



The Thorax

Axial & Appendicular Skeleton

Mammary Glands

Surface Anatomy

www.fisiokinesiterapia.biz

Axial vs. Appendicular Skeleton

- ◆ Axial Skeleton
 - Skull = Cranium + Facial bones
 - Vertebrae
 - Ribs
 - Sternum
- ◆ Appendicular Skeleton
 - Bones of upper/lower limbs
 - Limb Girdles

The Bony Thorax

- ◆ Sternum
 - Manubrium, Body (Gladiolus), Xiphoid Process
- ◆ Ribs
 - 7 True Ribs
 - 5 False Ribs
- ◆ Clavicle
- ◆ Scapula
- ◆ Vertebrae
 - Cervical, Thoracic, Lumbar, Sacral (Sacrum), Coccygeal (Coccyx)

Projections and Depressions

- ◆ Site of muscle and ligament attachments
 - Spine
 - Process
- ◆ Help form joints
 - Head
 - Facet
- ◆ Allow BV, nerves, and muscles to pass
 - Notch
 - Fossa

Thoracic Cage

- ◆ Borders:
 - Thoracic vertebrae posteriorly
 - Ribs laterally
 - Sternum and costal cartilages anteriorly
- ◆ Forms protective cage around heart, lungs, and other organs
- ◆ Composed of:
 - Sternum
 - Ribs
 - Vertebrae

The Sternum

(Composed of fused sternebrae)

- ◆ Manubrium
 - Jugular (sternal) notch
 - Articulation with rib #1 & 2
 - Clavicular Articular facets
 - **Sternal Angle** – 2nd rib
- ◆ Body (Gladiolus)
 - Articulates w/ribs 2-7
 - **Xiphosternal joint**
- ◆ Xiphoid process
 - Cartilage-calcifies thru time
 - Partial attachment of many muscles

The Ribs

- ◆ Usually, 12 pairs
 - 7 **True ribs**-direct attachment to sternum
 - 5 **False ribs**-indirect or no attachment to sternum
 - **Floating ribs**-make up 2 of 5 False ribs, no ventral attachment
- ◆ Typical Ribs
 - Ribs # 2-9
- ◆ Atypical Ribs
 - Ribs #1, 10, 11, 12
- ◆ Reinforce thoracic cage

Rib Anatomy

◆ Typical Ribs

- Head
- Neck
- Tubercle
- Angle
- Shaft
- Subcostal Groove

Rib Anatomy

◆ Atypical Ribs

- #1-short, flat (S-I), wide, Supports Subclavian vessels
- #1, 10-12 articulate with only = # vertebra
- #11, 12 don't articulate with transverse processes, or anteriorly at all

Typical Rib Articulation

- ◆ **Dorsal (P) Attachment Thoracic Vertebrae**
 - ◆ Head of Rib → 2 costal facets
 - Superior costal facet
 - Inferior costal facet of vertebra above it
 - Intervertebral disc
 - ◆ Tubercle of Rib → Transverse Costal Facet
 - ◆ e.g. Rib #4 articulates with Superior Costal Facet and Transverse Costal Facet of T4 & Inferior Costal Facet of T3
- ◆ **Ventral (A) Attachment to Sternum**
 - Via costal cartilage

Pectoral Girdle

- ◆ Attaches upper extremity to axial skeleton
- ◆ Holds upper extremity away from skeleton for mobility



Intercostal Muscles

◆ External Intercostals

- **O: Inferior border of rib above** **I: Superior border of rib below**
- Fibers run **OBLIQUE** (down and forward)
- Aid in Inspiration (lift ribcage, increase dimensions)

◆ Internal Intercostals

- **O: Superior border of rib below** **I: Inferior border of rib above**
- Fibers run at **RIGHT ANGLES** to external intercostals
- Aid in forced expiration (depress ribcage, decrease dimensions)

◆ Innermost Intercostals, Subcostals, Transversus thoracis

- Attachments similar to Internal Intercostals, Attach ribs
- Small, variable, function unclear

Neurovascular Bundle of Intercostal Muscles

- ◆ **VAN** (vein, artery, nerve)
 - Intercostal vein
 - Intercostal artery
 - Intercostal nerve
- ◆ Sit in Subcostal Groove
- ◆ Between Internal Intercostal and Innermost intercostal layer

Vertebral Column

- ◆ Humans' made of 26 bones
 - Cervical 7
 - Thoracic 12
 - Lumbar 5
 - Sacrum (5 fused sacral vertebrae)
 - Coccyx (4 fused coccygeal vertebrae)
- ◆ Extends from skull to pelvis
- ◆ Supports body, muscle attachment
- ◆ Vertebral Canal
 - Created by vertebral foramen
 - Contains + protects spinal cord
- ◆ Intervertebral foramina

Cervical Vertebrae (7)

- ◆ ****Transverse Foramen****
- ◆ Superior Articular Facets face superoposteriorly
- ◆ Inferior Articular Facets face inferoanteriorly
- ◆ Allows wide range of motion
- ◆ Spinous process fairly short, bifid (except for C7)
- ◆ Vertebral Foramen is Triangular
- ◆ Body is wider laterally than in A-P direction

Atypical Cervical Vertebrae

- ◆ C1 – Atlas
 - No body
 - No Spinous Process
 - Superior Articular facets are kidney shaped
- ◆ C2 – Axis
 - Odontoid Process = Dens
 - Other features typical

Thoracic Vertebrae (12)

- ◆ ****Transverse Costal Facets ****
- ◆ ***S/I Costal facets on vertebral body***
- ◆ Spinous Processes long, point inferiorly
- ◆ Superior Articular Facets face Dorsally/Posteriorly
- ◆ Inferior Articular Facets face Ventrally/Anteriorly
- ◆ Vertebral Foramen is Circular
- ◆ Body is Heart-shaped

Lumbar Vertebrae (5)

- ◆ Spinous process is short, rectangular, projects dorsally
- ◆ Superior Articular Facets face Medially
- ◆ Inferior Articular Facets face Laterally
- ◆ Vertebral Foramen is Triangular
- ◆ Body is large and Kidney-shaped

Sacrum & Coccyx

Sacrum

- ◆ 5 fused Sacral Vertebrae
- ◆ Articulates with
 - 5th Lumbar vertebra
 - Coccyx
 - Iliac of coxal bones
- ◆ Functions in weight transfer
- ◆ Has a body, sacral canal, sacral foramina
- ◆ Remnants of other typical vertebrae features visible
 - Lateral & median sacral crest

Coccyx

- ◆ 3-4 fused Coccygeal vertebrae
- ◆ Articulations
 - #1 articulates with 5th Sacral Vertebra
- ◆ Some muscle + ligament attachment
- ◆ Slightly different orientation in males vs. females
- ◆ No canal

Intervertebral Discs

- ◆ Absent between
 - C1 and C2
 - Sacrum and coccyx
- ◆ Annulus Fibrosus
 - Outer collar of concentric rings
 - Outer rings = ligaments
 - Inner rings = fibrocartilage
 - Supportive/Structural
- ◆ Nucleus Pulposus
 - Inner disc, cushiony pad
 - Remnants of notocord
 - Shock Absorber

Vertebral Column

← IN

← OUT

← IN

← OUT

◆ Lateral Curvature

(Following Dorsal Side)

- Cervical Region = Concave curve
- Thoracic Region = Convex curve
- Lumbar Region = Concave curve
- Sacrum = Convex curve

Abnormal Curves

- ◆ **Scoliosis**-abnormal lateral curve of more than 10°
 - “twisted disease”
- ◆ **Kyphosis**-exaggerated thoracic curve
 - “humped disease”
- ◆ **Lordosis**-accentuated lumbar curve
 - “bent-backward disease”

Ligaments of Vertebral Column

- ◆ **Anterior Longitudinal Ligaments** (neck – sacrum)
 - Run vertically on anterior surface of vertebral bodies + intervertebral discs
 - Wide, strong
 - Prevents hyperextension
- ◆ **Posterior Longitudinal Ligaments** (neck – sacrum)
 - Run vertically on posterior surface of intervertebral discs only
 - Narrow, weak
 - Prevents hyperflexion
- ◆ **Ligamentum Flavum** (contains elastic connective tissue)
 - Attaches lamina of vertebrae (one on right, one on left)
 - Very strong

Muscles of Thorax

<i>Muscle</i>	<i>Origin</i>	<i>Insertion</i>	<i>Action</i>	<i>Innervation</i>
Pectoralis major	Sternum, Ribs 2-6	Inter-tubercular groove of humerus	Adduct, Flex, Med Rotate Arm	M & L pectorals
Pectoralis minor	Ribs 3-5	Coracoid process of scapula	Depress, Rotate scapula	M & L pectorals
Serratus anterior (ventralis)	Ribs 1-9	Scapula	Protract, Rotate scapula	Long Thoracic

Muscles of Thorax

<i>Muscle</i>	<i>Origin</i>	<i>Insertion</i>	<i>Action</i>	<i>Innervation</i>
Trapezius	Ligamentum nuchae, C ₇ -T ₁₂	Clavicle, Spine & acromion of scapula	Elevate, Adduct, Rotate, Depress	Accessory
Levator Scapulae	C ₁ -C ₄	Medial border of scapula	Elevate scapula	D. Scapular
Rhomboids	C ₇ -T ₅	Medial border of scapula	Adduct, Elevate, Rotate	D. Scapular

Muscles of Thorax

<i>Muscle</i>	<i>Origin</i>	<i>Insertion</i>	<i>Action</i>	<i>Innervation</i>
Deltoids	Clavicle, Spin & acromion of scapula	Deltoid tuberosity of humerus	Flex, Abduct, Extend, Lat & med. rotate arm	Axillary
Latissimus dorsi	Iliac crest, Sacrum, T ₇₋₁₂ , Lumbar fascia	Inter- tubercular groove of humerus	Extend, Adduct, Med. rotate arm	Thoraco- dorsal

Rotator Cuff Muscles

Muscle	Origin	Insertion	Action	Innervation
Supraspinatus	Supraspinous fossa of scapula	Greater tubercle of humerus	Abduction of arm	Suprascapular
Infraspinatus	Infraspinous fossa of scapula	Greater tubercle of humerus	Lat rotation of arm	Suprascapular
Teres Minor	Lateral border of scapula	Greater tubercle of humerus	Lat rotation of arm	Axillary
Subscapularis	Subscapular fossa of scapula	Lesser tubercle of humerus	Med rotation of arm	Subscapular

The Breast

- ◆ Location: (female breast)
 - Superior border: 2nd rib
 - Inferior border: 6th rib
 - Medial border: Sternum
 - Lateral border: Midaxillary line
- ◆ Location: (male nipple)
 - Fourth Intercostal Space, Midclavicular line
- ◆ Underlying muscle
 - Pectoralis major and minor
 - Part of serratus anterior, external obliques
- ◆ Lateral Thoracic Artery, branches of Internal Thoracic A., Post. Intercostals
- ◆ Intercostal, Internal Thoracic, Axillary Veins
- ◆ Branches of Intercostal Nerve

Mammary Glands

- ◆ **Lactiferous (modified sweat) Glands**
- ◆ Breast made of 15-25 lobes (each a compound alveolar gland)
- ◆ Lobes made of lobules (= clusters of acini/alveoli)
- ◆ Acini/Alveoli lined w/milk-secreting simple epithelial cells
- ◆ **Lactiferous Ducts** of lobes open at nipple
- ◆ **Areola**-ring of pigmented skin around nipple
 - Sebaceous gland produce **sebum** during nursing
- ◆ Lobes separated by adipose tissue and suspended by connective tissue = **Suspensory Ligaments of the Breasts**



Surface Anatomy

Use the next 3 slides and follow the book to
palpate (feel) the features listed

Anterior Surface of Thorax

- ◆ Palpate the following
 - Sternum (3 parts)
 - Jugular notch
 - Sternal Angle (= 2nd rib)
 - Clavicle
 - Costal margin
 - Xiphosternal joint
- ◆ Midclavicular Line
- ◆ Midaxillary Line

Posterior Surface of Thorax

- ◆ Palpate the following
 - Spinous Process of C7
 - Scapula (ribs 2-7)
 - Scapular spine
 - Acromion Process
 - Inferior Angle of Spine
 - Inferior Border

Locating Internal Structures

◆ Pleural Cavities

- Inferior margin = adjacent to T12 in Posterior Midline
- To Rib 10 at Midaxillary line
- To Rib 8 at Midclavicular line
- To Xiphosternal joint medially
- Lungs posterior border is 2 ribs superior to pleural cavity (rib 8)

◆ Heart

- Deep to xiphisternal angle