Anatomy of the Heart and Cardiovascular System

- General Information
  - Circulatory System
    - Pulmonary, Systemic Circulation
    - Arterial, Venous, Portal, Lymphatic Circulation
- Heart
- Aorta and its distrubution
- Great veins

INTRODUCTION

- The cardiovascular system is transport system of body
- It comprises blood, heart and blood vessels.
- The system supplies nutrients to and remove waste products from various tissue of body.
- The conveying media is liquid in form of blood which flows in close tubular system.

FUNCTION OF CARDIOVASCULAR SYSTEM

- Transport nutrients, hormones
- Remove waste products
- Gaseous exchange
- Immunity
- Blood vessels transport blood
  - Carries oxygen and carbon dioxide
  - Also carries nutrients and wastes
- Heart pumps blood through blood vessels

COMPONENTS OF CARDIOVASCULAR SYSTEM

- BLOOD
- HEART
- BLOOD VESSELS

FUNCTIONS OF THE HEART

- Generating blood pressure
- Routing blood

Heart separates pulmonary and systemic circulations

- Ensuring one-way blood flow

Heart valves ensure one-way flow

- Regulating blood supply

Changes in contraction rate and force match blood delivery to changing metabolic needs

BLOOD VESSELS

- Blood Vessels -A closed network of tubes

- These includes:
  - Arteries
  - Capillaries
  - Veins

Portal Circulation

- Digestive organs
- Portal vein
- Liver
- Inferior vena cava
- Heart (right atrium)

Heart

- Four chamber muscular organ
- Comparable to the size of a closed fist
- Located in the mediastinum
  - Between 2nd and 6th ribs
  - Between T5-T8
  - Superior surface of diaphragm
  - Left of the midline (2/3)
  - Anterior to the vertebral column, posterior to the sternum

Heart

- Apex of the heart
  - Located at the 5th intercostal space
  - 9 cm to midline
- Base of the heart
  - Great vessels

BLOOD VESSELS

-Arteries(Distributing channel)

- **Thick walled tubes**
- **Elastic Fibers**
- **Circular Smooth Muscle**

- **Capillaries (microscopic vessels)**
  - **One cell thick**
  - **Serves the Respiratory System**

- **Veins (draining channel)**

BLOOD VESSELS

Arteries

- Blood vessels that carry blood away from the heart
- Thick walled tubes
- the thickest blood vessels and they carry blood high in oxygen known as oxygenated blood (oxygen rich blood).
- Elastic Fibers
- Circular Smooth Muscle

- **Elastic arteries** (Aorta & its major branches)
- **Muscular arteries** (Renal, Testicular, Radial, Tibial etc.)
- **Arterioles** (<0.1 mm)

- Accompanied by vein and nerves
- Lumen is small
- No valves
- Repeated branching

BLOOD VESSELS
Veins

- Blood vessels that carry blood back to the heart
- They have one-way valves which prevent blood from flowing backwards.
- They carry blood that is high in carbon dioxide known as deoxygenated blood (oxygen poor blood).
- Slow current
- Thin walled.
- Capillary > venules > small> medium> great sized veins

Veins

SUPERFICIAL VEINS

- Don't accompany arteries
- Valves
- Communicate with each other
  - **Communicating veins***
- Open to deep veins
  - **Perforating veins***

DEEP VEINS

- accompany arteries
- Valves
- **1 ARTERY - 2 VEINS**
  - **Comitanting veins**

VEINS

- **Veins without valves:**
  - **SVC & IVC**
  - **Hepatic, Renal**
  - **Uterine, Ovarian not Testicular**
  - **Facial**
  - **Pulmonary**
  - **Umbilical**
  - **Emissary**
  - **Portal Veins <2mm**

VEINS

- **Veins without Muscular tissue:**
  - **Dural venous sinuses**
  - **Pial Veins**
  - **Retinal**
  - **Veins of erectile tissue of sex organs**
  - **Veins of spongy bones**

VEINS

- **Factors responsible for venous return:**

1. **Muscle contraction**
2. **Negative intrathoracic pressure**
3. **Pulsation of arteries**
4. **Gravity**
5. **Valves**

Varicose veins

- Skin, subcutaneous tissue

- Superficial veins

- Perforating veins

- Deep veins

CAPILLARIES (5-8 micron)

- The smallest blood vessels are capillaries and they connect the arteries and veins.
- This is where the exchange of nutrients and gases occurs.

AORTA

- Left ventricle
- Ascending Aorta
  - A.coronaria dextra
  - A.coronaria sinistra
- Aortic Arch
  - Brachiocephalic trunk
  - Left common carotid artery
  - Left subclavian artery
- Descending Aorta (T4-L4)
  - Thoracic aorta
  - Abdominal aorta
  - Aortic bifurcation
    - Left and right common iliac artery

ASCENDING AORTA

- Right coronary artery
- Left coronary artery

AORTIC ARCH

- **Branches :**
  - Brachiocephalic trunk
    - Right common carotid artery
    - Right subclavian artery
  - Left common carotid artery
  - Left subclavian artery

Arteries of head and neck

- Right and left common carotid arteries
  - External carotid artery
  - Internal carotid artery

ABDOMINAL AORTA

- T12-L4
- Aortic hiatus (T12)
- Left to midline

- Bifurcation: L4 Level
  - Right common iliac artery
  - Left common iliac artery

Pelvic Arteries

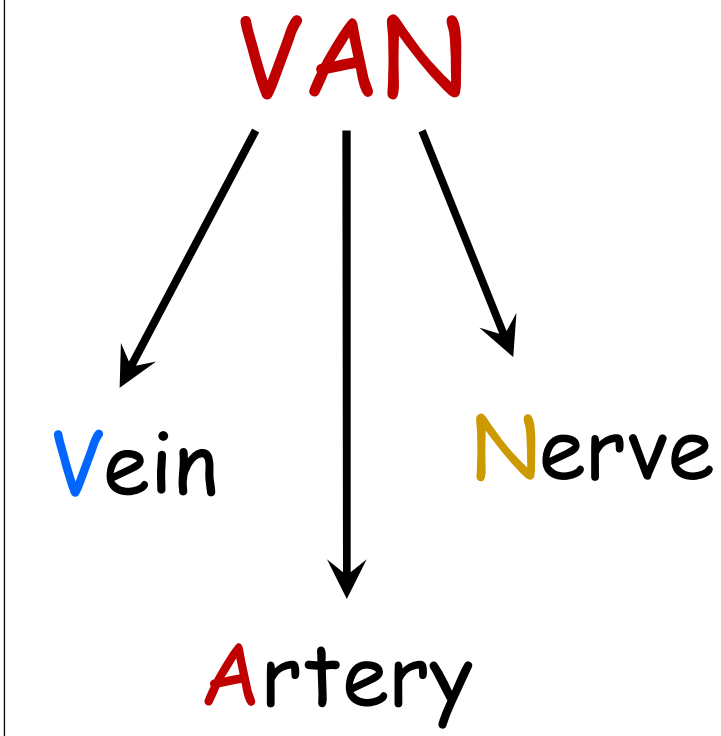
- Right and left common iliac artery
- **Internal iliac artery**
- **External iliac artey**

continues as femoral artery

Arteries of the lower limb

External iliac artery

- Inguinal ligament
- Femoral artery



Medial ⟶ Lateral

Great Veins

- Superior vena cava
- Inferior vena cava
- Portal vein
- Pulmonary veins

SUPERIOR VENA CAVA

- Brachiocephalic veins (right and left)
- Internal jugular vein + subclavian vein = brachiocephalic vein

Veins of the Head and Neck

- External jugular vein
- Internal Jugular vein

Veins of the Upper Limb

Deep :

accompany to arteries.

- Radial vein
- Ulnar vein
  - Brachial vein
  - Axillary vein
  - Subclavian vein

Veins of the Upper Limb

Superficial:

- Rete venosum dorsale manus
- Cephalic vein
- Basilic vein
- Median antebrachial vein
- Median cubital vein

INFERIOR CAVAL VEIN

- Right to abdominal aorta
- Largest
- Common iliac vein, L5
- Right atrium

Veins of the Pelvis

- External iliac vein

+

- Internal iliac vein

↓

- Common iliac vein

↓

- Inferior vena cava

↓

- Right atrium

Veins of the Lower Limb

Superficial Veins

- Arcus venosus dorsalis pedis
- Great saphenous vein (medial)
  - Femoral vein
- Small saphenous vein (lateral)
  - Popliteal vein

Veins of the Lower Limb

- **Deep veins**
  - Tibial veins (anterior-posterior)
  - ↓
  - Popliteal vein
  - ↓
  - Femoral vein
  - ↓
  - External iliac vein