



# **Interpretation of acute injury of head & spine**

**DR : F.ALBADR**

TO all my love brothers and sisters

\* Sorry I don't hold responsibility for any missing information or perhaps – I say perhaps – wrong material. **I swear to God** that I tried my best to present this lecture in the best way and I hope that what I wrote was enough to cover the subject .

If you have any question plz contact me at [www.ksums.com](http://www.ksums.com) or send to me at [zizo2rad@hotmail.com](mailto:zizo2rad@hotmail.com)

\* شكر خاص للدكتور فهد البدر على مراجعته للمذكرة ومساعدته لنا .  
\* هذه المذكرة إهداء إلى أخي علي الصغير على جهوده في الميكن واىضا  
مساعدته لي المعنوية بالراد  
🌟 هذا الرمز شيء مهم .

Diagnostic imaging قام بتلخيص كتاب  
خالد العودان

Lecture note قام بتلخيص كتاب  
عبد العزيز السعد

All note by

خالد العودان وعبد العزيز السعد

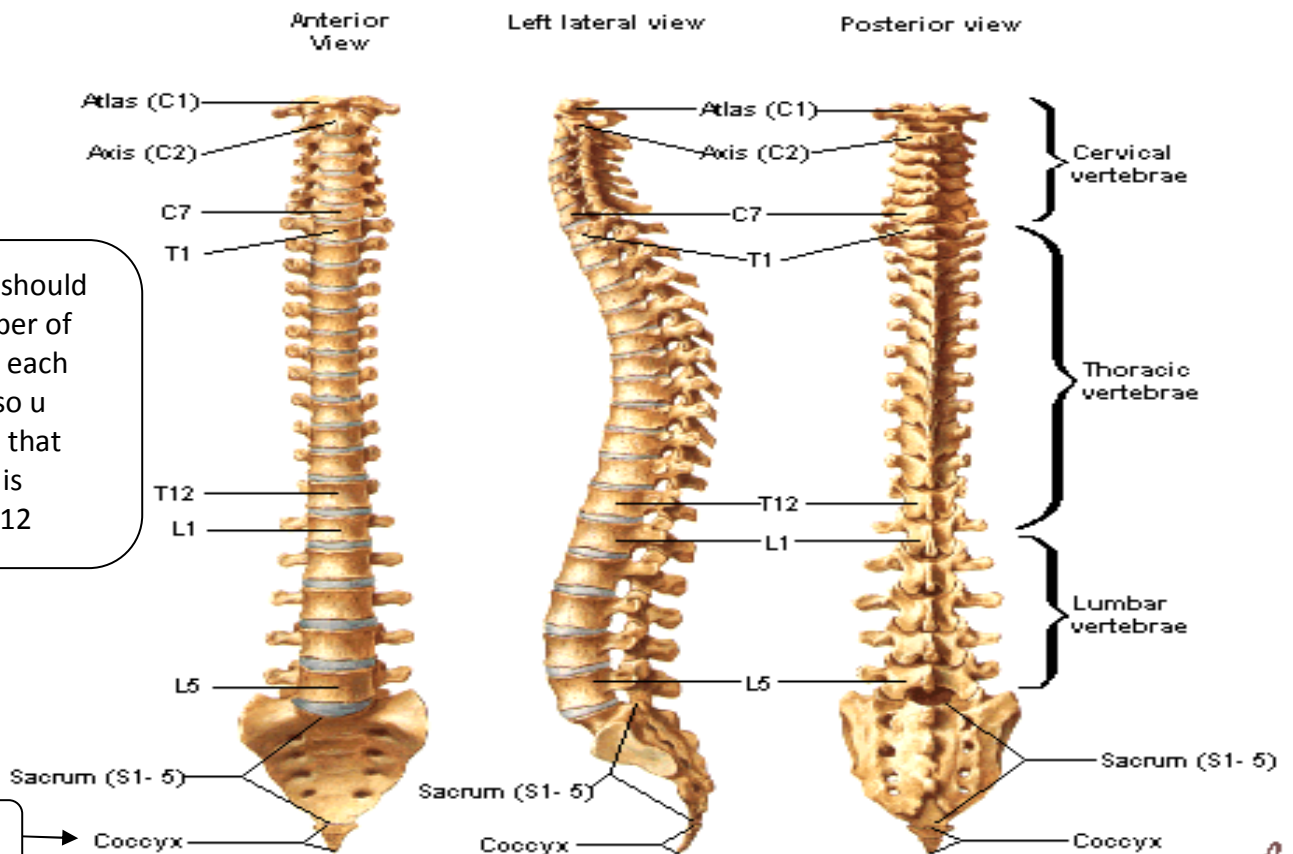
typed by dr.zeezu

( dr.zeezu ☺ )

# \* Introduction to imaging in CNS

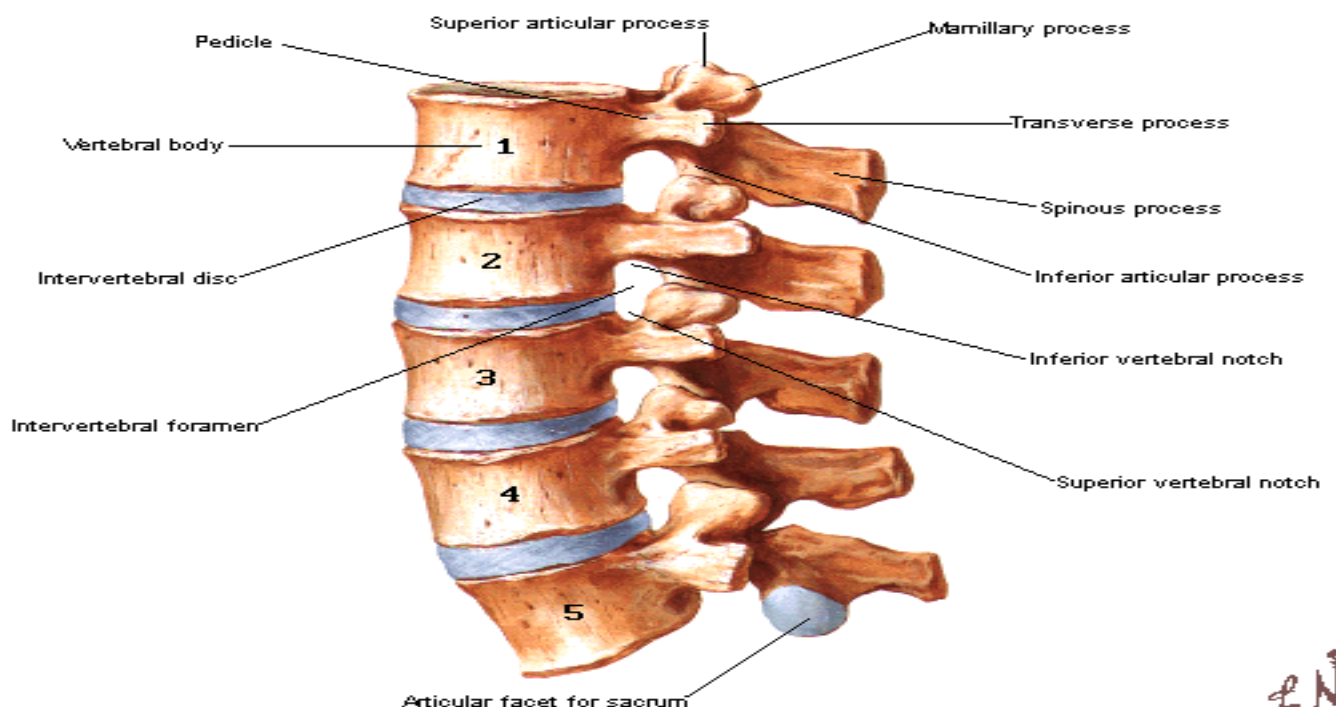
**First you should know the basic anatomy of CNS**

## Vertebral Column



## Lumbar Vertebrae [L1-L5] - Assembled

### Left Lateral View

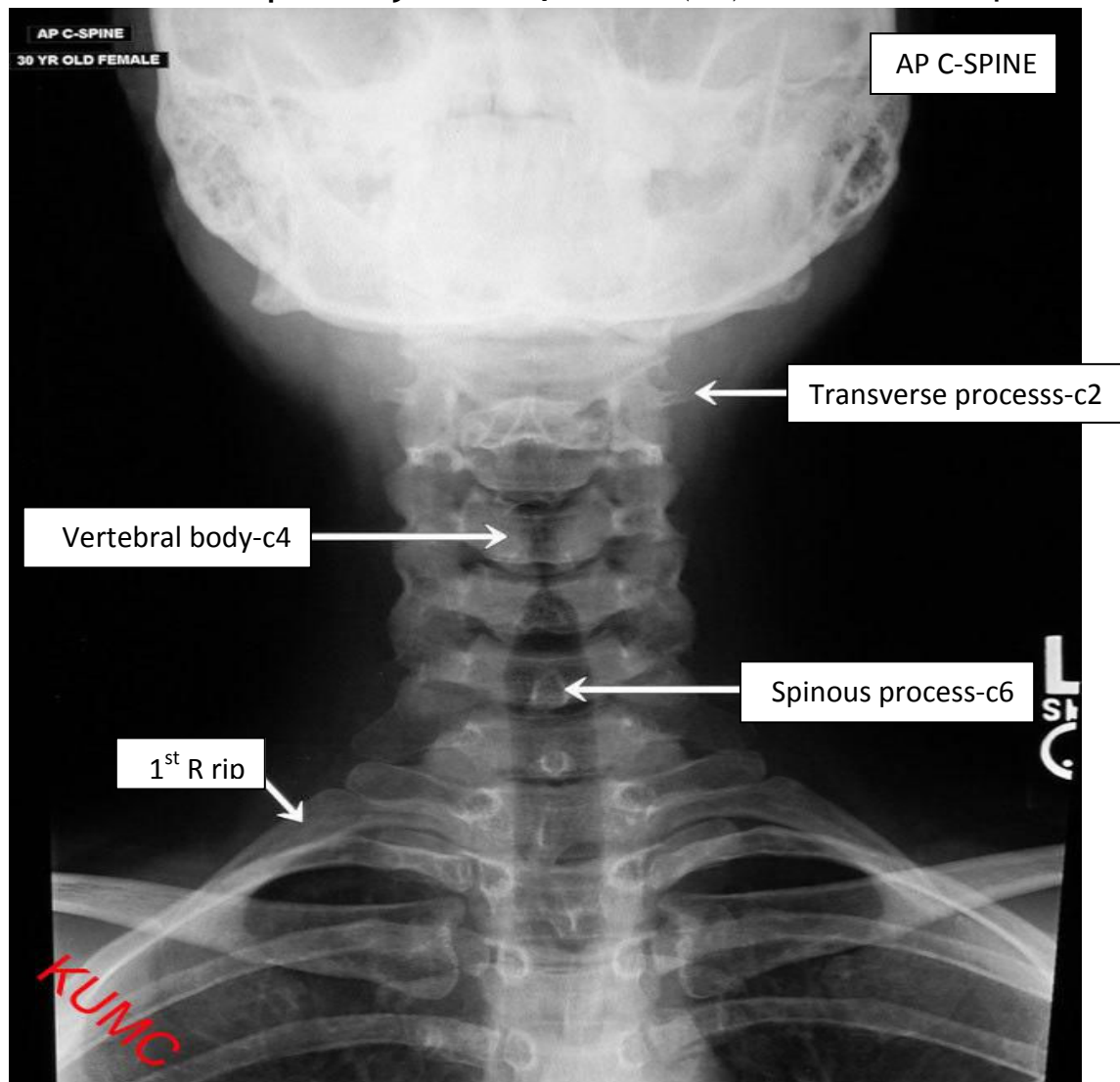


**S**pinal cord and spinal nerves are invisible on plain films but MRI is able to visualize not only the vertebrae and the intervertebral discs but the spinal canal and contents as well.

MRI is the preferred examination for degenerative, inflammatory and malignant conditions of the spine.

Other modalities employed in spinal imaging:

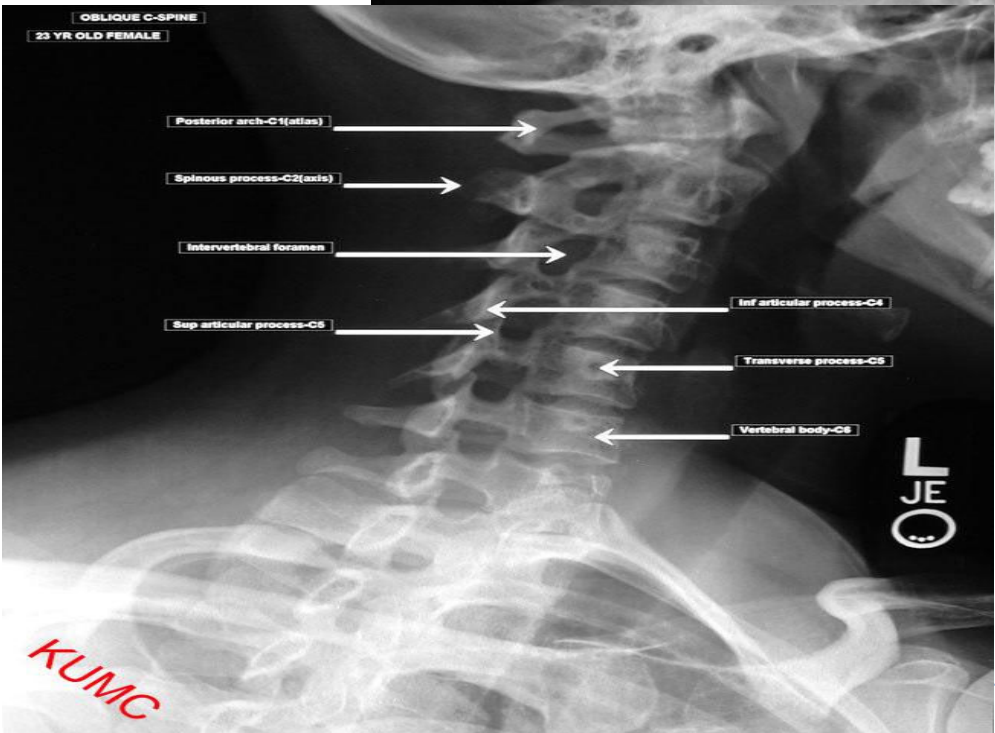
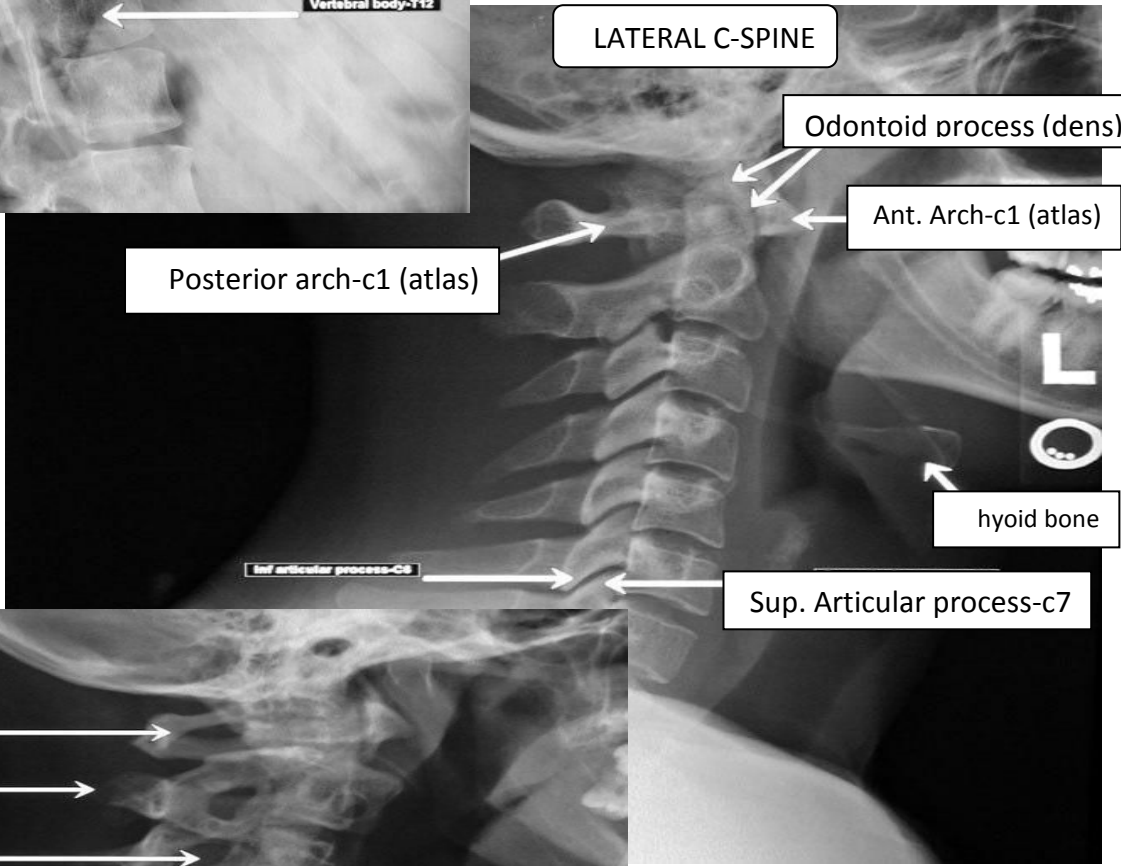
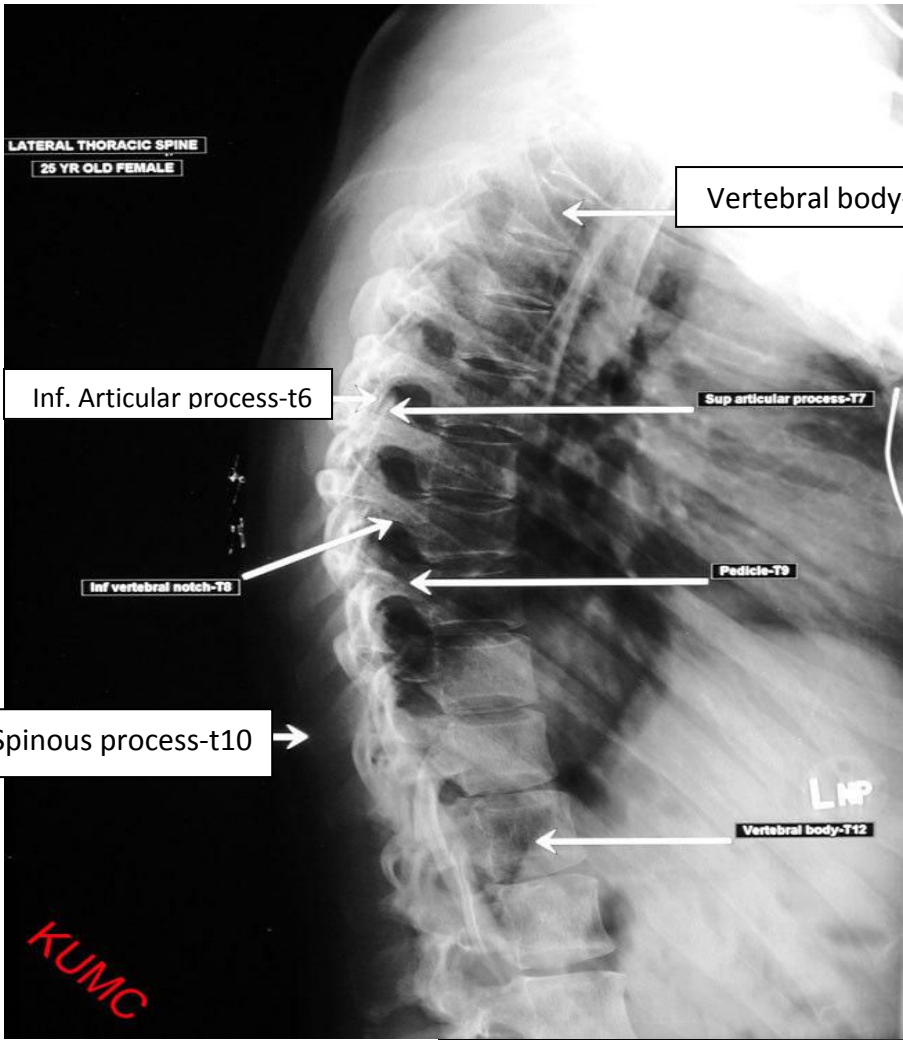
- ➔ Radionuclide bone scan: used in detection of bony metastasis and we use (tc99m MDP) .☼
- ➔ CT: plays an important role in spinal trauma
- ➔ Myelography: it involves injection of a contrast into the subarachnoid space by lumbar puncture(LP)but now it is replaced by MRI.



**Importance of 1<sup>st</sup> rib:** The Neurovascular bundle which passes down to it

**How to read x ray spine ?**

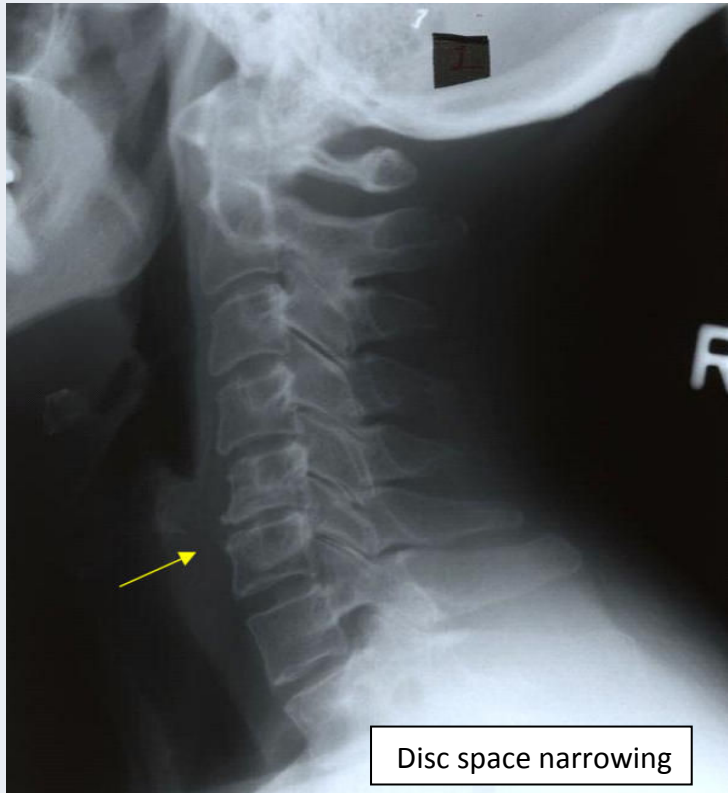
- |                                       |                   |
|---------------------------------------|-------------------|
| 1-check vertebrae body                | 2-check alignment |
| 3-prevetebral space (30% or 3-5mm) C3 | (100% or 20mm) C7 |
| 4-atlantaxial space                   | 5- disc space     |





## \* Abnormality of Spine

When you are reading x ray look for :  
Alignments and Subluxation .  
Paravertebral swelling.  
Collapsed vertebra.  
Spondylolysis.  
Spondylolisthesis.  
Retrolisthesis.



### Note

**Collapse of vertebral bodies:** A collapsed vertebral body is one which has lost height..it's most easily appreciated on lateral plain film of the spine. If any collapse is present it's essential to look at the adjacent disc to see if it is narrowed and to check if part of any pedicle is destroyed.

Causes may include :

- 1-metastases & myeloma
- 2- infection
- 3-osteoporosis & osteomalacia
- 4- trauma (most imp. cause)💣



### Note

→ Hangman's fracture : is a fracture of pars interarticularis of C2 . usually we use x-ray but we use MRI to see the cord inside the spine.💣

→ When there is overflexion of the spine,, a trauma to the back will hit the weakest part which is the thoracolumbar junction and a fracture will occur at that area of the spine .

### Note

Distance between anterior arch of atlas and odontoid process in adult = 3mm 💣👉👈 and 5mm in children.

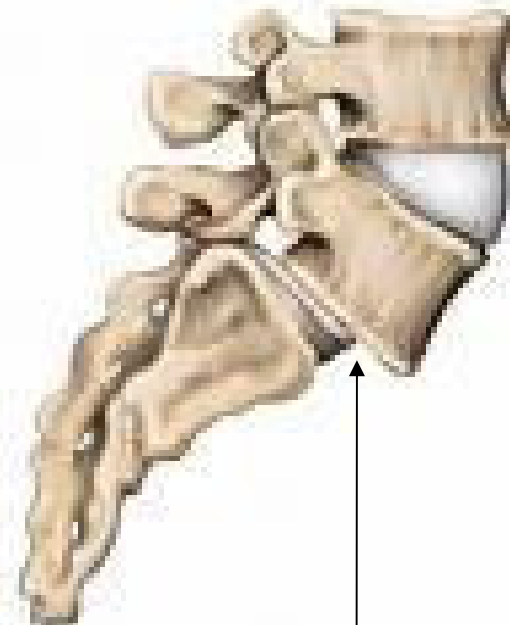
# \* Spondylolisthesis

There is 4 grades classification :

1. 0-25% Grade 1
2. 25-50% Grade 2
3. 50-75% Grade 3
4. >75 % Grade 4

## Note

It is slip of one vertebral body on the one below it  
Usually غالباً at lumbosacral junction(L5\S1) and  
between L4&L5 .  
Result of a defect in pars interarticularis(it's  
between sup. And inf. Articularis facets .  
Thought 2 be due to a stress fracture  
can see in lateral projection and better in oblique  
films .👁\*



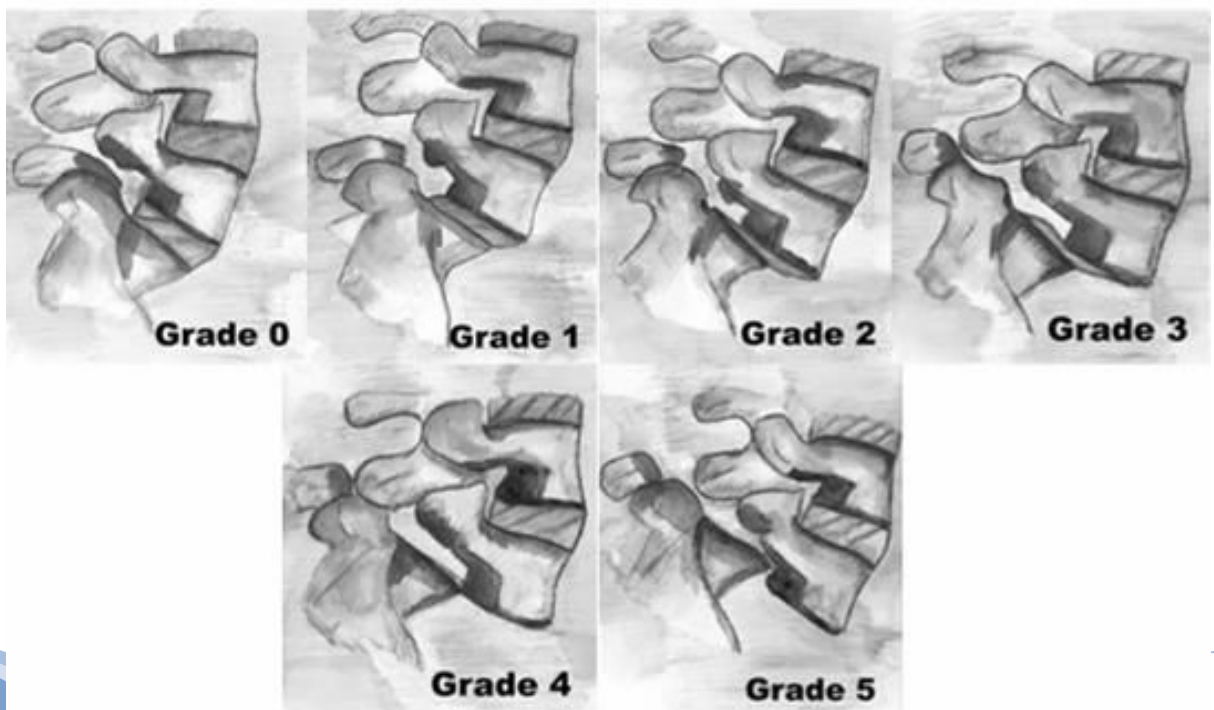
Two  
grading  
system

in the lectuer the classification:

- 1- <30% grade 1
- 2- 30- 60% grade 2
- 3- >60% grade 3



And there is also 6 classification :

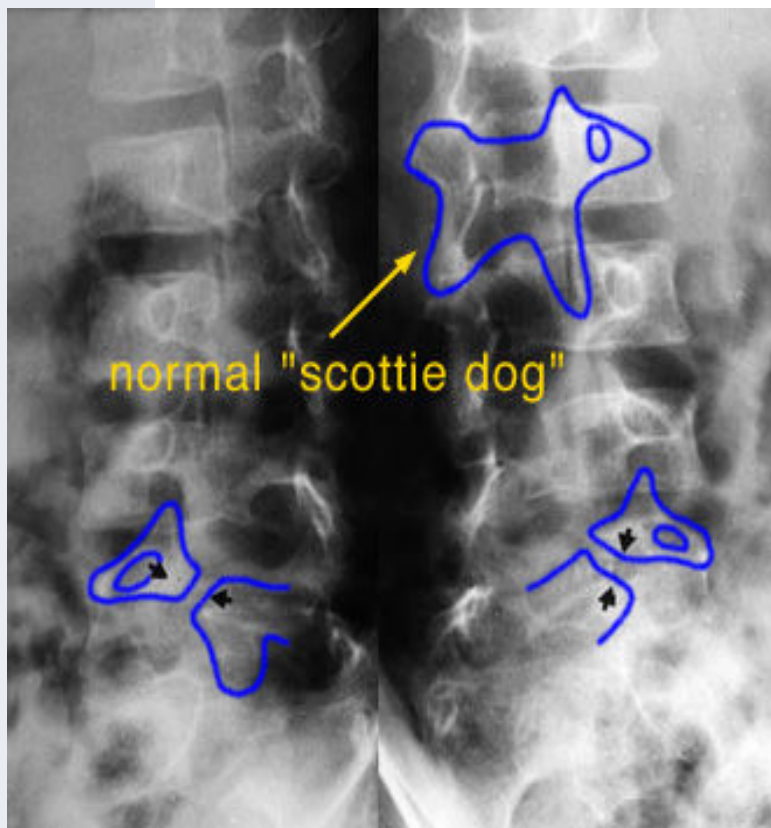
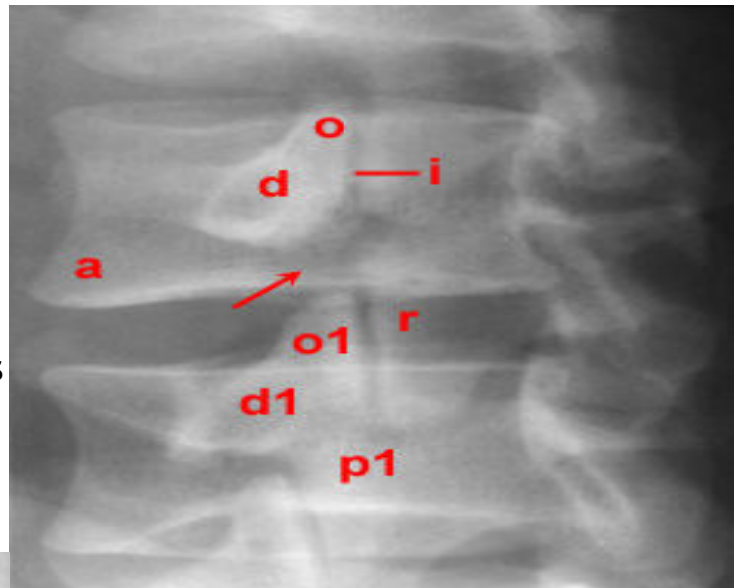


# \*Spondylolysis:

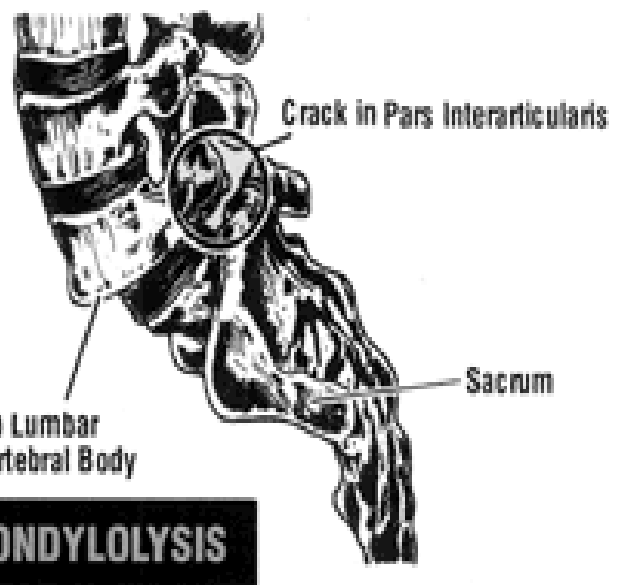
## Note

Here it's defect only in pars interarticularis without a forward slip of vertebral body on other  
It's a stress fracture common in people doing active sport . to be seen at X-ray in oblique view or CT . 🌟

a-vertebral body.  
d- Rt. pedicle, (en face. مواجهة)  
i- interfacetal joint.  
o- Rt. superior articular process.  
r-Rt. inferior articular facet  
Arrow-absent pars = spondylolysis



Defect in the neck of scottie dog

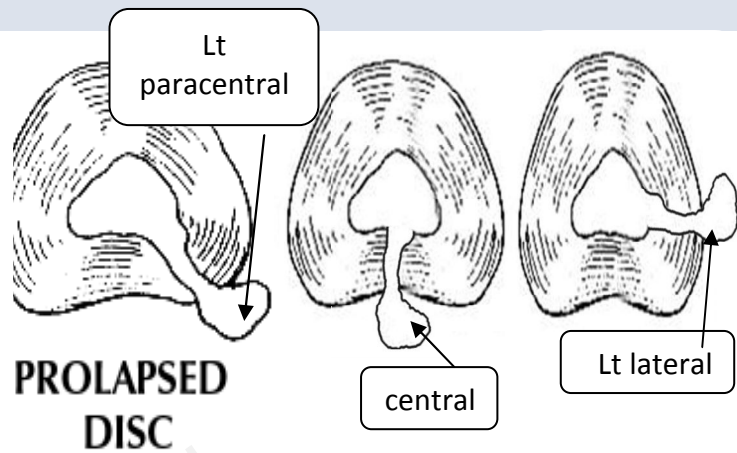
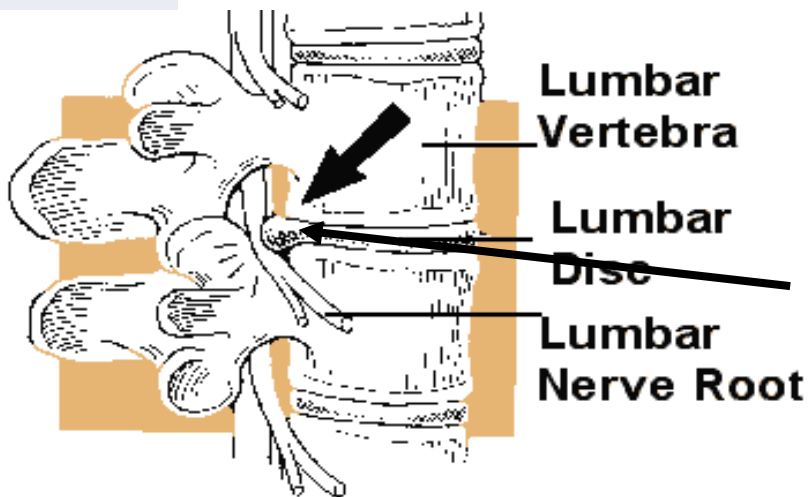


## Lumbar Spondylolysis

This condition is usually caused by a fracture in the pars interarticularis area of the vertebrae.



## \* Disc prolapsed:



## Disc prolapse :

Intervertebral disc ,when it is prolapsed , it Compresses the adjacent nerve root That emerges from the neural foramen, near to it ..

It causes back pain, Radiculopathy ,Sciatica

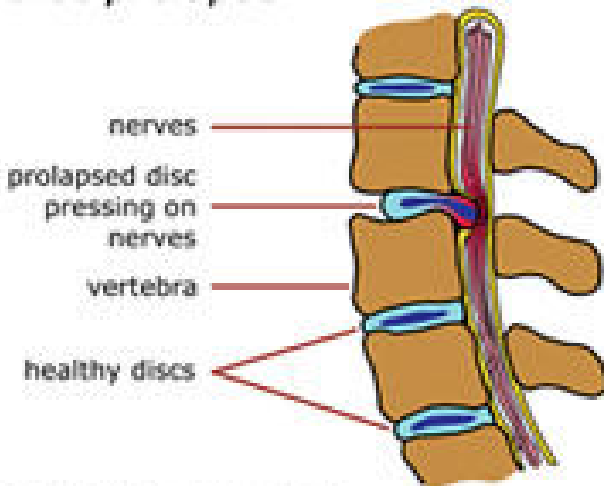
It may be : ☛

- centrally
- para centrally
- laterally ..

\*Cauda equina also may be compressed by prolapse ..



## Disc prolapse



The jelly-like substance in the disc spills out, pressing on the nerves.

L5,S1 disc هنا  
prolapse > effecting  
S1 nerve ☛



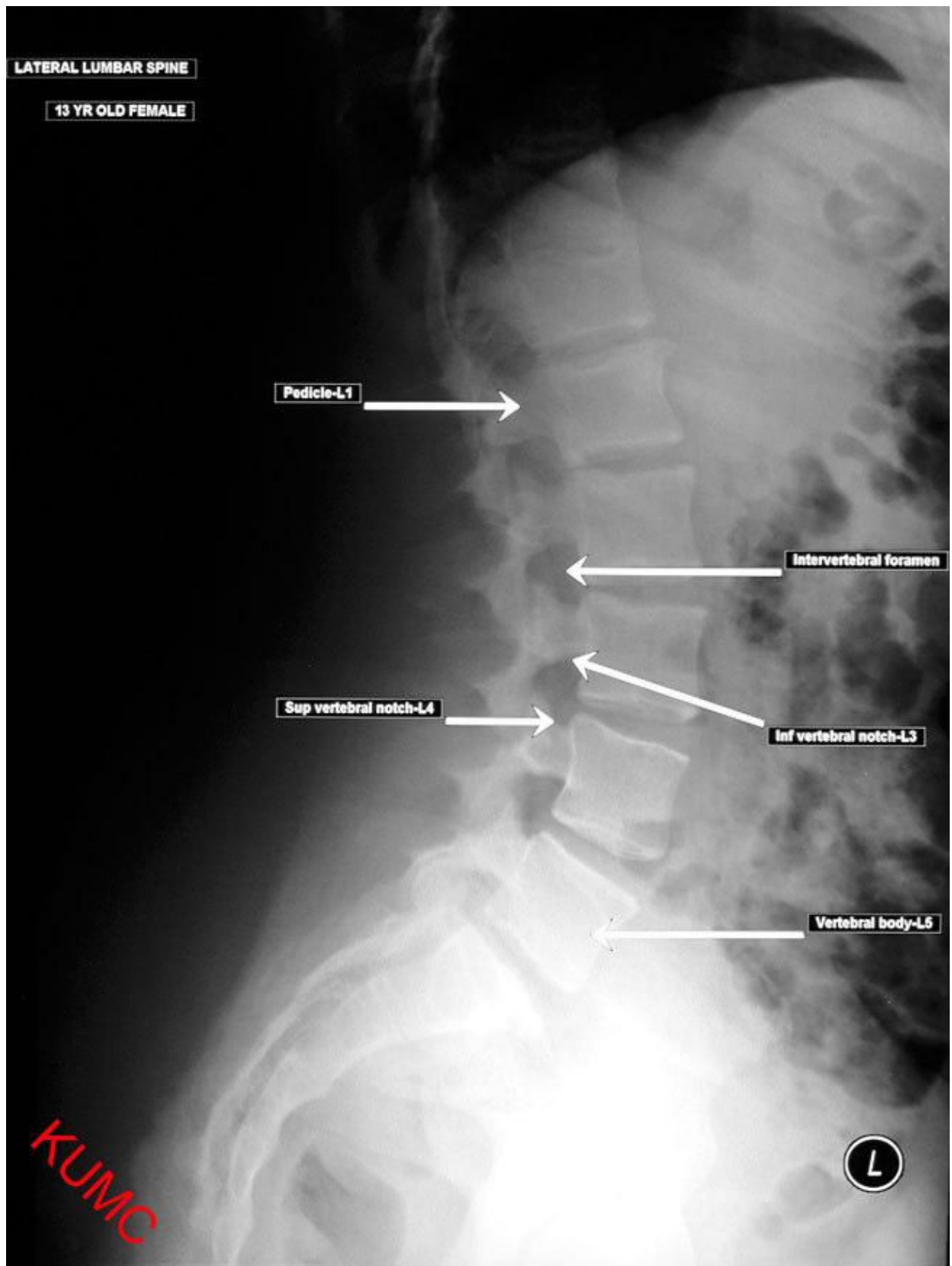
Sagetal T2 MRI – BETWEEN L5&S1

Dr.zee zuuuuuuuu

## Note

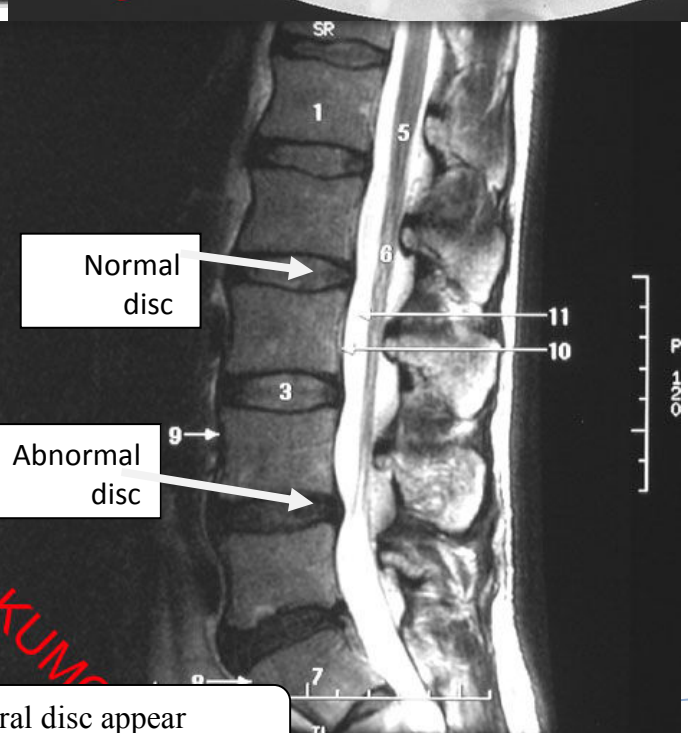
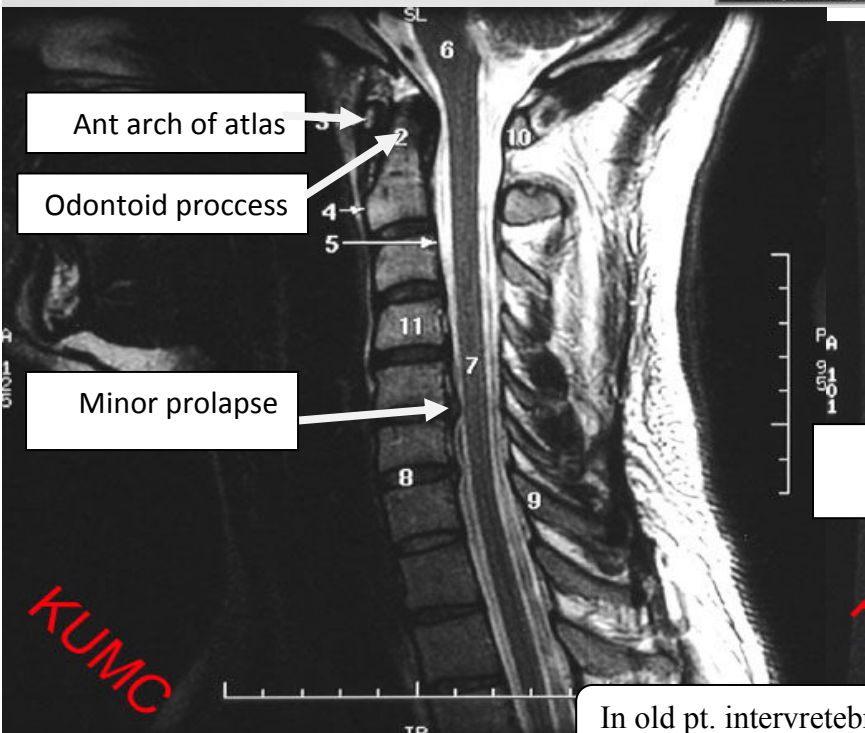
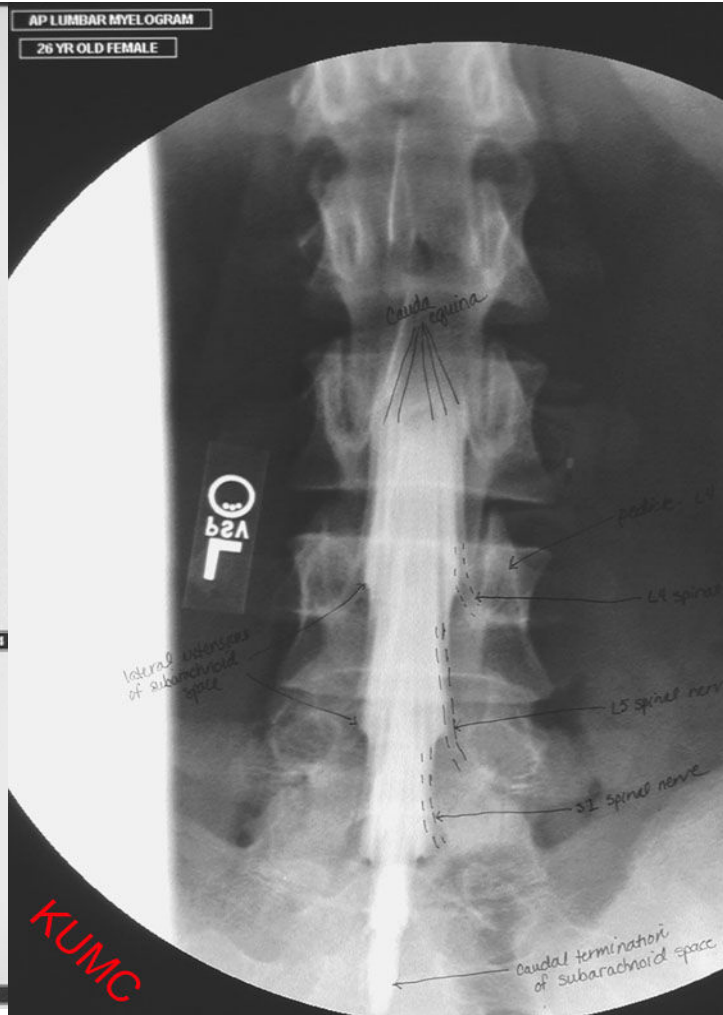
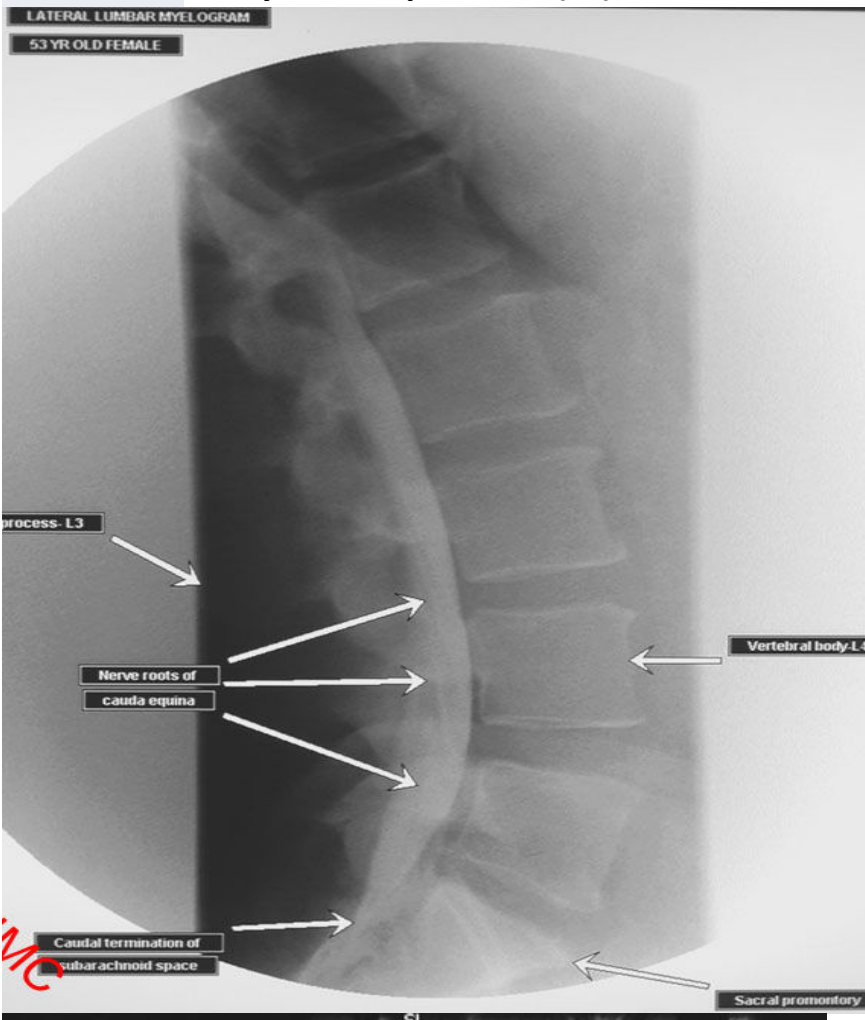
Disc prolapse occurs in lower lumbar L4\L5= 20%  
L5\S1=70%

Prolapse is due to extrusion of soft disc material from  
nucleus pulposus & characterized by sciatic pain



## \* Myelogram

My friend myelogram we used rarely because of MRI is safe & non invasive but we can use it when MRI is contraindicated .It's used for dx of disc prolapse\*.  
It's an x-ray with water soluble contrast medium injected in theca (spinal canal) by lumbar puncture (LP).\*

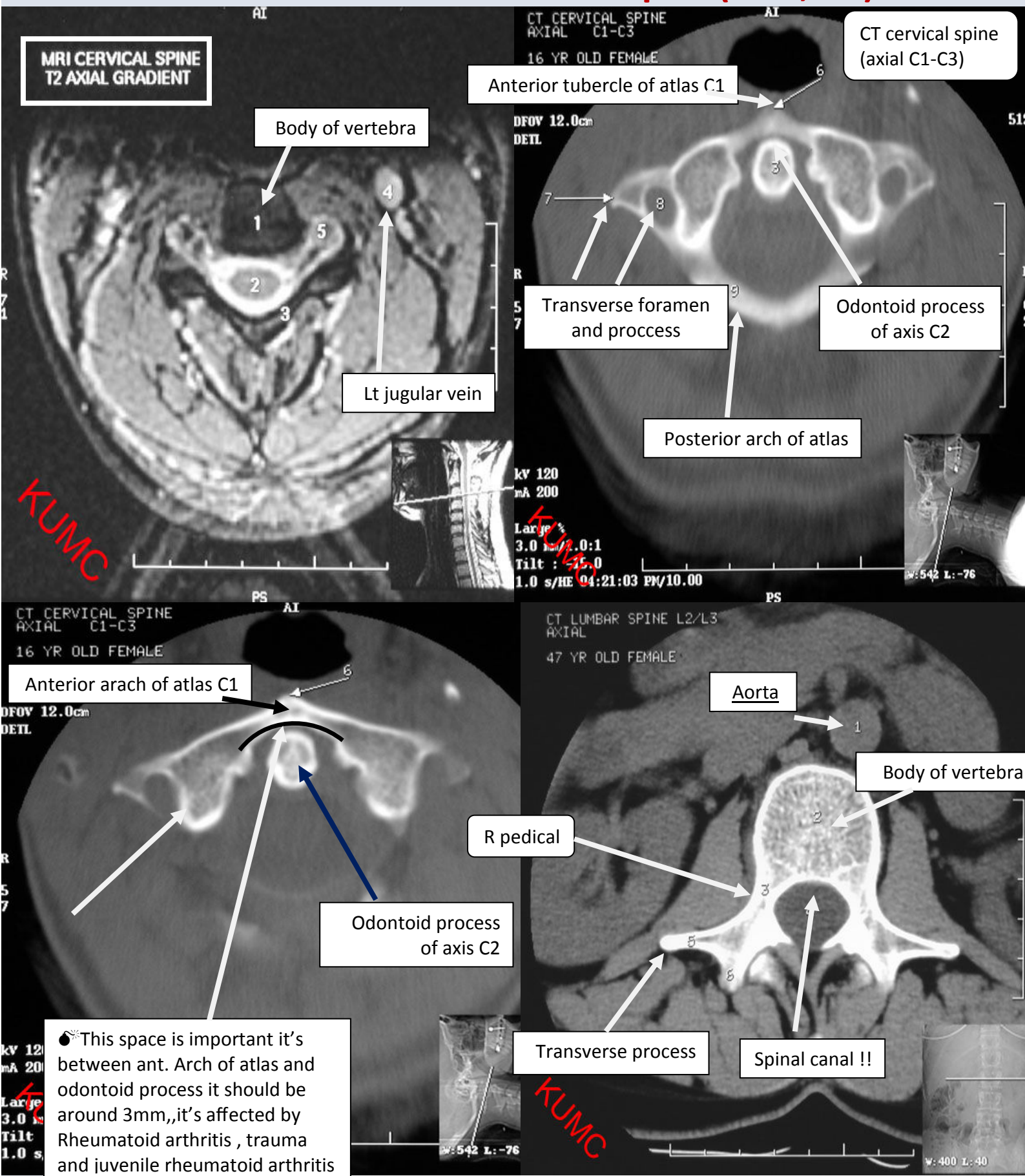


In old pt. intervertebral disc appear Dark ,not bright due to loss of it's fluids



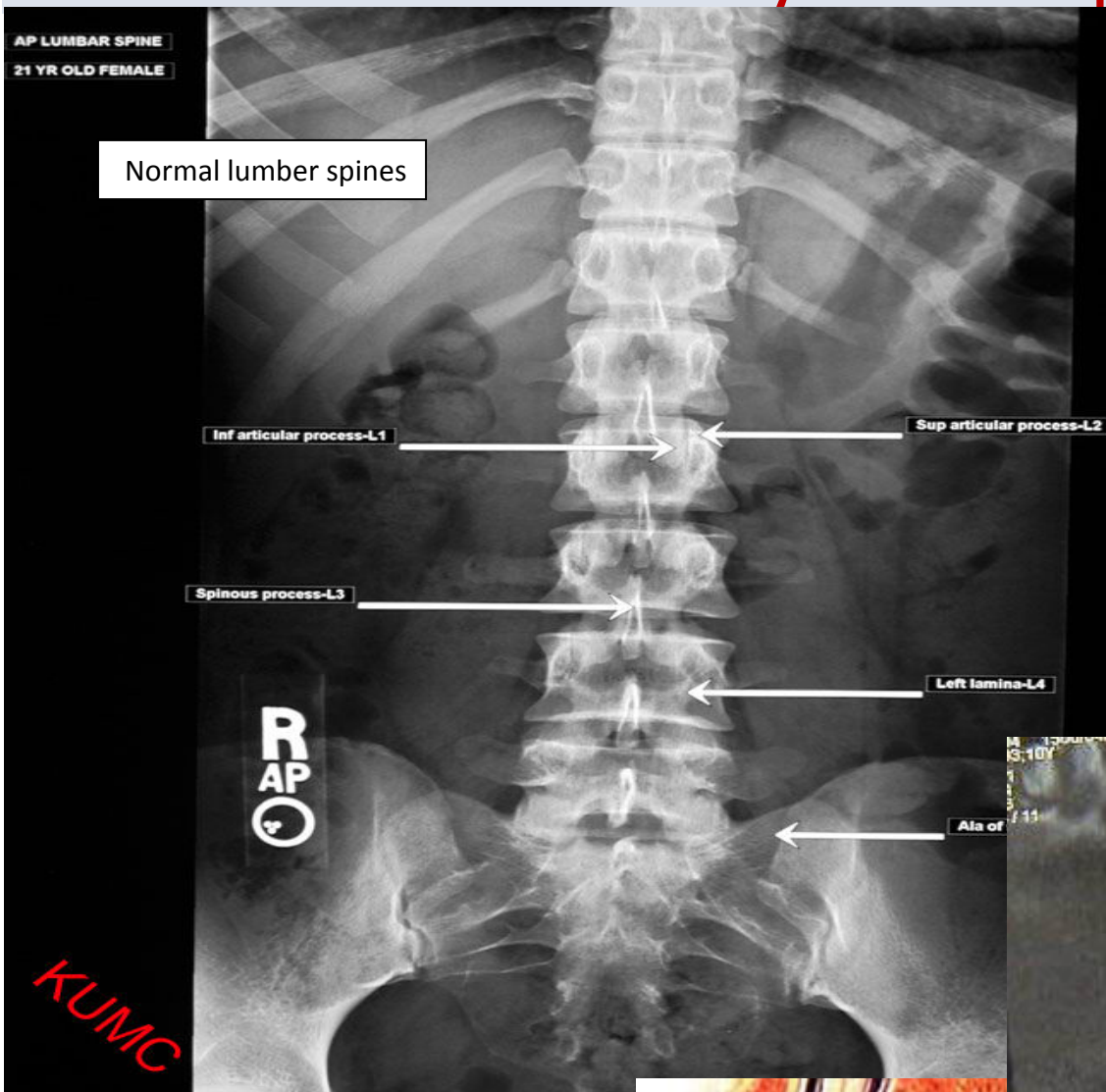
هذه أمثلة فقط عليك بالرجوع للكتاب

**\* Transverse section of the spine(MRI, CT) .**





## \* Tuberculous osteomyelitis of the spine (pott's disease)



Eaten vertebrae



Tuberculous osteomyelitis of spine (Pott's disease) with angulation and compression of spinal cord



كل هذي الصور  
من مرضى TB



# \* Brain injury ☹️

If u have pt. with RTA u have to look for:

- 1- Fracture
- 2- Hematoma (hemorrhage )
- 3- Brain edema

How to read CT brain ?

- 1-Site of the lesion (Intra or extra axial)
- 2- site of Ventricles
- 3-skull and orbit

Normal calcification in the brain

- 1-pineal gland (in midline)
- 2-choroid plexus (within ventricles)
- 3-basal ganglia ( if the pt. above 40 years is normal )

Hyperdense lesion occurs in

**Acute Hematoma** (like epidural ☹️)

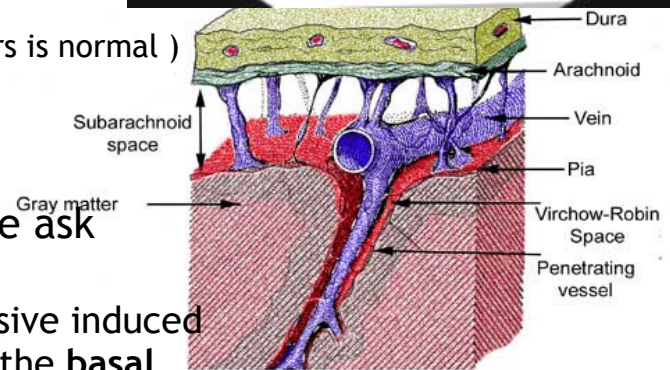
So look for fractures if not fracture ask

Is the patient hypertensive ?

Yes , so this is may be due to hypertensive induced

Hemorrhage . and the common site are the **basal ganglia** ☹️☹️, thalamus, cerebellum and pons. Predominantly, hemorrhages of the basal ganglia involve the putamen .

Epidural .  
Note the shape  
(biconvex) and it,  
hyperdense in CT (acute



# \* Hematoma of the brain

Type of haematma :

- 1- Subdural
- 2- epidural
- 3-subaracnoid

If u have hematoma You have to know: Age of pt (pt. present), cause of hemorrhage, shape of hemorrhage (appears), site of lesion and character.

Subdural	epidural (extradural )
Older age group	Younger age group
Minor Hx of trauma or no trauma	Usually, there is a Hx of trauma (RTA)
Not limited by sutures	Limited by sutures
Curvilinear in shape	Biconvex shape (lens shape)
Between dura & brain (below the dura )	out side of brain (the dura)
Usually venous ☹️☹️	Usually arterial blood

# \* Herniation of the brain :

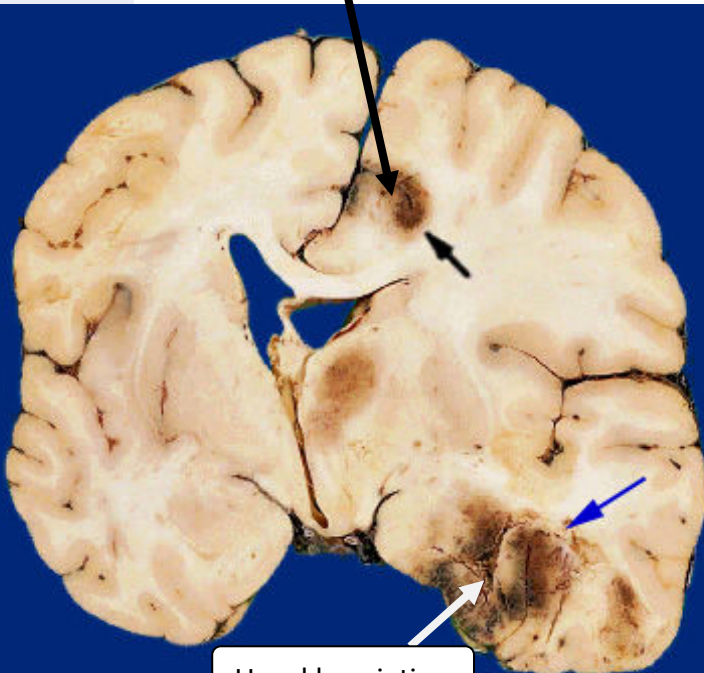
## Types of herniation:

- 1-Subfalcine
- 2-Uncal herniation

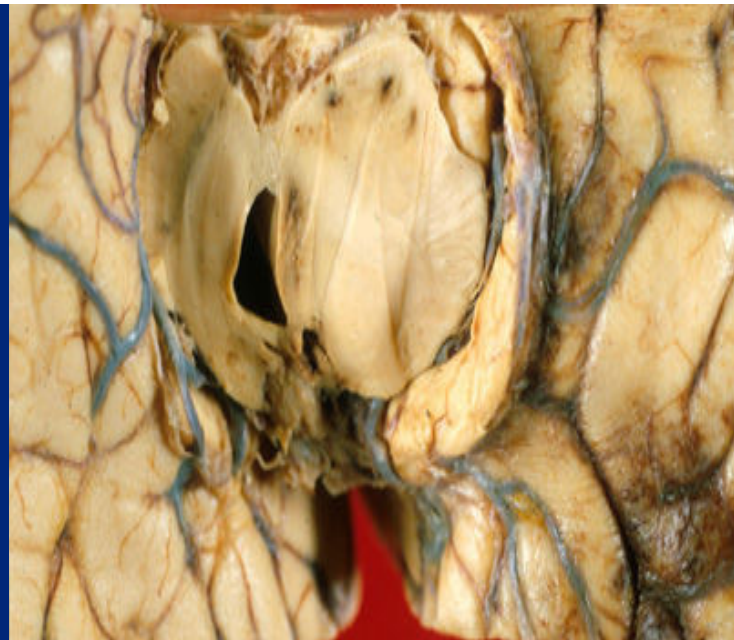
- 1- Subfalcine :it's a compressor of one cerebral hemispheres and midline shift to other side
- 2- Uncal : herniation of parahippocampus and hippocampus areas,,, the innermost part of the temporal lobe, the uncus, can be squeezed so much that it goes by the tentorium and puts pressure on the brainstem . and may lead to fixed dilated pupil (unilaterally ) due to affection of 3<sup>rd</sup> nerve ..

مو شرط انو الهيماتوما يسوي لك هيرنيشن أي باثولوجكل ممكن يسوي لنا هيرنيشن وراح ناخذ بالمحاضرة الجاية شيء ممكن يسوي مثل قلايوما

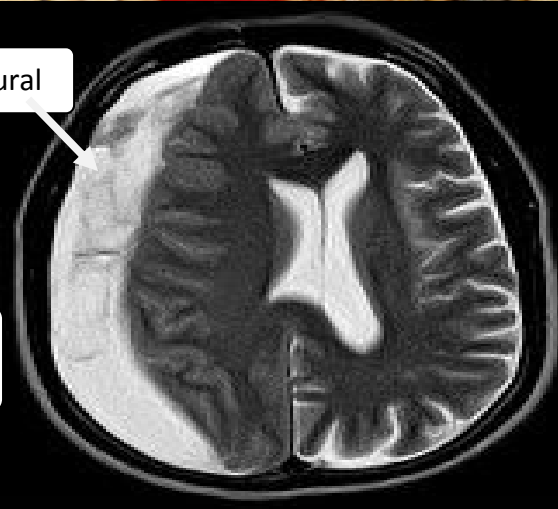
Subfalcine herniation



Uncal herniation

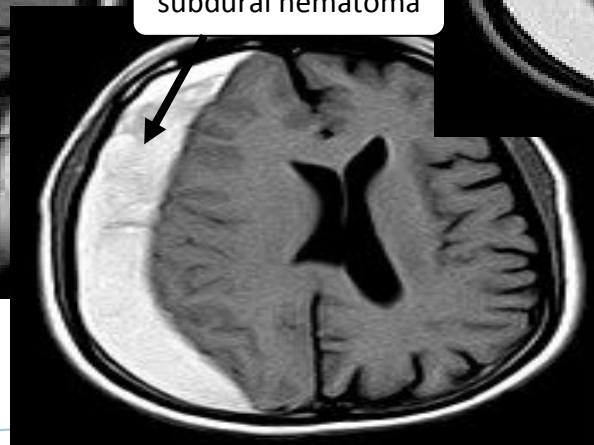


T2 MRI subdural



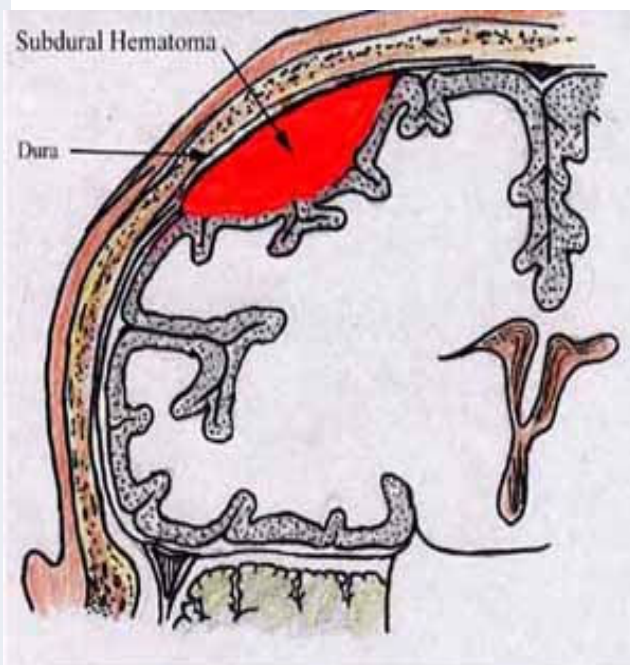
T1 MRI

This is T1 MRI subdural hematoma



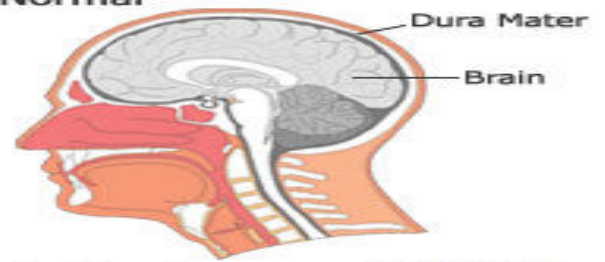
بالمحاضرة القادمة توجد تفاصيل كاملة عن T1 & T2





## Subdural Hematoma

Normal



Subdural Hematoma

Subdural Hematoma



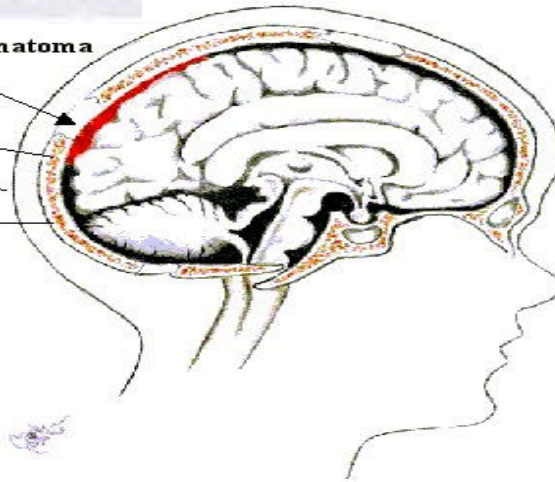
اللي باللون العنابي ☺

Subdural Hematoma

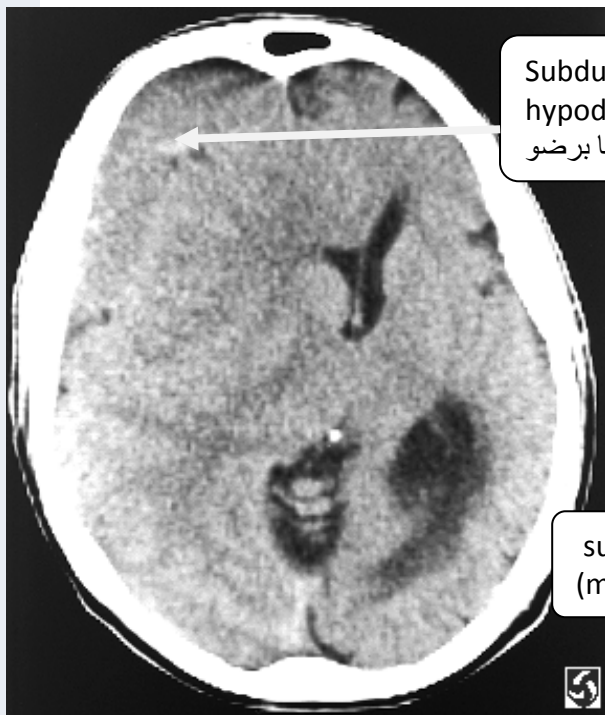
Dura

Scalp

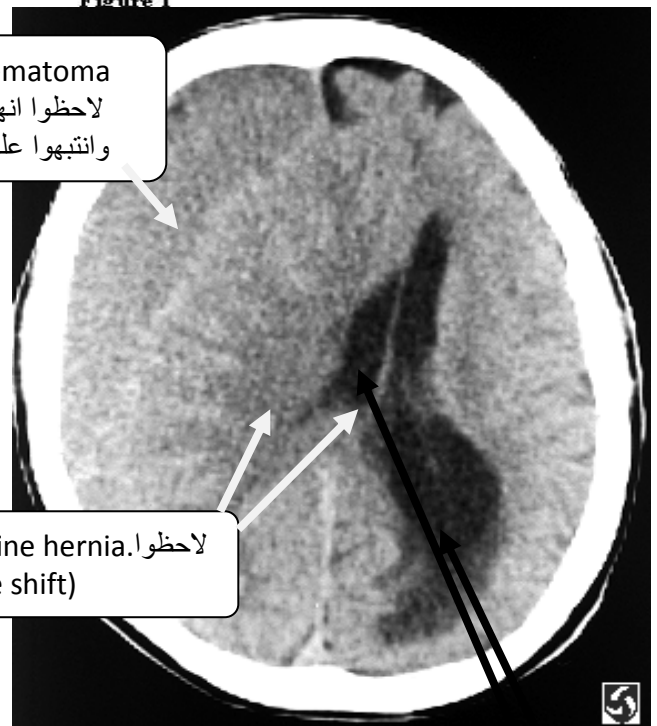
Skull



Subfalcine herniation ≈ midline shift



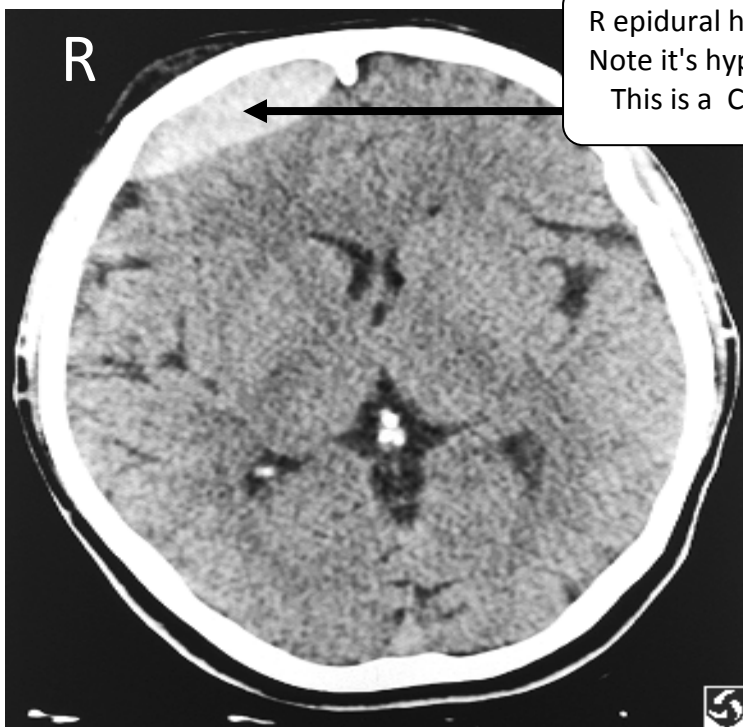
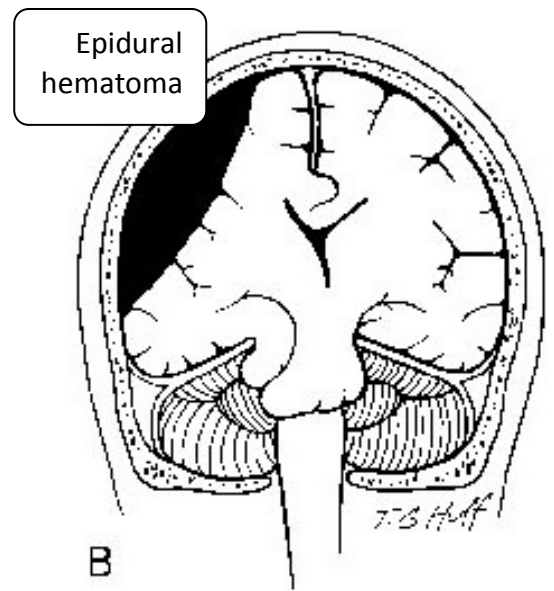
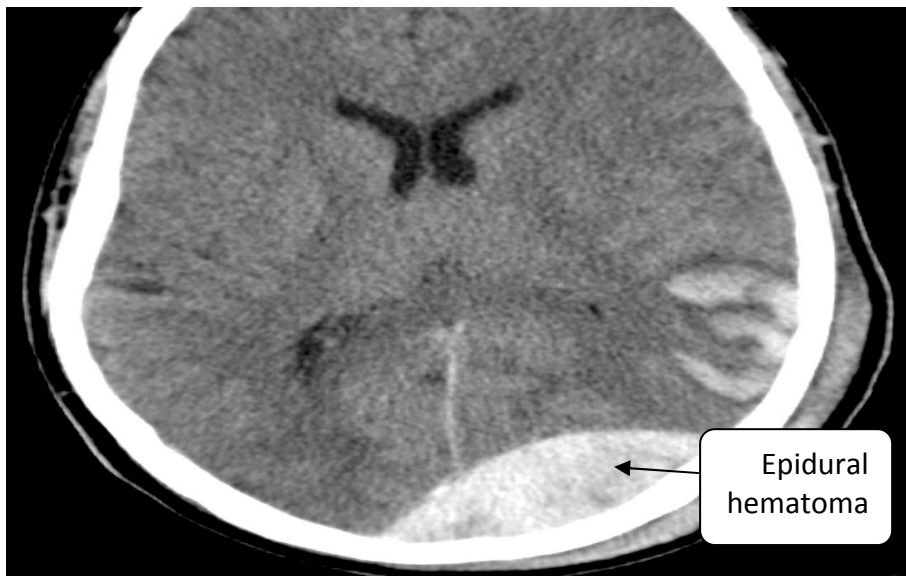
Subdural hematoma hypodens  
لاحظوا انها  
وانتبهوا على شكلها برضو



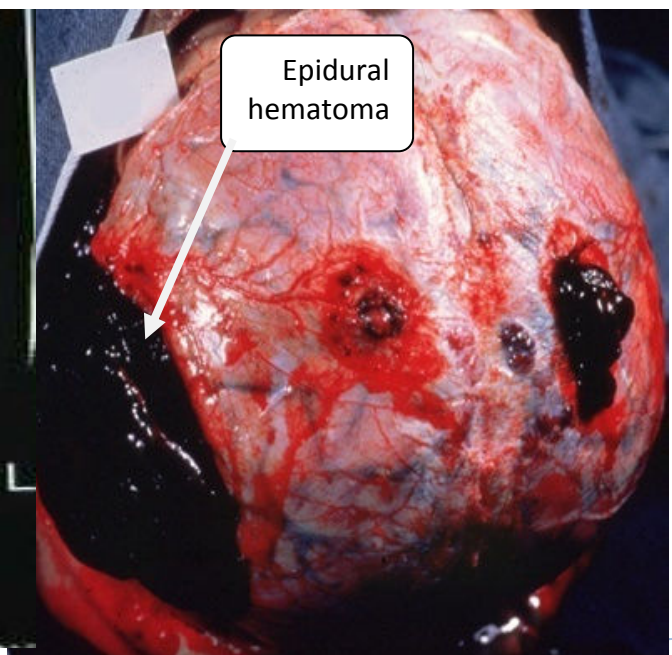
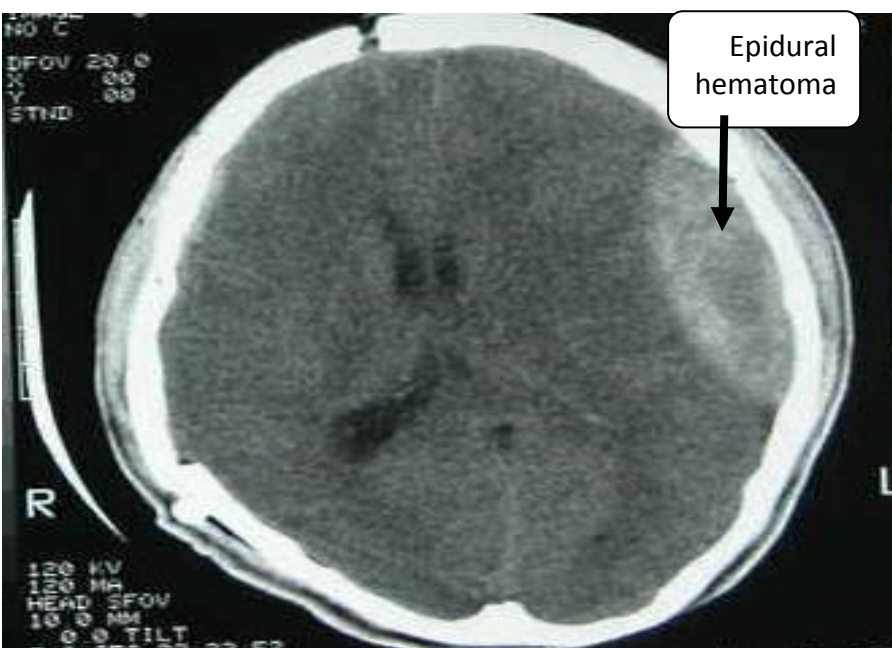
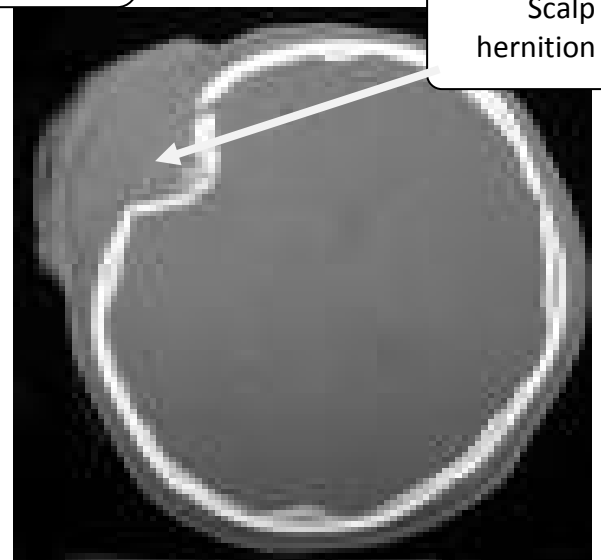
لاحظوا.  
subfalcine hernia.  
(midline shift)

ventricle

If hematoma acute it will be hyper dense  
with epidural or subdural



R epidural hematoma  
Note it's hyperdense  
This is a CT

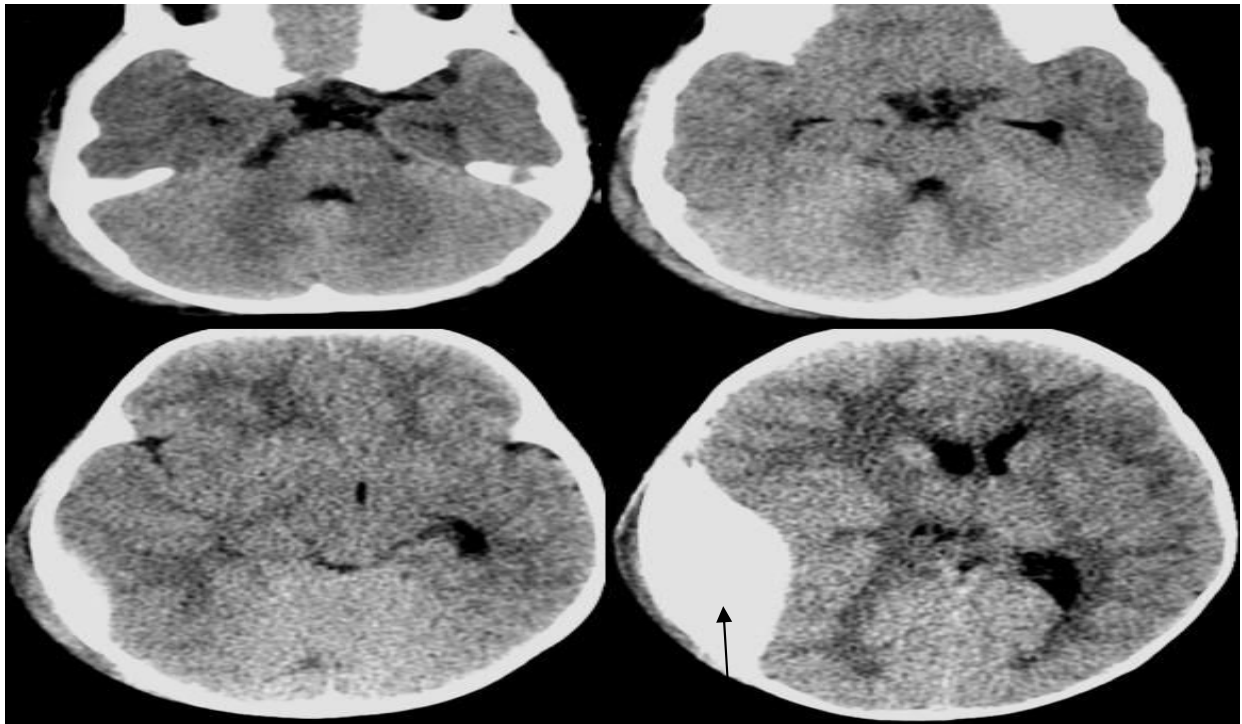




# \* Edema in the brain

Type of edema :

Vasogenic 🌧️	Cytotoxic
Usually caused by: RTA, infection, metastasis gliomas	Usually caused by infarction (CVA) may also by defect in Na/K pump
can respond to steroid treatment	can't respond to steroid treatment
extracellular	intracellular



In CT edema hypodens

SDH

Done  
Abdulaziz alsaad