Chapter 21: PERIPHERAL CIRCULATION AND REGULATION

I. BLOOD VESSELS

A. Large and medium arteries (Fig. 21.6a, b)

1. Thick walls
   a. Tunica intima: endothelium
   b. Tunica media: smooth muscle and elastic fibers
   c. Tunica adventitia: connective tissue

2. Large arteries: Tunica media is more ______________________

3. Medium arteries: Tunica media is more ______________________

4. Function: High pressure pipes (with elastic recoil)

5. Atherosclerosis (Fig.21.7)
   a. Tunica affected
   b. Locations

B. Arterioles (Fig. 21.3)

1. Very small, muscular arteries

2. Capable of most change in diameter : __________________________

3. Function: Control of blood flow to tissues
C. Capillaries (Fig. 21.1, 21.2, 21.3)

1. Primarily endothelium; numerous, branching
2. Allow for exchange of nutrients and wastes
3. Types based on permeability (Fig. 21.2)
   a. Continuous
   b. Fenestrated
   c. Sinusoidal

D. Venules and veins (Fig. 21.6, c and d)

1. Compare with arteries (Fig. 21.5)
   a. Same three layers
   b. Walls are ________________; lumen is ________________
   c. Valves
   d. Location
   e. Blood volume
   f. Vascular compliance

Varicose veins

E. Distribution of blood (Table 21.13)

1. Arteries and arterioles: ________ 2. Capillaries ________
3. Veins and venules ________ 4. Heart and lungs ________
III. CIRCULATORY DYNAMICS

A. Relationship of velocity of flow to combined cross-sectional area (Fig. 21.32)
   1. As blood flows into larger area, rate of flow ___________
   2. As blood flows into smaller area, rate of flow __________

B. Pressures within arteries (Fig. 21.33)
   1. Systolic: Reflects systolic wave of ___________ _________________
   2. Diastolic: Reflects diastole of _________ _____________
   3. Pulse pressure: Difference of Systolic - Diastolic pressure

C. Direction of blood flow as related to pressure (Fig. 21.33)

D. Relationship between B.P., C.O. and P.R.
   1. Peripheral resistance (PR): opposition to the flow of blood
   2. Cardiac output: ___________________
E. Capillary dynamics (Fig. 21.35 [21.34])

1. As blood flows via capillaries, _________ is forced out.

   Major force:

2. At end of capillary, _________ % of this fluid is reabsorbed.

   Major force:

3. "Leftover" fluid enters lymph capillaries ( _________%)

F. Edema (p.765, [760]) Def.:

1. Basic causes:
   a. Capillary blood pressure ________________
   b. Blood osmotic pressure (BOP) ________________
   c. _________ entry of lymph

2. Specific causes
   a. Venous obstruction
   b. Increased blood volume
   c. Decrease of plasma proteins
   d. Increase of interstitial proteins
   e. Lymph vessel blockage
G. Venous Pressure

1. Venous return = cardiac output
   If V.R. increases, then preload ________ and C.O. _______

2. Venous pressure is ________________ than arterial pressure and
   Is ________________ affected by gravity.

3. Skeletal muscle venous pump ________ V.R.

4. Venous tone: State of partial contraction of smooth muscle in veins
   To increase V.R., ______ venous tone and _________ diameter
   of veins via ________________ stimulation

H. Local control of blood flow (Fig. 21.3, 21.36 [21.35])

1. Blood flow is proportional to need in most tissues, except:

2. Autoregulation (regulation of blood flow without nerves or hormones)
   The precapillary sphincter and vasomotion:
   CO₂, lactic acid, H⁺, wastes ________________ P.C.S. , causing it to
   ________________ and ___________ blood flow to nearby tissues.
   O₂ and nutrients _________________________ PCS, causing it to
   ________________ and _________ blood flow to nearby tissues.

3. Long term adjustment:
I. Nervous system control of local circulation (Fig. 21.37 [21.36])

1. Vasomotor center of medulla oblongata

2. Vasomotor tone
   
   Def.: State of partial contraction of arterioles (and veins)

3. Vasoconstrictor fibers
   
   a. Def:
   
   b. Location: Most important in “nonvital” organs:
   
   c. Neurotransmitter

4. Effect of widespread vasoconstriction on nonvital organs? _____ their blood flow

5. Effect of widespread vasoconstriction on vital organs? _____ their blood flow. Why?

6. Effect of widespread vasoconstriction on P.R.? P.R._____, —>____ B.P.

IV. BLOOD PRESSURE

A. Factors affecting blood pressure

1. Mean arterial pressure (M.A.P.) = B.P. = C.O. x P.R.
   
   a. If C.O. increases, blood pressure ________.
      
      To increase C.O.: ________ Blood Volume (B.V.), ________ V.R.,
      
      ________ S.V. and/or ________ H.R.
b. If P.R. increases, blood pressure _______.  
To increase P.R.: _______ vessel diameter: __________________

c. If C.O. is to stay same, and P.R. increases, B.P. must ______

d. If blood viscosity ________, P.R. ________, ----> _______ B.P.

B. Short-term control of blood pressure

1. Baroreceptor reflex (Fig. 21.38, 21.39 [21.37])

Low blood pressure  ____________ Blood pressure

Stimulation of aortic and carotid

__________________________ ________ P.R. ________ C.O.

Vasomotor center and _______ Vasoconstriction

Cardioregulatory center _______ H.R., _______ S.V.

2. Adrenal medullary mechanism: Epinephrine and NE (Fig. 21.40 [21.39])

a. Stimulus:

b. Effect: ______ H.R., ______ S.V., —> ______ C.O.—> ______ B.P.

______ vaso__________________, ---> _____ P.R., —>_____ B.P.

3. Chemoreceptor reflex (Fig.21.41, 21.42 [21.40])

a. Elevated CO₂ , ______ pH ________________ central chemo-

receptors, ______ S.V, ______ H.R, ______ P.R., —> _____ B.P.

4. CNS ischemic response: Lack of blood flow to brain _______ B.P.
C. Long-term regulation of blood pressure (Fig. 21.45 [21.44])

1. Aldosterone (Fig. 21.43 [21.42])
   a. Source:
   b. Stimulus:
   c. Effect: Causes kidneys to retain salt and ________ →
       ______ B.V., → ______ V.R., → ______ C.O., → ______ B.P.

2. Antidiuretic hormone--ADH (Vasopressin) (Fig. 21.44 [21.43])
   a. Source:
   b. Stimulus:
   c. Effects: Causes kidney to retain water→ ____ B.V.→ ____ B.P.
   d. Also causes vaso ____________________ which ______ B.P.

3. Atrial natriuretic hormone (Fig. 21.45)
   a. Source:
   b. Stimulus:
   c. Effect: Causes kidneys to excrete salt and ________ →
       ______B.V.,→ ______ V.R.,,→ ______C.O., →______ B.P.

4. Fluid shift mechanism of B.P. regulation
   a. When B.P. rises, ________________ ISF is formed
   b. Therefore B.V. ______, causing B.P. ______
   c. If B.P. drops? ____________ ISF forms, B.V. _____, → B.P. _____.
V. CARDIOVASCULAR DISORDERS

A. Atherosclerosis (Fig. 21.5)

1. Def:

2. Causes:

3. Effects: ______ P.R.,—> ______ B.P.,—> ______ workload on the heart
   ______ blood flow to tissues

B. Coronary artery disease

1. Def: Atherosclerosis of:

2. Causes:

3. Effects:

C. Hypertension (See lab notes)

D. Circulatory shock (See Clinical Focus, p. 771 [775])

1. Def:
   a. Causes:
   b. Symptoms:

2. Compensations:
   a. _____ sympathetic stimulation: _____ vasoconstriction,
      _____ H.R.
   b. _____ water, salt retention
   c. _____ fluid reabsorption from capillaries (Fluid shift mechanism)