

# ANATOMY

---

# ANATOMY

---

NECK

AREAS	BONES	ORGANS	MUSCLES	NERVES	VESSELS	OTHER
<ul style="list-style-type: none"> <li>• Anterior Triangle</li> <li>• Posterior Triangle</li> </ul>	<ul style="list-style-type: none"> <li>• Cervical Spine</li> <li>• Hyoid Bone</li> </ul>	<ul style="list-style-type: none"> <li>• Pharynx</li> <li>• Larynx</li> <li>• Oesophagus</li> <li>• Thyroid Gland</li> <li>• Parathyroid Glands</li> </ul>	<ul style="list-style-type: none"> <li>• Suboccipital</li> <li>• Suprahyoids</li> <li>• Infrahyoids</li> <li>• Scalenes</li> </ul>	<ul style="list-style-type: none"> <li>• Phrenic Nerve</li> <li>• Cervical Plexus</li> </ul>	<ul style="list-style-type: none"> <li>• Arterial Supply</li> <li>• Venous Drainage</li> <li>• Lymphatics</li> </ul>	<ul style="list-style-type: none"> <li>• Fascial Layers</li> </ul>

# NECK

# NECK

---

## Bones of the Neck

- Cervical Spine
- Hyoid Bone

# CERVICAL SPINE

## Contents

### 1 Characteristic Features

#### 1.1 Atlas and Axis

### 2 Joints

### 3 Ligaments

### 4 Anatomical Relationships

### 5 Clinical Relevance: Injuries to the Cervical Spine

#### 5.1 Jefferson Fracture of the Atlas

#### 5.2 Hyperextension (Whiplash) Injury

#### 5.3 Hangman's Fracture

#### 5.4 Fracture of the Dens

# CERVICAL SPINE

## Introduction

- The **cervical spine** is the most superior portion of the vertebral column, lying between the cranium and the thoracic vertebrae.
- It consists of seven distinct vertebrae, two of which are given unique names:
- The first cervical vertebrae (C1) is known as the **Atlas**.
- The second cervical vertebrae (C2) is known as the **Axis**.
- In this article, we shall look at the anatomy of the **cervical vertebrae** – their characteristic features, articulations and clinical relevance.

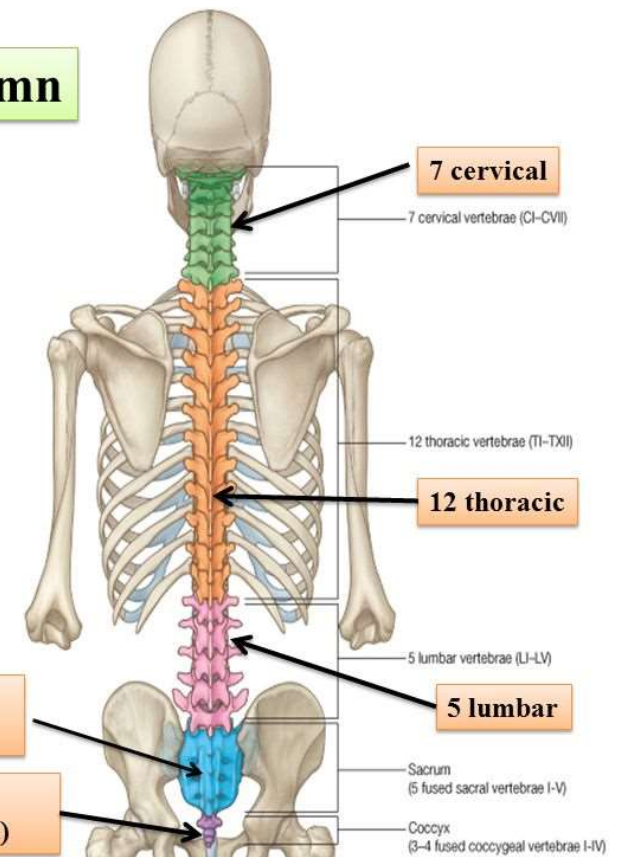
# Cervical Spine

## The Vertebral Column

Is composed of 33 vertebrae

5 sacral  
(fused to form the sacrum)

4 coccygeal  
(the lower 3 are commonly fused)



# CERVICAL SPINE

## Characteristic Features

The cervical vertebrae have three main features which distinguish them from other vertebrae:

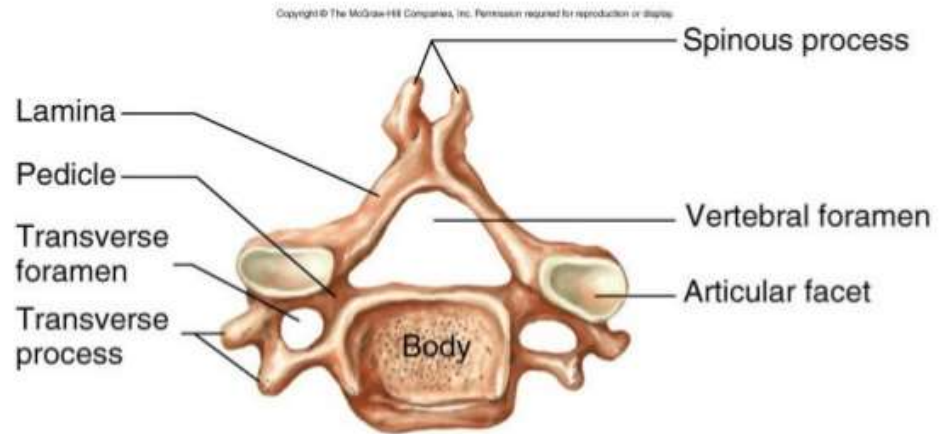
- **Triangular** vertebral foramen.
- **Bifid spinous process** – this is where the spinous process splits into two distally.
- **Transverse foramina** – holes in the transverse processes. They give passage to the vertebral artery, vein and sympathetic nerves.



# CERVICAL SPINE

## Characteristic Features

## Typical Cervical Vertebra

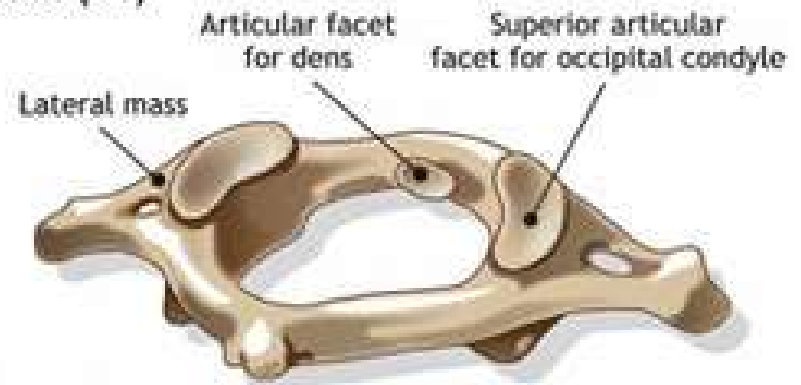


(c) **Cervical vertebra, superior view**

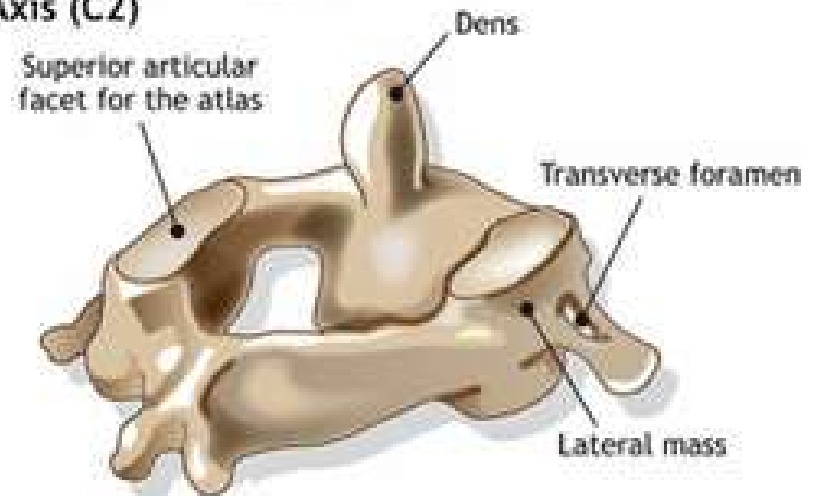
# CERVICAL SPINE

Characteristic Feature

**Atlas (C1)**



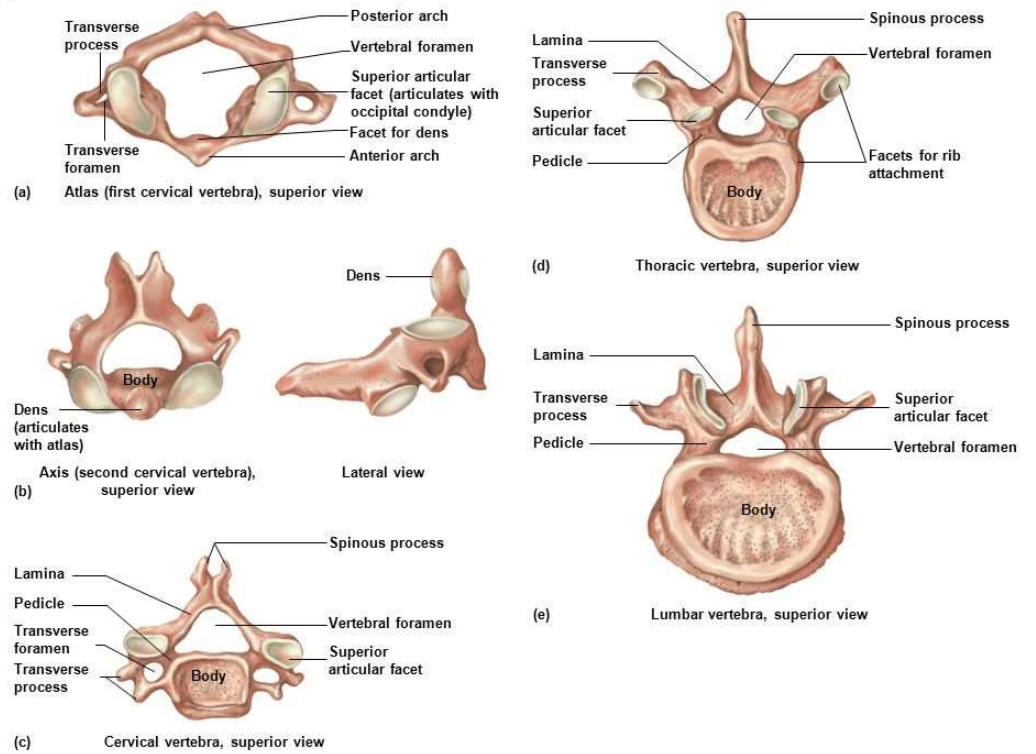
**Axis (C2)**



# CERVICAL SPINE

Fig. 6.19

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



# CERVICAL SPINE

## Atlas and Axis

The atlas and axis have additional features that mark them apart from the other cervical vertebrae.

### Atlas

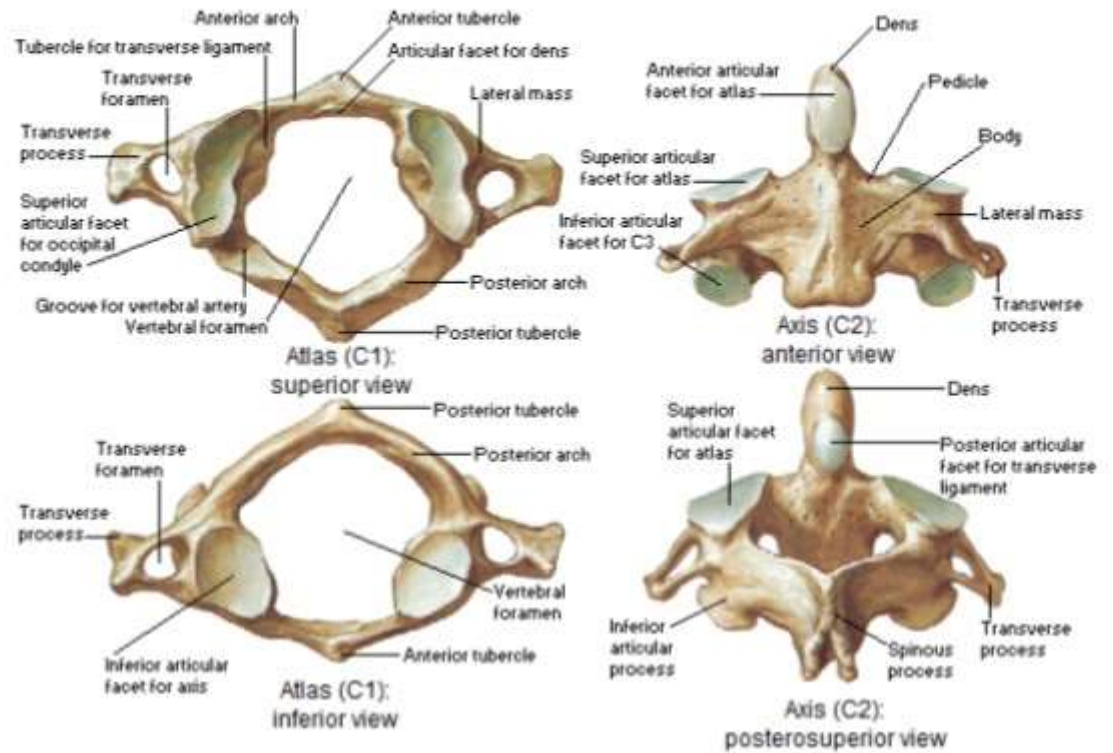
- The atlas is the first cervical vertebra and articulates with the occiput of the head and the axis (C2). It differs from the other cervical vertebrae in that it has no vertebral body and no spinous process.
- Instead, the atlas has **lateral masses** which are connected by an anterior and posterior arch. Each lateral mass contains a superior articular facet (for articulation with occipital condyles), and an inferior articular facet (for articulation with C2).
- The anterior arch contains a facet for articulation with the dens of the axis. This is secured by the **transverse ligament of the atlas** – which attaches to the lateral masses. The posterior arch has a groove for the vertebral artery and C1 spinal nerve.

# CERVICAL SPINE

Features

HOME

## Cervical Vertebrae Atlas and Axis



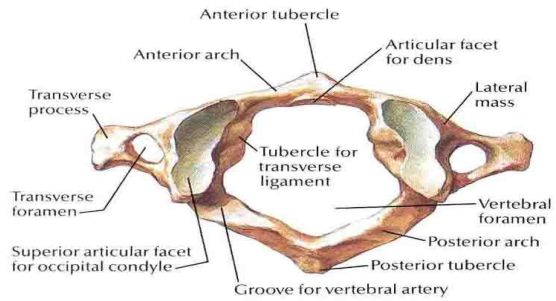
# CERVICAL SPINE

## Axis

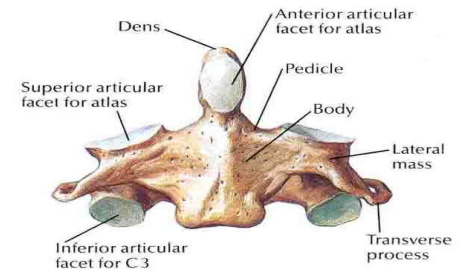
- The **Axis** (C2) is easily identifiable due to its dens (odontoid process) which extends superiorly from the anterior portion of the vertebra.
- The dens articulates with the anterior arch of the atlas, in doing so creating the **medial Atlanto-Axial joint**. This allows for rotation of the head independently of the torso.
- The axis also contains **superior articular facets**, which articulate with the inferior articular facets of the atlas to form the two **Lateral Atlanto-axial joints**.

# CERVICAL SPINE

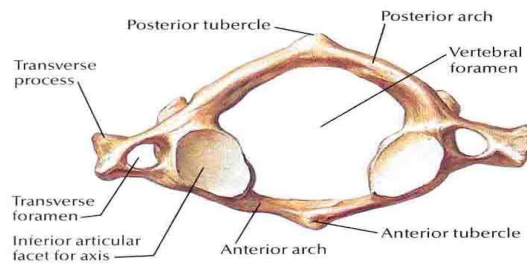
## C1 And C2



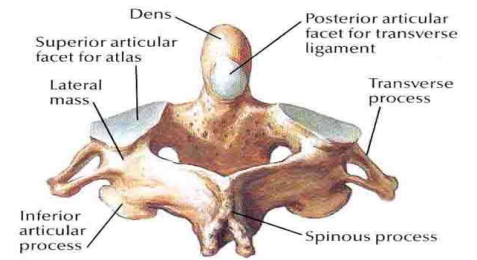
**Atlas (C1): superior view**



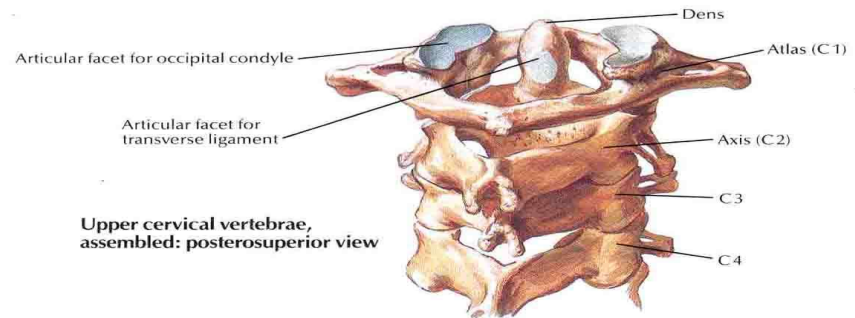
**Axis (C2): anterior view**



**Atlas (C1): inferior view**



**Axis (C2): posteroinferior view**



**Upper cervical vertebrae, assembled: posteroinferior view**

# CERVICAL SPINE

## Joints

The joints of the cervical spine can be divided into two groups – those that are present throughout the vertebral column, and those unique to the cervical spine.

- **Present throughout Vertebral Column**
- There are two different joints present throughout the vertebral column:
- **Between vertebral bodies** – adjacent vertebral bodies are joined by intervertebral discs, made of fibrocartilage. This is a type of cartilaginous joint, known as a symphysis.
- **Between vertebral arches** – formed by the articulation of superior and inferior articular processes from adjacent vertebrae. It is a synovial type joint.



# CERVICAL SPINE

## Unique to Cervical Spine

There are two joints unique to the cervical spine – the atlanto-axial (x3) and atlanto-occipital joints (x2).

The atlanto-axial joints are formed by the articulation between the atlas and the axis:

- **Lateral Atlanto-axial joints (x2)** – formed by the articulation between the inferior facets of the lateral masses of C1 and the superior facets of C2. These are plane type synovial joints.
- **Medial Atlanto-axial joint** – formed by the articulation of the dens of C2 with the articular facet of C1. This is a pivot type synovial joint.
- The **Atlanto-occipital joints** consist of an articulation between the spine and the cranium. They occur between the superior facets of the lateral masses of the atlas and the occipital condyles at the base of the cranium. These are condyloid type synovial joints, and permit flexion at the head i.e. nodding.

# CERVICAL SPINE

## Ligaments

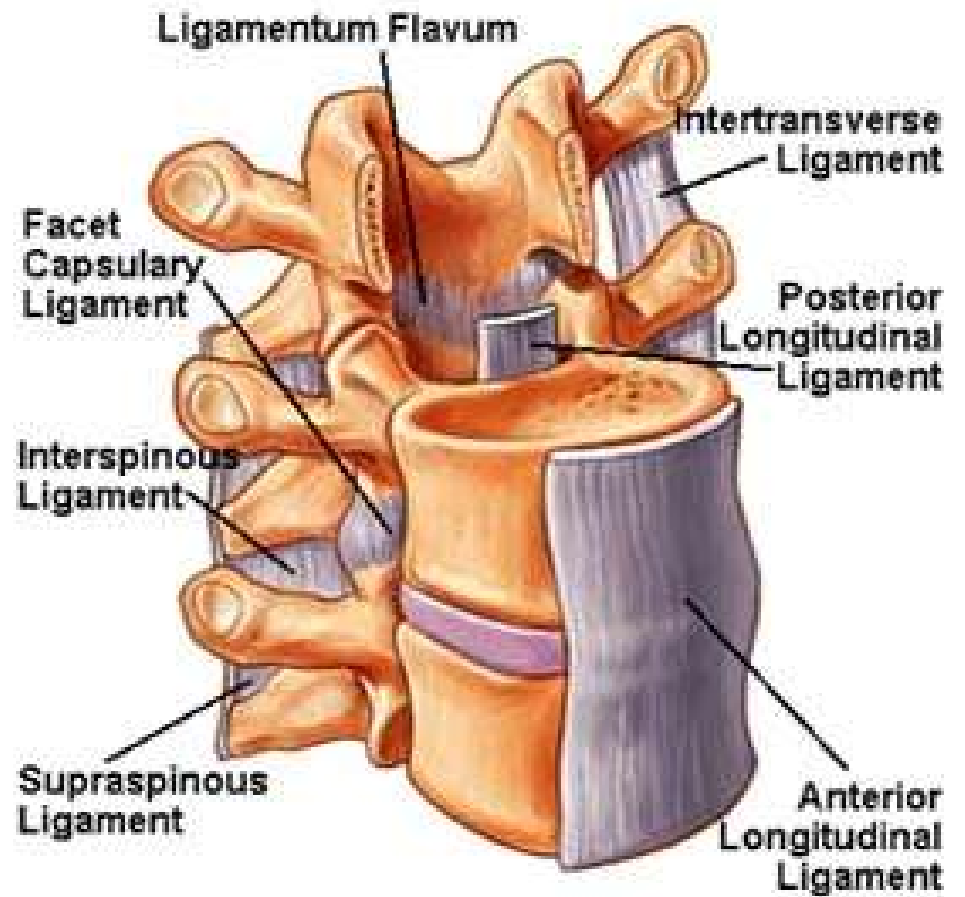
There are six major ligaments to consider in the cervical spine. The majority of these ligaments are present throughout the entire vertebral column.

### Present throughout Vertebral Column

- **Anterior and posterior longitudinal ligaments** – long ligaments that run the length of the vertebral column, covering the vertebral bodies and intervertebral discs.
- **Ligamentum flavum** – connects the laminae of adjacent vertebrae.
- **Interspinous ligament** – connects the spinous processes of adjacent vertebrae.

# CERVICLA SPINE

Ligaments



# CERVICAL SPINE

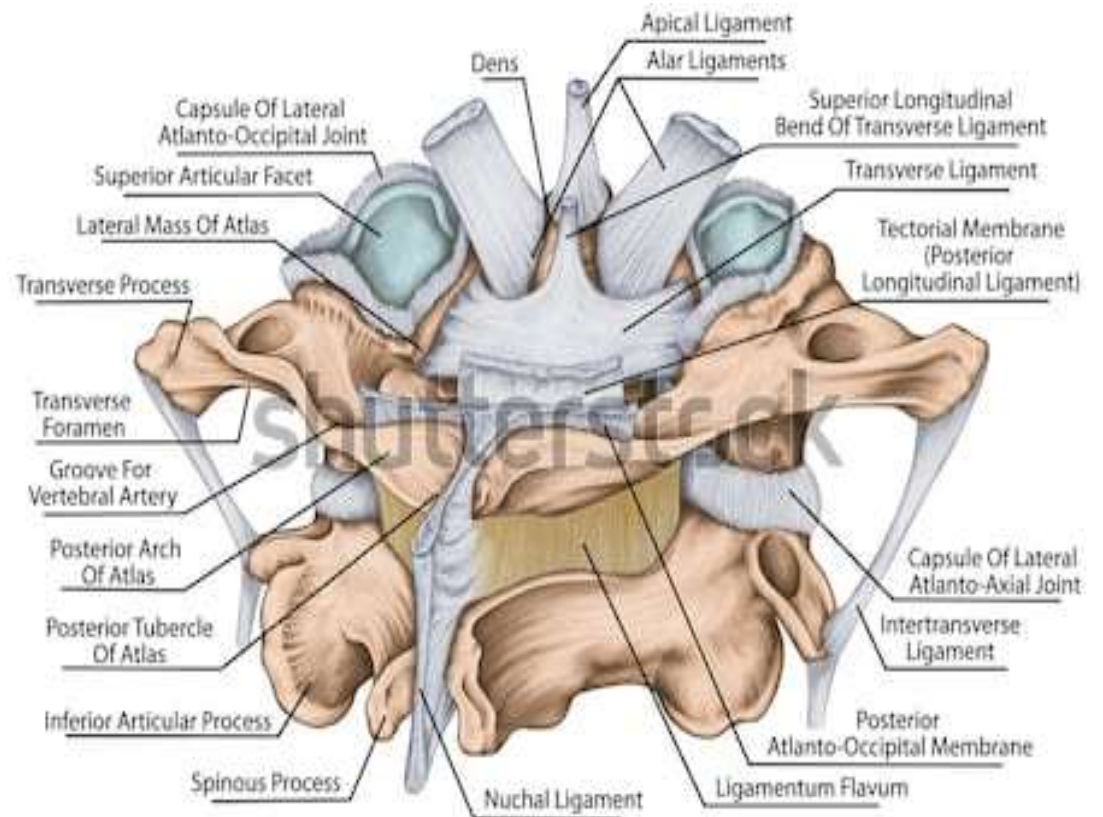
## Unique to Cervical Spine

- **Nuchal ligament** – a continuation of the supraspinous ligament. It attaches to the tips of the spinous processes from C1-C7, and provides the proximal attachment for the rhomboids and trapezius.
- **Transverse ligament of the atlas** – connects the lateral masses of the atlas, and in doing so anchors the dens in place.

# CERVICAL SPINE

Ligaments

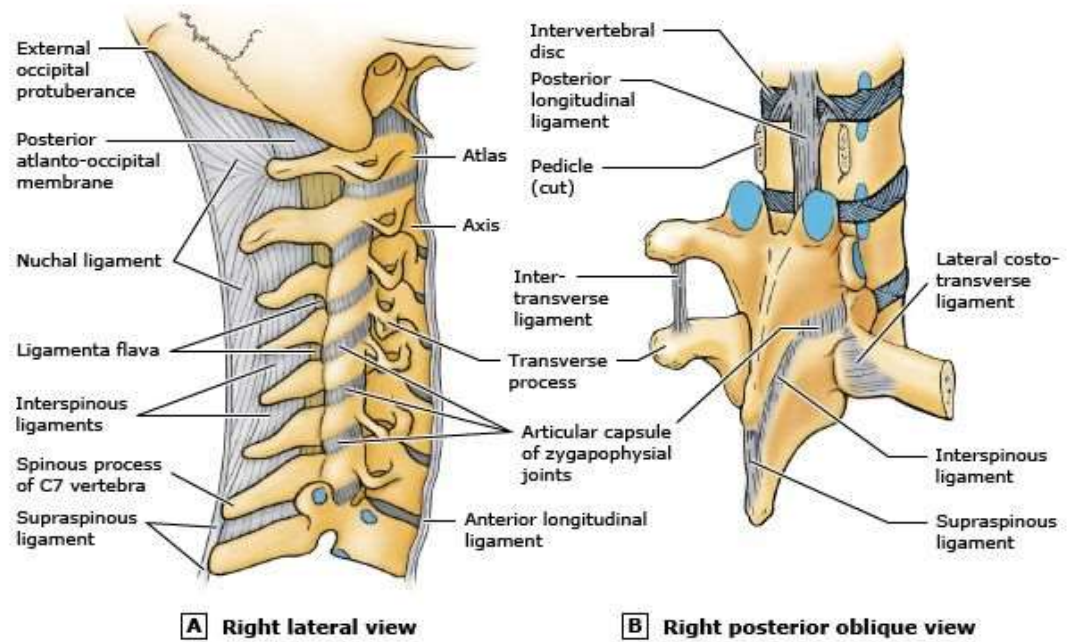
Unique to Cervical Spine



www.shutterstock.com • 505306114

# CERVICAL SPINE

## Nuchal Ligament



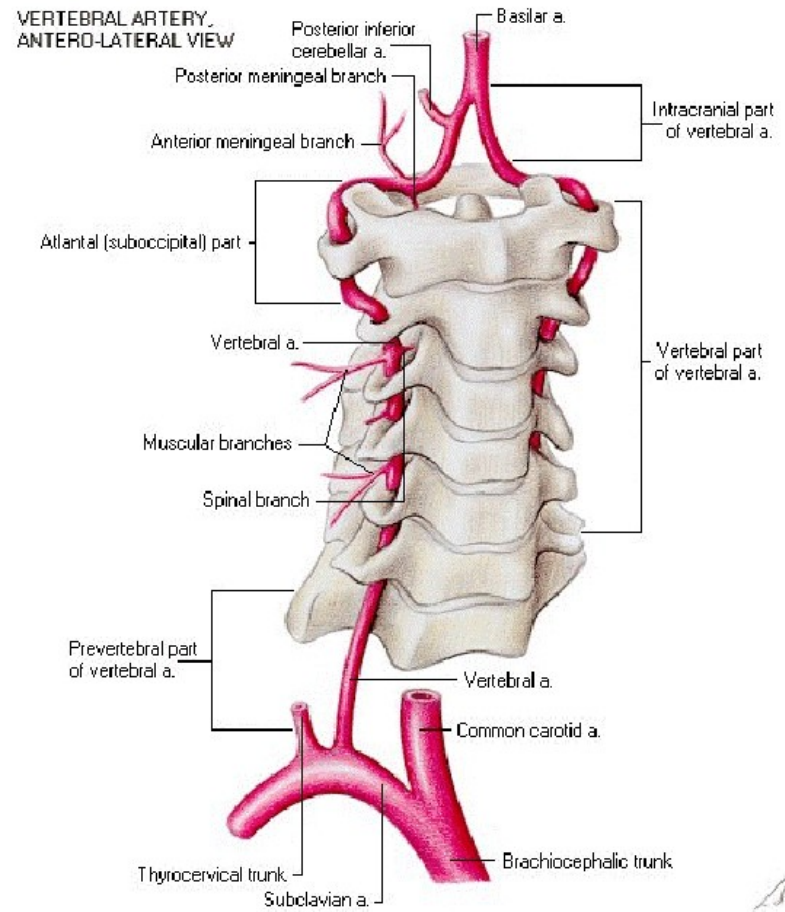
# CERVICAL SPINE

## Anatomical Relationships

- The cervical spine has a close relationship with several neurovascular structures in the neck.
- The transverse foramina of the cervical vertebrae provide a passageway by which the **vertebral artery**, vein and sympathetic nerves can pass. The only exception to this is C7 – where the vertebral artery passes around the vertebra, instead of through the transverse foramen.
- The spinal nerves are intimately related to the cervical vertebrae. They extend from above their respective vertebrae, through the **intervertebral foramen** created by the joints at the articular processes. Again, C7 is an exception – it has a set of spinal nerves extending from above (C7) and below (C8) the vertebra. Therefore, there are eight spinal nerves associated with seven cervical vertebrae.

# CERVICAL SPINE

## Vertebral Artery



*Schlegel*



# CERVICAL SPINE

## Clinical Relevance: Injuries to the Cervical Spine

### Jefferson Fracture of the Atlas

- A vertical fall onto an extended neck e.g. diving into excessively shallow water can compress the **lateral masses** of the atlas between the occipital condyles and the axis. This causes them to be driven apart, fracturing one or both anterior/posterior arches.
- If the fall occurs with enough force, the **transverse ligament of the atlas** may also be ruptured.
- Since the vertebral foramen is large, it is unlikely that there will be damage to the spinal cord at the C1 level. However, there may be damage further down the vertebral column.

## CERVICAL SPINE

### Hyperextension (Whiplash) Injury

- A rear-end traffic collision or a poorly performed rugby tackle can both result in the head being whipped back on the shoulders, causing whiplash. In minor cases, the **anterior longitudinal ligament of the spine** is damaged which is acutely painful for the patient.
- In more severe cases, fractures can occur to any of the cervical vertebrae as they are suddenly compressed by rapid deceleration. Again, since the **vertebral foramen** is large there is less chance of spinal cord involvement.
- The worst-case scenario for these injuries is that dislocation or subluxation of the cervical vertebrae occurs. This often happens at the C2 level, where the body of C2 moves anteriorly with respect to C3. Such an injury may well lead to spinal cord involvement, and as a consequence quadriplegia or death may occur. More commonly, subluxation occurs at the C6/C7 level (50% of cases).

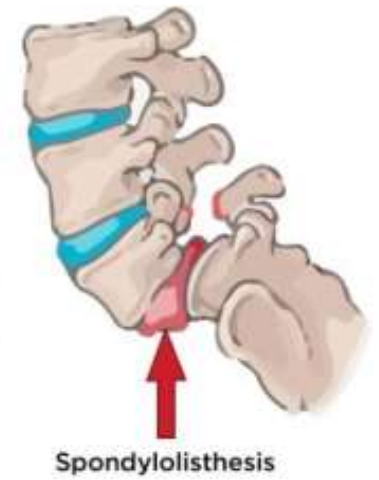
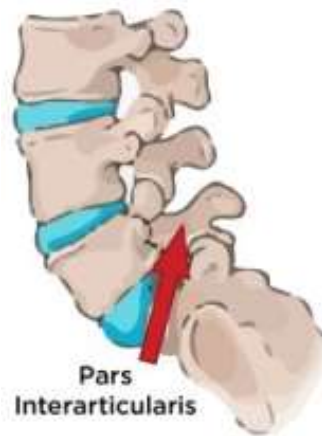
# CERVICAL SPINE

## Hangman's Fracture

- The hangman's fracture is the name given to a fracture of the **pars interarticularis**, which is a bony column between the superior and inferior articular facets of the axis. Its name originates from the mechanism by which it is most commonly created, as a result of the sudden deceleration that occurs in hanging.
- Such an injury is likely to be lethal, as either the fracture fragments or the force involved are likely to rupture the spinal cord, causing deep unconsciousness, respiratory and cardiac failure, and death.

# CERVICAL SPINE

## HANGMAN FRACTURE



# CERVICAL SPINE

## Fracture of the Dens

- Fractures of the dens make up around 40% of the fractures of the axis, and are most commonly caused by traffic collisions and falls. Often these fractures are unstable and are at high risk of avascular necrosis, due to the isolation of the distal fragment from any blood supply. As a result, fractures of the dens often take a long time to heal.
- As with any fracture of the vertebral column, there is a risk of spinal cord involvement.



# ANATOMY

---

NECK

# NECK

## Bones of Neck

1. Cervical Spine
2. Hyoid Bone



# HYOID BONE

## **Contents**

1 Structure

2 Muscular Attachments

3 Ligament Attachments

4 Clinical Relevance: Fracture of the Hyoid Bone

# HYOID BONE

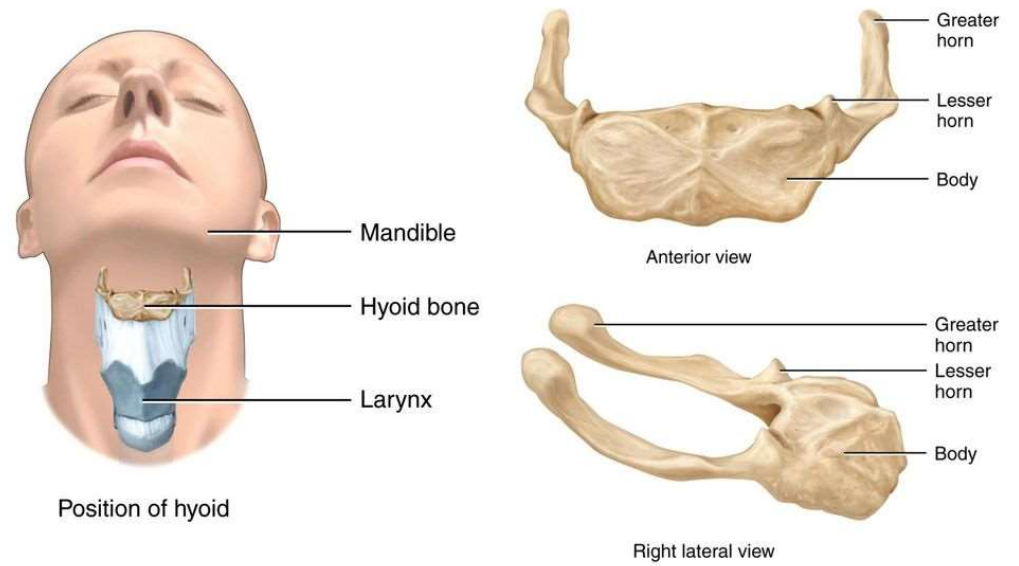
## HYOID BONE

- The **hyoid** bone is a 'U' shaped structure located in the anterior neck. It lies at the base of the mandible (approximately C3), where it acts as a site of attachment for the anterior neck muscles.
- In this article, we shall look at the anatomical structure, muscular attachments and clinical relevance of the hyoid bone.

# HYOID BONE

## STRUCTURE

### Facial Bones: The Hyoid Bone



# HYOID BONE

## Structure

- The hyoid is composed of a body, two greater horns and two lesser horns:
- **Body** – the central part of the bone. It has an anterior convex surface and a concave posterior surface.
- **Greater horn** – projects from each end of the body in a posterior, superior and lateral direction. It acts as a site of attachment for numerous neck muscles.
- **Lesser horn** – arises from the superior aspect of the hyoid bone, near the origin of the greater horn. It projects superoposteriorly (toward the styloid process of the temporal bone). The stylohyoid ligament attaches to the apex of the lesser horn.

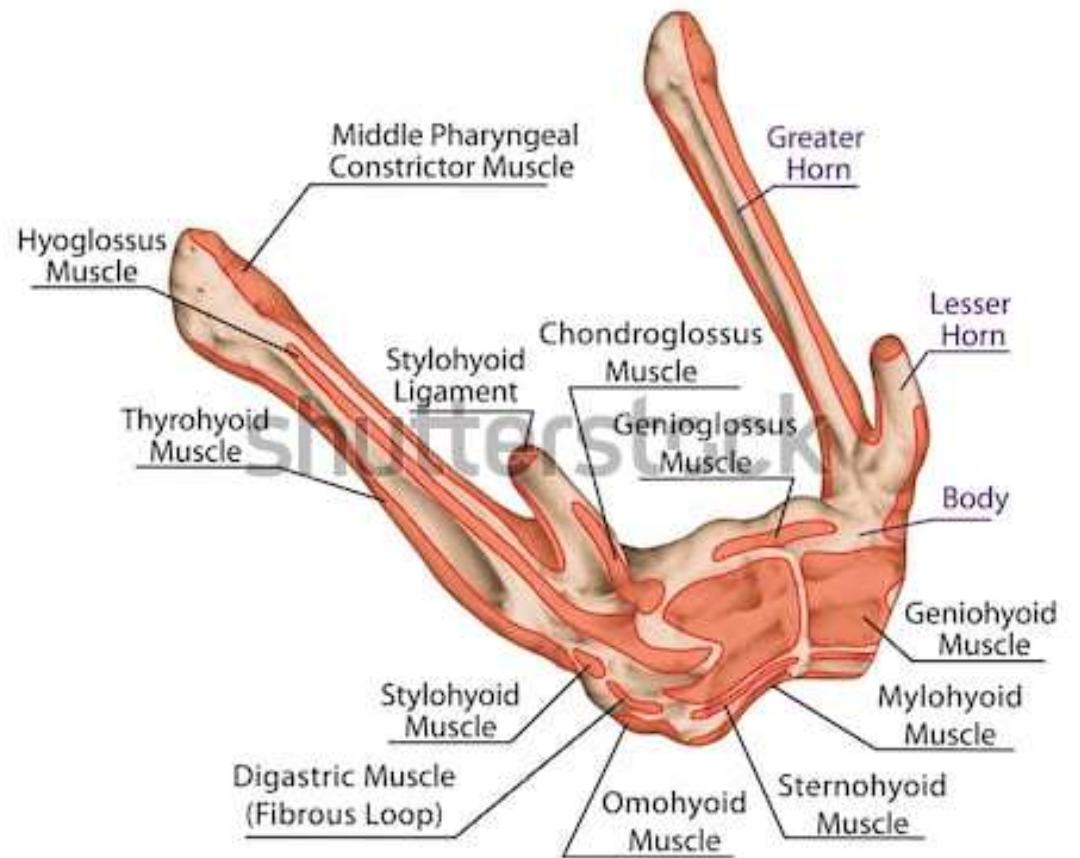
# HYOID BONE

## Muscular Attachments

<u>Oral Cavity and Pharynx</u>	<u>Suprahyoid</u>	<u>Infrahyoid</u>
<ul style="list-style-type: none"><li>• Middle pharyngeal constrictor</li><li>• Hyoglossus</li><li>• Genioglossus</li></ul>	<ul style="list-style-type: none"><li>• Digastric</li><li>• Stylohyoid</li><li>• Geniohyoid</li><li>• Mylohyoid</li></ul>	<ul style="list-style-type: none"><li>• Thyrohyoid</li><li>• Omohyoid</li><li>• Sternohyoid</li></ul>

# HYOID BONE

## MUSCLE ATTACHMENT



www.shutterstock.com • 1022242291

# HYOID BONE

## Ligament Attachments

- There are three main **ligaments** that attach to the hyoid bone – stylohyoid, thyrohyoid and hyoepiglottic. They act to support the position of the hyoid in the neck.
- **Stylohyoid ligament** – extends from the styloid process of the temporal bone to the lesser horn of the hyoid bone.
- **Thyrohyoid membrane** – originates from the superior border of the [thyroid cartilage](#) and attaches to the posterior surface of the hyoid bone and the greater horns.
- **Hyoepiglottic ligament** – connects the hyoid bone to the anterior aspect of the epiglottis.

# HYOID BONE

## Clinical Relevance: Fracture of the Hyoid Bone

- The hyoid is well protected by the mandible and **cervical spine**, so fractures are relatively rare.
- Hyoid bones fractures are characteristically associated with **strangulation** (found in approximately 1/3 of all homicides by strangulation). It is therefore a significant post-mortem finding.
- They can also occur as a result of **trauma**, with clinical features of pain on speaking, odynophagia and dyspnoea.