

# ThoracoLumbar

Anatomy Team 434

## Color Index:

- **Important Points**
- Helping notes
- **Explanation**

If you have any complaint or suggestion please don't hesitate to contact us on:  
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# Introduction

The vertebral column is not straight, it only looks straight from the posterior and anterior view

It is **CURVED** as seen from the sides "lateral and medial views.

In the embryo the whole vertebral column is concave anterior and convex posterior. After birth several changes are going to happen: Primary curves in thorax and pelvic are going to stay the same, while Secondary curves in the cervix and lumbar are going to turn to the opposite side.

## Curves of the vertebral column:

### 1- The primary

Curves A- Thoracic

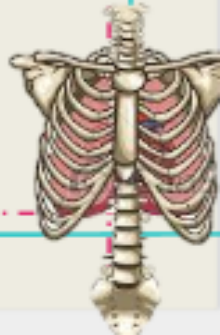
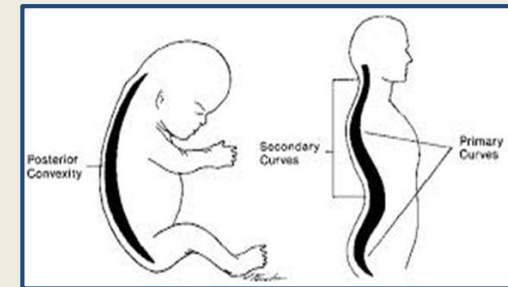
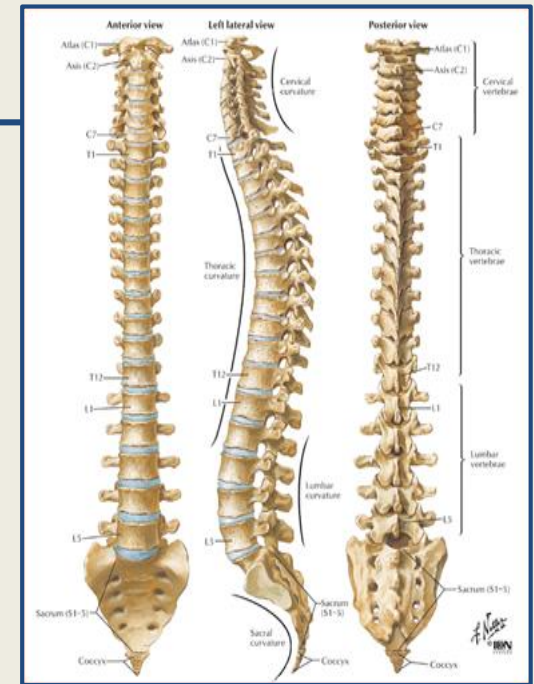
B- Pelvic (which is also the Sacral Curvature)

### 2- The secondary Curves

A- Cervical

B- Lumbar

**Most thoracic vertebrae are typical, have bodies, vertebral arches, and seven processes for muscular and articular connections.**



# Thoracic Vertebrae

## The characteristics (that differentiates it from the other vertebral bodies)

- 1- The SPINE PROCESS is **LONG** and **INCLINED DOWNWARDS**
- 2- The BODY is **MEDIUM SIZED** and **HEART SHAPED**
- 3- The VERTEBRAL FORAMEN is **SMALL** and **CIRCULAR**
- 4- The COSTAL FACETS ( **IS THE MAIN CHARACTERISTIC** )

A - on the **Transverse processes** for ARTICULATION WITH THE TUBERCLES OF THE RIBS

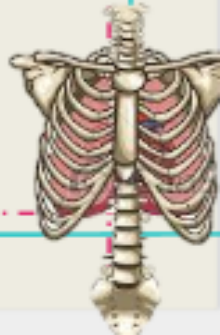
B - on the **Sides of the Body** for ARTICULATION WITH THE HEADS OF THE RIBS

## Remember

- 1- The facets of the SUPERIOR ARTICULAR PROCESSES face **BACKWARDS** and **LATERALLY**
- 2- the facets of the INFERIOR ARTICULAR PROCESSES face **FORWARD** and **MEDIALY**

## Exception

- 1- **T11** and **T12** DO NOT HAVE COSTAL FACETS ON THE TRANSVERSE PROCESS!!
- 2- the INFERIOR ARTICULAR PROCESSES of **T12** face **LATERALLY**



# Thoracic Vertebrae

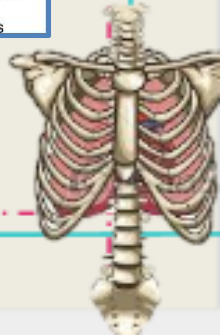
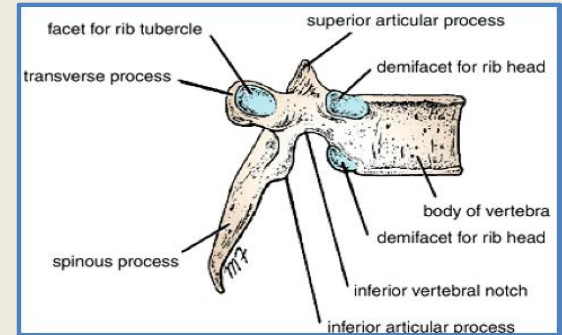
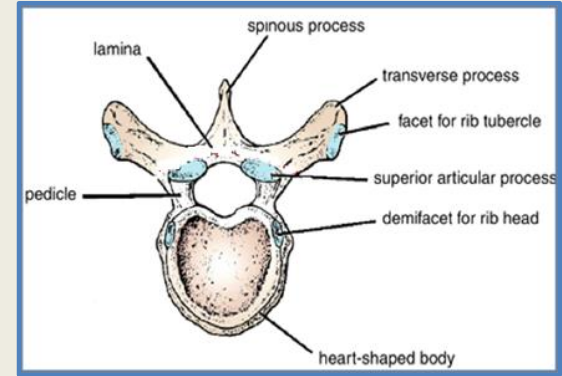
The upper part of the Vertebral Arch is composed of Eleven parts ( 7 process, 2 lamina (Thick) 2 pedicles )

T11 and T12 DO NOT HAVE COSTAL FACETS ON THE TRANSVERSE PROCESS because they are articulation with the floating ribs. (Not typical) the body of thoracic vertebrae is heart shaped. The vertebral foramen in thoracic is circular unlike cervical which is triangular.

The body of thoracic vertebrae is heart shaped.  
The vertebral foramen in thoracic is circular unlike cervical which is triangular.

**Process** : is a projection or outgrowth on the vertebral body  
**Coastal** : Type of Cartilage, that prolongs the ends of the Ribs

The body of the vertebra and the vertebral arch form the vertebral foramen  
“الفتحة الي في النص“



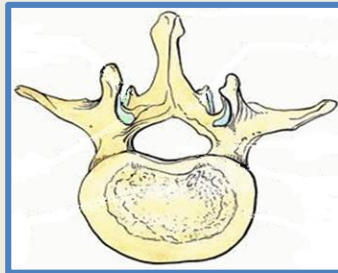
# Lumbar Vertebrae

## The characteristics (that differentiates it from the other vertebral bodies)

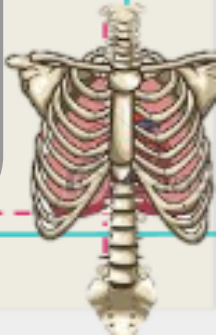
- 1- The SPINE PROCESS is A- SHORT B- FLAT C- QUADRANGULAR D- directed **BACKWARDS** (MAIN)
- 2- The BODY is **KIDNEY SHAPED** and **LARGE** (MAIN)
- 3- The VERTEBRAL FORAMEN is **TRIANGULAR** (MAIN)
- 4- The LAMINAE are **THICK** (The Thoracic laminae is also THICK)
- 5- The TRANSVERSE PROCESSES are **LONG** and **SPINDLE** (long and thin)
- 6- The PEDICLES are **STRONG** and directed **BACKWARD**

## Remember:

- 1- The SUPERIOR ARTICULAR PROCESSES face **MEDIALY**.
- 2- The INFERIOR ARTICULAR PROCESSES face **LATERALLY**.



- Pedicle (of vertebral arch): the segment between the transverse process (of the vertebral Arch) and the vertebral body “it joins the body to the arch“
- Laminae: the Laminae join to form the Spinous process (spin process)
- They don't have demifacets as thoracic vertebrae because they are not attached with the ribs.

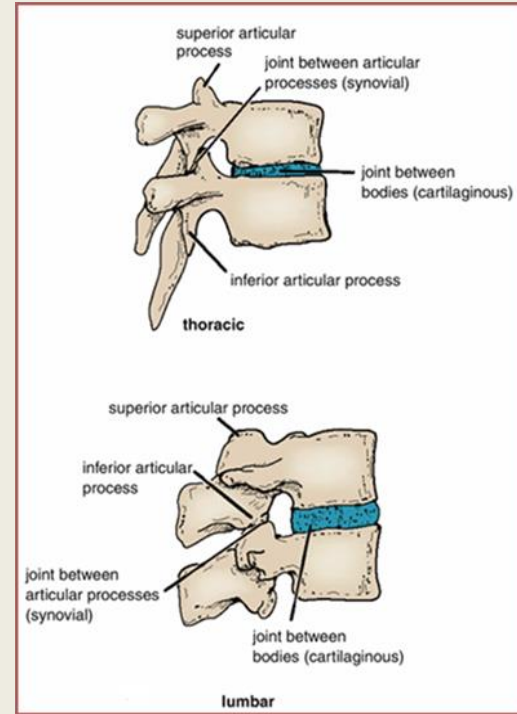


# Joints between two Vertebral Bodies

## Cartilaginous Joint

- 1- There is **HYALINE cartilage** on the upper and lower surfaces of **EACH OF THE VERTEBRAL BODIES**
- 2- Between two vertebral bodies\* is the **INTERVERTEBRAL DISK OF FIBROCARTILAGE**

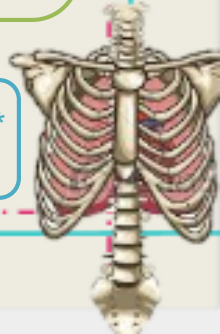
**FUNCTION** of the **COLLAGEN FIBROUS OF THE DISK** strongly unite the vertebral bodies.



**Exception**  
Atlas and Axis  
don't have  
cartilaginous  
joints.

**Remember**  
Three types of  
joints:  
1- Cartilage  
2- Synovial  
3- Fibrous

\* المقصود ما بين الهيالين كارتلاج الموجود في الجزء السفلي من الفرتيبرال بودي الأول و الهيالين كارتلاج الموجود في الجزء العلوي من الفرتيبرال بودي الذي يليه الذي يقع أسفل منه



# Intervertebral Discs

## It Consists of:

1- Peripheral part: THE ANULUS FIBROSUS

which is composed of FibroCartilage

2- Central Part: THE NUCLEUS PULPOSUS

which is a mass of Gelatinous material  
the Gelatinous material consists of

1- Large amount of water

2- small number of collagen fibers

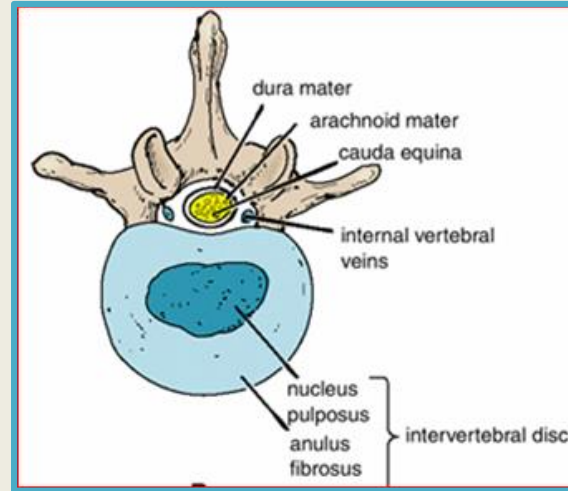
3- few cartilage cells

## Exception

NO DISK between the 1st and 2nd Cervical region

NO DISK in the sacrum

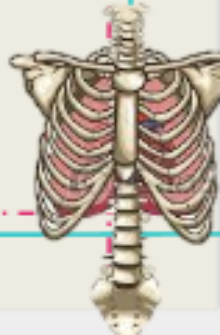
NO DISK in the coccyx



Features of each type in the vertebral column

It is responsible of  $\frac{1}{4}$  of the length of the VERTEBRAL COLUMN

It is **THICK** at the CERVICAL and LUMBAR regions  
“they have greater movement” unlike the thoracic region which is **LESS THICK** and has less movement



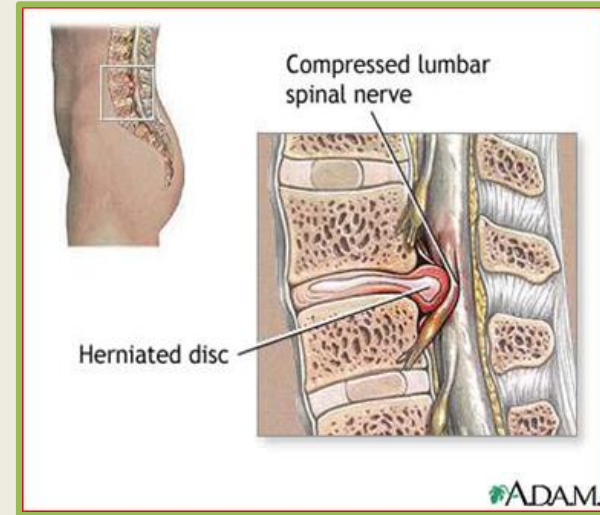
# FUNCTION OF THE INTERVERTEBRAL DISCS

- 1- Allow **flexion and extension** of vertebral column (by allowing the vertebral bodies to rock forward and backwards on each other)
- 2- Serves as **shock absorbers** ( when the load on the vertebral column suddenly increases) Such as jumping from high place.

## Abnormality

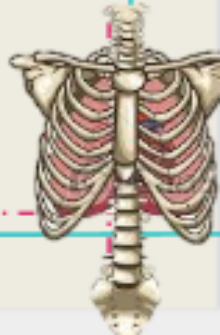
Sometimes, the **annulus fibrosus** ruptures, allowing the **nucleus pulposus** to **herniate and protrude** into the **vertebral canal** (usually to the **Posterior-Lateral side**) where it may press on the spinal nerve roots, the spinal nerve, or even the spinal cord

Note that: when it Presses on the spinal nerve roots it may cause **peripheral neuritis** which is caused by carrying heavy things or obesity.



Herniate: to move from its normal place to another abnormal place and might cause problems

Rock: يتحرك

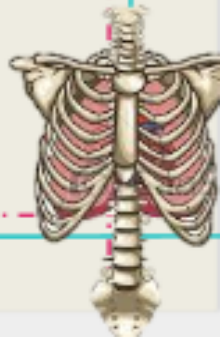
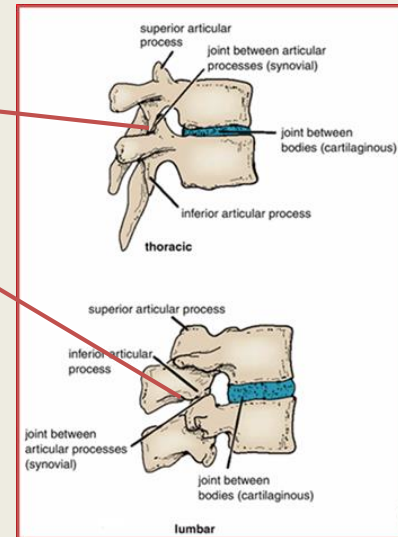




# Joints between two Arches

It consists of **synovial joints** between the **superior** and **inferior articular processes** of adjacent vertebrae.

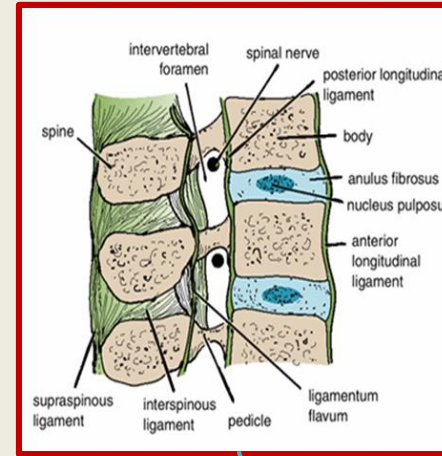
Synovial joints here are like the cervical joints we studied in the previous lecture.  
"Joints between vertebral arches"



# Ligaments

The anterior longitudinal ligament is **wide** and is **strongly** attached to the front and sides of the vertebral bodies and to the intervertebral discs.

The posterior longitudinal ligament is **weak** and **narrow** and is attached to the posterior borders of the discs.

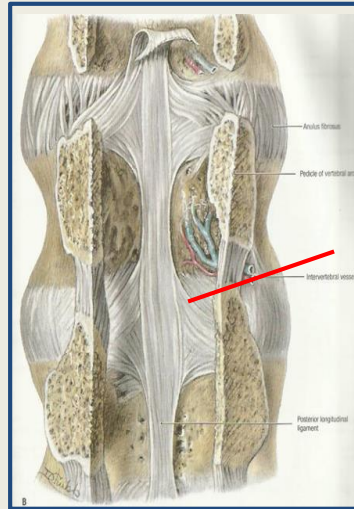
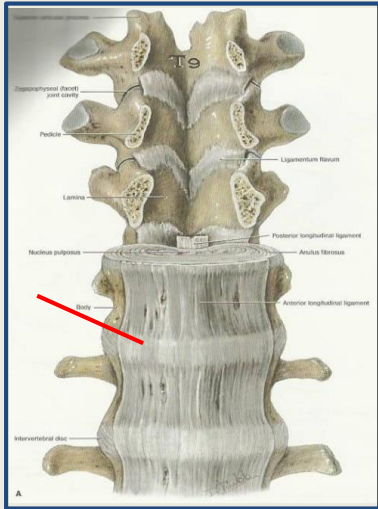


Hold the vertebrae firmly together

Produce small amount of movement

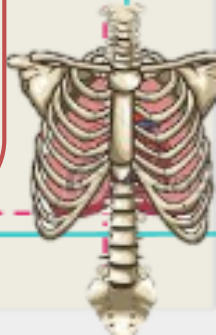
## Ligaments

They both run as continuous bands down the **anterior** and **posterior surfaces** of the vertebral column from the **skull** to the **sacrum**



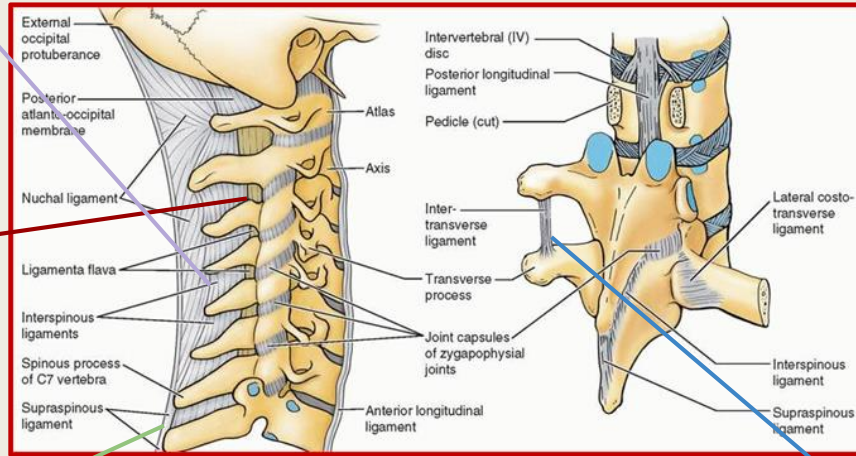
[Spines of vertebral column](#)

A wonderful introduction video that explain the whole lecture ( [There is Music](#) )



# Ligaments

The following ligaments are the same as the cervical ligaments



**Interspinous ligament:**  
connects adjacent spines

**Ligamentum flavum:**  
connects the laminae of adjacent vertebrae

**Supraspinous ligament:** runs between the tips of adjacent spines

**Intertransverse ligaments:** run between adjacent transverse processes



# MOVEMENTS OF THE THORACOLUMBAR SPINE

**Flexion & Extension**  
**Lateral flexion**

Extensive in the lumbar regions  
Restricted in the thoracic regions

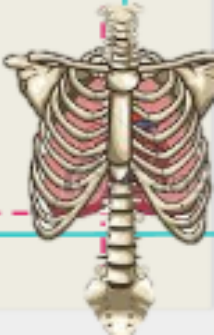
It's better in the lumbar region because there isn't ribs, costal cartilage and the sternum that **restrict the range of movement** (in the thoracic)

**Rotation**

Extensive in the thoracic regions  
Less extensive in the lumbar regions

**The type and range of movements depend on:**

- 1/ Thickness of the **intervertebral discs**
- 2/ Shape and direction of the **articular processes**.

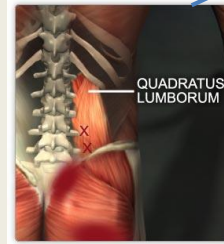
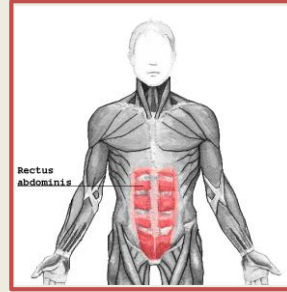
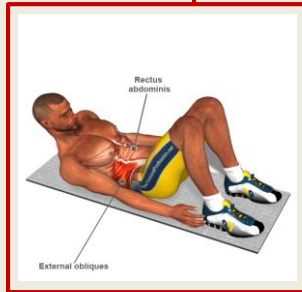
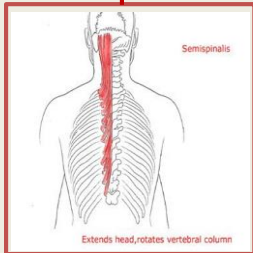


1: Thickened more than the cervical region > will be better in movement than in the cervical region.

# MUSCLES PRODUCING MOVEMENTS

## Thoracic Region

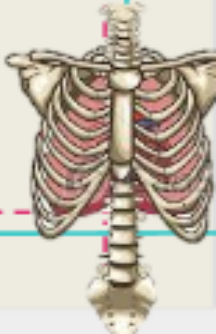
**Rotation**  
produced by  
**semispinalis** and  
**rotator** muscles,  
assisted by the  
**oblique muscles**  
of the  
**anterolateral**  
**abdominal wall.**



## Lumbar Region

- **Flexion** is produced by the **rectus abdominis** and the **psaos muscles**
- **Extension** is produced by the **postvertebral muscles**
- **Lateral flexion** is produced by the **postvertebral muscles**, the **quadratus lumborum**, and the **oblique muscles** of the **anterolateral abdominal wall**. The **psaos** may also play a part in this movement.

**Rotation:** Same as the Thoracic Region



# Vertebra L5

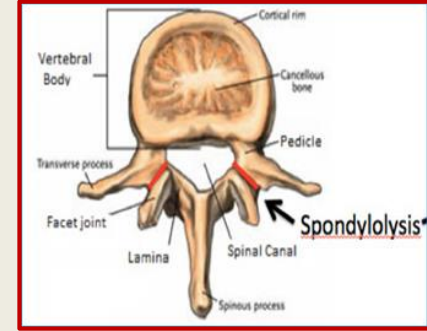


The largest of all movable vertebrae.

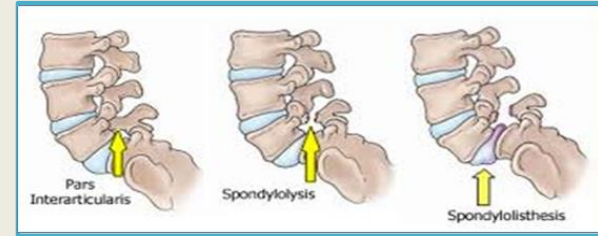
Distinguished by its **massive body** and **thick transverse processes**

It carries the weight of the whole upper body.

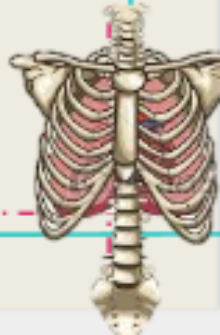
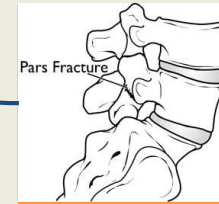
The **L5 body** is largely responsible for the **lumbar angle** between the long axis of the lumbar region of the vertebral column and that of the sacrum.



Body weight is transmitted from **L5 vertebra** to the base of the **sacrum**, formed by the superior surface of S1 vertebra.



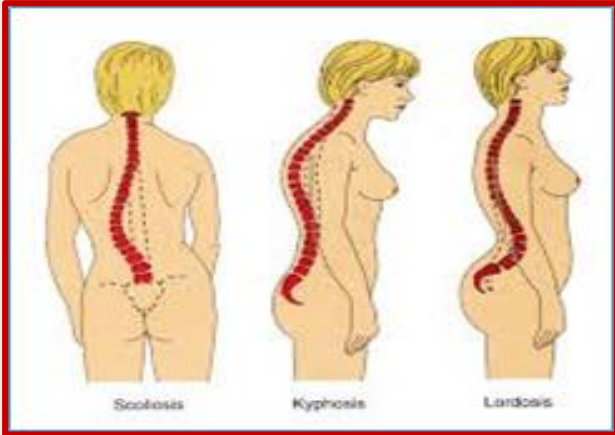
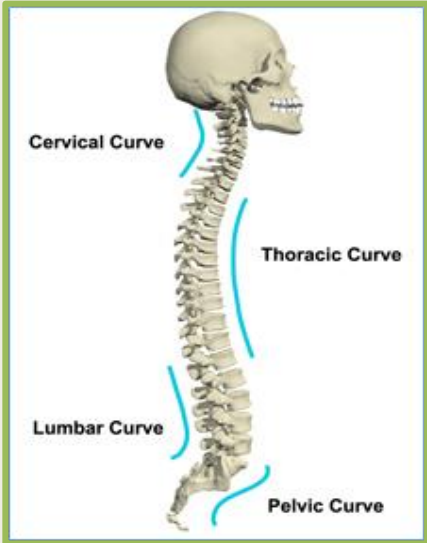
The 5th lumbar vertebra is by far the most **common site** of  
-**Spondylolysis** (defect in the **pars interarticularis** of the vertebral arch)  
-**Spondylolisthesis** (the forward **displacement** of a vertebra)



After the fracture happens in Pars Interarticularis it (slides in the sacrum) > Spondylolisthesis

Spondylolysis could be caused by osteoporosis, degenerative disease or fracture.

# Curvatures in Spine

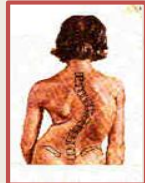
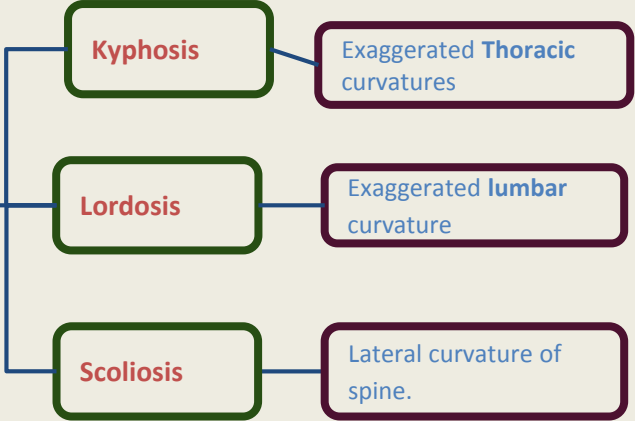


**Normal Curvatures in Spine**

Primary (Thoracic & Pelvic)  
 -Concave forward

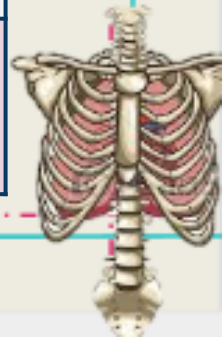
Secondary (Cervical & Lumbar)  
 -Convex forward

**Abnormal Curvatures of spine**



The type and range of movements depend on: - Thickness of the **intervertebral discs**  
 - Shape and direction of the **articular processes**.

Region	Type of Movement	Muscles
Thoracic Region	Rotation ( <b>extensive</b> )	<b>Semispinalis</b> and <b>rotator muscles</b> , assisted by the <b>oblique muscles</b> of the <b>anterolateral abdominal wall</b> .
	Flexion, extension and lateral flexion ( <b>Restricted</b> )	It's <b>restricted</b> because there is ribs, costal cartilage and the sternum that <b>restrict the range of movement</b> (in the thoracic)
Lumbar Region	Rotation ( <b>least extensive</b> )	- The <b>rotator muscles</b> - The <b>oblique muscles</b> of the <b>anterolateral abdominal wall</b> .
	Flexion	The <b>rectus abdominis</b> , the <b>psoas muscles</b> .
	Extension	<b>Postvertebral muscles</b>
	Lateral flexion	The <b>postvertebral muscles</b> , the <b>quadratus lumborum</b> , and the <b>oblique muscles</b> of the <b>anterolateral abdominal wall</b> . The <b>psoas</b> may also play a part in this movement.





# CHARACTERISTICS of TYPICAL Thoracic Vertebrae

The **Transverse processes** for ARTICULATION WITH THE TUBERCLES OF THE RIBS

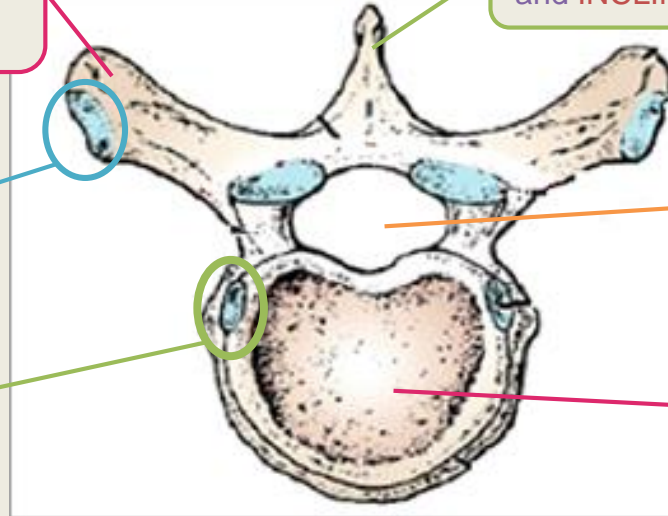
**Costal facets** - for articulation with the tubercles of the ribs

**Costal facets** - for articulation with the heads of the ribs

The **SPINE PROCESS** is LONG and **INCLINED DOWNWARDS**

The **VERTEBRAL FORAMEN** is SMALL and CIRCULAR

The **BODY** is MEDIUM SIZED and HEART SHAPED

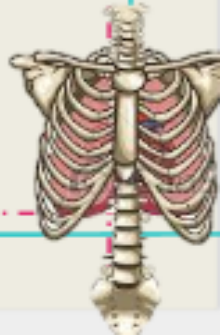


## Remember

- 1- The facets of the SUPERIOR ARTICULAR PROCESSES face **BACKWARDS** and **LATERALLY**
- 2- the facets of the INFERIOR ARTICULAR PROCESSES face **FORWARD** and **MEDIALY**

## Exception

- 1- **T11** and **T12** DO NOT HAVE COSTAL FACETS ON THE TRANSVERSE PROCESS !!
- 2- The INFERIOR ARTICULAR PROCESSES of **T12** face **LATERALLY**



# CHARACTERISTICS of TYPICAL LUMBAR VERTEBRA

The **spinous processes** are short, flat, & quadrangular and project backward.

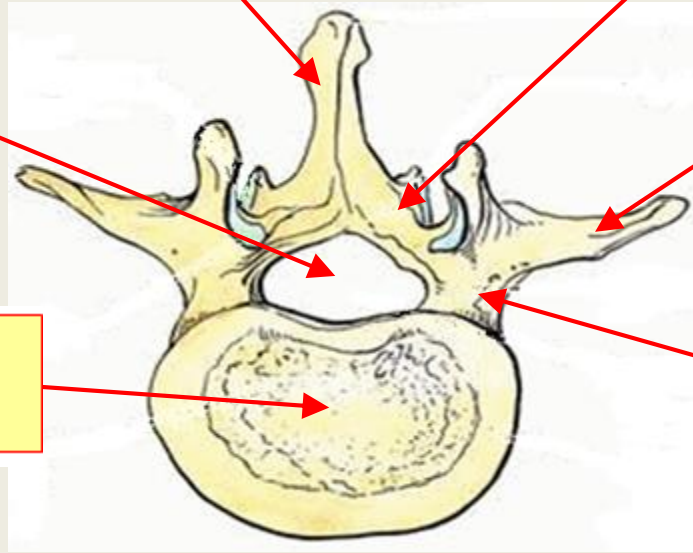
The **laminae** are thick.

The **vertebral foramina** are triangular.

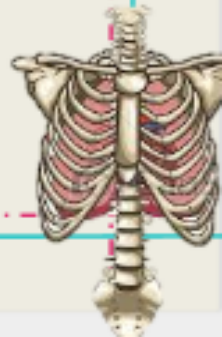
The **transverse processes** are long and slender.

The **body** is large and kidney shaped.

The **pedicles** are strong and directed backward.



The articular surfaces of the **superior articular processes** face **medially**, and those of the **inferior articular processes** face **laterally**.





1- Which muscle play role in the lumbar region for (Extension)?

- A) psoas muscles
- B) rotator muscles
- C) postvertebral muscles
- D) rectus abdominis

2- The anterior longitudinal ligament is wide and weak...

- A) true
- B) false

3-which one is secondary curvatures in spine?

- A) lumbar
- B) pelvic
- C) thoracic
- D) Laminae

4- The peripheral part of the disk composed of?

- A) water
- B) synovial fluid
- C) gelatinous material
- D) Fibrocartilage

5- Has no facets on the transverse processes?

- A) L5
- B) L11
- C) T5
- D) T11

6- The costal facets which present on the sides of the bodies articulates with the heads of the ribs

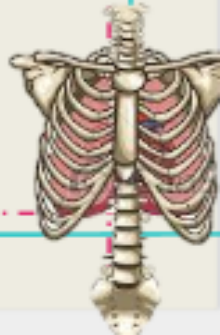
- A) true
- B) false

7- The thoracic vertebrae has...

- A) 6 processes
- B) 7 processes
- C) quadrangular spinous processes
- D) slender transverse processes

Answers:

- 1 C
- 2 B
- 3 A
- 4 D
- 5 D
- 6 A
- 7 B



Have you ever heard of a spine  
transplant?

Neither have we.

Take care of the one  
you have.

someecards  
user card



GOOD  
LUCK

Done By Anatomy Team 434 ..

