Dr. Weyrich

**G06: Heart and Middle Mediastinum**

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

**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

![Mediastinal Diagram](image-url)
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
**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><strong>Right Coronary</strong></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>SA Nodal</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><strong>Right Marginal</strong></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>Posterior IV</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>AV Nodal</td>
<td>Right coronary artery near origin of posterior IV</td>
<td>Passes to AV node</td>
<td>AV node</td>
<td></td>
</tr>
<tr>
<td><strong>Left Coronary</strong></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><strong>Circumflex</strong></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*