BLOOD VESSELS

FUNCTIONS:

1. **Carries** blood
2. **Exchanges** nutrients, wastes and gases
3. **Transports** substances
4. **Helps** regulate blood pressure
5. **Directs** blood flow to tissues

SYSTEMIC VESSELS – from LV and back to the RA

PULMONARY VESSELS – from RV to lungs to LA

PERIPHERAL CIRCULATION

GENERAL FEATURES OF BLOOD VESSEL STRUCTURE

ARTERIES

- carry blood **AWAY** from the heart
- **Oxygenated** blood

CLASSIFICATION:

1. **ELASTIC –** largest diameter and have the thickest walls

2. **MUSCULAR –** medium-sized and small diameter
   - called DISTRIBUTING ARTERY because it can control blood flow to diff. regions of the body

3. **ARTERIOLES –** smallest artery; transport blood from small artery to capillary

- Site where exchange occurs between blood and tissue fluids; has thinner walls

ENDOTHELIUM – makes up capillary walls

PRECAPILLARY SPHINCTERS – regulates blood flow

VEINS

- Carry blood **TOWARD** the heart
- **Deoxygenated** blood
- From capillaries; thinner walls & has less elastic tissue

CLASSIFICATION:

1. **VENULES –** tubes with a diameter slightly larger than that of capillary

2. **SMALL VEINS –** slightly larger than venules; has 3 tunics

3. **MEDIUM-SIZED VEINS –** collect blood from small veins and deliver it to large veins

3 TUNICS OF BLOOD VESSELS

1. **TUNICA INTIMA –** innermost; basement membrane; composed of *Endothelium*

2. **TUNICA MEDIA –** middle layer; smooth muscles arranged circularly

3. **TUNICA ADVENTITIA –** outer portion

BLOOD VESSELS OF THE PULMONARY CIRCULATION

- **Pulmonary Trunk**
- **Right and Left pulmonary arteries**
- **Pulmonary veins**

BLOOD VESSELS OF THE SYSTEMIC CIRCULATION – ARTERIES

AORTA – where all arteries of the systemic circulation branch directly or indirectly

3 PARTS:

1. **ASCENDING AORTA –** passes superiorly from LV; where R and L coronary arteries arise from its base

2. **AORTIC ARCH –** aorta arches posteriorly and to the left
   3 major arteries that carry blood to the head and upper limbs:
   - **BRACHIOCEPHALIC ARTERY**
   - **L COMMON CAROTID ARTERY**
   - **L SUBCLAVIAN ARTERY**

3. **DESCENDING AORTA –** longest part
   - **THORACIC AORTA –** extends through the thorax and diaphragm
   - **ABDOMINAL AORTA –** extends through the diaphragm
   - **ARTERIAL ANEURYSM –** localized dilation of an artery that usually develops in response to trauma or a congenital weakness of the artery wall

ARTERIES OF THE HEAD AND NECK

BRACHIOCEPHALIC ARTERY – first vessel to branch from the aortic arch

- **R Common carotid artery and R Subclavian artery; L Common carotid artery and L Subclavian artery** – 2nd and 3rd branches

COMMON CAROTID ARTERY – internal and external CA

VERTEBRAL ARTERY – supply blood to the brain

BASILAR ARTERY – supply blood to the pons, cerebellum and midbrain

ARTERIES OF THE UPPER LIMBS

1. **AXILLARY ARTERY –** axilla (armpit)

2. **BRACHIAL ARTERY –** arm

3. **ULNAR AND RADIAL ARTERY –** forearm and arm
   a. **RADIAL A –** commonly used for taking a pulse

THORACIC AORTA AND ITS BRANCHES

1. **VESCERAL ARTERY –** supply the THORACIC ORGANS

2. **PARIETAL ARTERY –** supply the THORACIC WALL

MAJOR PARIETAL ARTERIES:

- **POSTERIOR INTERCOSTAL ARTERY –** from thoracic aorta and extend bet the ribs
- **SUPERIOR PHRENIC ARTERY –** supply the diaphragm
- **INTERNAL THORACIC ARTERY –** descend along the internal surface of the anterior thoracic wall
- **ANTERIOR INTERCOSTAL ARTERY –** extend bet ribs to supply the anterior chest wall

ABDOMINAL AORTA AND ITS BRANCHES

1. VISCERAL
   a. *PAIRED BRANCHES*
      i. **RENAL ARTERIES –** kidneys
      ii. **SUPRARENAL A. –** adrenal glands
      iii. **TESTICULAR and OVARIAN A. –** testes and ovaries
   b. *UNPAIRED BRANCHES*
      i. **CELIAC TRUNK –** supply blood to stomach, pancreas, spleen, upper duodenum and liver
      ii. **SUPERIOR MESENTRIC A. –** small intestines and upper portion of the large intestines
      iii. **INFERIOR MESENTRIC A. –** remainder of the large intestines

2. PARIETAL
   a. **INFERIOR PHRENIC A. –** diaphragm
   b. **LUMBAR A –** lumbar vertebrae and back muscles
   c. **MEDIAN SACRAL –** inferior vertebrae

ARTERIES OF THE PELVIS

1. **EXTERNAL ILIAC A –** enters lower limbs

2. **INTERNAL ILIAC A –** supplies the pelvic area
   a. **VISCERAL BRANCHES –** supply urinary bladder, rectum, uterus, vagina
   b. **PARIETAL BRANCHES –** walls and floor of the pelvis; lumbar, gluteal and proximal thigh muscles; external genitalia

ARTERIES OF THE LOWER LIMBS

1. **FEMORAL ARTERY –** thigh

2. **POLITEAL ARTERY –** popliteal space, posterior region of the knee
   a. **ANTERIOR TIBIAL A. –** dorsalis pedis A. (ankle)
   b. **POSTERIOR TIBIAL A. –** fibular/peroneal A. (supply blood to the leg and foot)

BLOOD VESSELS OF THE SYSTEMIC CIRCULATION – VEINS

SUPERIOR VENA CAVA – head, neck, thorax, upper limbs

INFERIOR VENA CAVA – abdomen, pelvis, lower limbs

VEINS OF HEAD AND NECK

EXTERNAL AND INTERNAL JUGULAR VEINS – 2 major veins that drain blood from head and neck

1. **EXTERNAL –** more superficial
2. **INTERNAL –** larger and deeper

VEINS OF THE UPPER LIMBS

1. **DEEP VEINS –** drain deep structure of upper limbs
   - **BRACHIAL VEIN –** only noteworthy deep vein which accompany the brachial artery and empties the axillary vein

2. **SUPERFICIAL VEIN –** drain the superficial structure of the upper limbs

MAJOR SUPERFICIAL VEINS:

- **CEPHALIC VEIN –** empties in the axillary vein
- **BASILIC VEIN –** becomes the axillary vein
- **MEDIAN CUBITAL VEIN –** connects the Cephalic w/ Basilic vein
  - **CUBITAL FOSSA –** site for draining blood

VEINS OF THE THORAX

1 – 2. R and L BRACHIOCEPHALIC VEINS

3. **AZYGOS VEIN**

VEINS OF THE ABDOMEN AND PELVIS

INTERNAL ILIAC VEINS – drain the pelvis

EXTERNAL ILIAC VEINS – from lower limbs

COMMON ILIAC VEINS – combine to form the IVC

PORTAL SYSTEM – Vascular system; has no pumping mechanism

HEPATIC PORTAL SYSTEM – begins w/ capillaries in the viscera and ends w/ capillaries in the liver

- **MAJOR TRIBUTARIES:**
  1. **SPLENIC VEIN**
  2. **SUPERIOR MESENTRIC VEIN**
     a. **SUPERIOR AND INFERIOR MV –** carry blood from intestines
     b. **SPLENIC AND SUPERIOR MV –** enters the liver

OTHER VEINS:

- **RENAL VEINS –** drain the kidneys
- **SUPRARENAL VEINS –** adrenal gland
- **TESTICULAR AND OVARIAN VEINS –** testes and ovaries

VEINS OF THE LOWER LIMBS

SUPERFICIAL VEINS:

- **GREAT SAPHENOUS VEIN –** dorsal and medial side of foot
- **SMALL SAPHENOUS VEIN –** lateral side of foot

PHYSIOLOGY OF CIRCULATION

FUNCTION OF CIRCULATORY SYSTEM:

- To maintain adequate blood flow

- Blood flows through arterial system primarily as a result of the pressure produced by the contraction of the heart.

BLOOD PRESSURE – measure of the force of blood exerted against the blood vessel walls

- **SYSTOLIC PRESSURE –** maximum value
- **DIASTOLIC PRESSURE –** minimum value
- **mmHg –** standard unit for BP
- **KOROTKOFF SOUNDS –** can be heard through a stethoscope

PRESSURE AND RESISTANCE – if blood vessels constrict, resistance to blood flow increases and blood flow decreases

PULSE PRESSURE – can be detected on large arteries near body surface

CAPILLARY EXCHANGE – most exchange across the wall of the capillary occurs by DIFFUSION

CONTROL OF BLOOD FLOW IN TISSUES

LOCAL CONTROL – periodic contraction and relaxation of pre-capillary sphincters

NERVOUS CONTROL

- **SYMPATHETIC NERVE FIBERS –** innervate most blood vessels of the body
- **VASOMOTOR CENTER –** controls blood vessel diameter
- **VASOMOTOR TONE –** state of partial constriction of blood vessels

REGULATION OF ARTERIAL PRESSURE

MEAN ARTERIAL PRESSURE – controlled by min. to min. basis by changes in heart rate, stoke vol and pulse rate

BARORECEPTOR REFLEXES – respond to stretch in arteries caused by an increased in pressure

CHEMORECEPTOR REFLEXES – respond to changes in blood oxygen and CO_2 concentration and pH

HORMONAL MECHANISM

- **ADRENAL MEDULLARY MECHANISM**
- **RENIN-ANGIOTENSIN-ALDOSTERONE MECHANISM**
- **VASO PRESSIN MECHANISM**
- **ARTRIAL NATRIURETIC MECHANISM**

EFFECTS OF AGING ON THE BLOOD VESSELS

ARTERIOSCLEROSIS – arteries become narrowed and blood flow decreases

ATHEROSCLEROSIS – type of arteriosclerosis