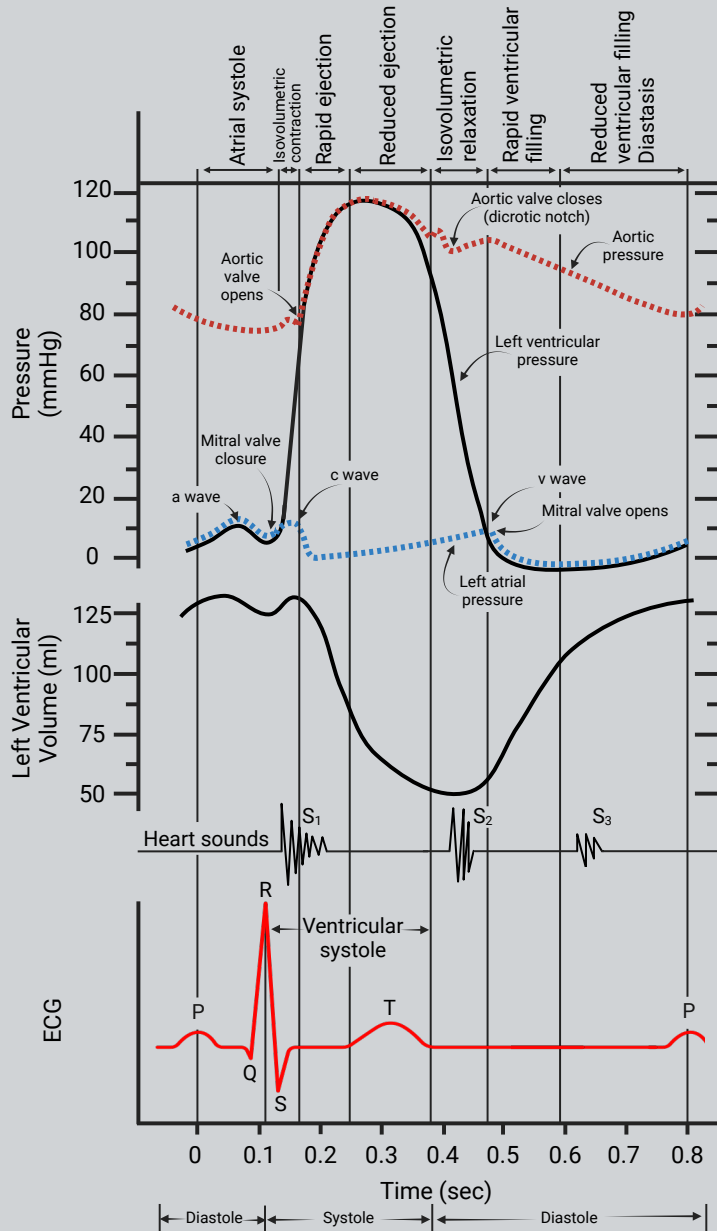


The Cardiac Cycle

The cardiac cycle involves movement of blood through the heart and the body as a result of a series of pressure changes and muscle contractions within the heart.



Atria

Both the atria and ventricles are in diastole at the beginning of the cardiac cycle.

The coronary sinus and vena cava (superior and inferior) supply the right atrium with blood while the pulmonary veins supply the left atrium with blood.

Blood begins to fill the right and left ventricles passively through open tricuspid and mitral valves during diastole. Approximately 70-80% of ventricular filling occurs during this time. The pulmonary and aortic valves are closed during this phase.

Depolarization of the atria occur and subsequently contraction follows (P wave on EKG) causing blood to be pumped into the ventricles (atrial systole ~100ms). Atrial contraction accounts for the final 20-30% of ventricular filling.

Atrial systole ends prior to the beginning of ventricular systole and returns to diastole

Ventricles

The Ventricles are now filled with ~130ml of blood in the resting adult. This volume is known as end-diastolic volume or preload.

Depolarization of the ventricles occur and is followed by contraction (ventricular systole). The rise in pressure inside the ventricles cause the tricuspid and mitral valves to close. The period after the AV valves close prior to the pulmonary and aortic valves opening is called **isovolumetric contraction** (no blood is ejected during this phase of ventricular systole).

In the ejection phase of ventricular systole, pressure inside the ventricles exceed the pulmonary and aortic pressures causing the pulmonary and aortic valves to open ejecting 70-80mls of blood (stroke volume). The 50-60mls of blood remaining in the ventricles following systole is the end-systolic volume.

Ventricular systole is represented by the QRS complex on EKG and lasts ~270ms

Following systole, repolarization of the ventricles occurs. Ventricular pressures fall as the ventricles relax causing the closure of the pulmonary and aortic valves (dicrotic notch on ABP tracing)

During this phase prior to the opening of the AV valves **isovolumetric ventricular relaxation** occurs (ventricular volume remains constant during this phase).

Once ventricular pressure drops below atrial pressure, AV valves open and blood begins to fill the ventricles.

Ventricular repolarization is represented as the T wave on EKG. Ventricular diastole lasts ~430ms.