Insights Imaging. 2018 Aug;9(4):511-526. doi: 10.1007/s13244-018-0608-3. Epub 2018 Jun 12. PMID: 29949034; PMCID: PMC6108975.



Multiple Sclerosis



Multiple Sclerosis



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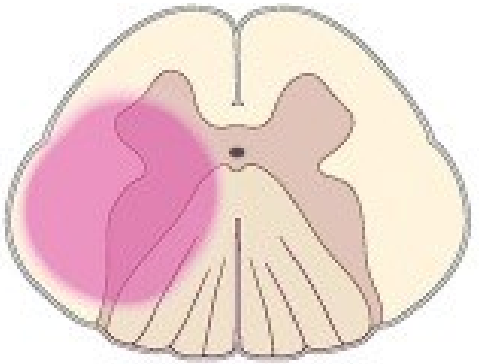
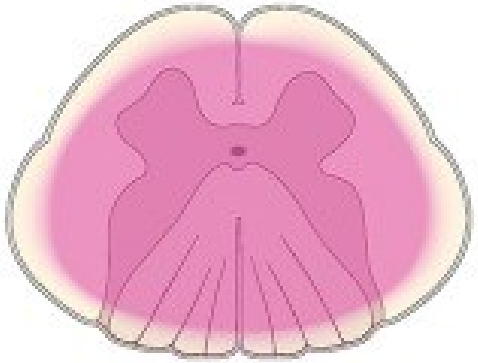
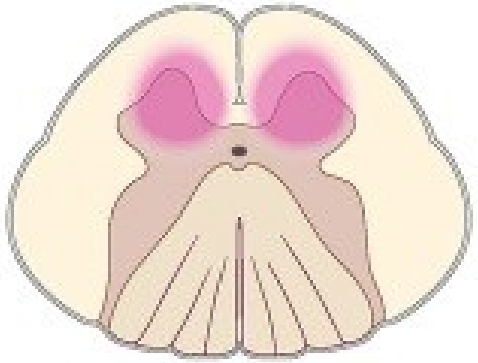


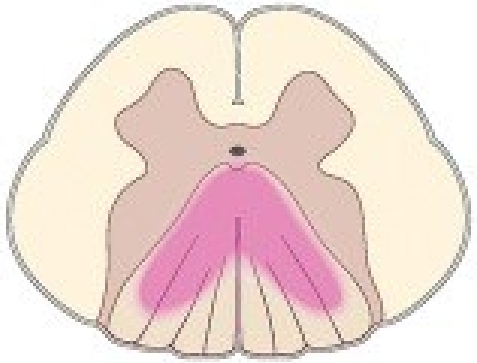
Multiple Sclerosis
Herpes



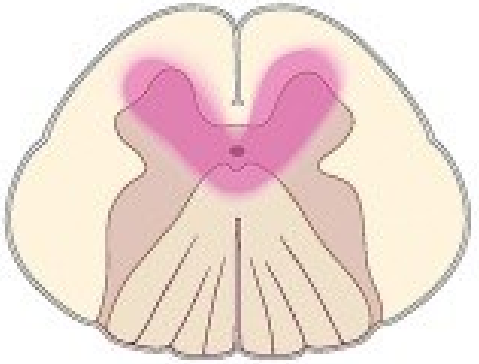
Transverse Myelitis
Neuromyelitis Optica
Multiple Sclerosis
Cross Sectional Ischemia



Anterior Horn Ischemia
Polio
Post-vaccination
Neuromyelitis Optica



Vitamin B12 Deficiency



Ischemia

ndkiriyak
Nadezhda D. Kiriyak UR

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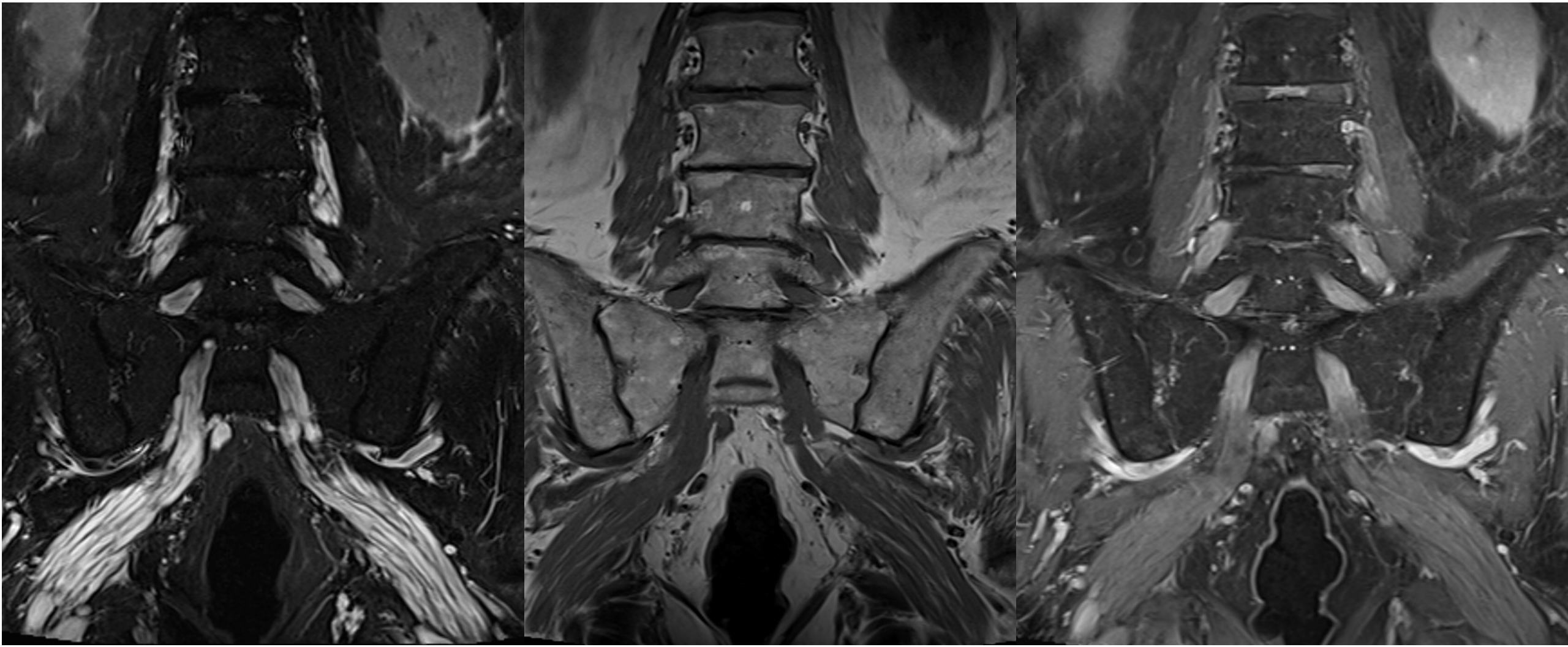
Progressive weakness and sensory disturbance



Hypertrophic polyneuropathy

- Common aetiologies:
  - Charcot Marie Tooth
  - Chronic Inflammatory Demyelinating Disorder
- DD: Guillain-Barré Syndrome

Imaging – features to include in report

- Level/s involved
- Location – epidural, intradural, medullary
- Compression / no compression
  - Surgical versus medical management
- Cord signal change
  - Oedema/ischaemia
  - Blood
  - Lesions: long or short segment
- Edge of field
  - E.g. spine mets - partially imaged lung mass in apex

Summary

- Reviewed common non-traumatic spinal emergencies
- Recognise compressive and non-compressive abnormalities that need immediate management
- Know key findings that are crucial to report

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Trauma & Emergency Radiology

Non-Traumatic Spinal Emergencies

Thank You!

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