

The Recording of Jugular Venous & Carotid Arterial Pulses



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Objectives



Identify and understand:

- ✓ The events causing the different waves of the JVP & CAP tracings.
- ✓ Difference between JVP and CAP.
- ✓ Correlation between JVP, CAP, ECG and Phonocardiogram.



- The **carotid pulse** tells about the **aorta** and **left ventricular** function.
- **JVP** provides information regarding hemodynamic changes in the **right side of the heart**.
- Evaluation of pulse waveform helps in the diagnosis of certain cardiac diseases & assessing their severity.



Distinguishing features between venous and arterial pulses

| JVP | CAP |
|---------------------------------|------------------------------------|
| Visible but not palpable | Palpable |
| Obliterated by pressure | Not obliterated by pressure |
| 2 pulsations per systole | 1 pulsation per systole |
| Decreases with inspiration | No effect of respiration |
| Enhanced by H-J-Reflex | No effect of abdominal pressure |

Carotid arterial pressure



- ❑ The carotid pulse can be taken on the right side of the neck over the carotid artery in order to determine heart rate.
- ❑ When blood is forced into the aorta during ventricular systole, two things happen:
 1. Blood is moved forwards.
 2. A pressure wave is set up which travels along the wall of arteries (faster than the flow of blood), expanding the arterial walls as it travels. The expansion of the arterial wall is palpable as the pulse.



How to examine

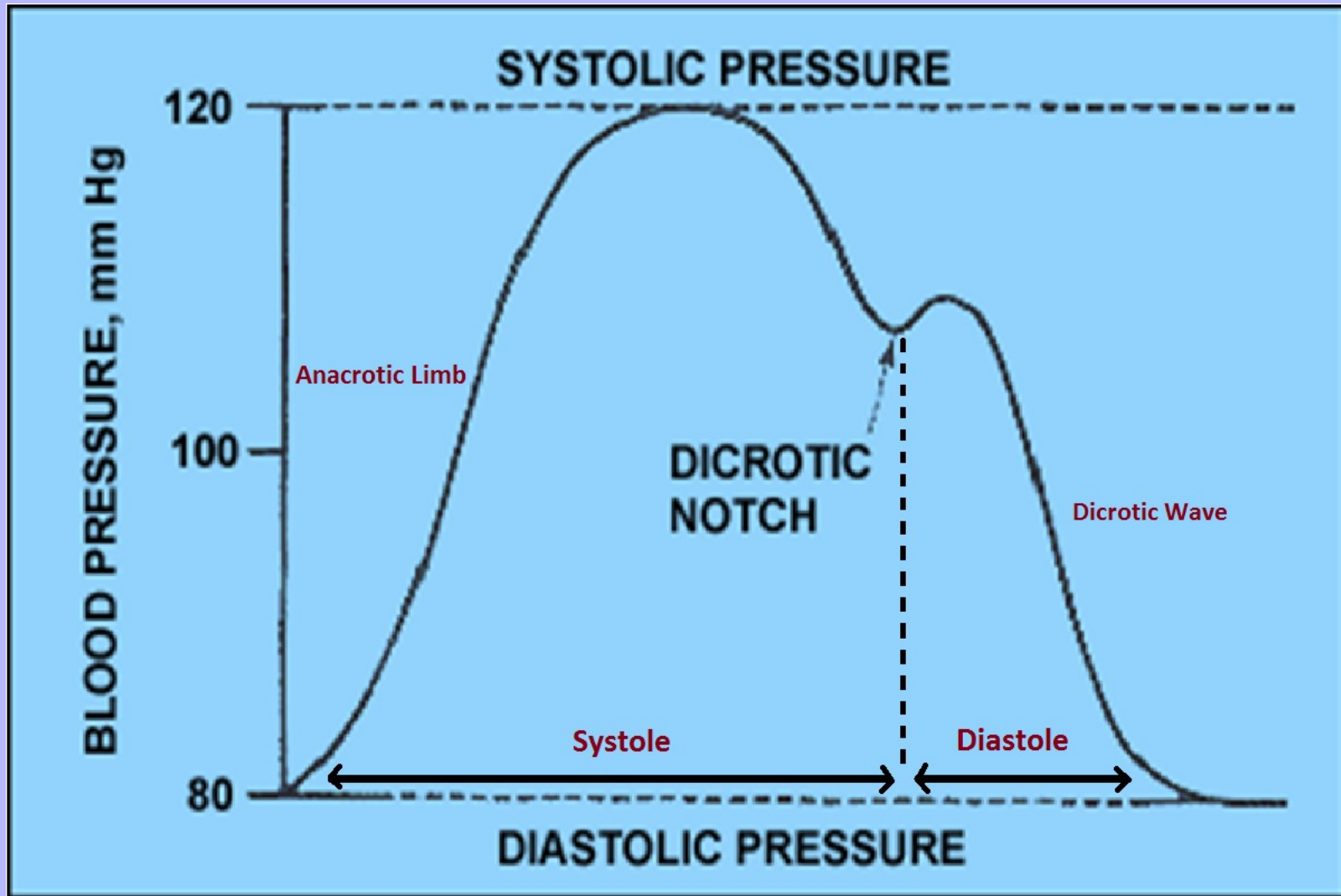
1. Subject supine at 30° head slightly bent to the examined side.
2. Feel CAP on medial side of SCM alongside the lateral border of thyroid cartilage.
3. Apply transducer over CAP using soft rubber band & connect it to recorder.





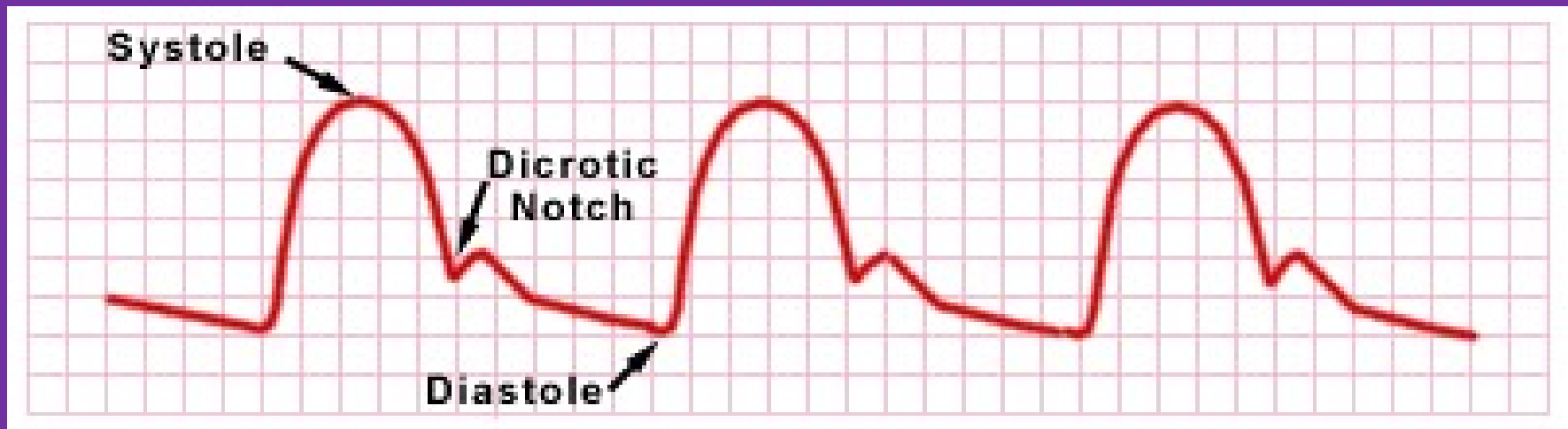
Recorded CAP graph

- ❑ **Anacrotic limb** (rapid upstroke):
Sharp rise in pressure to a peak of **120mmHg** during maximum ejection phase of ventricular systole.
- ❑ **Dicrotic notch (Incisura)**:
Aortic valve snaps shut; blood rebounded against arterial walls produces slight elevation in pressure (marks beginning of ventricular diastole).
- ❑ **Dicrotic limb** (descending limb after Incisura):
↓ in pressure to **80mmHg** due to elastic recoil of arterial wall.





- ❑ Cardiac Cycle duration: **0.8** sec.
- ❑ Ventricular systole: **0.3** sec.
- ❑ Ventricular diastole: **0.5** sec.

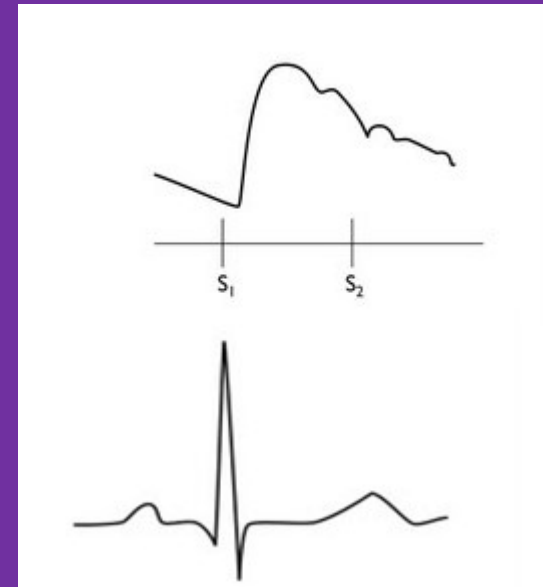




CAP and ECG

Dicrotic Notch (Dn) or Incisura:

Coincides with the **second heart sound** when we relate it to a **phonocardiogram** and occurs just after the **T-wave** when we relate it to an **ECG**.





Abnormal CAP

- **Aortic stenosis:** pressure drops.
- **Aortic regurgitation:** pulse strong.



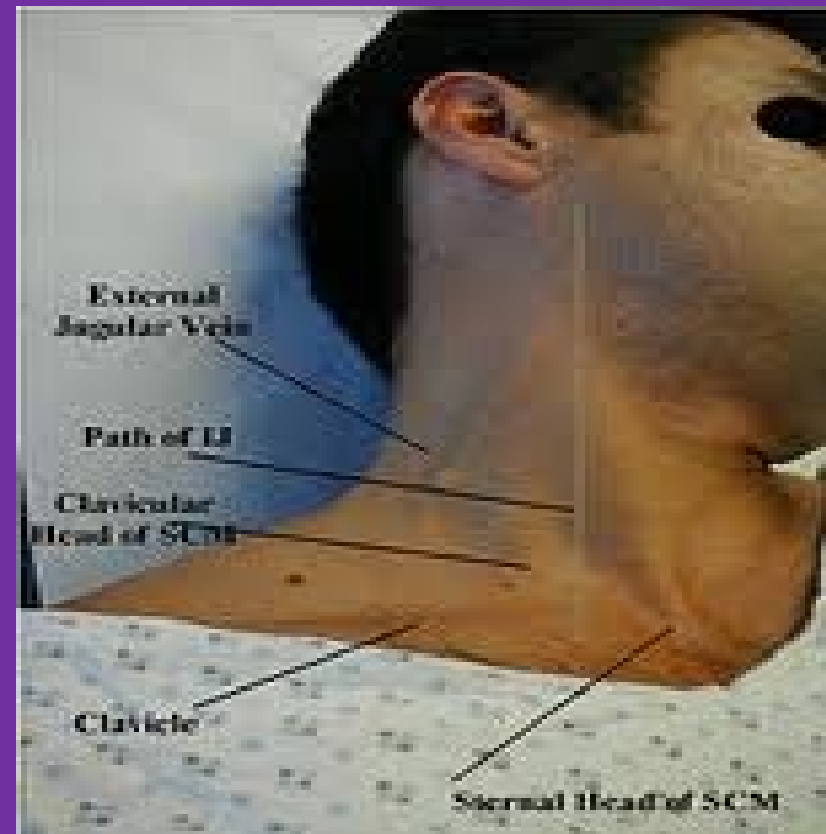
Jugular Venous Pressure

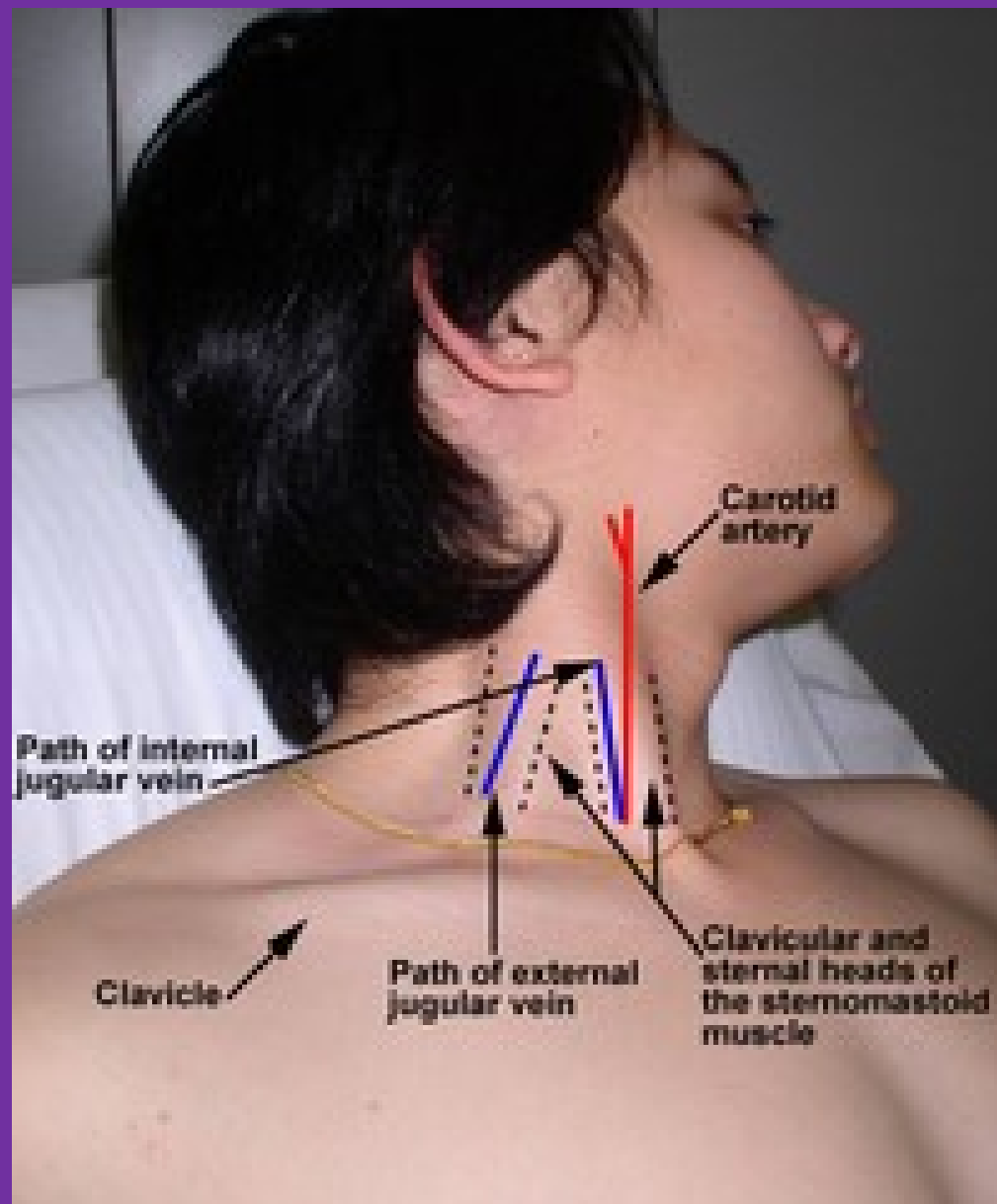
- ❑ Pressure changes in the right atrium are transmitted directly to the **internal jugular vein (IJV)** as there are no valves between this vein and the right atrium.
- ❑ The **external jugular vein** is easier to see but has valves and is subject to compression as it enters the chest (tortuous course).



How to examine

- ❖ Use the right IJV.
- ❖ Patient at a 45° angle.
- ❖ Head turned slightly to the left.
- ❖ IJV runs from medial end of clavicle to the ear lobe under medial aspect of the SCM.
- ❖ Find its pulsation between the 2 attachments of SCM.
- ❖ More prominent with **Valsava** manoeuvre.

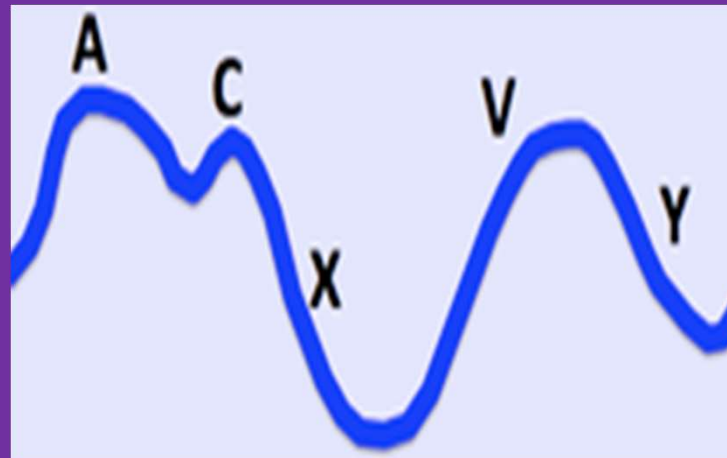






JVP waveform

Classically 3 visible peaks (waves) and 2 visible descents/troughs.





Causes of these waves

- **'a' wave:** right atrial systole.
Right atrial contraction in late diastole to propel additional blood into ventricles.
- **'c' wave:** transmitted manifestation of the rise in atrial pressure produced by bulging of tricuspid valve into the right atrium during isovolumetric ventricular contraction.

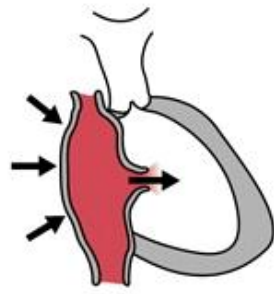
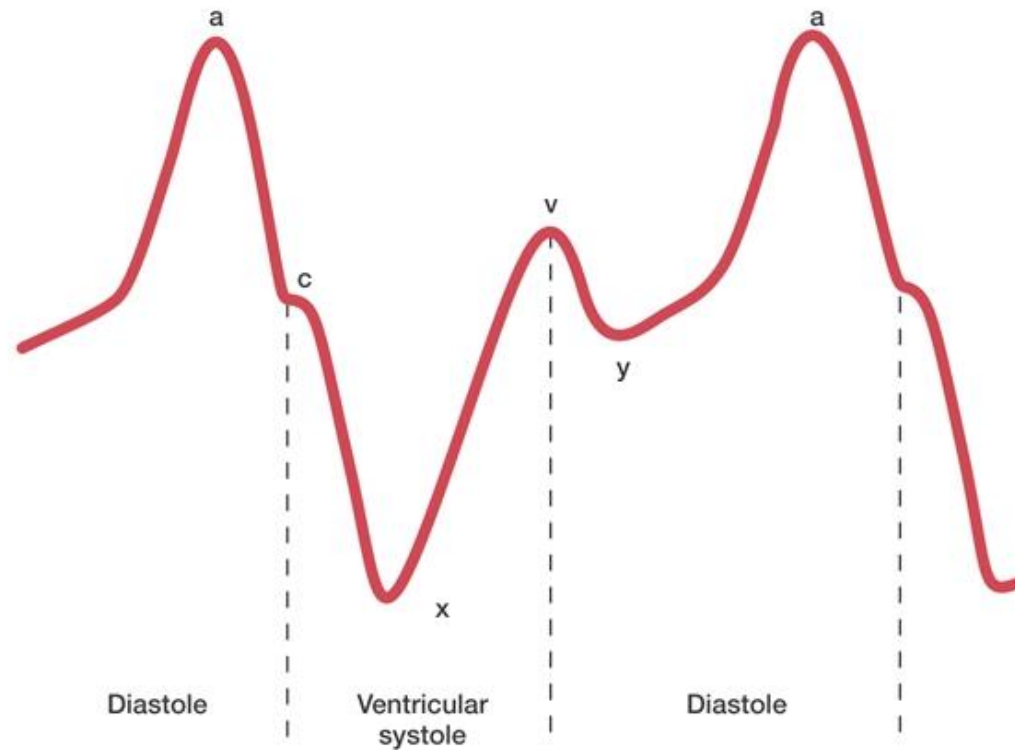


- **'x' descent:** atrial relaxation.

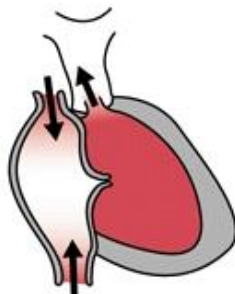
Due to downward displacement of the tricuspid valve by the contraction of papillary muscles during ventricular systole.

- **'v' wave:** rise in atrial pressure by venous return before tricuspid valve opens.

- **'y' descent:** tricuspid valve opens. Passive rapid ventricular filling, decreasing right atrial pressure.



a wave
Atrium contracting
tricuspid valve open



x descent
Atrium relaxing then
filling, tricuspid
closed



v wave
Atrium tense, full;
tricuspid closed

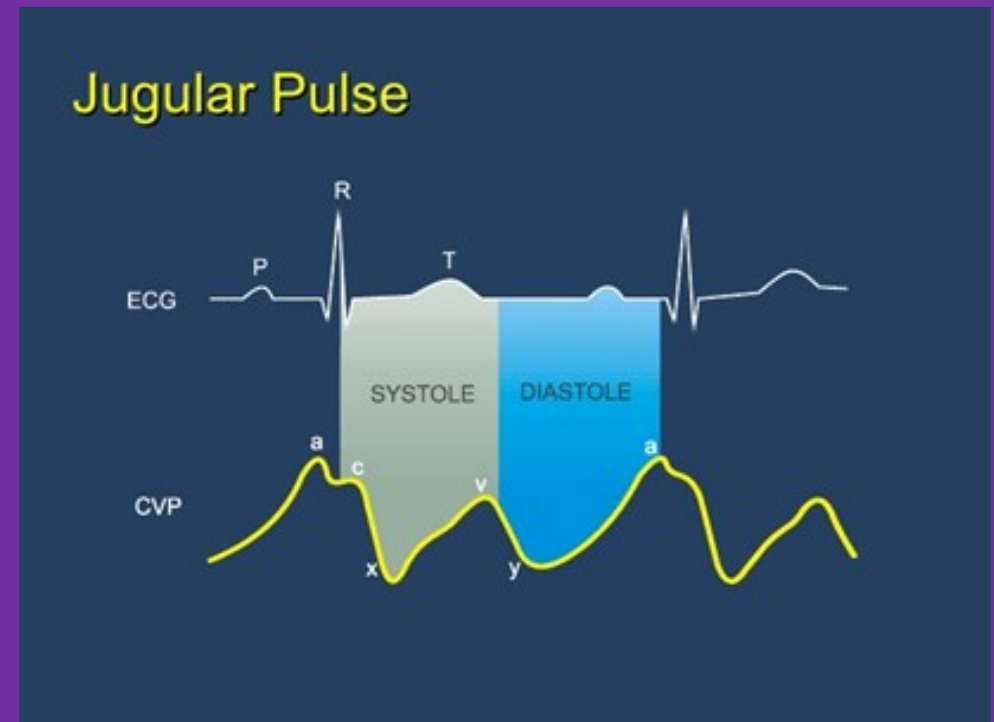


y descent
Atrium emptying,
tricuspid open



How to identify JVP tracing?

1. First identify **v** wave, you will find it between two descents **x** & **y**.
2. The **a** & **c** wave precede the **x** descent.
3. **x** more prominent than **y**.
4. **c**, **x** and **v** are **systolic**.
y and **a** are **diastolic**.





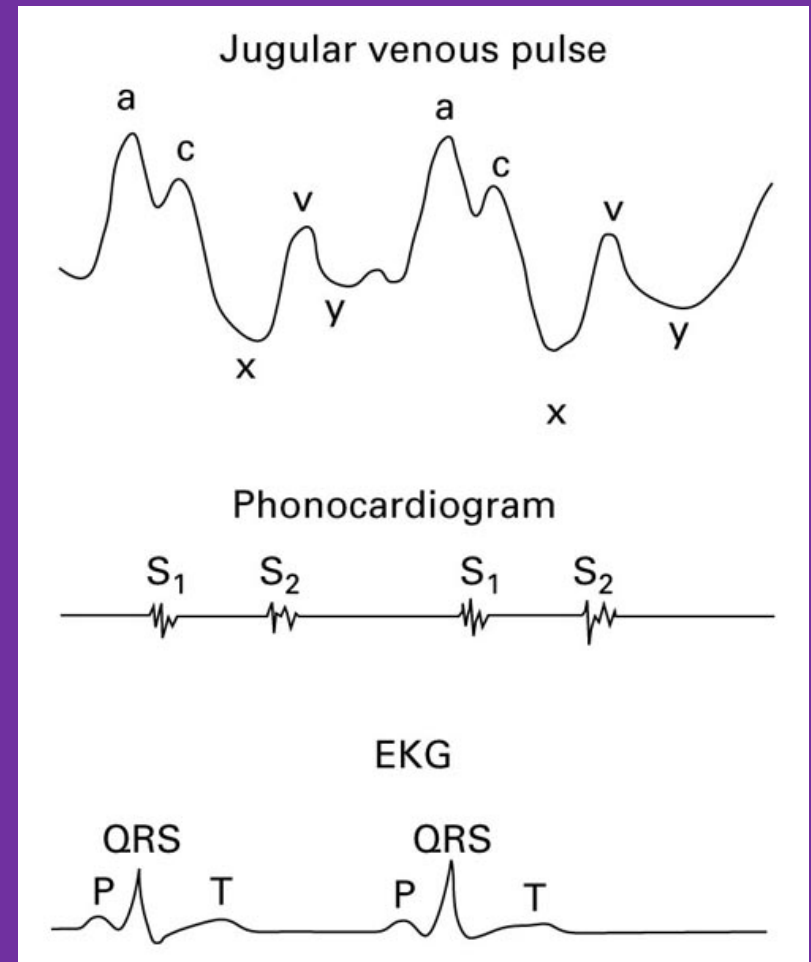
Correlations

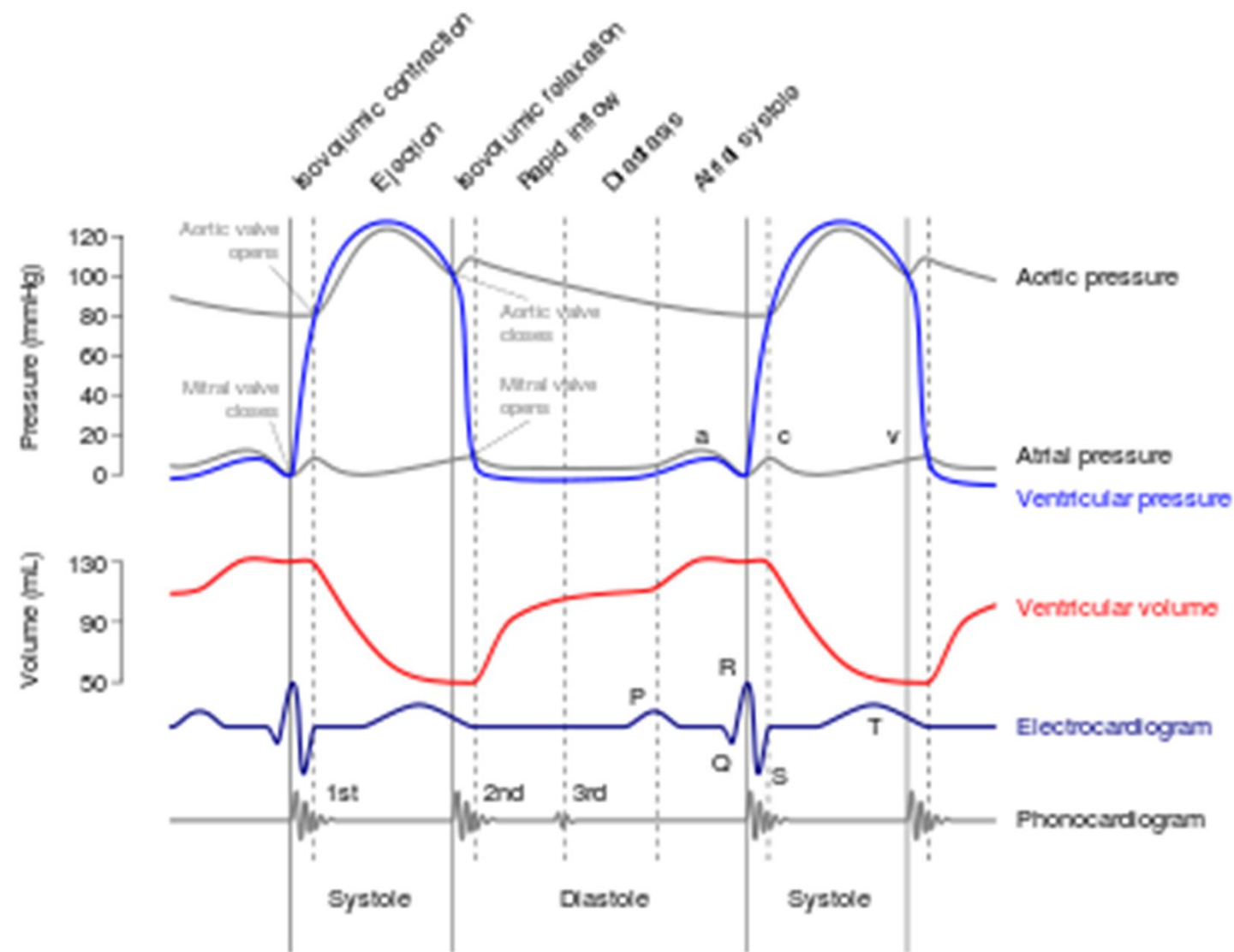
□ a wave:

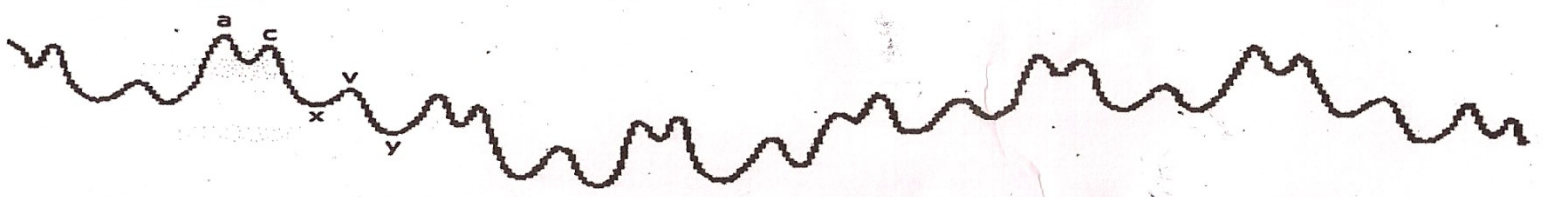
- ❖ Follows **P** wave of ECG.
- ❖ Precedes upstroke of carotid pulse.
- ❖ Just before **S1**.

□ c wave follows **QRS** and **S1**.

□ v wave peaks after **S2** which is synchronous with dicrotic notch (late systole).







Clinical abnormalities



□ a wave:

- **Prominent:** Right heart failure, pulmonary stenosis, pulmonary hypertension, tricuspid stenosis.
- **Absent:** Atrial fibrillation.
- **Cannon wave:** Complete AV block, atrial flutter, ventricular tachycardia.

□ c wave: Prominent in tricuspid regurgitation.

□ v wave: Prominent in tricuspid regurgitation.

Thank you!