

# JoVE: Science Education

## Physical Examination of the Cardiac System: Inspection and Palpation --Manuscript Draft--

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## Overview

The cardiac assessment is one of the core examinations performed by almost every physician whenever they encounter a patient. Disorders of the cardiac system are among the most common reasons for hospital admission, with conditions ranging from myocardial infarction to congestive heart failure. Learning a complete and thorough cardiac examination is therefore crucial for any practicing physician.

If there is pathology in the heart or circulatory system, the consequences can also be manifested in other bodily areas including the lungs, abdomen, and legs. Many physicians instinctively reach straight for their stethoscope when performing a cardiac exam. However a large amount of information is gained before auscultation by going through the correct sequence of examination, starting with inspection and palpation.

## Procedure:

### 1. Introduction

1.1. As always, before examining any patient, wash hands thoroughly with soap and water or clean them with antibacterial wash.

1.2. Enter the examination room and introduce yourself to the patient, explaining that you are going to perform a cardiac examination.

### 2. Positioning

2.1. Have the patient undress down to the waist (females keeping on their underwear).

2.2. Position the patient on the examination table at 30-45 degrees angle, and approach the patient from their right side.

2.3. Have a general look at the patient first. Note whether they are comfortable or in any distress.

### 3. Peripheral examination

3.1. Ask the patient to hold their hands up and assess for the following:

3.1.1. Capillary refill.

3.1.1.1. Press on the patient's thumbnail with your first finger while holding the other side of their finger with your thumb. The skin under the nail will blanch (turn a white color).

3.1.1.2. Measure the amount of time it takes to turn back to red. This should be less than 2 seconds, which indicates good peripheral circulation.

3.1.2. Clubbing. This is defined as a decrease in angle between the nail and nail bed. Clubbing can be a sign of right-to-left shunt disease or bacterial endocarditis (infection of the heart valves).

3.1.2.1. Ask the patient to put their two thumbnails side-by-side. Note if a diamond-shape is formed on the inside. If clubbing is present, this doesn't happen (Figure 1).

3.1.3. Signs of bacterial endocarditis: splinter hemorrhages (tiny red hemorrhages under the nails), Osler's nodes (painful red papules often found on the ends of the fingers), Janeway lesions (painless red macules often found on the palms).

3.2. Palpate the radial pulse with the index and middle finger, and assess for the rate per minute, rhythm regularity, volume, and character. Low volume or faint pulses are a sign of a low flow state such as sepsis. An abnormally strong "bounding" pulse can be found in conditions such as anemia and congestive heart failure.

3.3. Examine the skin on the arms for Xanthoma deposits, which may be observed near the elbows and can be a sign of hyperlipidemia.

3.4. Inspect the patient's head for any signs of cardiac disease:

3.4.1. de Musset's sign: a "bobbing" head movement associated with aortic regurgitation.

3.4.2. Malar flush: a flushing or red facial appearance indicative of mitral stenosis.

3.4.3. Inspect the cornea for corneal arcus, a gray-white discoloration around the cornea that is a sign of hyperlipidemia.

3.4.4. Inspect the skin around the eyes for yellow cholesterol deposits known as xanthelasma.

3.4.5. Inspect the fundus for retinopathy, which often occurs with cardiovascular disease, diabetes, and Roth's spots, pale-centered retinal hemorrhages that occur with bacterial endocarditis.

3.4.6. Ask the patient to open their mouth and stick out their tongue. The color of the tongue should be pink/red. If it is a bluish discoloration, this is a sign of central cyanosis.

### 3.5. Neck inspection.

3.5.1. Palpate the carotid pulse gently with your first two fingers, and assess the volume and character of the pulse. A slow rising pulse is a sign of aortic stenosis.

3.5.2. The jugular venous pressure (JVP) is nature's manometer of right atrial pressure and is elevated in congestive heart failure.

3.5.2.1. To measure the JVP, ask the patient to turn their head to the left while they are positioned at 45 degrees.

3.5.2.2. Observe for a double pulsation from the right internal jugular vein between the two heads of sternocleidomastoid (the sternal head and the clavicular head) (**Figure 2B**). The carotid pulse that sometimes can be seen in thin patients has a single pulsation and is palpable, while the jugular vein pulsation is not.

3.5.2.3. Locate the angle of Louis (manubriosternal joint), which is positioned about 5 cm above the center of the right atrium.

3.5.2.4. Extend a long rectangular object (such as a paper card) horizontally from the highest point at which the internal jugular vein pulsation can be seen.

3.5.2.5. Using a vertically positioned ruler measure the distance from the angle of Louis to the card and calculate the JVP by adding 5 cm (the distance from the angle of Louis to the right atrium) to that number (**Figure 2A**).

3.5.2.6. Another way to visualize the internal jugular vein is to press gently in the right upper quadrant of the abdomen, just below the costal margin. This maneuver induces so-called hepatjugular reflux (blood shift from abdominal vessels into the right atrium). Normally, a transient increase in JVP can be observed before a decrease. Sustained increase in JVP is seen in congestive heart failure and other conditions, such as tricuspid regurgitation and constrictive pericarditis.

## 4. Chest inspection

4.1. Inspect the patient's chest anteriorly and posteriorly for any visible scars. Look for any evidence of a median sternotomy scar (a sign of coronary artery bypass surgery or aortic valve surgery) (**Figure 3**). A more lateral scar below the left nipple would be indicative of prior mitral valve surgery.

## 5. Palpation

5.1. The apex beat, also known as the point of maximal impulse (PMI), corresponds to the lower left heart border. It is the most inferior and lateral position that the cardiac impulse can be felt.

5.1.1. Locate the PMI in the fifth intercostal space in the mid-clavicular line by counting down from the second intercostal space adjacent to the angle of Louis.

5.1.2. Palpate with your first two fingers.

5.1.3. If this cannot be palpated, ask the patient to lie on their left side. The apex beat will be displaced laterally if the heart is enlarged (cardiomegaly).

5.2. Next, palpate for heaves and thrills (a thrill is a palpable murmur).

5.2.1. Place the palm of your hand in each of the four heart zones in the precordium and then on the upper left and right chest wall. A thrill feels like a vibration or buzzing underneath your hand.

5.2.2. Place your hand at the left sternal edge. A parasternal heave is a sign of right ventricular enlargement and feels like a “lifting feeling” under your hand.

## 6. Percussion of heart

6.1. Unlike many other examinations, percussion is rarely employed for the cardiac system, although a few generations ago, physicians would use percussion of the borders of the heart to assess for cardiomegaly.

## 7. Other inspection and palpation

7.1. Palpate for an abdominal aneurysm in the midline of the abdomen using both hands placed parallel with each other.

7.2. Look at the legs and assess for any signs of edema.

7.3. Feel the peripheral pulses at the femoral, popliteal, anterior tibial, and dorsalis pedis locations.

## Summary

A significant amount of clinical information is to be gained with a thorough comprehensive inspection and palpation of the cardiac system. The examiner should be able to tell whether a patient has a number of likely conditions including atrial fibrillation, valvular heart disease, cardiomegaly, hyperlipidemia, and bacterial endocarditis. Unfortunately, during every day clinical practice, these steps are often

abbreviated or skipped. By learning the full examination technique, a medical professional gains a solid foundation on which to build the clinical skills, as they see more cardiac pathology. Going through a stepwise fashion of the cardiovascular system can lead the physician to a diagnosis even before placing their stethoscope on the patient.

### Figures and legends

Figure 1. Testing for clubbing.

A diamond-shape aperture normally seen between the thumbnails when put side-by-side (A) is absent when the patient has clubbing (B).

**Comment [JR1]:** Can this image be redrawn?

Figure 2. Measurement of the Jugular Venous Pressure (JVP).

A. Placement of the centimeter rule and measurement of the JVP pressure with regard to the sternal angle of Louis.

B. Major blood vessels and muscles of the human neck. An internal jugular vein can be found between the sternal head and the clavicular head of the sternocleidomastoid muscle.

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Figure 3. Median sternotomy scar.

A photograph of a sternotomy scar, indicating open heart surgery in the past.







