

Osteology of the Thorax

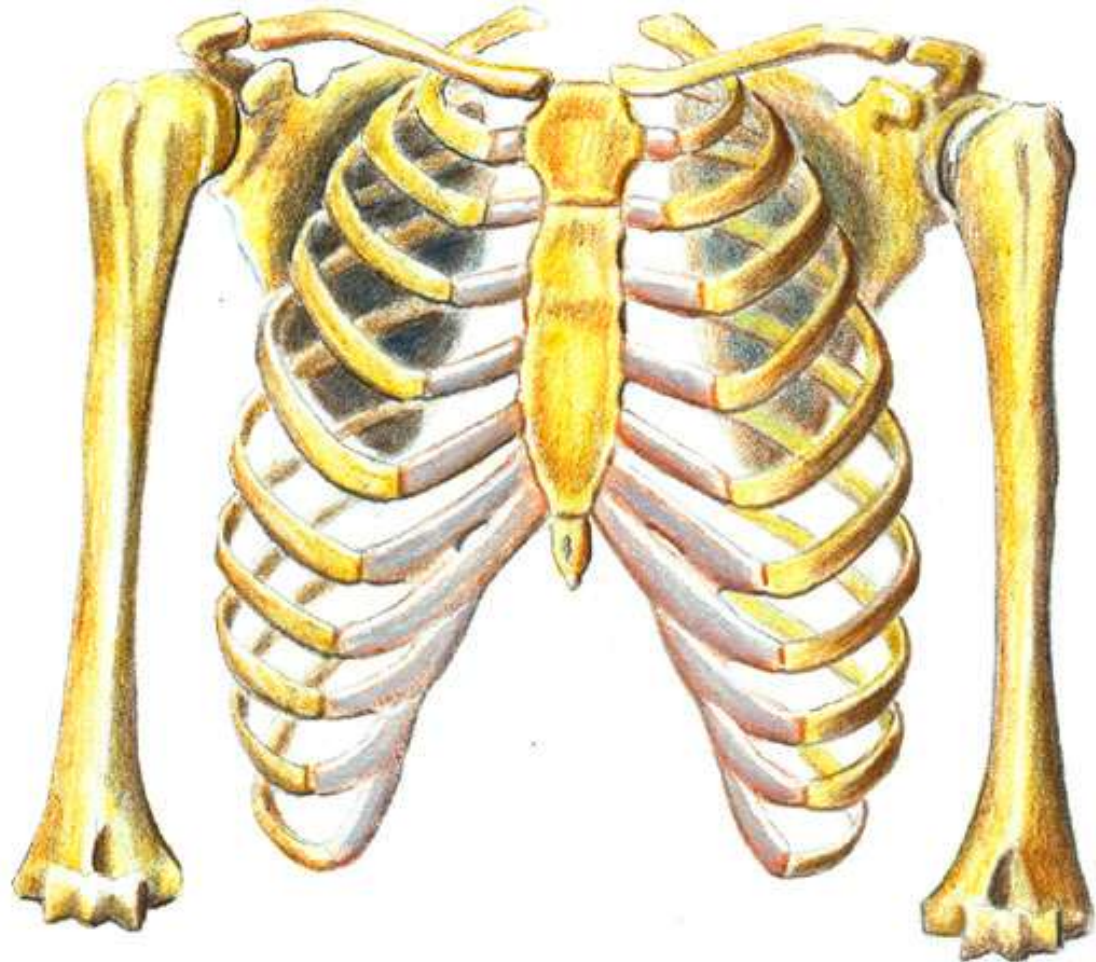
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Introduction

The thoracic skeleton consists of the following:

- 12 pairs of ribs and associated costal cartilages
- 12 thoracic vertebrae and their intervertebral discs
- The sternum
- The ribs and costal cartilages form the largest part of the thoracic cage.

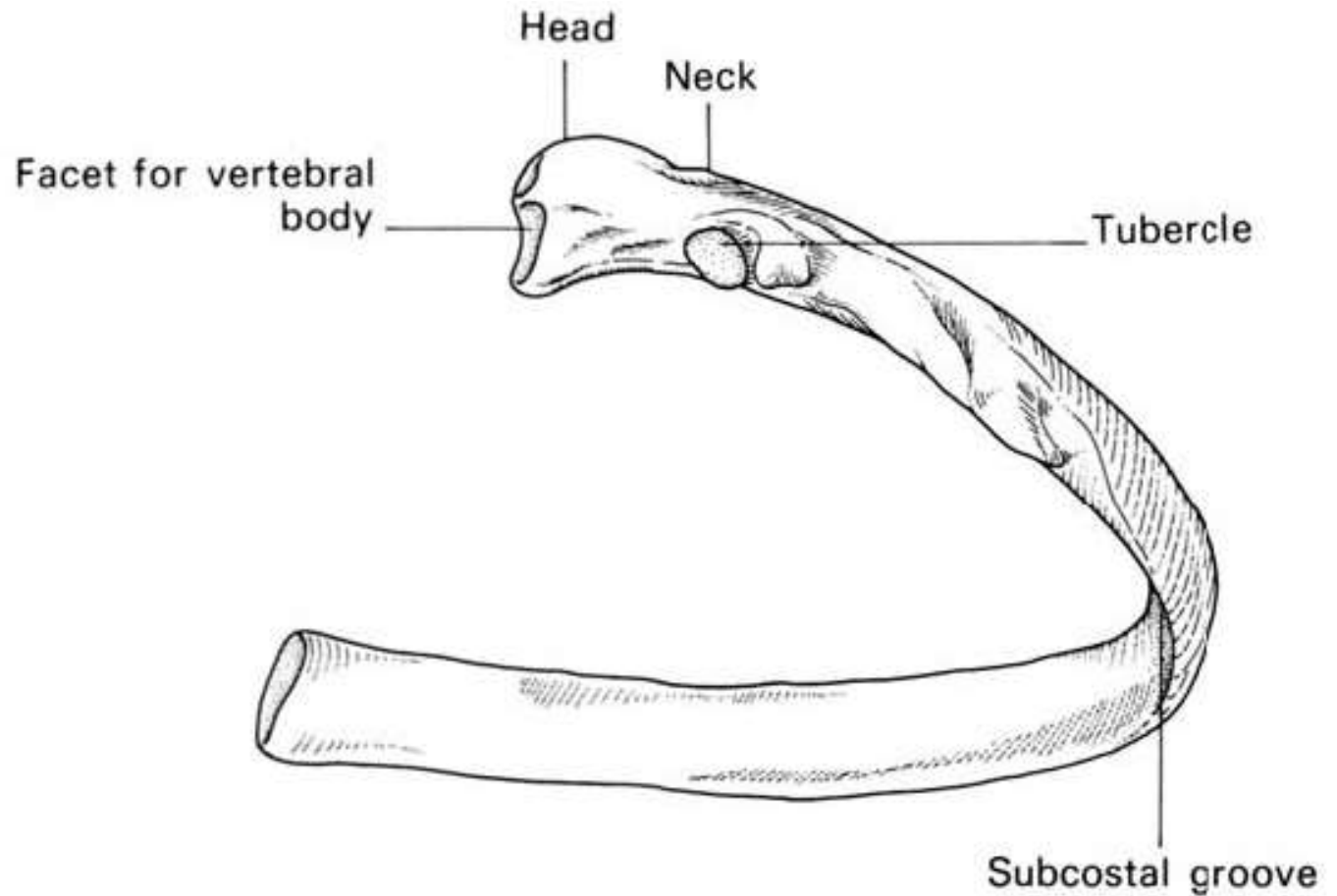


The ribs

- 12 pairs
- Forms the greater part of the thoracic cage
- Three Types:
 - True ribs (1st 7 ribs): attach directly to the sternum through their own costal cartilages.
 - False ribs (8th, 9th, and usually 10th ribs): These have indirect connection to the sternum because their cartilages are connected to the cartilage of the rib above.
 - Floating ribs (11th and 12th): They end in the posterior abdominal musculature and have no connection whatsoever with the sternum.

Typical ribs

- These are the 3rd to the 9th ribs



Typical ribs

Typical ribs have the following parts:

- **The Head:** This has 2 facets. One facet is for the numerically corresponding vertebrae while the other is for the vertebra above
- **Neck:** Which is stout and connects the head with the body. It gives attachment to the costotransverse ligaments

Typical ribs

Typical ribs have the following parts:

- **Tubercle:** This has a smooth articular part which articulates with the corresponding transverse process of the vertebra, and a rough non-articular part, for the attachment of the costotransverse ligament.
- **The Shaft or body:** This is thin, curved and flattened. It is most curved at the costal angle where the rib turns anterolaterally. The internal surface has a groove where the intercostal nerves and vessels lie.

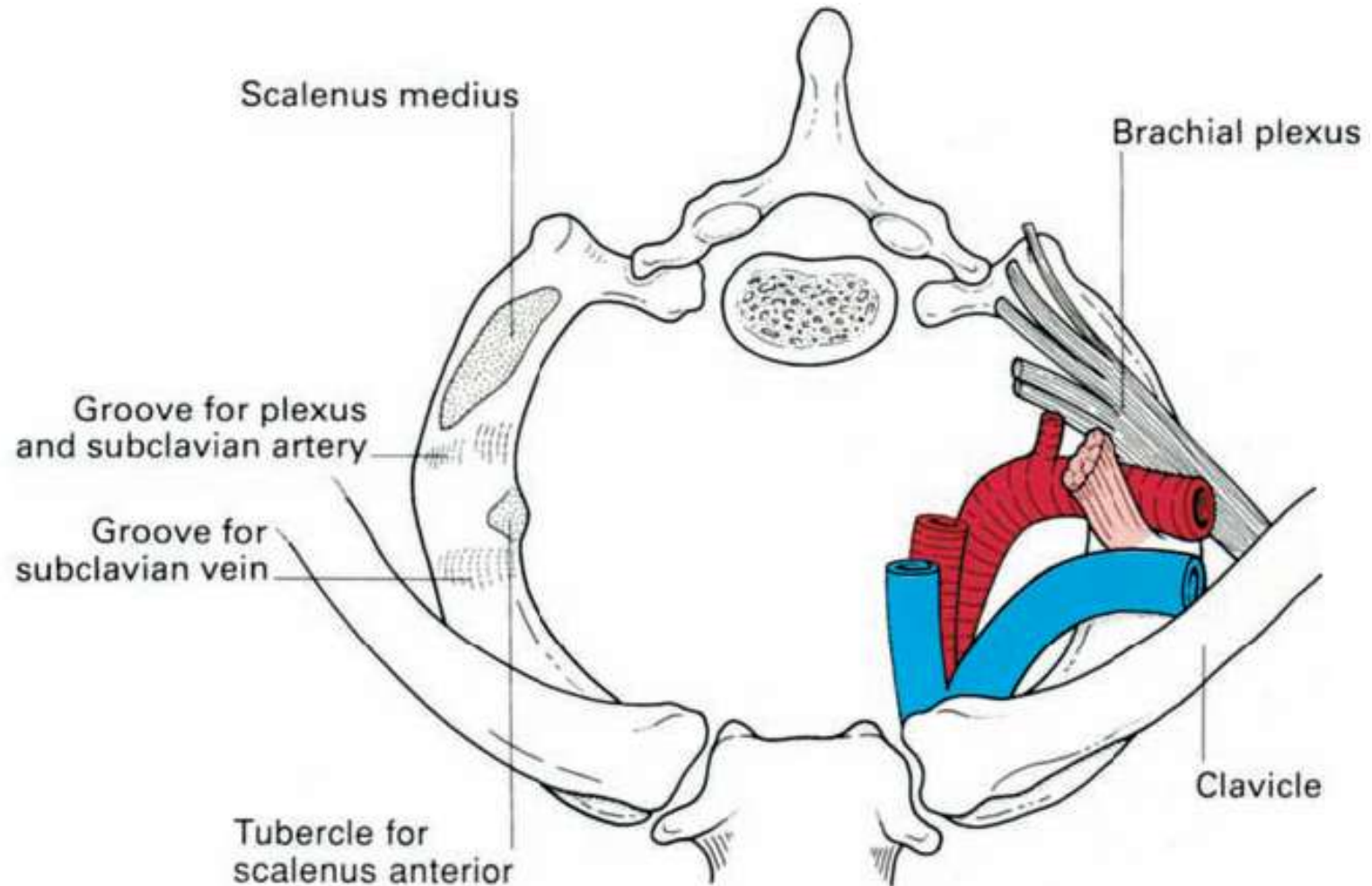
Atypical ribs

These are the 1st, 2nd, 10th 11th and the 12th ribs

1st Rib:

- Flattened from above down
- Shortest, broadest and most curved rib
- Has only one facet on the head for articulating with the first thoracic vertebra only
- Has two grooves on its upper surface on which the subclavian vessels lie
- Has the scalene tubercle between the grooves. This is the attachment of the anterior scalene muscle

Atypical ribs: First Rib



Atypical ribs

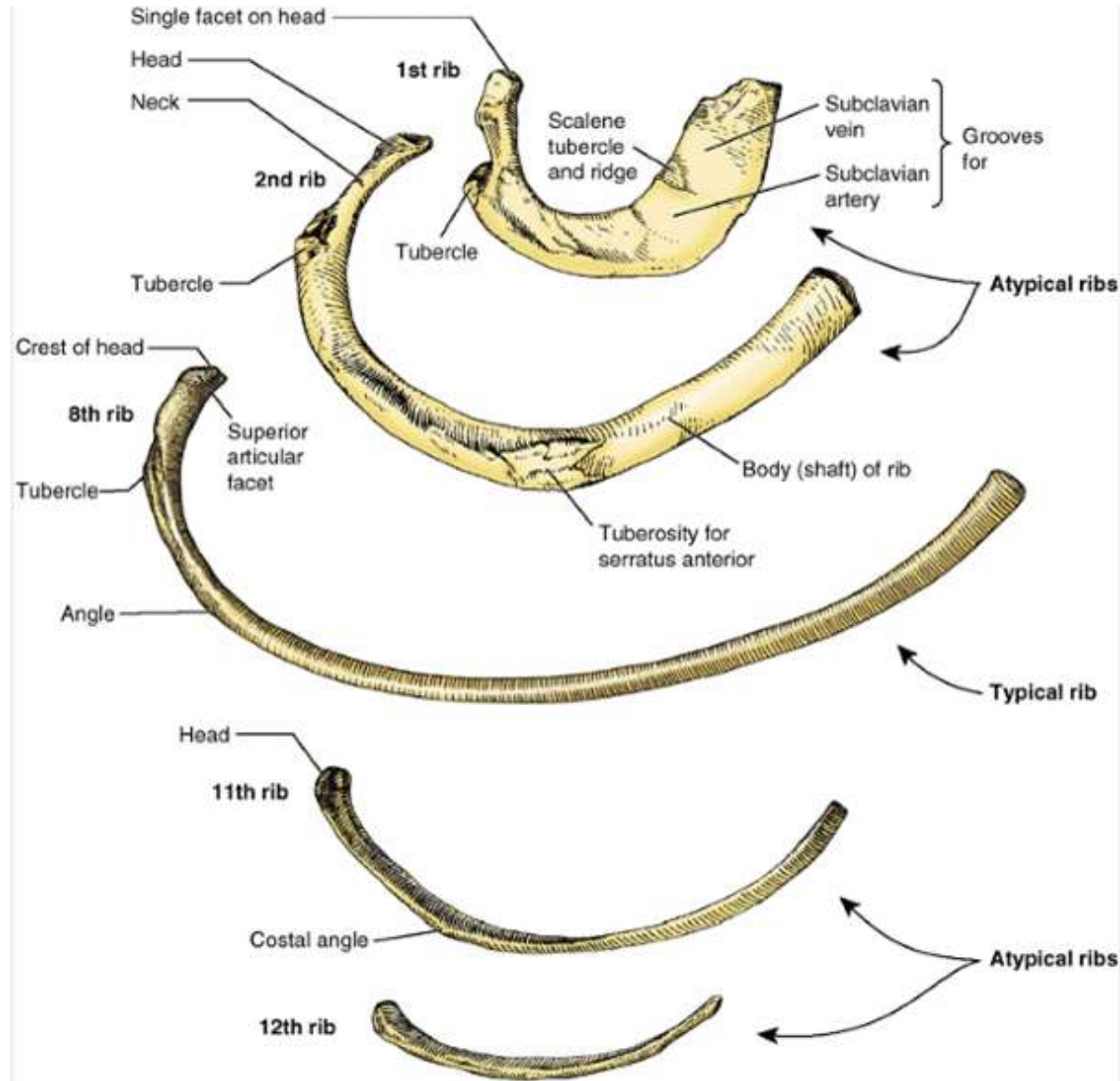
2nd Rib

- The tuberosity for serratus anterior is found on its upper surface , from which part of the muscle originates.

10th, 11th and 12th ribs

- The 10th and 12th ribs, have only one facet on their heads and articulate with a single vertebra (like the 1st).
- The 11th and 12th ribs are the floating ribs. They are short and have no neck or tubercle.

Typical and Atypical Ribs

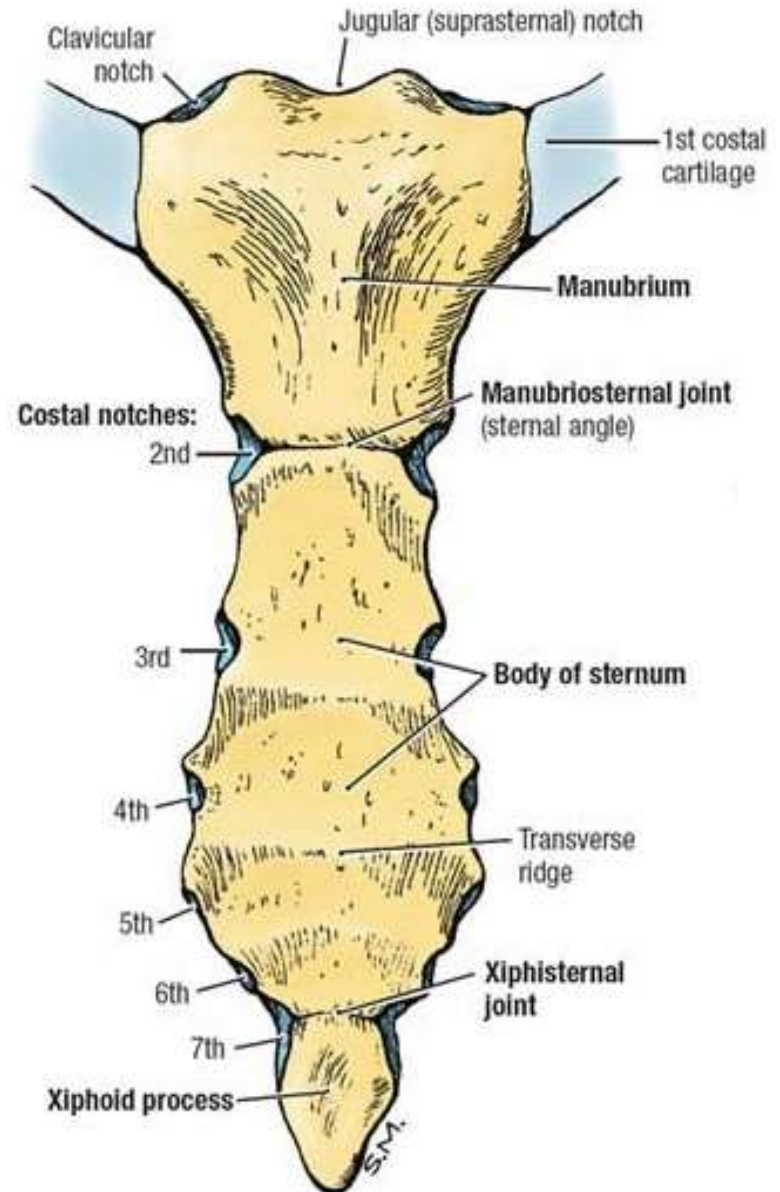


Coastal Cartilages

- All 12 ribs possess coastal cartilages
- The cartilages of the first seven ribs connect the ribs to the sternum
- The 8th, 9th and 10th cartilages connect to the cartilage above, forming a continuous coastal margin
- The cartilages of the 11th and 12th ribs forms knobby structures on the ribs, ending blindly in the muscles
- The cartilage adds considerable resilience to the thoracic cage and serves to protect the ribs and sternums from (more) frequent fractures

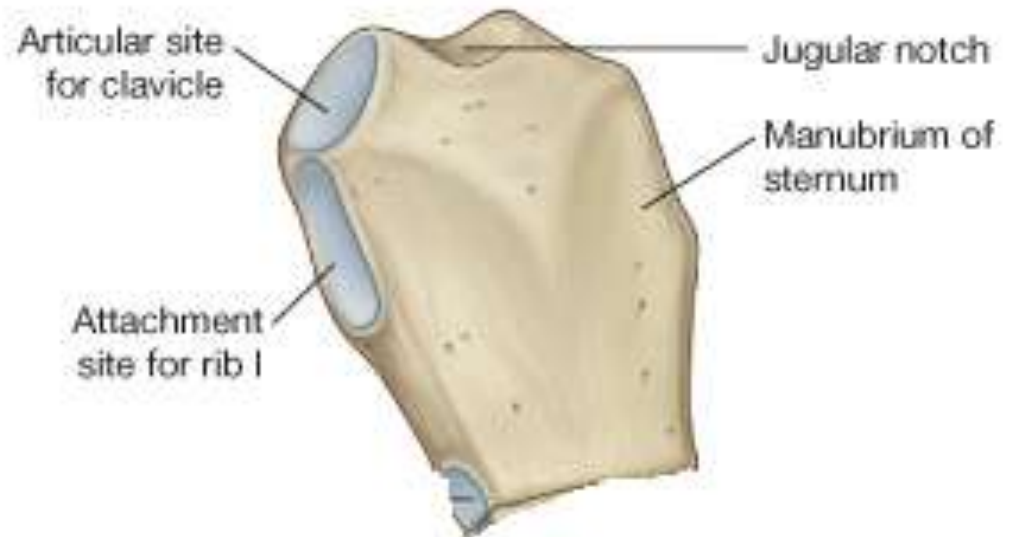
The Sternum

- Dagger shaped
- Forms the anterior part of the thoracic cage
- Consists of 3 parts:
 - The manubrium
 - The body
 - Xiphoid process



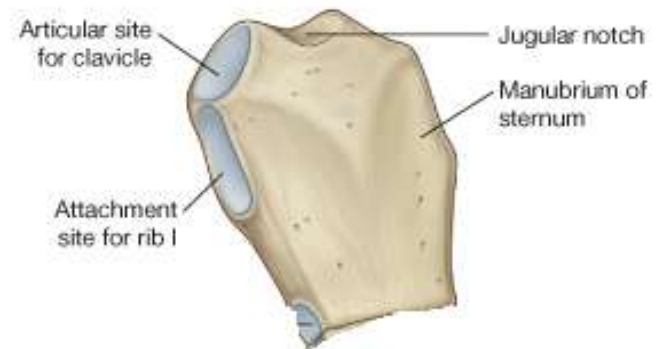
The Manubrium

- The superior most part of the sternum
- Forms part of the bony framework of the chest as well as the neck
- The jugular notch is located in the midline on the superior surface
- On either side of the notch are the facets for articulating with the clavicles



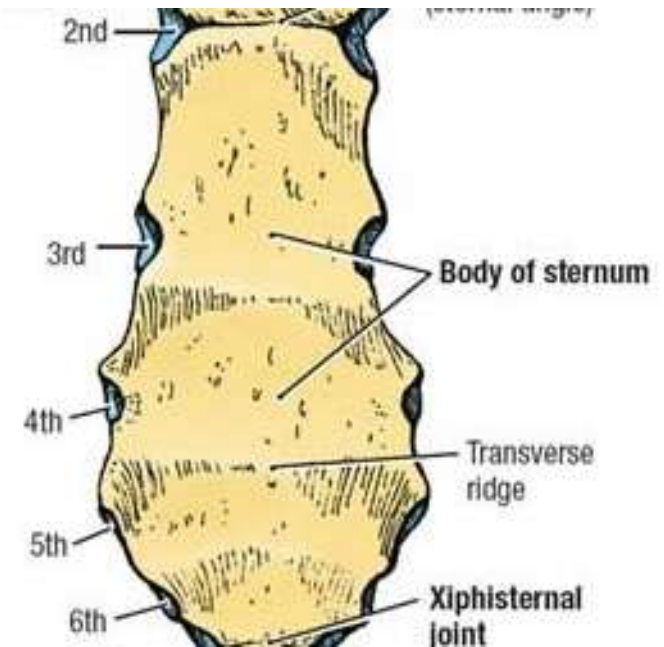
The Manubrium

- On the lateral surface and immediately below the facets for the clavicles are the facets for the 1st rib
- The demi-facet for the upper half of the 2nd rib is located at the distal end of the lateral surface
- It articulates with the body at the manubrosternal angle or angle of Louis which is opposite the T4-T5 intervertebral disc.



The body of the sternum

- This lies opposite the T5-T8 vertebrae
- Anterior surface of the body of the sternum is often marked by transverse ridges, which represents the line of fusion of the segments that embryological origin of the sternum
- These segments, called the sternebrae usually fuse between puberty and 25 years
- Its lateral border is notched to receive part of the 2nd, the 3rd to 6th and part of the 7th costal cartilages



Xiphoid process

- This is the smallest part of the sternum and usually remains cartilaginous well into adult life
- The Shape varies
- It may be wide, thin, pointed, bifid, curved, or perforated
- On each side of its upper lateral margin is a demi-facet for articulation with the inferior end of the seventh costal cartilage

The Joints of the Thorax

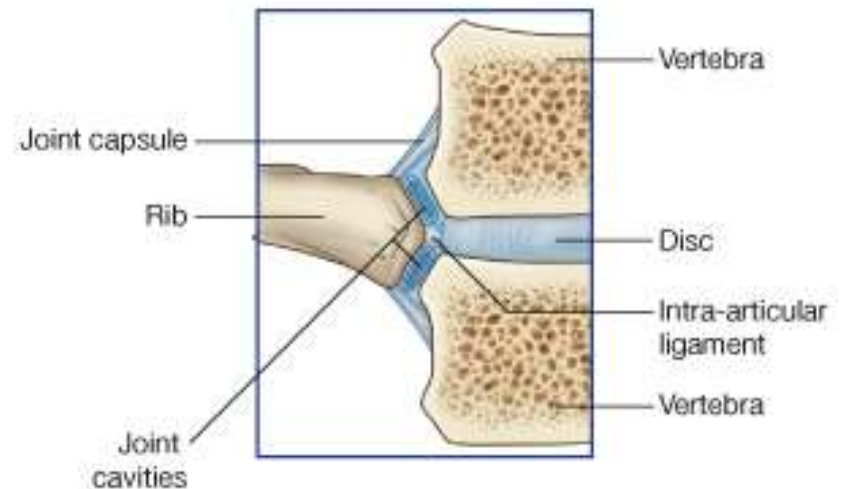
- These are six in numbers
 - i. Costovertebral joints
 - ii. Costotransverse joints
 - iii. Sternocostal joints
 - iv. Interchondral joints
 - v. Manubrosternal
 - vi. Xiphisternal joints
- Articulations between ribs and vertebrae**

Costovertebral joints

- One of the two articulations between ribs and vertebrae
- It is a synovial joint
- It is the articulation between the bodies of adjacent vertebrae and the head of a rib
- The two facets on the head of the rib articulate with the superior facet on the body of its own vertebra and with the inferior facet on the body of the vertebra above

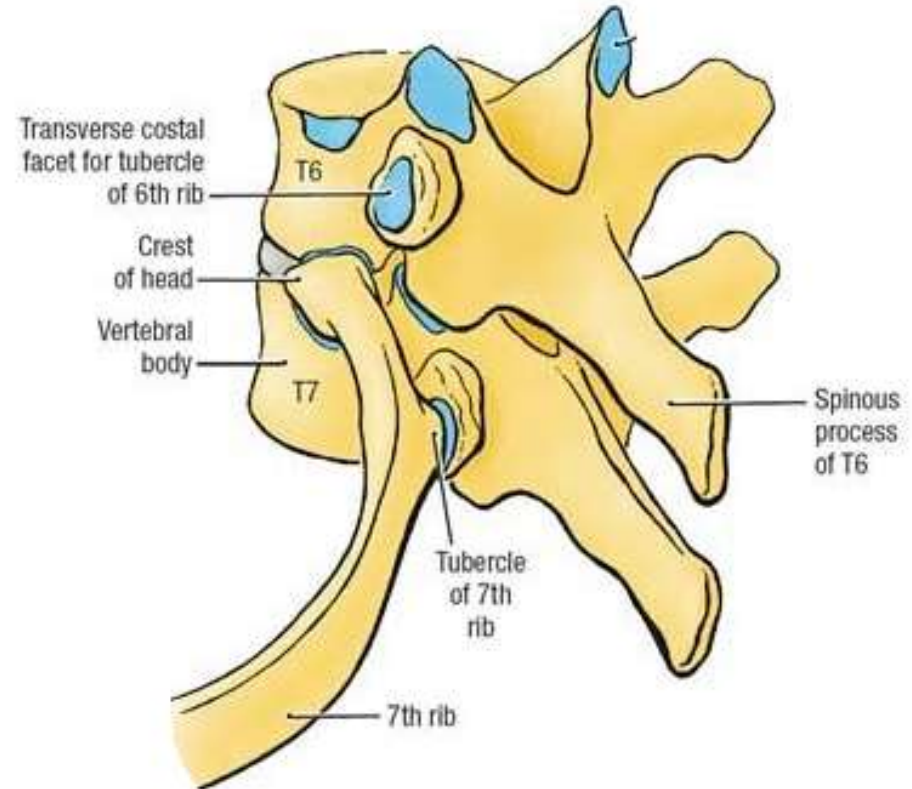
Costovertebral joints

- The joint is divided into two synovial cavities by an intra-articular ligament
- The joint is surrounded by a single joint capsule which attaches to bones at the outer margins of the joint



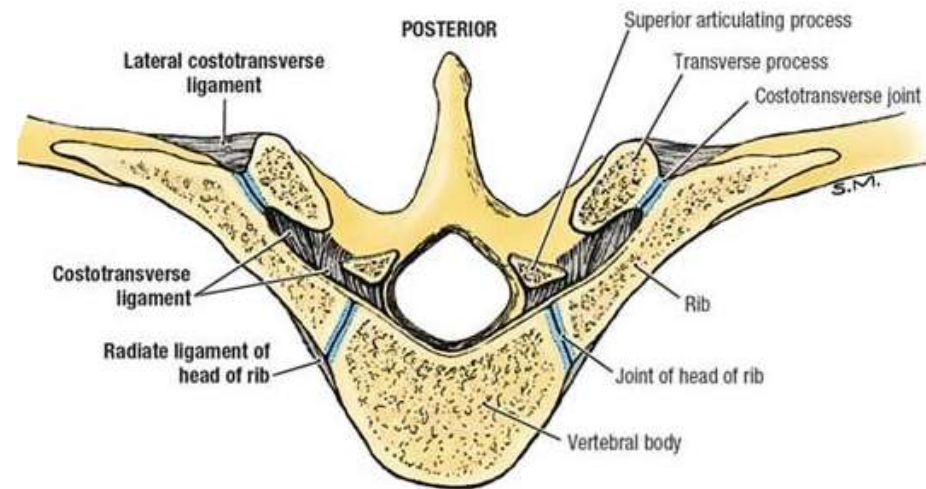
Costotransverse joint

- This is the synovial joint between the tubercle of a rib and the transverse process of the related vertebra
- Slight gliding movements occur at the costotransverse joints
- It is stabilize by 3 extra-articular ligaments



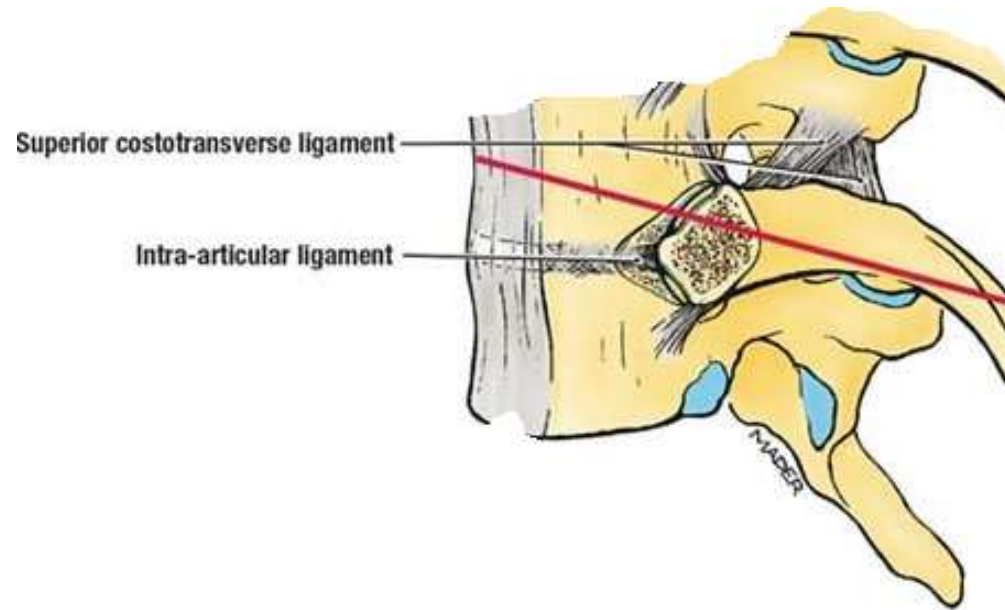
Ligaments of the costovertebral joint

- I. Costovertebral ligament: Medially situated between the transverse process and the rib
- II. Lateral Costovertebral ligament: Laterally situated between the transverse process and the rib



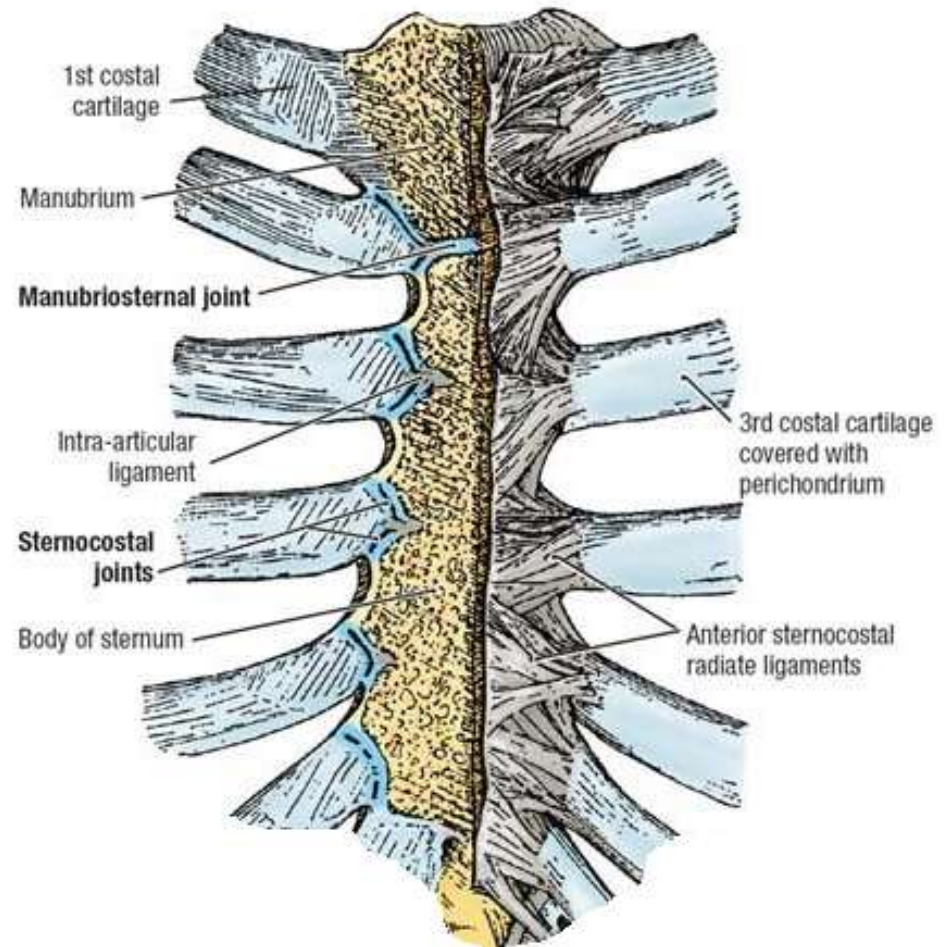
Ligaments of the costovertebral joint

III. Superior Costovertebral ligament: attaches the superior surface of the neck of the rib to the transverse process of the vertebra above.



Sternocostal joints

- These are the joints between the upper seven costal cartilages and the sternum
- The first one is fibrocartilagenous while the rest are synovial
- The second one is divided into two compartments by an intra-articular ligament



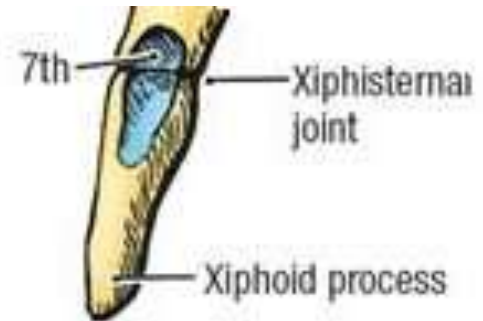
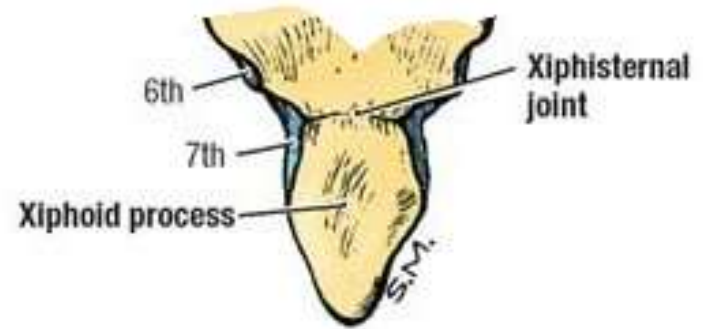
Interchondral joints

- Synovial joints between the costal cartilages of adjacent ribs (6 – 10)
- Provide indirect anchorage to the sternum
- contribute to the formation of a smooth inferior costal margin



Manubrosternal and Xiphisternal joints

- These joints are symphysis
- During inspiration, slight angular movement occur in the manubrosternal joint.
- The Xiphisternal joint usually becomes ossified at old age





Any Question?