

# **Anatomy of Systemic Vessels**



**Al-Farabi Kazakh  
National  
University  
Higher School of  
Medicine**



# LEARNING OUTCOMES

**As a result of the lesson you will be able to:**

- ❑ *Identify the principal systemic arteries and veins of the axial region;*
- ❑ *Trace the flow of blood from the heart to any major organ of the axial region and back to the heart.*
- ❑ *Trace the route of blood through the pulmonary circuit.trace the route of blood through the pulmonary circuit;*
- ❑ *Identify the principal systemic arteries and veins of the limbs;*
- ❑ *Trace the flow of blood from the heart to any region of the upper or lower limb and back to the heart;*

# Special Circulatory Routes Skeletal Muscle

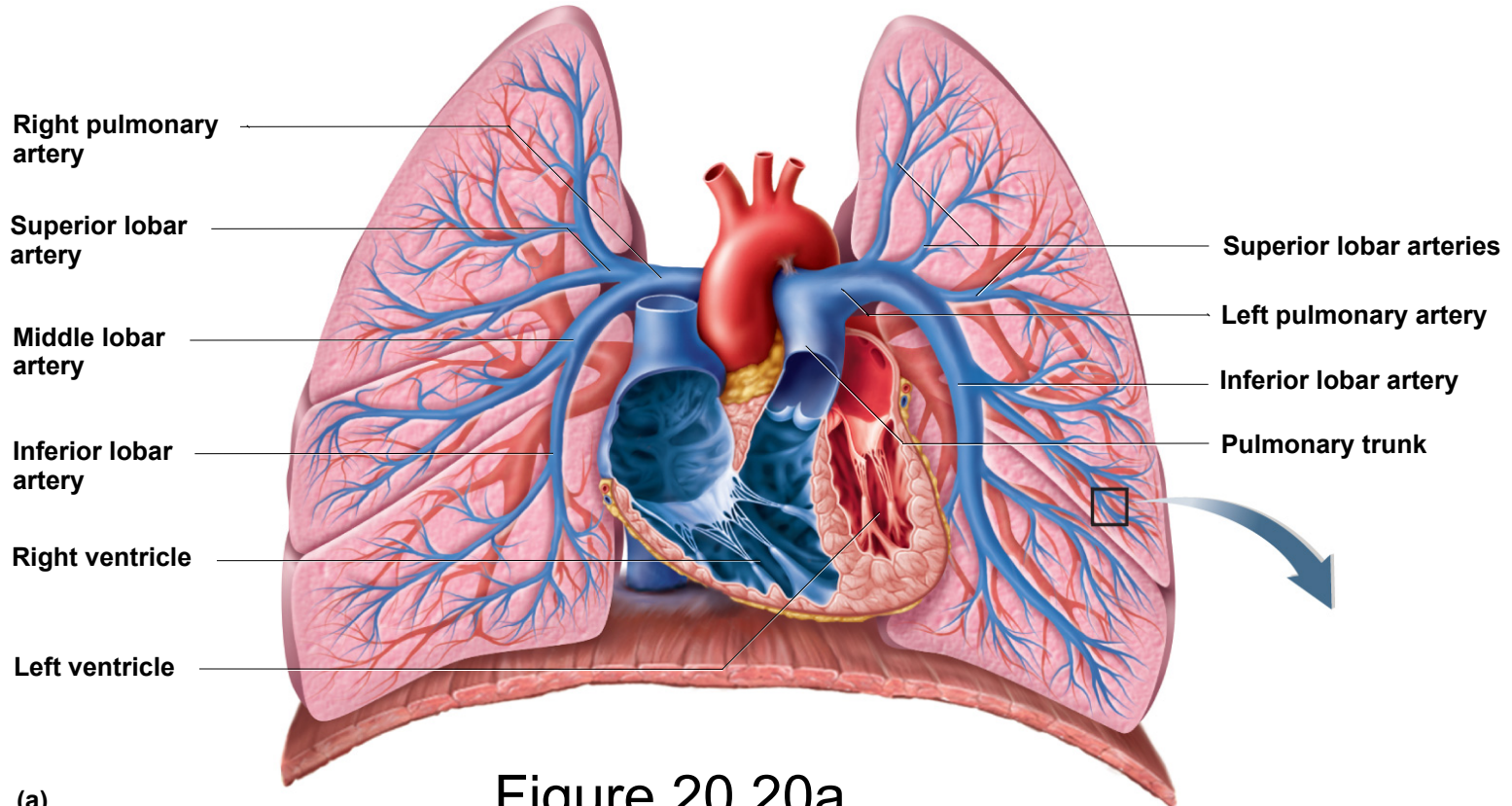
- highly variable flow depending on **state of exertion**
- **at rest:**
  - arterioles constrict
  - most capillary beds shut down
  - total flow about 1L/min
- **during exercise:**
  - arterioles dilate in response to epinephrine and sympathetic nerves
  - precapillary sphincters dilate due to muscle metabolites like lactic acid, CO<sub>2</sub>
  - blood flow can increase 20 fold
- **muscular contraction impedes flow**
  - isometric contraction causes fatigue faster than intermittent isotonic contractions

# Special Circulatory Routes Lungs

- low pulmonary blood pressure (25/10 mm Hg)
  - flow slower, more time for gas exchange
  - engaged in capillary fluid absorption
    - oncotic pressure overrides hydrostatic pressure
    - prevents fluid accumulation in alveolar walls and lumens
- unique response to hypoxia
  - pulmonary arteries constrict in diseased area
  - redirects flow to better ventilated region

# Pulmonary Circulation

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



(a)

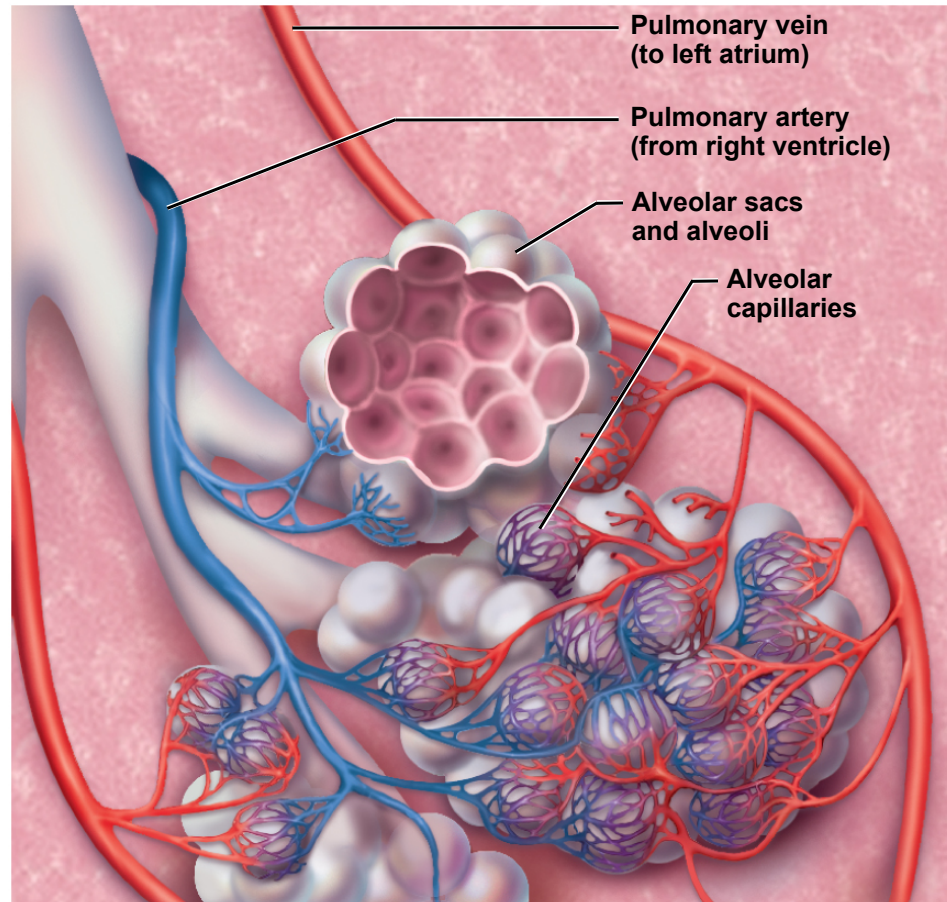
Figure 20.20a

- pulmonary trunk to pulmonary arteries to lungs
  - lobar branches for each lobe (3 right, 2 left)
- pulmonary veins return to left atrium
  - increased  $O_2$  and reduced  $CO_2$  levels

# Pulmonary Capillaries Near Alveoli

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

- basketlike capillary beds surround alveoli
- exchange of gases with air and blood at alveoli



(b)

Figure 20.20b

# Major Systemic Arteries

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

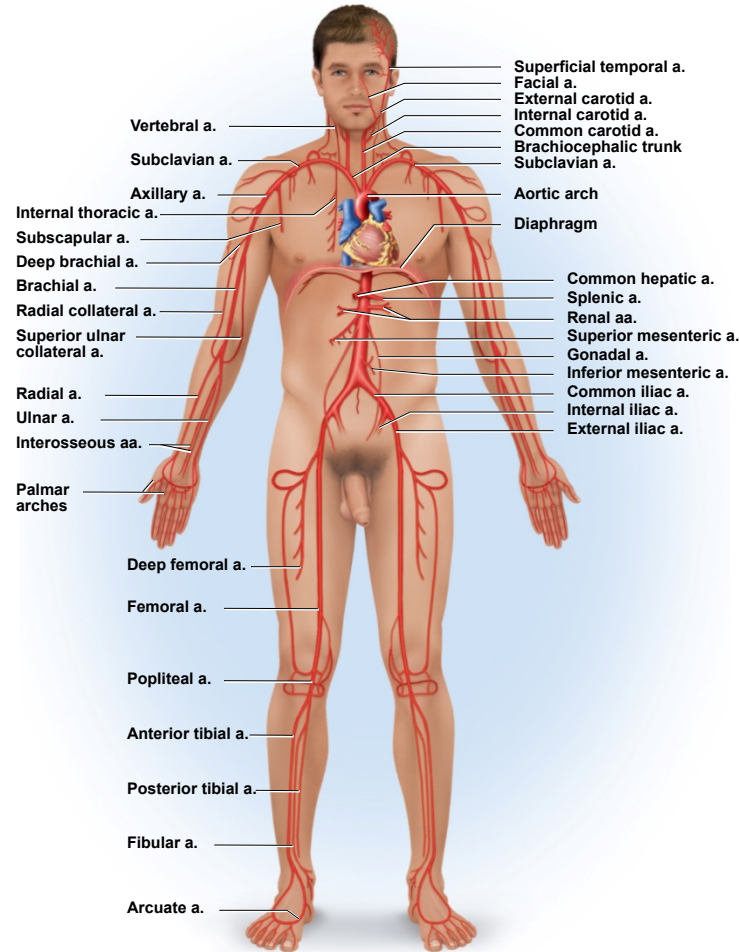


Figure 20.21

- supplies oxygen and nutrients to all organs

# Major Branches of Aorta

- **ascending aorta**
  - right and left **coronary arteries** supply heart
- **aortic arch**
  - **brachiocephalic**
    - right common carotid supplying right side of head
    - right subclavian supplying right shoulder and upper limb
  - **left common carotid** supplying left side of head
  - **left subclavian** supplying shoulder and upper limb
- **descending aorta**
  - **thoracic aorta** above diaphragm
  - **abdominal aorta** below diaphragm



# Major Branches of the Aorta

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

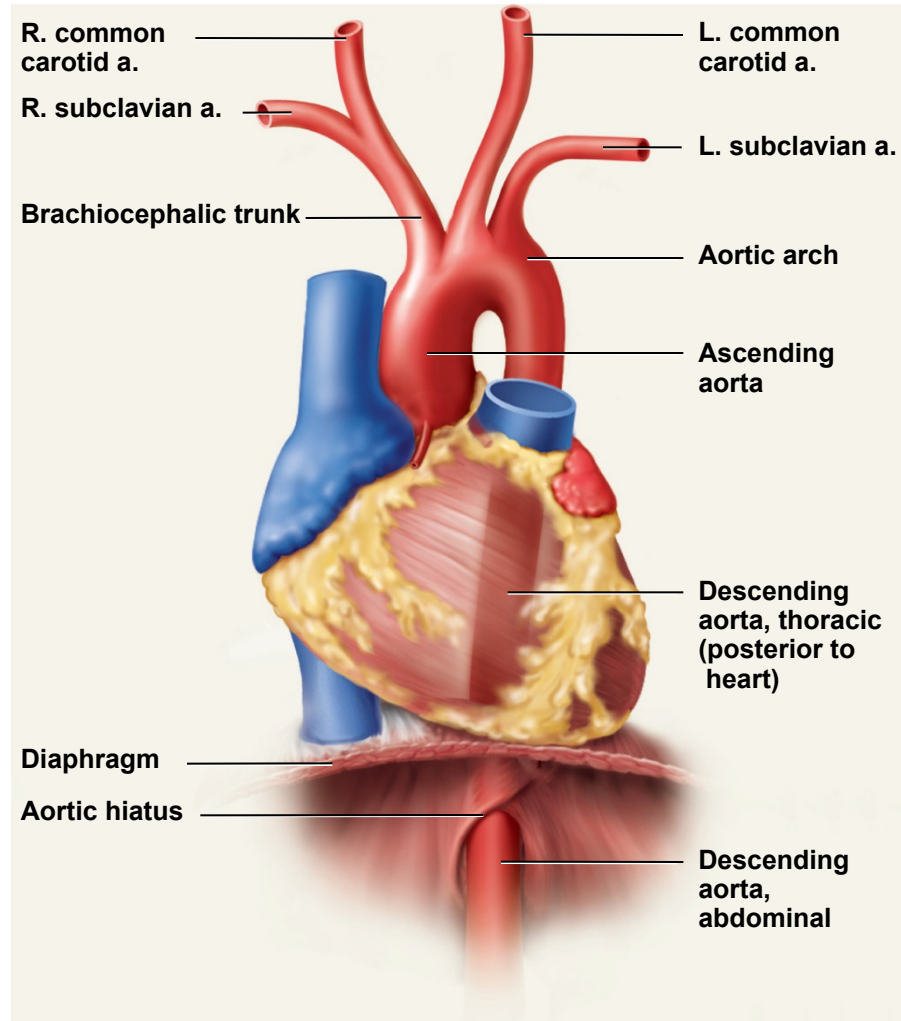


Figure 20.23

# Arteries of the Head and Neck

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

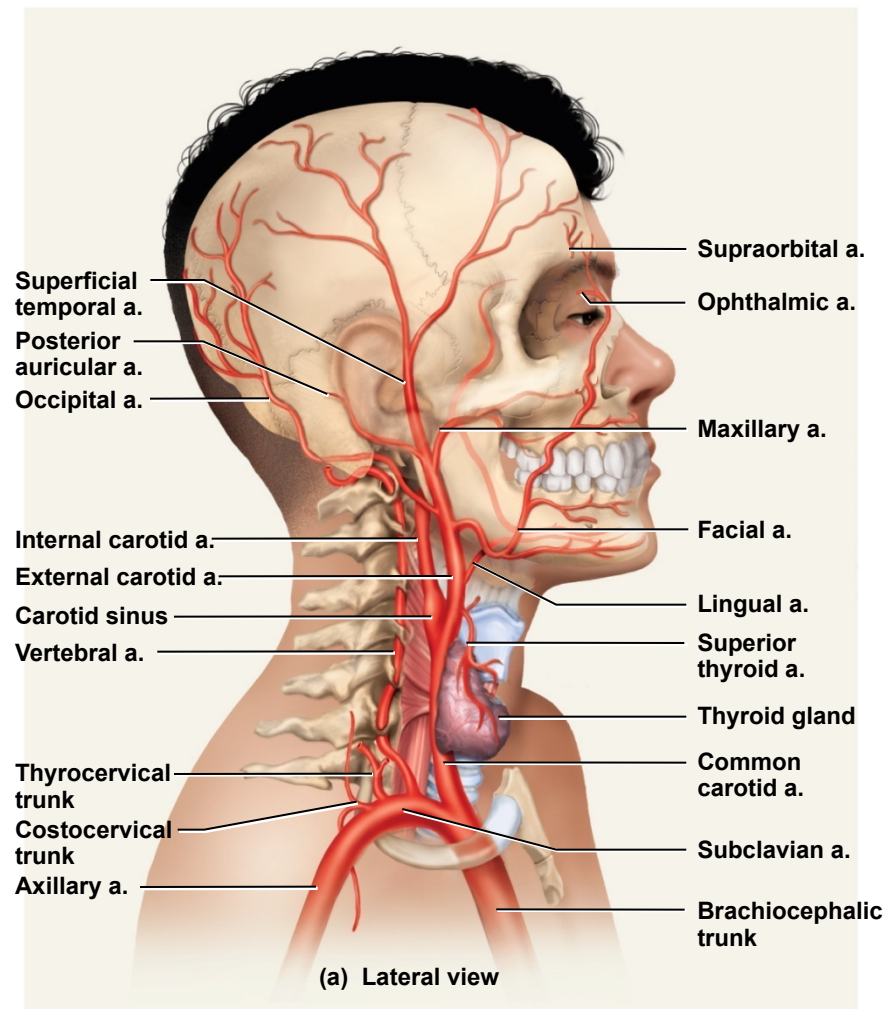


Figure 20.24a

- common carotid divides into internal and external carotids
  - external carotid supplies most external head structures

# Arterial Supply of Brain

- paired **vertebral arteries** combine to form **basilar artery** on pons
- **Circle of Willis** on base of brain formed from anastomosis of basilar and internal carotid arteries
- supplies brain, internal ear and orbital structures
  - anterior, middle and posterior cerebral
  - superior, anterior and posterior cerebellar

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

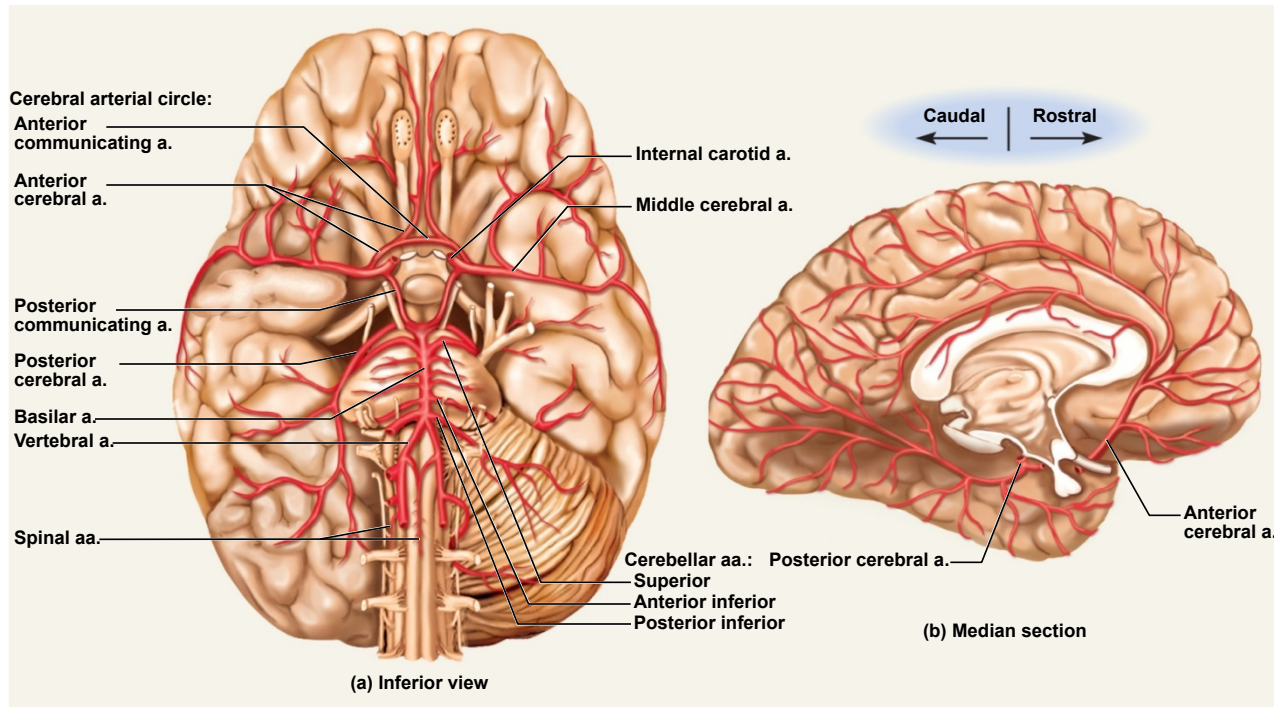


Figure 20.25 a-b

# Major Systemic Veins

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

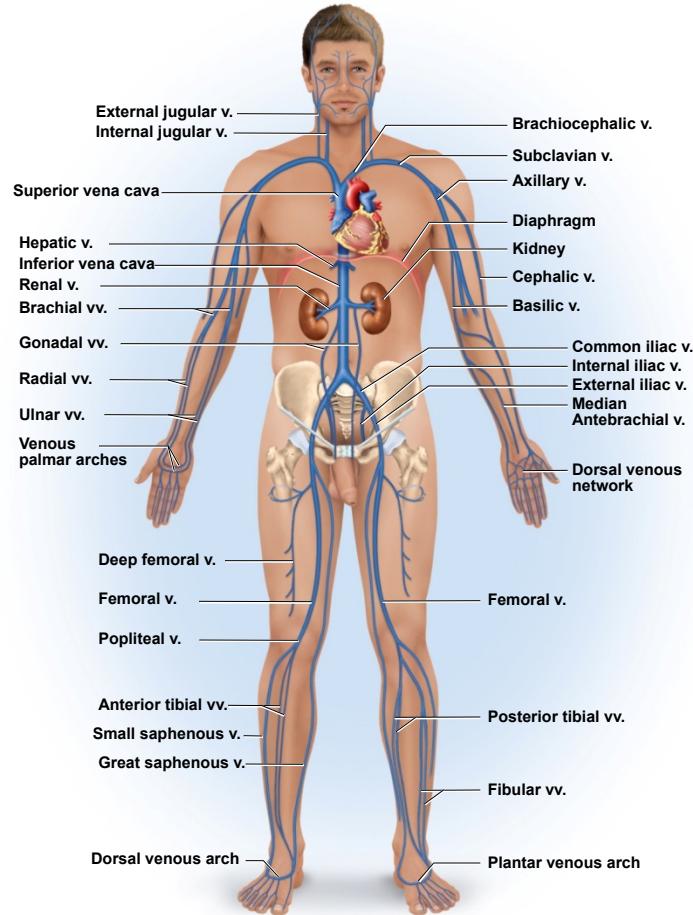


Figure 20.22

- deep veins run parallel to arteries while superficial veins have many anastomoses

# Deep Veins of Head and Neck

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

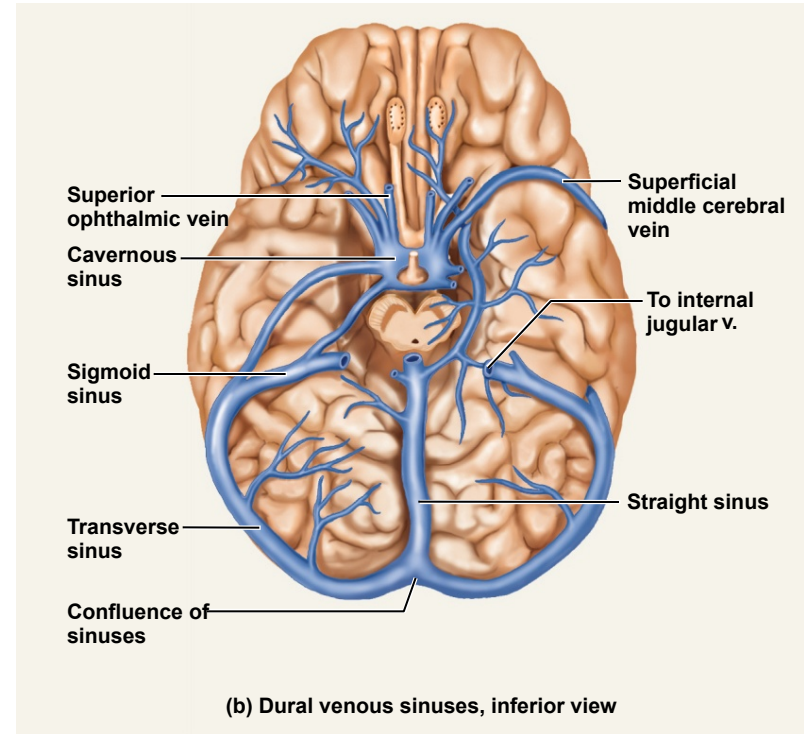
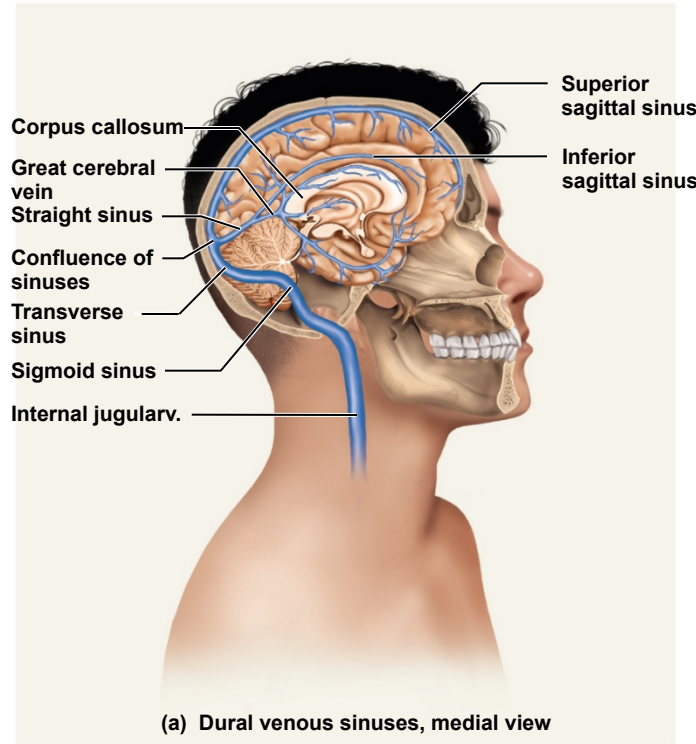


Figure 20.26 a-b

- large, thin-walled **dural sinuses** form in between layers of dura mater
- drain blood from brain to internal jugular vein



# Superficial Veins of Head and Neck

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

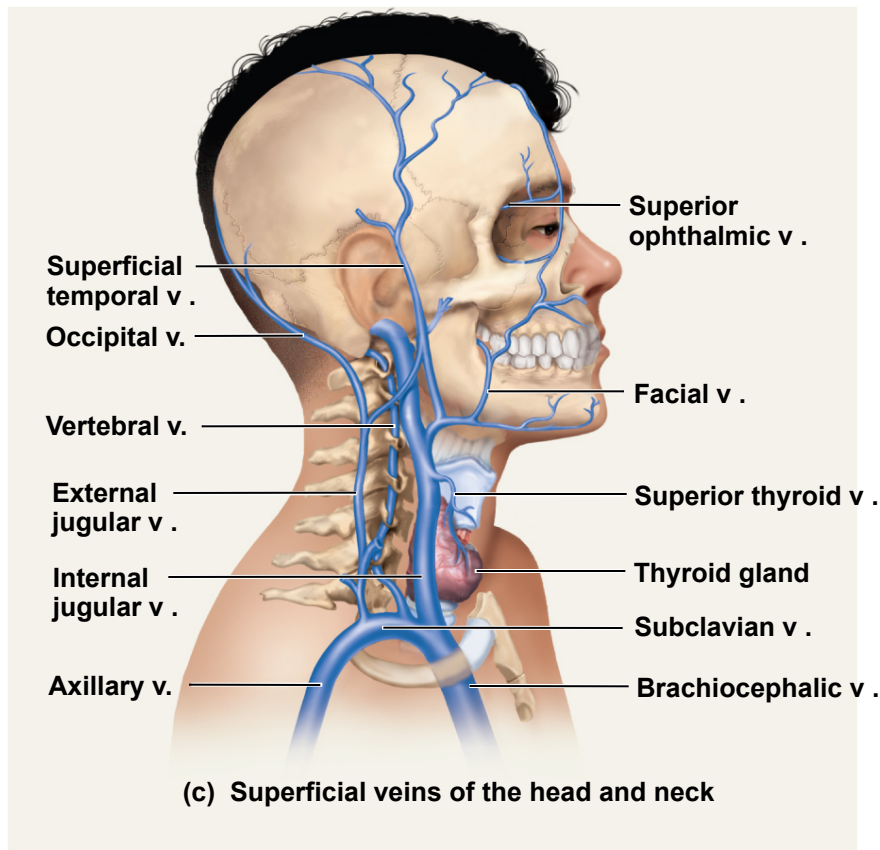


Figure 20.26c

- **internal jugular vein** receives most of the blood from the brain
- branches of **external jugular vein** drain the external structures of the head
- upper limb is drained by **subclavian vein**

# Arteries of the Thorax

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

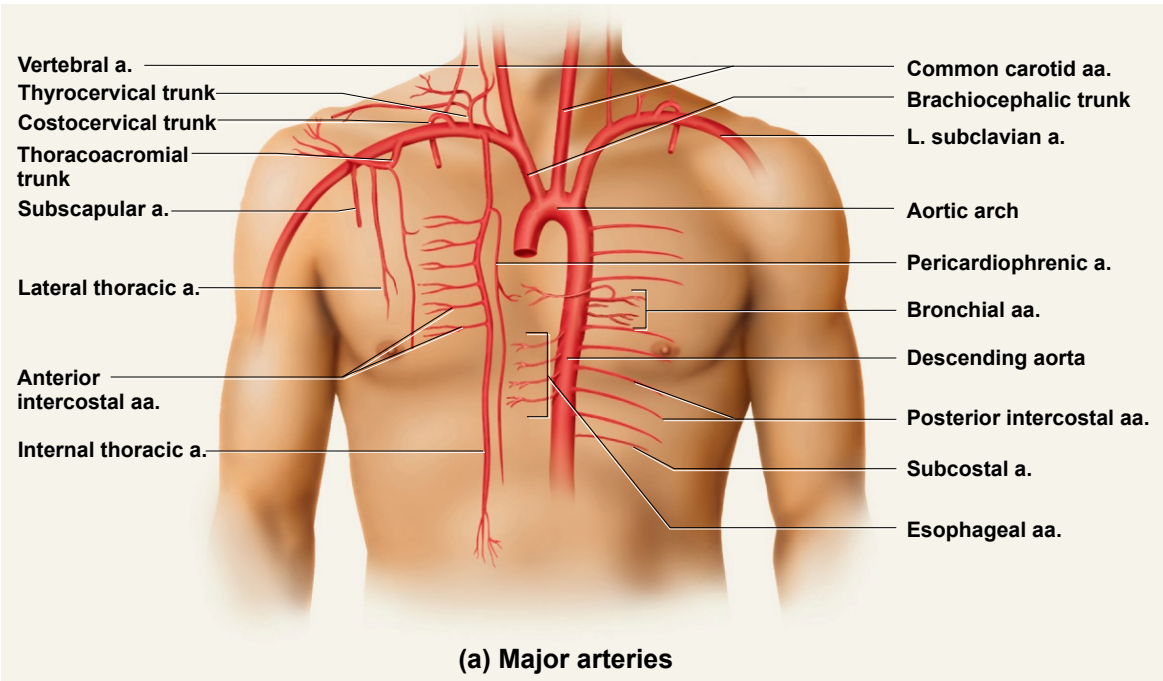


Figure 20.27a

- thoracic aorta supplies viscera and body wall
  - bronchial, esophageal, and mediastinal branches
  - posterior intercostal and phrenic arteries
- internal thoracic, anterior intercostal, and pericardiophrenic arise from subclavian artery

# Major Branches of Abdominal Aorta

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

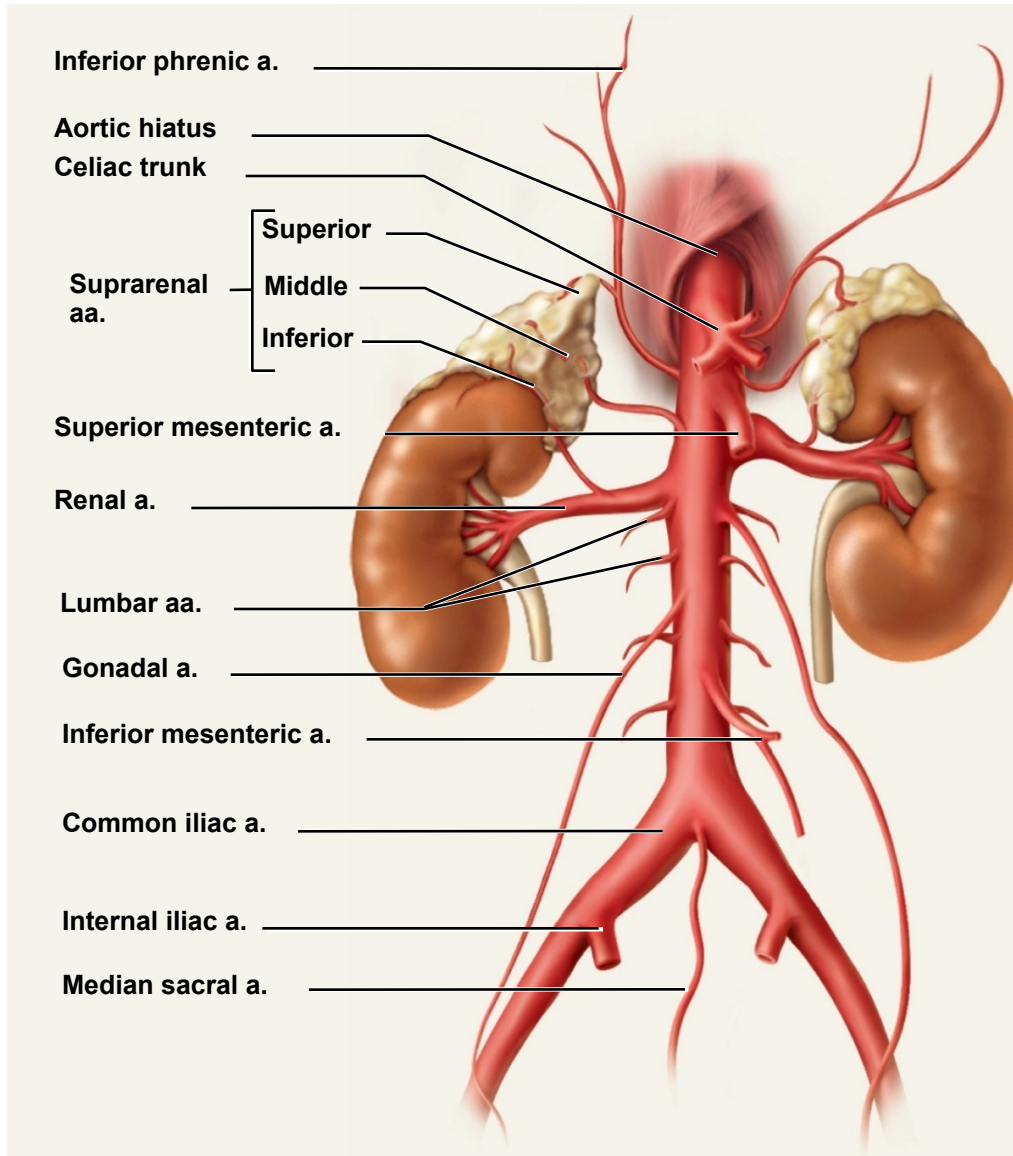


Figure 20.29



# Celiac Trunk Branches

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

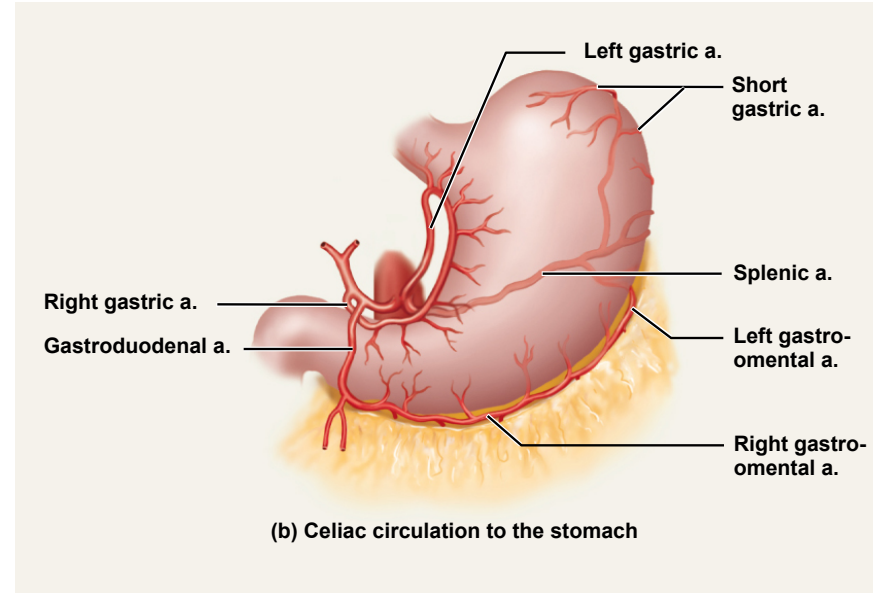
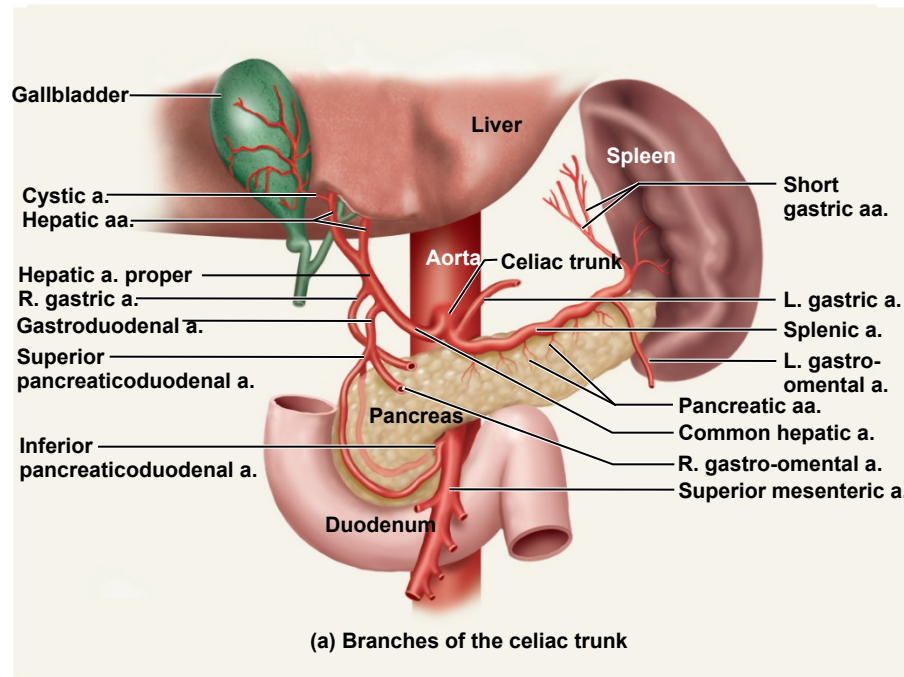


Figure 20.30 a-b

- branches of **celiac trunk** supply upper abdominal viscera - stomach, spleen, liver, and pancreas

# Mesenteric Arteries

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

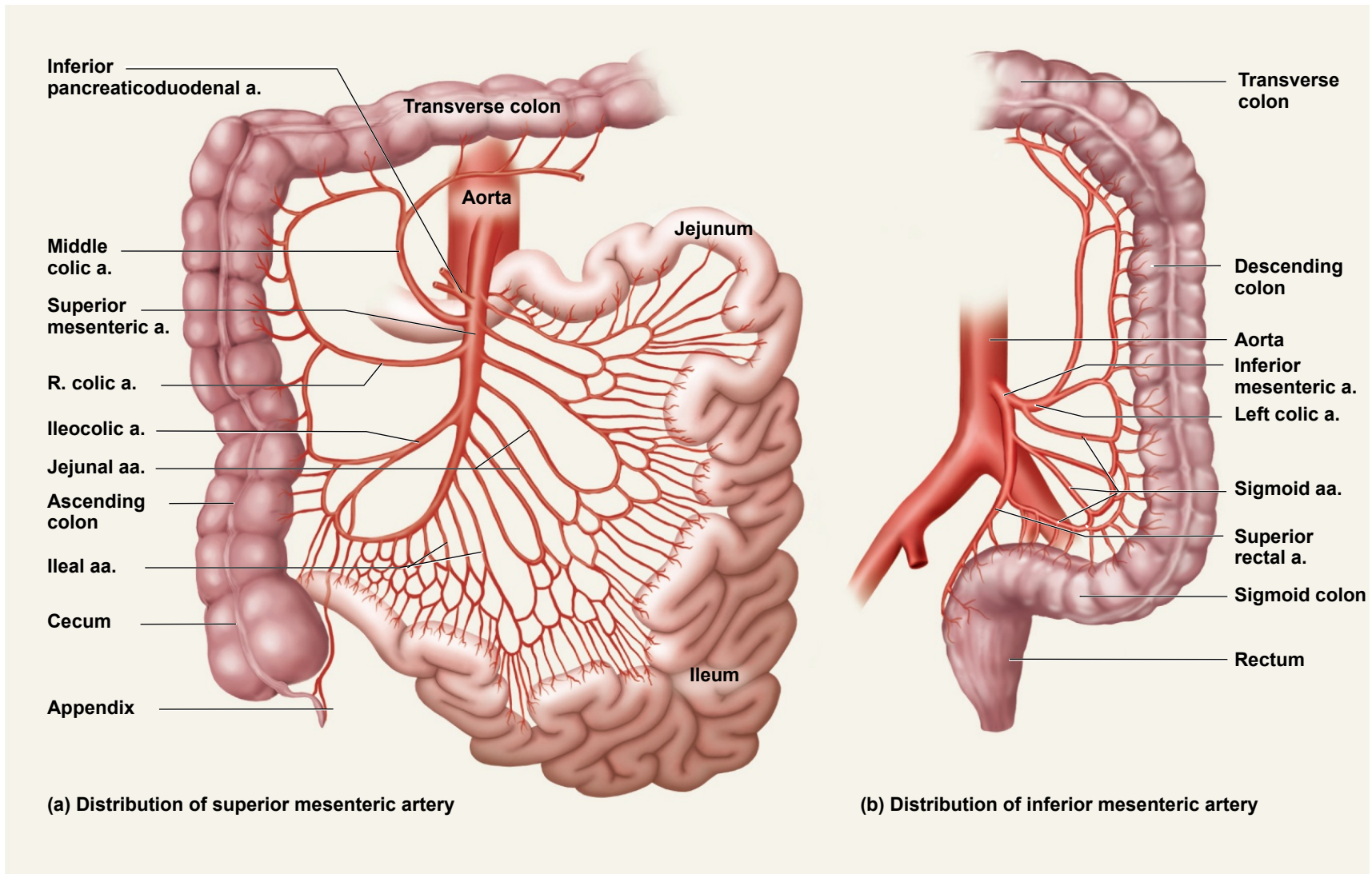


Figure 20.31 a-b

# Inferior Vena Cava and Branches

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

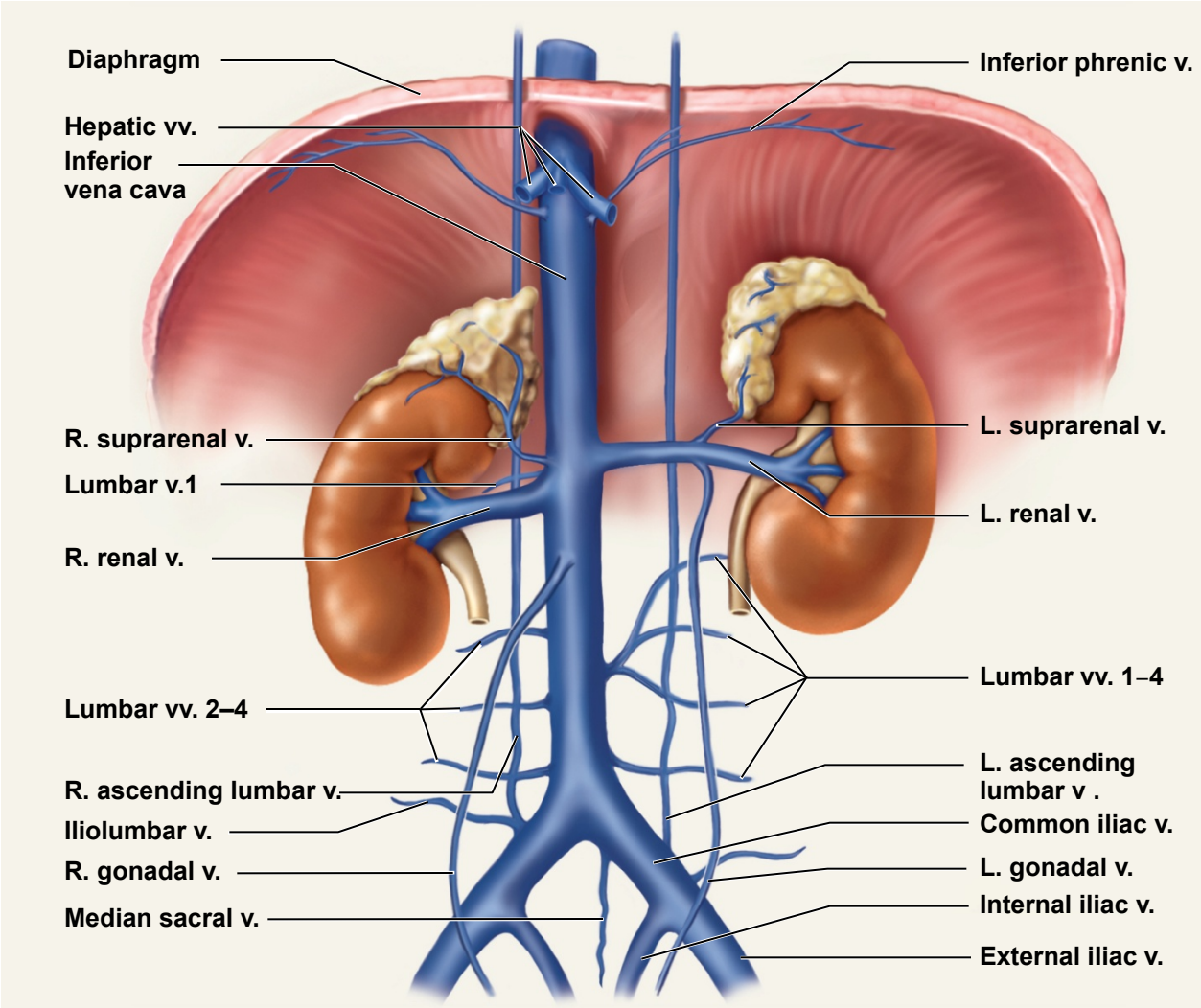


Figure 20.32

# Veins of Hepatic Portal System

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

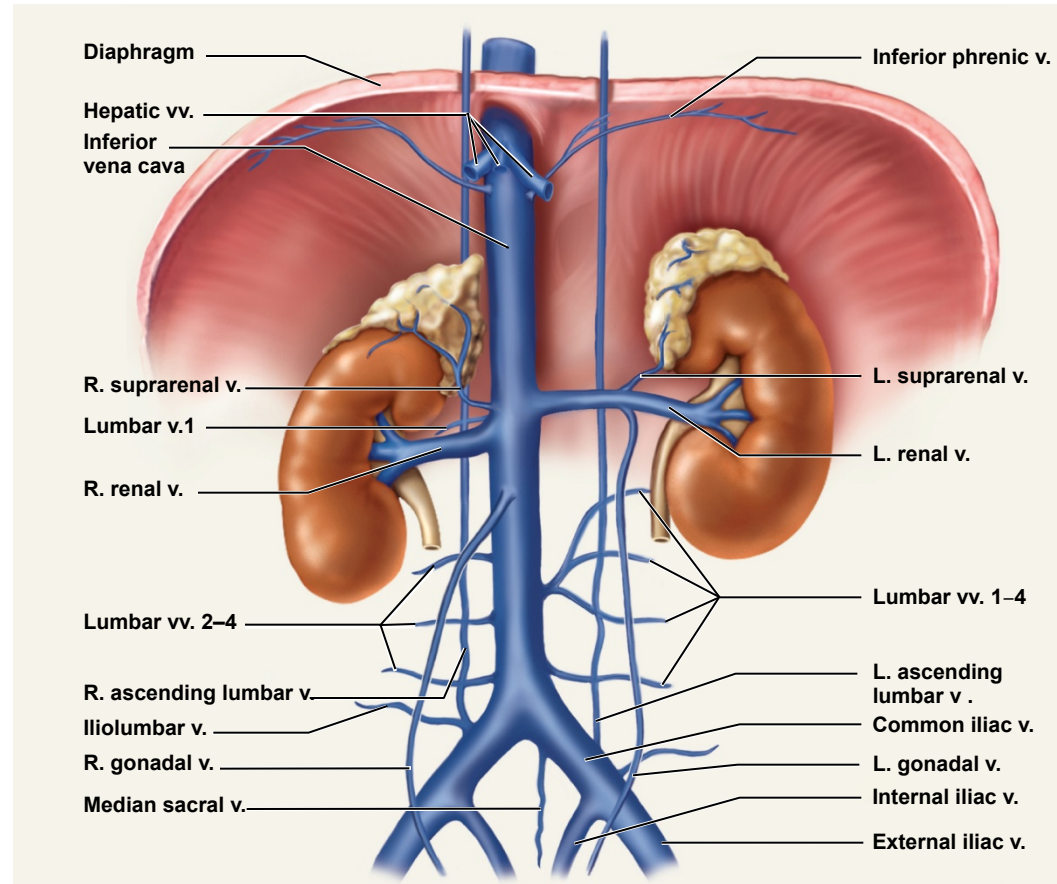


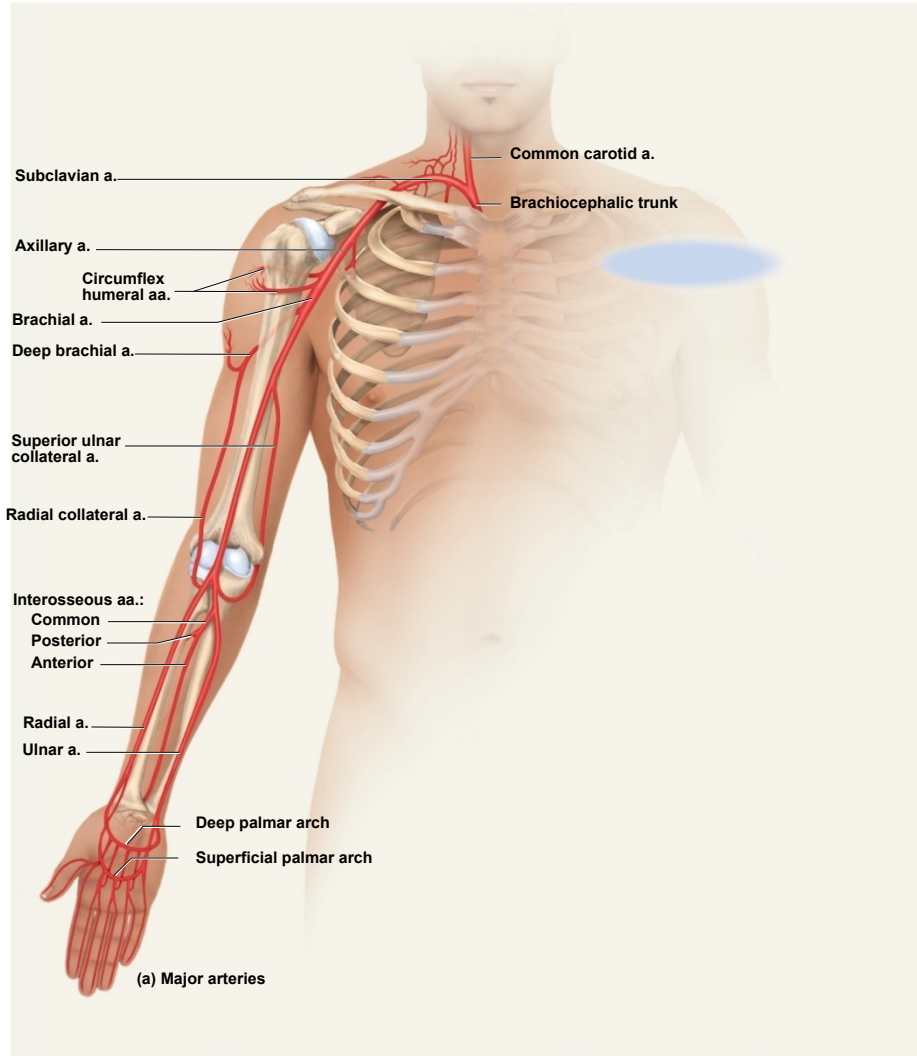
Figure 20.32

- drains nutrient rich blood from viscera (stomach, spleen and intestines) to liver so that blood sugar levels are maintained



# Arteries of the Upper Limb

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



- subclavian passes between clavicle and 1st rib
- vessel changes names as passes to different regions
  - **subclavian** to **axillary** to **brachial** to **radial** and **ulnar**
  - **brachial** used for BP and **radial** artery for pulse

Figure 20.34a

# Superficial and Deep Veins of Upper Limb

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

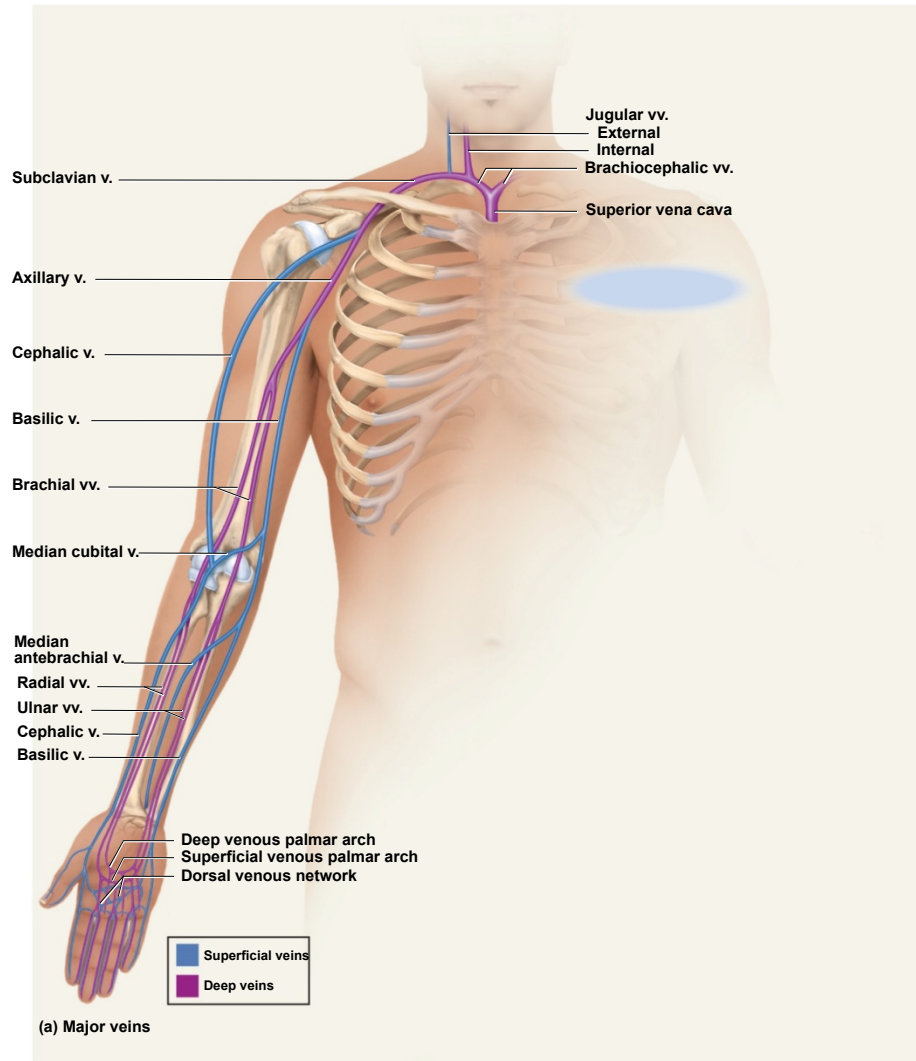


Figure 20.35a

# Arteries of the Lower Limb

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

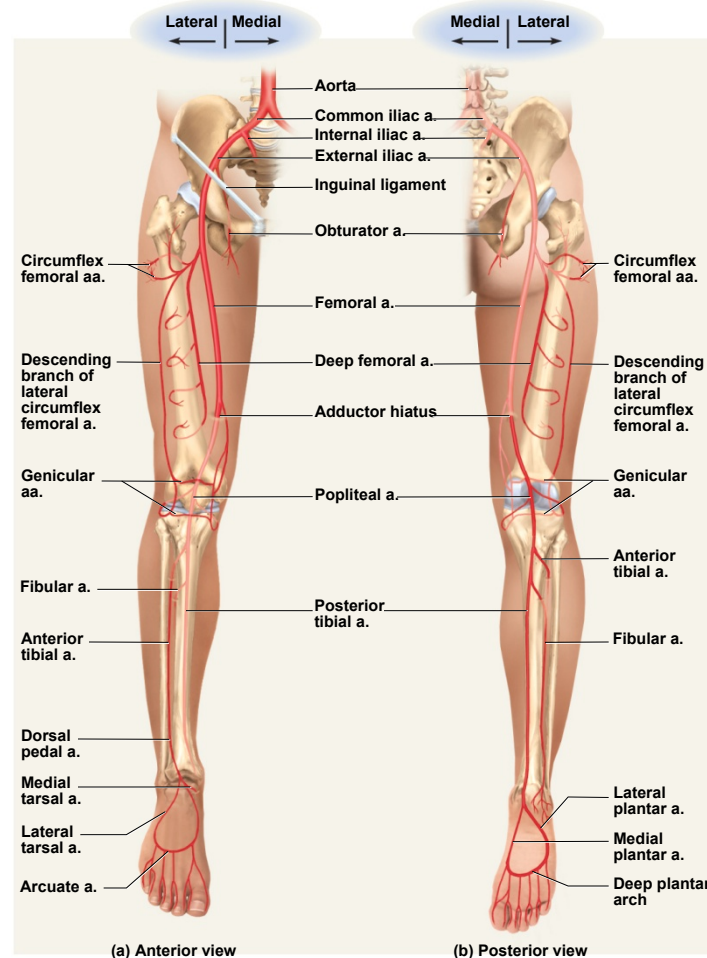


Figure 20.36 a-b

- branches to the lower limb arise from external iliac branch of the common iliac artery

# Superficial and Deep Veins of Lower Limb

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

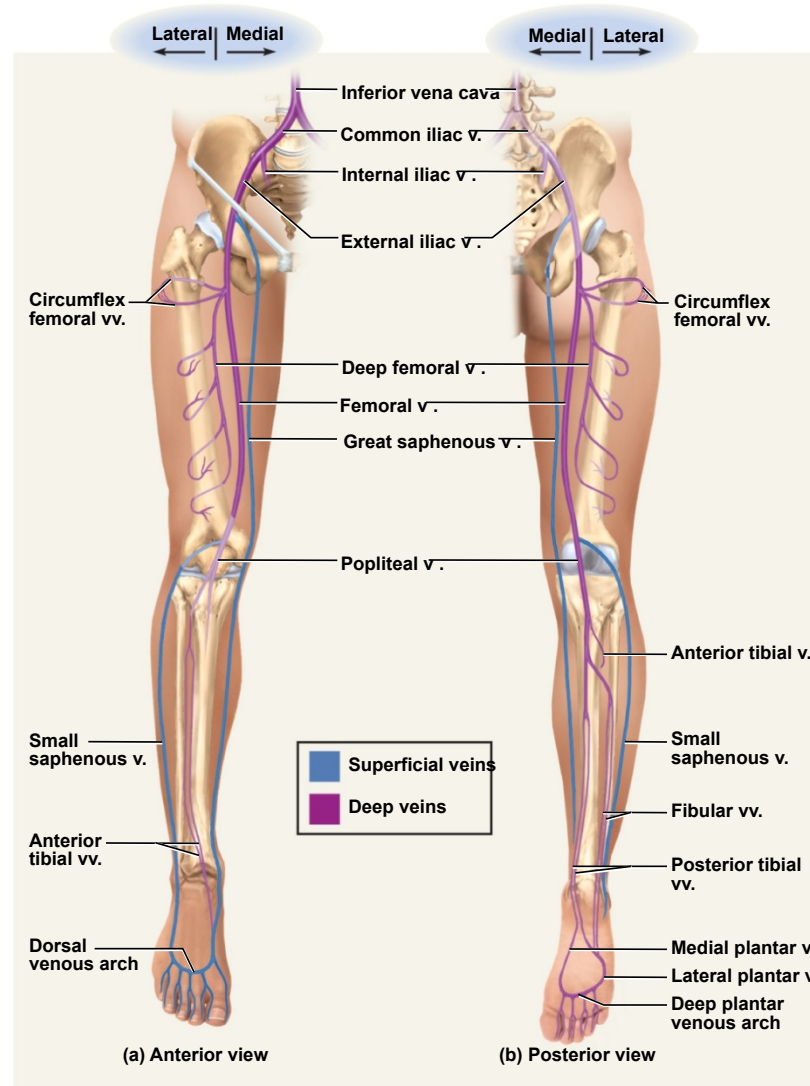


Figure 20.38 a-b



# Arterial Pressure Points

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

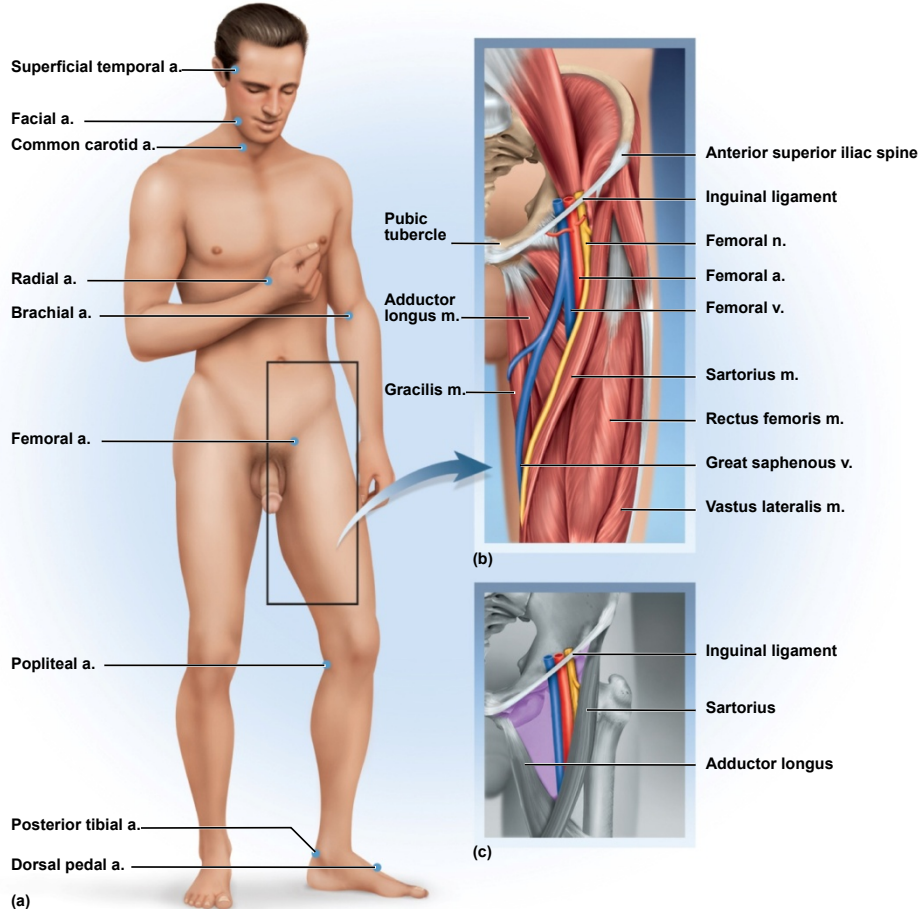


Figure 20.40 a-c

- some major arteries close to surface which allows for palpation for pulse and serve as pressure points to reduce arterial bleeding

# Hypertension

- **hypertension** – most common cardiovascular disease affecting about 30% of Americans over 50
- **“the silent killer”**
  - major cause of heart failure, stroke, and kidney failure
    - damages heart by increasing afterload
      - myocardium enlarges until overstretched and inefficient
    - renal arterioles thicken in response to stress
      - drop in renal BP leads to salt retention (aldosterone) and worsens the overall hypertension
- **primary hypertension**
  - obesity, sedentary behavior, diet, nicotine
- **secondary hypertension** – secondary to other disease
  - kidney disease, hyperthyroidism