CARDIOVASCULAR SYSTEM

Vessels of the human body

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Heart Great Vessels

1. superior vena cava
2. inferior vena cava
3. pulmonary veins
4. pulmonary trunk
5. The aorta
Overview of the circulatory system

The systemic circulation

- Includes the arteries and arterioles that carry blood containing oxygen and nutrients from the left ventricle to systemic capillaries throughout the body,
- plus the venules and veins that carry blood containing carbon dioxide and wastes to the right atrium.
**SYSTEMIC CIRCULATION**

- Oxygenated blood to body organs leaves LV through the **Ascending Aorta**
- Gives two branches
- The **two coronary arteries** to the heart muscle

- **Aortic Arch has three branches:**
  1. **Brachiocephalic trunk**, has 2 branches:
     a. Right common carotid a.
     b. Right subclavian a.
  2. **Left common carotid a.**
  3. **Left subclavian a.**
PULMONARY CIRCULATION

- Pulmonary arteries carry blood AWAY from the heart to the lungs

- The flow of deoxygenated blood from the right ventricle to the air sacs (Alveoli) of the lungs “This blood is low in oxygen, high in carbon dioxide”

- Oxygenated blood from the air sacs through the Pulmonary veins carry blood BACK to the heart to the left atrium “This blood is high in oxygen and will be sent out to the body tissues through the systemic circuit”
The pulmonary trunk emerges from the right ventricle and then divides into two (2) branches. The right pulmonary artery runs to the right lung; the left pulmonary artery goes to the left lung.

On entering the lungs, the branches divide and subdivide until ultimately they form capillaries around the air sacs in the lungs. The capillaries unite, venules and veins are formed, and, eventually, two pulmonary Veins from each lung transport the oxygenated blood To the left atrium.
LEFT COMMON CAROTID ARTERY

- Carotid sinus
- External carotid artery
- Right common carotid artery
- Right subclavian artery
- Brachiocephalic trunk
- Sternoclavicular joint
- Arch of aorta
- Superior thyroid artery
- Superior laryngeal artery
- Omohyoid muscle
- Left common carotid artery
- Left subclavian artery
- Manubrium of sternum
**Terminal branches** Common Carotid Arteries

- (R) common carotid artery arises from the brachiocephalic artery
- (Lt) common carotid artery arises directly from the aortic arch

- **Main sources of blood supply to head, face and neck**
- **Located on either side of neck and divide into internal and external carotid arteries**
  - **Internal carotid artery** (supplies the inside of the skull)
    - Supplies brain, eyes, eyelids, forehead, nose and internal ear
  - **External carotid artery** (Supplies structures outside skull)
    - Supplies the scalp, ear, face, neck and sides of head
    - **Common carotid artery** split into the external and internal carotid arteries at the upper border of the thyroid cartilage, at around the level of the fourth cervical vertebra.
Branches of External Carotid Artery

- **Anterior**
  - Superior thyroid
  - Lingual
  - Facial
- **Posterior**
  - Posterior auricular
  - Occipital
- **Terminal**
  - Superficial temporal
  - Maxillary
- **Medial**
  - Ascending pharyngeal
INTERNAL CAROTID A.

Enters skull through carotid canal
It gives branches
1- Ophthalmic artery
2- Anterior cerebral
3- Middle cerebral arteries

Internal carotid arteries sharing the formation of
Circle of Willis
Subclavian artery

Gives the following branches

1- Thyrocervical art
2- Internal thoracic art
3- Vertebral art
Vertebral artery
- Rt and Lt vertebral arteries
  - Ascend through vertebral foramina of C6-C1 vertebral transverse processes
  - They enter the skull through foramen magnum and unite forming the Basilar artery, which gives off branches to the pons, cerebellum & inner ear

Circle of Willis inside the skull is formed by Internal carotid arteries + Basilar artery (formed by the union of the two vertebral arteries)
Basilar artery: gives main branches
1- posterior cerebral arteries
2- Posterior communicating arteries connect to middle cerebral arteries

CIRCLE OF WILLIS

Note how it loops around pituitary gland & optic chiasm
**ARTERIES SUPPLYING THE UPPER LIMB**

- **Subclavian artery**
  - (Rt) subclavian artery arises from the brachiocephalic artery
  - (Lt) subclavian artery arises directly from the aortic arch

The subclavian artery runs laterally between the clavicle & 1st rib to enter the axilla
- *Subclavian* runs laterally onto 1st rib, under clavicle
- Enters the axilla and its called then *Axillary* artery
  - Sends branches
- Continues as *brachial* artery in upper arm
  - Splits into *radial* & *ulnar* arteries
Brachial artery

Branches.

Terminals: radial and Ulnar
- **Superficial & deep palmar arches**
  - formed by an anastomosis of the radial & ulnar arteries in the palm of the hand
  - the metacarpal arteries arise from the deep palmar arch
  - the digital arteries arise from the superficial palmar arch
WHERE TO TAKE PERIPHERAL ARTERY PULSES IN THE UPPER LIMB.
**Descending Aorta**

Thoracic aorta
- at T12 becomes abdominal aorta

Abdominal aorta
- ends at L4 branching into:
  - R & L common iliac artery

**Branches of Thoracic aorta**
*Posterior intercostal branches*
*Pericardial branches*
*Oesophageal branches*
*Bronchial branches*
*superior phrenic art.*
Branches of the abdominal aorta

1- Anterior, midline branches supply the digestive tube
   Celiac trunk
   Superior mesenteric artery
   Inferior mesenteric artery
2- Paired branches from the side of abdominal aorta
   Inferior Phrenic arteries
   adrenal arteries,
   Renal arteries
   Gonadal arteries
3- paired branches from behind of abdominal aorta
   Lumbar arteries
4- Terminal branches
   Right and left common iliac arteries
   Median sacral artery
Branches of Abdominal Aorta

- Hiatus (opening) for inferior vena cava
- Hiatus (opening) for esophagus
- Adrenal (suprarenal) gland
- Celiac trunk
- Kidney
- Abdominal aorta
- Lumbar arteries
- Ureter
- Diaphragm
- Inferior phrenic artery
- Middle suprarenal artery
- Renal artery
- Superior mesenteric artery
- Gonadal (testicular or ovarian) artery
- Inferior mesenteric artery
- Common iliac artery
- Median sacral artery
The Abdominal aorta terminate by branching into Rt and Lt Common iliac A. at L4 level these branch into

- **Internal iliacs** to pelvic organs, perineum, buttocks, medial thighs
- **External iliacs**: to rest of lower limbs
- **External iliac** passes under **inguinal ligament** becoming **Femoral artery**
- At back of knee, femoral becomes **popliteal artery**, and branches
POPLITEAL ARTERY

- It is the continuation of the femoral artery at the adductor hiatus. It runs through the popliteal fossa.
- It ends at the lower border of the popliteus muscle by dividing into its terminal branches.
  1. The Anterior tibial artery
  2. Posterior tibial artery

which gives the peroneal artery
ANTERIOR TIBIAL ARTERY

It supplies all structures in the anterior compartment of the leg and perforating branches to lateral compartment

- It enters the foot at the midpoint between the malleoli. On the foot it continues as Drorsalis Pedis Artery

![Arteries of the Lower Limb](image)
**POSTERIOR TIBIAL ARTERY**

- It supplies all structures in the posterior compartment of the leg and gives Peroneal artery which supplies the posterior and lateral compartments of the leg.

- Post. Tibial artery runs behind and inferior to medial malleolus

- It then enters the sole of the foot and divides into **Medial and Lateral plantar** branches
PLANTAR ARTERIES

- The posterior tibial artery divides into:
  - Lateral plantar
  - Medial plantar

Deep plantar arch is formed by the deep plantar branch of dorsalis pedis artery and lateral plantar artery
Venous drainage of the body

A. Veins of the systemic circulation empty into the superior vena cava, inferior vena cava and the coronary sinus, which, in turn, empty into the right atrium.

B. Pulmonary circulation: pulmonary veins

C. Portal circulation: hepatic veins

Ligamentum arteriosum connecting the Aortic arch to the left pulmonary artery. It is an embryonic duct that conveys the blood from pulmonary trunk to aorta. It is closed after birth and changed to a ligament.
Internal jugular veins
- Drain most of blood from brain
- Run lateral to internal then common carotid
- **At base of neck joins subclavian v. to form brachiocephalic v.**

External jugular veins – drain some of scalp & face and ends into the subclavian vein

Right and left Brachiocephalic veins forming the superior vena cava which receives the Azygos vein and ends into Rt. atrium
Veins of the Upper Limb

SUPERFICIAL VEINS OF THE UPPER LIMB

*Dorsal venous arch of the hand
*Cephalic vein, joins the Axillary vein.
*Basilic vein joins the Brachial artery
*Median vein of the forearm, joins the Basilic or cephalic vein

At elbow joint
Deep Venous Supply of the Upper Limb Seen on Anterior Surface

*Deep and superficial palmar venous arches
*Radial vein on radial side
  +
*Ulnar vein on ulnar side
  =
*Brachial vein
*Axillary vein
*Subclavian vein
Venous drainage of lower limb

**Popliteal vein** drains

a. anterior tibial vein
b. posterior tibial vein
c. Small saphenous vein

\[\downarrow\]

**Femoral Vein** drains

Great saphenous veins

\[\downarrow\]

**External Iliac Vein**

\[+\]

**Internal iliac vein** drains

Pelvic veins

\[=\]

Lt Common Iliac Vein + Rt Common iliac vein

\[=\]

**Inferior vena cava**
Inferior vena cava drains

a. paired hepatic veins
b. Paired Inferior phrenic veins
c. paired renal veins
d. paired gonadal veins

e. Lumber veins

Tributaries of IVC: which are asymmetrical
Left gonadal and suprarenal veins drain into left renal vein. While on right they drain directly into IVC
Portal system

- Picks up digested nutrients from stomach & intestines and delivers them to liver for processing and storage
  - Storage of nutrients
  - Detoxification of toxins, drugs, etc.

Portal circulation starts in capillaries and ends in capillaries

- Route: arteries ➔ capillaries of gut ➔ portal vein ➔ liver’s capillaries ➔ hepatic veins ➔ IVC

Don’t confuse *hepatic vein* with *hepatic portal vein*
Superior mesenteric and splenic veins unite to form portal vein, which enters the liver.

Inferior mesenteric vein empties into the splenic vein.

Blood leaves the liver through four hepatic veins which drain into inferior vena cava.
Thank You