Unit 3: Blood and Heart Cheat Sheet

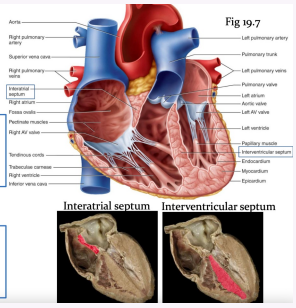
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General

Plasma	matrix of blood, clear light yellow fluid 55%
Buffy Coat	made of leukocytes and platelets <1%
Erythrocytes	RBC's, 45%
Hematocrit	percentage of blood volume composed of RBC's
Hemoglobin	protein in RBC that carries oxygen, 4 protein chains (globins) that bind co2 and 4 heme groups that bind o2 to iron
Hemostasis	the cessation of bleeding, stopping fatal leaks
Hemorrhage	excessive bleeding

Interior of the Heart

The Chambers



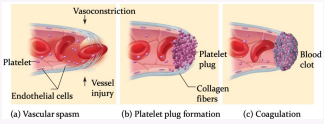
Interatrial septum

- Wall that separates atria

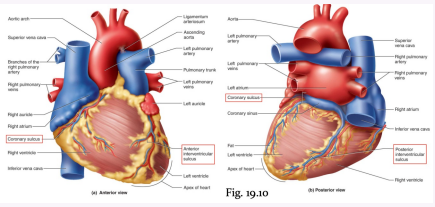
Interventricular septum

- Muscular wall that separates ventricles

Platelets and Hemostasis



Exterior of the Heart

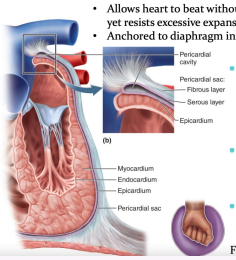


Walls of the Heart

The Pericardium

= Double-walled sac that encloses the heart

- Allows heart to beat without friction, provides room to expand, yet resists excessive expansion
- Anchored to diaphragm inferiorly and sternum anteriorly



- Outer **Parietal** pericardium
  - Pericardial sac
  - Superficial fibrous layer of connective tissue
  - Deep, thin serous layer
- Inner **Visceral** pericardium (epicardium)
  - Serous membrane covering heart
- Pericardial cavity
  - space inside the pericardial sac filled with pericardial fluid

Fig. 19.3

Left Arterial Supply

Left coronary artery (LCA) branches off the ascending aorta

1. **Anterior interventricular branch**
   - Supplies blood to both ventricles and anterior 2/3 of interventricular septum
2. **Circumflex branch**
   - Supplies left atrium and posterior left ventricle
   - Passes around left side of heart in coronary sulcus
   - Gives off left marginal branch and then ends on the posterior side of the heart

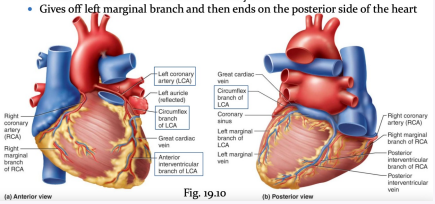
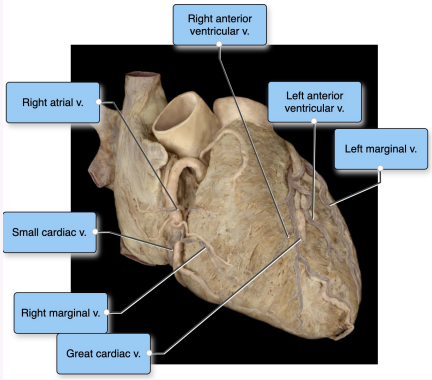


Fig. 19.10

Cardiac Veins



Erythrocytes

Erythrocytes (Red Blood Cells)

- Functions
  1. Carry oxygen from lungs → cell tissues
  2. Pick up CO_2 from tissues → lungs
- Disc-shaped (**biconcave**) cell with thick rim
  - Lose nearly all organelles during development
    - Lack mitochondria
      - Anaerobic fermentation to produce ATP
    - **Lack nucleus** and DNA
      - No protein synthesis or mitosis
    - ↑ surface area/volume ratio

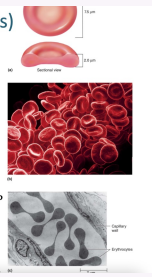


Fig. 18.4

Erythrocyte Disorders



Erythrocyte Disorders:

- **Anemia:**
  - Deficiency in RBCs or Hb
- **Polycythemia**:
  - Excess RBCs

Fig. 18.10

Electrical Conductivity

The Cardiac Conduction System

- Coordinates the heartbeat
- Internal pacemaker – **sinoatrial (SA) node**

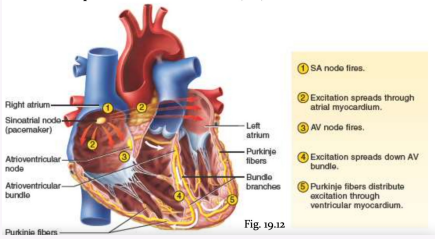
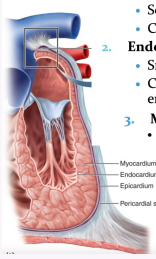


Fig. 19.12

Layers of the Heart (Epi, Endo, Myo)

Layers of The Heart Wall

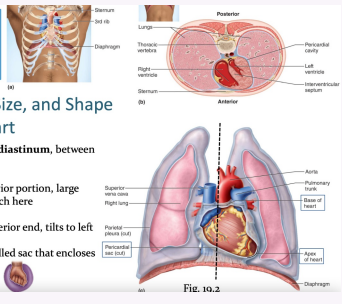


1. **Epicardium** (visceral pericardium – outer lining)
   - Serous membrane covering heart
   - Coronary blood vessels travel through this layer
2. **Endocardium** (inner lining)
   - Smooth inner lining of heart and blood vessels
   - Covers the valve surfaces and is continuous with endothelium of blood vessels
3. **Myocardium**
   - Middle layer of cardiac muscle
     - proportional to work load
     - Thickest layer

The myocardium in the left ventricle is thicker than the right ventricle. Why?

Position, Size, and Shape of Heart

Does most of the heart lie to the right or left of the median plane?



Position, Size, and Shape of the Heart

- Located in **mediastinum**, between lungs
- **Base**
  - wide, superior portion, large vessels attach here
- **Apex**
  - tapered inferior end, tilts to left
- **Pericardium:**
  - Double-walled sac that encloses the heart

Fig. 19.2

By **vweiss**

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Right Arterial Supply

- **Right coronary artery** (RCA) branches off the ascending aorta
  - Supplies right atrium and sinoatrial node (pacemaker)
1. **Right marginal branch**
   - Supplies lateral aspect of right atrium and ventricle
2. **Posterior interventricular branch**
   - Supplies posterior walls of ventricles

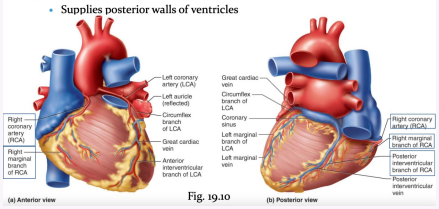


Fig. 19.10

WBC Disorders

White Blood Cells

White Blood Cell Disorders:

- **Leukopenia**:
  - low white blood cell count (<5000/ul)
    - Lead, arsenic, mercury poisoning
    - Radiation sickness
    - Infectious diseases (i.e. AIDS)
- **Leukocytosis**:
  - high white blood cell count (>10000/ul)
    - Infection, allergy
- **Complete Blood Count** (CBC):
  - # RBCs, # WBCs, platelets and relative #s of WBCs
  - Hematocrit, Hb content, RBC size
- Leukemia:
  - Cancer of hemopoietic tissues → abnormally high number of circulating leukocytes

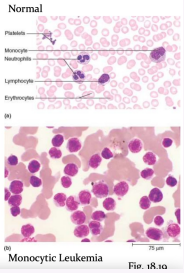


Fig. 18.10

Leukocytes WBC

Leukocytes (White Blood Cells)

- Least abundant formed elements
- Conspicuous nuclei
  - violet to dark purple in blood stains
- Retain their organelles
- More abundant in connective tissues

1. Granulocytes
2. Agranulocytes

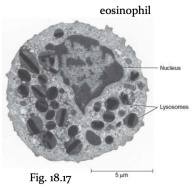
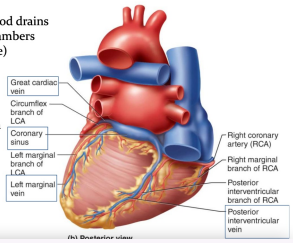


Fig. 18.17

Venous Heart Drainage

Heart Venous Drainage: Route by which blood leaves the heart

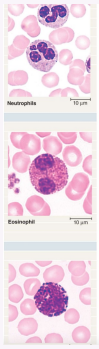
- 5-10% of coronary blood drains directly into heart chambers (mostly right ventricle)
- Most coronary blood returns to right atrium by way of the **coronary sinus** which has three main inputs:
  1. **great cardiac vein**
  2. **posterior interventricular** (middle cardiac) **vein**
  3. **left marginal vein**



Granulocytes

- Contain **specific granules** that stain conspicuously and distinguish cell types

1. **Neutrophils** (60-70%):
   - Polymorphonuclear leukocytes
   - Barely visible granules in cytoplasm
   - 3-5-lobed nucleus
2. **Eosinophils** (2-4%):
   - Large rosy-orange granules (eosin)
   - bilobed nucleus
3. **Basophils** (<1%):
   - Large, abundant, violet granules (methylene blue) (obscure a large S-shaped nucleus)



Blood Flow through the Heart

Blood Flow Through the Chambers

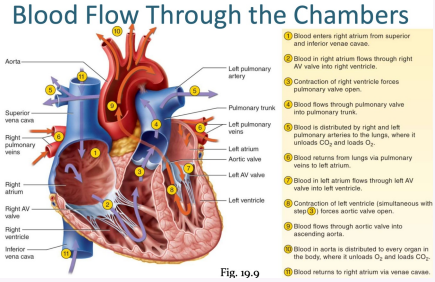


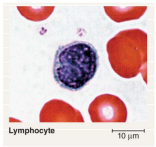
Fig. 19.9

Aganulocytes

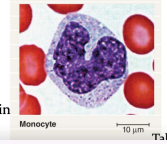
Agranulocytes

Do not contain **specific granules**

1. **Lymphocytes**
   - 25-33%
   - Variable bluish cytoplasm
   - Ovoid/round
   - Uniform dark violet nucleus



2. **Monocytes**
   - 3-8%
   - Usually largest WBC
   - Ovoid
   - Kidney-, or horseshoe-shaped nucleus
   - Differentiate into **macrophages** in tissue



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