

# **Carotid Arterial & Jugular Venous Pulses**

By

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# Objectives

- Describe the normal carotid arterial pulse (CAP) recording.
- Identify the phases of the cardiac cycle, systole & diastole, on the CAP trace.
- Explain the physiologic phenomenon behind the appearance of the dicrotic notch in the CAP recording.
- Identify systolic and diastolic pressures from the CAP recording.
- Describe the normal jugular venous pressure (JVP) recording.
- Enumerate and identify the different waves seen on the JVP trace.
- Explain the physiologic events causing each wave on the JVP trace.

# Carotid Arterial Pulse (CAP)

## Equipment

- Examination bed.
- Recorder (BioPac machine).
- Pulse transducer.

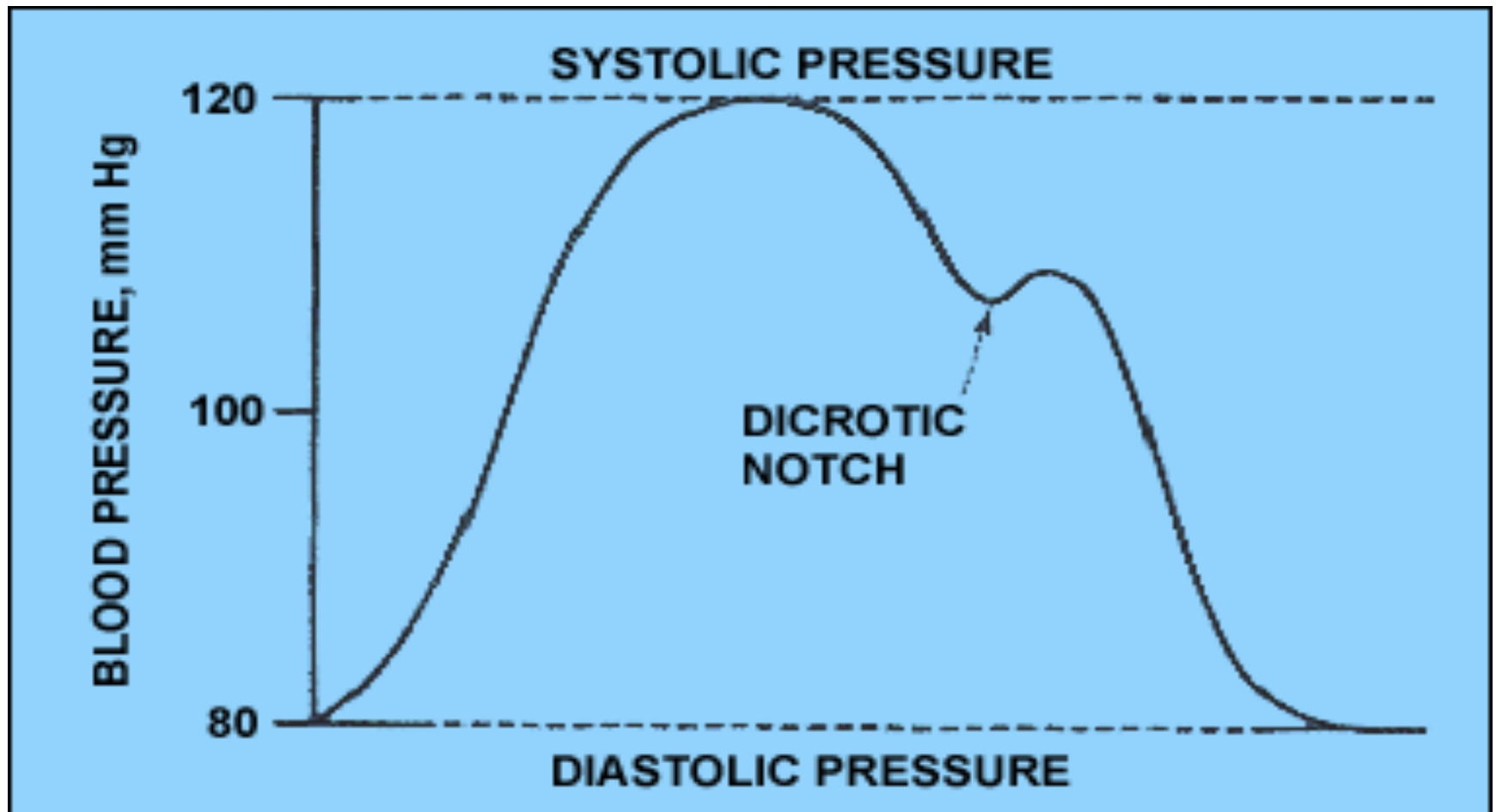
# Procedure

1. Ask subject to lie quietly on the examination bed with the head lifted at  $45^{\circ}$ .
2. Ask the subject to turn his head to the opposite side. Feel the carotid arterial pulse on the medial side of the sternocleidomastoid muscle.
3. Apply the transducer over the carotid artery using a soft rubber band and connect it to the recorder.

When blood is forced into the aorta during ventricular systole, two things happen:

1. Blood moves forward.
2. A pressure wave is set up which travels along the wall of arteries (faster than the flow of blood). The pressure wave expands the arterial walls as it travels. The expansion of the arterial wall is palpable as the pulse.

# CAP



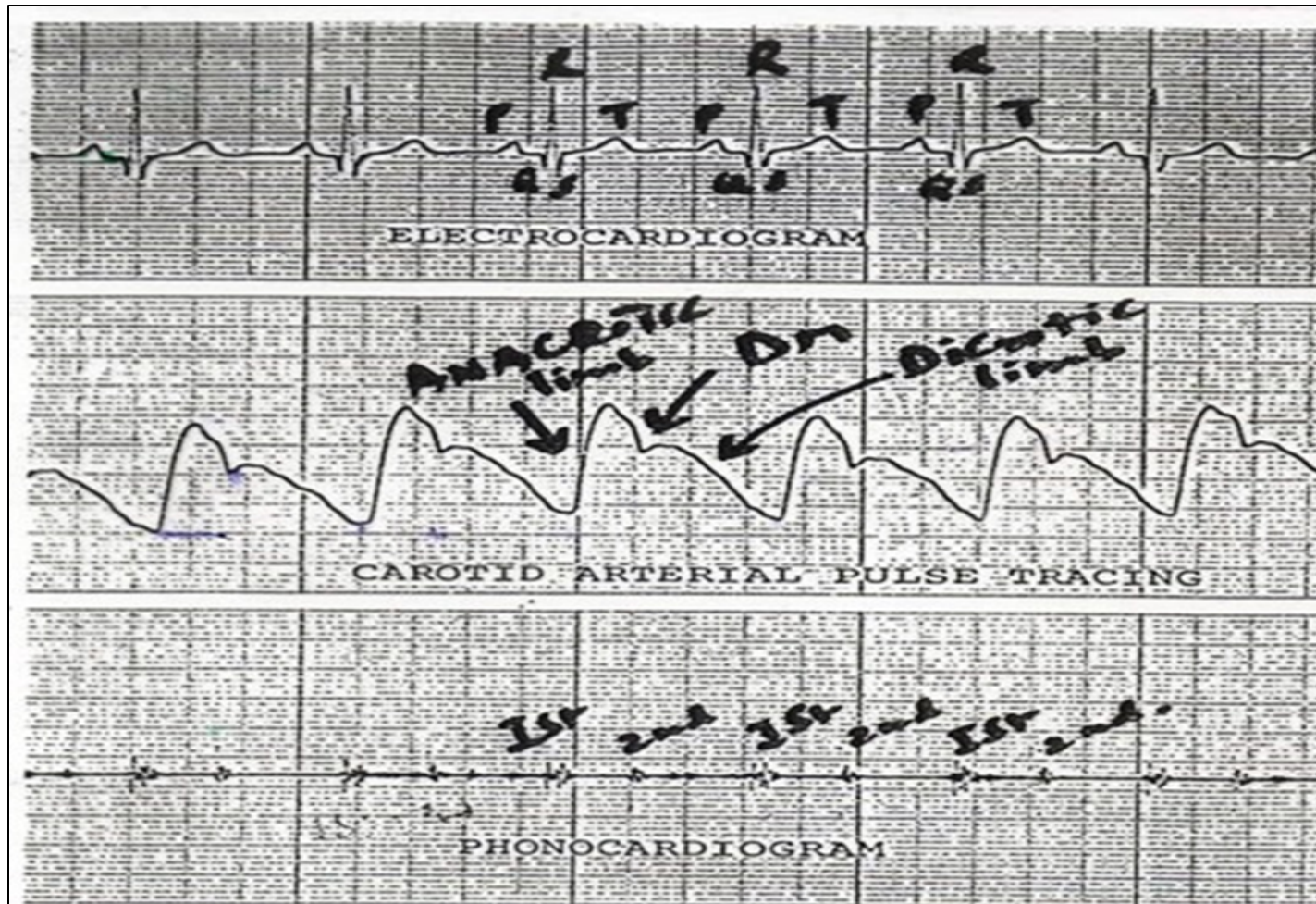
## **The anacrotic limb (ana- means up)**

- It is the upward deflection in the carotid arterial pulse tracing.
- It represents increasing pressure in the carotid artery during the maximum ejection phase of ventricular systole.
- In healthy individuals, the arterial pressure recorded at the peak of the anacrotic limb is 120 mmHg, i.e. systolic pressure.

## The dicrotic notch or incisura

- It occurs during the phase of diastole in the CAP tracing
- It is caused by the sudden closure of the aortic valve.
- It marks the beginning of ventricular diastole.
- It coincides with  $S_2$  when we relate it to a phonocardiogram and occurs just after the T wave when we relate it to an ECG.





Recording of ECG, CAP and phonocardiogram.

## The dicrotic limb

- It is the descending phase of the carotid arterial pulse tracing.
- It is caused by the decrease in carotid arterial pressure during ventricular diastole.
- In healthy individuals, the lowest pressure recorded during this phase is about 80 mmHg due to the elastic recoil of the arterial wall.

# The difference between venous and arterial pulses

- Multiphasic, venous pulse "beats" twice (in quick succession) in a cardiac cycle. The first beat represents that atrial contraction (termed 'a') and second beat represents venous filling of the right atrium against a closed tricuspid valve (termed 'v'), where as an artery only has one beat in a cardiac cycle.
- Non-palpable, venous pulse cannot be palpated.
- Varies with respiration, venous pulse usually decreases with deep inspiration.

# Jugular Venous Pulse(JVP)

## Equipment

- Examination bed.
- Pulse transducer.
- Recorder (BioPac machine).

## Procedure

1. Position the subject at  $45^\circ$  on a couch or bed so that the pulsation of the internal jugular vein can be visualized.
2. Ask the subject to perform a Valsalva maneuver (deep inspiration followed by a forced expiration against a closed glottis). As a result, the internal jugular vein becomes prominent.
3. Choose a position on the internal jugular vein away from the carotid artery.
4. Place the pulse transducer over the vein and keep it in position with a self-adhesive plaster and connect to the recorder.

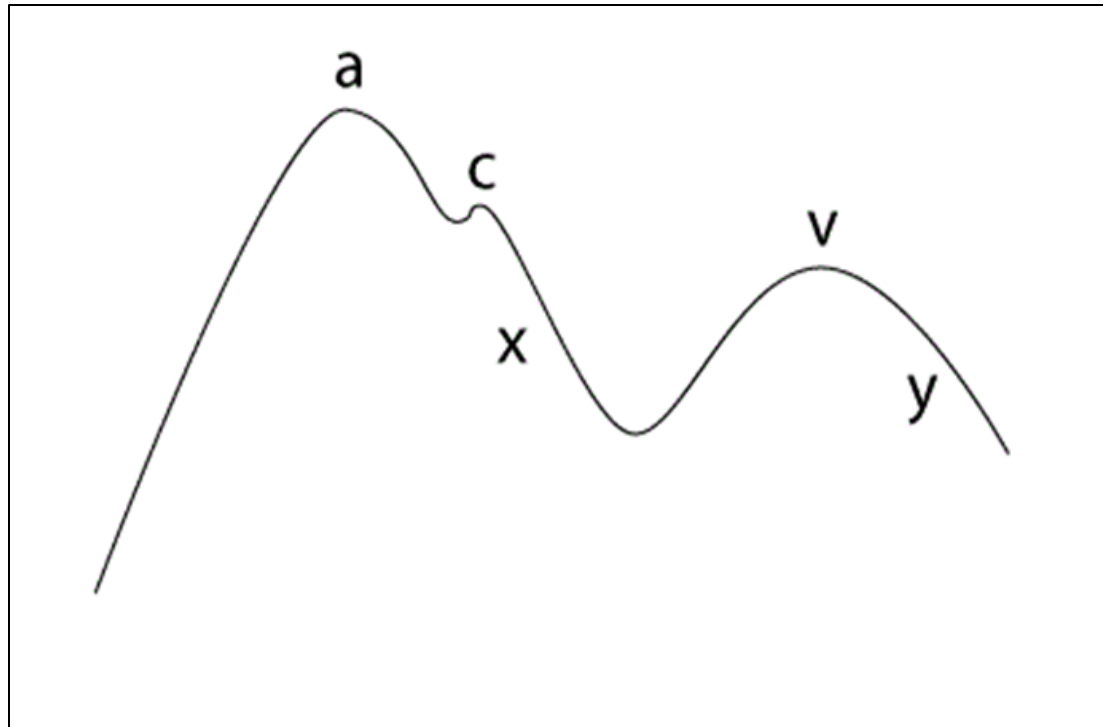
# Internal Jugular vs external Jugular

**Why do we prefer internal jugular vein to record JVP?**

Pressure changes in the right atrium are transmitted directly to the internal jugular vein as there are no valves between this vein and the right atrium. The external jugular vein cannot be relied upon because this vessel:

- Has valves.
- May be obstructed by the fascial and muscular layers through which it passes.

# JVP waves

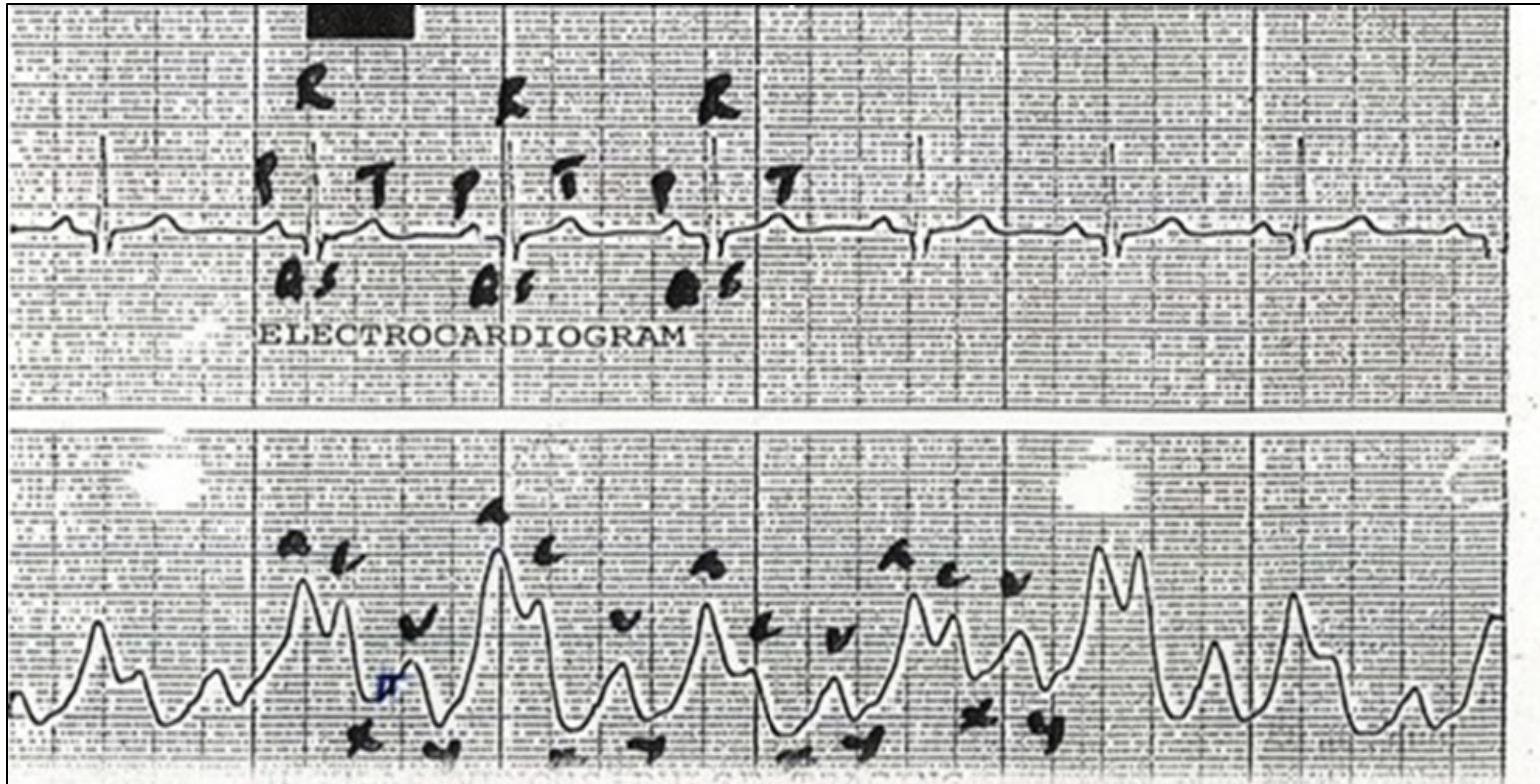


## The different waves in the JVP trace and their underlying physiologic event.

Wave name	Physiologic event
'a' wave	Increased right atrial pressure secondary to right atrial contraction occurring at the end of ventricular diastole.
'c' wave	Increased right atrial pressure caused by the bulging of tricuspid valve into the right atrium during isovolumetric ventricular contraction. Or due to transmitted carotid pulsations.
'x' descent	Decreased right atrial pressure due to downward displacement of tricuspid valve secondary to contraction of papillary muscles during ventricular systole.
'v' wave	It represents the increase in right atrial pressure as it fills with blood returning from the great veins against a closed tricuspid valve.
'y' descent	It represents the fall in right atrial pressure as blood flows out of the right atrium and into the right ventricle upon opening of the tricuspid valve.



## Recording of JVP with ECG.



P wave in ECG occurs just before the "a" wave of JVP as the atrial depolarization (P wave) precedes the atrial contraction ("a" wave)

# Clinical applications of JVP

Clinical finding	explanation	Possible causes
Prominent 'a' wave	Signifies increased right atrial pressure	Right heart failure Tricuspid stenosis Pulmonary stenosis Pulmonary hypertension
Cannon 'a' wave	It occurs when the right atrial pressure becomes very high usually secondary to right atrial contraction against a closed tricuspid valve	Atrial flutter Third degree heart block (Complete heart block) Ventricular Tachycardia
Absent 'a' wave	The right atrial pressure does not increase due to failure of proper contraction	Atrial fibrillation
Large 'v' wave		Tricuspid regurgitation

**Thank You**