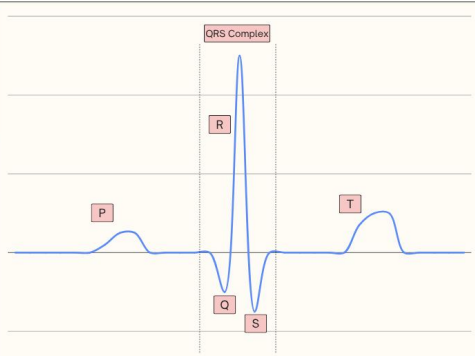


ECG Reading

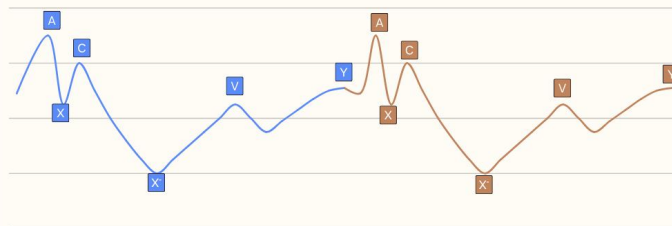
P Wave: Begins Atrial Systole

QRS Complex: Begins Ventricular Systole

T Wave: Ends after Ventricular Diastole



Right Atrial Pressure Curve



Measured through the Right Internal Jugular Vein

+ A Wave:

- Atrial Contraction during Atrial Systole

- X Wave:

- Escape of blood from atria to ventricle During Isometric Contraction

+ C Wave:

- Bulge of AV Valve cusps into atria
- During isometric contraction phase

- X⁻ Wave:

- Downwards pull of AV Cusps

+ V Wave:

- Accumulation of VR in atrium

- y Wave:

- Blood flow from atria to ventricle During Ventricular Filling

Made by Dr. Moataz Alsharkawy

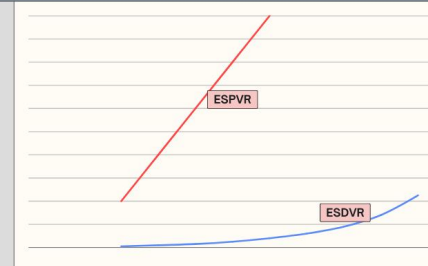


EDPVR Vs. ESPVR

EDPVR = Passive Length-Tension relationship of isolated muscle.

ESPVR = Active Relationship.

Starling Law: Within limit, max ESP (Active Tension) developed during iso-contraction phase $\propto$ EDV (preload)



Relationship Between JVP, ECG, and Carotid Pulse

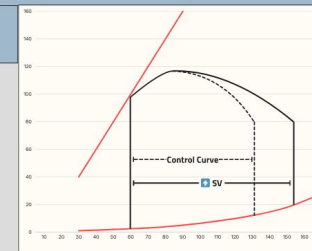
- **A Wave** follows **P Wave** of ECG
- **C Wave** follows **QRS Complex** and occurs with beginning of Carotid Pulse
- **X- Wave** Occurs with carotid pulse = Normally Jugular Veins collapse with Carotid Pulsation
- **V Wave** occurs with Descending Limb of Carotid Pulse



Changes of the Pressure Loop

Effect of ↑ Preload:

- **More Filling & ↑ Volume** along EDPVR Line.
- Contraction begins at **↑ EDV** and reaches the **Same ESV**.
- **Width = ↑ Stroke Volume**



Pressure Volume Loop

Point 1 - End Systolic Volume. Mitral valve opens since Atrial Pressure > Ventricular Pressure

Line A - Filling Phase: Ventricular Pressure & Volume ↑

Point 2 - End Diastolic Volume: Mitral Valve closes since Ventricular Pressure > Atrial Pressure.

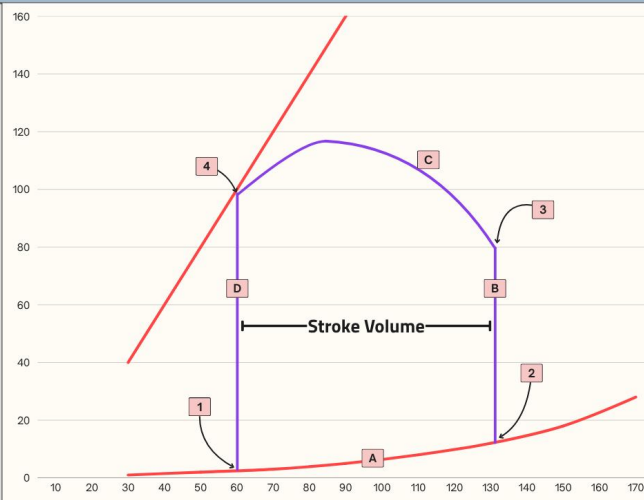
Line B - Isometric Contraction Phase: Ventricular volume constant, but pressure ↑ to reach point 3.

Point 3: Aortic valve opens since Ventricular pressure > Aortic Pressure.

Line C - Ejection Phase: Volume ↑ but pressure ↑ to maximum until the end of systole

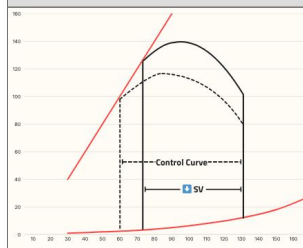
Point 4 - End Systolic Pressure & Volume: Aortic valve closes since Aortic Pressure > Ventricular Pressure

Line D - Isometric Relaxation Phase: Ventricular volume constant and Pressure ↓



Effect of ↑ Afterload:

- Contraction begins at **Same EDV** but needs **↑ pressure** to open valve
- Aortic valve close at **↑ ESP** and at **↑ ESV** therefore **↓ SV**



Effect of ↑ Inotropy:

- **↑ Inotropy** shifts **ESPVR** Upwards & Left.
- Contraction begins at **Same EDV** and reaches the **↓ ESV** (Ejects Greater % of EDV)

