11.25-11.45

Spinal Emergencies

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Past President European Society of Radiology

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Nordter, Aarhus, DK May 2023

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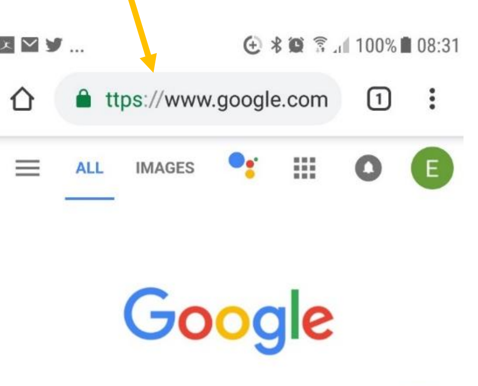

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SPINAL EMERGENCIES

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CAUDA EQUINA SYNDROME

METASTATIC SPINAL CORD COMPRESSION

INFECTION (SpondyloDiscitis, Osteomyelits, Epidural Abscess)

VASCULAR (Spontaneous haematoma, ischaemia)

SPINAL EMERGENCIES

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CAUDA EQUINA SYNDROME

METASTATIC SPINAL ...D COMPRESSION

Clinically non specific
Avoid delay
Avoid neurological deficit

INFECTION (SpondyloDiscitis, Osteomyelits, Epidural Abscess)

VASCULAR (Spontaneous haematoma, ischaemia)

CAUDA EQUINA SYNDROME - CES

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Concerning Cauda Equina Syndrome which of the following are true?

Disc herniation is most common cause

Bowel, bladder dysfunction is highly suggestive

can usually be treated with bed rest

is a relatively common cause of medicolegal cases

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Cauda Equina Syndrome

- Due to acute or rapidly progressive compression of the lumbosacral nerves
- Multiple causes (haematoma, infection, tumour) - most common: disc herniation
- Rare (0.1% of herniated discs cause CES)
- Variable presentation

GIRFT: NHS Guidelines Feb 23, Spinal Surgery: National Suspected CES Pathway (Hutton et al).
Babu et al, Spinal emergencies in primary care practice, Am J Med 2018 Kuris et al, Evaluation and Management of Cauda Equina Syndrome, Am J Med 2021
Stokes, Arnold, Spinal emergencies *Surgery* 2012

Cauda Equina Syndrome – Clinical Diagnosis

- Collection of symptoms and signs (no single sign/symptom is pathognomonic)
- Leg +/or back pain
- AND recent onset (<2 weeks) of ANY of the following
  - Difficulty starting micturition or decreased sensation of urinary flow BLADDER
  - Altered perianal, perineal or genital sensation (S2 to S5) PERINEAL SENSATION
  - Severe /progressive neurological deficit both legs (eg motor weakness) MOTOR
  - Loss of sensation of rectal fullness BOWEL
  - Sexual dysfunction (loss of erection/ejaculation/vaginal sensation) SEXUAL

- MRI alone cannot diagnose CE Syndrome

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  - Loss of sensation of rectal fullness
  - Sexual dysfunction (loss of erection/ejaculation/vaginal sensation)
- MRI demonstrates CE COMPRESSION

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Babu et al, Spinal emergencies in primary care practice, *Am J Med* 2018 Kuris et al, Evaluation and Management of Cauda Equina Syndrome, Am *J Med* 2021 Stokes, Arnold, Spinal emergencies *Surgery* 2012

CES Pathophysiology

LumboSacral
NERVE
ROOTS

Kuris et al, Evaluation and Management of Cauda Equina Syndrome, Am J Med 2021

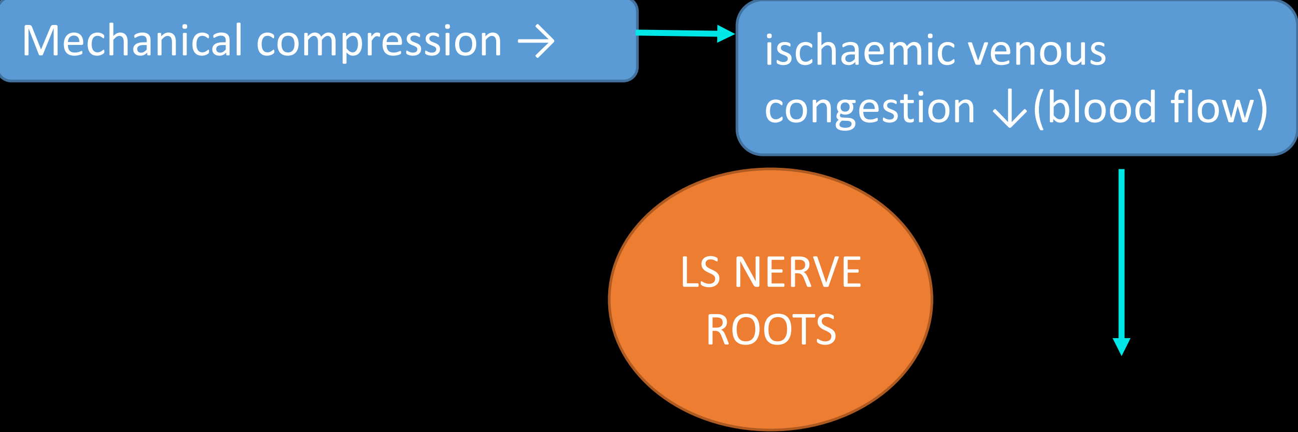
CES Pathophysiology

Mechanical compression →

LS NERVE ROOTS

Kuris et al, Evaluation and Management of Cauda Equina Syndrome, Am J Med 2021

CES Pathophysiology



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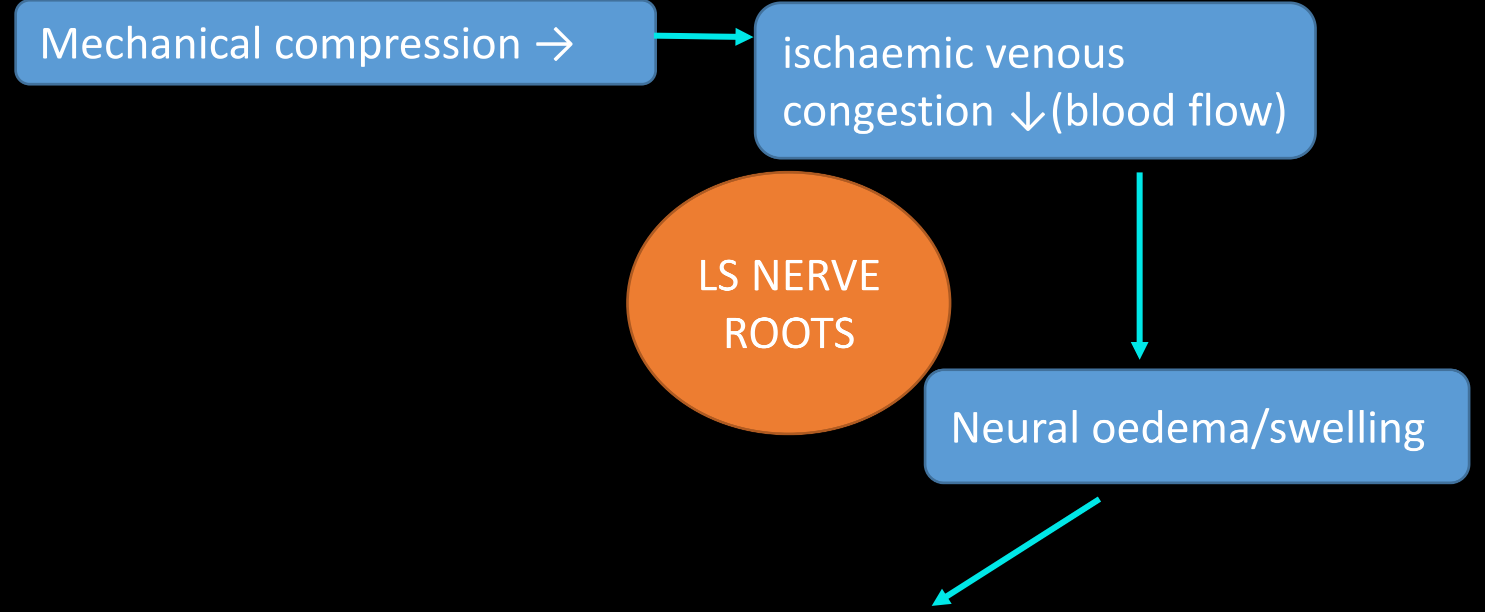
CES Pathophysiology



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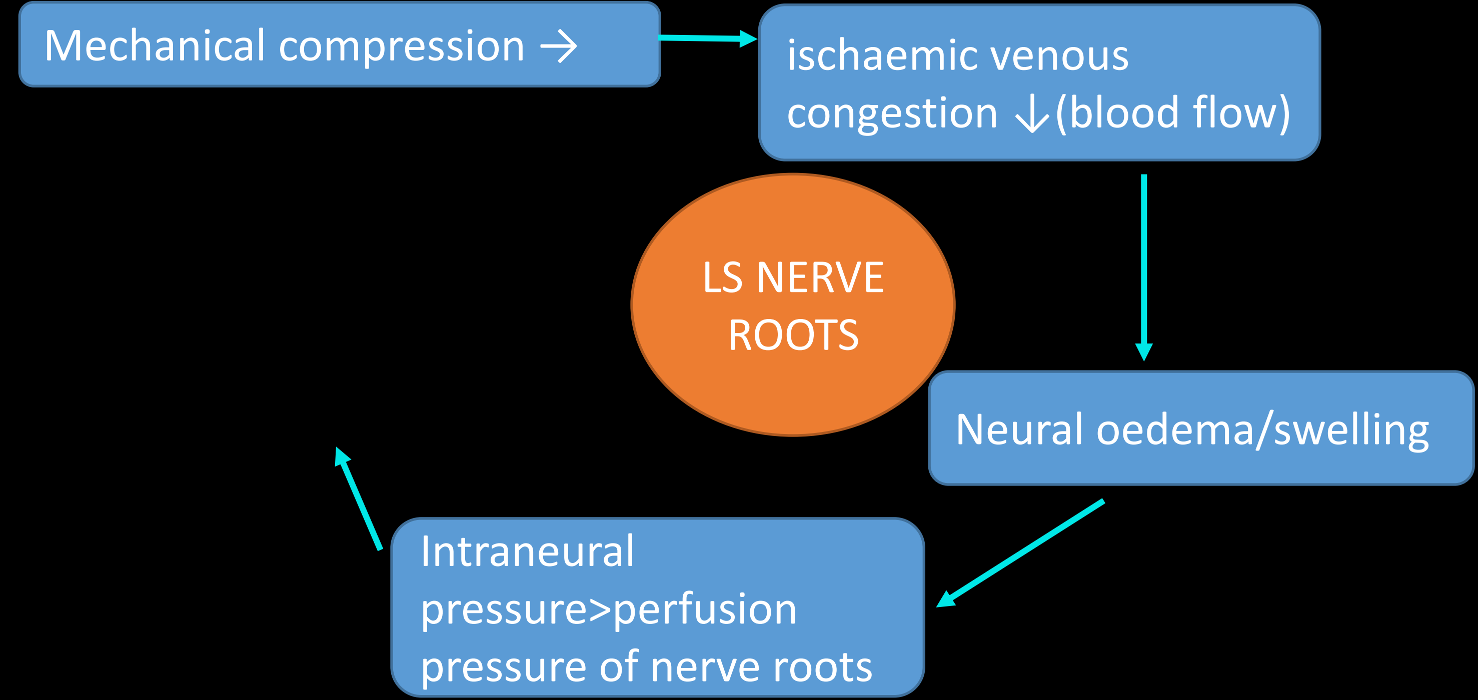

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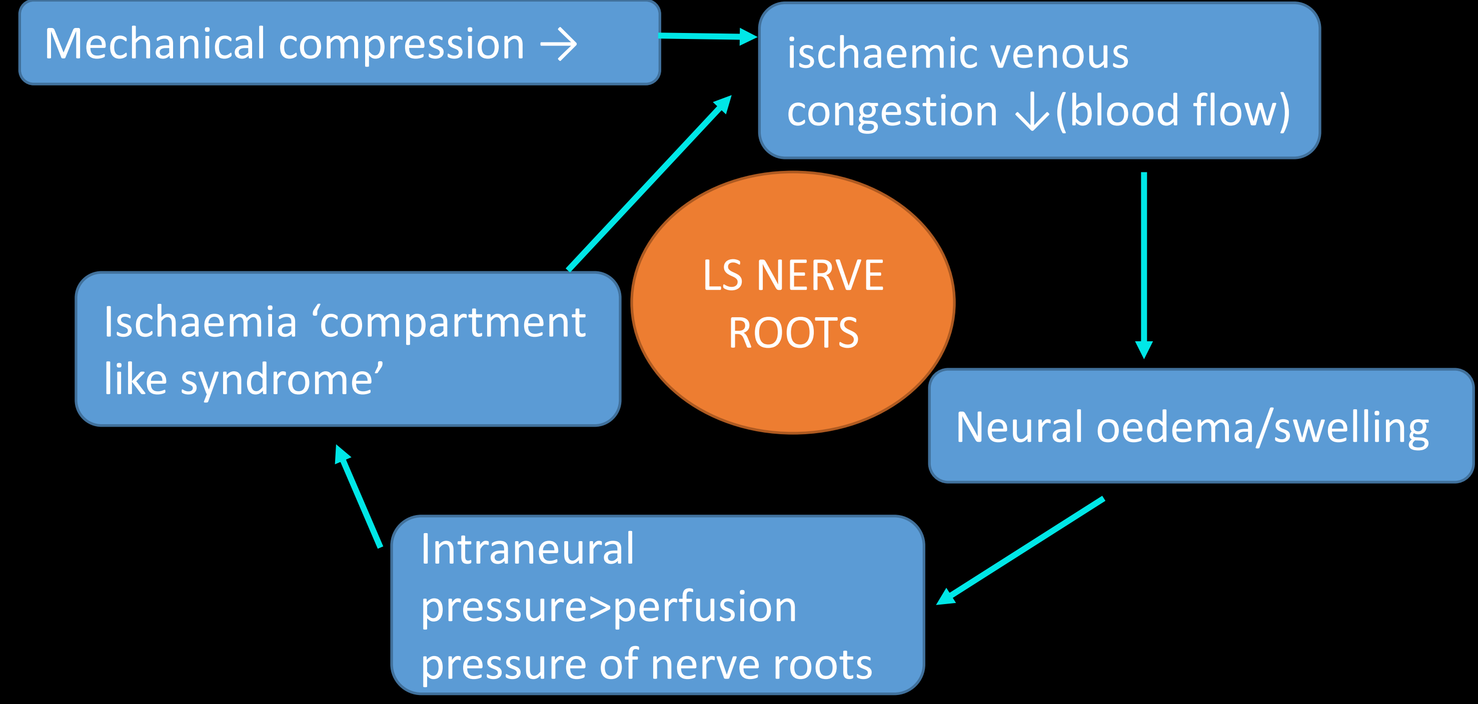

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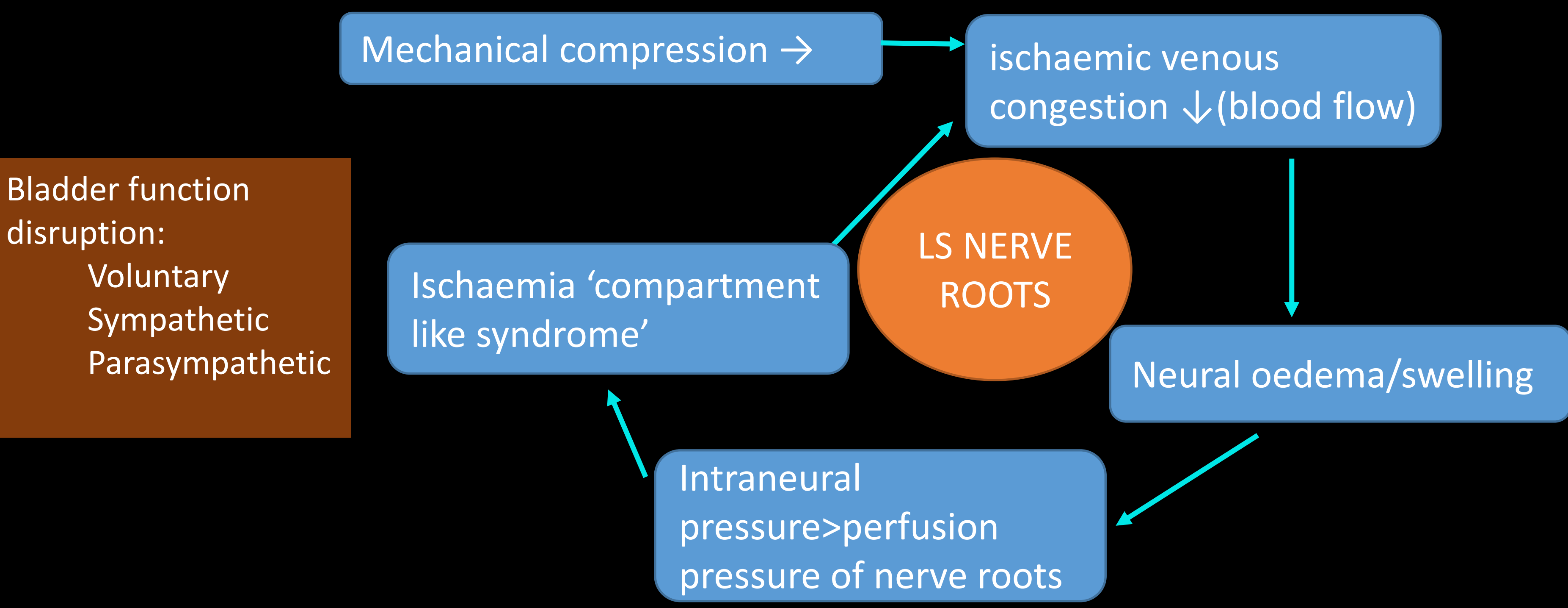

Kuris et al, Evaluation and Management of Cauda Equina Syndrome, Am J Med 2021

Cauda Equina Syndrome

Pt in Community: CES signs/symptoms

- Spinal surgical emergency
- Needs urgent specialist assessment and intervention
- Timely management essential to avoid disability

GIRFT: NHS Guidelines Feb 23, Spinal Surgery: National Suspected CES Pathway (Hutton et al).

Cauda Equina Syndrome

- Spinal surgical emergency
- Needs urgent specialist assessment and intervention
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Pt in Community: CES signs/symptoms

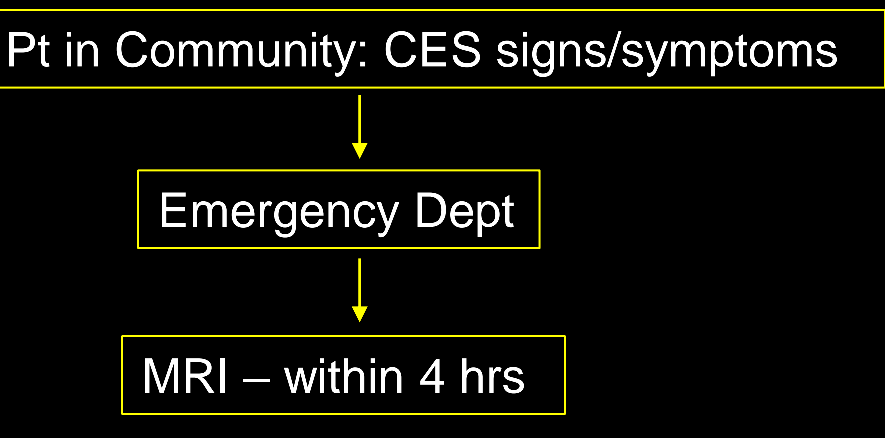
↓

Emergency Dept

GIRFT: NHS Guidelines Feb 23, Spinal Surgery: National Suspected CES Pathway (Hutton et al).

Cauda Equina Syndrome

- Spinal surgical emergency
- Needs urgent specialist assessment and intervention
- Timely management essential to avoid disability



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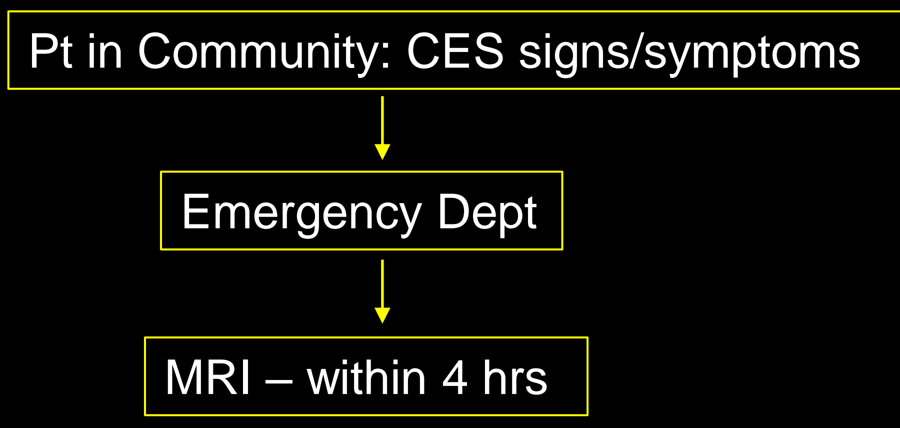
Cauda Equina Syndrome



PROTOCOL: Lumbar Spine Sag T2: If CES, proceed to axial T2/T1
If no CES, do Cervical & Thoracic Sag T2

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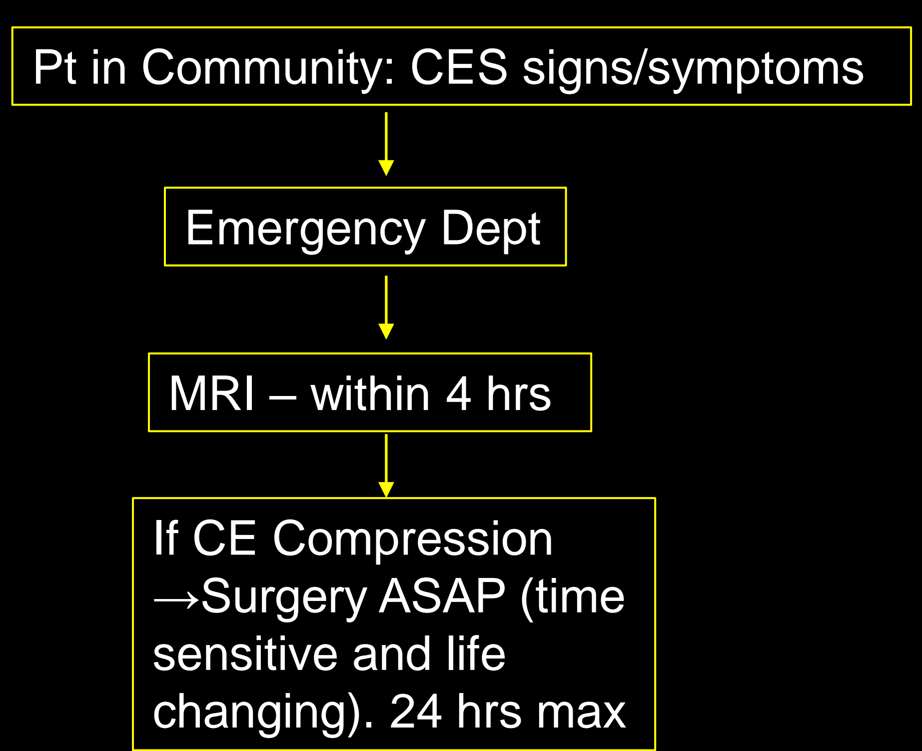
Cauda Equina Syndrome



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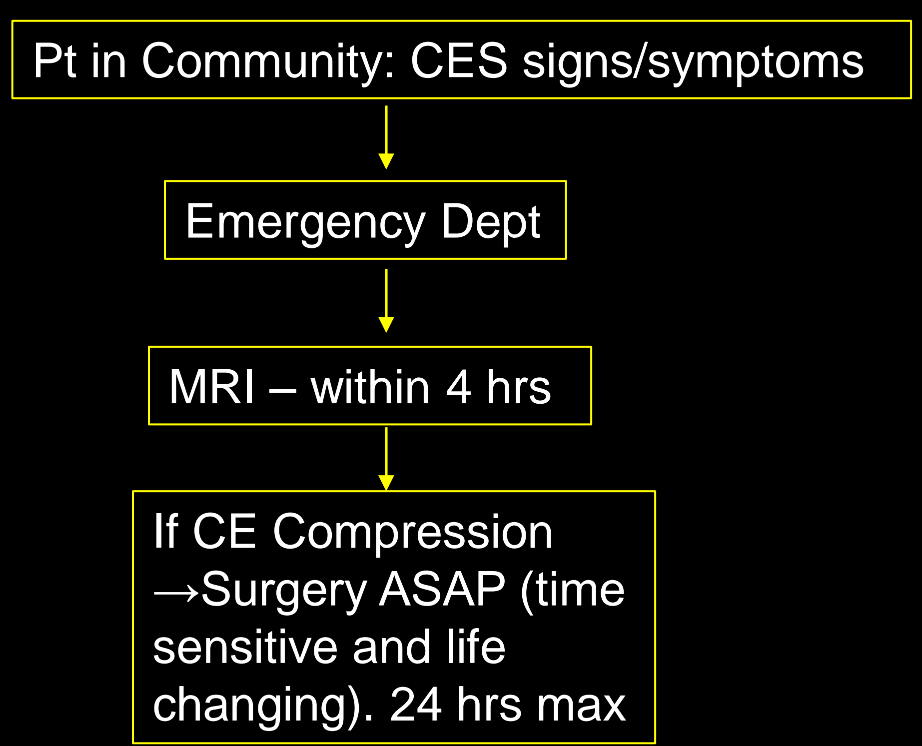
Cauda Equina Syndrome

SAFETY NET – COME BACK IF SYMPTOMS WORSEN

JUST SAY YES



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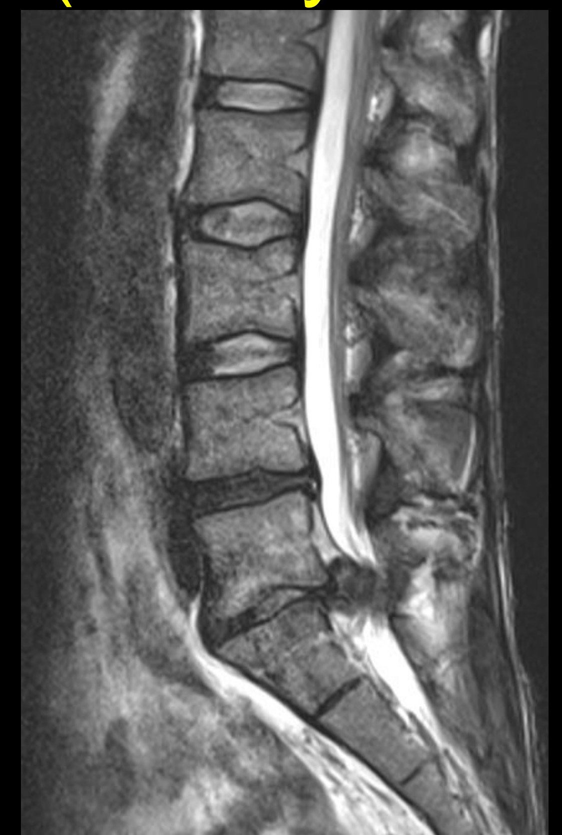
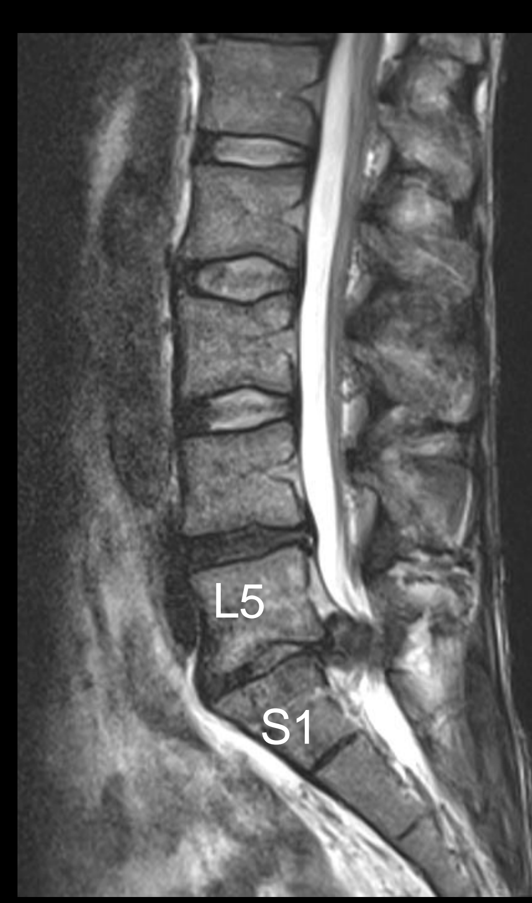
Acute cauda equina symptoms (urinary retention, saddle anaesthesia)



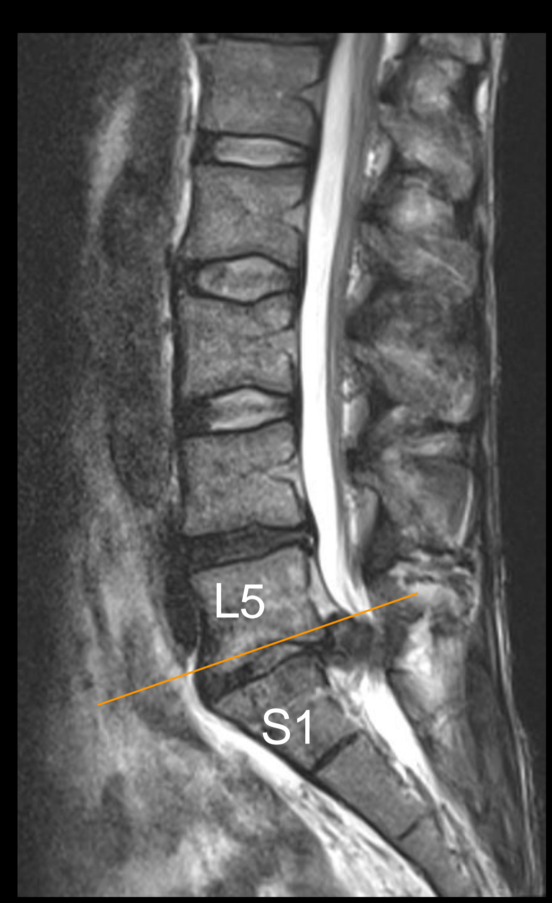
Sag T2 fat sat

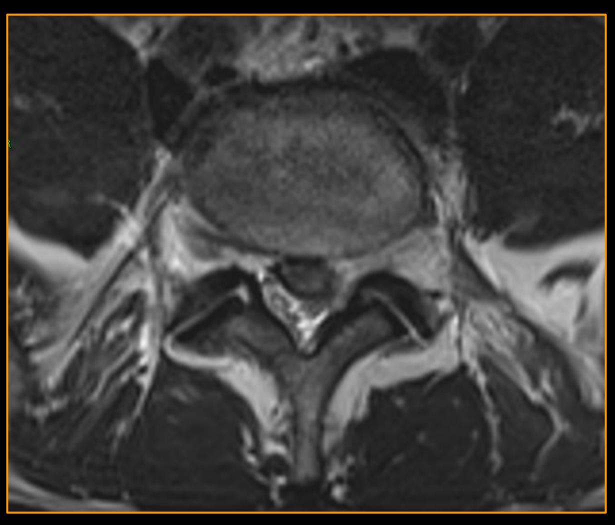
Acute cauda equina symptoms



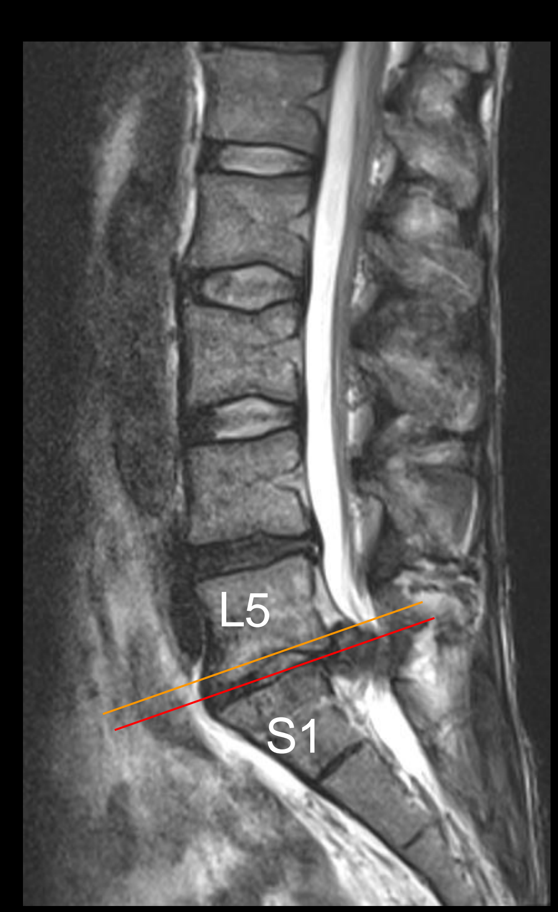
Sag T2 fat sat

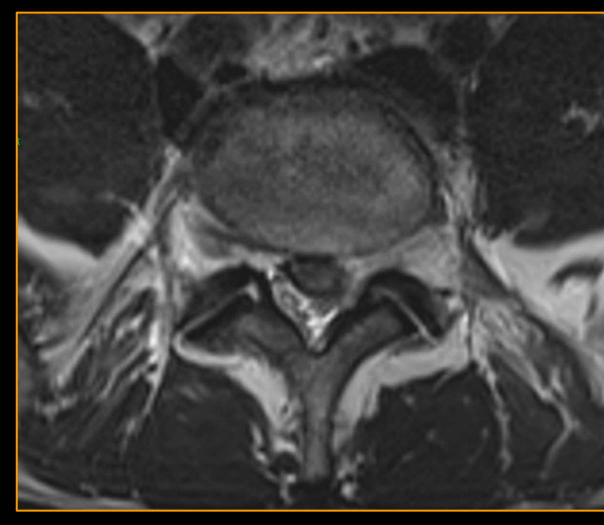
Acute cauda equina symptoms

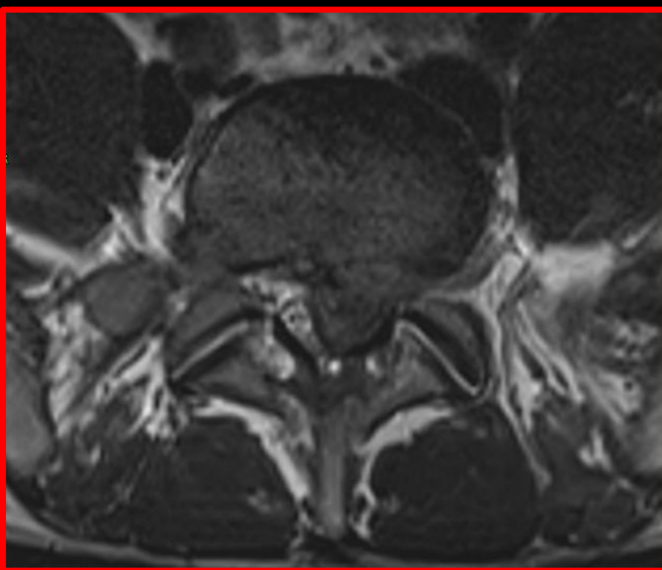




Acute cauda equina symptoms







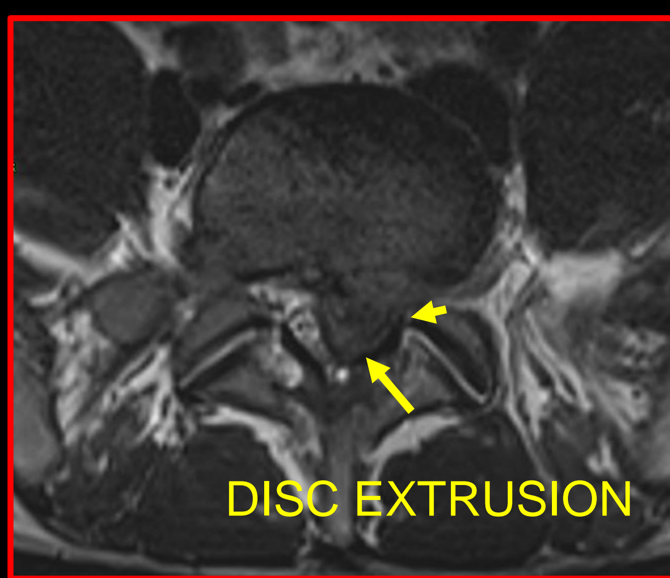
Acute cauda equina symptoms

DISC EXTRUSION

L5

S1

DISC EXTRUSION

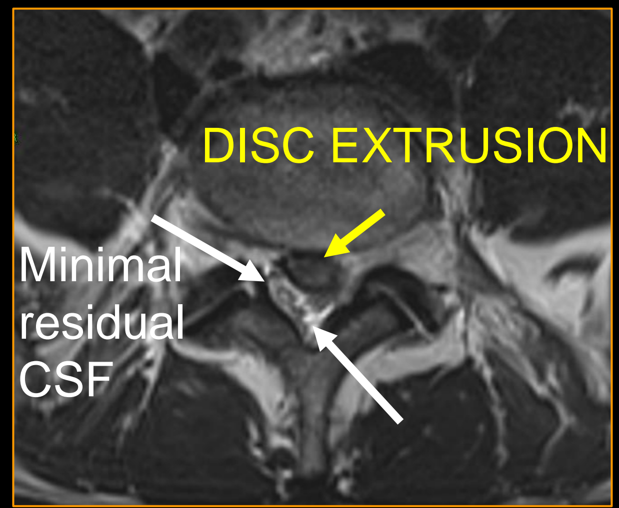


Does presence of CSF rule out Cauda Equina Syndrome?

L5

S1

DISC EXTRUSION



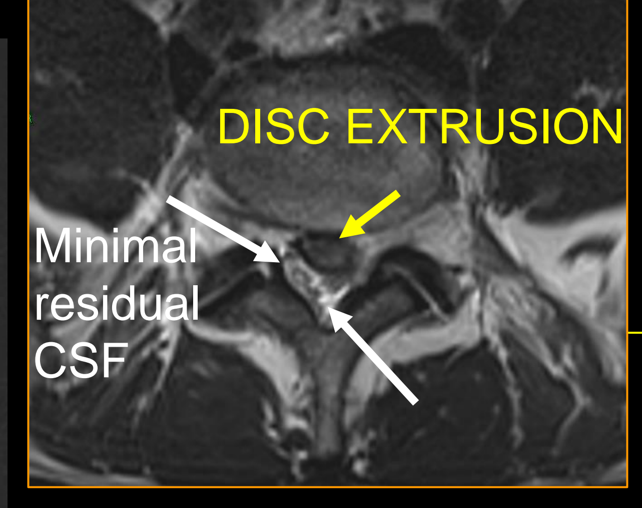
LS nerve roots compressed

Minimal residual CSF

DISC EXTRUSION

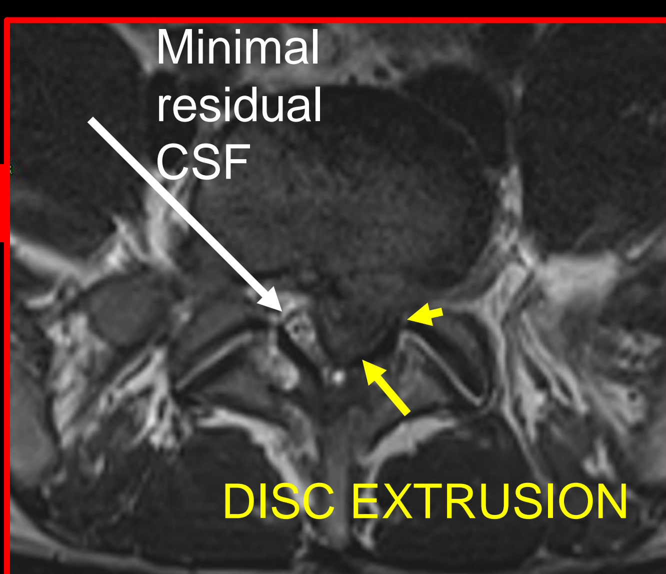
Does presence of CSF rule out Cauda Equina Syndrome?

MRI: Compression of multiple lumbosacral nerve roots = Cauda Equina Compression



No rules on volume of residual CSF

L5
S1
DISC EXTRUSION



METASTATIC/MALIGNANT SPINAL CORD COMPRESSION (MSCC)

Metastatic spinal cord compression (MSCC) = an oncological emergency

- Compression of cord or cauda equina by vertebral body collapse or tumour expansion
- Affects 5% of cancer patients
- Most common: breast, prostate, lung CA
- Most patients have known malignancy
- 25% MSCC is first presentation of their cancer

Stokes, Arnold, Spinal emergencies Surgery 2012

MSCC symptoms and signs - PAIN

- Thoracic or cervical pain
- Progressive lumbar pain
- Severe unremitting lower spine pain
- Straining aggravates spinal pain
- Pain prevents sleep
- Localised spinal tenderness

Stokes, Arnold, Spinal emergencies Surgery 2012, Imperial Guidelines 2022

MSCC symptoms and signs - PAIN

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PATIENT INFORMATION

MACMILLAN CANCER SUPPORT

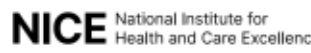
MSCC alert card

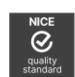
You have been given this card because you have cancer and are at risk of developing malignant spinal cord compression (MSCC).

You should contact your hospital team immediately if you develop any of these symptoms:

- Back or neck pain that becomes severe.
- Pain that feels like a band around the chest or tummy (abdomen).
- Pain that spreads into your lower back,

Stokes, Arnold, Spinal emergencies Surgery 2012, Imperial Guidelines 2022


National Institute for Health and Care Excellence



Metastatic spinal cord compression in adults

Quality standard
Published: 27 February 2014
www.nice.org.uk/guidance/qs56

Suspected MSCC

Immediate referral

Emergency Dept

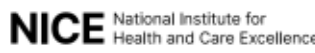
MRI whole spine – within 12hrs

JUST SAY YES

Q1 does pt have MSCC
Q2 What treatment options?
Surgery, RT, Chemo, Palliation

Bx if new presentation

GIRFT: NHS Guidelines Feb 23, Spinal Surgery: National Suspected CES Pathway (Hutton et al).



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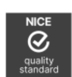

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MSCC Team: Radiology, Neurosurgeon, RT, Oncology

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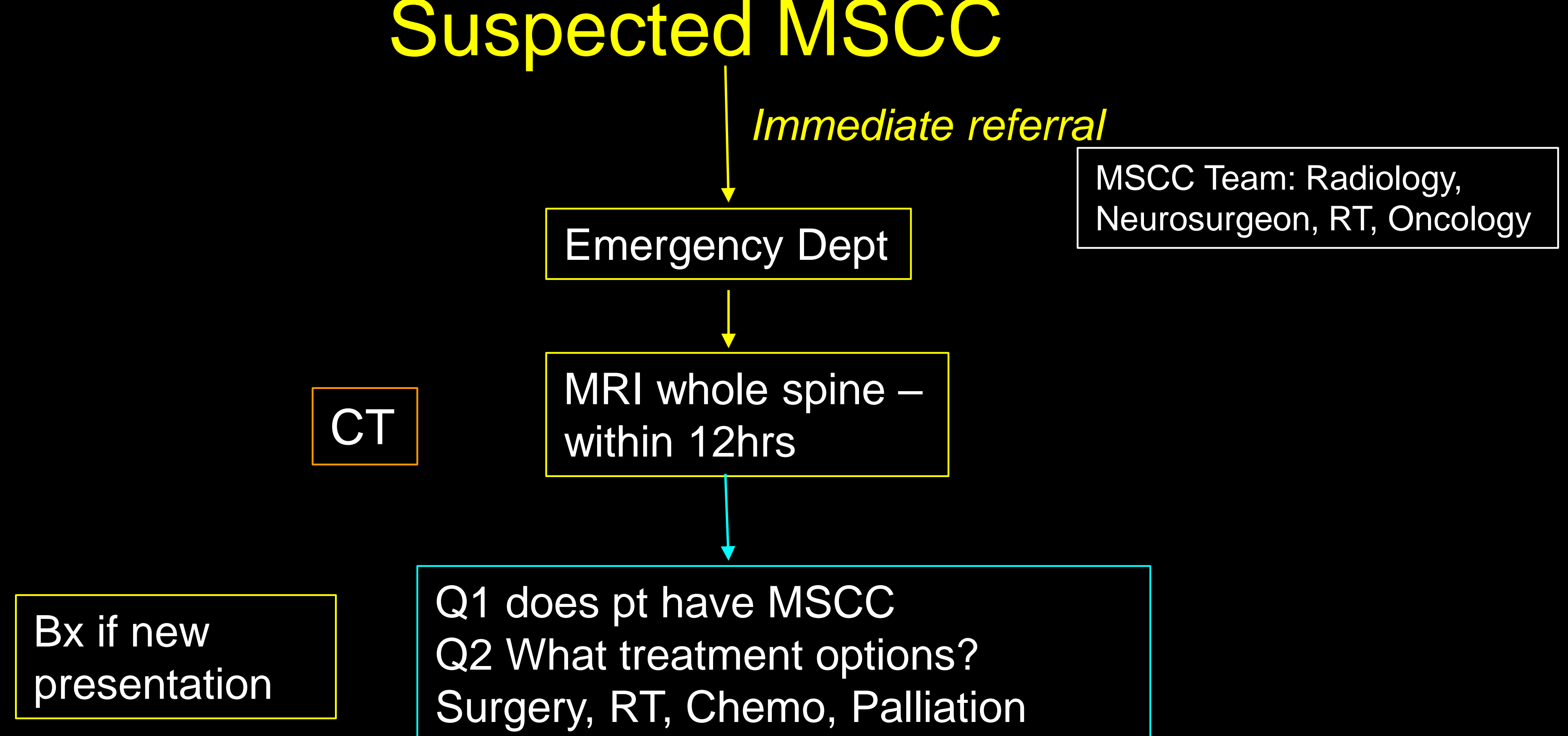

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Spinal Stability

Spinal instability neoplastic score (SINS)

Component	Score
Location	
Junctional: O-C2; C7-T2; T11-L1; L5-S1	3
Mobile spine: C3-6; L2-4	2
Semirigid : T3-10	1
Rigid: S2-S5	0
Mechanical pain	
Yes	3
No	2
Pain free lesion	1
Bone lesion	
Lytic	2
Mixed: lytic or blastic	1
Blastic	0
Radiographic spinal alignment	
Subluxation or translation present	4
Deformity: kyphosis or scoliosis	2
Normal	0
Vertebral body collapse	
>50% collapse	3
<50% collapse	2
No collapse with >50% body involved	1
None of the above	0
Posterolateral involvement	
Bilateral	3
Unilateral	1
None of the above	0

Spinal instability neoplastic score (SINS)

- <u>Higher score:</u>
- Junctional location
- Mechanical pain present
- Lytic
- Malalignment
- Vertebral body collapse
- Posterolat involvement (bilateral>unilateral)

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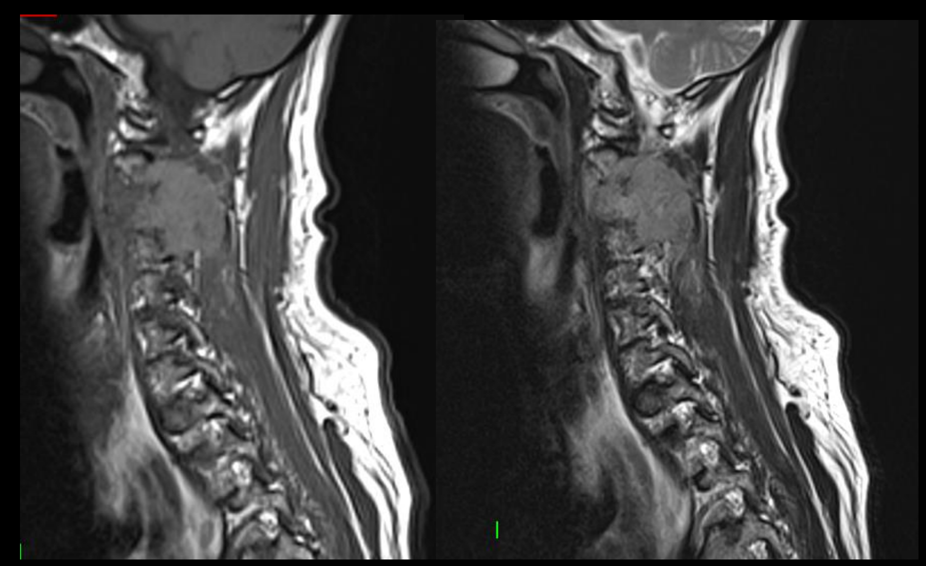
New Presentation: Myeloma -Cervical spine



T1 T2

CHECKLIST

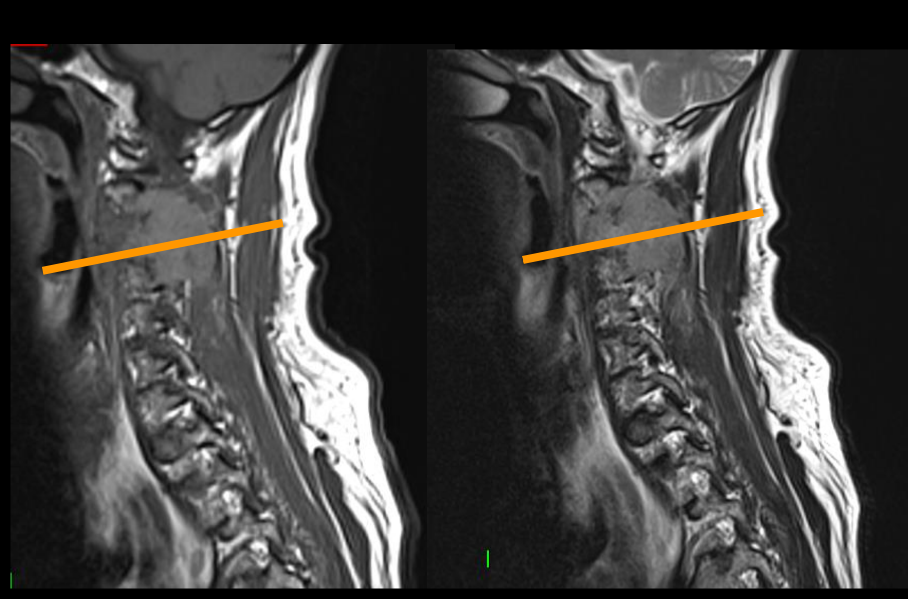
OSSEOUS:

- Involve vertebral body and/or posterior elements
- Stable vs unstable

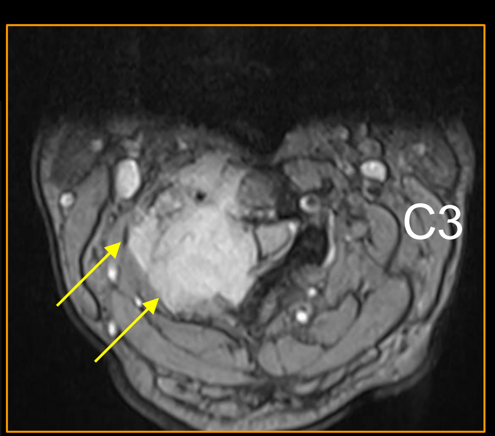
EXTRAOSSEOUS:

- Invade canal
- Cord/cauda compression
- Neural foramina
- paravertebral

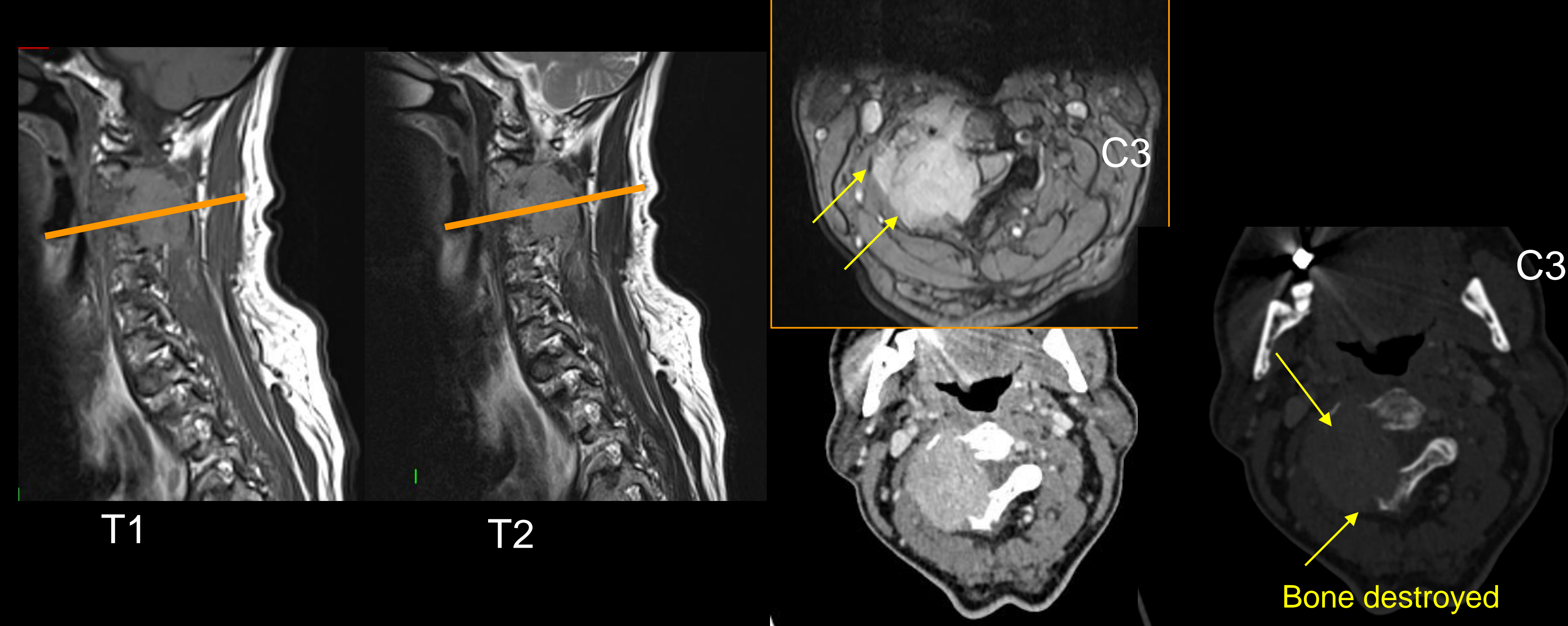
Myeloma -Cervical spine



T1 T2

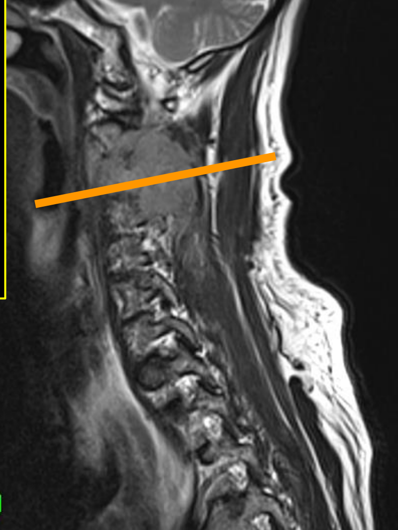


Myeloma -Cervical spine



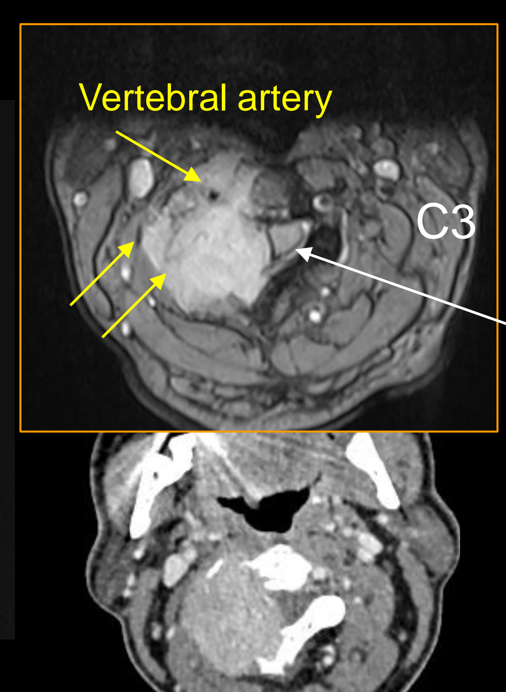
Myeloma -Cervical spine
What imaging features do you search for?

- Destroys C3/C2 vertebral body & posterior elements (?stable)
- Invades neural F
- Surrounds vertebral A
- Within canal:
- Compresses cord

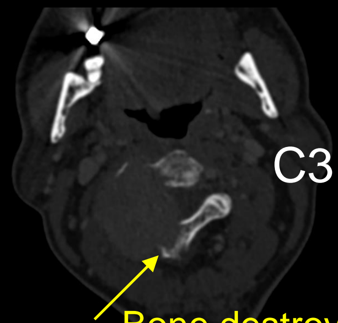


T1

T2



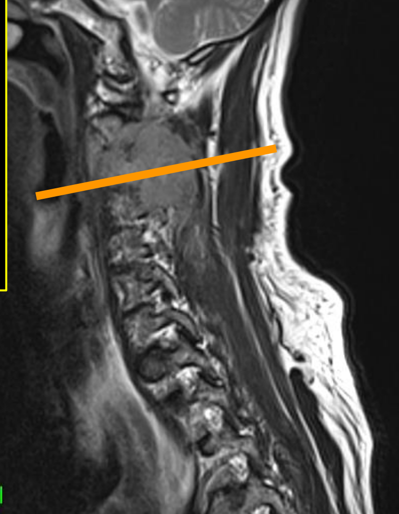
Cord compressed



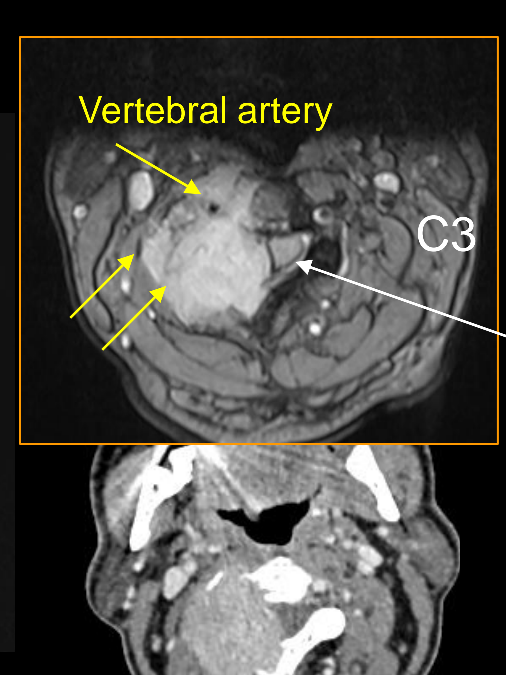
Myeloma -Cervical spine
Is this stable?

- Destroys C3/C2 vertebral body & posterior elements (?stable)
- Invades neural F
- Surrounds vertebral A
- Within canal:
- Compresses cord

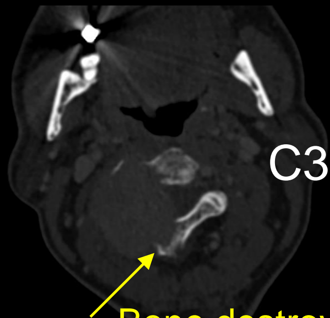
T1



T2

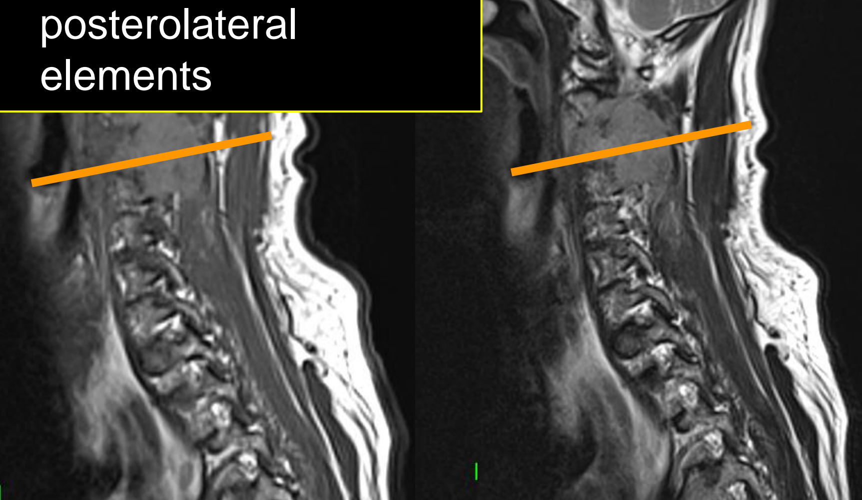


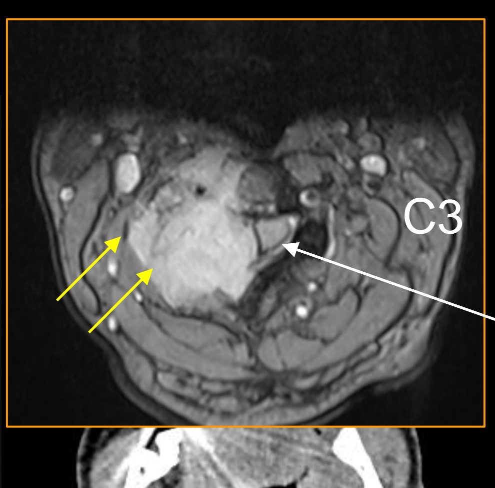
Cord compressed

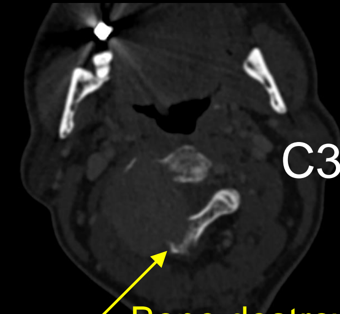


Myeloma -Cervical spine
Likely unstable

- Lytic
- Multilevel
- Destroys posterolateral elements







INFECTION

Spinal infection

- Haematogenous or direct spread (incl iatrogenic)
- Vertebral bodies/discs: Osteomyelitis and spondylodiscitis
- Canal and contents: epidural abscess, meningitis, intramedullary abscess
- Staph aureus most common pyogenic cause (>50%)
- TB most common non-pyogenic cause
- Clinical: severe back pain, spine tenderness, fever

Stokes, Arnold, Spinal emergencies Surgery 2012

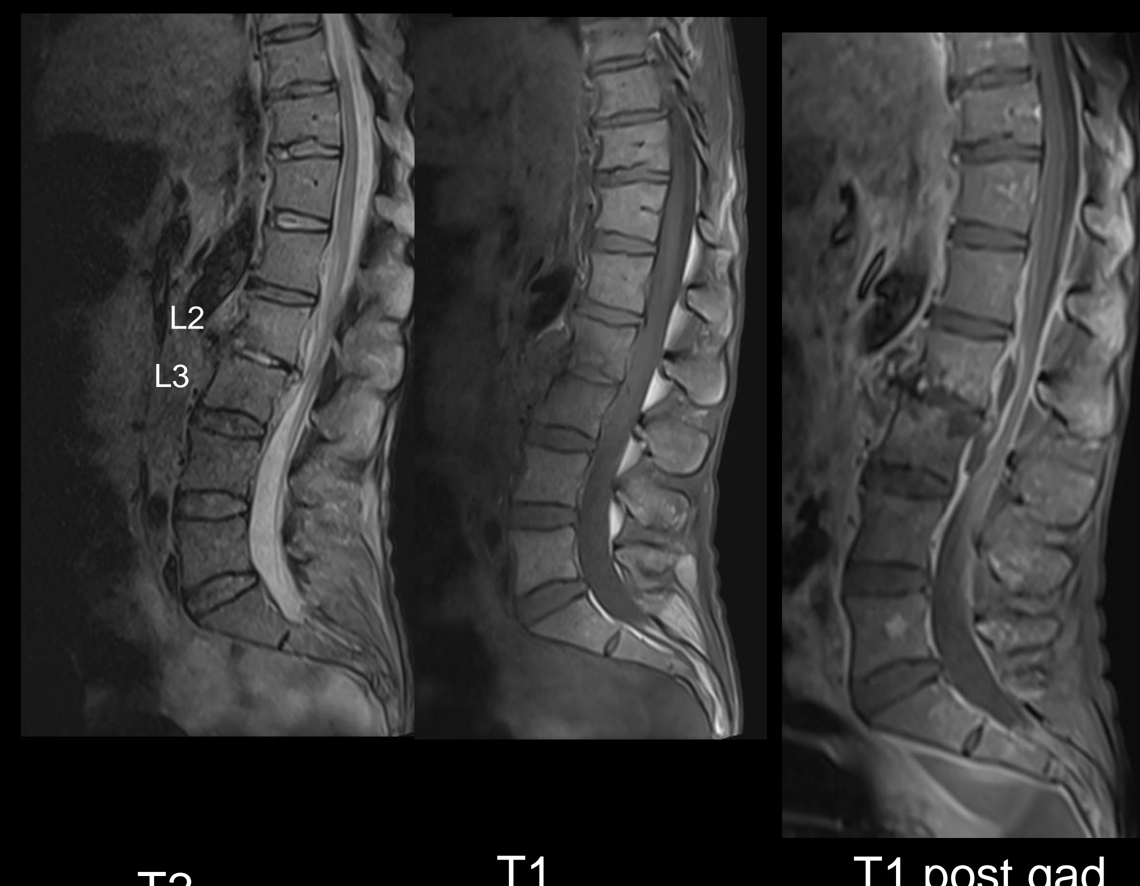
Spinal infection

- Important to isolate organism - blood culture and direct biopsy
- Discitis/osteomyelitis – respond well to Abs, (at least 6 weeks iv)
- Epidural abscess – surgical intervention
- Neurological compromise – surgical intervention

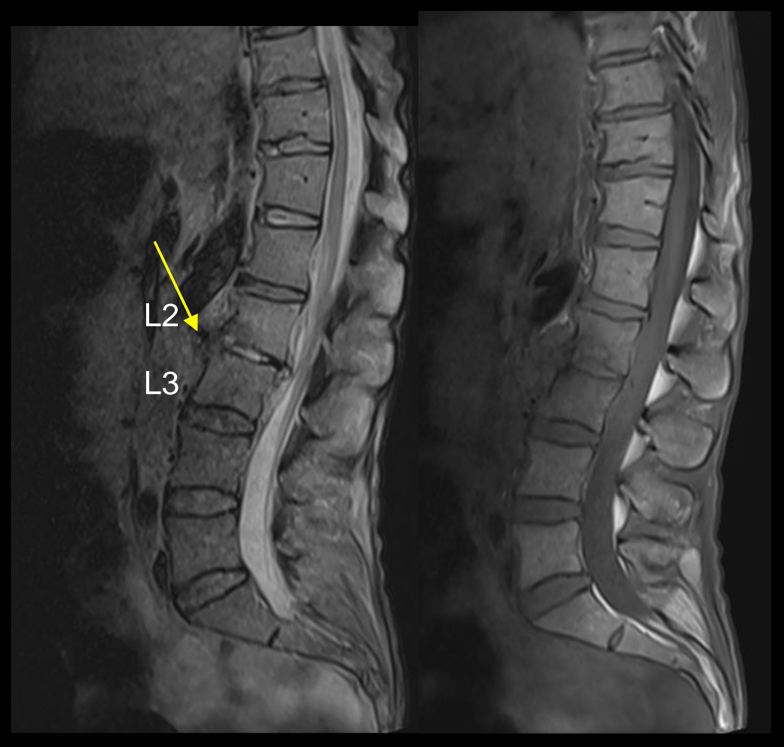
JUST SAY YES

Stokes, Arnold, Spinal emergencies Surgery 2012

L2/3 Spondylodiscitis - Staphlococcus aureus

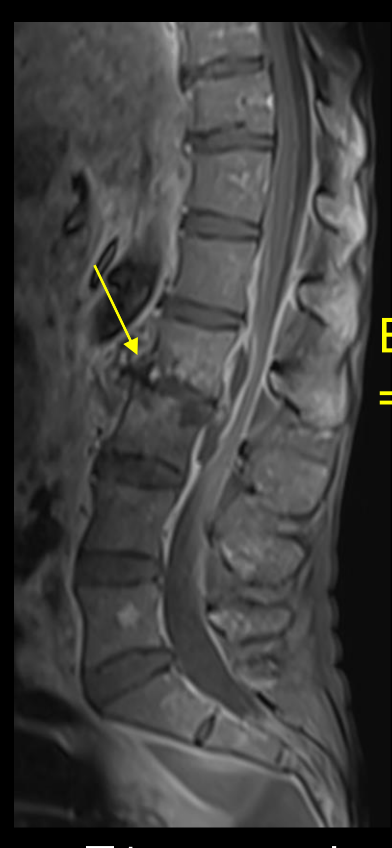


L2/3 Spondylodiscitis Staphlococcus aureus



T2

T1



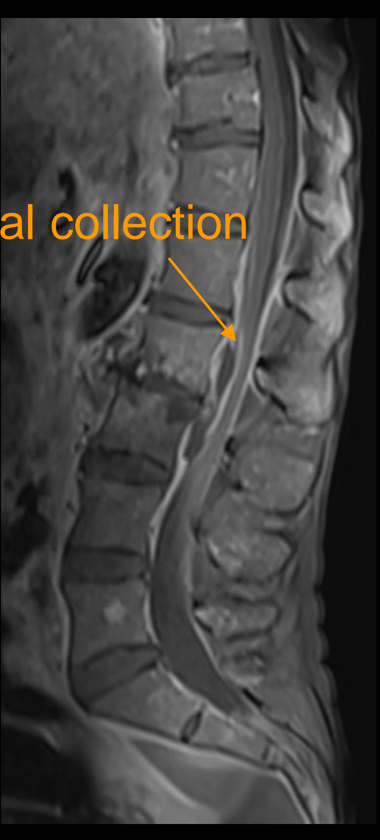
T1 post gad

End plate destruction
= Spondylodiscitis

Learning Point: Early spondylodiscitis can be difficult to differentiate from degenerative end plates

L2/3 Spondylodiscitis & anterior epidural collection, psoas collection - Staphlococcus aureus

Epidural collection



T2

T1

T1 post gad

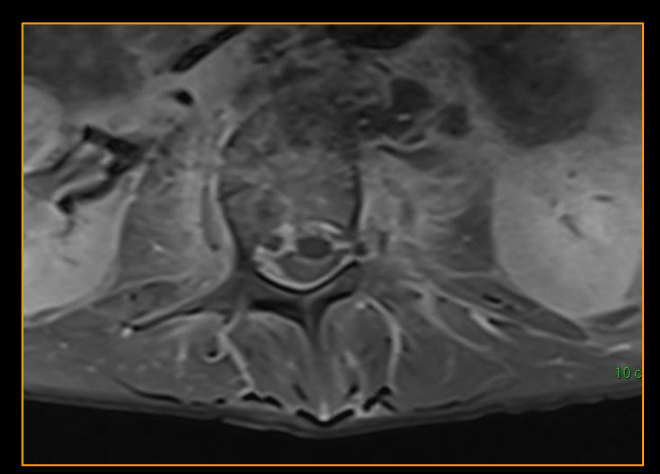
L2/3 Spondylodiscitis & anterior epidural collection, psoas collection - Staphlococcus aureus

Epidural collection

T2

T1

T1 post gad



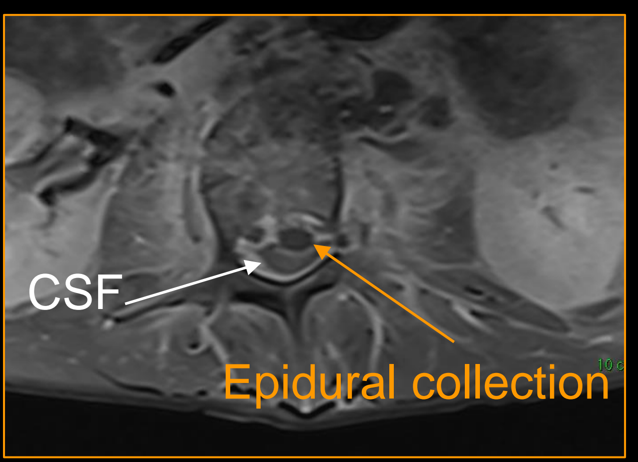
L2/3 Spondylodiscitis & anterior epidural collection, psoas collection - Staphlococcus aureus

Epidural collection

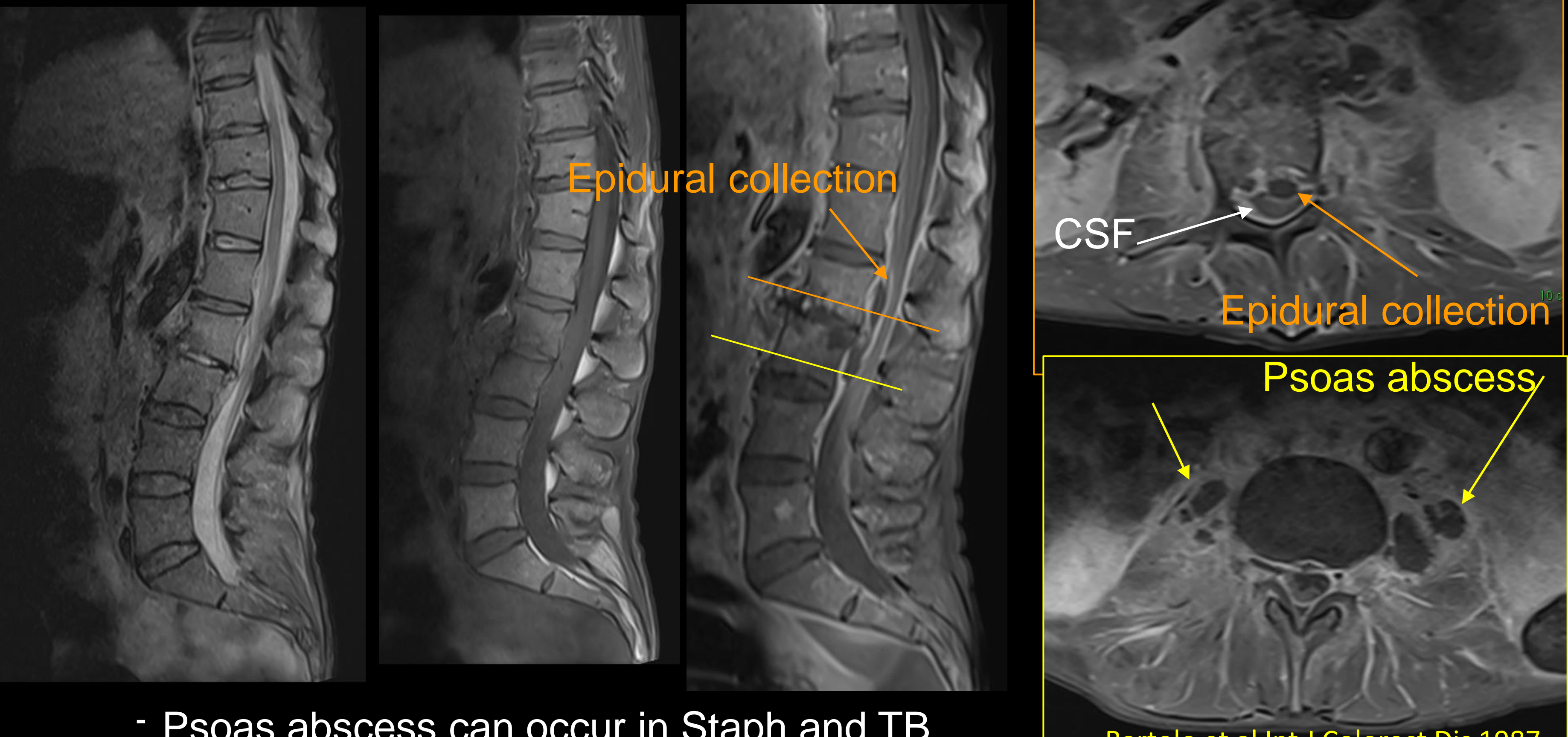
T2

T1

T1 post gad



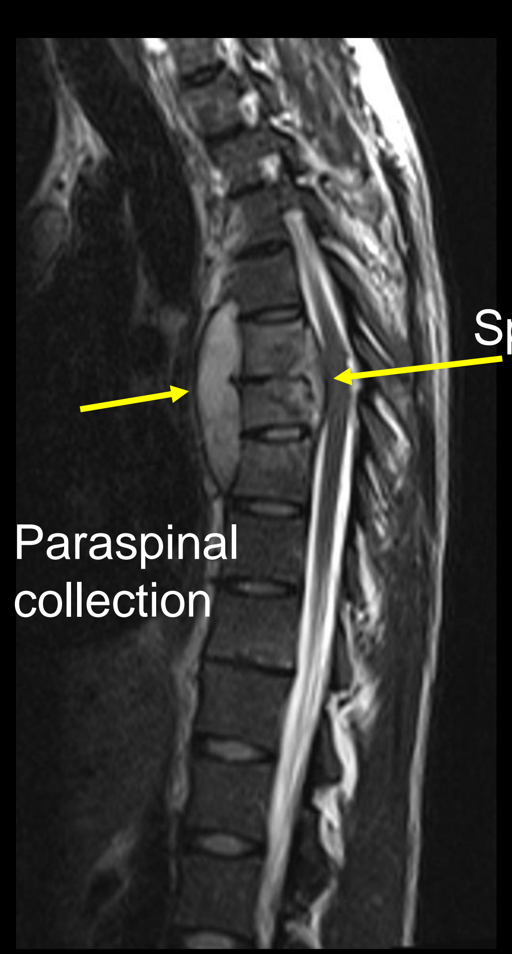
L2/3 Spondylodiscitis & anterior epidural collection, psoas collection - Staphlococcus aureus



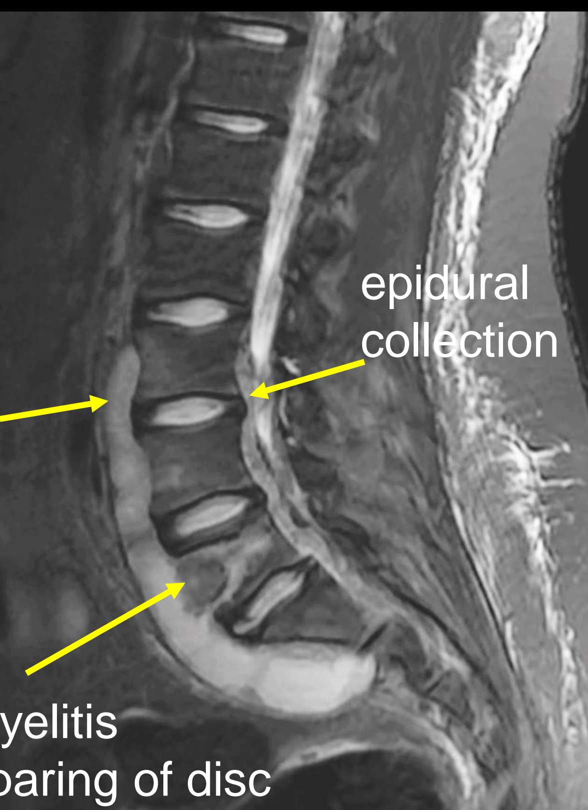
- Psoas abscess can occur in Staph and TB

Two patients with spinal TB

Pt #1 TB Spine

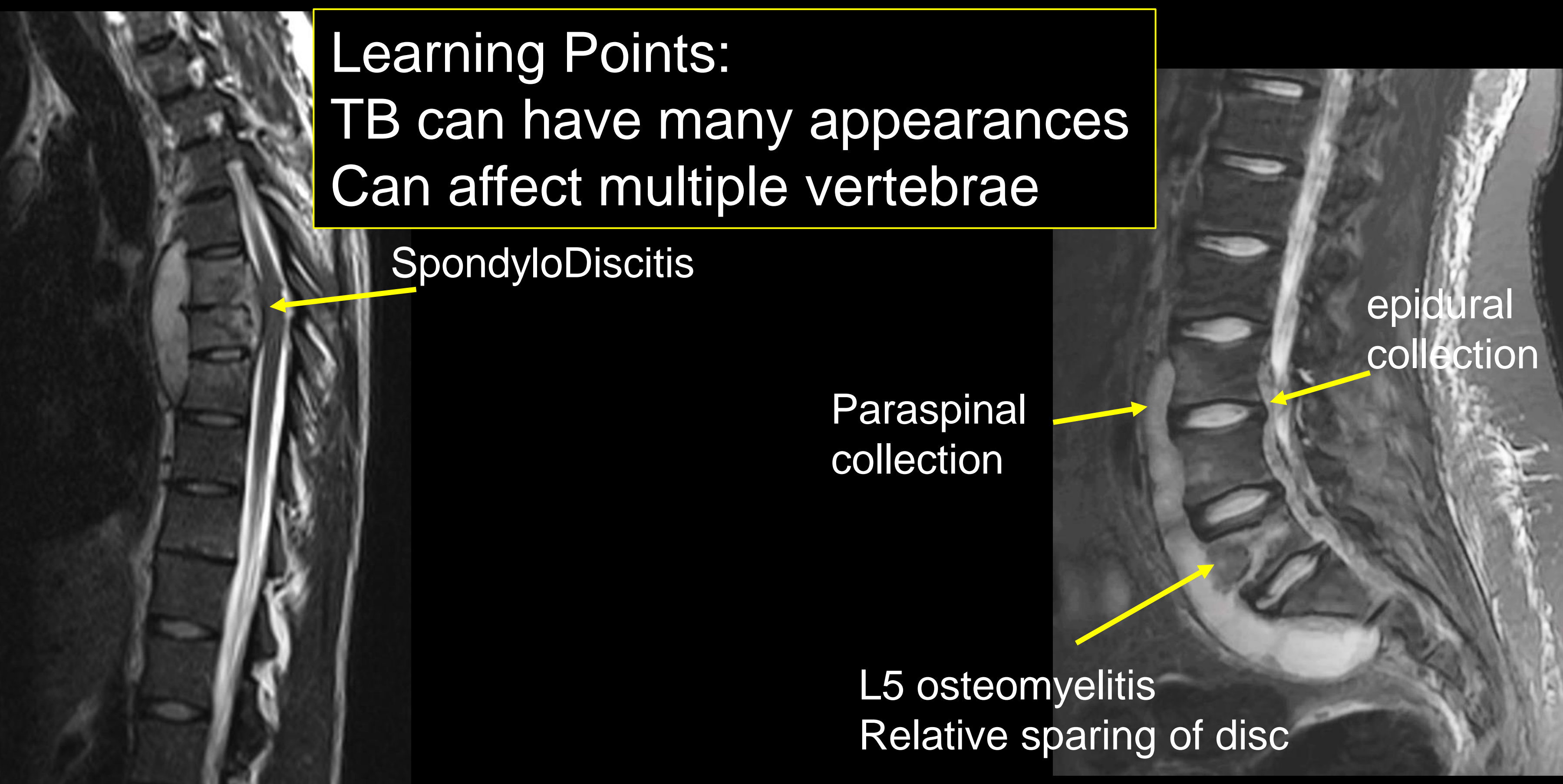


Pt #2 TB Spine



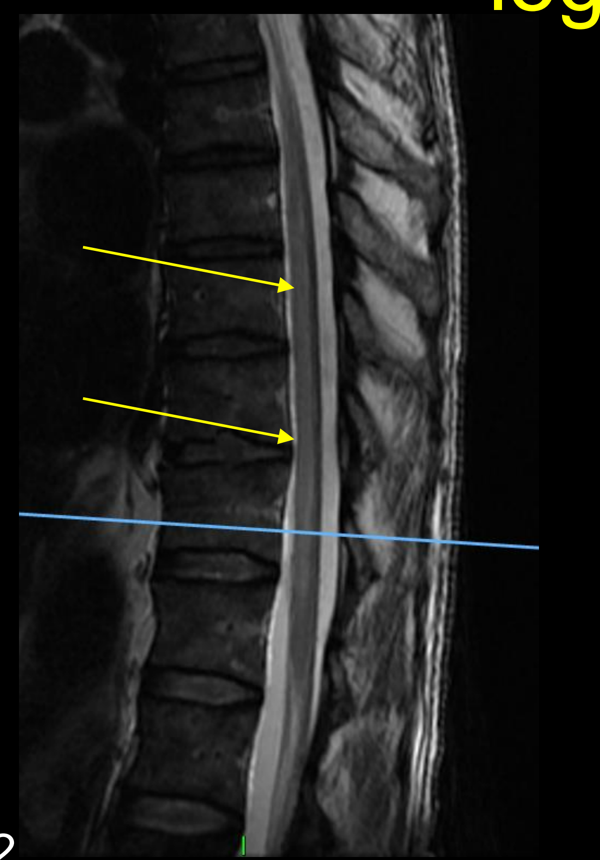
Pt #1 TB Spine

Pt #2 TB Spine

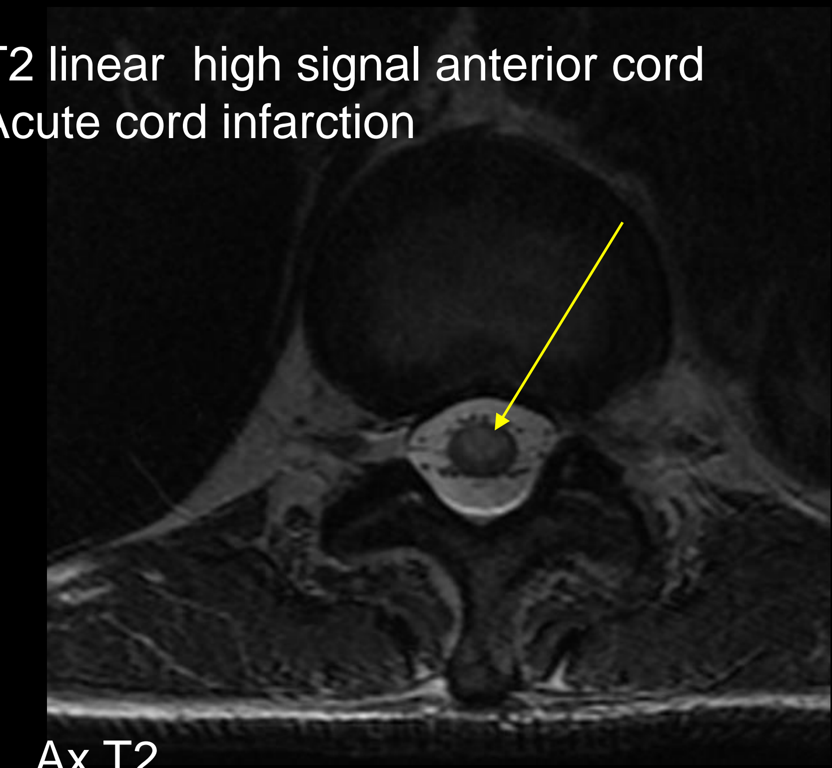


VASCULAR – HAEMATOMA, ISCHAEMIA

Acute aortic dissection, sudden onset leg weakness



Sag T2



T2 linear high signal anterior cord
Acute cord infarction

Ax T2

VASCULAR – HAEMATOMA, ISCHAEMIA

Imaging features of blood on MRI

	<24 hrs	1-3days	3-7days	7 days-1 month	>1 month to years
HGB=haemoglobin	OxyHGB	DeoxyHGB	i/c meth HGB	e/c meth HGB	Haemosiderin
T1					
T2					
	HYPERACUTE	ACUTE	EARLY SubACUTE	LATE SubACUTE	CHRONIC

HGB = haemoglobin
i/c = intracellular
e/c= extracellular

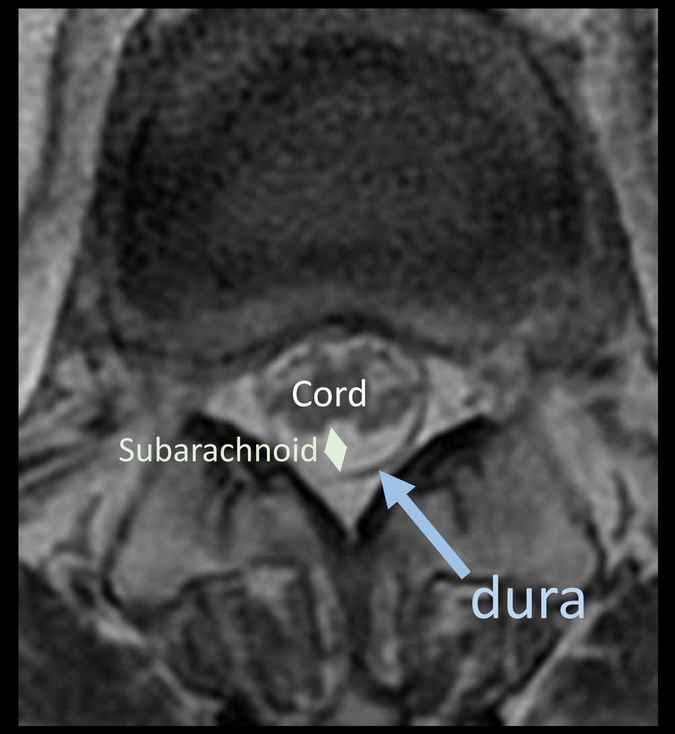
Extracranial blood – Signal change is variable (unlike intracranial blood)

Moriarty HK, Cearbhaill RO et al. MRI of spinal haematoma, a pictorial review BJR 2019

EPIDURAL HAEMATOMA - compressive

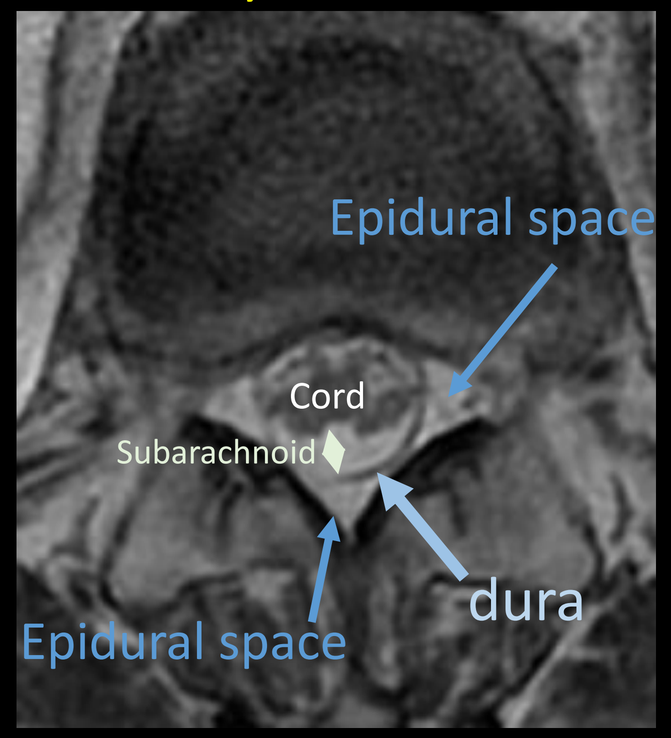
85, anticoagulated, sudden leg weakness

Anatomy



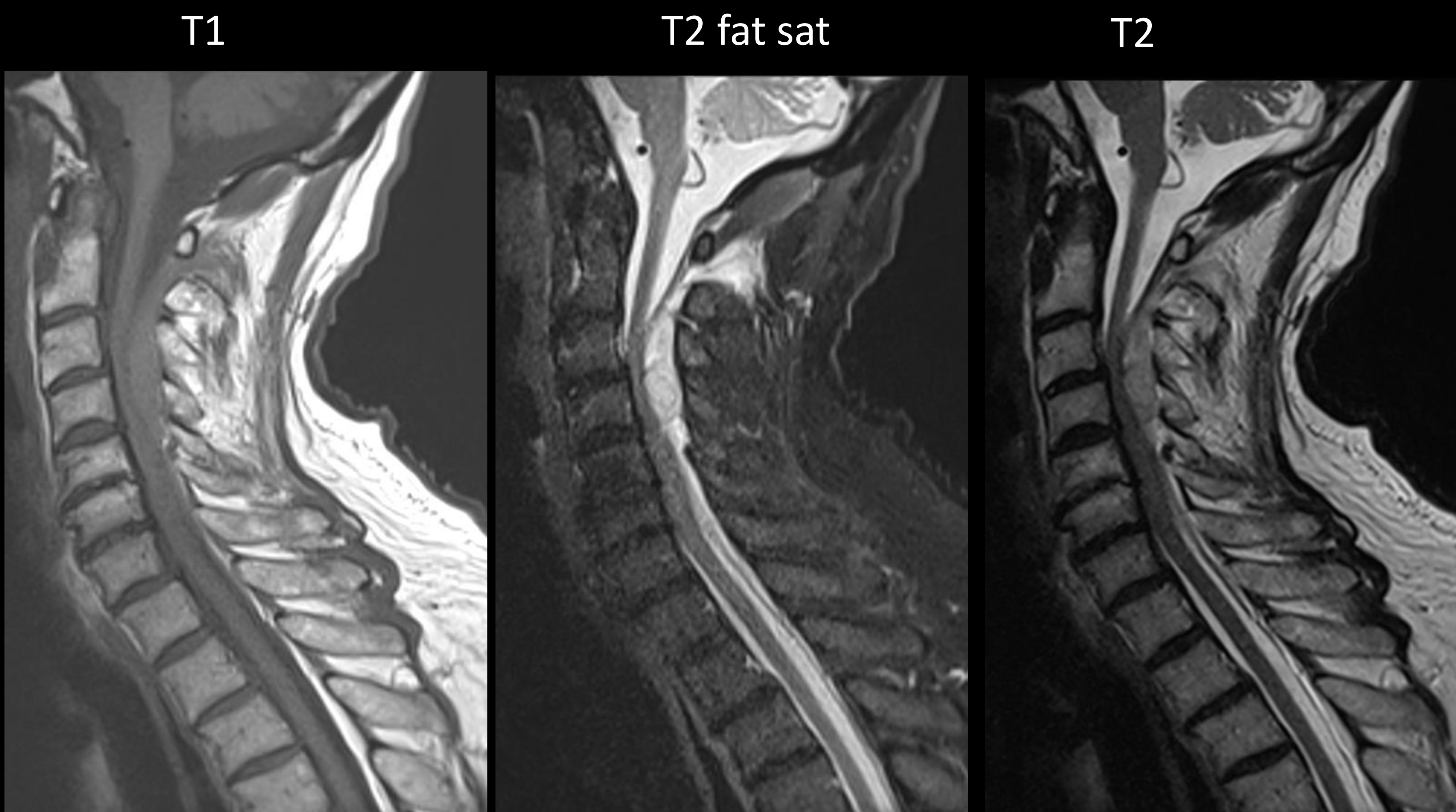
Moriarty HK, Cearbhaill RO et al. MRI of spinal haematoma, a pictorial review BJR 2019

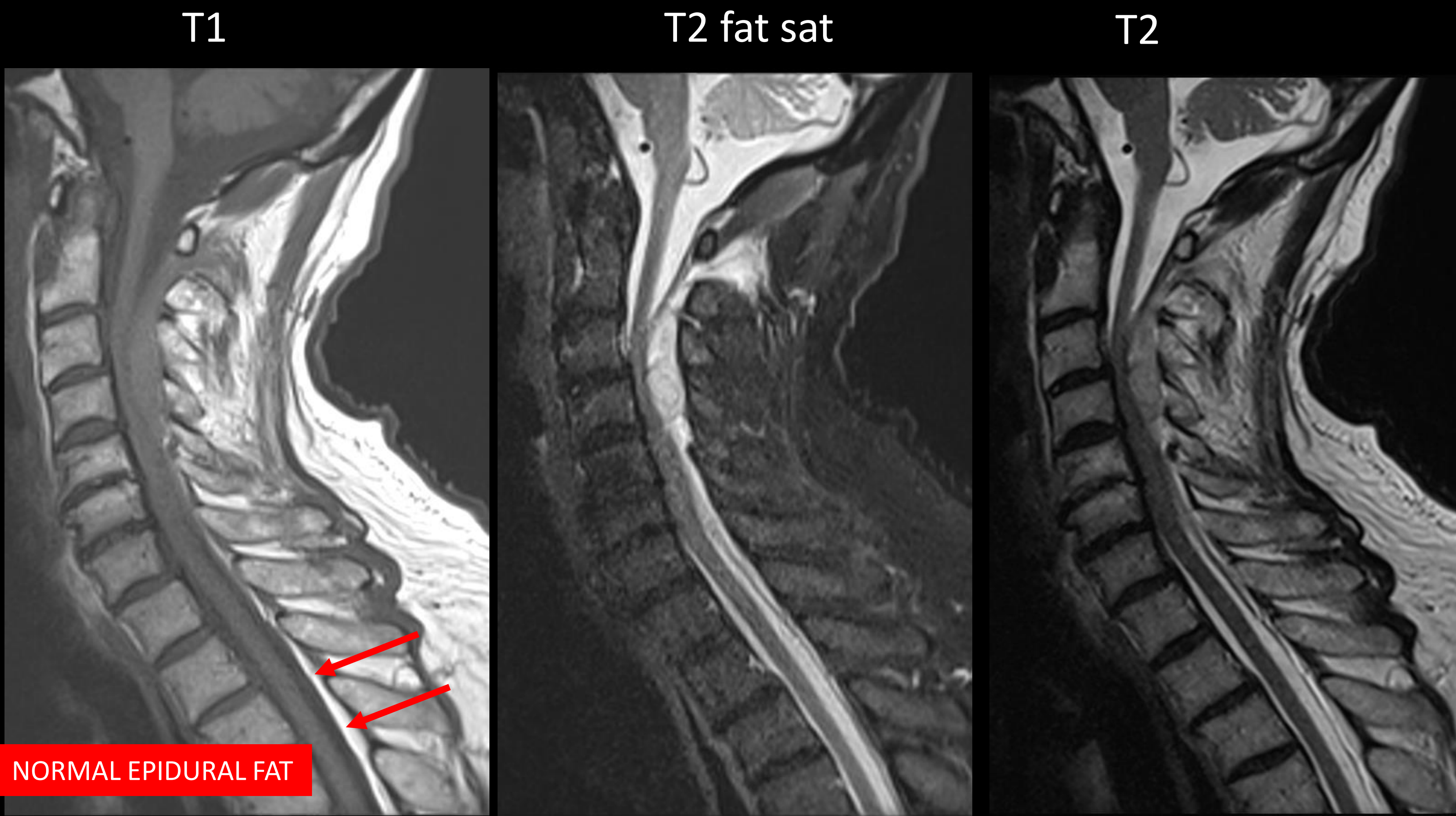
Anatomy

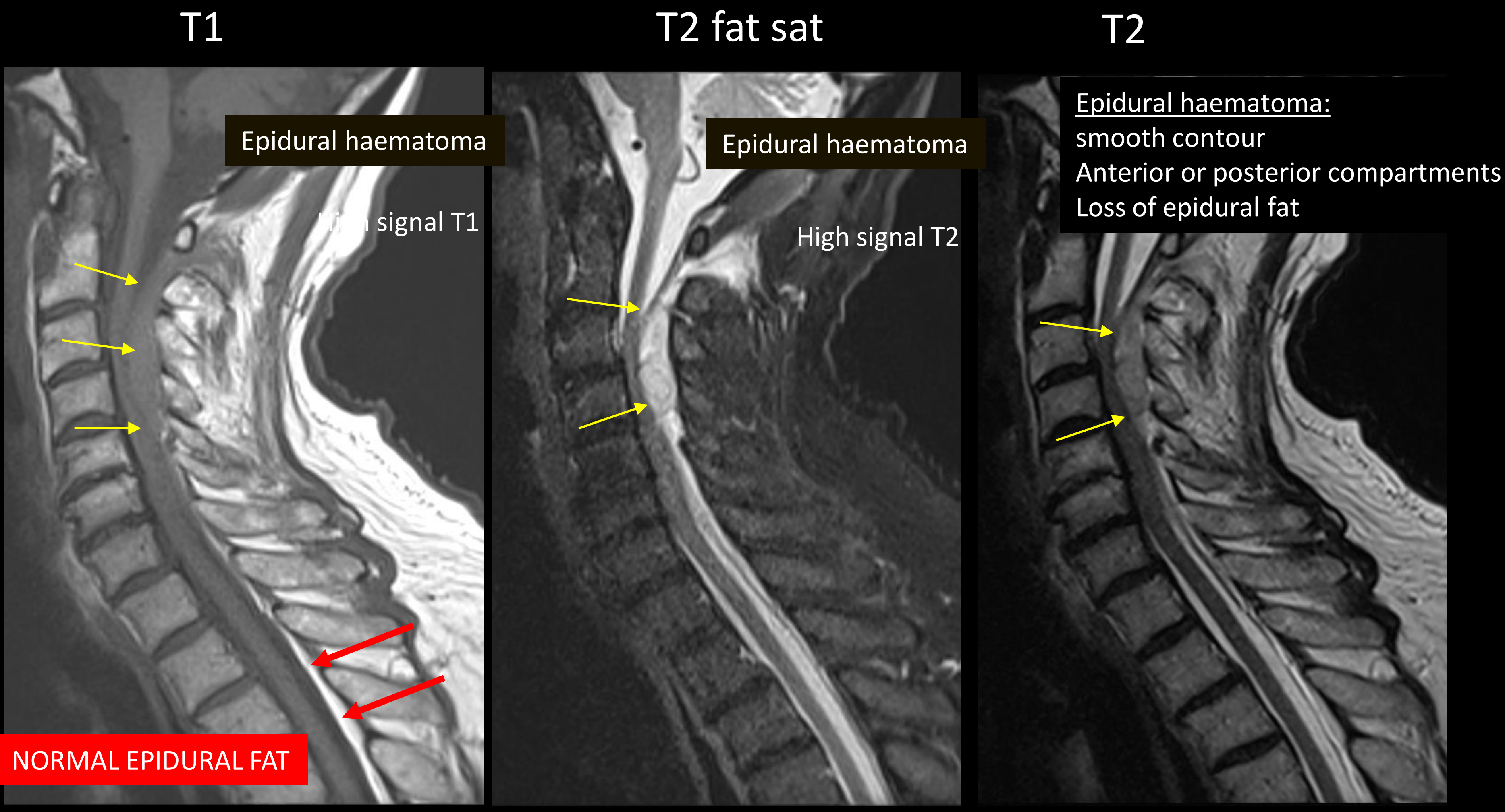


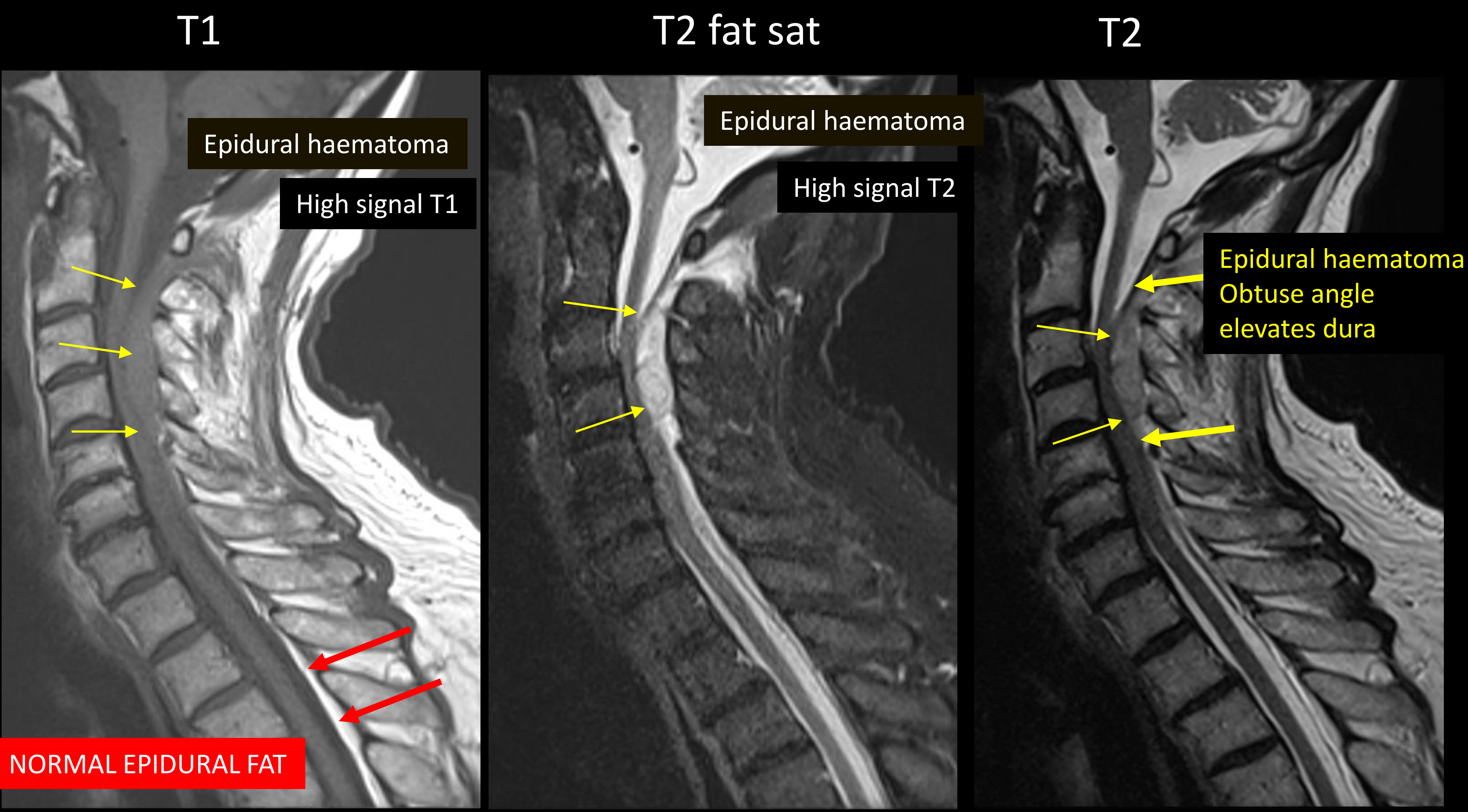
Epidural
Subdural
Subarachnoid
Intramedullary
Cord
pia
arachnoid
dura

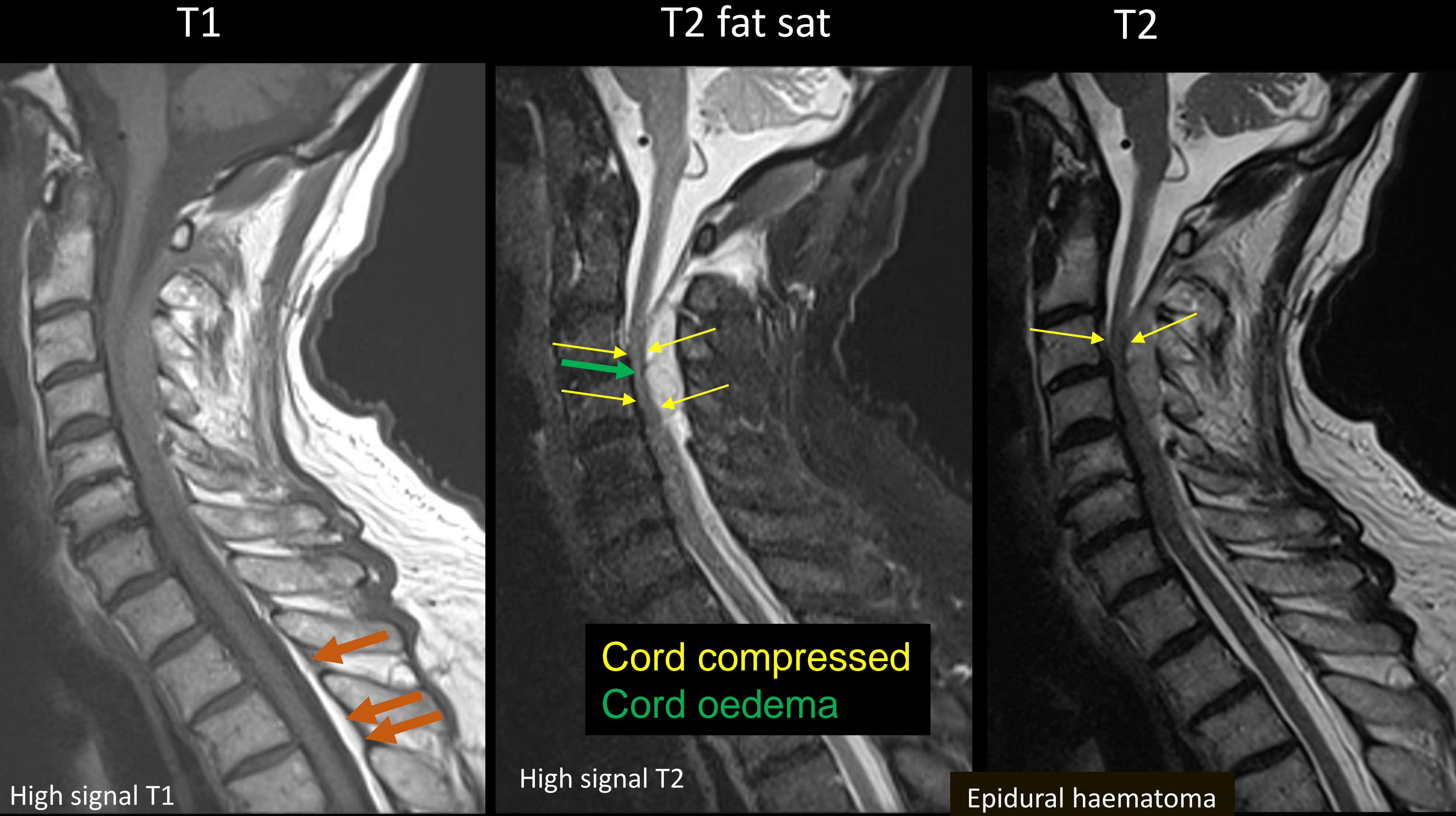
Moriarty HK, Cearbhaill RO et al. MRI of spinal haematoma, a pictorial review BJR 2019


T1
T2 fat sat
T2


T1
T2 fat sat
T2
NORMAL EPIDURAL FAT


T1
T2 fat sat
T2
Epidural haematoma
signal T1
NORMAL EPIDURAL FAT
Epidural haematoma
High signal T2
Epidural haematoma:
smooth contour
Anterior or posterior compartments
Loss of epidural fat


T1
T2 fat sat
T2
Epidural haematoma
High signal T1
NORMAL EPIDURAL FAT
Epidural haematoma
High signal T2
Epidural haematoma
Obtuse angle
elevates dura


T1
T2 fat sat
T2
Cord compressed
Cord oedema
High signal T1
High signal T2
Epidural haematoma

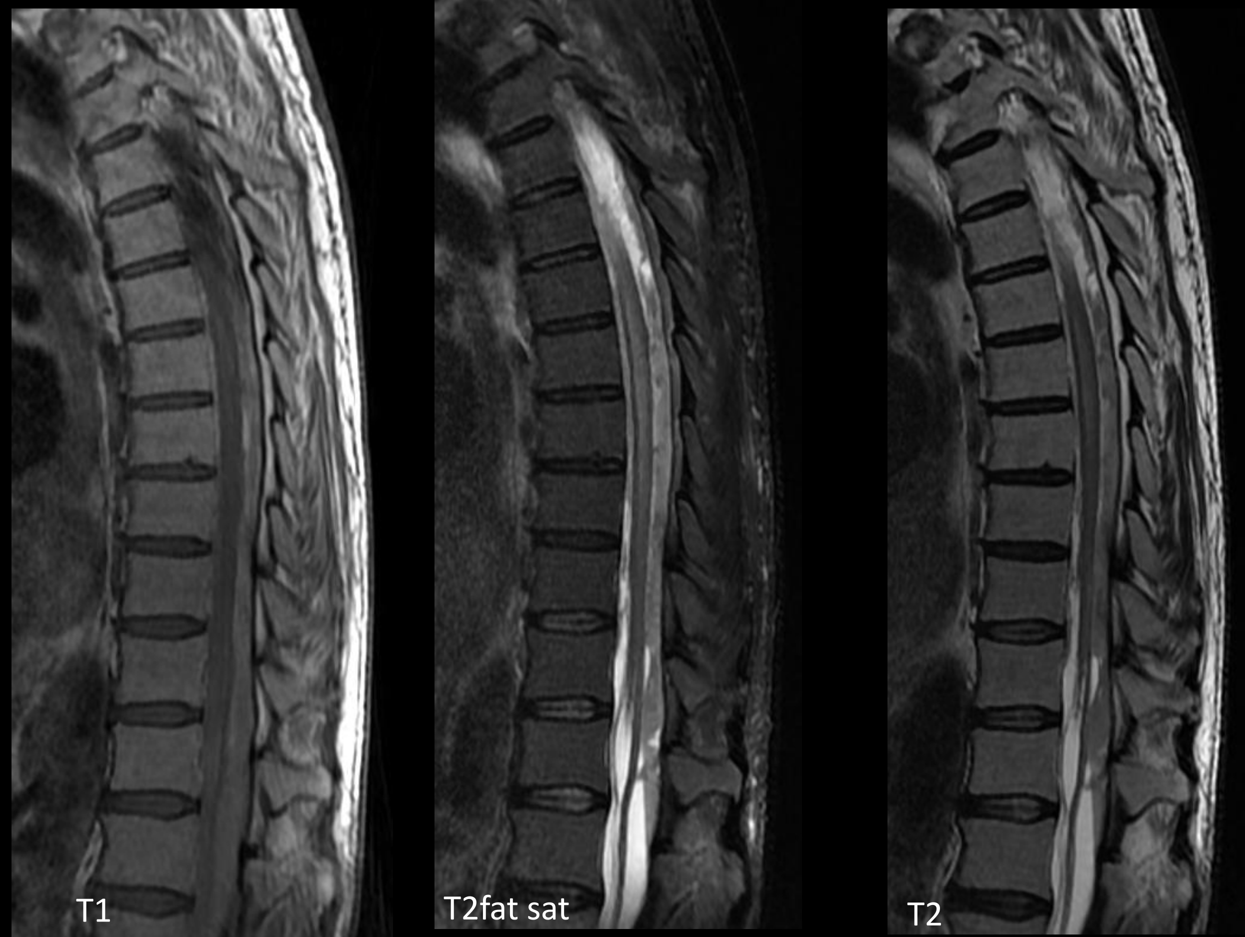
SUBARACHNOID HAEMATOMA

Locating haematoma by compartment

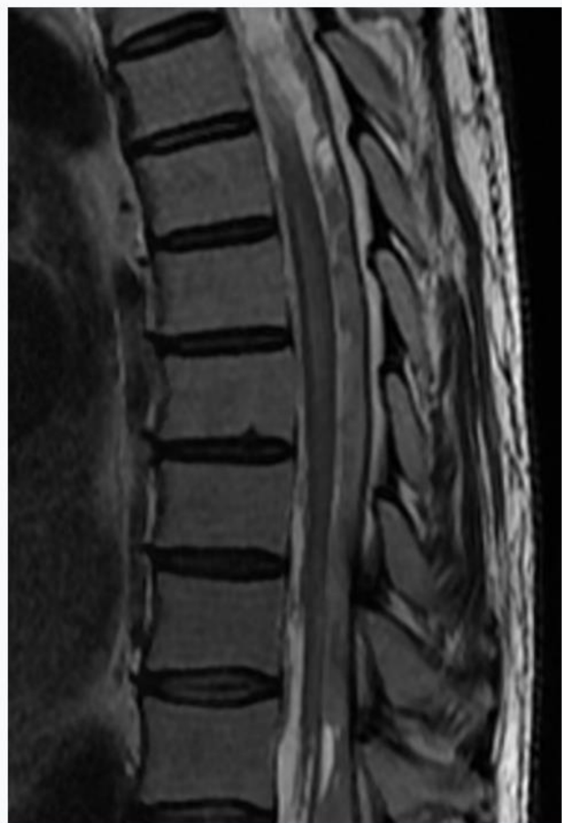
- Subarachnoid space
  - Spreads throughout CSF space
  - Forms layers (dependant – either horizontal or distal thecal sac) CLUE!!!

Moriarty HK, Cearbhaill RO et al. MRI of spinal haematoma, a pictorial review BJR 2019

No trauma, Sudden Leg weakness, on anti-coagulation



(T2Sag) Point to the epidural fat



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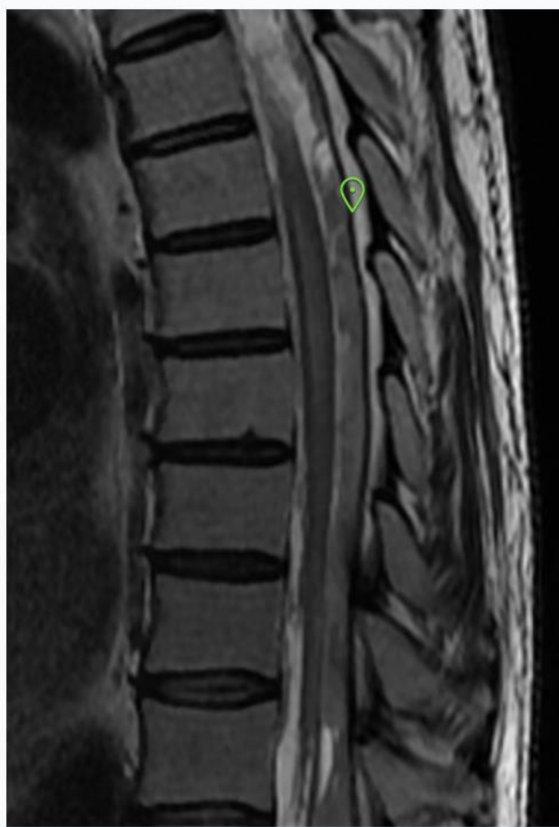
(T2 sag) Point to the dura



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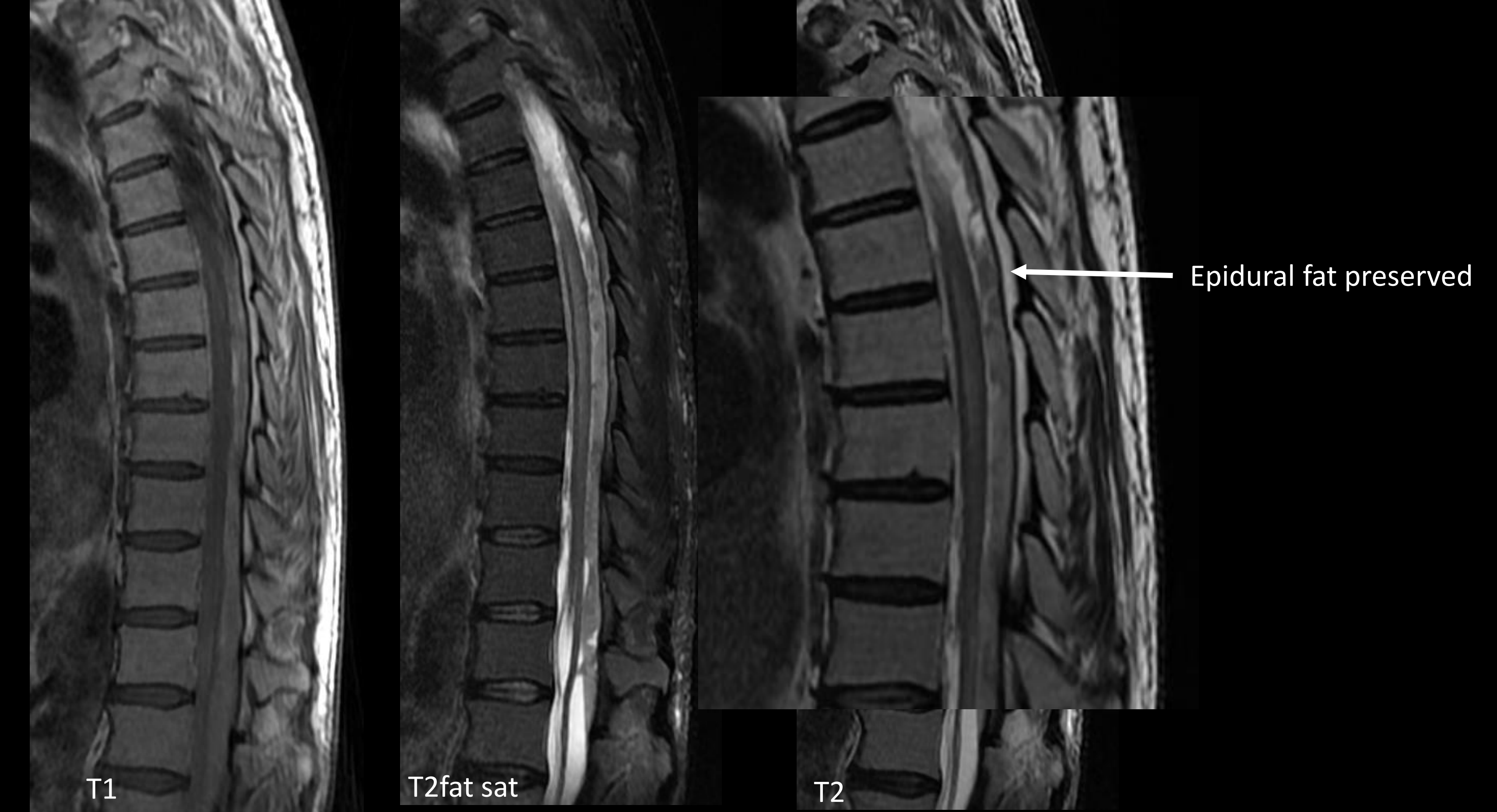
No trauma, Sudden Leg weakness, on anti-coagulation



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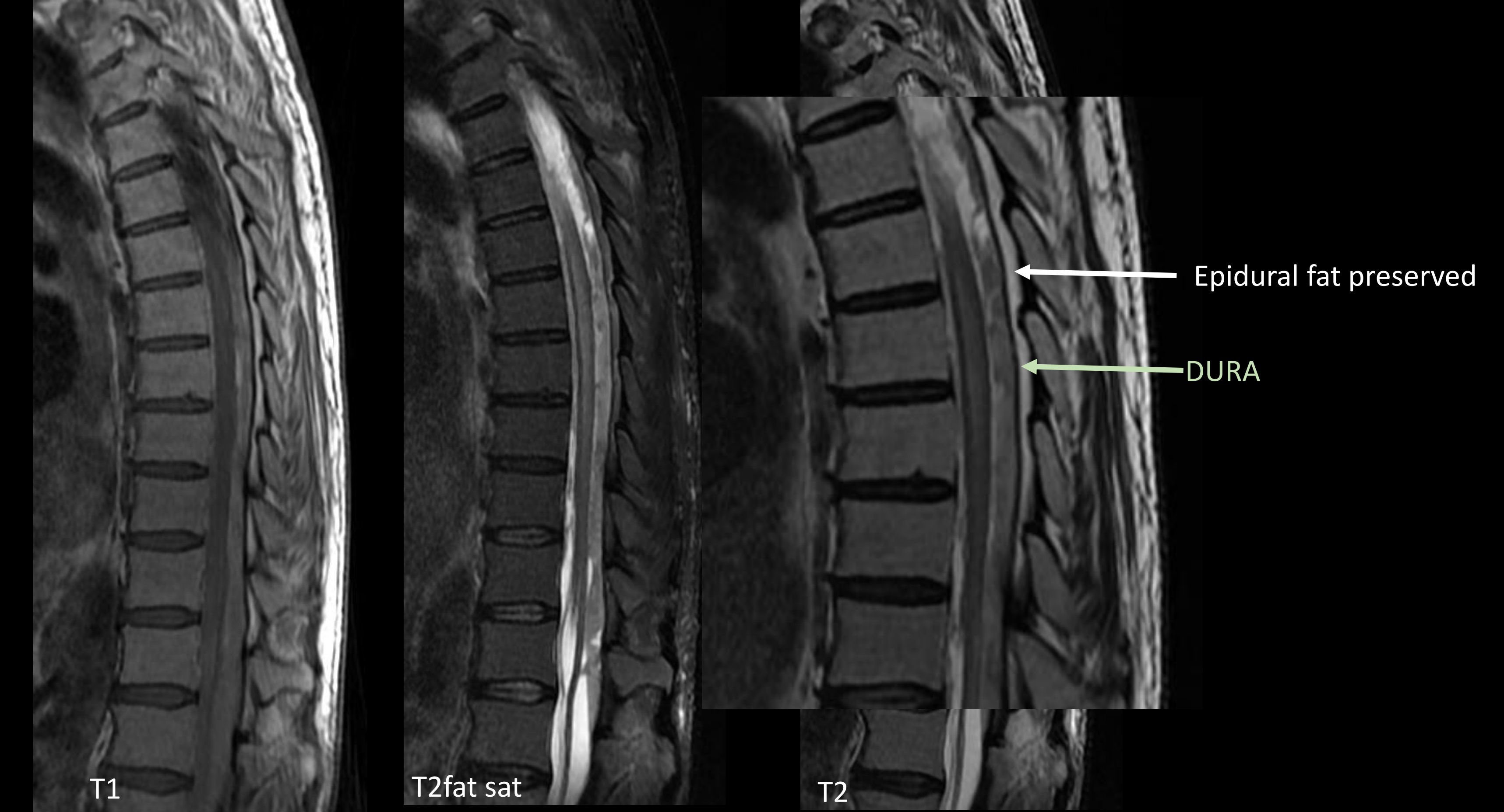

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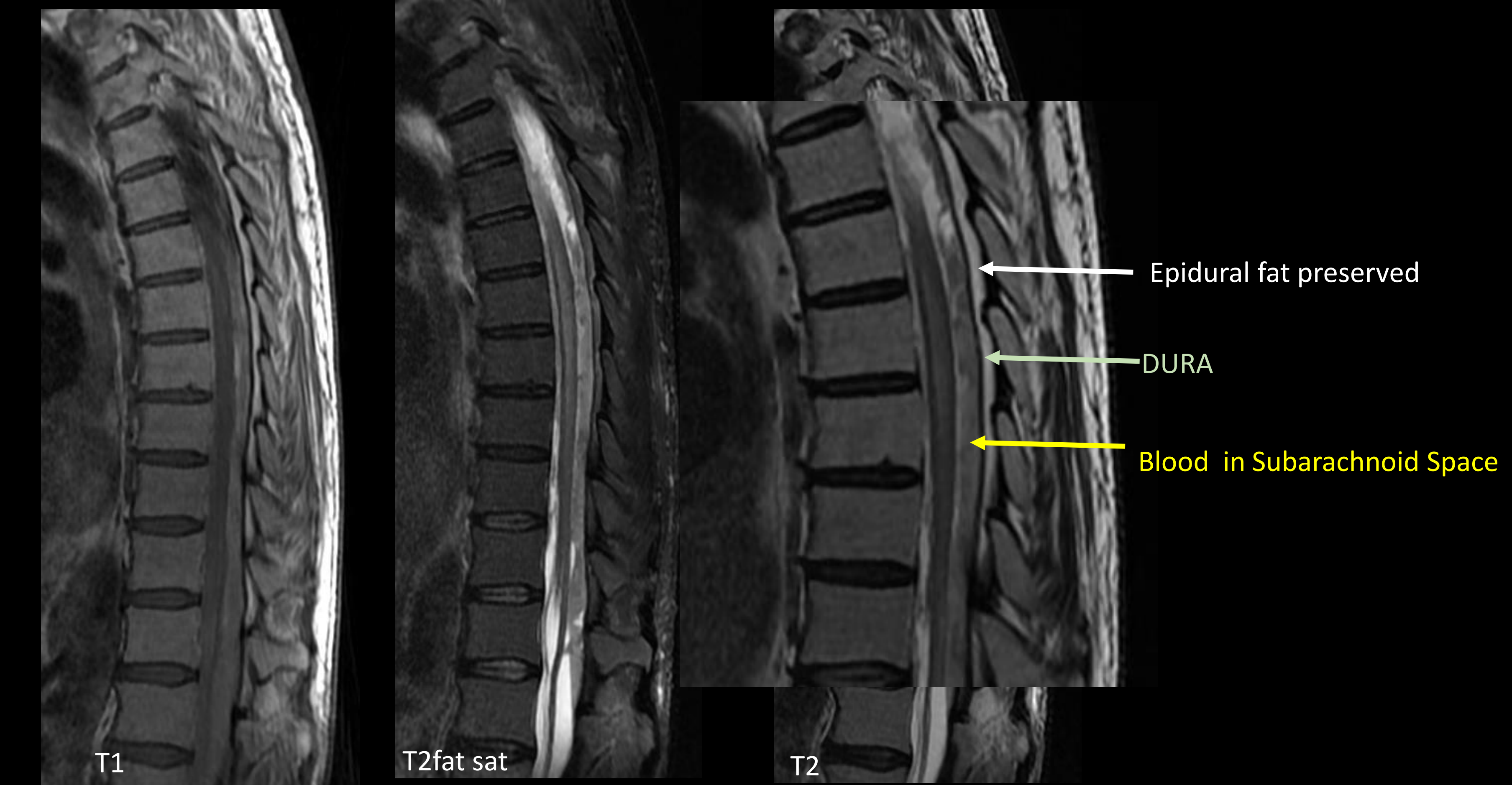

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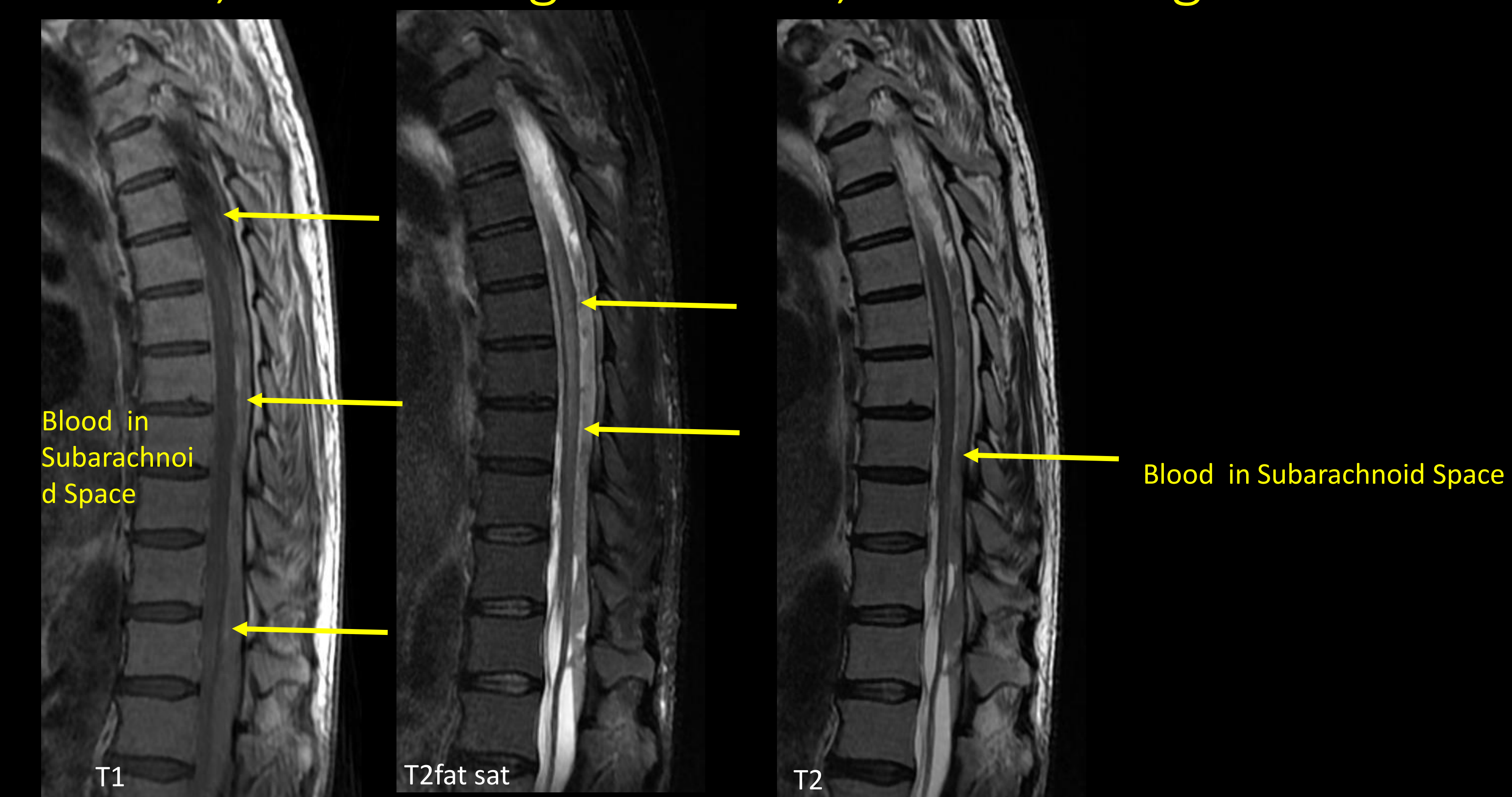

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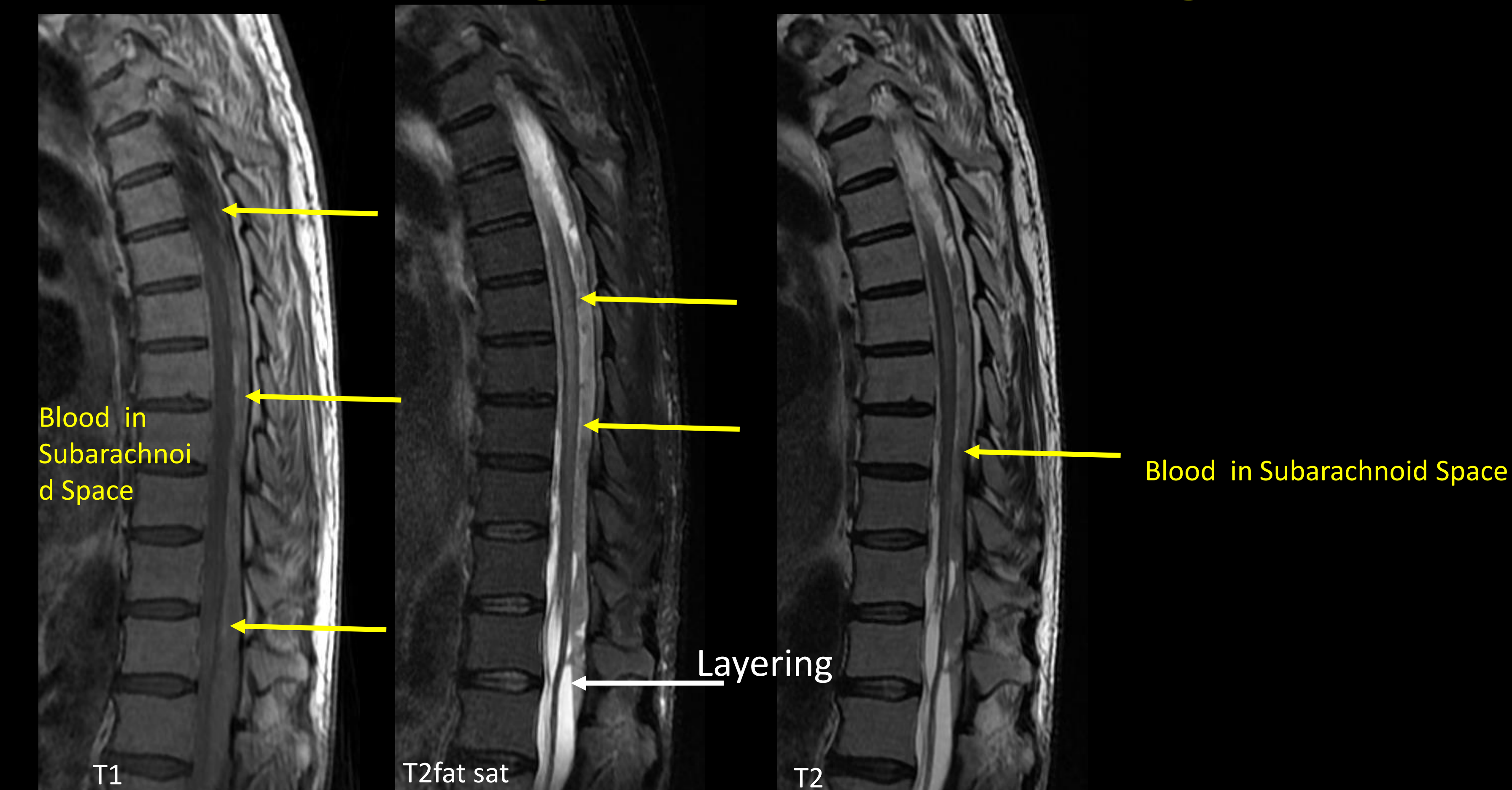
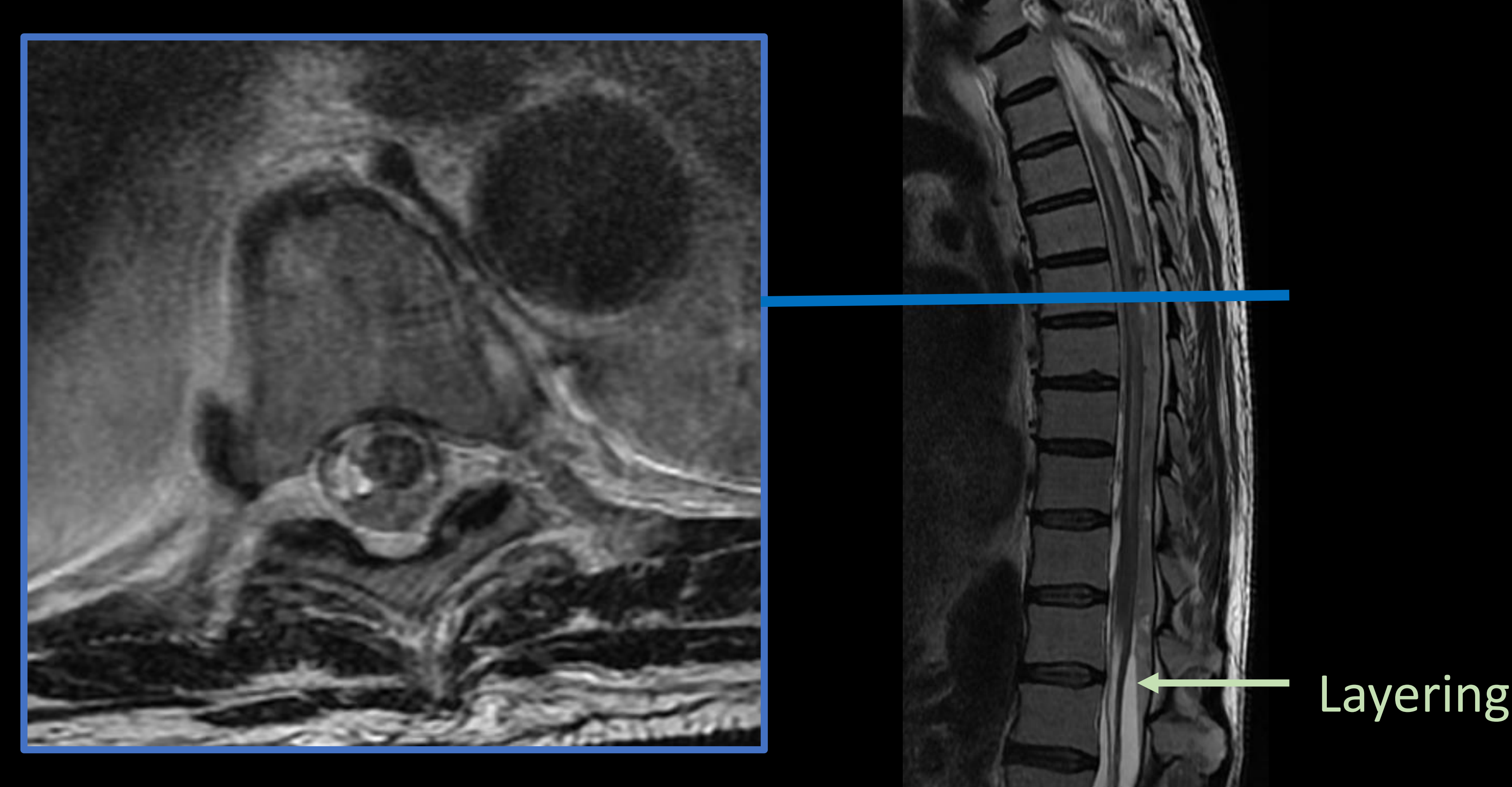


No trauma, Sudden Leg weakness, on anti-coagulation



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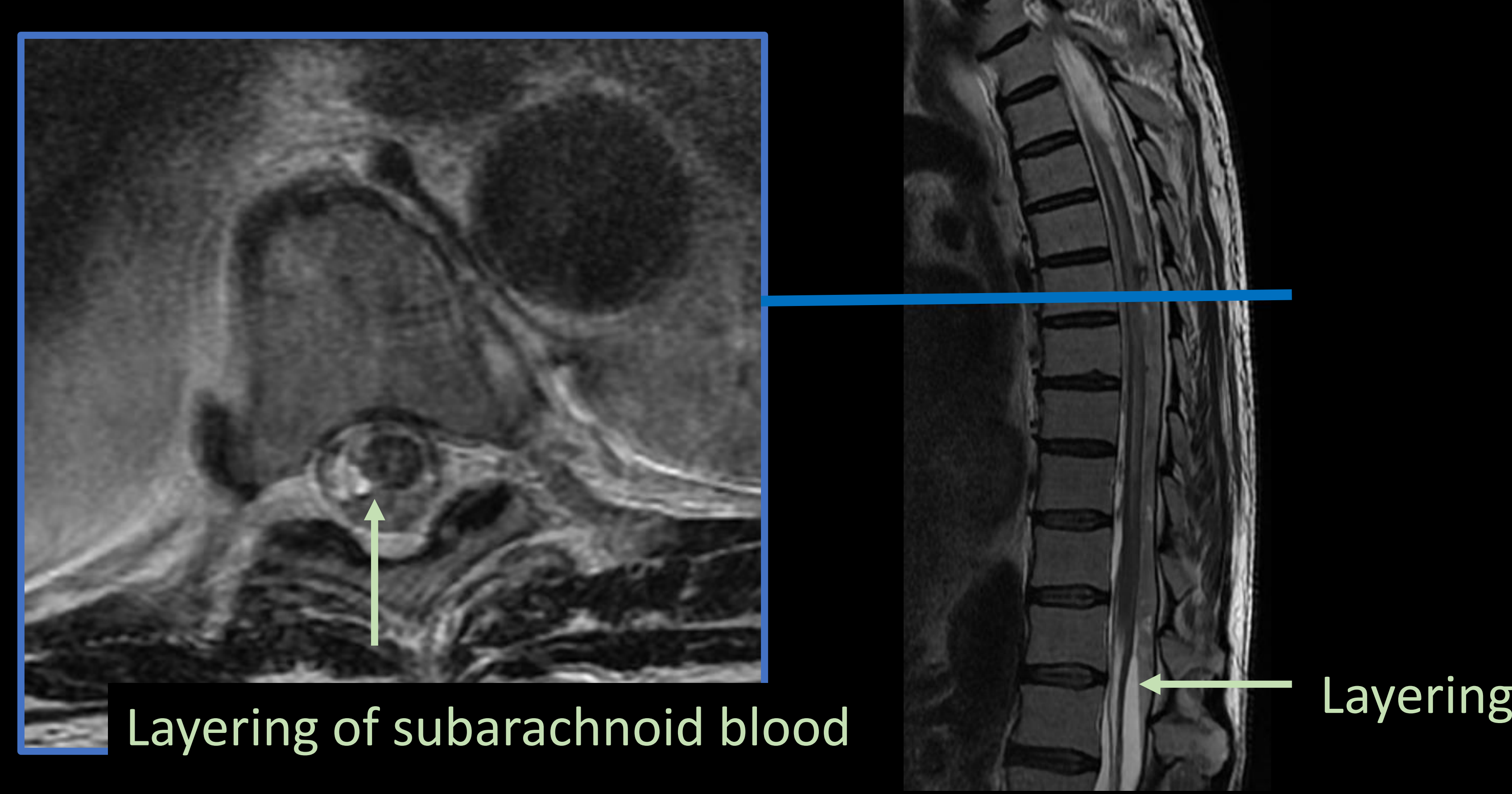

Share one thing you have learnt

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SPINAL EMERGENCIES

CAUDA EQ
SYNDR

METASATIC SPINAL
D COMPRESSION

INFECTION
(SpondyloDiscitis,
Osteomyelits, Epidural
Abscess)

ULAR
taneous
haemat na, ischaemia)

DIFFICULT PICK-UP
TIME IS OF THE ESSENCE
JUST SAY YES

Thanks to Dr Olga Kirmi, Dr Wajanat Jan, Mr Reza Mobasheri