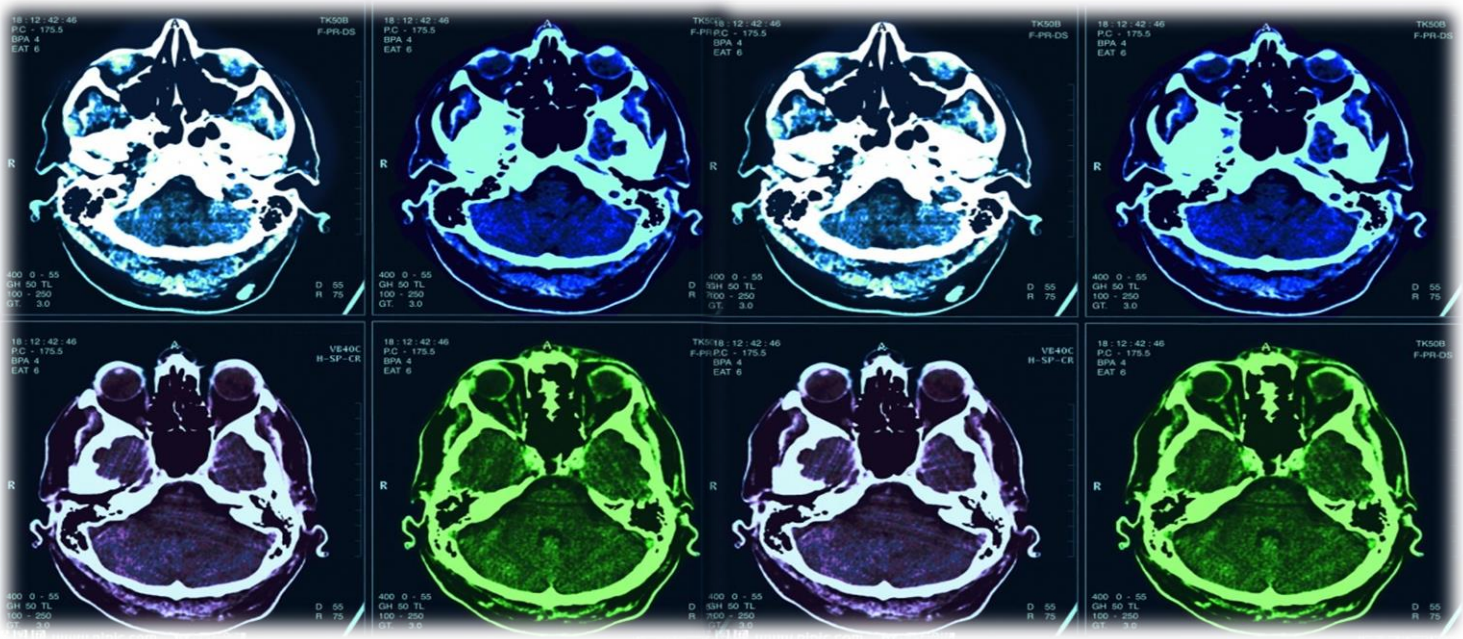
Radiology
Team 436

436
MEDICINE
KING SAUD UNIVERSITY

Neurosychatry Block



SPINAL CORD

Lecture one

Objectives:

1. Identify and distinguish between common types of radiographic images.
2. Recognizing the use, limitations, advantages and disadvantages of the different radiological modalities.
3. Recognize the radiological presentation of the common spinal cord diseases and abnormalities.

Red: important

Green: Doctor's notes

Grey: Extra

You can skip this page if you already know it.

Introduction:

At the beginning we're going to review some basic concepts.

Body sections:

- Coronal (frontal) plane.
- Midsagittal (median) plane.
- Transverse (horizontal) plane.

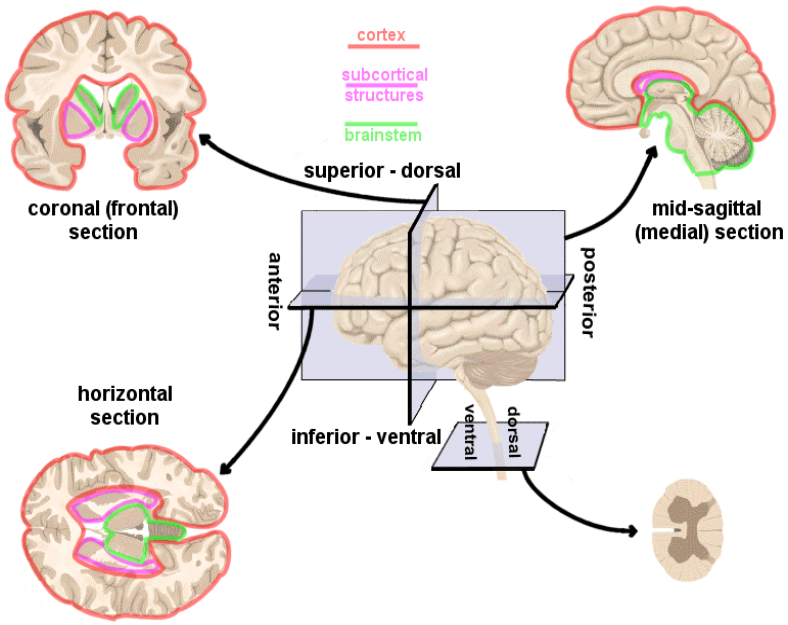
Types of Imaging views:

A. PA (posterior-anterior) view.

B. AP (anterior-posterior) view.

C. Lateral view.

D. Open mouth view.



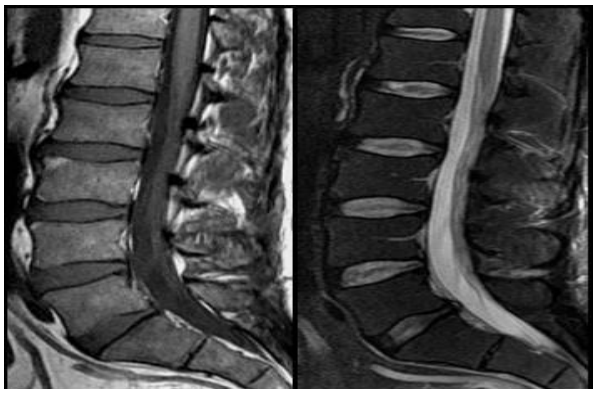
Imaging modalities:

- US (Ultra Sound).
- X-ray (Radiographs).
- Angiography.
- CT scan (Computerized Tomography).
- MRI (Magnetic Resonance Imaging).

Imaging Methods to Evaluate Spinal Cord:

X-ray

CT



MRI

X-Rays (Radiographs)

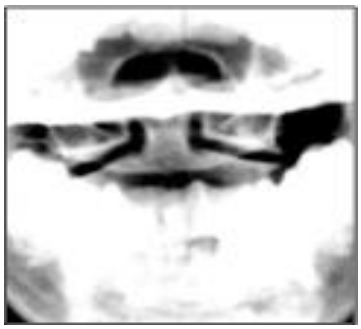
- Often the first (initial) diagnostic imaging test ordered by physicians.
- **Quick and cheap.**
- Uses small dose of radiation to visualize the bony parts.
- Can detect:

1. Spinal alignment and curvature.
2. Spinal instability – with flexion and extension views
3. Congenital (birth) defects of spinal column. (like scoliosis).
4. **Fractures caused by trauma**.
5. Moderate osteoporosis (loss of calcium from the bone).
6. Infections.
7. Tumors.
8. Important for assessing cervical spine. Has to include all the cervical vertebrae + the junction between C7 and T1.

AP view - patient with scoliosis

An adequate AP view

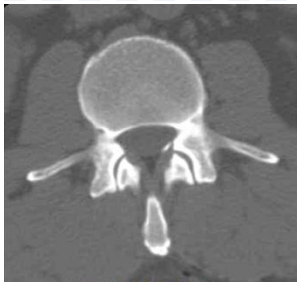
It's not an adequate film; because only 6 vertebrae are seen, has to include all the 7 + the junction between C7 & T1.



Open mouth view

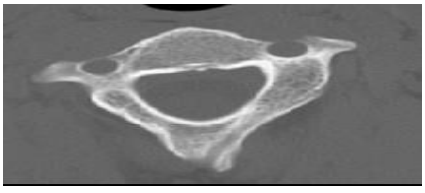
An adequate lateral view

CT Scan (Computerized tomography):



- Uses ionized radiation.*
- Gold standard of imaging for Bone fractures and traumas. *
- Obtain 2-D images > can be processed to 3-D images.
- Entire spine can be imaged within a few minutes.(5 minutes)*.
- Detailed information regarding bony structures.
- Limited information about spinal cord & soft tissues.

Normal C-spine with CT:



Axial Sagittal Coronal

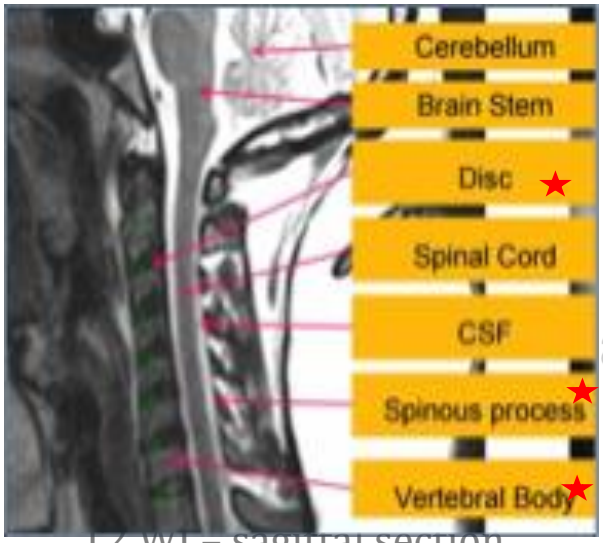
*in male`s slides(Uses radiation).
*only in female`s slides .
*in male`s slides (few second).

MAGNETIC RESONANCE IMAGING (MRI):

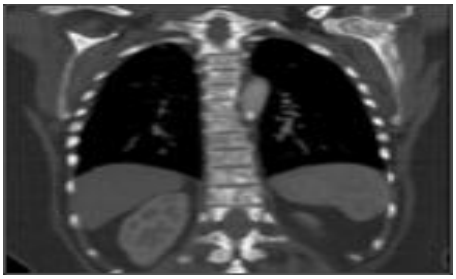
- Gold standard of imaging for spinal cord disorders.
- No radiation
- Can identify abnormalities of bone, soft tissues and spinal cord.
- Limitation: laustrophobic patients, uncooperative and children may need sedation or general anesthesia.
- Contraindications include implanted devices e.g. cardiac pacemakers and electromagnetic devices. (Most of modern artificial joints and advanced cardiac pacemakers are MRI friendly).
- MR vs CT: In MR we see the bone gray and black, where as in CT we can see the bone white

IT has 2 common sequences:

- T1 weighted image. (Fat = light color and CSF = dark color)
- T2 weighted image. (Fat = dark color and CSF = light color)



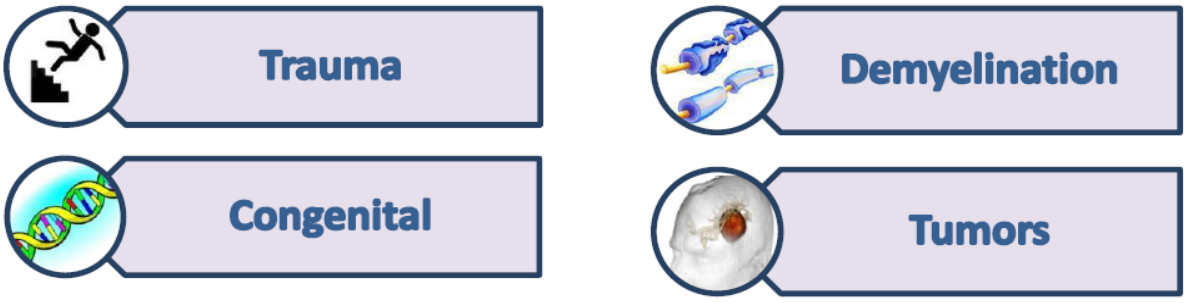
T2 WI – sagittal section



T2 WI – coronal section

	Indications	Advantages	Disadvantages
X-RAY	Trauma Intra-operative localization	Inexpensive Widely available Quick Portable	Radiation exposure Difficulty in interpretation High rate of false-positive findings
CT	Trauma	Visualization of bony structures Widely available Quick	Less useful at showing soft tissue structures Radiation exposure -Expensive
MRI	Patients with "red flags" (urgent conditions) Radiculopathy Tumor Myelopathy	Visualization of soft tissue structures (e.g. relationship of disc to nerve) No radiation exposure	Contraindications: presence of ferromagnetic implants, cardiac pacemakers, intracranial clips, Claustrophobia Availability -Expensive

Abnormalities of Spinal Cord



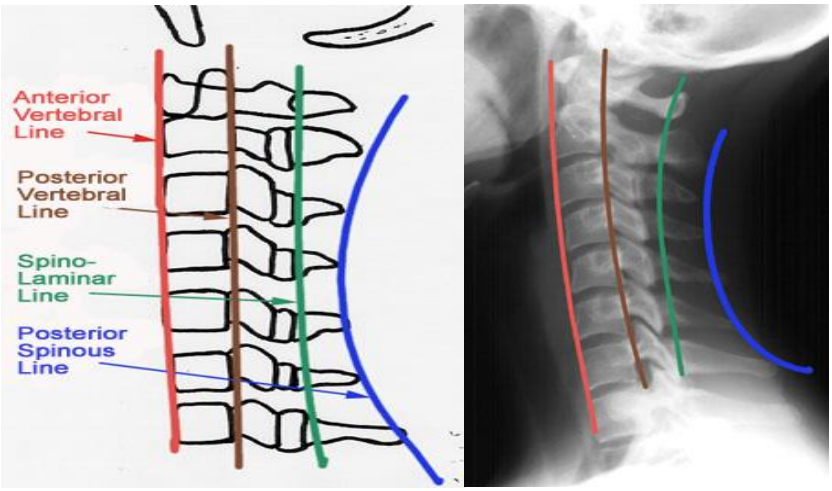
What are the differences between X-ray, CT scan and MRI?

Trauma

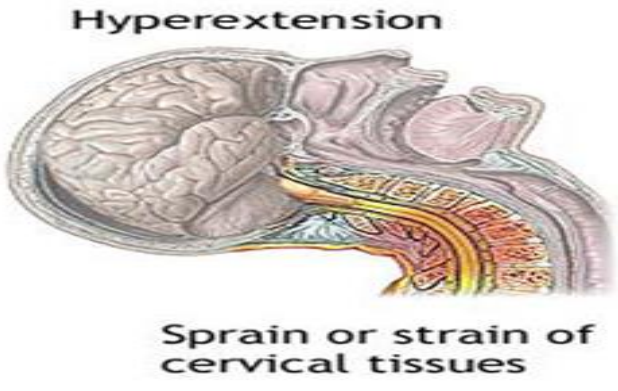
- Plain films (X-ray) are usually the first imaging method used in minor trauma.
- If fractures, or other bony defects, are suspected, CT images can provide very detailed information.
- When soft tissue / spinal cord injury is suspected, MRI is the imaging method of choice.

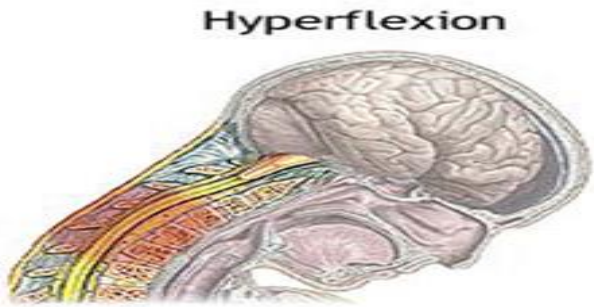
Assess for parallel lines* **(imaginary lines):**

1. Anterior vertebral line.
2. Posterior vertebral line.
3. Spinolaminar line.
4. Posterior spinous line.



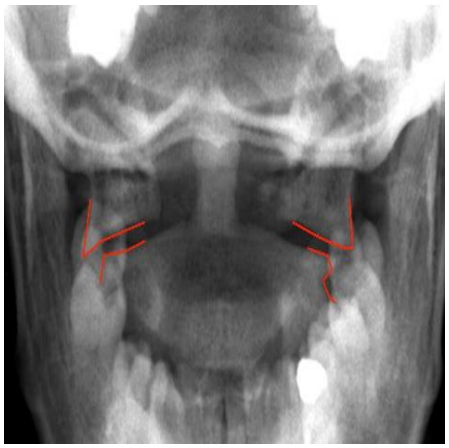
Mechanism of injury:

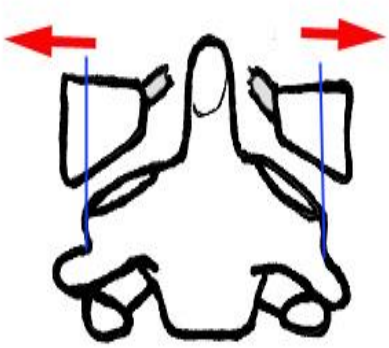




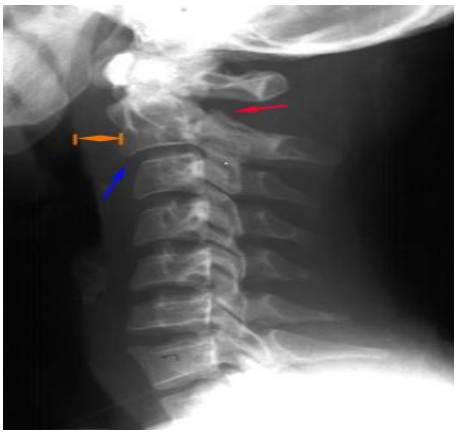
*This is so important!!! And the divisions depend on anatomy.

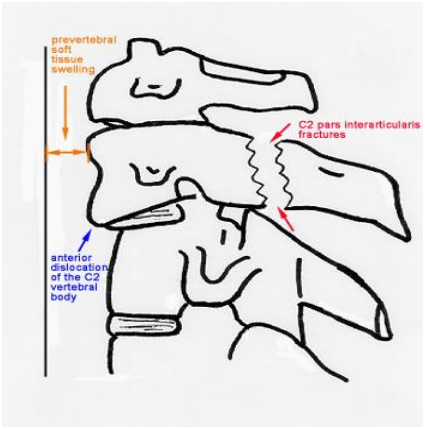
Compression Fracture:



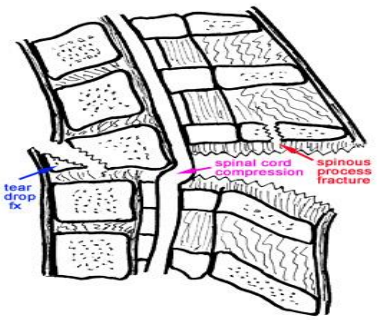


Hangman's Fracture: result of hyperextension



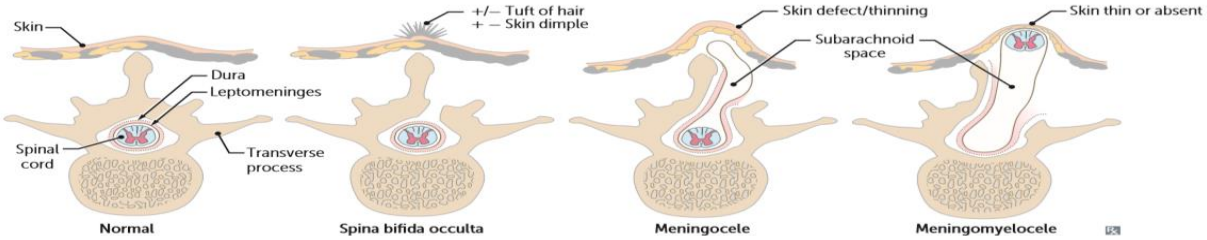


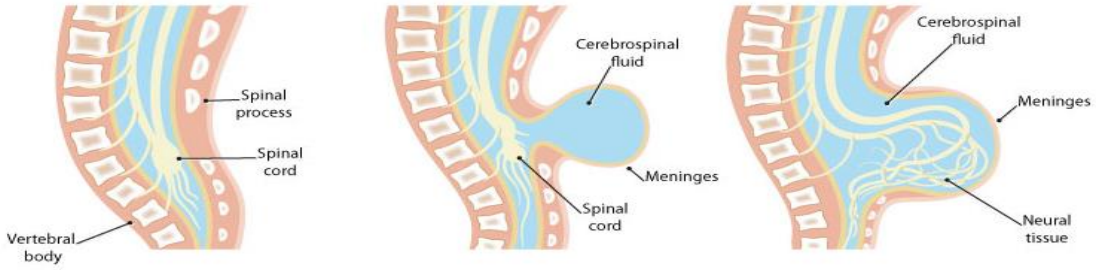
Hyperflexion:

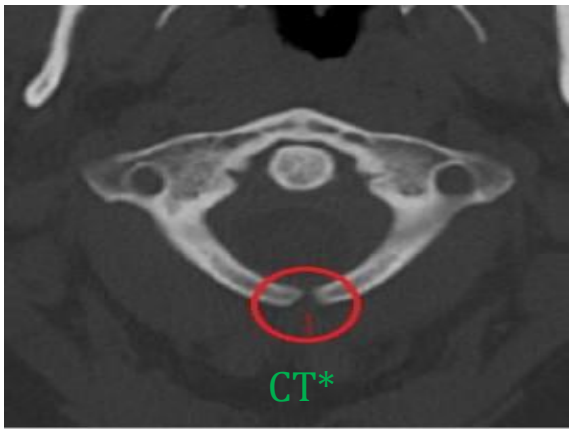


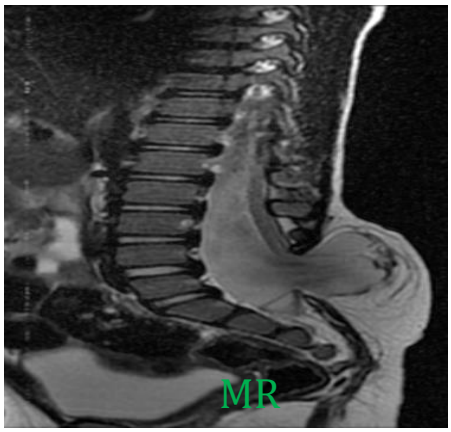
*all pictures here are X-RAY

Spina bifida:

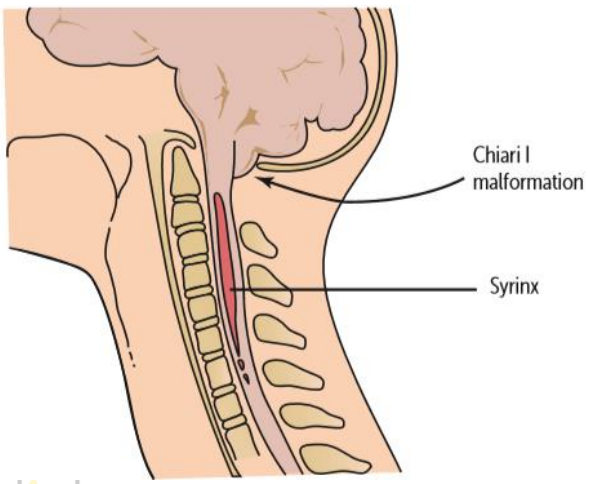








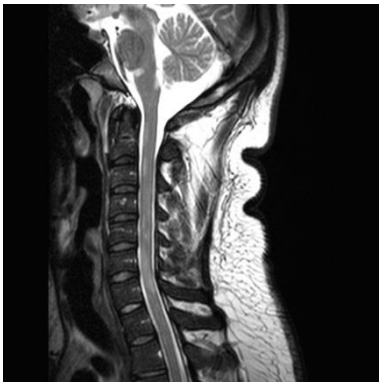
Syringomyelia: is the development of a fluid-filled cyst within the SC



*Notice the missing spinous process.

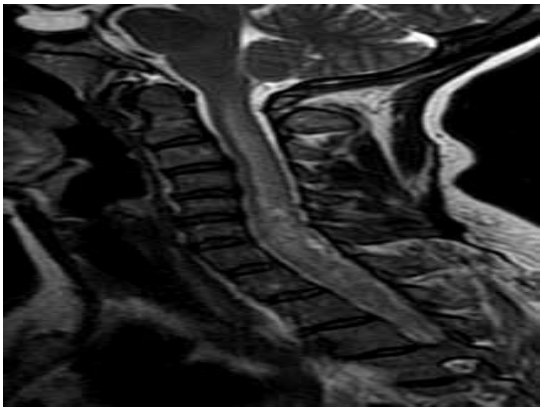
Demyelination

Multiple Sclerosis:



- Multiple sclerosis (MS) is a relatively common acquired chronic relapsing demyelinating disease involving CNS.
- Characteristically disseminated not only in space but also with time.

Transverse Myelitis:

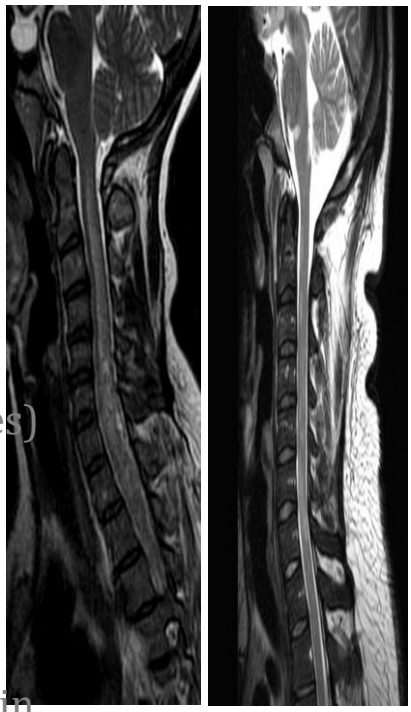


Inflamed cord of uncertain cause.

- Viral infections.
- Immune reactions.
- Idiopathic.

Myelopathy progressing over hours to weeks.(only in female`s slides)

MS VS TM*:



MS lesions in spinal cord are

- More likely multiple.
- focal and peripherally located.(only in female`s slides)
- Don't cover the entire section on axial images.
- Often < 2 vertebral body heights on sagittal images.
- Are disseminated in time and space.(only in female`s slides)

Transverse myelitis lesions

- Often one big lesion. .(only in male`s slides).
- Extend over >3 vertebral body heights on axial images.
- Often >4 vertebral body heights on sagittal images. .(only in female`s slides)
- No brain lesions.
- Covers entire spinal cord in axial plane. .(only in male`s slides
- Monophasic.(only in male`s slides).

*This is too advanced for you. The most important thing to study is the anatomy.

Classification:

1. Intramedullary lesions (within the substance of spinal cord)
   its location is determined within the cord.

2. extramedullary lesions*
   May be related to nerve roots and may extend into the neural foramen Intradural-extramedullary (e.g. schwannomas and neurofibromas) or they may have a broad dural attachment Intradural-extramedullary (e.g. meningiomas).

Astrocytoma: intramedullary tumor

Ependymoma: Intramedullary and the most common in the spinal cord



*It can be divided into: (this part is very important)

1. Intradural-extramedullary (between the spinal cord and the dura),(in the meninges).

2. Extradural (outside the meninges/ dura). The most common between the 3 types, it occurs in the vertebral column and grow either from the bone or disk elements of the spine.

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References:

male & female doctor slides.

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