

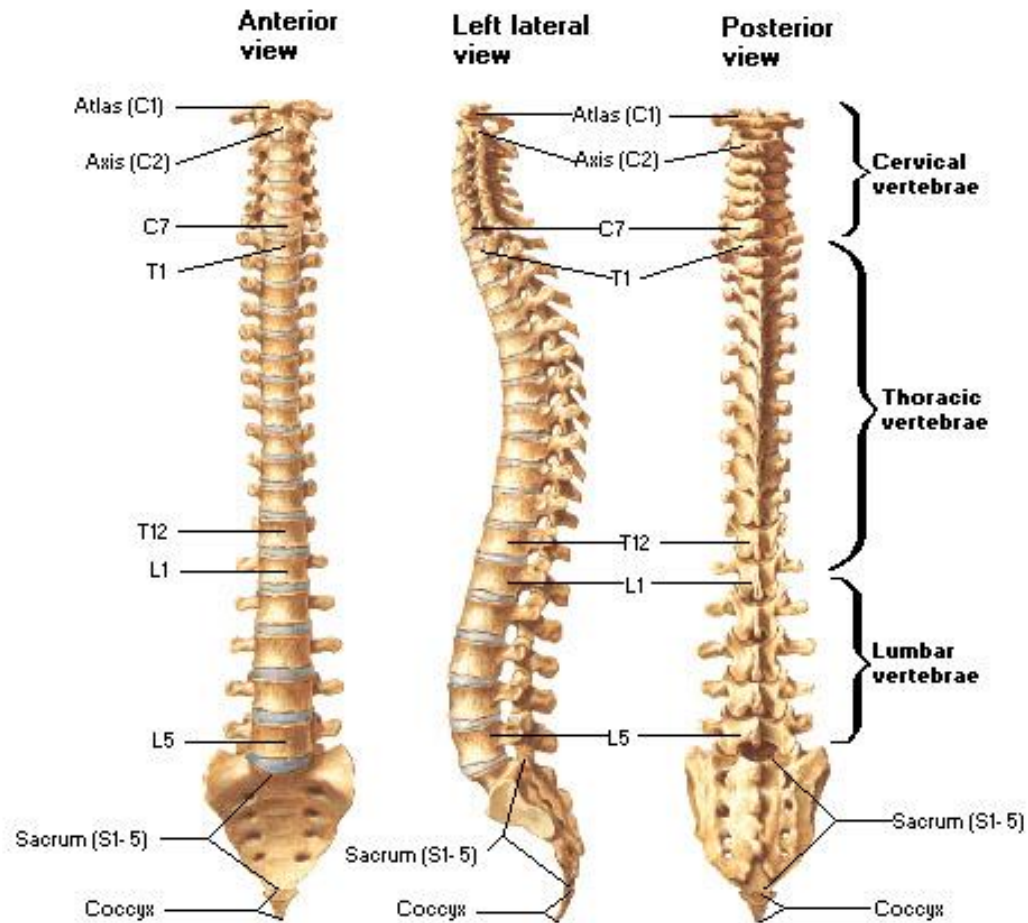
Anatomy and Physiology II

Spine

Bones and Other Structures

- Vertebrae
 - Contains Cervical, Thoracic, Lumbar, Sacral and Coccygeal regions
 - We use Capital letters to refer to these (C, T, L, S, and Co) and a subscript number to indicate individual vertebra (1 indicates most superior)
 - Cervical-7, Thoracic-12, Lumbar-5, Sacrum-5 (fused into 1 by adulthood), Coccyx-3-5 (fused into 1 by adulthood)
 - Cervical is convex anterior (or concave posterior)
 - Thoracic is concave anterior (or convex posterior)
 - Lumbar is convex anterior (or concave posterior)
 - Sacrum is concave anterior (or convex posterior)
 - Note: babies have a general C curve to the spine, this arrangement (concave anterior) is said to be a primary curve
 - The other curves develop as babies look up, crawl, walk, etc. These are secondary curves (fully developed by age 10)
- Ribs – associated with the 12 thoracic vertebrae

Vertebral Column



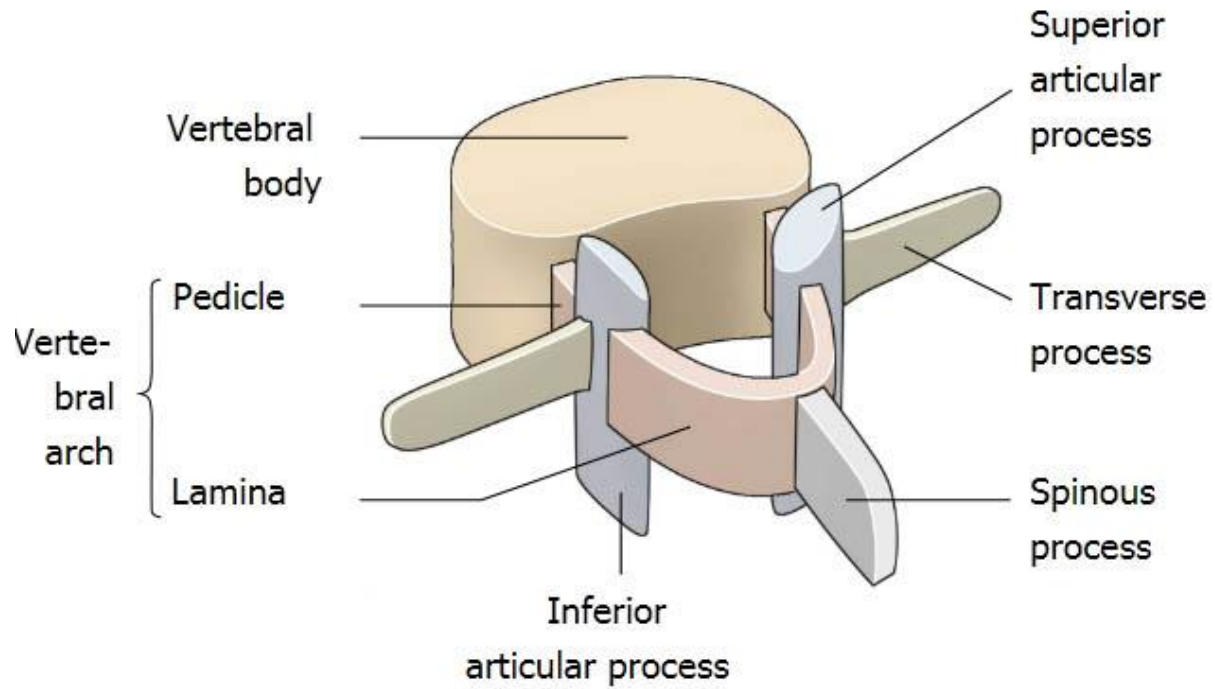
Vertebral Anatomy

- Vertebra contain
 - A Vertebral Body
 - Connected by ligaments
 - Separated by intervertebral discs
 - A Vertebral Arch
 - Consists of
 - Pedicles – ‘walls’
 - Laminae – ‘roof’
 - Together these form the Vertebral foramen. Vertebral foramina of all the vertebrae create the vertebral canal which houses and protects the spinal cord
 - The spinal nerves exit from the intervertebral foramen between the pedicles of two vertebrae
 - Spinous process
 - Process that projects posterior
 - Transverse processes
 - Processes that project lateral
 - Articular processes
 - Each process has a smooth, concave surface called an articular facet (also called zygapophyseal joints)
 - These articulate with superior and inferior vertebrae (and for thoracic vertebrae with the ribs)

Thoracic Vertebrae [T6]

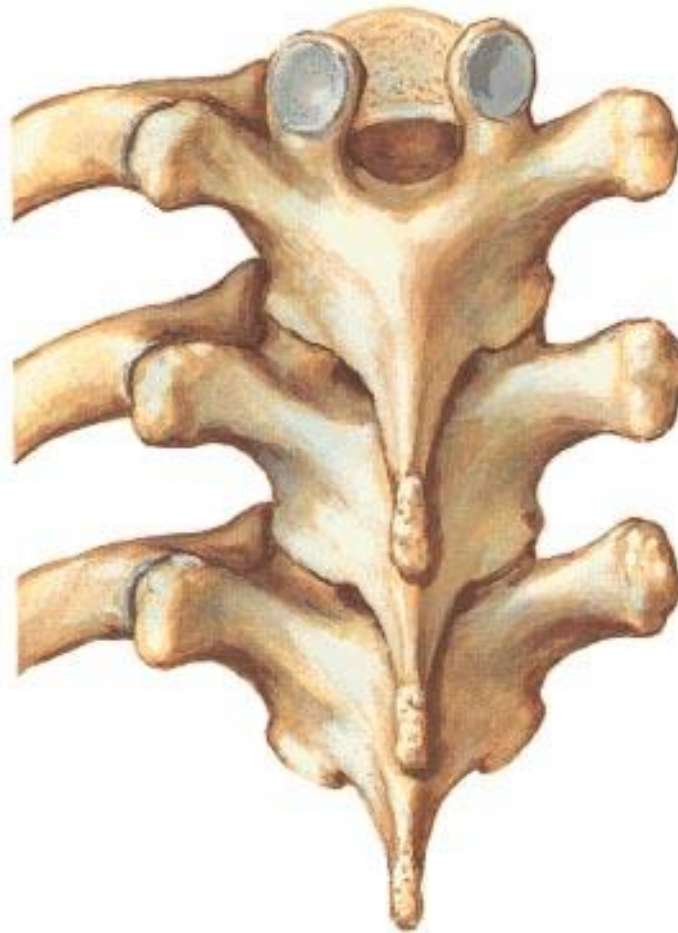
Superior View





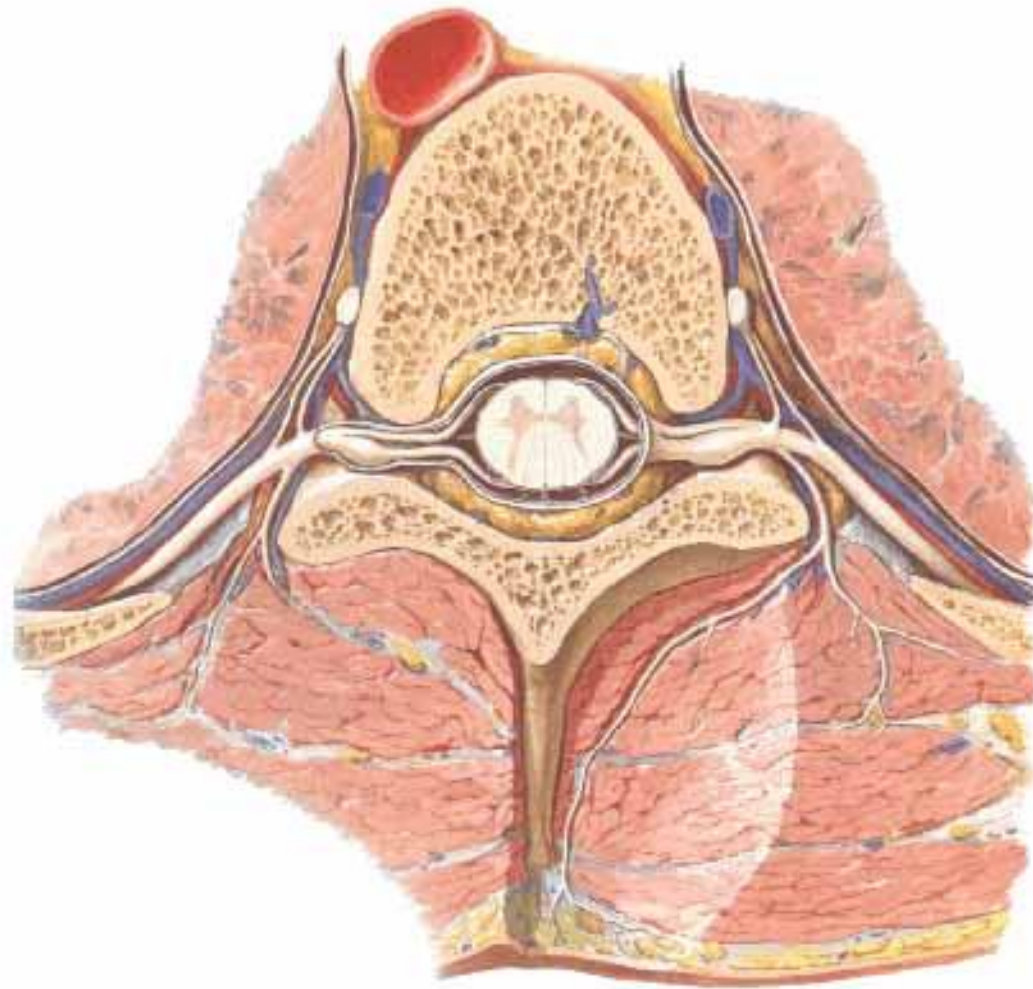
Thoracic Vertebrae [T7-9] - Assembled

Posterior View



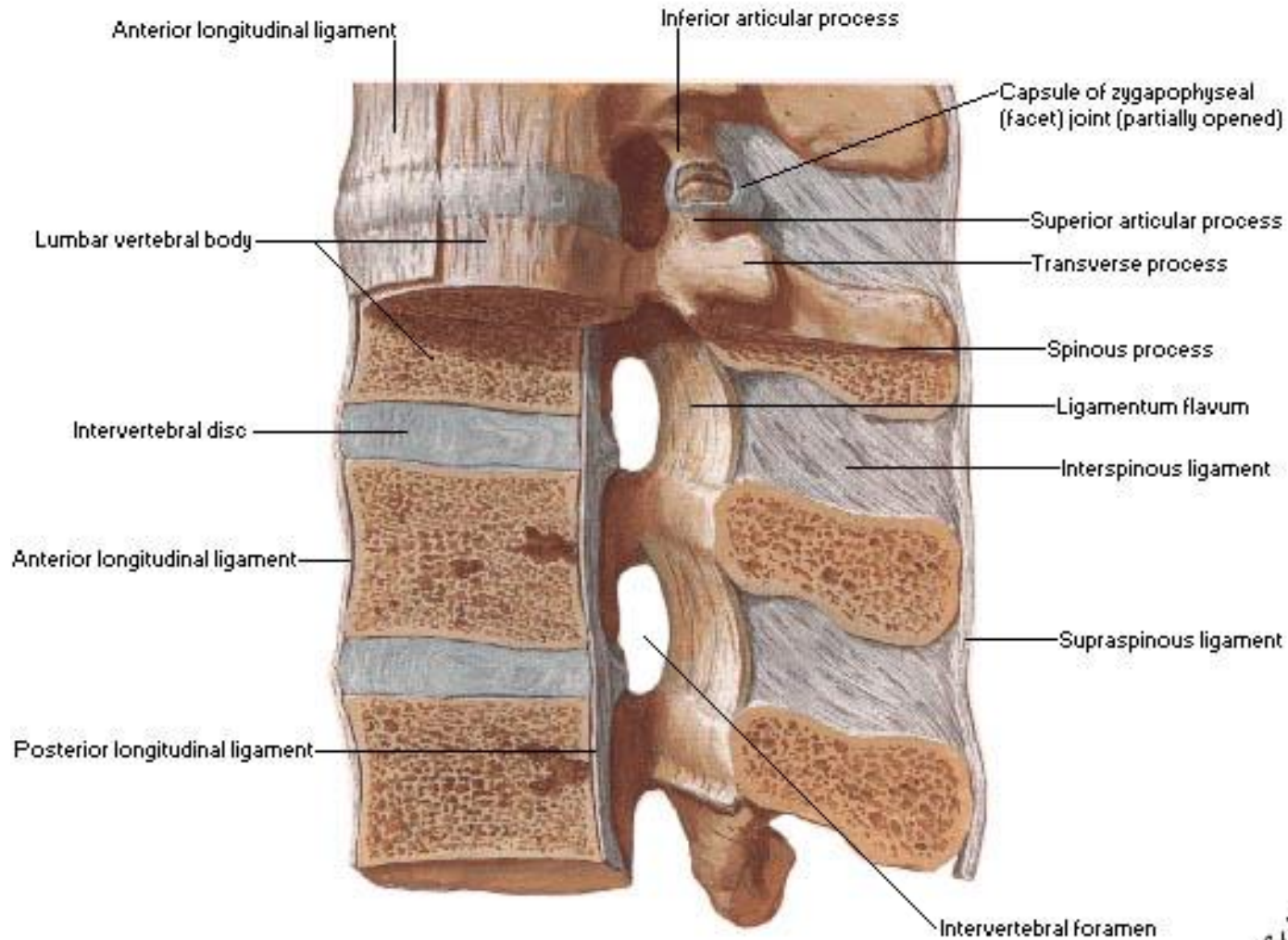
Spinal Nerve Origin

Section through Thoracic Vertebra



Vertebral Ligaments of Lumbar Region

Left Lateral View - Partially Sectioned



Differences between Regions

(Table 7-2, Martini, pg 191)

- **Vertebral Bodies**
 - Smallest with cervicals, largest with lumbar
- **Vertebral foramen**
 - Largest with cervicals, smallest with lumbar
- **Transverse Processes**
 - Cervicals have transverse foramen
 - Thoracic have facets for rib articulation

Anatomy and Physiology II

Cervical Spine

Bones and Other Structures

- Vertebrae
 - Cervical-7, Thoracic-12, Lumbar-5
 - ‘Special’ vertebra of cervical spine
 - C1-Atlas
 - C2-Axis
 - C7-Vertebra prominens
- Ribs – associated with the 12 thoracic vertebrae
- Hyoid bone
- Thyroid and cricoid cartilage
- Carotid artery
- Jugular vein

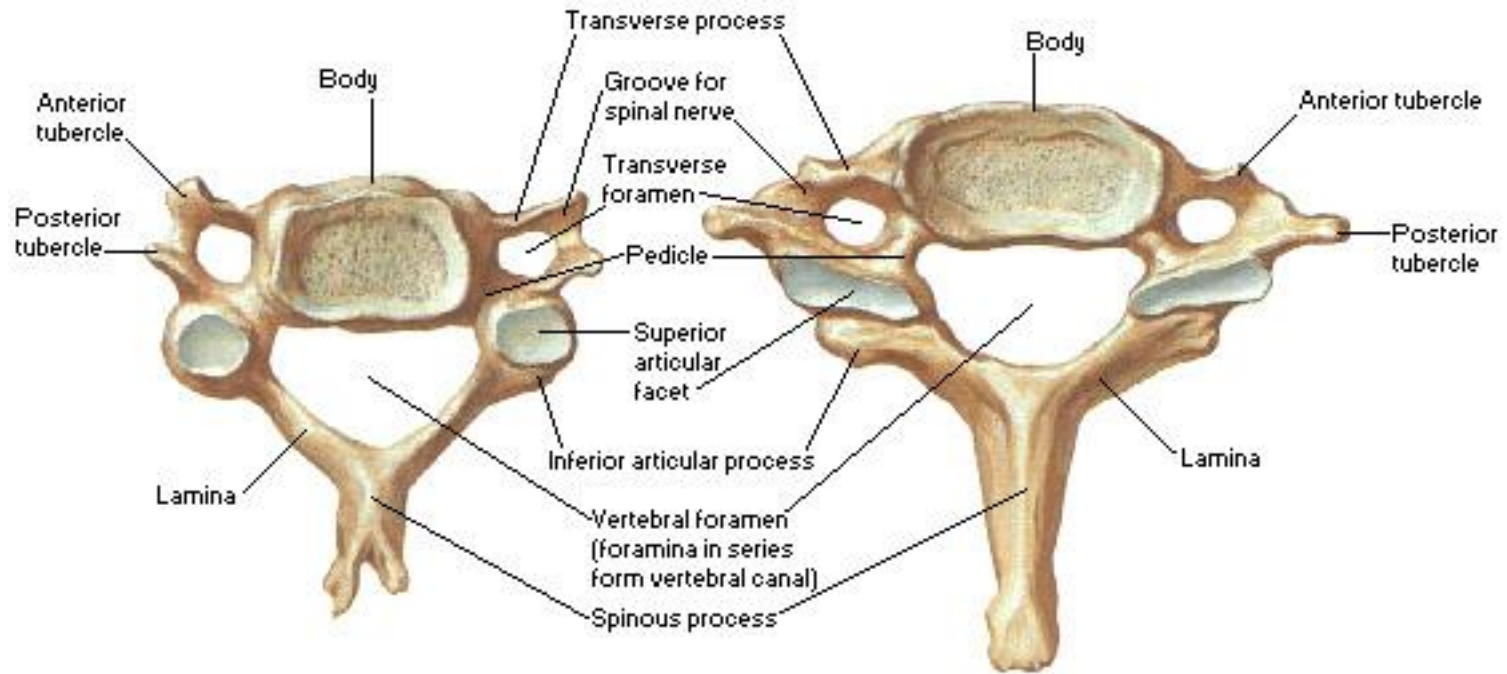
Bony Framework of the Head and Neck



Cervical Spine Features

- Small bodies compared to vertebral foramen
- C1 (called the Atlas) contains no SP, largest TP
- Remainder of the cervical SP are relatively short (C2 and C7 are exceptions)
- C7 (called Vertibra Prominens) contains the largest SP
- The SP of C2-C6 is bifid
- The TP of most cervical vertebrae have an anterior tubercle and a posterior tubercle
- There is a Transverse Foramen formed by the fusion of the TP and the costal process, this foramen encloses and protects the vertebral artery and vein which are important vascular structures of the brain

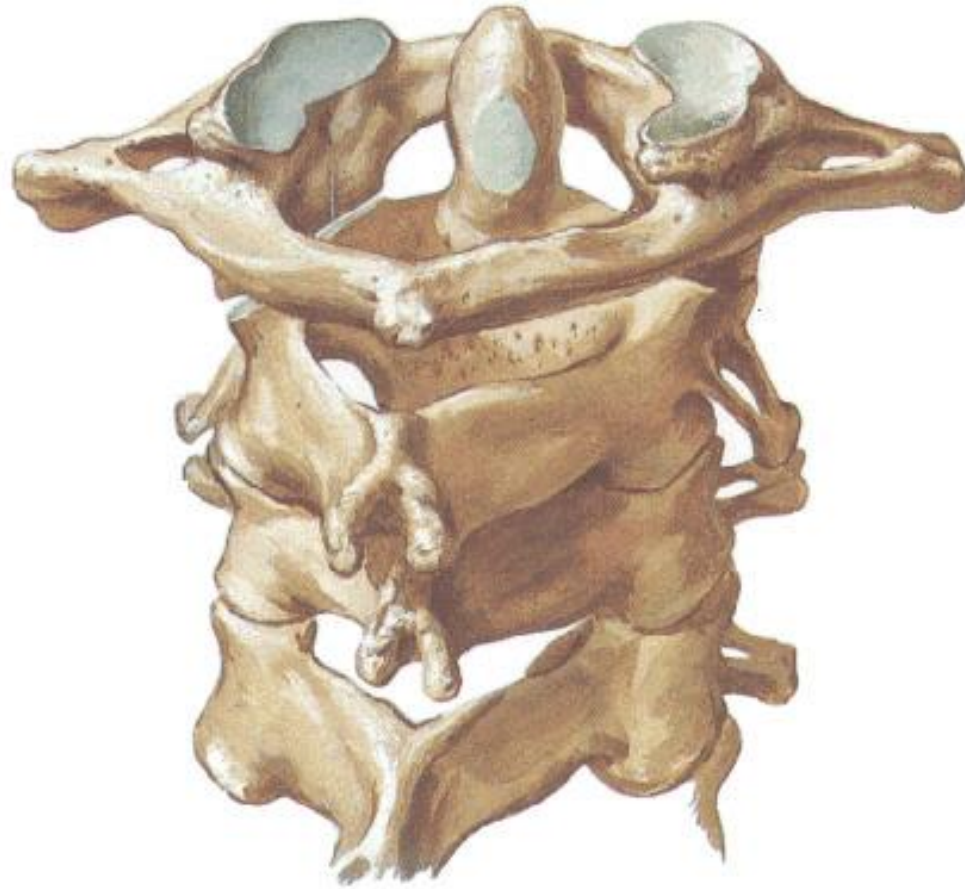
Cervical Vertebrae [C4 and C7] Superior Views



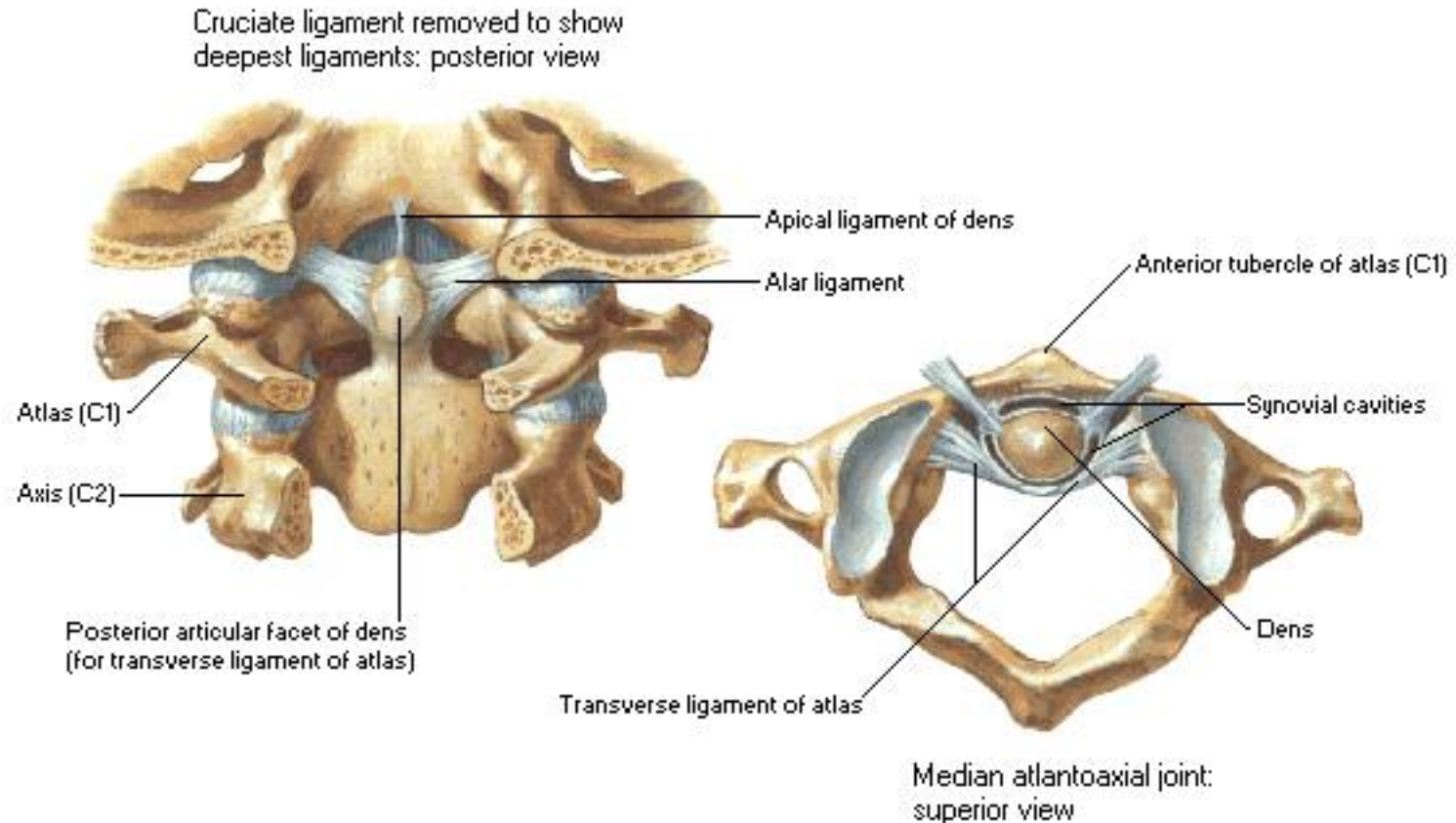
C4 vertebra: superior view

C7 vertebra: superior view

C1-C4 Posterosuperior View



Craniocervical Ligaments (With a view of the transverse ligament)



Cervical Vertebrae

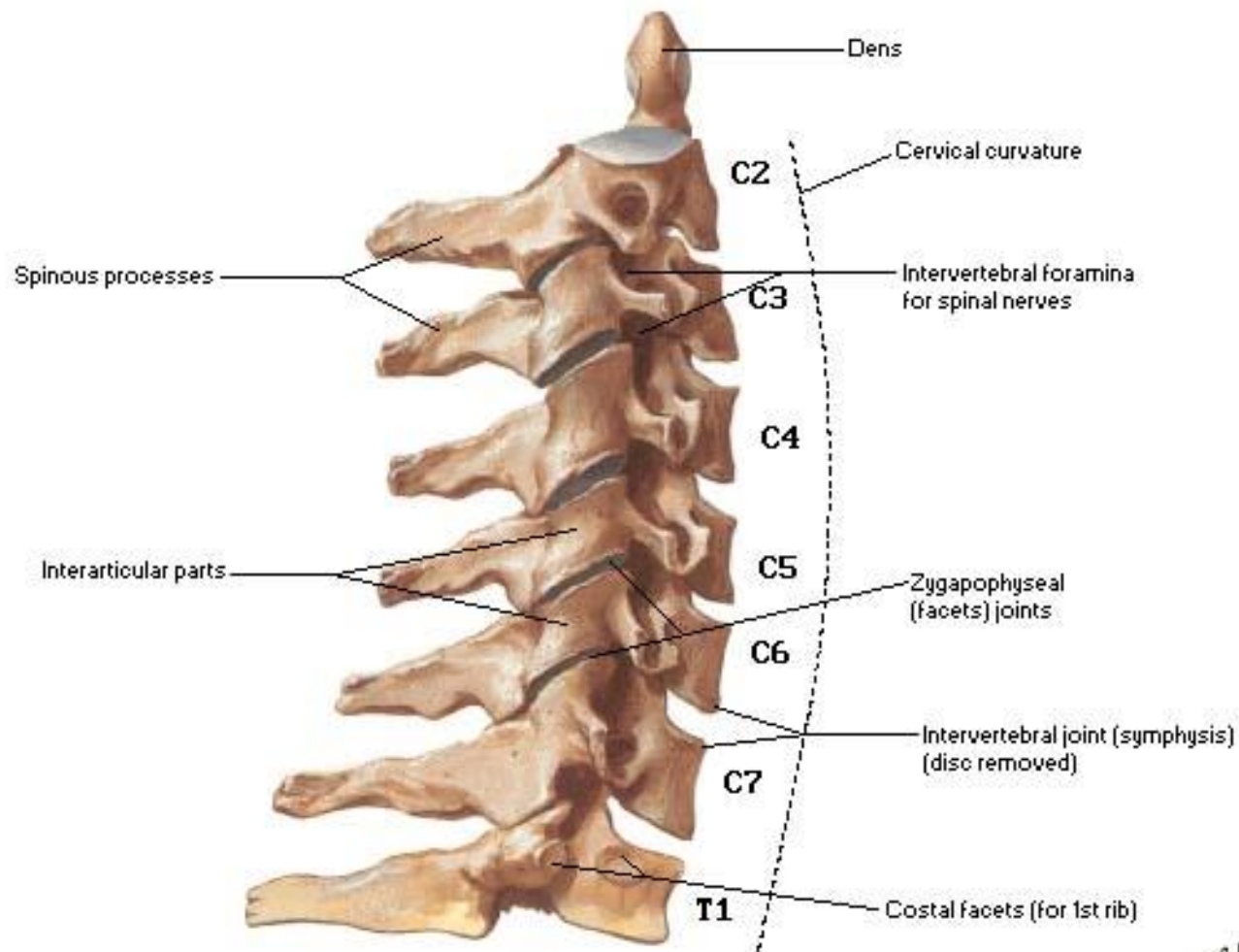
Vertebra Prominens

- C7 – Vertebra prominens
 - Contains the longest SP
 - Attachment of the ligamentum nuchae (nuchal ligament) which attaches to the cervical SPs and ends at the EOP (external occipital protuberance)



Cervical Vertebrae [C2-T1], Assembled

Right Lateral View



Cervical Region

Muscles

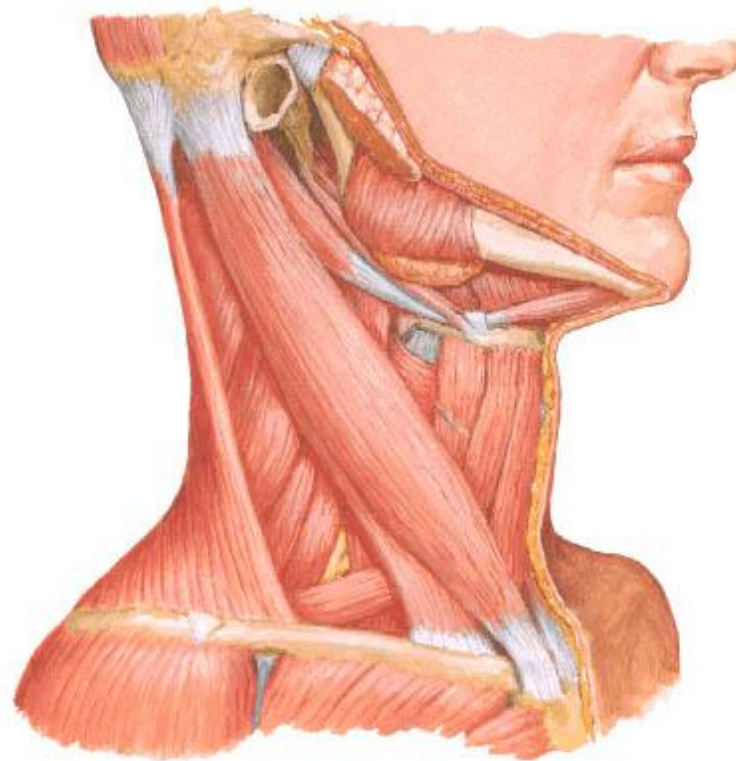
Neck Muscles

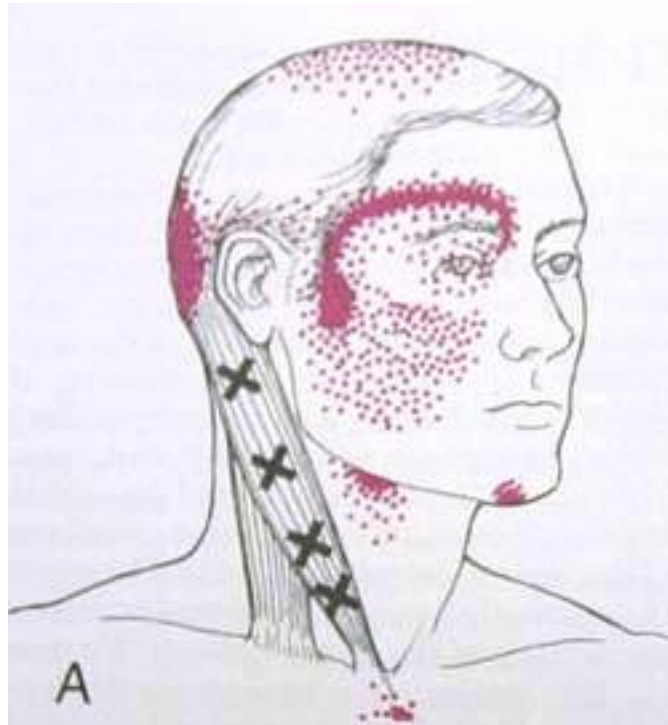
- Sternocleidomastoid (SCM)
- Scalenes (anterior middle, posterior)
- Splenius cervicis and Splenius capitis

Sternocleidomastoid - SCM

Muscles of Neck

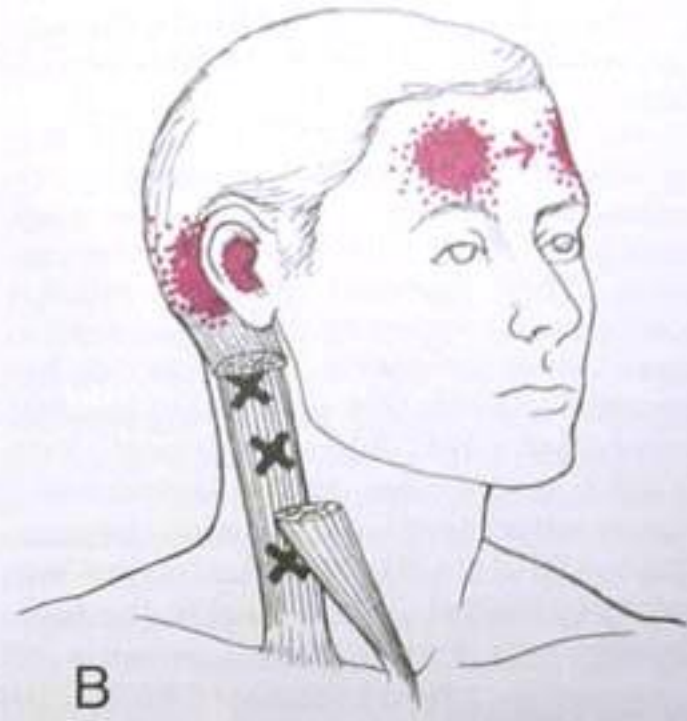
Lateral View





A

Sternal division

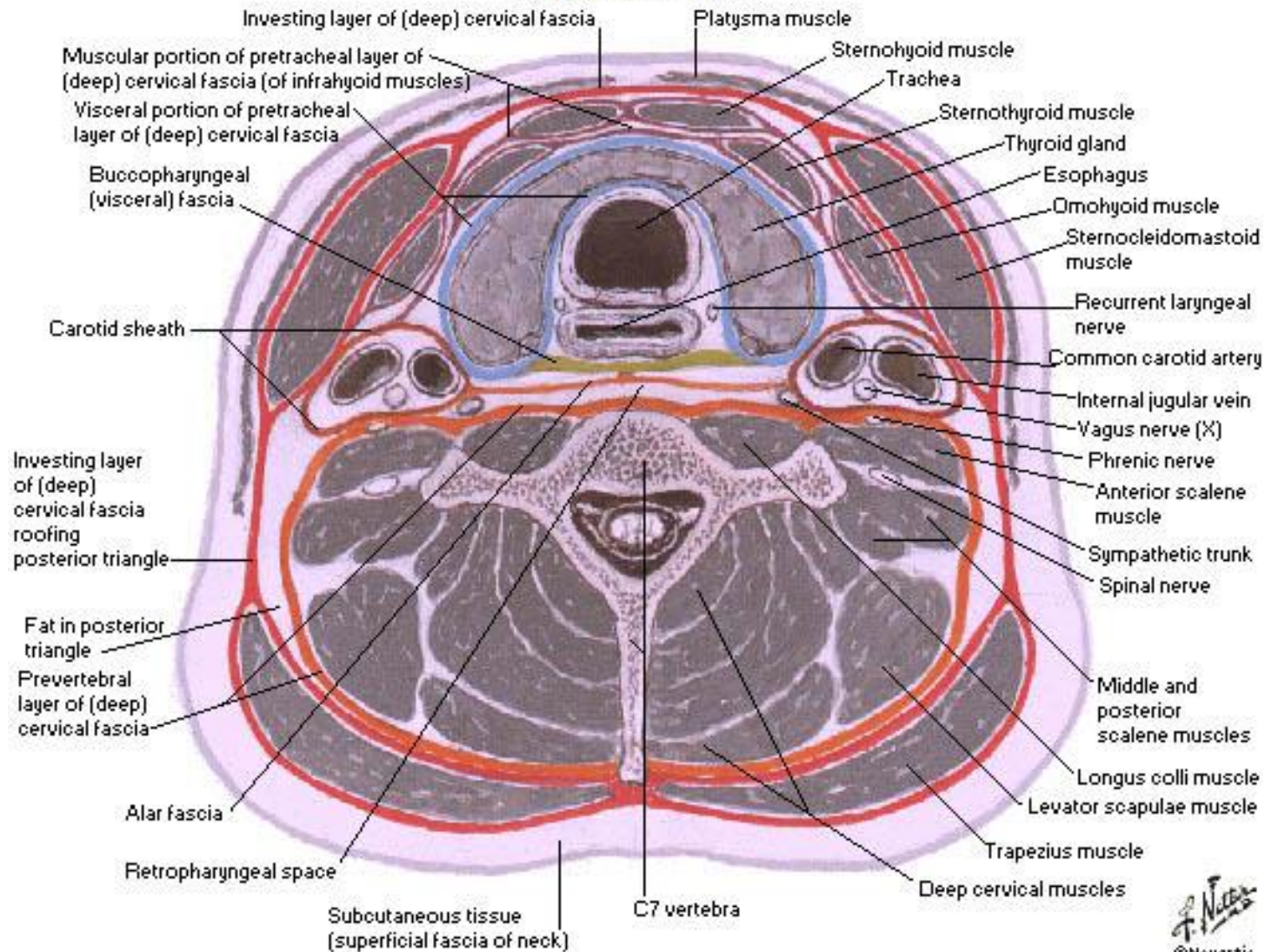


B

Clavicular division

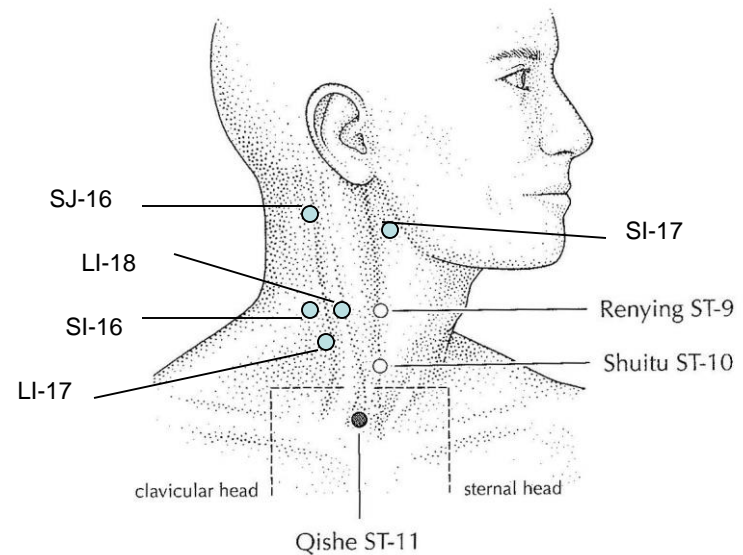
Fascial Layers of Neck

Cross Section



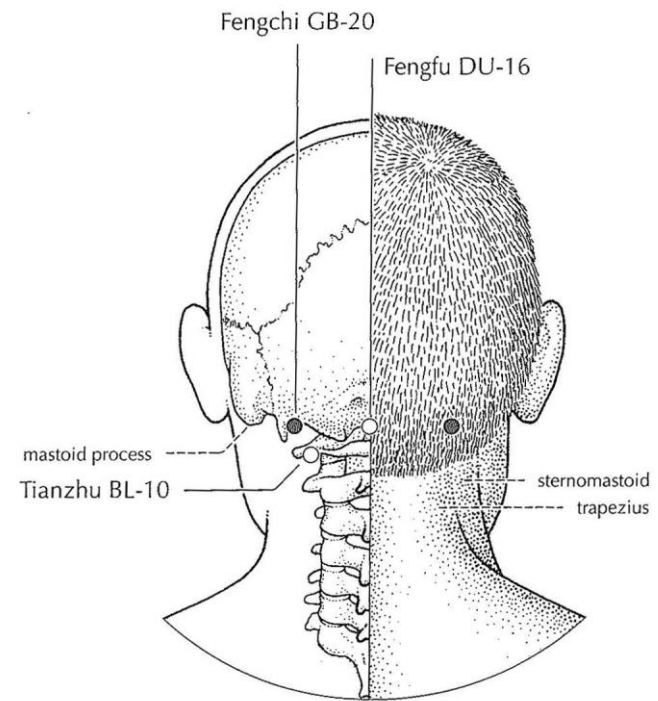
SCM Points

- Several important points are located in reference to the SCM
 - ST-9 is anterior to the sternal head at the level of the laryngeal prominence
 - LI-18 is also level with the laryngeal prominence and between the sternal and clavicular heads of the SCM
 - SI-16 is level with the laryngeal prominence and is posterior to the clavicular head
- Four (Si) important points surround the SCM, these have tian in their names
 - LI-17 (Tianding)
 - SI-16 (Tianchuang)
 - SI-17 (Tianrong)
 - SJ-16 (Tianyou)



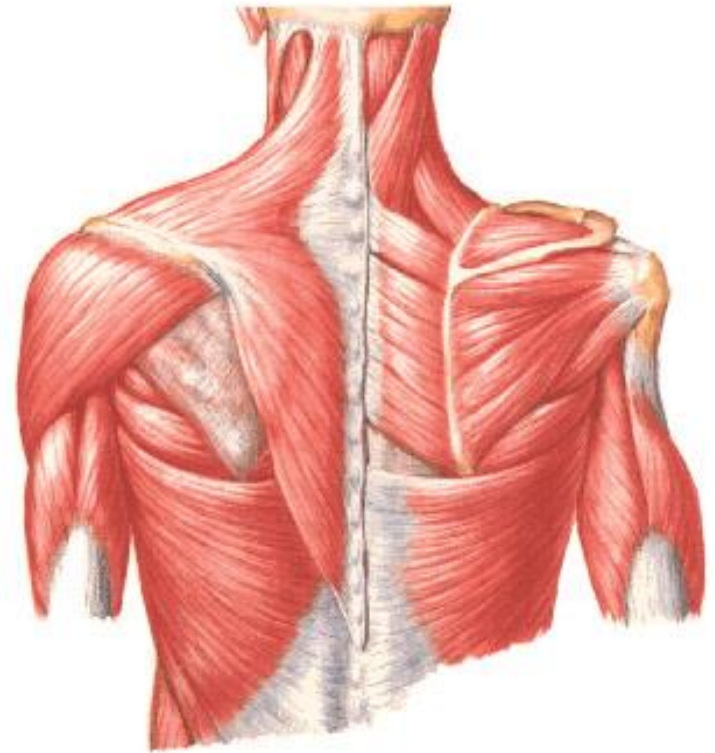
SCM Points (cont.)

- In addition, GB-20 is found posterior to the insertion of the SCM between the SCM and the Trapezius



Trapezius – Upper Fibers

- Recall that the trapezius also acts on the cervical region
 - Attachments
 - External occipital protuberance (EOP), medial 1/3rd of the superior nuchal line, nuchal ligament, spinous processes of C7-T12 *to the* lateral 1/3rd of the clavicle, acromion process, and spine of the scapula
 - Action of the upper fibers on the shoulder girdle
 - Elevates, retracts and upwardly rotates the scapula
 - Action of the upper fibers on the cervical region and head
 - Extends, laterally flexes, and contralaterally rotates the head and neck



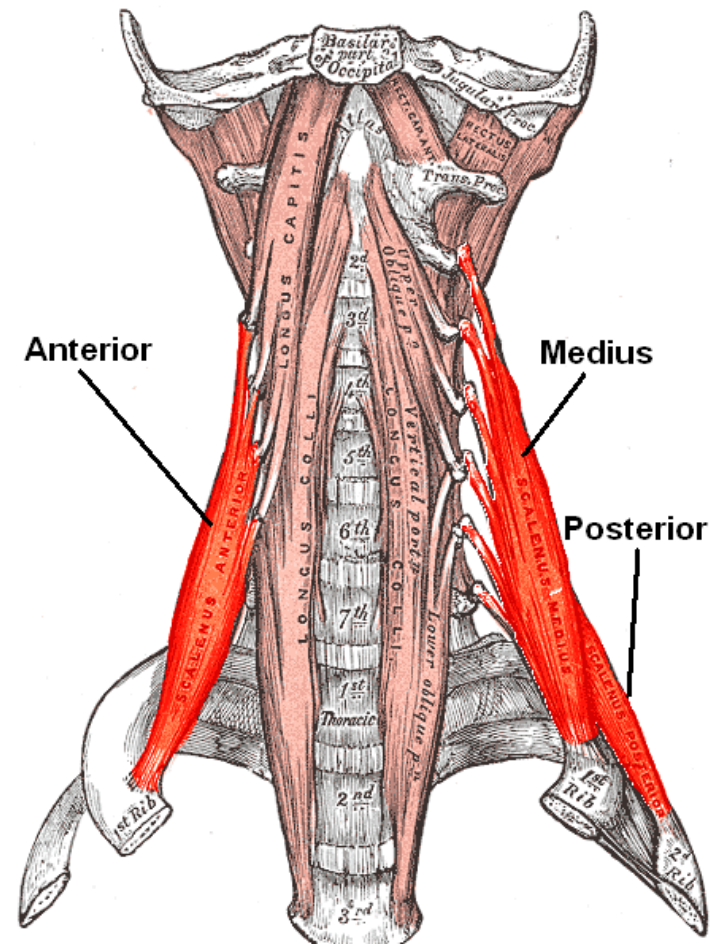
Levator Scapula

- Recall that the levator scapula also acts on the neck
 - Attachments
 - Transverse processes of C1 through C4 *to the* medial border of the scapula from the root of the spine to the superior angle of the scapula
 - Action of the levator scapula on the shoulder girdle
 - Elevates the scapula
 - Action of the upper fibers on the cervical region and head
 - Extends, laterally flexes, and ipsilaterally rotates the neck

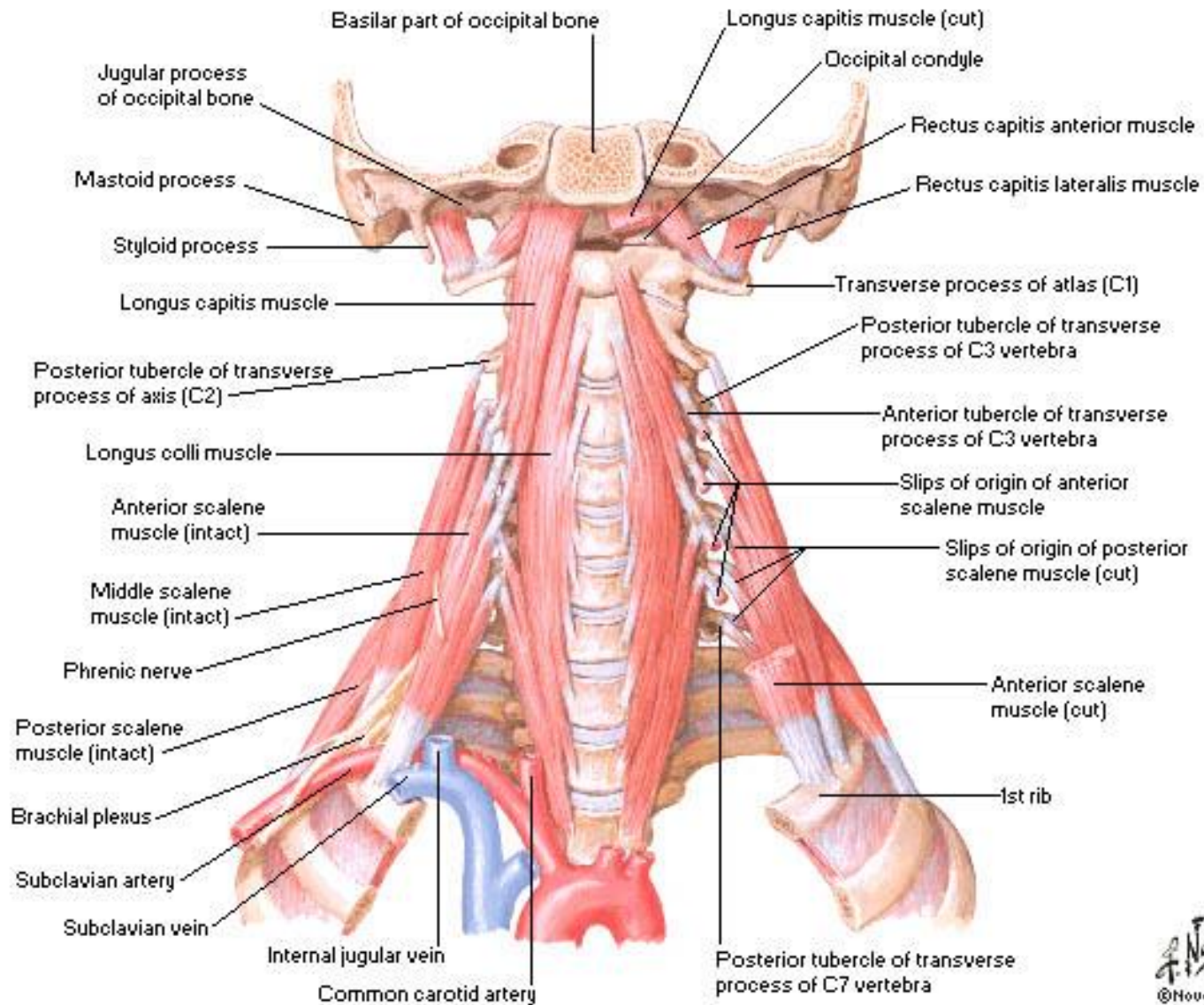


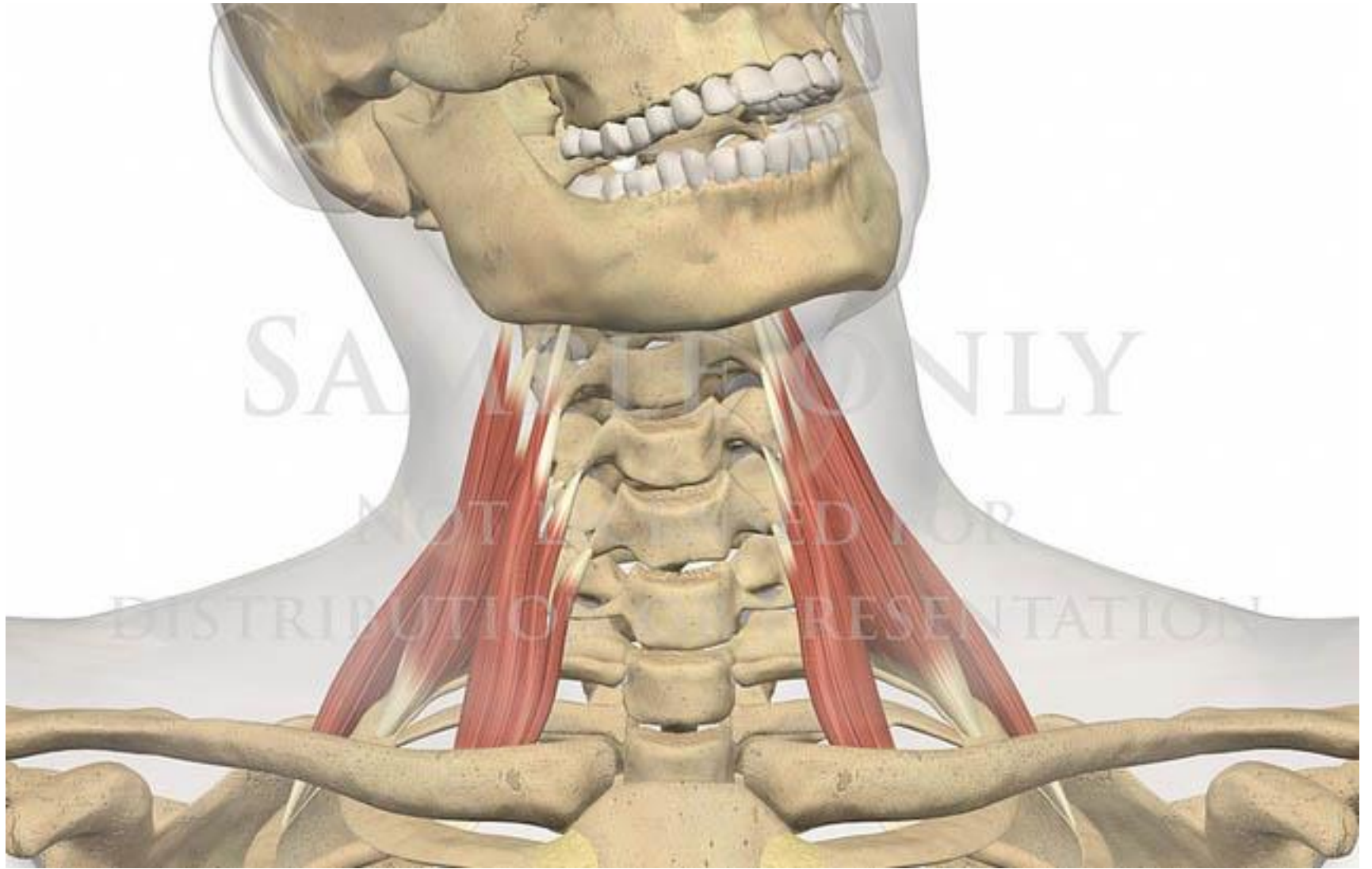
Scalenes

- The Scalene muscles can be palpated in a triangle between the SCM and the Trapezius
- The scalenes are an accessory (help elevate the upper ribs) breathing muscle and can become tight with paradoxical breathing
 - They work with pectoralis minor for this
- These muscles can be involved with radicular pain down the arm due to their relationship to the brachial plexus and their attachments on the upper ribs



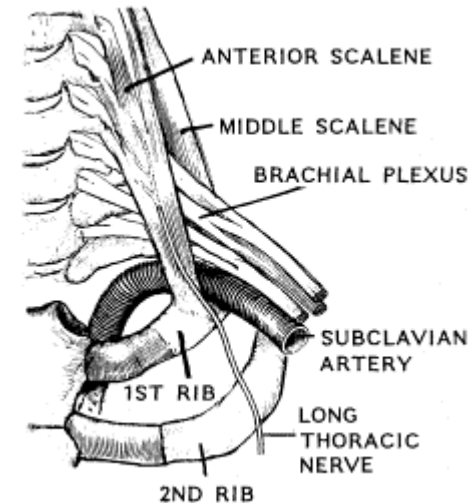
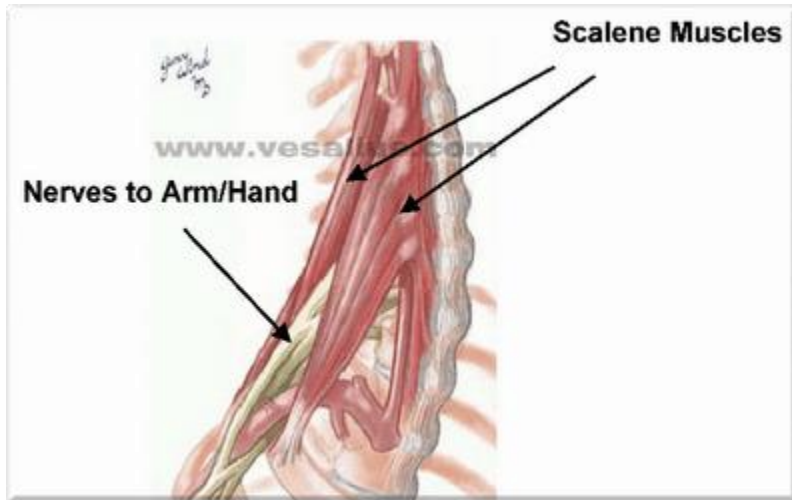
Scalene and Prevertebral Muscles

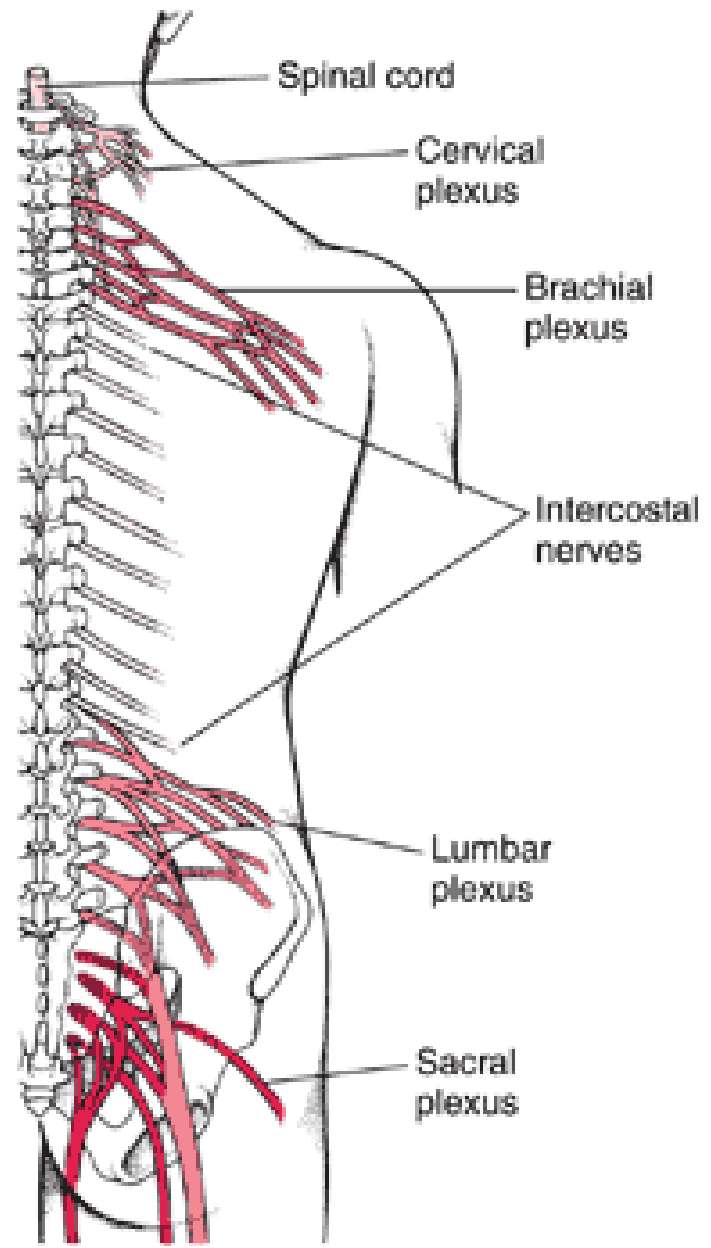




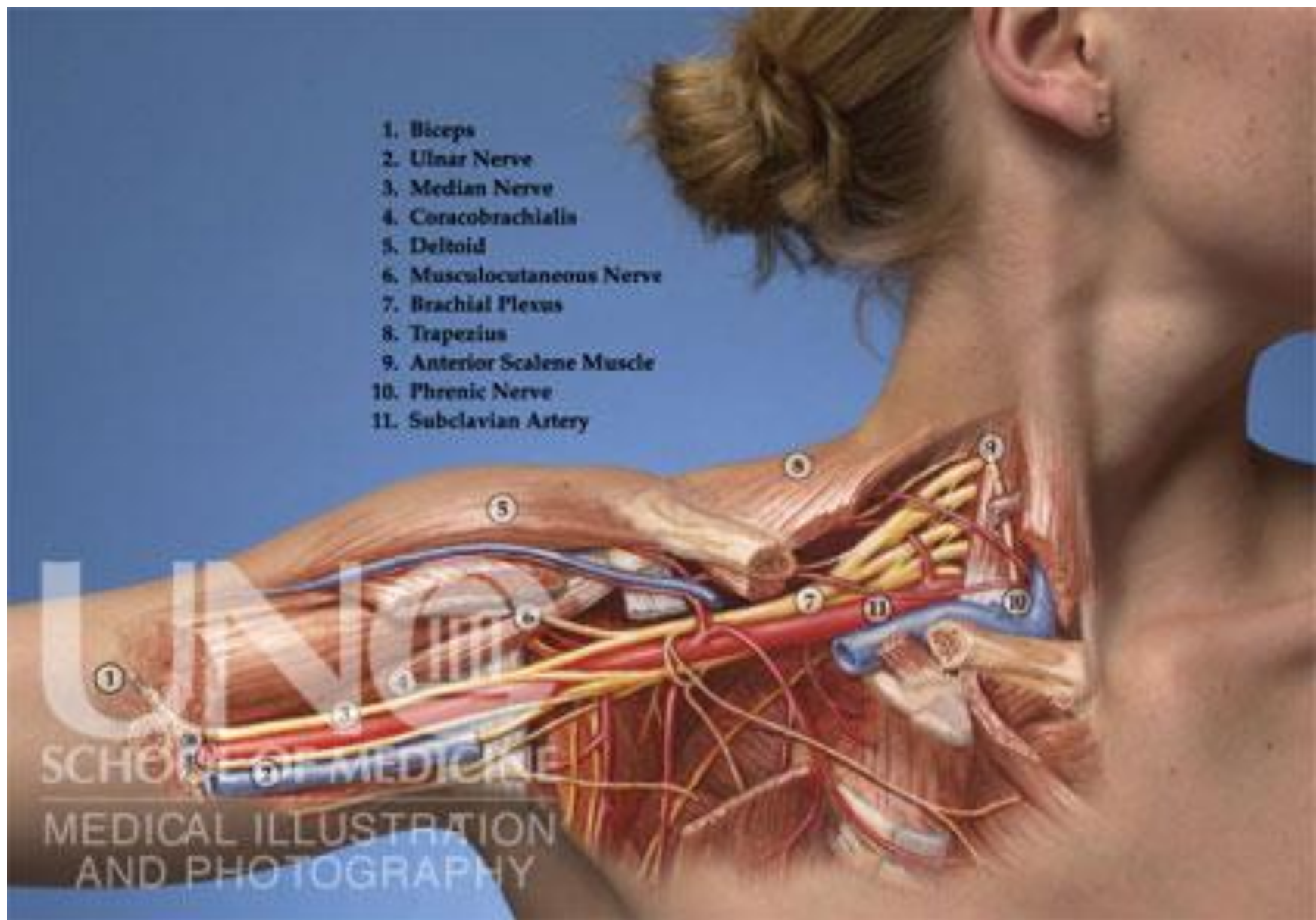
Relationship to Brachial Plexus

Thoracic Outlet Syndrome





1. Biceps
2. Ulnar Nerve
3. Median Nerve
4. Coracobrachialis
5. Deltoid
6. Musculocutaneous Nerve
7. Brachial Plexus
8. Trapezius
9. Anterior Scalene Muscle
10. Phrenic Nerve
11. Subclavian Artery



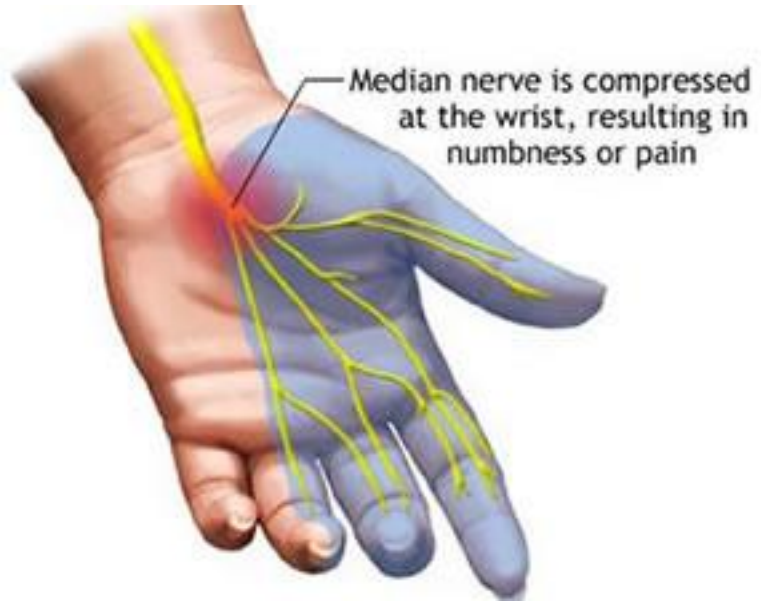
UNIVERSITY OF MICHIGAN
SCHOOL OF MEDICINE
MEDICAL ILLUSTRATION
AND PHOTOGRAPHY

An anatomical illustration of the human arm and hand, showing the skeletal structure and the major nerves. The Median nerve is shown as a yellow cord running along the inner side of the forearm, from the elbow towards the wrist. The Ulnar nerve is shown as a yellow cord running along the outer side of the forearm, from the elbow towards the wrist. Both nerves are highlighted in yellow. Cyan arrows point from the text labels to the respective nerves. The background is black.

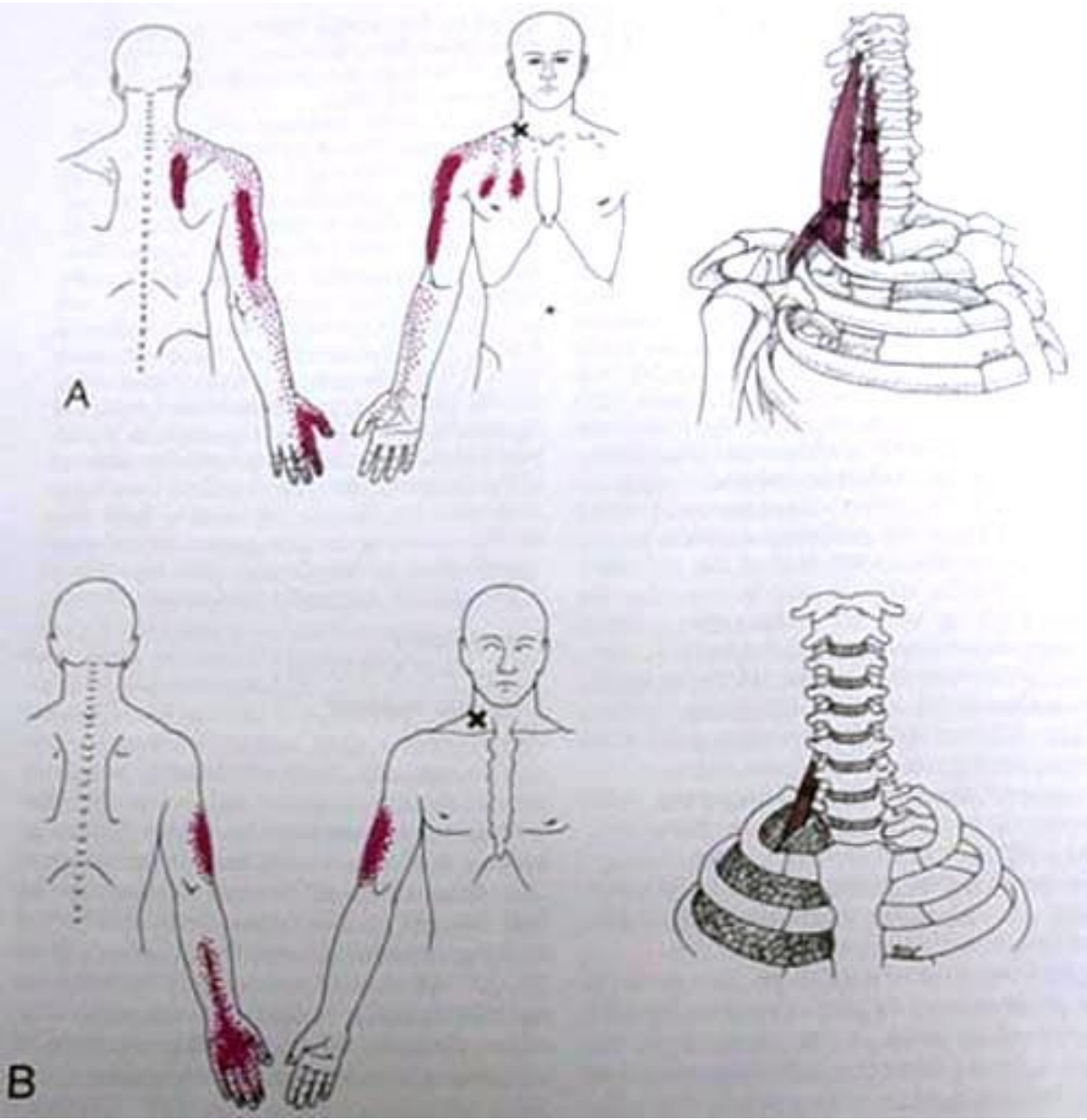
Median nerve

Ulnar nerve

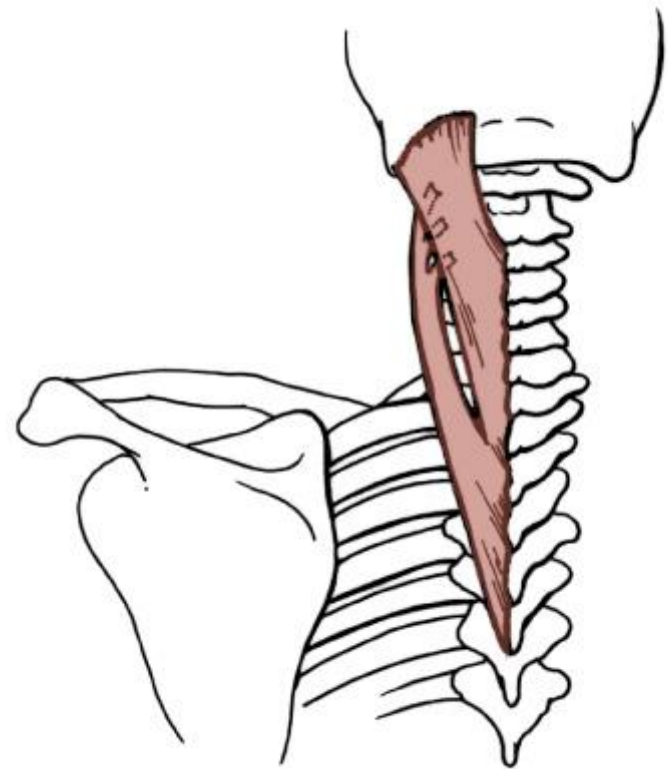
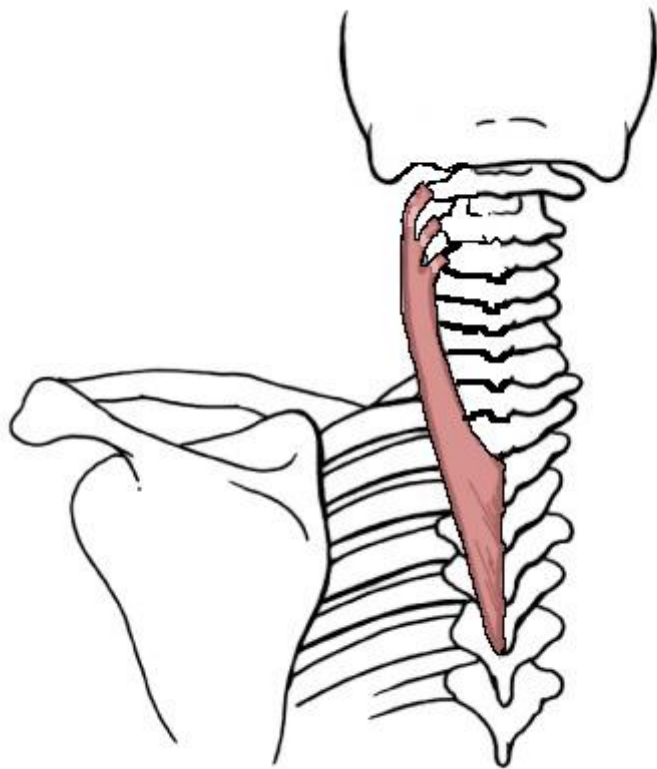
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Median nerve is compressed at the wrist, resulting in numbness or pain

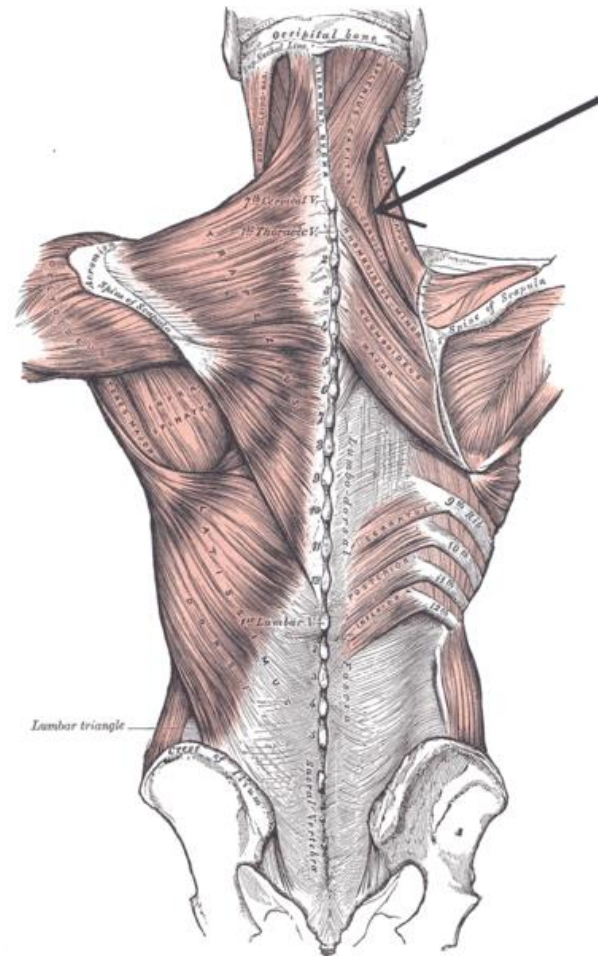


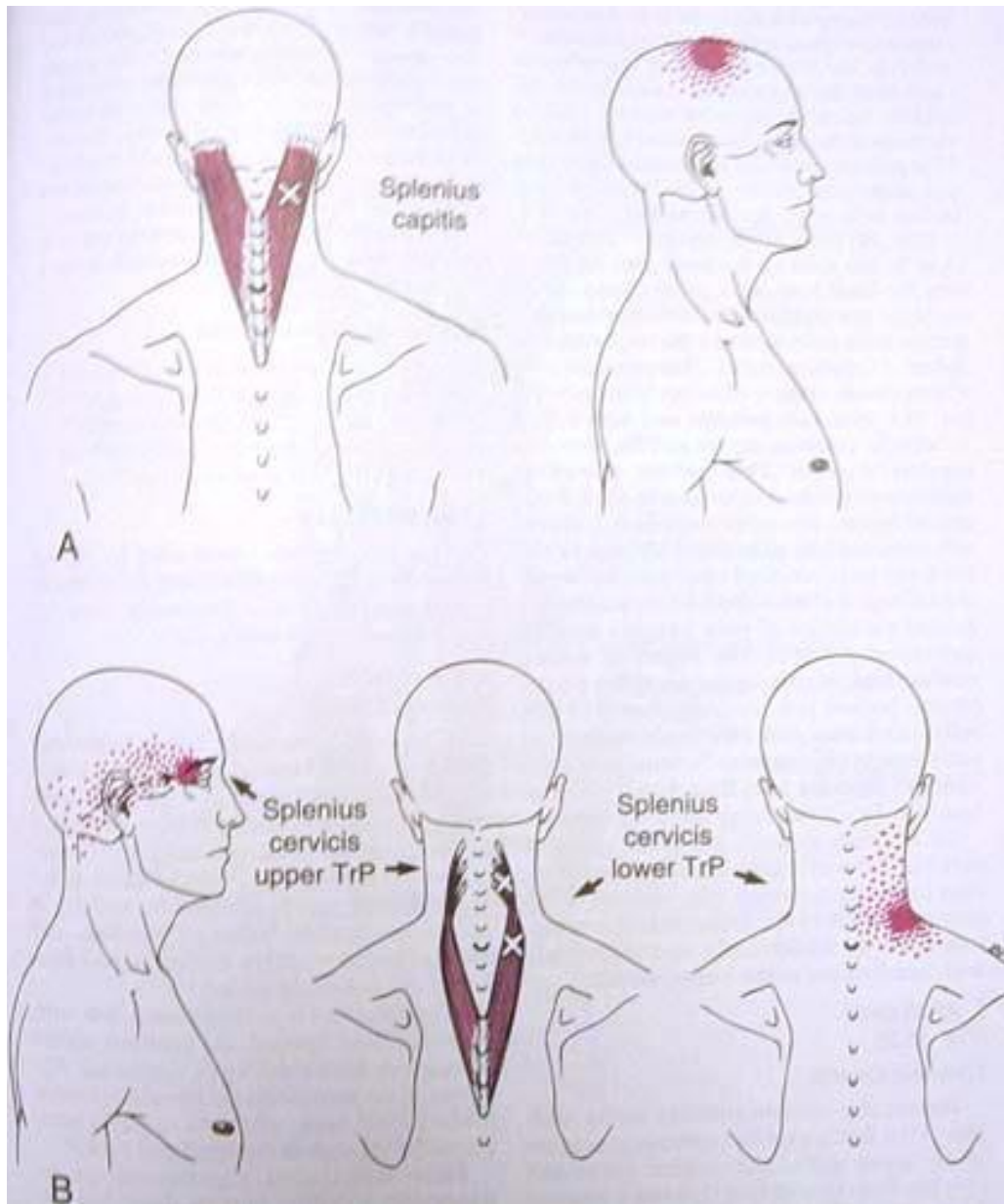
Splenius Capitis and Cervicis



Splenius Capitis and Cervicis

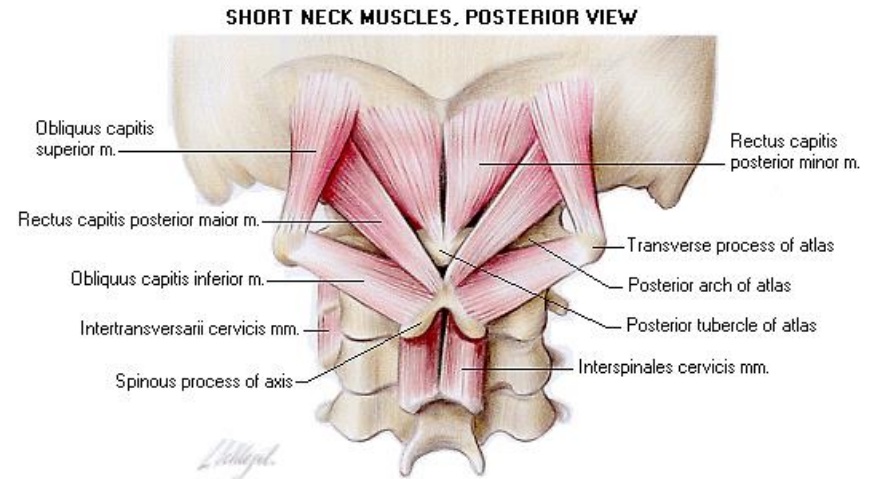
- These muscles originate on SPs or the Nuchal Ligament and insert on TPs (cervicis) or the occipital bone (capitis)
- They extend the neck (bilateral action) and laterally flex and rotate the head to the same side (ipsilateral rotation)

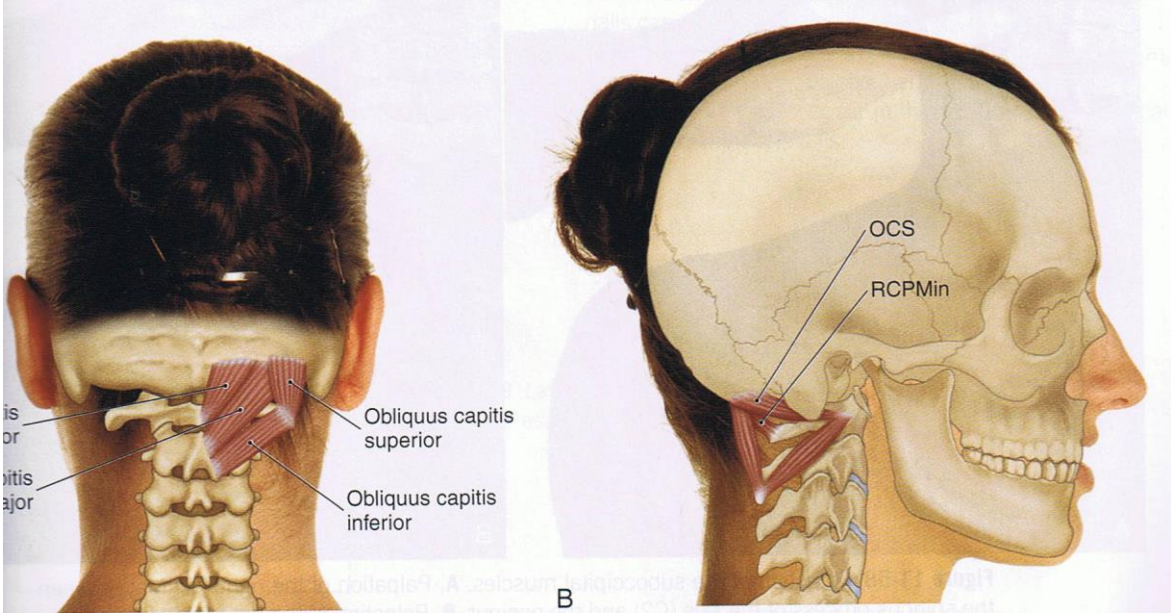




Suboccipital Muscles

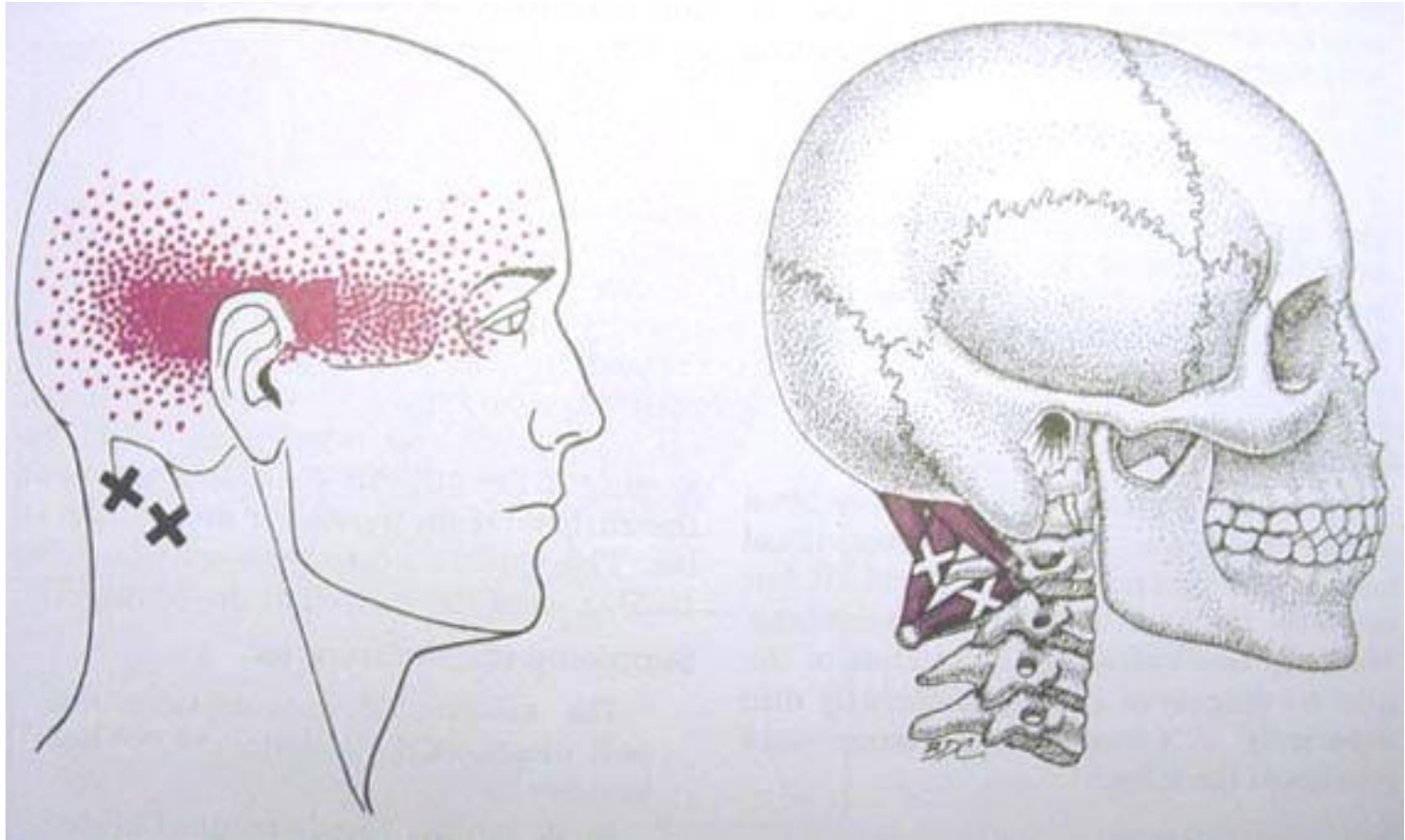
- These muscles include
 - Oblique capitis inferior
 - Oblique capitis superior
 - Rectus capitis posterior major
 - Rectus capitis posterior minor
- These all do extension of the head



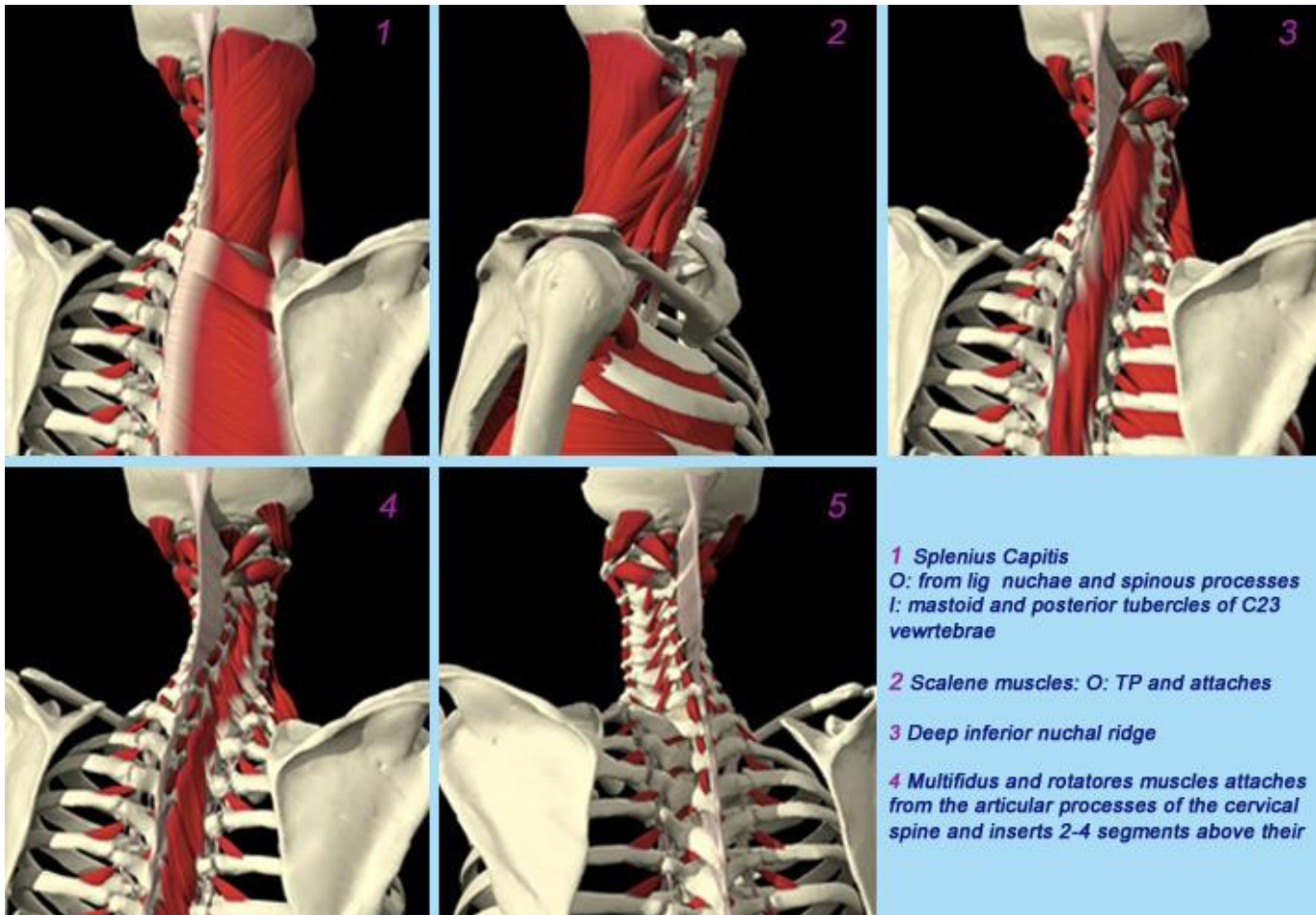




Scalene TrPts



Various Cervical Muscles



Vertebral Levels

Cervical Spine

Vertebral Levels and Relevant Structures

- Hyoid bone – C3
- Superior border of the thyroid cartilage – C4
- Cricoid cartilage – C6

