Blood Vessels

1. Functions

A) Serves as a

B) The site of exchange of

2. Structure of Vessels

A) All vessels except capillaries have the same basic structure

1)

a) Innermost layer composed of

b) Remains unchanged in thickness throughout the circulation pathway

2)

a) Middle layer composed mostly of

3)

a) Outermost layer composed of

3. Types of Vessels

A)

1) Carry blood

2) Thick tunica externa & media with narrow, circular lumen

3) Two types

a)

i) Large diameter arteries leaving the heart

ii) Their elasticity helps propel blood when ventricles are relaxed

b)

i) Branch off of elastic arteries

ii) Distribute blood to **large areas** of the body

iii) Capable of great vasoconstriction & vasodilation to control the rate of blood

flow to these areas

B)

1) Small vessels that deliver blood from the arteries to the capillaries

2) Capable of vasoconstriction & vasodilation

a) Responsible for controlling blood flow into **specific tissues**, as well as systemic

blood pressure

C)

1) Connect arterioles to venules

2) Have only a tunica

3)

4) Three types

a)

i) Complete cells with small intercellular clefts (gaps)

ii) Found in

b)

i) Cells contain small pores (fenestrations) with small intercellular clefts

ii) Found in

c)

i) Cells have very large fenestrations and wide intercellular clefts

ii) Found in

5) Capillary Beds

a)

i) Vessel that connects an arteriole to 10-100 capillaries (capillary bed)

ii) Passes directly thru the capillary bed

(a) Directly connects the arteriole to the venule

b)

i) Found at the junction of the metarteriole and the capillary bed

ii) Control blood flow within the capillary bed

D)

1) Collect blood from capillaries

2) Primarily serve as a conduit for blood

3)

E)

1) Carry blood back to the heart

2) Have thin tunica media, which contains little smooth muscle & elastin

a)

3) Thick tunica externa composed of collagen and elastin

4) Large, collapsed lumens

5) Have in their lumens to prevent the backflow of blood.

4. Capillary Exchange – 3 main processes

A)

1) O2, CO2, glucose, amino acids, steroid hormones, and urea

B)

1) Protein hormones and antibodies

C)

1) A large numbers of ions and molecules move within a fluid

2) Fluid may move out (filtration) or back into (reabsorption) the capillary

3) Responsible for the relative volumes of the blood and interstitial fluid

4) Driven by a

a)

i) NFP –

(a) The difference between the forces favoring filtration and those

opposing it

ii) CHP –

(a) Created by blood pushing against the walls of the vessel

(b) Favors

(c) Only pressure to change significantly from one end of the capillary to the

other

iii) BCOP –

(a) Created by

(b) Favors

(c) Remains constant from one end of the capillary to the other.

5. Blood Flow (Circulation) & Blood Pressure

A) – volume of blood that flows thru any tissue

1) Total blood flow =

2) Distribution of blood throughout the body is dependent on:

a) A at the tissues (localized blood pressure)

b)

B) – pressure of the blood on the walls of the vessel

1) Decreases as you move

2) 2 components

a) pressure

b) pressure

3) Pulse pressure

a)

4) Mean arterial blood pressure (MABP)

a)

5) Dependent on total blood volume

a) Small decrease (<10%) in blood volume

b) Large decrease (>10%) in blood volume

c) Any increase in blood volume

C) Resistance

1) Created by friction between blood and walls of vessels

2) Dependent on:

a)

i) Ratio of RBC to plasma

(a) Dehydration

(b) Anemia

b)

c)

i) Controlled by sympathetic NS through vasoconstriction/vasodilation

3)

a) The total resistance of all systemic blood vessels combined

b) Adjusted by altering

i) Controlled by

c) Determines localized blood pressure and flow to particular tissues & systemic

BP

D) Venous Return

1) Requires a pressure difference

2) Heart normally creates enough pressure to keep blood moving

3) Aided by:

a) Skeletal muscle pump

b) Respiratory pump

6. Control of Blood Flow & Pressure

A) 3 mechanisms

1) Alter cardiac output (addressed during heart lecture)

2)

3)

B) Autonomic NS –

1) Via cardiovascular center

2) Input

a) Baroreceptors

i) Monitor

b) Chemoreceptors

i) Monitor

3) Output

a) Sympathetic fibers

i) Cardiac accelerator nerves

(a) Innervates the conduction system & ventricular myocardium

(i) Causes an increase in SR & HR

ii) nerves (sympathetic) – cause both excitatory and inhibitory

responses in the tunica media of select vessels

(a) Cause vasoconstriction of

(i) This increases systemic blood pressure

(b) Cause vasodilation of the blood vessels supplying the

(i) This increases blood flow to these areas

(ii) Because of their limited numbers (as compared to the constricting

arterioles previously mentioned), it does not cause a drop in systemic

blood pressure

b) Parasympathetic fibers

i)

(a) Innervate the conduction system only

(b) They **do not** innervate any

4) Vasomotor Reflexes

a)

i) Triggered by

ii) Inhibits sympathetic output and stimulates Vagus nerve (parasympathetic)

b)

i) Triggered by

ii) Stimulates sympathetic output

c)

i) Triggered by

ii) Stimulates the vasomotor center (sympathetic)

(a) Causes vasoconstriction of vessels in lower parts of the body

C) Hormonal Control –

1)

a)

i)

(a) Released from the in response to decreased blood

volume

(b) Converts angiotensinogen (plasma protein) to

ii)

(a) Found primarily in the

(b) Converts angiotensin I to

iii)

(a) Systemic

(b) Causes release from adrenal cortex

(i) Increases Na+ & H2O reabsorption by the kidneys

2)

a)

i) Released from the ventricles of the heart in response to an increase in blood

volume

ii) Decreases Na+ & H2O reabsorption (increases excretion) by the kidneys and

inhibits the release of aldosterone

7. Blood Vessel Disorders

A) Atherosclerosis – plaque build-up (fat and cholesterol) within the vessel

1) The plaque obstructs the vessel causing increased blood pressure and a reduction in

elasticity

B) Aneurysm – ballooning of a blood vessel, which increases risk of rupture

C) Hypotension – low blood pressure

1) Systolic below 90 or diastolic below 60

D) Hypertension – high blood pressure

1) Prehypertension – systolic 120-139 or diastolic 80-89

2) Stage 1 Hypertension – systolic 140-159 or diastolic 90-99

3) Stage 2 Hypertension – systolic 160 & up or diastolic 100 & up