



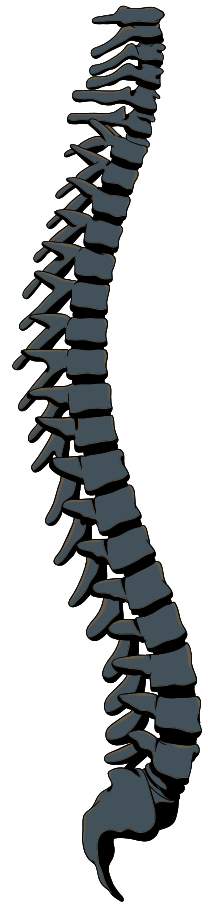
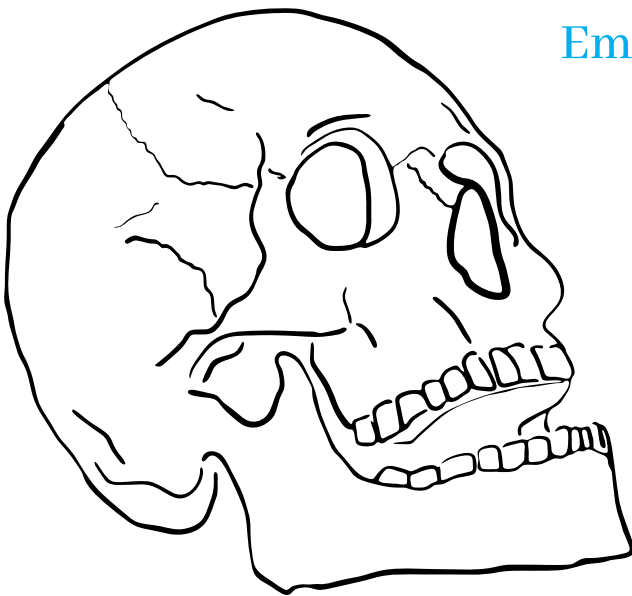
# ANATOMY: THE VERTEBRAL COLUMN

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NB: the pictures in the yellow frames  
are additional for extra explanation

C shaped ← primary curve ← after birth we begin with one curve ★

↓ Convex posteriorly → kyphotic متحدب

بتلاقي البيبي منكوم عليك ورقبتك مش مرفوعة نازلة على جسمه

development of this different curve ← Extension of the neck ← اول ما يلبس يرفع رقبتك ★



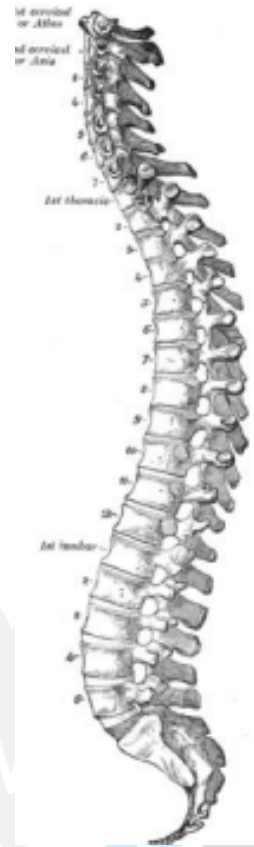
→ convex anteriorly صار

development of lumbar region



convex anteriorly curve

ببيدا بعد كم شهر يقعد وبعدها بيوقف على رجليه ★



7 cervical  
12 thoracic  
5 lumbar  
5 fused sacral  
(3-5) fused coccyx

the coccyx is rudimentary

## THE VERTEBRAL COLUMN:

It consists of 33 vertebrae separated by intervertebral discs. It houses and protects the spinal cord in its spinal canal. It shows several Curves The cervical curve: convex forward. The thoracic curve: concave forward. The lumbar curve: convex forward. more marked in the female than in the male. convexity of the lower three vertebrae being much greater than that of the upper two. This curve is described as a lordotic curve. The pelvic curve: begins at the lumbosacral articulation and ends at the point of the coccyx; concave forward.

### Regions and Normal Curvatures :

#### A. Curvatures of the spine

1. Cervical and lumbar curvatures ► Concave posteriorly
2. Thoracic and sacral curvatures ► Convex posteriorly

#### Convex posteriorly

kyphosis – exaggerated curvature in thoracic region (humpback)

#### concave posteriorly

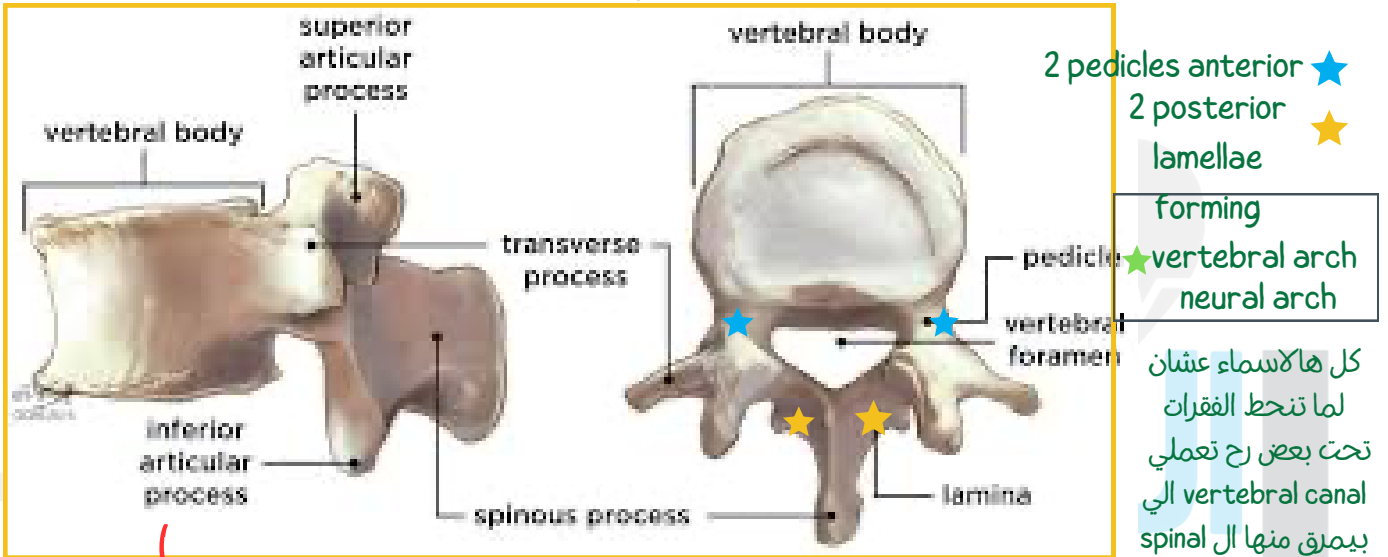
lordosis – exaggerated curvature in the lumbar region

scoliosis – S-shaped curvature of the whole vertebral column

#### lateral curvature of spine

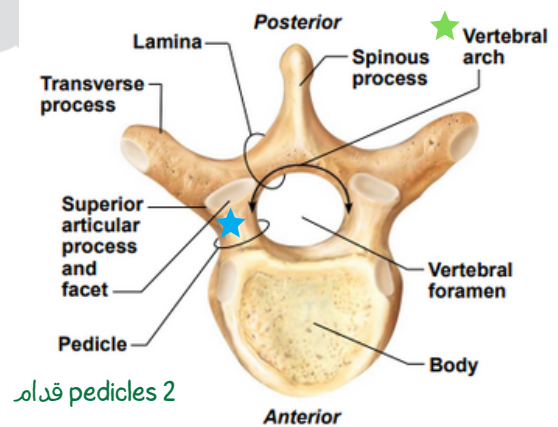
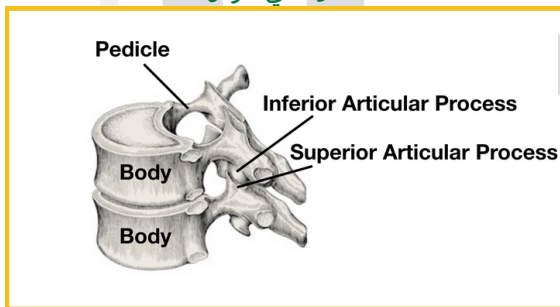
Primary and secondary curves 1. primary curves: present during fetal life. includes thoracic and pelvic curves. 2. Secondary curves: developed after birth. Includes cervical and lumbar curves. cervical when the child is able to hold up its head (at three or four months) and to sit upright (at nine months) Lumbar at twelve or eighteen months, when the child begins to walk

عندي body و 7 processes لهيك  
صنفتها irregular shape

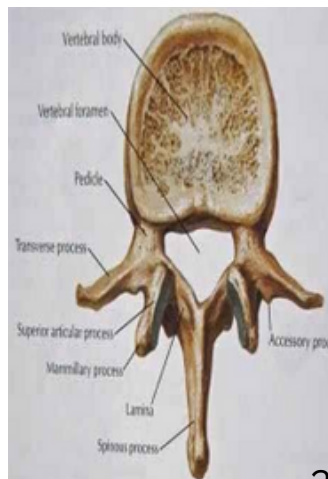


Spine بنعمل من 2 laminae united

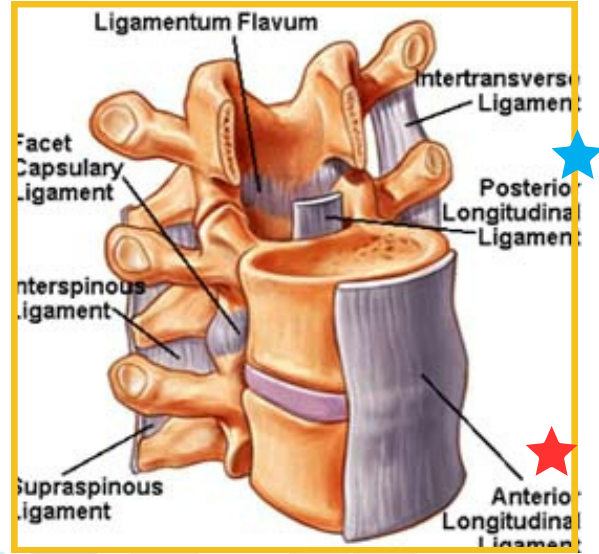
عندي 2 articular process -> حيعملوا joint intervertebral مع superior articular process مع inferior articular process للفقرّة الي فوقها



2 pedicles قدام

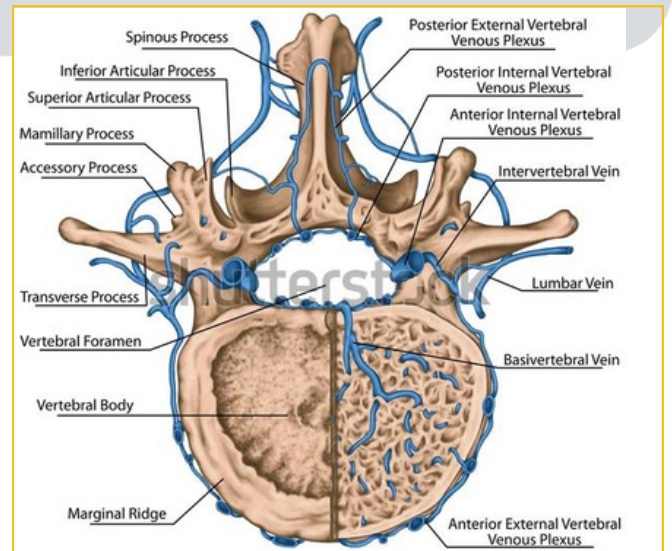
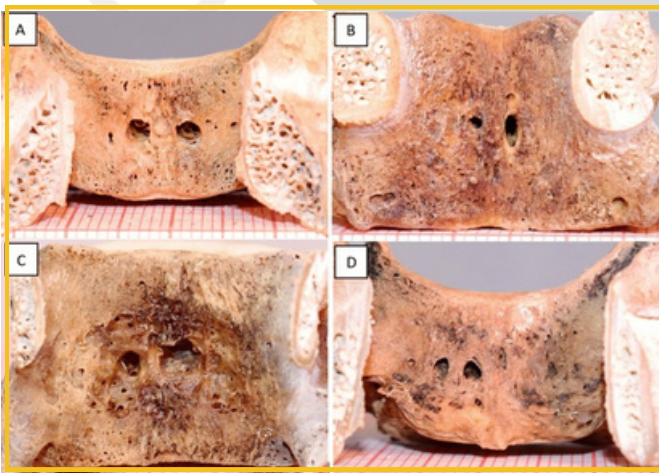


□ Body: thick ventral part. It has upper and lower flat surfaces, that give attachment to the cartilaginous intervertebral disc. ■ It has anterior and posterior surfaces, give attachment to the anterior and posterior longitudinal ligaments respectively. ■ The posterior surface contains from one to two foramina



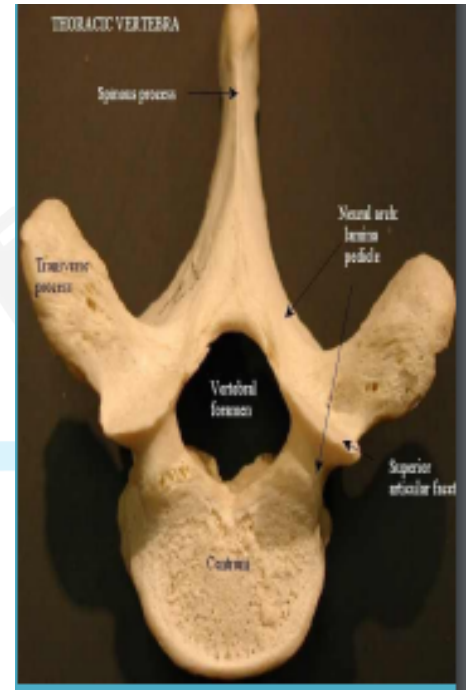
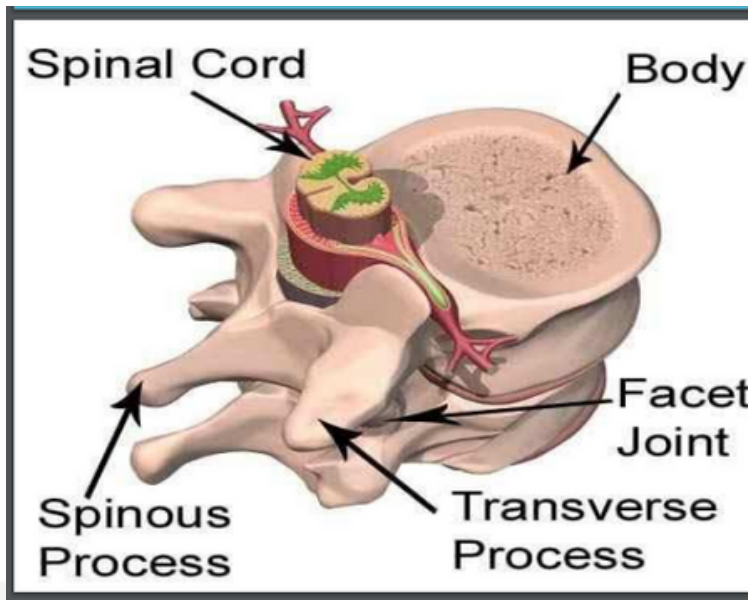
■ for the exit of basivertebral vein which drains the body of vertebra to the internal vertebral venous plexus of veins present inside the vertebral arches. ■ The body is convex anteriorly and slightly concave posteriorly.

حتلاقي بالbody من ورا فتحات - basivertebral foramina  
 بيمرق منها basivertebral veins بيحمل venous blood من ولى الbody وهي  
 احدى وسائل انتقال السرطان للعظم - الدم حيكون حامل malignant cells من  
 المكان المنصاب مثل الprostate cancer

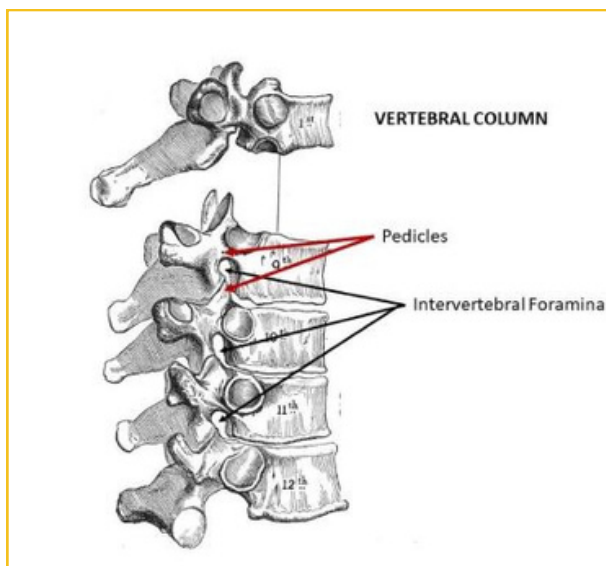




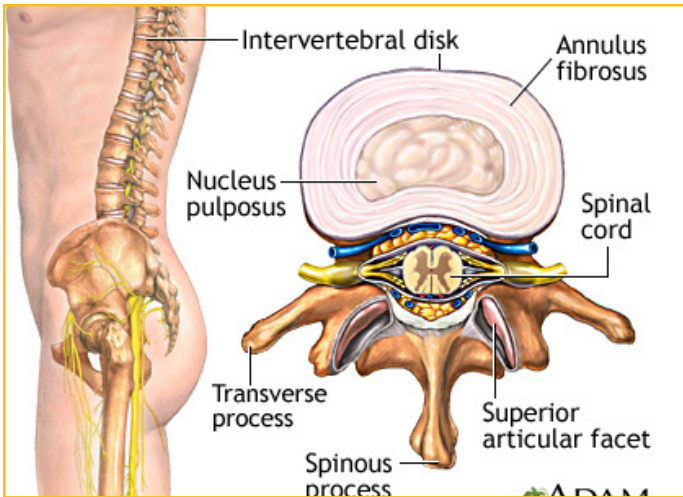
□ Vertebral arch: bony arch projecting backward, from the lateral margin of the body's posterior surface. ▪ encircles a vertebral foramen through which the spinal cord passes. ▪ From this arch seven bony processes project; two transverse, two superior articular, two inferior articular and midline posterior spine. ▪ The superior and inferior articular processes of two adjacent vertebrae articulate together at facet joint. ▪ In articulated vertebrae, the vertebral foramen of each vertebra forms the vertebral or spinal canal



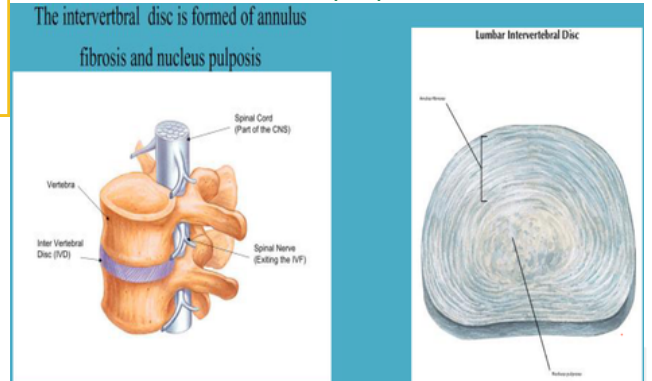
□ Pedicle: the part of arch lying between the body and transverse process. ▪ Its upper and lower border form the superior and inferior vertebral notch respectively. □ Lamina: the part of arch lying between the transverse process and spine. □ Intervertebral foramen: it is a foramen created in articulated vertebrae and bounded by the superior and inferior vertebral notch of two adjacent vertebrae. It give exit to the spinal nerve



بكل pedicle في notch ولما تتركب الفقرات على بعض the superior and inferior notches become foremen -> intervertebral foramen-> it gives passage for the spinal nerve

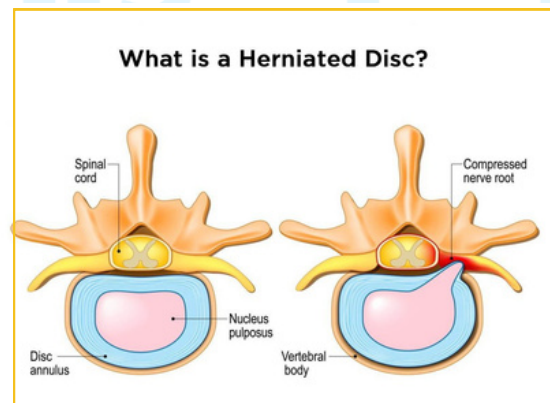


The intervertebral disk -> between body and body -> body secondary cartilaginous -> permanent cartilage composed of fibrocartilage  
 معمول من حلقات من ال fibrous tissue اسمها  
 annulus fibrosus وفي ال core تبعه اسمه  
 nucleus pulposus

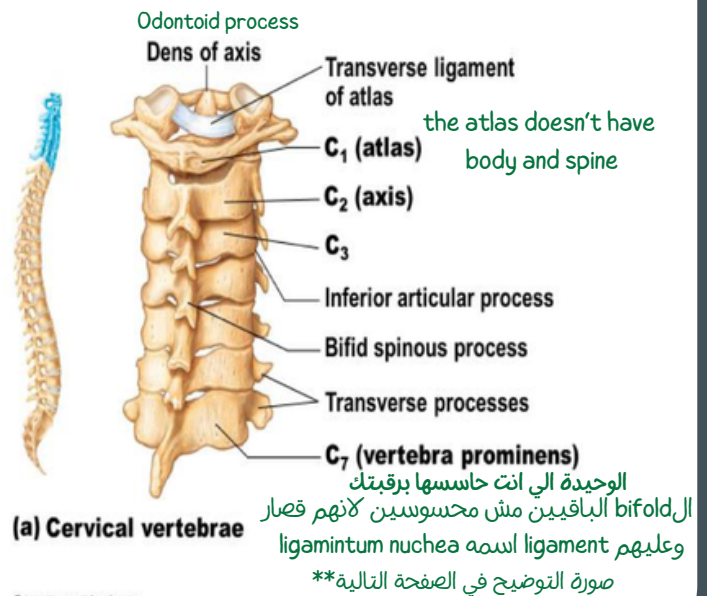


**Prolapsed disk (herniated disk )**

عملت حركة فجائية بالظهر -> غالبًا  
 flexion وطال -> لما تثني ظهرك بصير  
 tension of posterior ligament  
 بسحب الجزء ال fibrous من ال disk  
 ويعمله قطع وبصير bulge of the  
 nucleus pulposus out of the annulus  
 fibrosis and presses on the spinal  
 cord or the spinal nerve -> the  
 symptoms are manifestations of  
 compression



Individual vertebrae • A.Cervical vertebrae (C1–C7) – C1 is known as "atlas" and supports the head, C2 is known as "axis", C7 is known as "vertebra prominens" – C3-6 are typical – Possesses bifid spinous processes, which is absent in C1 and C7 – Only cervical vertebrae have transverse foramen – Small-bo

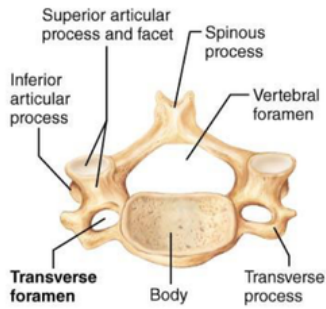


## Typical cervical

Table 7.2 Regional Charac

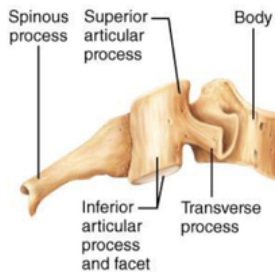
Characteristic Cervical (3-7)

### SUPERIOR VIEW

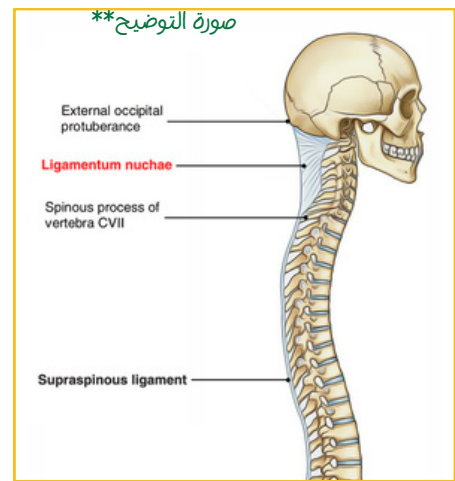


(a) Cervical

### RIGHT LATERAL VIEW



(a) Cervical



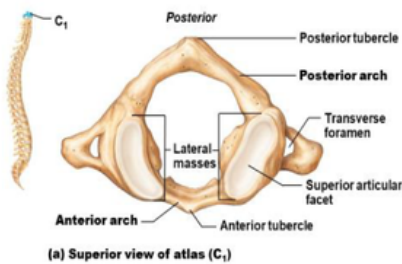
صورة التوضيح\*\*

بيكبر حجم ال body كل ما منزل لتحت لانه بزيد ال weight الي شايه Foremen transversarium of transverse process it only exists in cervical vertebrae The vertebral artery passes through it starting from C6 and up to the cranial cavity



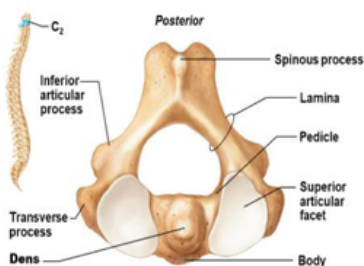
The superior articular process is oval and big -> to articulate with the occipital condyle -> Atlanto occipital joint -> synovial condyloid joint -> nodding movement

### C1 - The Atlas

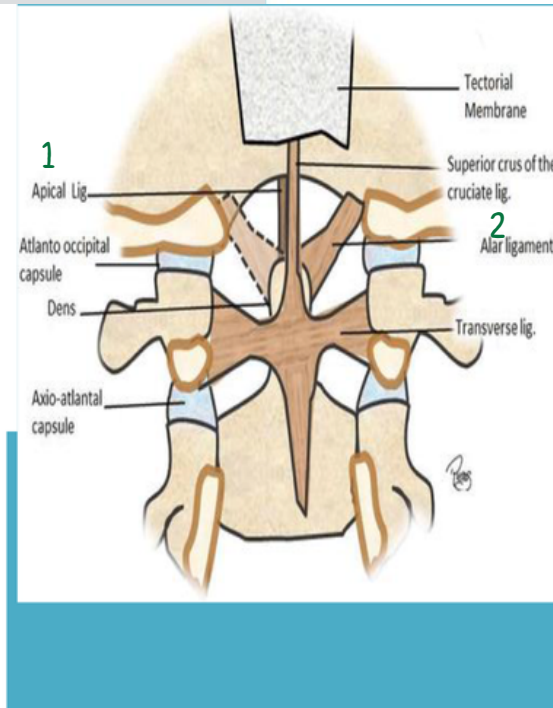


(a) Superior view of atlas (C<sub>1</sub>)

### C2 - Axis



(c) Superior view of axis (C<sub>2</sub>)

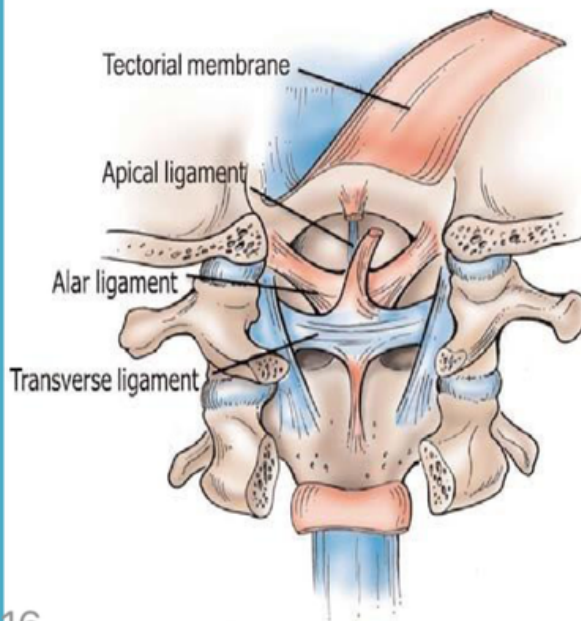
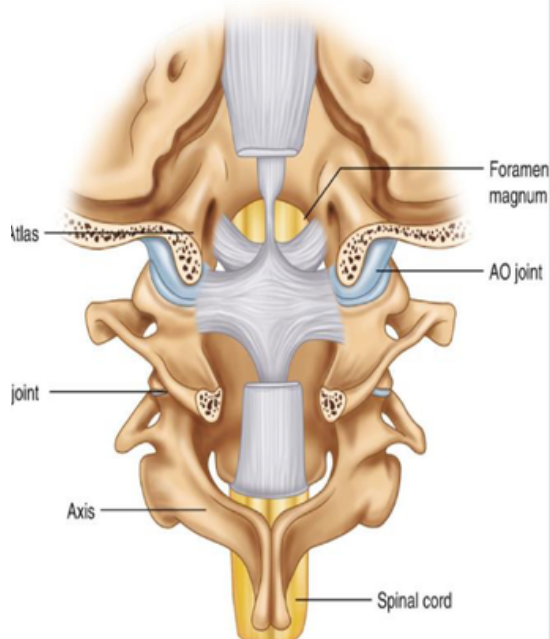


ال dens بيتربط ويتثبت مكانه ب 3 ligaments apical ligament and 2 alar ligament ويتثبت ال dense بال back of atlas بيتسمى cross ligament وشكله بيطلع ال superior crus وبنزل ال lower crus ويتغطى ب membrana tectoria كمالته حتكون ال longitudinal ligament

الوضعية هي رح تفسر mechanism of hanging الشق بدنا وسيلة سريعة وغير مؤلمة للموت، يتعلق فيصير dislocation فينك ال ligaments ويرجع ال dens لورا ويأخذ من اخر قطعة من ال medulla و بداية ال spinal cord و يموث



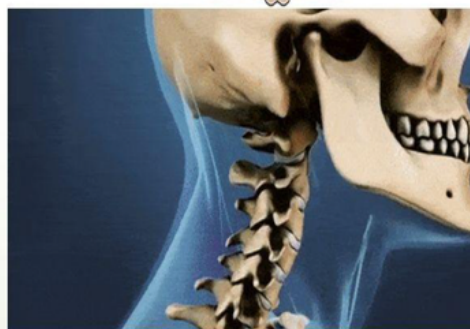
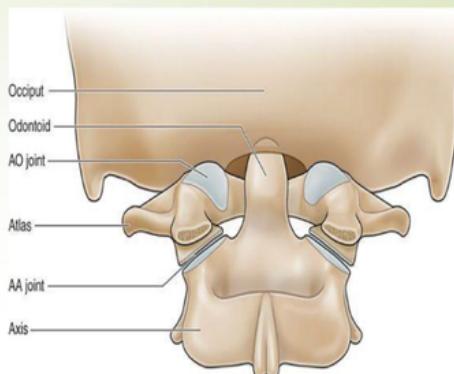
# Cranio cervical articulation



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## C1 - C2 Complex

- **Atlanto - Occipital Joint** (O-C1 Joint) permits primarily flexion and extension
- **Atlanto - Axial joint** (C1-C2 Joint) is primarily responsible for rotation in the cervical spine

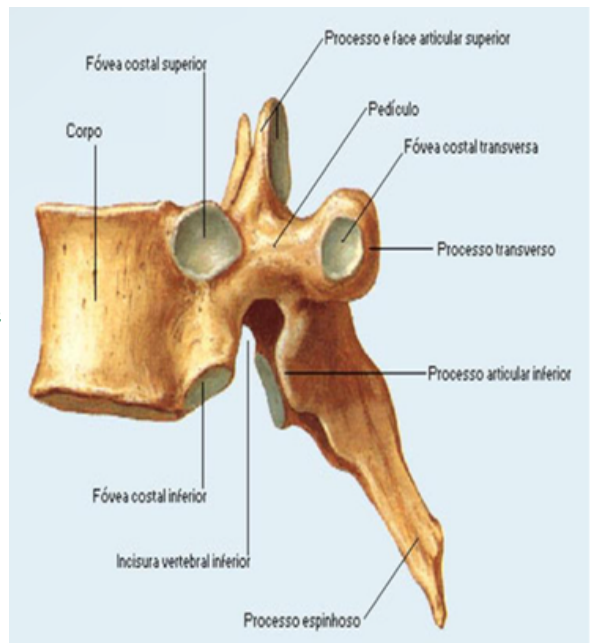


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عندي ٣ joints بين ال atlas and axis  
2 lateral atlanto axial joint  
& Median Atlanto axial joint →  
articulation of the dens of axis with  
the anterior arch of atlas



The smooth facets will articulate with the ribs and make plane synovial joint



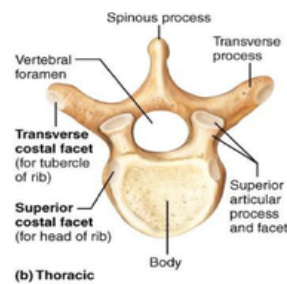
### Thoracic Vertebrae

A. Thoracic 1. long, inferior-directed spinous processes 2. transverse processes are long and heavy 3. T1 superior whole facet : inferior demifacet 4. T2-8 two demifacets; superior large / inferior small 5. T9 single superior demifacet 6. T10-12 whole facet for individual rib articulation

Table 7.2 Regional Characteristics of Cervical, Thoracic, and Lumbar Vertebrae

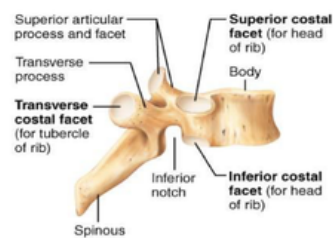
Characteristic	Cervical (3-7)	Thoracic	Lumbar
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**SUPERIOR VIEW**



(b) Thoracic

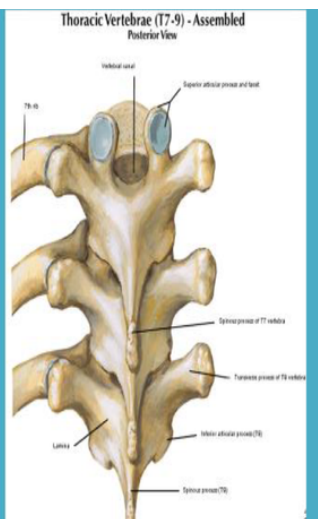
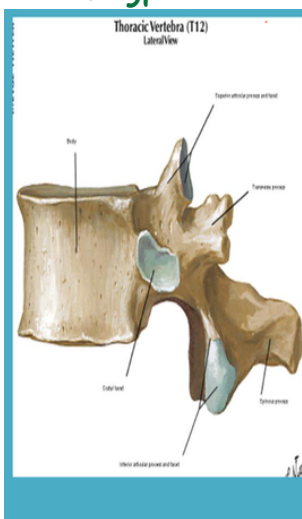
**RIGHT LATERAL VIEW**



(b) Thoracic

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**Atypical**



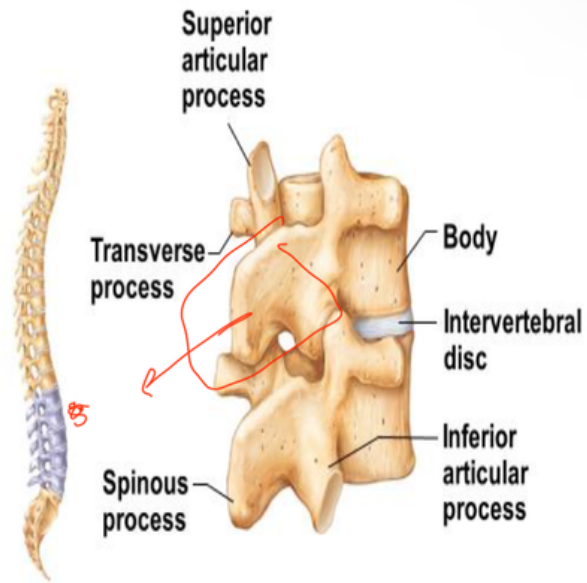
# Lumbar Vertebrae

## A. Lumbar

1. all have largest, thickest bodies

2. spinous processes are oblong and heavy

مميزات الـ lumbar  
Big body / it has no facets on the sides or the transverse process / no foramen in the transverse / quadrilateral spine



(c) Lumbar vertebrae

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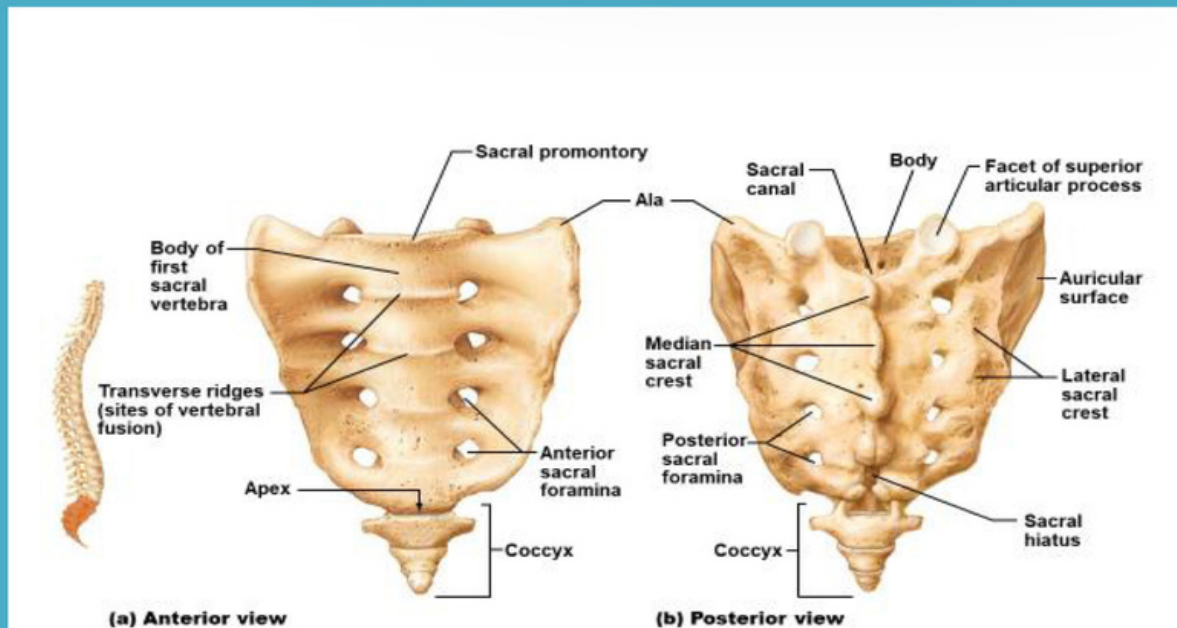
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Table 7.2

Regional Characteristics of Cervical, Thoracic, and Lumbar Vertebrae

Characteristic	Cervical (3-7)	Thoracic	Lumbar
<b>SUPERIOR VIEW</b>			
Direction of superior articular facet of: cervical vertebrae/ superior thoracic vertebrae/ posterolateral lumbar vertebrae/ posteromedial		superior اتجاه الـ articular process postomedial	<p>(c) Lumbar</p>
<b>RIGHT LATERAL VIEW</b>			
		inferior articular process اتجاه الـ Lateral-> it will articulate with the superior اتجاهه الي medial	<p>(c) Lumbar</p>

Sacral: 5 (fused) vertebrae (S1–S5)  
 Coccygeal: 4 (3–5) (fused) vertebrae (Tailbone)



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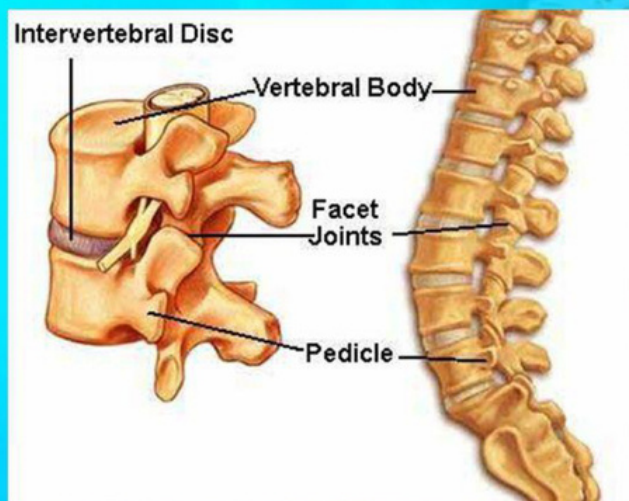
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A typical vertebra has **6 joints** with adjacent vertebrae.

■ 4 synovial joints (2 above & 2 below)

■ 2 symphyses (1 above & 1 below)

Each symphysis includes an intervertebral disc.

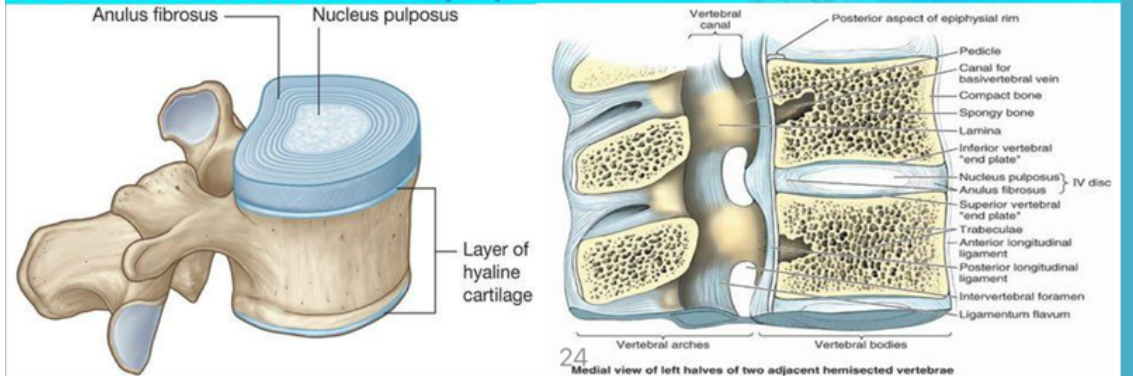


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# JOINTS OF VERTEBRAL BODIES

- **Symphyses** (Secondary cartilaginous joints)
- Designed for weight-bearing and strength.
- The articulating surfaces of adjacent vertebrae are connected by intervertebral discs and ligaments.
- The intervertebral disc consists of an outer **anulus fibrosus**, which surrounds a central **nucleus pulposus**.



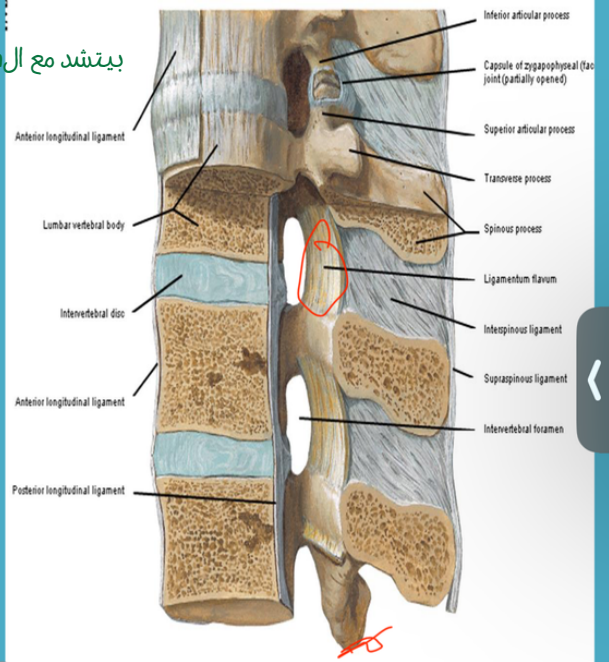
## Ligaments and Joint Capsules.

- The ligamentous system of the vertebral column is extensive and exhibits considerable regional variability. There are 6 main ligaments associated with the intervertebral and zygapophyseal joints.

- I. Anterior longitudinal ligaments (أكثر واحد قوي) hyperextension مع ال بيتشد
- II. Posterior longitudinal ligaments
- III. ligamentum flavum كلهم بالازرق يعني collagen هو الوحيد بالاصفر elastic - يقع بين كل lamina والي وراها
- IV. Interspinous بين كل spine والي تحته
- V. Intertransverse
- VI. Supraspinous ligaments

مش بكل ال vertebrae cervical محاط فيه ligamentum nucha

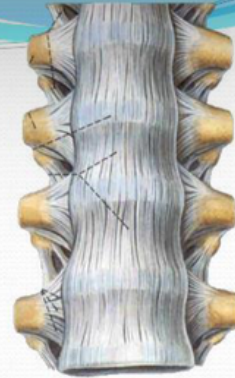
### Vertebral Ligaments of Lumbar Region Left Lateral View - Partially Sectioned in Median Plane





## Anterior longitudinal ligament

- Strong band covering the anterior part of the vertebral bodies and intervertebral discs running from the anterior margin of foramen magnum to the S1~S2
- Maintains stability of the intervertebral disc and prevents hyperextension of the vertebral column



## Posterior longitudinal ligament

- Attached to the posterior aspect of the intervertebral discs and posterior edges of the vertebral bodies from C2 vertebra to sacrum
- Prevents hyperflexion of the vertebral column and posterior protrusion of the discs



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### Ligaments

#### 1-Supraspinous ligament:

This runs between the tips of adjacent spines.

#### 2-Interspinous ligament:

This connects adjacent spines.

#### 3-Intertransverse ligaments:

These run between adjacent transverse processes.

#### 5-Ligamentum flavum:

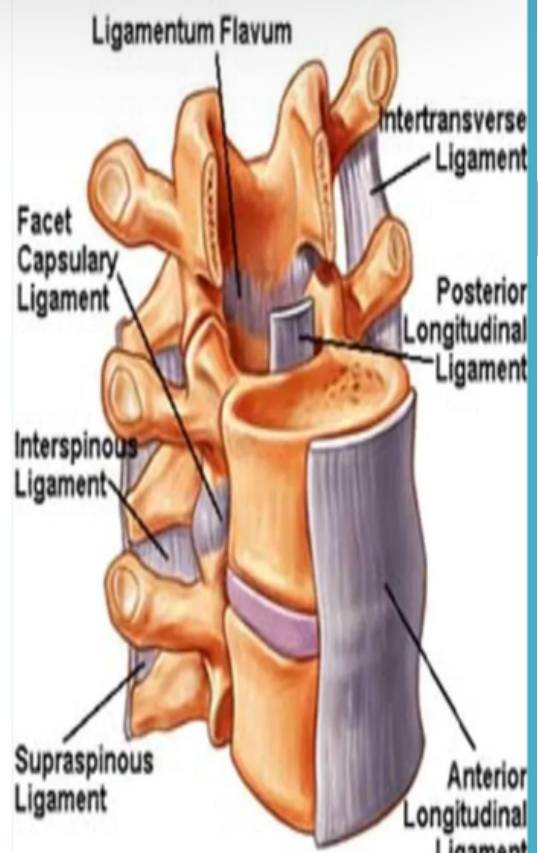
This connects the laminae of adjacent vertebrae.

#### In the cervical region,

the supraspinous and interspinous ligaments are greatly thickened to form

the strong **ligamentum nuchae**.

The latter extends from the spine of the seventh cervical vertebra to the external occipital protuberance of the skull



# الطب والجراحة لجنة

فاسْتَعِينِ بِاللَّهِ يَا صَاحِبِي وَعَلِّمْ  
أَنْ لِكُلِّ سَاعٍ مَا سَعَى وَأَنَّ اللَّهَ لَا  
يُكَلِّفُ نَفْسًا إِلَّا وُسْعَهَا، وَالَّذِي  
كُلَّفَكَ هَذَا قَدِيرٌ أَنْ يُعِينَكَ عَلَيْهِ؛  
فَلَا تَيْأَسْ وَحَاوِلْ حَتَّى تَصِلَ.

