THE HEART
The Heart

- 12 cm long
- 9 cm wide
- 6 cm thick
- Weighs between 250 and 300 gram
- Located in the middle mediastinum
Mediastinum

- The central compartment of the thoracic cavity

- Contains the heart, the great vessels, trachea, esophagus, thymus, thoracic duct, phrenic nerve, cardiac nerves, lymph nodes

- Extends from the sternum to the vertebra column, the first rib to the diaphragm, and between the lungs
Mediastinum

Inlet of Thorax

Superior Mediastinum

Anterior Mediastinum

Pericardium

Middle Mediastinum

Posterior Mediastinum
Pericardium

- A membrane that surrounds the heart and the root of the great vessels
- Has 2 components
  - **Fibrous:** Tough connective tissue, forms the outer layer
  - **Serous:** Thin and contains two parts
    - **Parietal layer:** Lines the inner surface of fibrous
    - **Visceral layer (epicardium):** Adheres to the heart and forms its most intimate covering
1. Fibrous Pericardium

2. Serous Pericardium
   - a. visceral pericardium (epicardium)
   - b. parietal pericardium
Pericardium

• The parietal and visceral layers of the pericardium are continuous at the root of the great vessels

Pericardial cavity

• A narrow space between the visceral and parietal layers of the serous pericardium
• Contains a thin film of lubricating fluid
• Collection of excess fluid in the pericardial cavity is known as pericardial effusion
PERICARDIAL EFFUSION

Massive Cardiomegaly

Blood or excess fluid in pericardial cavity between visceral and parietal layers
Fibrous pericardium

Parietal pericardium

Visceral pericardium (epicardium)

Serous pericardium

Pericardial cavity

Endocardium, myocardium and pericardium form the three layers of heart wall.
Surfaces of the heart

The heart consists of:

- An Apex
- A Base or Posterior surface
- Sternocostal or Anterior surface
- Left pulmonary surface
- Right pulmonary surface
- Diaphragmatic or Inferior surface
Surfaces of the heart

**Anterior surface:** Formed *mainly by the right ventricle*, some portions of the right atrium and left ventricle

**Inferior surface:** Formed by both ventricles, *mainly the left*

**Base:** Formed *mainly by the left atrium*
  - Located at the level of the 2\textsuperscript{nd} ICS

**Left pulmonary surface:** Faces the left lung
  - *Formed mainly by the LV*, and a portion of the left atrium

**Right pulmonary surface:** Faces the right lung
  - Consist of the right atrium

**Apex:** Formed by the tip of the LV
  - Located in the 5\textsuperscript{th} LICS in the MCL
Surfaces of the heart

- Base
- Left Pulmonary Artery
- Left Atrium
- Left Pulmonary Veins
- Sternocostal Surface
- Pulmonary Surface
- Diaphragmatic Surface
Borders (margins) of the heart

Right border: Right atrium

Left border: Left ventricle and Left auricle

Inferior border: Right ventricle and slightly left ventricle

Superior border: Both atria
Borders of the heart

- Appendage of Right Atrium
- Right Atrium (Right Border)
- Appendage of Left Atrium
- Left Ventricle (Left Border)
- Right Ventricle (Inferior Border)
- Apex
Heart chambers

2 atria
- Right atrium
- Left atrium

2 ventricles
- Right ventricle
- Left ventricle
Right atrium

- fossa ovale
- pectinate muscle
- tricuspid valve
- SVC
- IVC
Right ventricle

- R. auricle
- Tricuspid valve
- Trabeculae carneae
- 3 papillary muscles
Left ventricle & atrium

- L. auricle
- Aortic semilunar valve
- Fossa ovale from L. side
Heart (sagittal section)

Observe

- Texture of the walls
- Thickness of the chambers
- Type of valve
- Papillary muscle
- Chordae tendinae
Heart Valves

Semilunar Valves
• Have 3 cusps shaped like half-moons
• Aortic & Pulmonary valve
• Unlike the AV valves, are not attached to the chordae tendinae

Atrioventricular Valves
• Located between the atrium & ventricle
• Tricuspid & Mitral valve
Ventricular Contraction: Systole

- Pulmonary semilunar valve
- Aortic semilunar valve
- Bicuspid (mitral)
- Tricuspid
- Posterior
Ventricular Relaxation: Diastole
Heart valves & their anatomical position

• Atrioventricular valves
  – Tricuspid: behind the sternum next to right 4th intercostal space
  – Mitral (Bicuspid): inferior to aortic valve next to 4th left costal cartilage

• Semilunar valves
  – Aortic: inferior to pulmonary valve, next to 3rd left intercostal space
  – Pulmonary: at the junction of 3rd left costal cartilage and sternum
Auscultation sites of the heart valves
Compare & contrast the position of the heart valves with their auscultation sites.
Arterial supply of the heart

• The heart is supplied by two coronary arteries

• Two coronary arteries, right and left arise from the aortic sinuses in the initial portion of the ascending aorta and supply oxygenated blood to the muscle and other tissues of the heart
Arterial supply of the heart

- Left coronary artery:
  divides into two branches: the circumflex artery and the left anterior descending artery.

- Right coronary artery (RCA):
  supplies blood to the right atrium, right ventricle, bottom portion of the left ventricle and back of the septum.

- Circumflex artery:
  supplies blood to the left atrium and the side and back of the left ventricle.

- Left anterior descending artery (LAD):
  supplies blood to the front and bottom of the left ventricle and the front of the septum.

- Coronary veins (in blue):
  take oxygen-poor ("deoxygenated") blood that has already been "used" by muscles of the heart and return it to the right atrium.
Right coronary artery

• Supplies:
  – Right atrium & right ventricle
  – Sino-atrial & atrioventricular nodes
  – Interatrial septum
  – A portion of the left atrium
  – The posteroinferior one-third of the interventricular septum
  – A portion of the posterior part of the left ventricle
Coronary arteries

- Right coronary a
- Left coronary a
- Circumflex a
- Anterior interventricular a
- Right marginal branch
Left coronary artery

Supplies:

- Most of the left atrium & left ventricle
- Anterior two-thirds of the interventricular septum
- The atrioventricular bundle and its branches
Cardiac blood supply
Coronary artery disease
Coronary artery disease

(a) Normal artery

(b) Obstructed artery

Partially obstructed lumen (space through which blood flows)
Atherosclerotic plaque

Figure 20.21  Tortora - PAP 12/e
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Venous drainage of the heart

**Cardiac veins:** Remove deoxygenated blood from the heart

**Coronary Sinus:** Largest vein of heart *(drains to right atrium)*

Accept blood from 3 sources

- great cardiac v
- middle cardiac v
- small cardiac v
  - NOT from
- anterior cardiac v *(drains directly to right atrium)*
Nerve supply of the heart

**Sympathetics**
- Off chain T1-4
- Postganglionic

**Parasympathetics**
- Vagus CN X
- Preganglionic

Form cardiopulmonary nerve plexus

- **Sympathetics** increase heart rate, dilate cardiac vessels.
- **Parasympathetics** decrease heart rate, constrict cardiac vessels.
Conducting system of the heart

- Consist of specialized cardiac muscle fibers
- Coordinate the contraction of the heart chambers
- Gives the heart its automatic rhythmic beat
Conducting system of the heart

- Consist of the following components
  - Sinoatrial node
  - Atrioventricular node
  - Atrioventricular bundle of His
  - Right and left bundle branches
  - Purkinje fibers
- Initiate the normal heart beat