

Cervical vertebrae

Thoracic vertebrae

Lumbar vertebrae

Sacrum (5 pieces)

Coccyx (4 pieces)

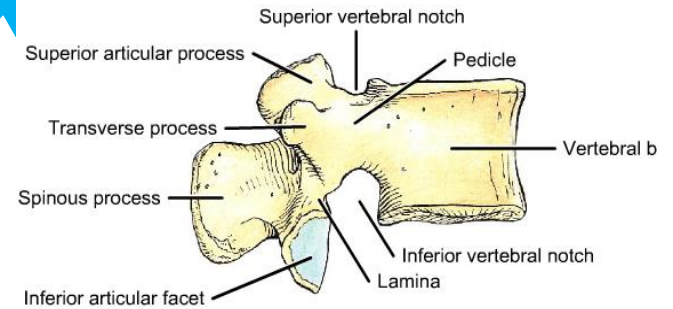
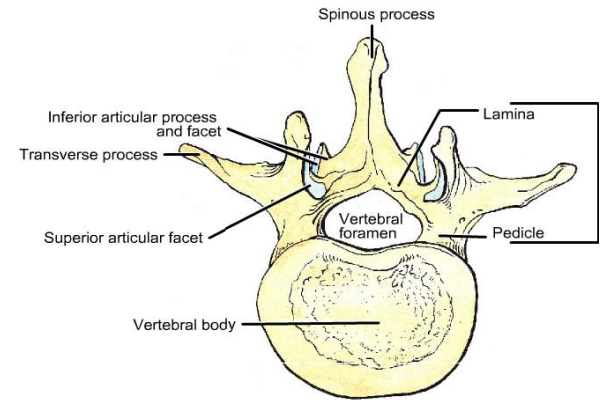
The vertebral column

comprises 24 separate •
(presacral) vertebrae and two
composite vertebrae, the
sacrum and coccyx; of the 24
separate vertebrae,

**-12 support ribs
(thoracic),**

**-7 are in the neck
(cervical)**

**-5 are in the lumbar
region (lumbar);**



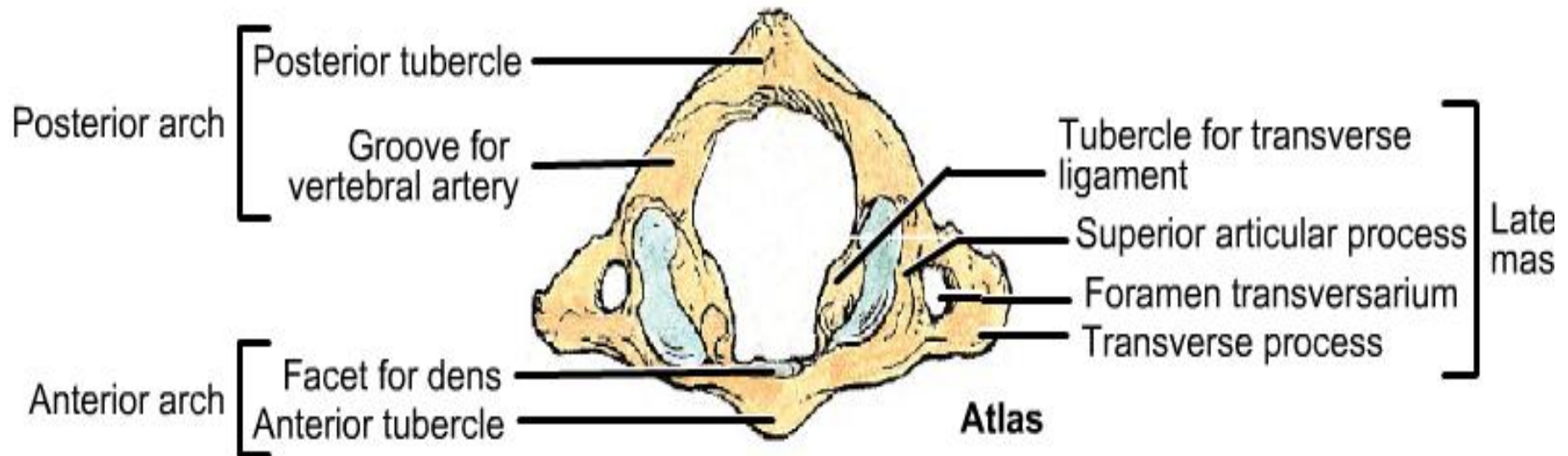
Cervical vertebrae :

Atypical v. (c1+c2+C7)

C1: -no body (**Dens: process from C2**)

-2 lateral masses

-2 anterior and posterior arch (**laminae and pedicles**)



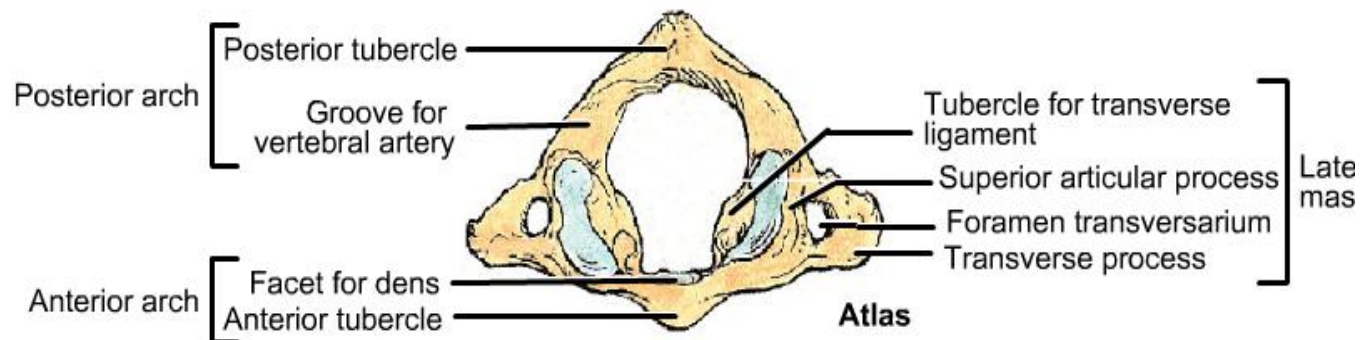
-spinshape replaced by posterior tubercle

-lateral masses (superior: concave shape like kidney

(inferior : circle in shape)+ and have 2 Medial projections for transvers

l igament

- Long transvers process (c1+c7)

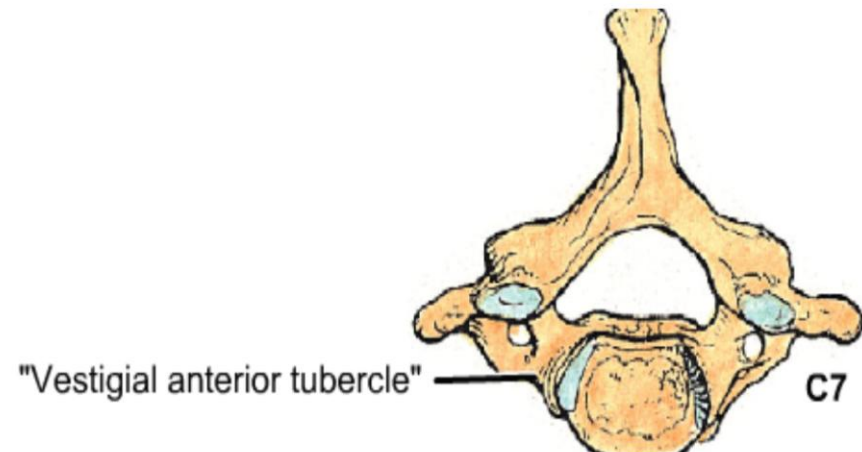


C7;

-spin is long(vertebra prominens) un bifid

-Transverse process lack anterior tubercle -

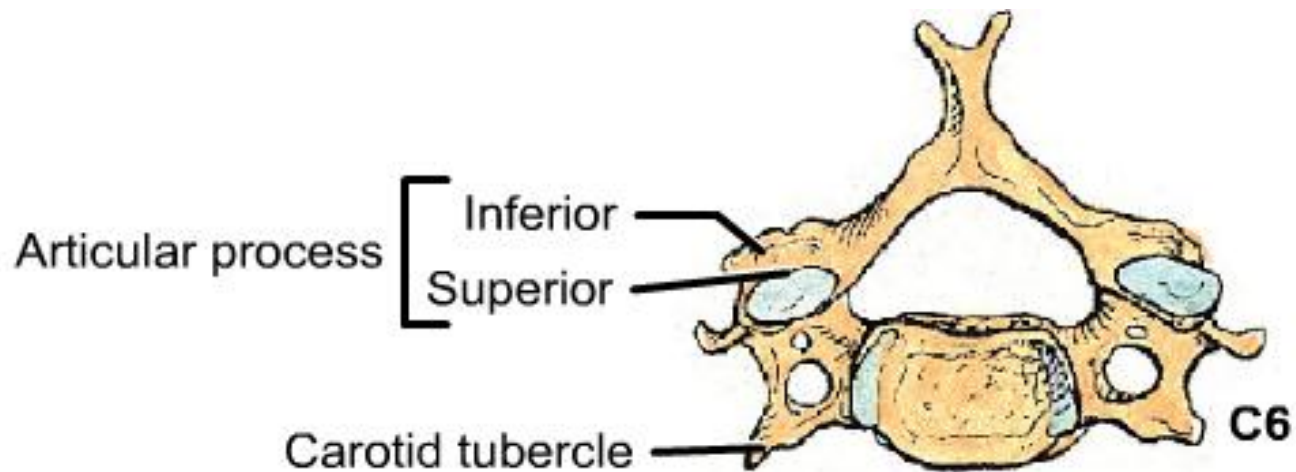
-Foramen transversarium transmit vein only



Palpable parts of c.v. •

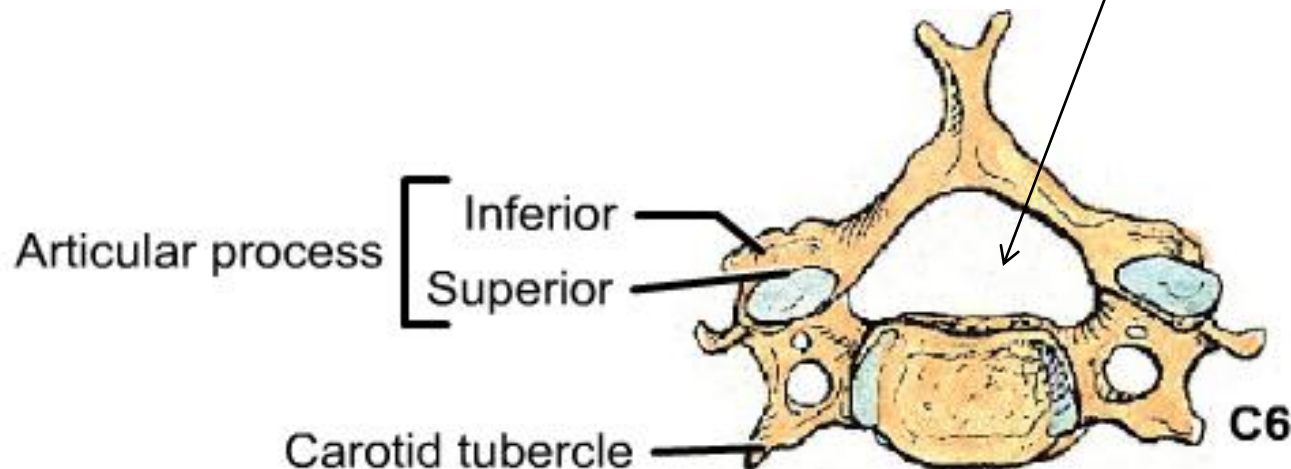
Spine of C2 5 cm below ext.occ. Protuber. •

Spine of C7. (vertebral prominence) •

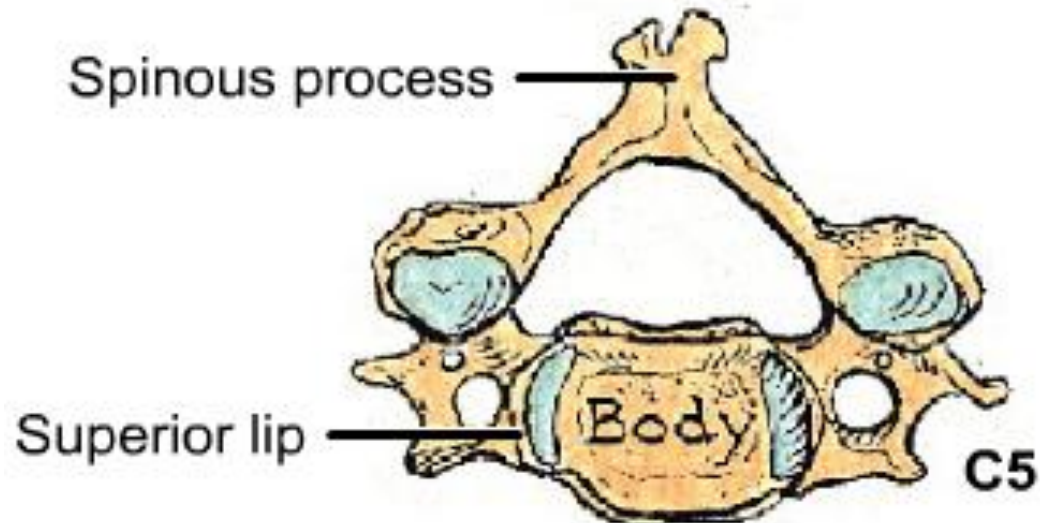


Typical cervical vertebrae (C3-C6)

- =vertebral bodies transversely elongated,
- =their superior surfaces with lateral lips,
- =vertebral foramina are large & triangular;
- =The superior and inferior vertebral notches are nearly equal in depth;
- =The spinous processes are short and bifid,;



=The transverse processes are short, perforated, and end laterally in anterior and posterior tubercles with a gutter between them; those of the atlas and C7 are long and have one (posterior) tubercle, as does the axis, but it is short.



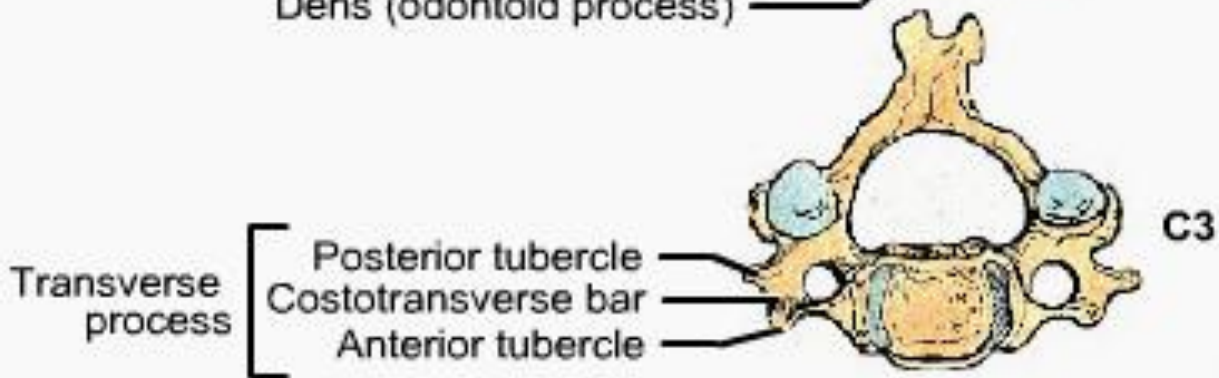
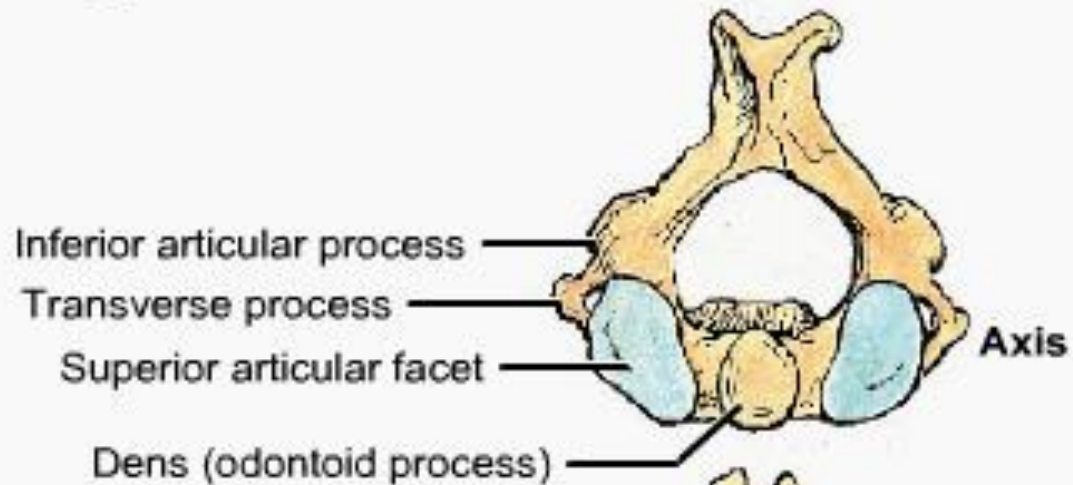
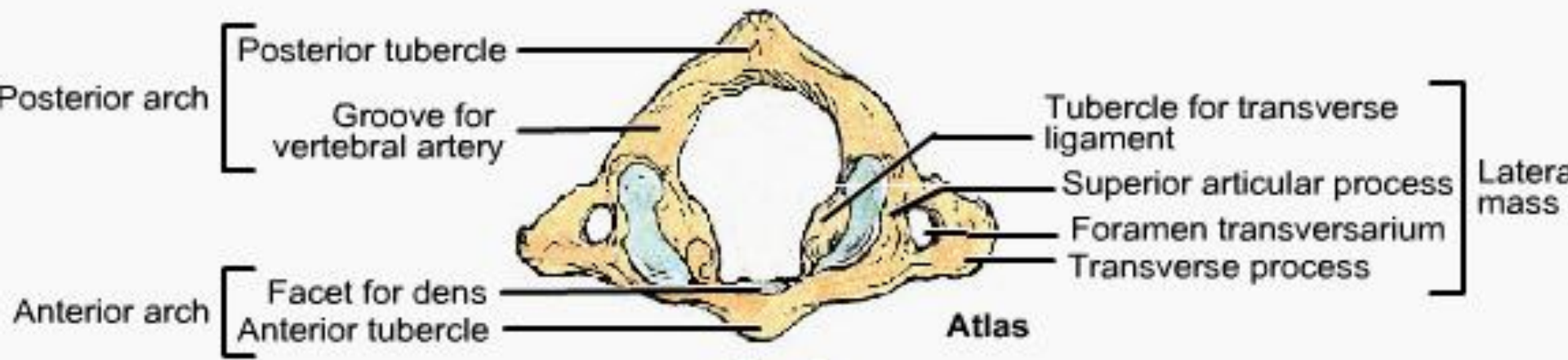
Transvers foramen transmit : •

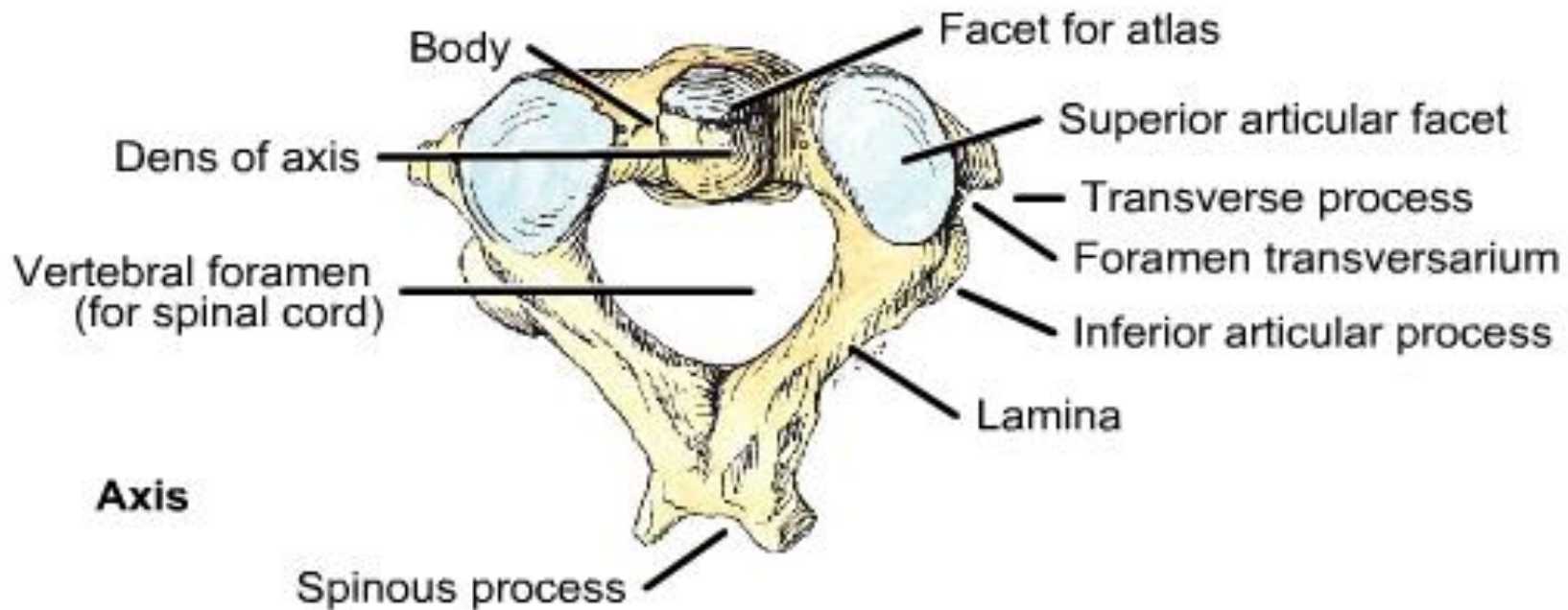
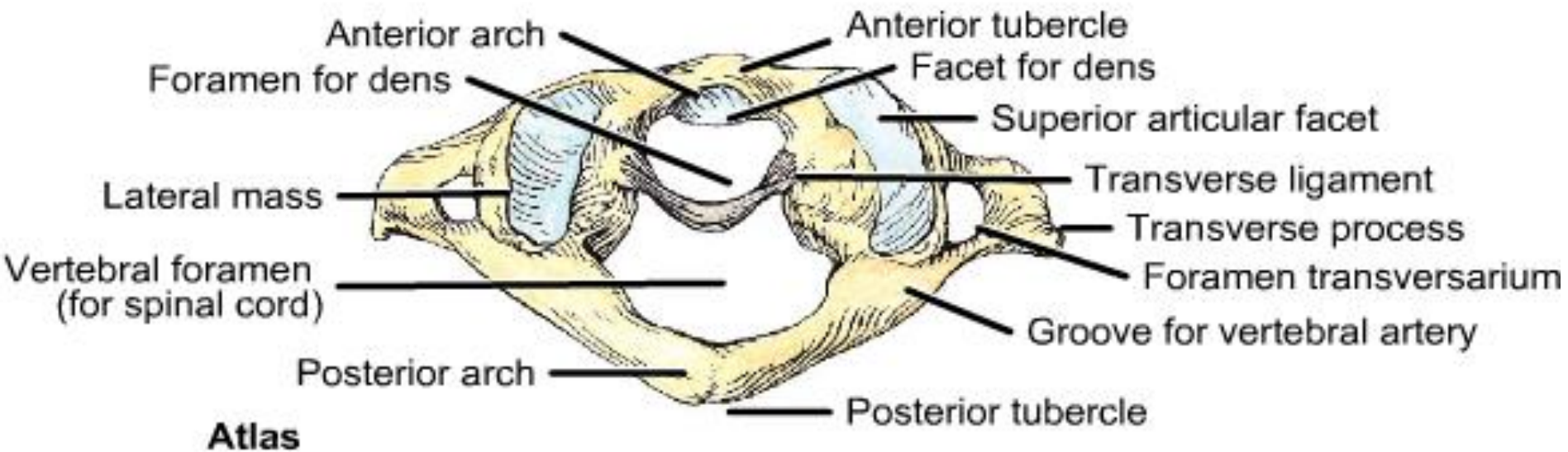
Artery •

Vein •

Sympathetic plexus

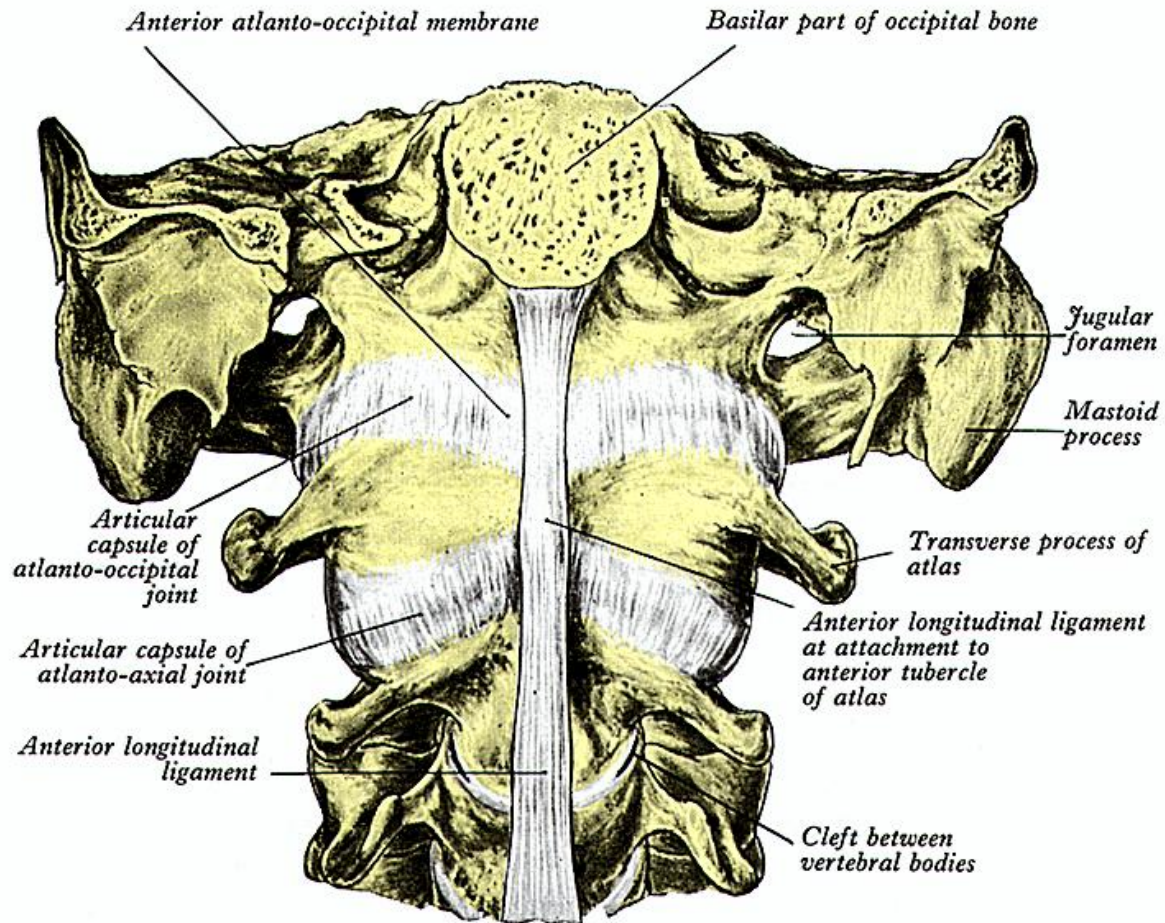
Cv7 transmit vein only

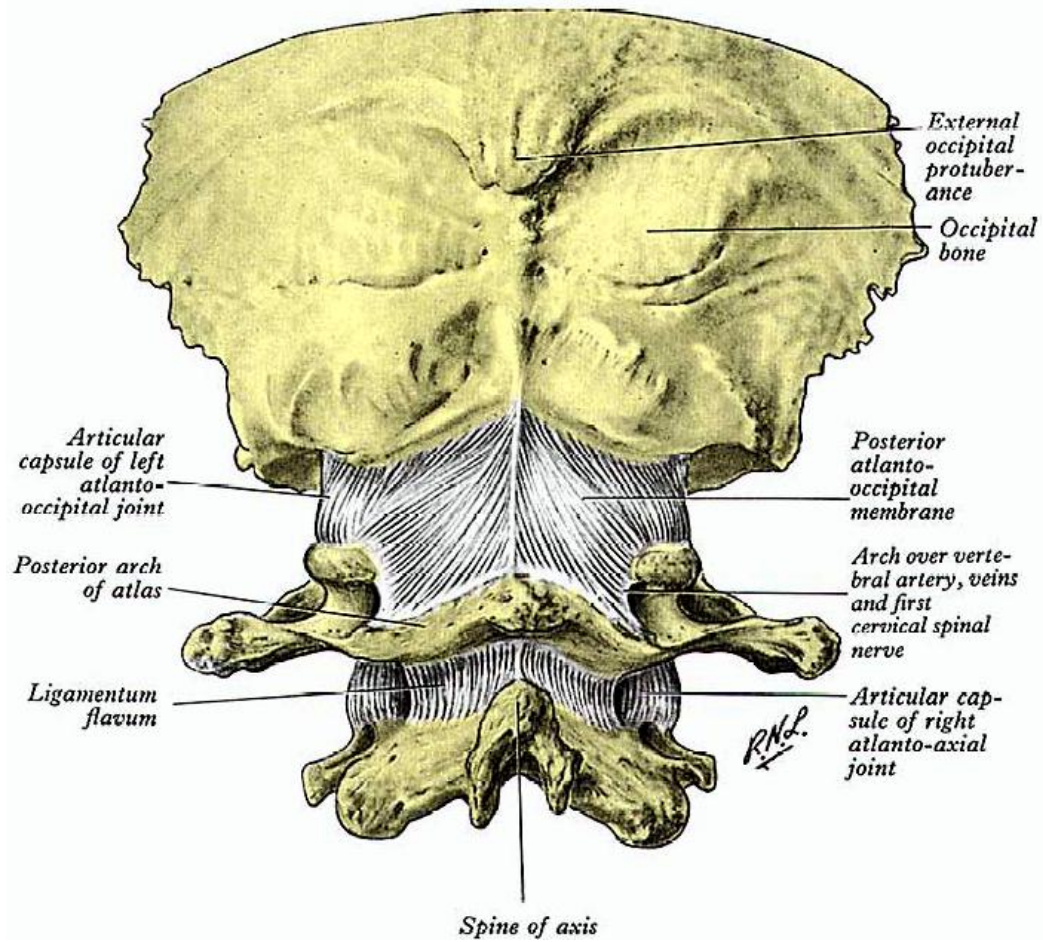


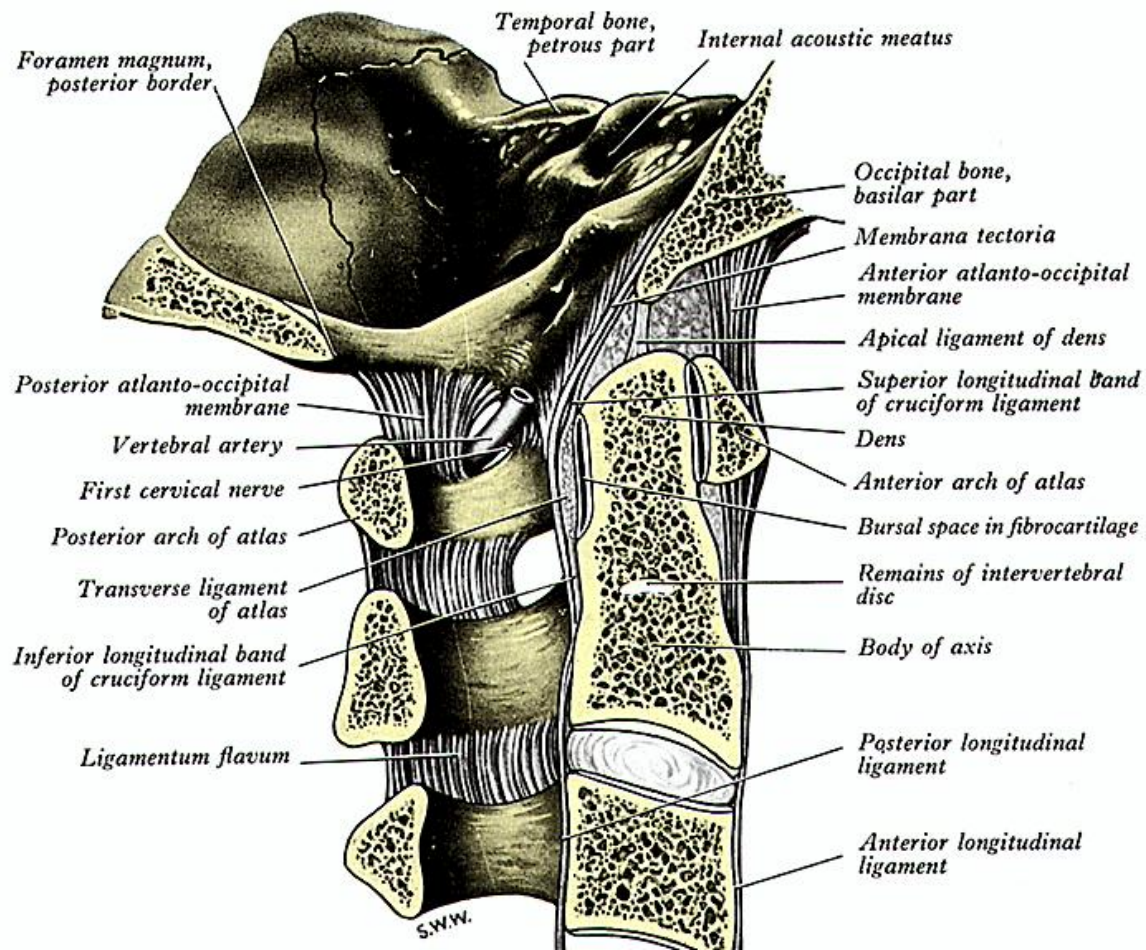


Atlanto-Axial Joints

Articulation of atlas to axis is at three synovial joints, a pair between lateral masses, and a median complex between the dens of the axis and the anterior arch and transverse ligament of the atlas.







- Craniovertebral Joints
- The articulation between the cranium and vertebral column is specialized to provide a wider range of movement than in the rest of the axial skeletal. It consists of the occipital condyles, atlas and axis, and functions like a universal joint, permitting horizontal and vertical scanning movements of the head, which is superbly adapted for eye-head co-ordination

- The Lateral Atlantoaxial Joints
- These are often classified as planar but the bony articular surfaces are more complex in shape, usually reciprocally concave in the coronal plane, with the medial parts being somewhat convex in the sagittal plane, especially that of the axis.

- The cartilaginous articular surfaces are usually less concave. Fibrous capsules attached to their margins are thin, loose and lined by synovial membrane. Each has a posteromedial accessory ligament attached below to the axial body near the base of its dens, and above to the lateral atlantal mass near the transverse ligament.

- Anteriorly, the vertebral bodies are connected by the anterior longitudinal ligament (6.101): here a strong, thickened band attaches above to the lower border of the anterior tubercle of the anterior arch of the atlas and below to the front of the axial body. Posteriorly the vertebral bodies are joined by the ligamenta flava (6.102), attaching to the lower border of the atlantal arch above, and to the upper borders of the axial laminae. At this level these ligaments are a thin membrane, pierced laterally by the second cervical nerves.

- The Median Atlantoaxial Joint
- A pivot between the dens and a ring formed by the anterior arch and transverse ligament of the atlas, it has two synovial cavities which sometimes communicate (Cave 1975). A vertically ovoid facet on the anterior dens articulates with one on the posterior aspect of the anterior atlantal arch.

- The fibrous capsule, which is lined by synovial membrane, is relatively weak and loose, especially superiorly. The synovial cavity of the posterior component of the median joint complex is larger, lying between the horizontally orientated ovoid facet, grooving the posterior surface of the dens and the cartilaginous anterior surface of the transverse ligament (6.103): communication often exists with one or both of the atlanto-occipital joint cavities.

- The Transverse Atlantal Ligament
- (6.99, 103, 104)
- This is a broad, strong band arching across the atlantal ring behind the dens: it is variable in length (mean 20.1 mm) (Dvorak et al 1988b). It is attached laterally to a small but prominent tubercle on the medial side of each atlantal lateral mass, and broadens medially where it is covered anteriorly by a thin layer of articular cartilage. It consists almost entirely of collagen fibres, which, in the central part of the ligament, cross one another at an angle to form an interlacing mesh (Dvorak et al 1988b).

- From its upper margin a strong median longitudinal band arises which inserts into the basilar part of the occipital bone between the apical ligament of the dens and membrana tectoria, and from its inferior surface a weaker and less consistent longitudinal band passes to the posterior surface of the axis. These transverse and longitudinal components together constitute the cruciform ligament.

- This is also broad, but relatively thin, connecting the posterior margin of the foramen magnum to the upper border of the posterior atlantal arch, blending laterally with the joint capsules. It arches over the grooves for the vertebral arteries, venous plexuses and first cervical nerve: the ligamentous border of the arch is sometimes ossified.
- Movements at the Atlanto-Occipital Joints

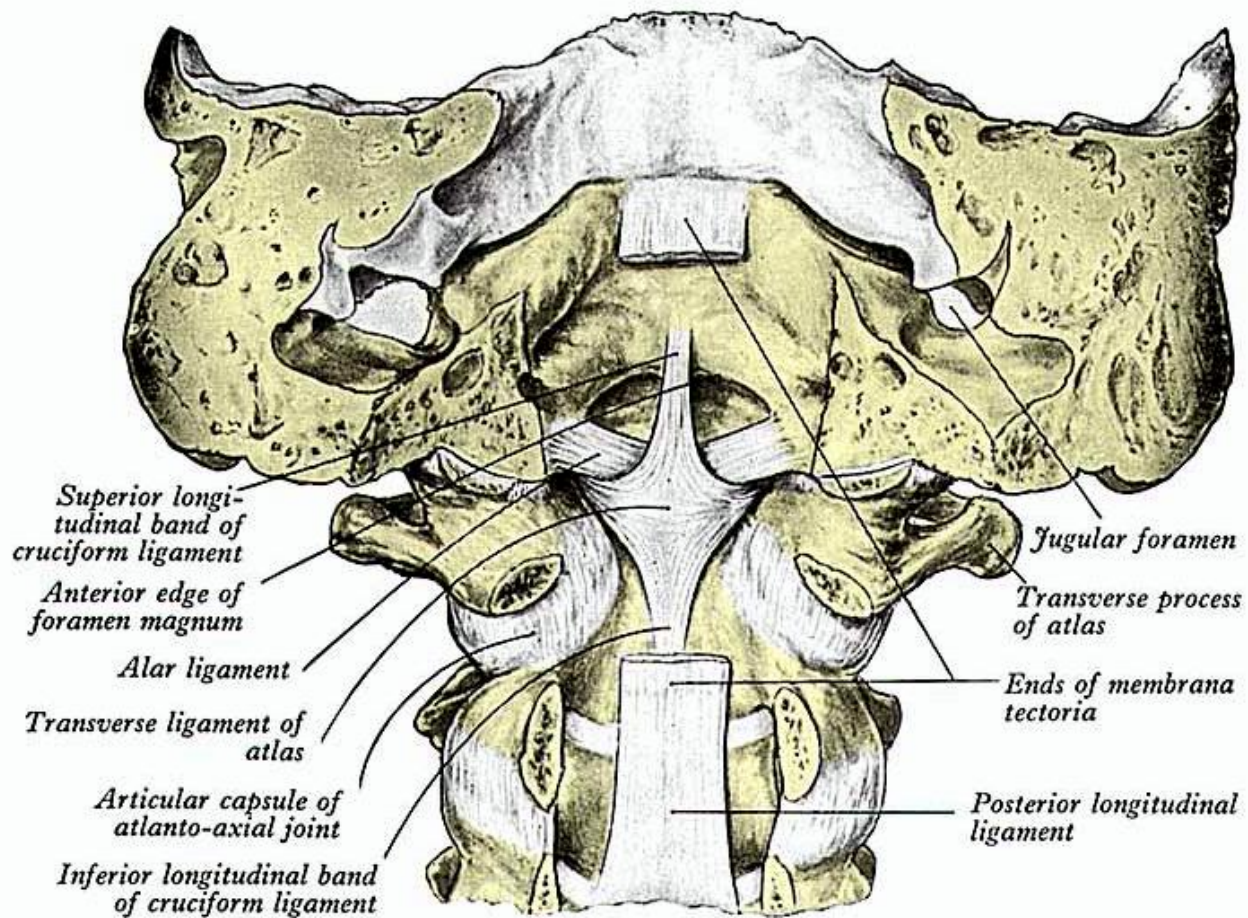
- The long (topographical) axes run anteromedially; because of this and their articular curvatures, the joints act as one around transverse and anteroposterior axes of movement but not about a vertical axis. The main movement is flexion, with a little lateral flexion and rotation. In young individuals the flexion range has been measured at 16.8–20.8° (Johnson et al 1977), lateral flexion at 3° and rotation at 5.7° (Dvorak et al 1988a).

- Muscles Producing Movements at the Atlanto-Occipital Joints
- These are for flexion: longus capitis and rectus capitis anterior; extension: recti capitis posteriores major and minor, obliquus capitis superior, semispinalis capitis, splenius capitis and trapezius (cervical part); lateral flexion: rectus capitis lateralis, semispinalis capitis, splenius capitis, sternocleidomastoid and trapezius (cervical part); rotation: obliquus capitis superior, rectus capitis posterior minor, splenius capitis and sternocleidomastoid

- Ligaments Connecting Axis and Occipital Bone
- These consist of the membrana tectoria, and paired alar and median apical ligaments.
- Membrana Tectoria
- Inside the vertebral canal, this is a broad strong band representing the upward continuation of the posterior longitudinal ligament (p. 512). Its superficial and deep laminae are both attached to the posterior surface of the axial body, the superficial lamina expanding as it ascends to the upper surface of the basilar occipital bone, attaching above the foramen magnum, where it blends with the cranial dura mater. The deep lamina has a strong median band ascending to the foramen magnum, and two lateral bands which pass and blend with the capsules of the atlanto-occipital joints as they reach the foramen magnum. The membrane is separated from the cruciform ligament of the atlas by a thin layer of loose areolar tissue, and sometimes by a bursa.

- Alar Ligaments
- (6.104)
- Thick cords about 11 mm long, they extend from the longitudinally ovoid flattenings on the posterolateral aspect of the apex of the dens horizontally and laterally to the roughened areas on the medial side of the occipital condyles. In most individuals there is also an anteroinferior band about 3 mm long which inserts into the lateral mass of the atlas in front of the transverse ligament; a few fibres are occasionally found passing from the dens to the anterior arch of the atlas (Dvorak and Panjabi 1987).

- In addition, in about 10% of cases a continuous transverse band of fibres passes between the occipital condyles immediately above the transverse ligament, the transverse occipital ligament (Dvorak et al 1988b). These ligaments consist mainly of collagen fibres arranged in parallel. The main function of the alar ligaments is now considered to be limitation of atlantoaxial rotation, the left becoming taut on rotation to the right and vice versa. The slightly upward movement of the axis during rotation helps permit a wider range of movement by reducing tension in the alar ligaments, as it does also in the capsules and accessory ligaments of the lateral atlanto-occipital joint.



- Apical Ligament of the Dens
- (6.103)
- It fans out from the apex of the dens into the anterior margin of the foramen magnum between the alar ligaments. It represents the cranial continuation of the notochord and its sheath (Ganguly & Roy 1964; O'Rahilly et al 1974). It is separated for most of its extent from the anterior atlanto-occipital membrane and cruciform ligament by pads of fatty tissue, though it blends with their attachments at the foramen magnum, and with the alar ligaments at the apex of the dens.

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