## **Blood clotting**

When blood vessels/tissues are damaged due to high blood pressure or toxins from cigarettes, platelets are activated and stick together. They release clotting factors like thromboplastin (enzyme) and form a plug to seal minor damage to reduce rate of blood loss if damage is great. The thromboplastin catalyses the conversion of prothrombin (inactive plasma protein) to thrombin (active enzyme). Calcium ions, Vitamin K, clotting factors VIIIa and Xa is required. Thrombin catalyses the conversion of fibrinogen (plasma protein to fibrin (insoluble fibrous strands forming a mesh that traps RBCs to form clot). As it dries, the clot forms a scab, both preventing blood loss and entry of microbes. Clothing process is aided by blood vessel vasoconstriction thus reducing blood flow to the damaged area. \_\_\_\_ = function

Removal of calcium ions is used to prevent blood donated by another individual from clotting. If factor VIII is missing, disorder – haemophilia – clotting time increases. Certain types of medical treatment can increase risk of a clot forming within the blood vessel even if vessel is not damaged.



Pressure gradients – direction of blood flow

Blood always flow from an area of high pressure to an area of low pressure

When atriver a ventricle opinion, the volume inside decreases and pressure increases which allows the right valves to open and close at the right time

Why is max pressure similar in both atria? – they have the same thickness of muscle and contract with equal force, since they only have to pump blood into the ventricles below

Structure	Function
Atria	Thin walled as they receive blood from the lungs (left atrium or body) and pump the blood into the adjacent ventricles (short distance) thus doesn't require much muscle tissue; atria walls have similar thicknesses as they contract with equal force
Ventricles	Thick walled as they pump blood to the lungs (right) or around the body (left); right ventricle has thinner walls than left as it doesn't have to pump with the same force as left since the distance the blood has to travel is less also the delicate pulmonary capillaries could get damaged. In addition, low pressure, slower rate of blood flow through lung capillaries, more time for diffusion/exchange of gases
Septum	Thick muscular wall that runs through the centre of the heart. This separates the two sides of the heart
AV (atrioventricular) valves (tricuspid&bicuspid)	Lie between the atria and the ventricles and prevent backflow of blood into the atria when the ventricle contract; they are anchored by the papillary muscles that are embedded in ventricle wall; prevented to turn inside out by chordae tendinae and aided by contraction of papillary muscles
Chordae tendinae	(Valve tendons/heart strings) link the muscle and the valves; resemble short lengths of string thus can function without impeding the flow of blood through the ventricle; very tough and flexible but not elastic, ensuring that when ventricle contract (increased pressure in ventricle forcing AV valves to shut), they prevent the valves

## The heart







## Pressure change during the cardiac cycle

Pressure changes in left atrium, the left ventricle and in the aorta during one cardiac cycle The pressure in right ventricle and pulmonary artery shows same feature in the graph as the left but lower First heart sound is softer and second is sharper – these sound is recorded in phonocardiogram Electrical activity through the heart is recorded as an electrocardiogram



of electrical stimulation that triggers the contraction of the atria

Short and straight line between P and Q – represents the wave of excitation passing through the AV node QRS - complex represents the electrical activity that stimulates contraction of ventricles R – peak has a greater

amplitude than P as there is much greater electrical activity in the ventricles since it's larger and has thicker muscle

 I – wave represents the relaxation of the ventricles (the ventricles are repolarised)

- A- Atrial wall contract, atrial pressure increases, AV valves open (as atrial pressure > ventricle pressure) and semilunar valves closed (as aortic pressure > ventricular pressure)
- B- Atrial contraction complete and empty of blood and ventricle begin to contract (ventricular pressure > atrial pressure) AV valve close first heart sound
- C- Continued contraction of ventricles (ventricular pressure > arterial pressure) thus semilunar valves open
- D- (arterial pressure > ventricular pressure) semilunar valves close due to loss of blood from ventricles second heart sound
- E- Ventricular pressure falls as little blood present and walls begin to relax, volume increases (atrial pressure > ventricular pressure) AV valves open