Dr. Weyrich

G04: Anterior Thoracic Wall, Breast and Lymphatic System

Reading:
1. Gray’s Anatomy for Students, Chapter 3
2. Dissection Guide for Human Anatomy, Lab 4

Objectives:
1. Osteocartilaginous thoracic cage
2. Anatomy of the female breast
3. Muscles of the thorax
4. Blood supply and innervation of the thoracic region

Clinical Correlates:
1. Breast cancer

Bones of the Thoracic Wall
(pp. 118-126)

Skeleton of the Thoracic Wall

Thoracic vertebrae (pp. 119-120)
Costal facets
Spinous processes

Superior View, thoracic vertebrae and rib
Skeleton of the Thoracic Wall

Ribs (pp. 120-122)
True ribs (1-7) – attach directly to the sternum
False ribs (8-10) – attach to the costal cartilages of superior ribs
Floating ribs (11-12) – no attachment to the sternum

Typical rib features
- head
- neck
- body
- superior facet
- inferior facet
- tubercle
- angle
- costal groove

Atypical ribs (1, 2, 11, 12)

Costal cartilages
Skeleton of the Thoracic Wall

**Sternum** (p. 122)
- Manubrium
- Body
- Xiphoid process
- Jugular notch
- Sternal angle (2nd rib articulates here)
- Sternal joints
  - Manubriosternal joint
  - Xiphisternal joint
Skeleton of the Thoracic Wall – Joints (pp. 123-125)

- Costovertebral joints
- Joints of the heads of the ribs
- Costotransverse joints
- Costochondral joints
- Interchondral joints
- Sternocostal joints

Anterior View of Thoracic Region
Breast
(pp. 115-116)

Female Breast (pp. 115-116)

Areola
Nipple
Suspensory ligaments
Lactiferous ducts
Mammary glands
Breast - Arterial supply

Anterior intercostal aa.
- Originate from internal thoracic a.

Lateral thoracic and thoracoacromial aa.
- Originate from axillary a.

Posterior intercostal aa.
- Originate from thoracic aorta

Breast - Venous drainage

Mainly to the axillary v.

Some drainage to the internal thoracic v.

Breast - Innervation

Intercostal nerves
The Lymphatic System (pp. 333-336)

Main Lymphatic Vessels

Cisterna chyli
- Located at approximately L1
- Drains into the thoracic duct

Thoracic Duct
- Drains into the left subclavian vein

Right Lymphatic duct
- Drains into the right subclavian vein
Lymphatic drainage of the breast (p. 116)

- Lateral quadrant of the breast drains mainly to the axillary lymph nodes
- Medial quadrant of the breast drains mainly to the parasternal lymph nodes

Clinical Correlate (p. 117)

Breast cancer and metastasis to lymph nodes
Muscles of the Thoracic Wall
(pp. 117-118)

Muscles of the Pectoral Region (pp. 117-118, table 3.1)

Pectoralis Major

Medial attachments

- Clavicular head – clavicle
- Sternocostal head – sternum, superior 6 costal cartilages, and aponeurosis of external oblique m.

Lateral attachments

- Intertubercular groove of humerus

Innervation

- Lateral and medial pectoral nerves

Main actions

- Adducts and medially rotates humerus
- Draws scapula anteriorly and inferiorly

Anterior region of the thorax, right
Muscles of the Pectoral Region (con’t)

**Pectoralis Minor**

Inferior attachments
- 3rd-5th ribs

Superior attachments
- Coracoid process of scapula

Innervation
- Medial pectoral nerve

Main actions
- Stabilizes scapula

**Subclavius**

Inferior attachments
- 1st rib and its costal cartilage

Superior attachments
- Middle third of clavicle

Innervation
- Nerve to the subclavius

Main actions
- Anchors and depresses the clavicle
**Serratus Anterior** (pp. 645-646 and table 7.4)

Medial attachments

- Lateral parts of 1st-8th ribs

Lateral attachments

- Medial border of scapula

Innervation

- Long thoracic nerve

Main actions

- Protracts and rotates scapula
**Intercostal Muscle Group** (pp. 127-129)

**External Intercostals**
- Inferior attachments
  - Superior border of inferior ribs
- Superior attachments
  - Inferior border of superior ribs
- Innervation
  - Intercostal nerves
- Main actions
  - Elevate ribs

**Internal Intercostals**
- Inferior attachments
  - Inferior border of rib
- Superior attachments
  - Superior border of ribs
- Innervation
  - Intercostal nerves
- Main actions
  - Depress ribs

**Innermost Intercostals**
- Inferior attachments
  - Inferior border of ribs
- Superior attachments
  - Superior border of ribs
- Innervation
  - Intercostal nerves
- Main actions
  - Elevate ribs

**Clinical Correlates:**
- Thoracocentesis
- Intercostal nerve block
Subcostal

Inferior attachments
- Superior borders of lower ribs

Superior attachments
- Internal surface of lower ribs

Innervation
- Intercostal nerves

Main actions
- Elevate ribs

Transversus Thoracis

Inferior attachments
- Internal surface of costal cartilage

Superior attachments
- Posterior surface of lower sternum

Innervation
- Intercostal nerves

Main actions
- Depress ribs

Rib cage and sternum - posterior view
**Scalene Muscles**

Medial attachments

- Transverse processes of C4-C6

Lateral attachments

- 1\(^{st}\) and 2\(^{nd}\) ribs

Innervation

- Ventral rami of cervical spinal nerves

Main actions

- Elevates first and second ribs
- Flexes neck laterally
Blood Supply and Innervation of the Thoracic Region
(pp. 129-133)

Arterial Supply

Internal thoracic arteries.
- Originate from subclavian arteries

Anterior intercostal arteries
- Originate from internal thoracic and musculophrenic arteries

Posterior intercostal arteries
- First two intercostal aa. originate from the superior intercostal a.
  - Branch of the costocervical trunk of the subclavian artery
  - Remaining posterior intercostals originated from thoracic aorta

Subcostal artery (feeds the 12th rib)
- Originates from the thoracic aorta

Venous Supply

Internal thoracic veins
- Drain into brachiocephalic veins

Anterior intercostal veins
- Drain into internal thoracic veins

Posterior intercostal veins
- First three posterior intercostals unite to form the superior intercostal vein
  - Superior intercostals drain into the brachiocephalic veins
  - Remaining posterior intercostals usually drain into the azygos venous system
Diaphragm

Attachments

- Xiphoid process
- Costal Margin
- Ribs XI and XII
- Ligaments
- Vertebrae of the lumbar region

Arterial Supply

- Superior phrenic arteries
- Inferior phrenic arteries

Venous Supply

- Parallels the arteries

Innervation

- Phrenic nerves
Thorax (Conceptual Overview)
(pp. 102-114)

Functions (p. 103)

Breathing

Protection of vital organs

Conduit

Component Parts (pp. 102-106)

Thoracic wall

Superior thoracic aperture

Inferior thoracic aperture

Diaphragm

Mediastinum

Pleural Cavities

Relationship to Other Regions (pp. 107-108)

Neck

Upper Limb

Abdomen

Breast
Thorax (Conceptual Overview, con’t)
(pp. 102-114)

Key Features (pp. 108-114)

Vertebral level

Venous shunts from left to right

Segmental neurovascular supply of thoracic wall

Sympathetic system

Flexible wall and inferior thoracic aperture

Innervation of the diaphragm
Dr. Weyrich

**G05: Airways, Lungs and Diaphragm**

**Reading:**
1. Gray’s Anatomy for Students, chapter 3

**Objectives:**
1. Surface anatomy of thoracic wall
2. Relationship of the pleurae and lungs
3. Anatomy of the lung

**Clinical Correlates:**
1. Pneumothorax
2. Bronchoscopy

**Surface Anatomy of the Thoracic Wall**
(pp. 200-208)

**Lines of the Thoracic Wall**
- Midsternal line
- Midclavicular line
- Anterior axillary line
- Midaxillary line (MAL)
- Posterior axillary line
- Mid-vertebral line
- Scapular line
- Jugular notch
- Sternal angle
- Infrasternal angle

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[Diagram of lines of the thoracic wall]

Trunk: Anterior
Trunk: Lateral, left arm abducted
Trunk: Posterior
Visceral pleura – invests the lungs

Parietal pleura – lines the pulmonary cavities
- Costal pleura
- Mediastinal pleura
- Diaphragmatic pleura
- Cervical pleura

Pleural cavity – Potential space between the layers of pleura

Pleural reflections – abrupt lines along which pleura changes directions

Pleural recesses – pleura-lined gutters (made by reflections)
- Costodiaphragmatic recesses
- Costomediastinal recesses

Clinical Correlate
Pneumothorax
Lungs
(pp. 140-144)

Lungs

General features

Apex

Base

Root – lung attaches to heart and trachea by these structures

Hilum – canal or opening for the structures that comprise the root

Difference between right and left lung

-Lobes – right lung has 3 lobes, left lung has 2 lobes

-Right lung is larger and heavier than left lung

Despite being larger and heavier, the right lung is shorter and wider than the left lung because of the right dome of the diaphragm is higher

Mediastinal surface of left lung has a huge cardiac impression

Left lung contains a lingula, a tongue-like projection that extends below the cardiac notch
Lobes and Fissures

Left Lung
- Superior lobe
- Inferior lobe
- Oblique fissure

Right lung
- Superior lobe
- Middle lobe
- Inferior lobe
- Oblique fissure
- Horizontal fissure
Surfaces of the Lung

Costal surface
Mediastinal surface
Diaphragmatic surface

Borders of the Lung

Anterior
Inferior
Posterior
Airways (pp. 145-146)

Main bronchi – right and left bronchus

-Right bronchus is wider, shorter and runs more vertically than left bronchus

-Left bronchus passes inferolaterally, inferior to arch of aorta

Lobar bronchi – also called secondary bronchi

Each lobar bronchi supplies a lobe of the lung (3 right, 2 left)

Segmental bronchi – also called tertiary bronchi

Supplies bronchopulmonary segments

Bronchopulmonary segments – structural unit of lung

- Terminal bronchioles
- Respiratory bronchioles
- Alveolus

CLINICAL CORRELATE

Bronchoscopy (p. 151)
Arterial Supply of the Lungs (p. 146)

Pulmonary arteries – carry poorly oxygenated blood to lungs for oxygenation
  - Give rise to lobar arteries
Bronchial arteries – supply blood for nutrition of structures that comprise the root of the lung
  - Left bronchial arteries – arise from thoracic aorta
  - Right bronchial artery – may have different origins

Venous Drainage of the Lungs (p.146)

Pulmonary veins – carry oxygenated blood from lungs to left atrium
  - Lobar veins drain into pulmonary veins
Bronchial veins – drain blood in lungs supplied by bronchial arteries although pulmonary vein tributaries drain some of bronchial arterial blood
  - Left bronchial vein drains into accessory hemiazygos vein (usually)
  - Right bronchial vein drains into azygos vein
**Lymphatic Drainage of the Lungs** (pp. 149-150)

Superficial (subpleural) lymphatic plexus
- Lies just deep to the visceral pleura and drains this area
- Drains into bronchopulmonary lymph nodes

Deep lymphatic plexus
- Largely drain structures that form the root of the lung
- Drain into pulmonary and bronchopulmonary lymph nodes

*Note - Lymph from the superficial and deep plexuses drains into superior and inferior tracheobronchial lymph nodes

**Innervation of the Lungs** (p. 149)

Lungs and viscera
- Parasympathetic – from Vagus nerve
- Sympathetic – from sympathetic fibers of sympathetic trunk

Parietal pleura – from intercostal and phrenic nerves
Reading: 1. Gray’s Anatomy for Students, chapter 3
2. Dissection Guide for Human Anatomy, Lab 6

Objectives: 1. Subdivisions of mediastinum
2. Anatomy of the heart
3. Circulation of the heart

Clinical Correlates: 1. Cardiac tamponade
2. Surface anatomy of the heart
3. Coronary artery disease and associated problems

Mediastinum (pp. 153-154)

Superior mediastinum
- Comprises area within the superior thoracic aperture and
  - Transverse thoracic plane
    - Transverse thoracic plane – arbitrary line from the sternal angle anteriorly to the IV disk or T4 and T5 posteriorly
  - Contains structures such as the thymus, great vessels related to the heart, trachea, etc. (reviewed thoroughly in lecture and lab #7)

Inferior mediastinum – area from transverse thoracic plane to diaphragm; It has 3 subdivisions:
- Anterior mediastinum
- Middle mediastinum – contains heart
- Posterior mediastinum
Pericardium
(pp. 154-155)

Parts

- Parietal pericardium:
  - Fibrous pericardium – external sac
  - Serous pericardium – internal sac
- Visceral pericardium – epicardium (outermost layer of wall of heart)
- Pericardial cavity – potential space between parietal and visceral layers

Heart in situ; Anterior View

Heart and Pericardium; longitudinal section
Vessels and Nerves

Arterial supply
- Pericardiophrenic artery – Branch of internal thoracic artery
- Pericardium also has smaller contributions from:
  - Musculophrenic – terminal branch of internal thoracic artery
  - Bronchial, esophageal, and superior phrenic – thoracic aorta branches
  - Coronary arteries (feed visceral pericardium only)

Venous drainage
- Pericardiophrenic veins – tributaries of brachiocephalic or internal thoracic veins
- Variable tributaries to azygos venous system

Innervation
- Mainly from the phrenic nerves

Clinical Correlate
Cardiac tamponade
The Heart
(pp. 157-181)

Walls
- Endocardium – internal layer of endothelium
- Myocardium – thick middle layer composed of cardiac muscle
- Epicardium – same as visceral layer of serous pericardium
- Fibrous skeleton – complex layer of dense collagen where muscle fibers attach

General Features
Base
Apex
Surfaces
- Sternocostal
- Diaphragmatic
- Pulmonary
Borders
- Right
- Inferior
- Left
- Superior
Chambers

Right atrium
- Sinus venarum
- Coronary sinus – small trunk receiving most of cardiac veins
- Musculi pectinati
- Right auricle
  - Sulcus terminalis – external groove that separates smooth and rough parts of atria
  - Crista terminalis – internal ridge
- Fossa ovalis – remnant of the oval foramen
Right ventricle

- Trabeculae carneae – irregular muscular elevations of the interior right ventricle
- Conus arteriosus – arterial cone that leads into the pulmonary trunk
- Right atrioventricular valve – also called the tricuspid valve
- Chordae tendinae – tendinous cords that attach to the anterior, posterior and septal cusps of tricuspid valve
- Papillary muscles – anterior, posterior, and septal
  - Conical projections that attach to the ventricle wall and tendinous cords arise from their apices
- Septomarginal trabecula – moderator band
  - Muscular bundle that runs from interventricular septum to the base of the anterior papillary muscle
  - Important because it carries part of the right bundle branch of AV node
- Pulmonary valve – 3 semilunar cusps (anterior, right, and left)
Left atrium

- Pulmonary veins (4) – enter its posterior wall

Left ventricle – thick wall

- Mitral valve – 2 cusps
- Aortic Valve – 3 cusps
  - mouth of right coronary artery is in the right aortic sinus
  - mouth of left coronary artery is in the left aortic sinus
  - no artery arises from the posterior aortic sinus
Clinical Correlate (pp. 200-205)

Surface anatomy of the heart

- Aortic area: Right upper sternal border (2nd intercostal space)
- Pulmonary area: Left upper sternal border
  - Secondary pulmonic area: 2nd and 3rd Left intercostal space
- Tricuspid area: 4th Left intercostal space (left sternal border)
- Mitral area: 5th Left intercostal space (near apex of heart)
**Arterial Supply to the Heart**

Right coronary artery – arises from right aortic sinus

SA nodal artery – supplies SA node

- NOTE: the SA nodal artery can also arise from the LCA (~40%)

Right marginal branch – supplies the right border of the heart

AV nodal artery – supplies AV node

Posterior interventricular branch – supplies both ventricles and IV septum

Left coronary artery – arises from left aortic sinus

Anterior interventricular branch – also called LAD

Circumflex branch

- Left marginal artery

**Clinical Correlate** (pp. 174-175)

Coronary atherosclerosis
Venous Drainage of the Heart

Coronary sinus – most veins empty into coronary sinus
Great cardiac vein - main tributary of the coronary sinus
Middle cardiac vein – also called posterior interventricular vein
Small cardiac vein – runs close to right marginal artery
Anterior veins – begin at anterior surface of right ventricle; cross over the coronary groove and directly drain into right atrium
Conduction System of the Heart

- SA node: pacemaker of the heart
- AV node: distributes signal from SA node to ventricles through AV bundle
  - Right and left bundles
    - Purkinje fibers: extends signal into walls of ventricle
### Arterial Supply of the Heart

<table>
<thead>
<tr>
<th>Artery/Branch</th>
<th>Origin</th>
<th>Course</th>
<th>Distribution</th>
<th>Anastomoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Coronary</td>
<td>Right aortic sinus</td>
<td>Follows atrioventricular groove</td>
<td>Right atrium; SA and AV nodes; posterior part of IV septum</td>
<td>Circumflex and anterior IV of left coronary artery</td>
</tr>
<tr>
<td>Right Marginal</td>
<td>Right coronary artery near its origin (60%)</td>
<td>Ascends to SA node</td>
<td>Pulmonary trunk and SA node</td>
<td></td>
</tr>
<tr>
<td>Posterior IV</td>
<td>Right coronary artery</td>
<td>Passes to inferior margin of heart and apex</td>
<td>Right ventricle and apex of heart</td>
<td>IV branches</td>
</tr>
<tr>
<td>Right Coronary</td>
<td>Right coronary artery</td>
<td>Runs from posterior IV groove to apex of heart</td>
<td>Right and left ventricles and IV septum</td>
<td>Circumflex and anterior IV branches of left coronary artery</td>
</tr>
<tr>
<td>Left Coronary</td>
<td>Left aortic sinus</td>
<td>Runs in groove and gives off anterior interventricular and circumflex branches</td>
<td>Most of left atrium and ventricle; IV septum; AV bundles; AV node</td>
<td>Right coronary artery</td>
</tr>
<tr>
<td>Anterior Interventricular</td>
<td>Left coronary artery</td>
<td>Passes along anterior IV groove to apex of heart</td>
<td>Right and left ventricles and IV septum</td>
<td>Posterior IV branch of right coronary artery</td>
</tr>
<tr>
<td>Circumflex</td>
<td>Left coronary artery</td>
<td>Passes to left in AV groove and runs posterior surface of heart</td>
<td>Left atrium and left ventricle</td>
<td>Right coronary artery</td>
</tr>
<tr>
<td>SA Nodal</td>
<td>Circumflex branch (40%)</td>
<td>Ascends on posterior surface of left atrium to SA node</td>
<td>Left atrium and SA node</td>
<td></td>
</tr>
<tr>
<td>Left Marginal</td>
<td>Circumflex branch</td>
<td>Follows left border of the heart</td>
<td>Left ventricle</td>
<td>IV branches</td>
</tr>
</tbody>
</table>

*IV=interventricular; AV=atrioventricular*
Dr. Weyrich

G07: Superior and Posterior Mediastina

Reading: 1. Gray's Anatomy for Students, chapter 3  
2. Dissection Guide for Human Anatomy, Lab 7

Objectives: 1. Subdivisions of mediastinum  
2. Structures in Superior mediastinum  
3. Structures in Posterior mediastinum

Clinical Correlate: 1. Aortic aneurysms

Superior Mediastinum  
(pp.181-199)
Review of the Subdivisions of the Mediastinum

Superior mediastinum
Comprises area within superior thoracic aperture and transverse thoracic plane
-Transverse thoracic plane – arbitrary line from the sternal angle anteriorly to the IV disk or T4 and T5 posteriorly

Inferior mediastinum
Extends from transverse thoracic plane to diaphragm; 3 subdivisions

Anterior mediastinum – smallest subdivision of mediastinum
-Lies between the body of sternum and transversus thoracis muscles anteriorly and the pericardium posteriorly
-Continuous with superior mediastinum at the sternal angle and limited inferiorly by the diaphragm
-Consists of sternopericardial ligaments, fat, lymphatic vessels, and branches of internal thoracic vessels. Contains inferior part of thymus in children

Middle mediastinum – contains heart

Posterior mediastinum

**Superior Mediastinum**

**Thymus** – lies posterior to manubrium and extends into the anterior mediastinum
-Important in development of immune system through puberty
-Replaced by adipose tissue in adult

Arterial blood supply
-Anterior intercostals and mediastinal branches of internal thoracic artery

Venous blood supply
-Veins drain into left brachiocephalic, internal thoracic, and thymic veins
**Brachiocephalic Veins** - Formed by the juncture of respective internal jugular and subclavian veins

Right brachiocephalic vein

- Receives lymph from right lymphatic duct

Left brachiocephalic vein

- Over twice as long as the right brachiocephalic vein
- Receives lymph from the thoracic duct

**Left Superior Intercostal Vein**

**Superior Vena Cava (SVC)**

Returns blood from all structures superior to diaphragm except the heart and lungs

- Drains into right atrium
- Runs in the right side of the superior mediastinum
- Right phrenic nerve lies between the SVC and mediastinal pleura
Arch of the Aorta (table 1.6, p. 145)

Ligamentum arteriosum – remnant of fetal ductus arteriosus
- Extends from root of left pulmonary artery to inferior surface of arch of aorta
- Left recurrent laryngeal hooks beneath arch of aorta, adjacent to ligamentum arteriosum

Brachiocephalic trunk – first branch of aorta
- Divides into right common carotid and right subclavian arteries

Left common carotid artery – 2nd branch of the arch
Left subclavian artery – 3rd branch of the arch

Clinical Correlate (p. 147)

Aortic arch aneurysms
**Nerves** (pp. 188-191)

Vagus nerves – arise from medulla of the brain, exit the cranium, and descend through the neck posterolateral to the common carotid arteries

- Right vagus nerve – enters thorax anterior to right subclavian artery
- Right recurrent laryngeal nerve – arises from right vagus and hooks around the right subclavian artery and ascends to larynx
- Contributes to pulmonary, esophageal, and cardiac plexuses
- Left vagus nerve – enters mediastinum between left common carotid and left subclavian arteries
- Left recurrent laryngeal nerve – arises from left vagus and ascends to larynx

Phrenic nerves – supply the diaphragm
- Right phrenic nerve
- Left phrenic nerve

Trachea

Esophagus

**Thoracic contents; anterior view**
Thoracic aorta

- Bronchial branches – supply trachea, bronchi and lymph nodes
- Pericardial branches – supply pericardium
- Posterior intercostal branches
- Superior phrenic branches
- Esophageal branches
- Subcostal branches
Esophagus

Thoracic duct - largest lymphatic channel in the body; empties into the venous system near the union of the left internal jugular and subclavian veins

Cisterna chyli – origination of thoracic duct

Azygos system of veins – drains back and thoracoabdominal walls

Azygos (i.e., paired) vein – forms collateral pathway between the SVC and IVC

- Receives the posterior intercostal, mediastinal, esophageal, and bronchial veins. Also receives vertebral venous plexuses

Hemiazygos vein – ascends on the left side of the vertebral column; crosses to the right side (~ T9 vertebra) and joins azygos vein

- Receives the inferior three posterior intercostal, inferior esophageal, and some mediastinal veins

Accessory hemiazygos vein – passes on the left side of the vertebral column through the medial end of 4th-5th intercostal space to T7-T8 where it crosses to the right side and joins the azygos vein

- NOTE – The azygos system exhibits tremendous variation from person to person
Azygos system of veins and thoracic duct
Nerves

Thoracic sympathetic trunks

Lower thoracic splanchnic nerves

-Greater (arises from sympathetic trunk at T5-T9)
  -Conveys preganglionic sympathetic fibers to the celiac ganglia

-Lesser (arises from sympathetic trunk at T10-T11)
  -Conveys preganglionic sympathetic fibers to the superior mesenteric ganglia

-Least (arises from sympathetic trunk at T12)
  -Conveys preganglionic sympathetic fibers to the aorticorenal ganglia
<table>
<thead>
<tr>
<th>Nerve</th>
<th>Origin</th>
<th>Course</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vagus (CN X)</td>
<td>8 to 10 rootlets from medulla of brainstem</td>
<td>Enters superior mediastinum posterior to sternoclavicular joint and brachiocephalic vein; gives rise to recurrent laryngeal nerve; continues to abdomen</td>
<td>Pulmonary plexus; esophageal plexus; cardiac plexus</td>
</tr>
<tr>
<td>Phrenic</td>
<td>Ventral rami of C3-C5 nerves</td>
<td>Passes through superior thoracic aperture and runs between mediastinal pleura and pericardium</td>
<td>Central portion of the diaphragm</td>
</tr>
<tr>
<td>Intercostals</td>
<td>Ventral rami of T1 to T11 nerves</td>
<td>Run in intercostal spaces between internal and innermost layers of intercostal muscles</td>
<td>Muscles and skin over intercostal space; lower nerves supply muscles and skin of anterolateral abdominal wall</td>
</tr>
<tr>
<td>Subcostal</td>
<td>Ventral ramus of T12 nerve</td>
<td>Follows inferior border of 12th rib and passes into abdominal wall</td>
<td>Abdominal wall and skin of gluteal region</td>
</tr>
<tr>
<td>Recurrent laryngeal</td>
<td>Vagus nerve</td>
<td>Loops around subclavian on right; on left runs around arch or aorta and ascends in tracheoesophageal groove</td>
<td>Intrinsic muscles of larynx (except cricothyroid)</td>
</tr>
<tr>
<td>Cardiac Plexus</td>
<td>Cervical and cardiac branches of vagus nerve and sympathetic trunk</td>
<td>From arch of aorta and posterior surface of heart; fibers extend along coronary arteries and to SA node</td>
<td>Impulses pass to SA node</td>
</tr>
<tr>
<td>Pulmonary Plexus</td>
<td>Vagus nerve and sympathetic trunk</td>
<td>Forms on root of lung and extends along bronchial subdivisions</td>
<td>Bronchial subdivisions</td>
</tr>
<tr>
<td>Esophageal Plexus</td>
<td>Vagus nerve; sympathetic trunk; greater splanchnic nerve</td>
<td>Distal to tracheal bifurcation, the vagus and sympathetic nerves form a plexus around the esophagus</td>
<td>Vagal and sympathetic fibers to smooth muscle and glands of inferior two-thirds of esophagus</td>
</tr>
</tbody>
</table>
### Aorta and Branches in the Thorax

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<th>Artery</th>
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<th>Branches</th>
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<tr>
<td>Ascending aorta</td>
<td>Aortic orifice of left ventricle</td>
<td>Ascends approximately 5 cm to sternal angle where it becomes arch of aorta</td>
<td>Right and left coronary arteries</td>
</tr>
<tr>
<td>Arch of aorta</td>
<td>Continuation of ascending aorta</td>
<td>Arches posteriorly on left side of trachea and esophagus and superior to left main bronchus</td>
<td>Brachiocephalic; left common carotid; left subclavian</td>
</tr>
<tr>
<td>Thoracic aorta</td>
<td>Continuation of arch of aorta</td>
<td>Descends in posterior mediastinum to left of vertebral column; gradually shifts to right to lie in median plane at aortic hiatus</td>
<td>Posterior intercostal; bronchial; esophageal; pericardial; superior phrenic; subcostal arteries</td>
</tr>
<tr>
<td>Posterior intercostal</td>
<td>Posterior aspect of thoracic aorta</td>
<td>Pass laterally, and then anteriorly parallel to ribs</td>
<td>Lateral and anterior cutaneous branches</td>
</tr>
<tr>
<td>Bronchial</td>
<td>Anterior aspect of aorta or posterior intercostal artery</td>
<td>Run with tracheobronchial tree</td>
<td>Bronchial and peribronchial tissue; visceral pleura</td>
</tr>
<tr>
<td>Esophageal</td>
<td>Anterior aspect of thoracic aorta</td>
<td>Run anterior to esophagus</td>
<td>To esophagus</td>
</tr>
<tr>
<td>Pericardial</td>
<td>Anterior aspect of thoracic aorta</td>
<td>Send twigs to pericardium</td>
<td>To pericardium</td>
</tr>
<tr>
<td>Superior Phrenic</td>
<td>Anterior aspects of thoracic aorta</td>
<td>Arise at aortic hiatus and pass to superior aspect of diaphragm</td>
<td>To diaphragm</td>
</tr>
<tr>
<td>Subcostal</td>
<td>Posterior aspects of thoracic aorta</td>
<td>In series with posterior intercostal arteries just inferior to the 12th rib</td>
<td>Lateral and anterior cutaneous branches</td>
</tr>
</tbody>
</table>