

# Radiology of the Spinal Cord

## First Lecture

Team 437

Color index

**Important**

Doctor's note

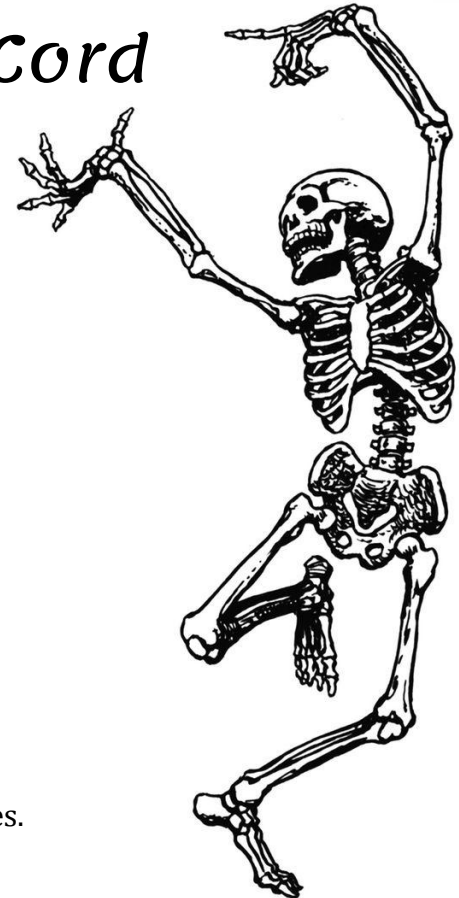
Extra explanation

# Radiology

**Neuropsychiatry Block**

### Lecture objectives:

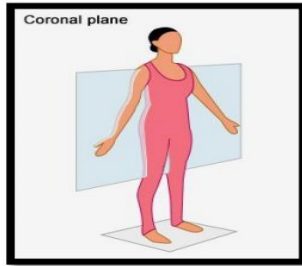
- 1- Anatomy of spinal cord .
- 2- Anatomy of vertebral column.
- 3- Identify, and distinguish between common types of radiographic Images
- 4- You should also be able to recognize some radiological presentation of spinal cord diseases.



# Introduction: Planes of the Body

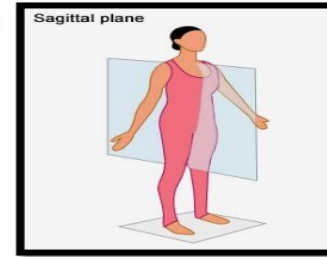
## **Coronal Plane (Frontal Plane):**

A vertical plane running from side to side; divides the body or any of its parts into anterior and posterior portions.



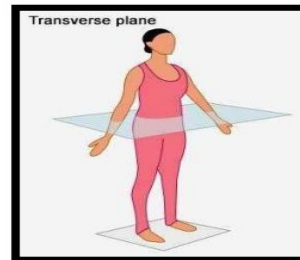
## **Sagittal Plane (Lateral Plane):**

A vertical plane running from front to back; divides the body or any of its parts into right and left sides.



## **Axial Plane (Transverse Plane) :**

A horizontal plane; divides the body or any of its parts into upper and lower parts.



# X-RAYS:

## Characteristics:

-Often the first diagnostic imaging test

-Small dose of radiation to visualize the bony parts

## -X-ray can detect:

1. Spinal alignment and curvature
2. Spinal instability-with flexion and extension views
3. Congenital (birth) defects of spinal column
4. Fracture caused by trauma
5. Moderate osteoporosis (loss of calcium from the bone)
6. Infections **Not always**
7. Tumors **Not always**



-X-ray image of a person who suffers from Scoliosis

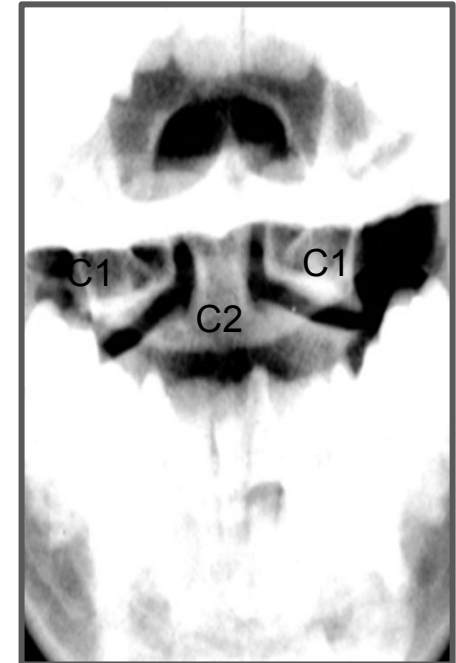
**Lateral view**



**Anteroposterior (frontal view)**



**Open mouth view**





**Is this film an adequate<sub>(acceptable)</sub> lateral film?**

**It's not an adequate film because the 7th cervical vertebra is not seen in the image.**

# Computerized Tomography (CT SCAN):

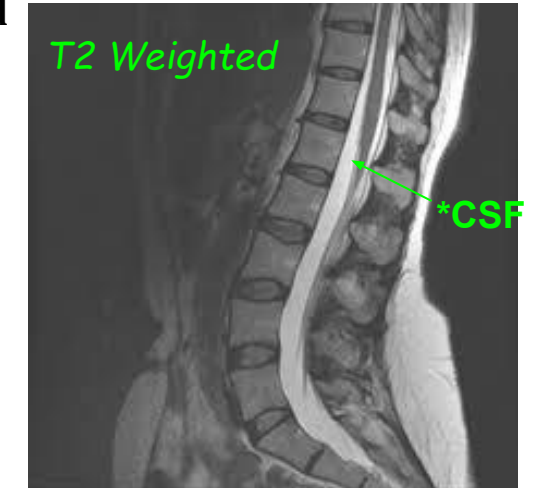
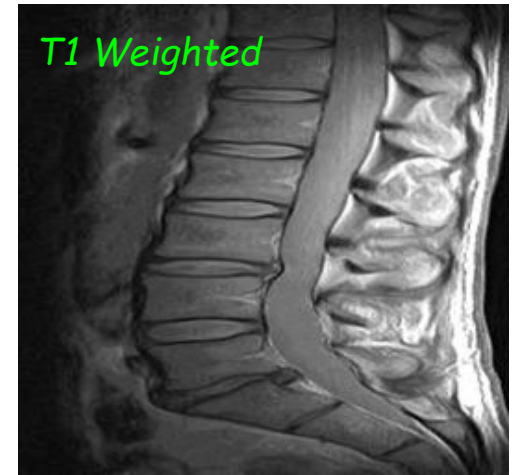
- Uses radiation
- Obtain 2-D images (can be processed to 3-D images)
- Entire spine can be imaged within a few minutes
- Detailed information regarding bony structures
- Limited information about spinal cord & soft tissues



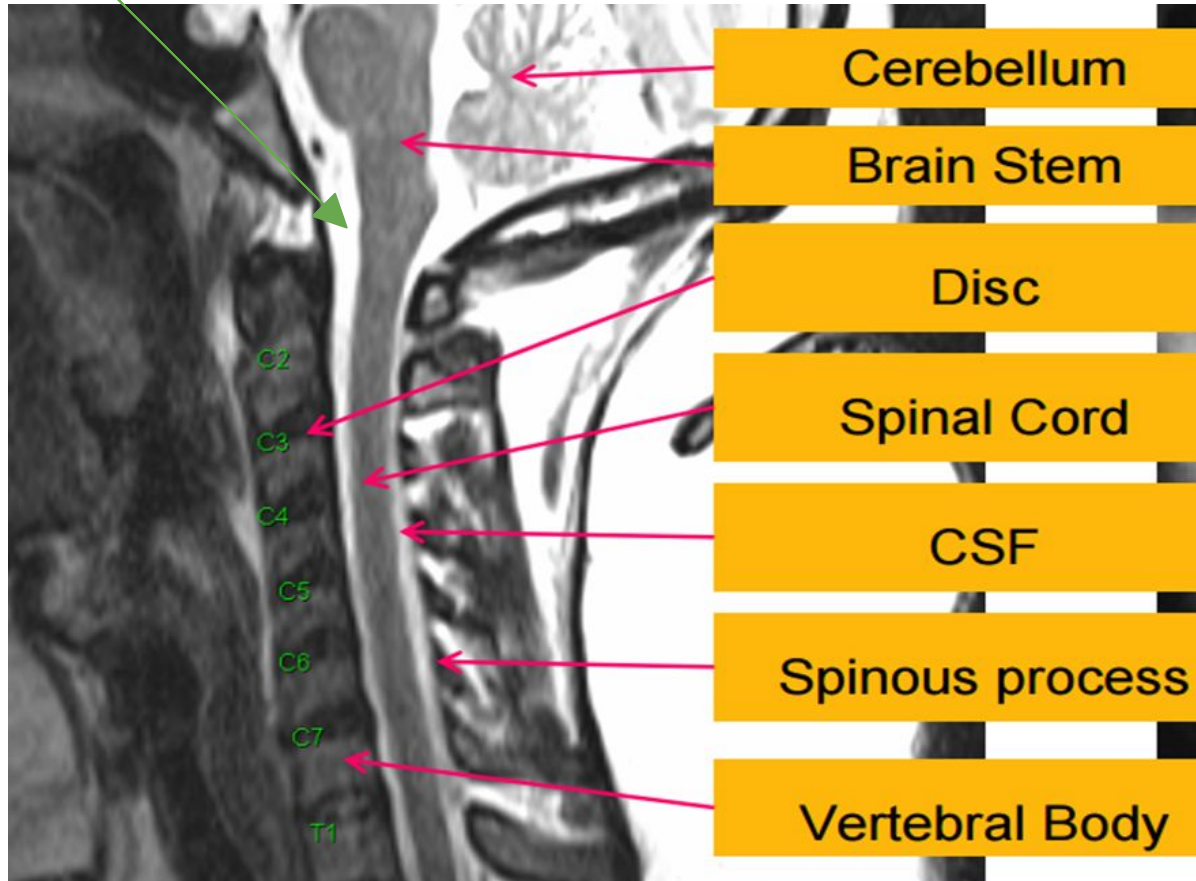
# Magnetic Resonance Imaging (MRI):

- Gold standard of imaging for spinal cord disorders
- No radiation
- Can identify abnormalities of bone, soft tissues and spinal cord
- Claustrophobic (fear of small places) patients, uncooperative and children may need sedation or general anesthesia
- Contraindications include implanted devices e.g. cardiac pacemakers and electromagnetic devices

\*Cerebrospinal fluid appears white when taken by the T2 MRI method, while the T1 method makes the CSF appear darker.



-It's MRI T2, because the fluid is white





	Indications (Usage)	Advantages	Disadvantages
<b>X-ray</b>	<ul style="list-style-type: none"> <li>● Trauma</li> <li>● Intraoperative localization (in the middle of a surgery)</li> </ul>	<ul style="list-style-type: none"> <li>● Inexpensive</li> <li>● Widely available</li> <li>● Quick</li> <li>● Portable</li> </ul>	<ul style="list-style-type: none"> <li>● Radiation exposure</li> <li>● Difficulty in interpretation</li> <li>● High rate of false-positive findings</li> </ul>
<b>CT</b>	<ul style="list-style-type: none"> <li>● Trauma</li> </ul>	<ul style="list-style-type: none"> <li>● Visualization of bony structures</li> <li>● Widely available</li> <li>● Quick</li> </ul>	<ul style="list-style-type: none"> <li>● Less useful at visualizing soft tissue structures</li> <li>● Radiation exposure</li> <li>● Expensive</li> </ul>
<b>MRI</b>	<ul style="list-style-type: none"> <li>● Patients with “red flags” case</li> <li>● radiculopathy</li> <li>● Tumor</li> <li>● Myelopathy (injury to spinal cord)</li> </ul> <p><b>-Red flag case = patient with dangerous symptoms</b></p>	<ul style="list-style-type: none"> <li>● Visualization of soft tissue structures (relationship of discs to nerves)</li> <li>● No radiation exposure</li> </ul>	<ul style="list-style-type: none"> <li>● Contraindications: presence of Ferromagnetic implants. cardiac pacemakers, intracranial clips, Claustrophobia (fear of small spaces)</li> <li>● Not widely available</li> <li>● Expensive</li> </ul>

# Abnormalities Of Spinal Cord:



Trauma



Congenital



demyelination



Tumors



## Trauma

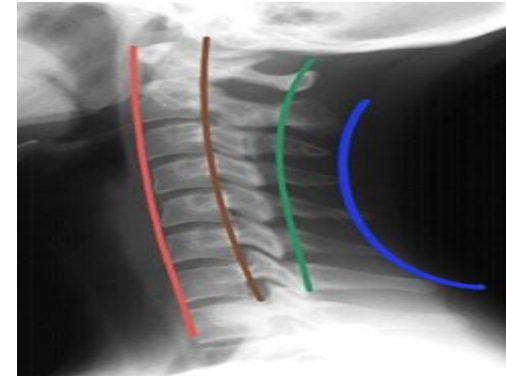
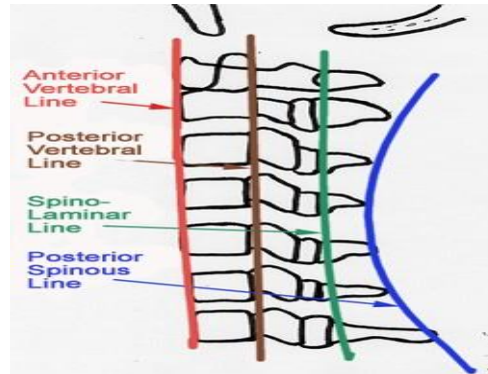
Usually the first series of images to be ordered by the physician → Plain Radiographs (**x-rays**).

If **fractures**, or other **bony defects** are suspected → **CT images** can provide very detailed information.

When **soft tissue injury** is suspected → **MRI** is usually the imaging technology of choice.

## Accesses for parallel lines (imaginary lines): **Important**

- 1- **Anterior vertebral line**
- 2- **Posterior vertebral line**
- 3- **Spinolaminar line**
- 4- **Posterior spinous line**



Any malalignment should be considered as an evidence of injury.

# Mechanism Of Injury

For trauma there is several mechanism of injury Here is some examples:



## Hyperextension:

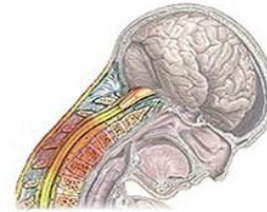
a sudden backward acceleration of the skull creating extreme extension of cervical spines, a common example is like hanging, or when the head hits the dashboard of the car in a car accidents.

Hyperextension



Sprain or strain of cervical tissues

Hyperflexion



## Hyperflexion:

excessive flexion of the neck like when diving in shallow water, could cause paraplegia

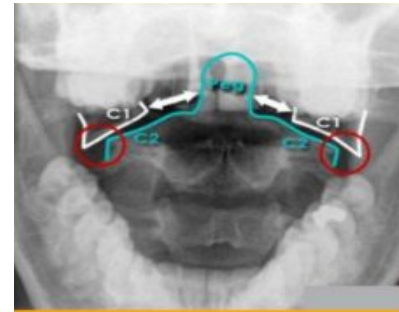
# Compression Fracture

Type of imaging in All pictures listed below is X-ray

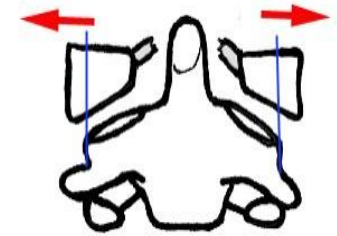
When you get a caudally directed force on your head (like when something heavy falls on your head).



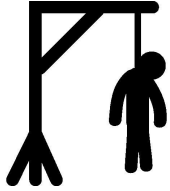
Normal open mouth view



Lateral mass splitting, displacement more than 2ml



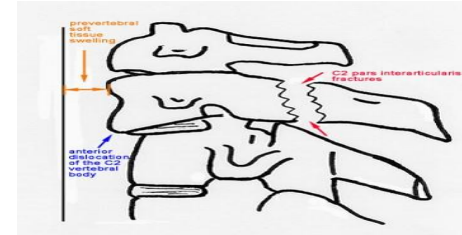
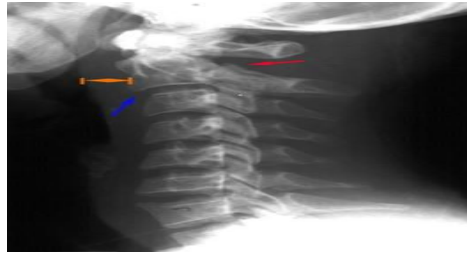
## Hangman's Fracture (result of hyperextension)



A fracture which involves the pars interarticularis of C2 on both sides, and a dislocation of C2, its a result of hyperextension and distraction



Normal lateral view



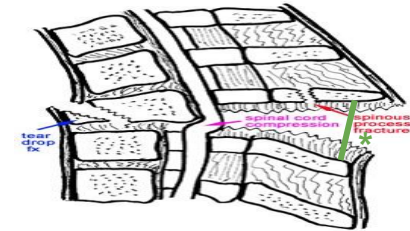
## Hyperflexion



Normal lateral view



A tear drop fracture in the anterior margin of the vertebral body



\*The distance between spinal processes is wide

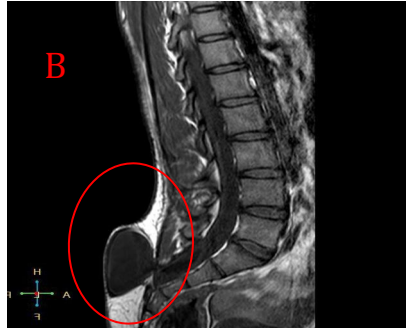
# Congenital defects

## Spina bifida

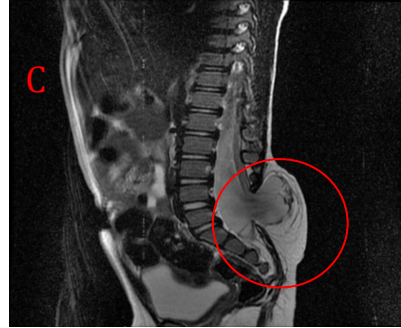
-Its when a pregnant mother has deficiency of folic acid then the babies neural tube gets defected. for more [information about the disease](#).



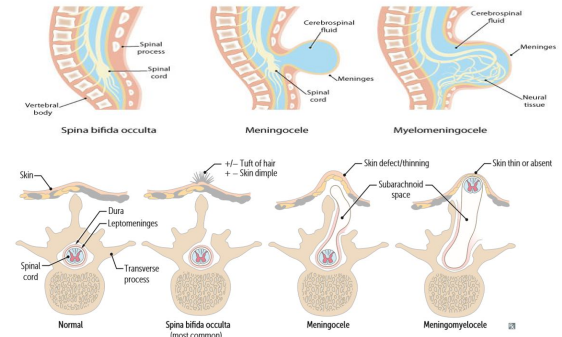
a) Spina bifida occulta,  
CT scan



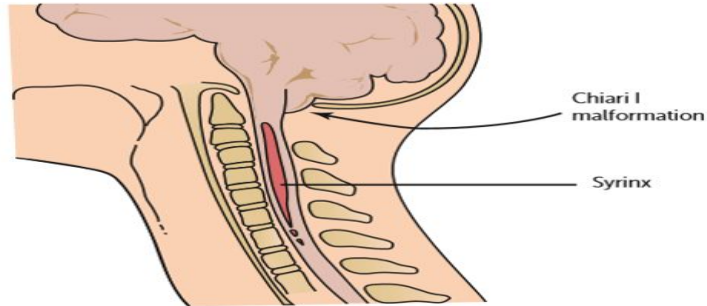
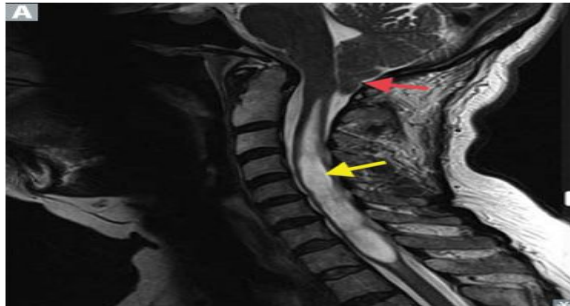
b) meningocele,  
MRI T1 WI



c) meningocele  
MRI T2 WI.



## Syringomyelia



-it is the development of a fluid-filled cyst within the spinal cord.



## demyelination

### Multiple Sclerosis

Multiple sclerosis (MS) is a relatively commonly acquired chronic relapsing demyelinating disease involving the CNS.

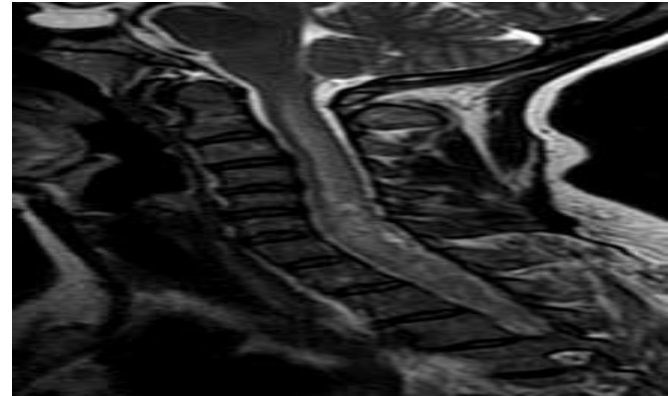
Characteristically disseminated not only in space but also in time.

### Transverse Myelitis -Spinal cord is swollen.

inflamed cord of uncertain cause

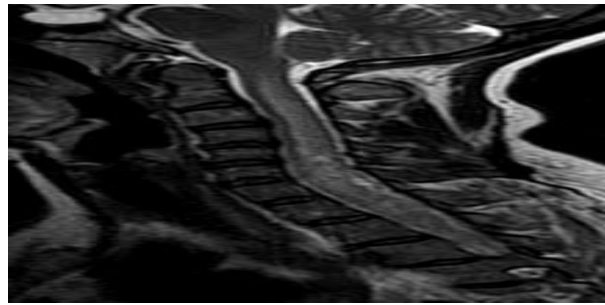
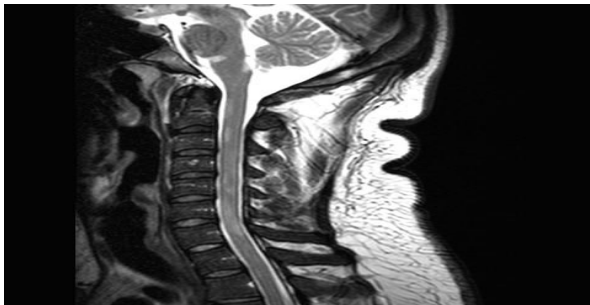
- Viral infections
- Immune reactions
- Idiopathic

Myelopathy progressing over hours to weeks.



# Multiple Sclerosis VS Transverse Myelitis

Multiple sclerosis lesions in spinal cord	Transverse myelitis lesions in spinal cord
More likely multiple, focal and peripherally located	-
Don't cover the entire section on axial images.	Extend over >3 vertebral body heights on axial images.
Often < 2 vertebral body heights on sagittal images	Often > 4 vertebral body heights on sagittal images
Usually associated with brain lesions	no brain lesions
Are disseminated in time and space.	-





# Tumors

## Classification of TUMORS

**-Intramedullary lesions:** its location is determined within the cord

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

### Astrocytoma



-Intramedullary tumor

### Ependymoma



-Intramedullary tumor

-There's a chance of bleeding



# MCQs:



**1-Technology that can Obtain 2-D images (can be processed to 3-D images).**

A- X-RAY

B-MRI

C- CT SCAN

D- ULTRASound

**2-is a relatively common acquired chronic relapsing demyelinating disease involving the CNS**

A-Multiple Sclerosis

B-Ependymoma

C-Astrocytoma

D-Transverse Myelitis

**3-inflamed cord of uncertain cause**

A-Multiple Sclerosis

B-Ependymoma

C-Astrocytoma

D-Transverse Myelitis

**4-When soft tissue injury is suspected, \_\_is usually the imaging Modality of choice.**

A- MRI

B- XRAY

C- CT SCAN

D- ULTRASOUND

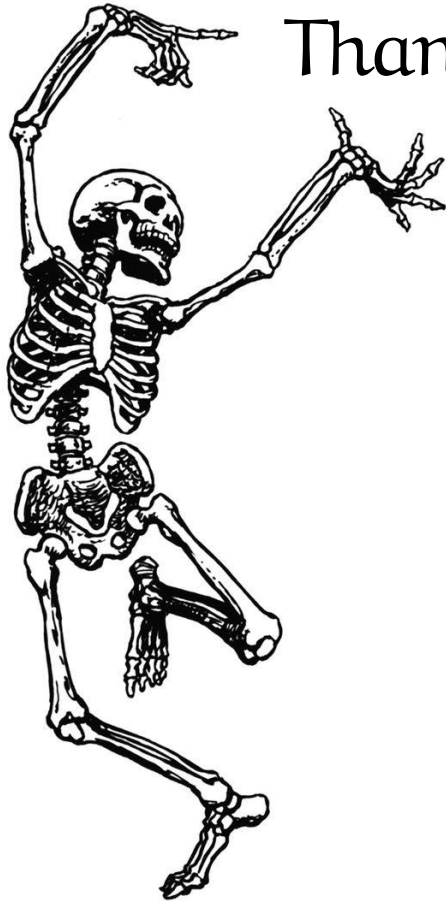
Answers:

1- C

2- A

3- D

4- A



# Thank you for checking our work

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