

Cardiovascular System Anatomy and Physiology

NEBDN

S.M.A.R.T. Course

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Cardiovascular system

■ Heart

- 2 muscular pumps arranged in parallel and beating in Unison
- Pulmonary circulation
- Systemic circulation

■ Blood Vessels

- Arteries, Capillaries & veins
- Aorta – main systemic artery

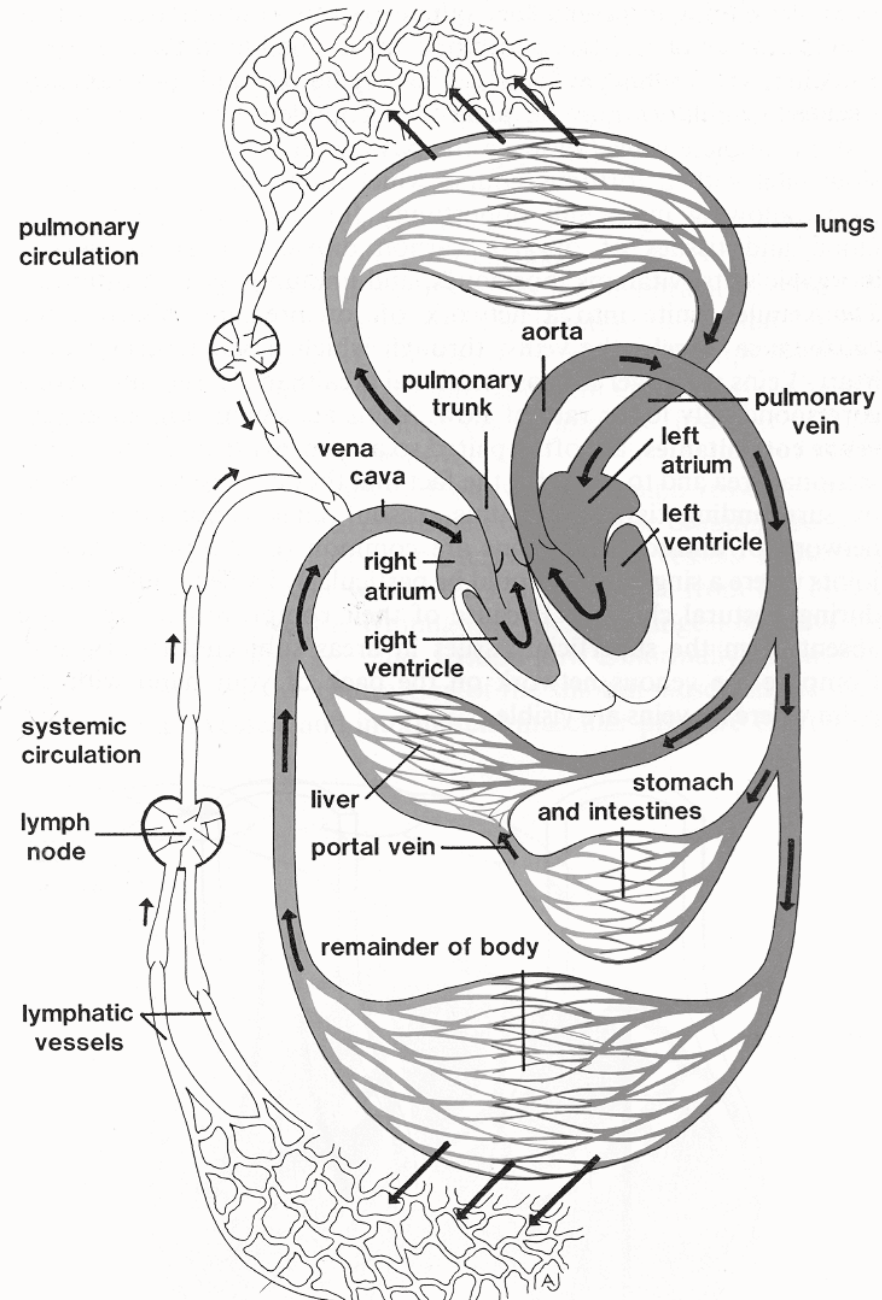
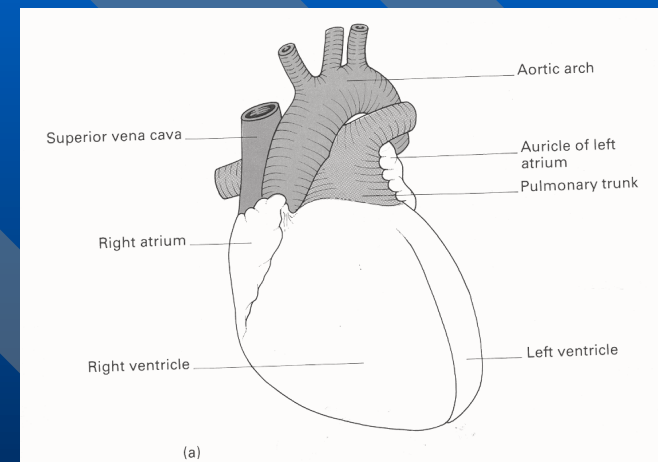
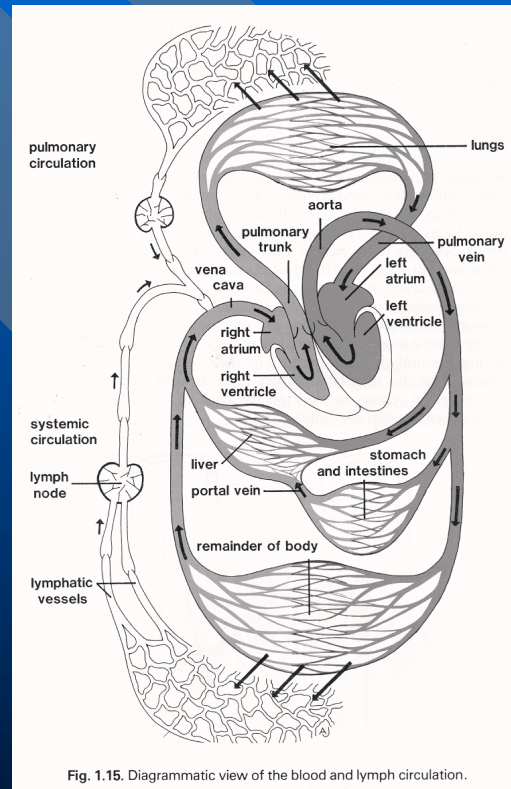


Fig. 1.15. Diagrammatic view of the blood and lymph circulation.

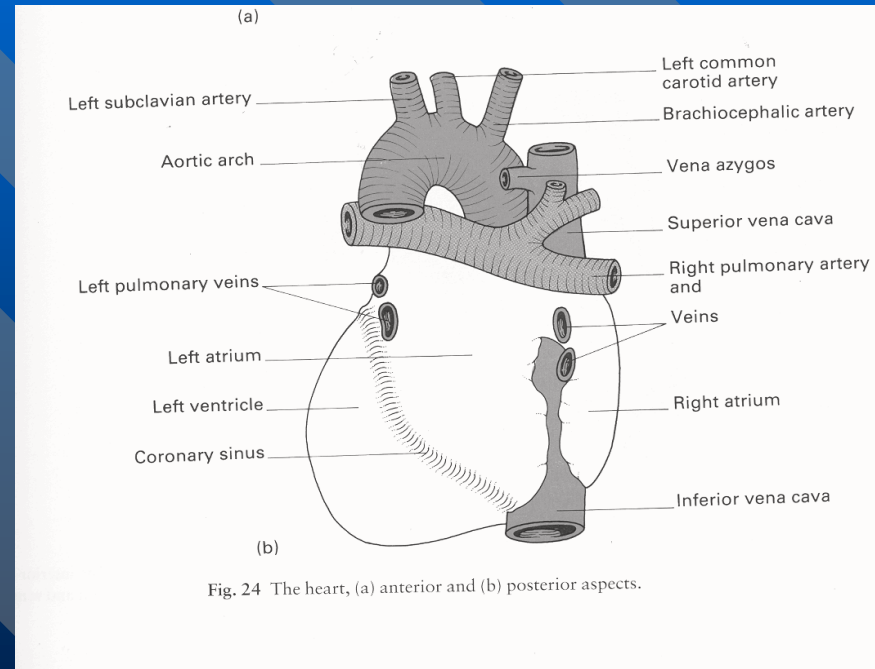
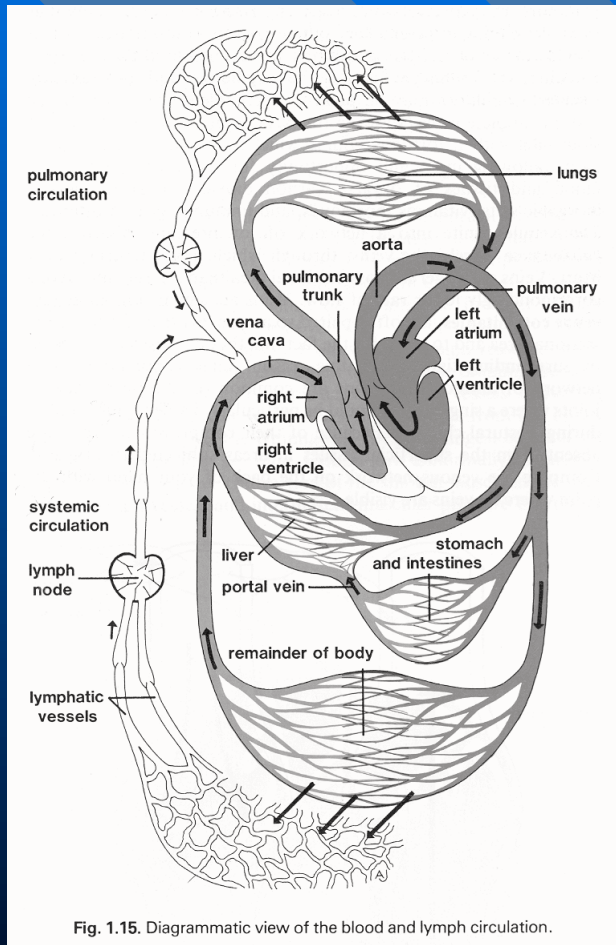
Cardiovascular system

Each pumping unit consists of 2 chambers

A thin walled atrium opening into a more muscular ventricle

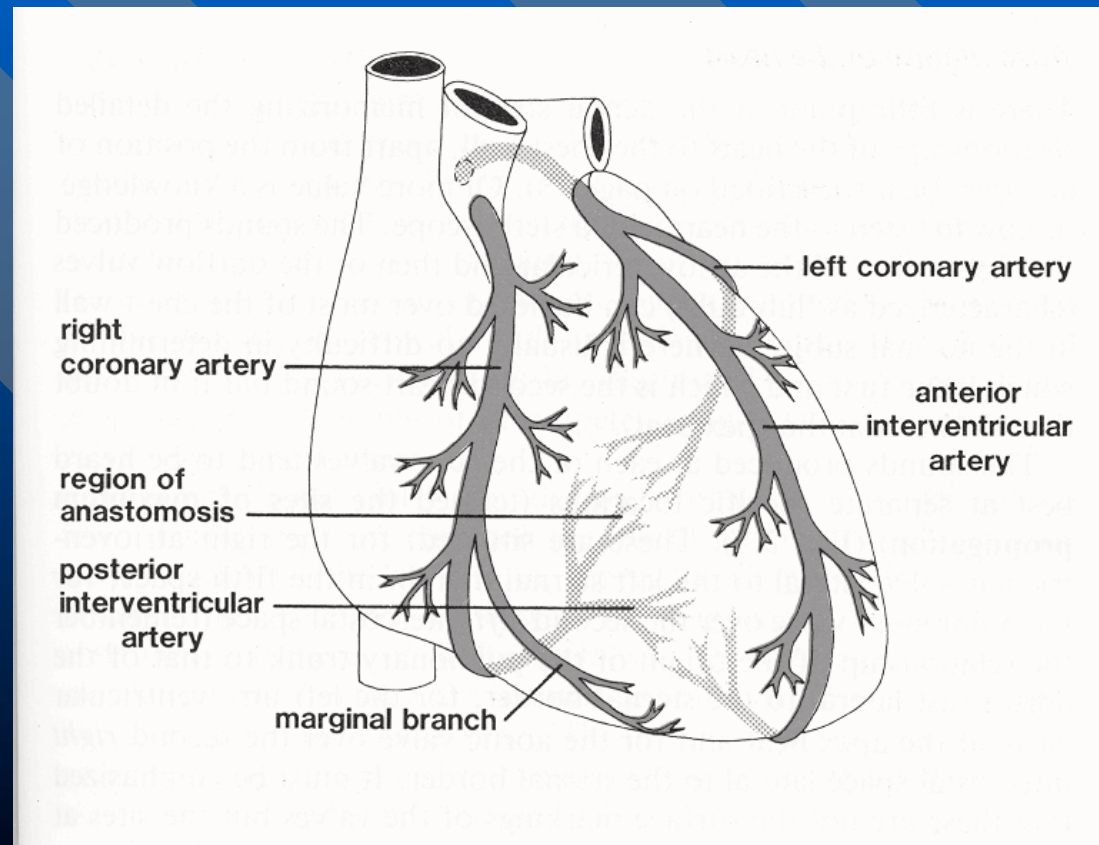
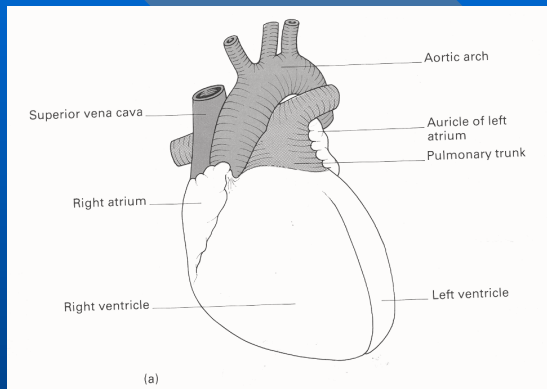


Cardiovascular system



Cardiovascular system

Coronary arteries



Cardiovascular system

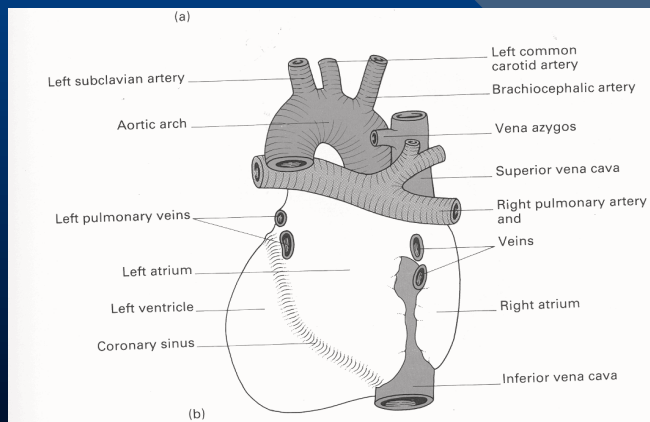
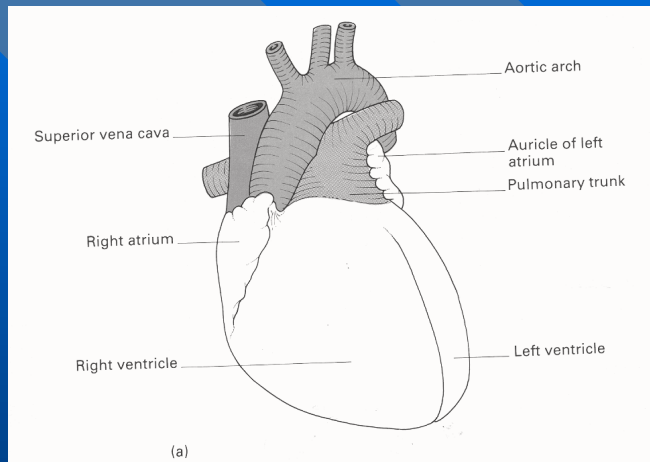
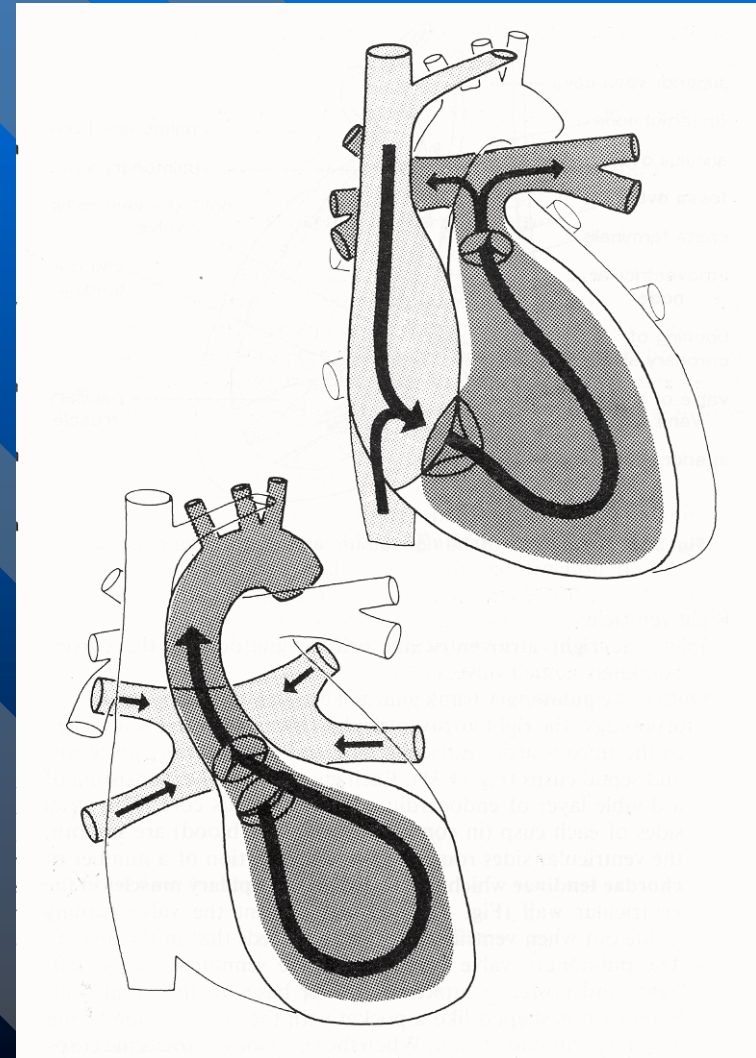


Fig. 24 The heart, (a) anterior and (b) posterior aspects.

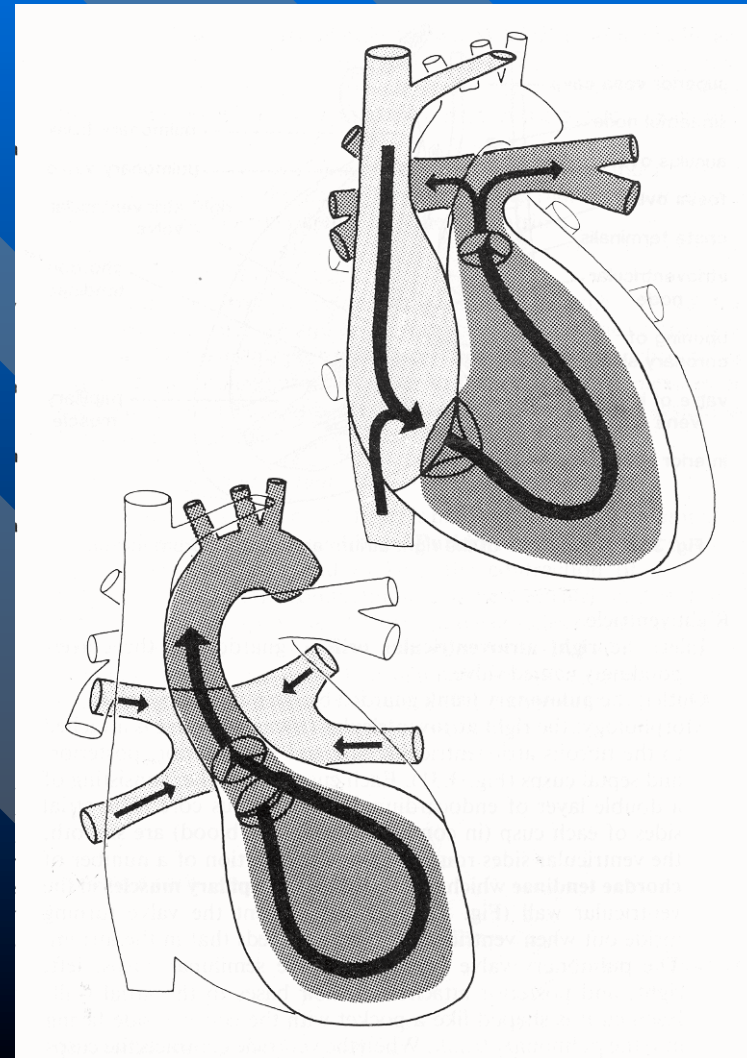


Cardiovascular system

Capacity of both ventricles is similar @ 60-70ml

Resistance offered by pulmonary circulation is less than that offered by the systemic circulation.

The wall of the right ventricle is therefore considerably thinner than that on the left

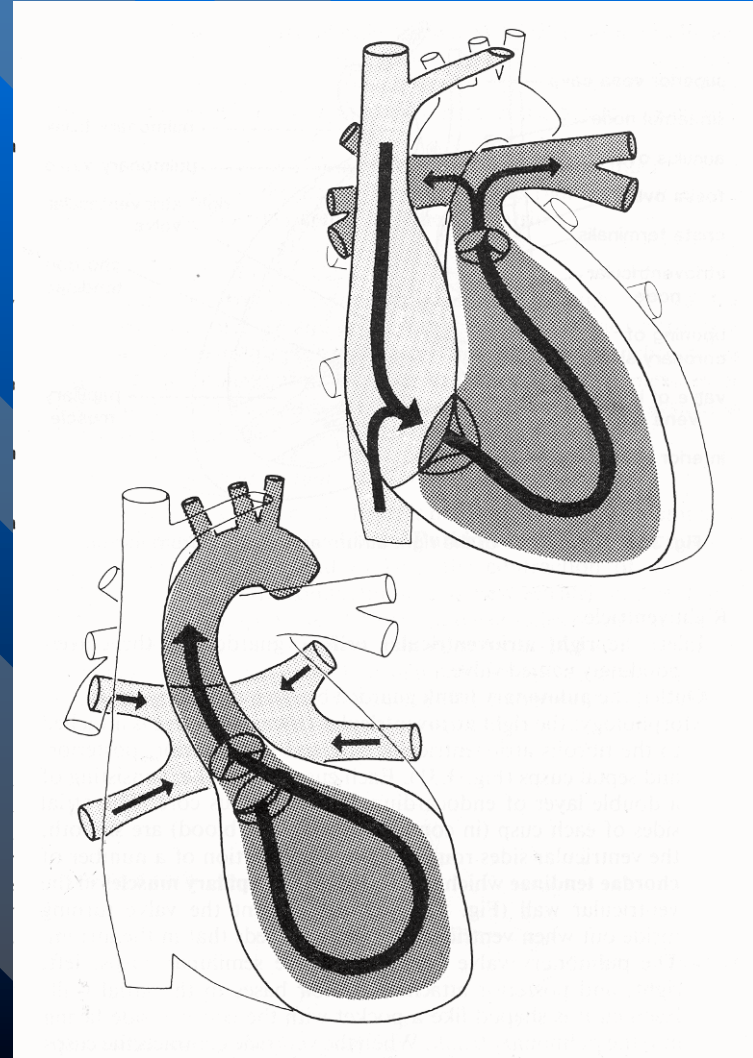


Cardiovascular system

Heart Sounds ‘ Lub Dub ’

Closure of the heart valves produces mechanical vibrations which are audible at the chest wall as the heart sounds

- First sound is caused by the closure of the atrio-ventricular valves and marks the beginning of ventricular systole
- The second heart sound is caused by the closure of the aortic and pulmonary valves

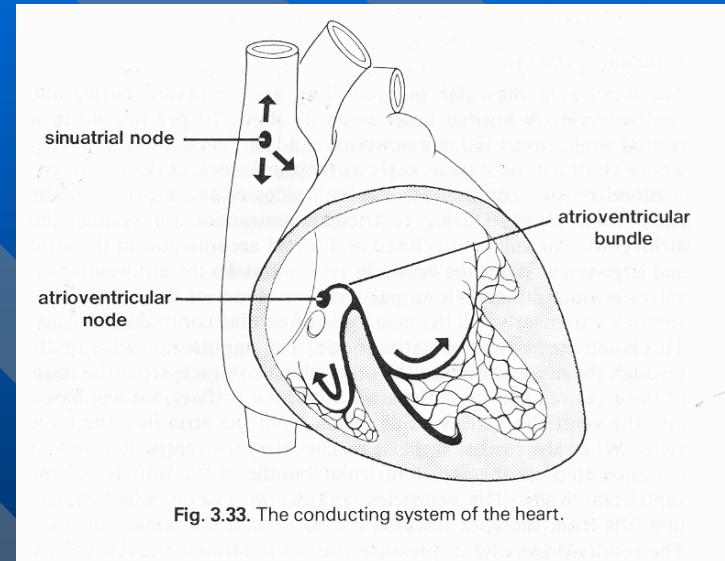
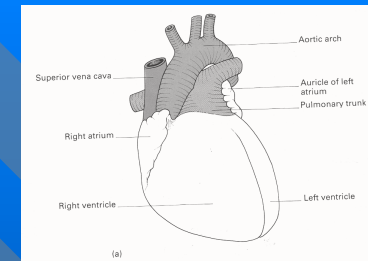


Cardiovascular system

Pacemaker cells located in Sino-atrial node (spontaneously produce action potentials)

Normal resting heart rate (HR)

72 beats per min



Cardiovascular system



P wave generated by spread of depolarisation across the atria

QRS complex produced by the spread of depolarisation across the ventricles. These contain more muscle and so generate larger surface potentials

T wave is caused by the repolarisation of the ventricles

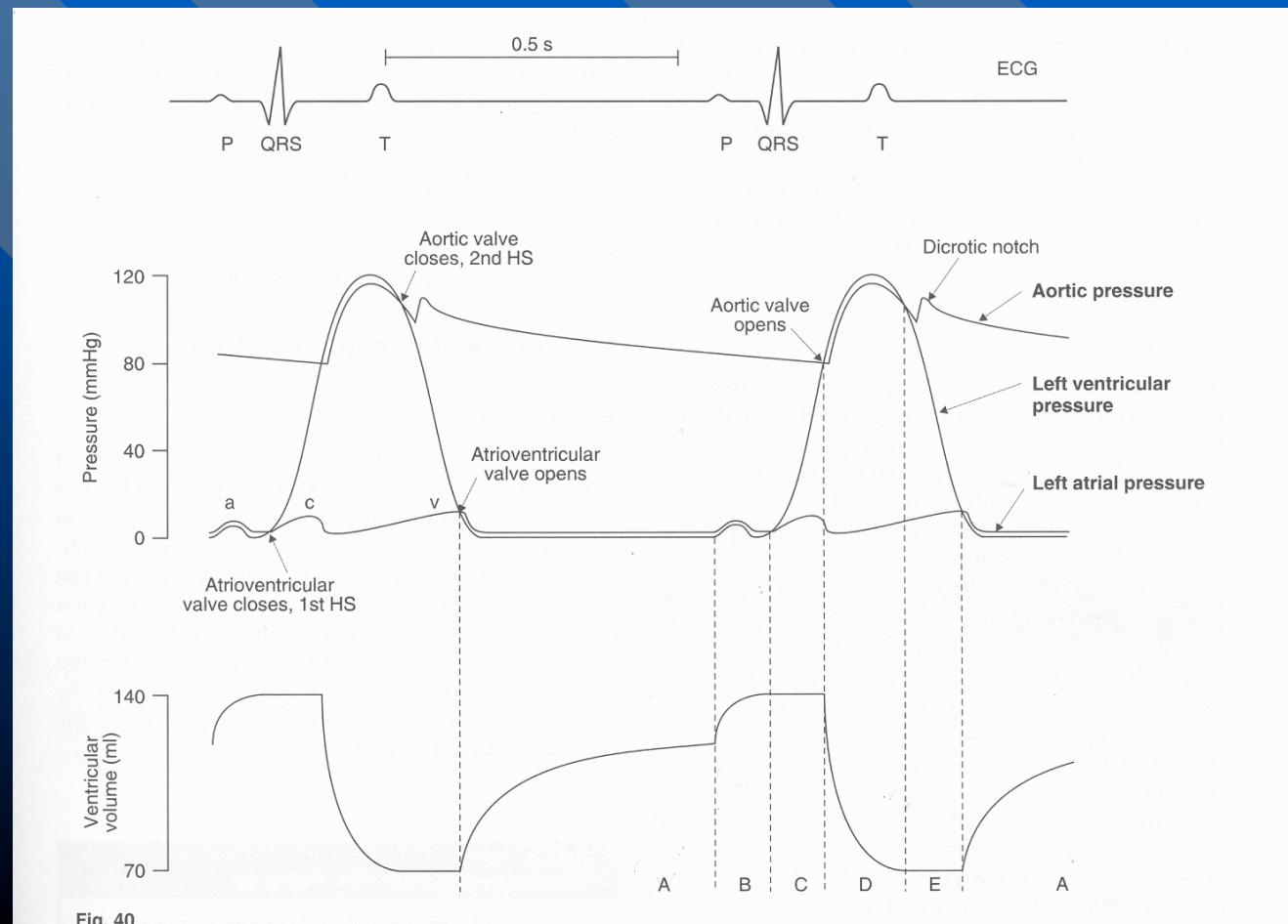


Fig. 40

Cardiovascular system

Cardiac output

Cardiac output is a measure of the hearts ability to pump blood and is defined as the *volume of blood expelled by either ventricle in 1 minute*

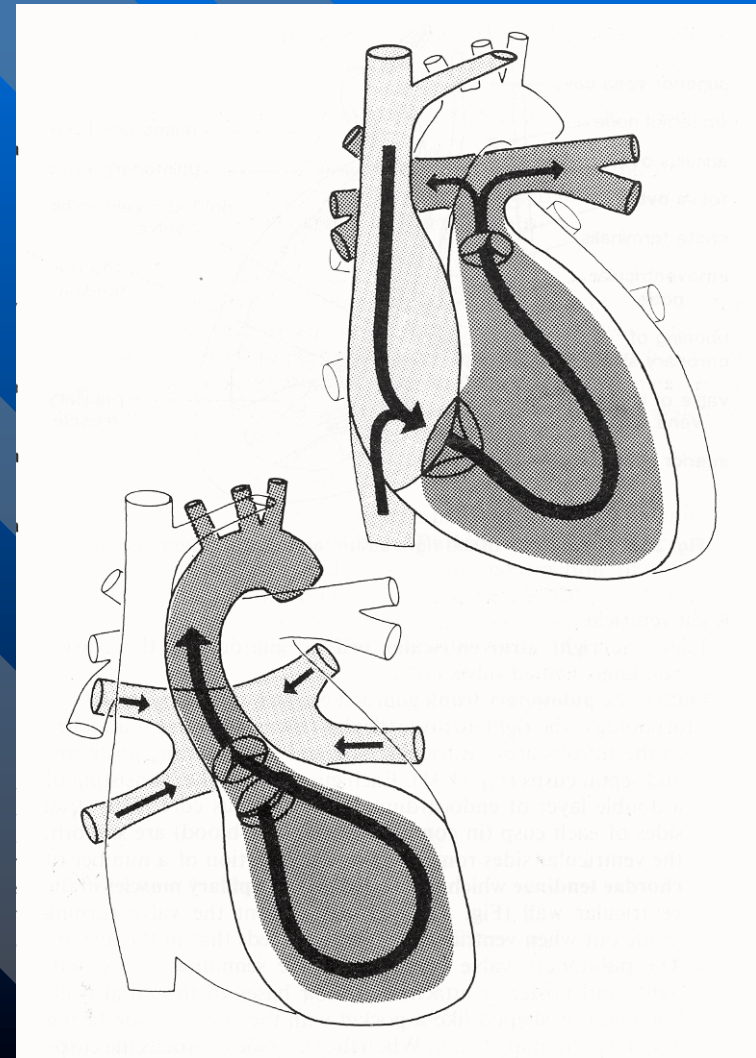
Cardiac output = HR x Stroke volume

At rest

Cardiac output = 72 min x 70 ml /beat

5040 ml / min

Approx 5L per minute



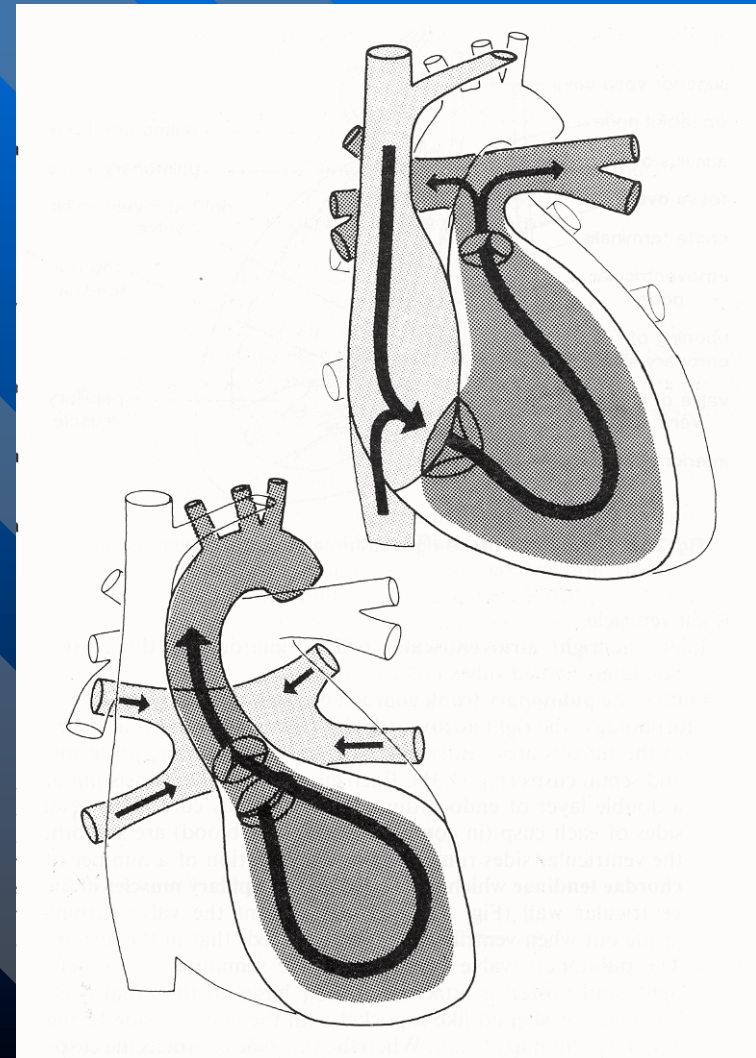
Cardiovascular system

Arterial Blood Pressure

Arterial blood pressure is equal to the cardiac output multiplied by the peripheral resistance

Peripheral resistance is regulated through changes in arteriolar constriction.

Changes in cardiac output result from changes in cardiac function (e.g. heart rate or changes in venous return.)



Cardiovascular system

Pulse

Common Sites

Carotid artery

Brachial artery

Radial artery

Assess

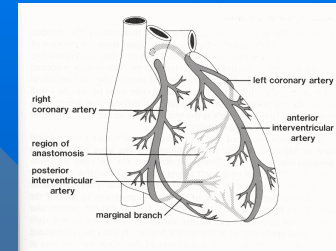
Rate

Rhythm

Volume

Cardiovascular system

Common Heart Problems



Heart defects

- hole in the heart
- leaky valve or narrowed valve
- Conduction defect

May have a murmur

May have an abnormal pulse

Heart disease

- Narrowing of coronary arteries (myocardial ischaemia)

May have Chest pain

May have SOB

- Heart attack (myocardial infarction)

May DIE !!

Cardiovascular system

Common Heart Problems

BROKEN HEART

SYMPTOMS

TREATMENT

TLC

TIME

CHOCOLATE

Questions?



Had enough by now!



Coronary Artery Disease

- Major cause of death in middle and old age in the Western world
- Factors predisposing to coronary artery disease
 - High fat diet esp. cholesterol
 - Cigarette smoking
 - Lack of exercise
 - Obesity
 - Stress
 - High BP
 - Diabetic patients

Angina

- A reduction in the oxygen supply to the heart
- Symptoms and signs
 - Chest pain
 - Pain may radiate down the left arm
 - Exacerbated by exertion, cold air, after a large meal
 - Relieved on rest
- Treatment
 - Stop activity
 - GTN spray or tablets sublingually – 1 or 2 doses
 - Oxygen 2-4 litres per minute
 - If symptoms do not subside in 10-15 mins treat as Coronary Thrombosis

Myocardial infarction

(Heart attack)

- **Ischaemia of an area of myocardial muscle due to narrowing or blockage of a coronary artery**
- **Signs and symptoms**
 - Severe crushing pain in the chest which may radiate down the left arm, may also radiate up to the neck and jaw
 - Pain lasts for several minutes or hours (much longer than angina)
 - Signs of shock – cold, clammy, low BP
 - Patient may collapse and go unconscious

Myocardial infarction

(Heart attack)

■ Treatment

- Call for help – 999
- Maintain comfortable posture for patient
- Aspirin
- Pain relief -morphine usually required or nitrous oxide if available
- Oxygen 2-4 litres per min
- Admit to hospital

Cardiac Arrest

- **Myocardial infarction**
- **Hypoxia secondary to respiratory depression or arrest**
- **Tachycardia**
- **Anaesthetic overdose**

- **Signs and symptoms**
 - Unconscious and unresponsive
 - No carotid pulse
 - Breathing difficult and then stops
 - Dilated pupils and ashen, grey appearance

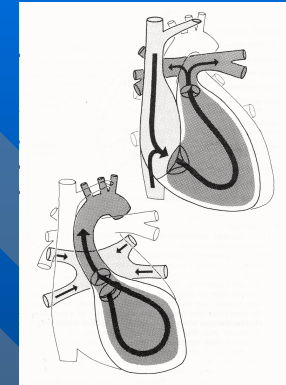
Cardiac Arrest

■ Treatment

- Summon help – 999
- Cardio-pulmonary resuscitation
- Rapid administration of defibrillation and drugs (Adrenaline, Atropine) under ECG monitoring

Cardiovascular system

Management of patients with heart problems



Heart murmur

**** Need AB cover ****

Heart disease

Conservative treatment if possible

Use LA without adrenaline

Caution if patient taking Warfarin

or Aspirin – risk of bleeding

