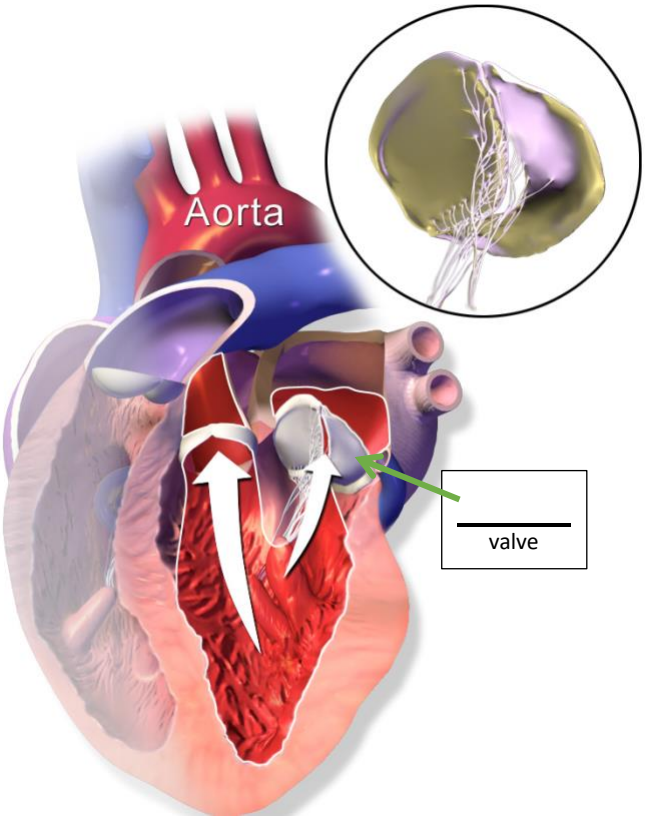
CLINICAL CASE 1: **ERM**

Heart Picture:



By BruceBlaus - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=60114099

Clinical Case:

Mitral Valve Regurgitation

A 56-year-old woman presents to the cardiology clinic with complaints of shortness of breath, fatigue, and occasional palpitations. She has a history of rheumatic fever in childhood, which was treated, but she has never had regular follow-up. Over the past few months, she noticed worsening fatigue with swelling of her ankles.

- Vital signs: Normal
- General appearance: Mildly overweight
- Auscultation: A murmur best heard at the apex, which may radiate to the left axilla
- Peripheral exam: Mild bilateral lower extremity edema; no jugular venous distention

Conceptual Study Questions:

- What valve is responsible for the murmur?
- What is the function of this valve?
- Look at your dissected heart and identify the responsible valve.
  - In what side of the heart, it is located?
- Describe the blood flow in this side of the heart starting from the Pulmonary veins into the Aorta.

Pulmonary veins → _____ (name the chamber) → _____ valve → _____ (name the chamber) → _____ valve → Aorta

- The white arrows inside the heart picture represent the blood flow.
  - Does it differ from the blood flow you described on the previous question? Explain your answer.
- Look at your dissected heart and mention what chamber(s) might be affected.
- Would you expect any changes in volume and/or pressure? Explain your answer.
- Look at your dissected heart. Where else could the blood backflow? (where does that chamber connect?)
- What symptoms in the clinical case suggests that the patient might already have a backflow to that organ?

CLINICAL CASE 1: **ERM**

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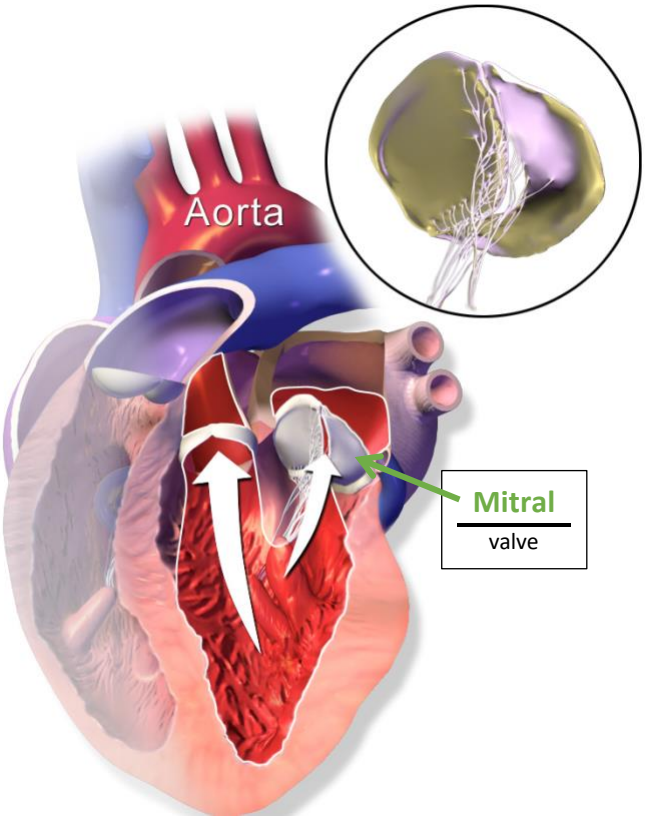

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Conceptual Study Questions:

- What valve is responsible for the murmur?
  The Mitral Valve (Bicuspid Valve, Left AV valve)

- What is the function of this valve?
  The Mitral V. regulates blood flow between the left atrium and left ventricle of the heart. It ensures blood flows in the correct direction and prevents backflow into the left atrium

- Look at your dissected heart and identify the responsible valve.
  - In what side of the heart, it is located?
    @Left side
- Describe the blood flow in this side of the heart starting from the Pulmonary veins into the Aorta.

Pulmonary veins → **__Left Atrium_____** (name the chamber) → **__mitral__** valve → **_Left Ventricle__** (name the chamber) → **__Aortic __** valve → Aorta

- The white arrows inside the heart picture represent the blood flow.
  - Does it differ from the blood flow you described on the previous question? Explain your answer.

  Yes, in the picture there is a backflow of blood from the left ventricle into the left atrium

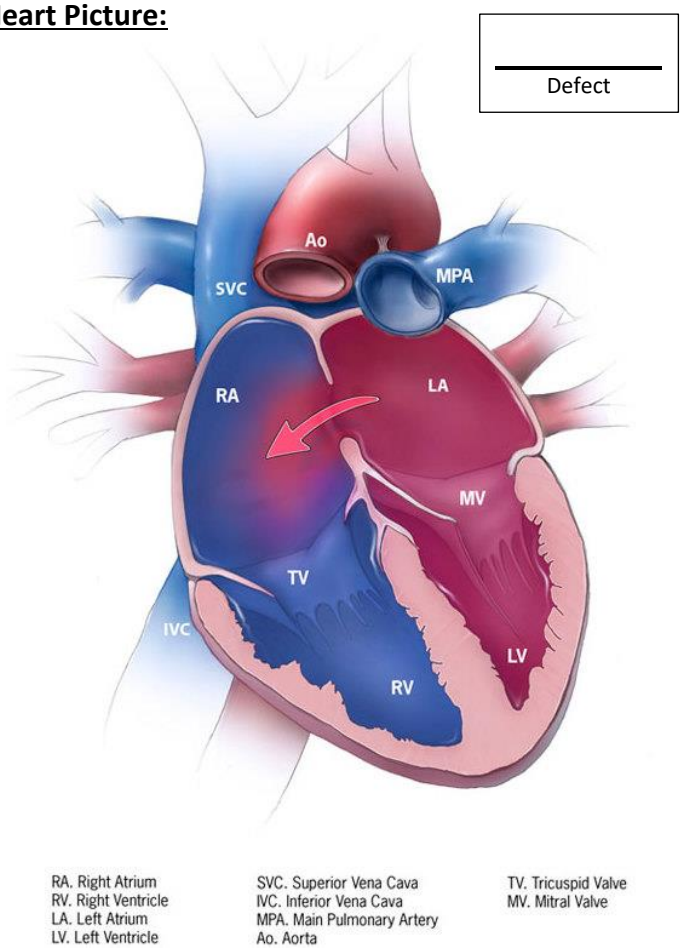
- Look at your dissected heart and mention what chamber(s) might be affected.

  Left atrium and Left ventricle
- Would you expect any changes in volume and/or pressure? Explain your answer.
  Volume and Pressure will increase in both chambers: Left atrium and Left ventricle, because valve doesn't close well.

- Look at your dissected heart. Where else could the blood backflow? (where does that chamber connect?).
  Lungs

- What symptoms in the clinical case suggests that the patient might already have a backflow to that organ?
  Shortness of Breath and fatigue.

Heart Picture:



By Centers for Disease Control and Prevention - <a rel="nofollow" class="external free" href="https://www.cdc.gov/heart-

Clinical Case:

Atrial Septal Defect

A 25-year-old female presents to the emergency department with complaints of fatigue, occasional palpitations, and shortness of breath, especially during exercise. She mentions that she has noticed a slight bluish discoloration of her lips during these episodes. The patient has no significant past medical history and is a non-smoker.

- Vital signs: Tachycardia and low oxygen levels in blood
- General appearance: Mild bluish-purple color on her lips and fingers (due to lack of oxygen).
- Auscultation: A continuous murmur best heard at the left sternal border

Conceptual Study Questions:

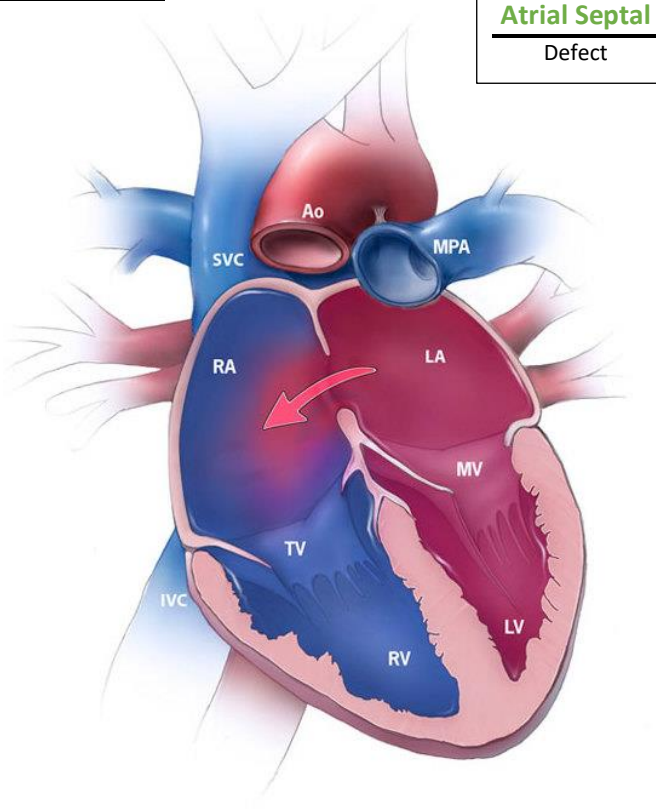
- Look at your dissected heart.
  - What structure is affected?
  - What side(s) is/are affected?
- What is the function of this structure?
- What benefit has this anatomical structure on a fetus?
- Describe the blood flow inside the heart starting from the SVC/IV into the Aorta.

SVC & IVC → _____ (name the chamber) → _____ valve → _____ (name the chamber) → _____ valve → _____artery → _____ (name the organ) → _____ veins → _____ (chamber) → _____ valve → _____ (chamber) → _____ valve → Aorta

- The red arrow inside the heart picture represents the blood flow.
  - Does it differ from the blood flow you described on the previous question? Explain your answer.
- Look at your dissected heart and mention what chamber(s) might be affected.
- Would you expect any changes in volume and/or pressure? Explain your answer.

Heart Picture:

Atrial Septal Defect



RA. Right Atrium
RV. Right Ventricle
LA. Left Atrium
LV. Left Ventricle

SVC. Superior Vena Cava
IVC. Inferior Vena Cava
MPA. Main Pulmonary Artery
Ao. Aorta

TV. Tricuspid Valve
MV. Mitral Valve

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- Auscultation: A continuous murmur best heard at the left sternal border

Conceptual Study Questions:

- Look at your dissected heart.
  - What structure is affected?
    Atrial septum
  - What side(s) is/are affected?
    Left and Right atrium
- What is the function of this structure?
  The Atrial septum function is to separate the right and left atria of the heart, preventing the mixing of oxygenated and deoxygenated blood.

- What benefit has this anatomical structure on a fetus?
  In fetal development, a portion of the septum, the foramen oval, allows blood to bypass the lungs, but this closes after birth.

- Describe the blood flow inside the heart starting from the SVC/IV into the Aorta.

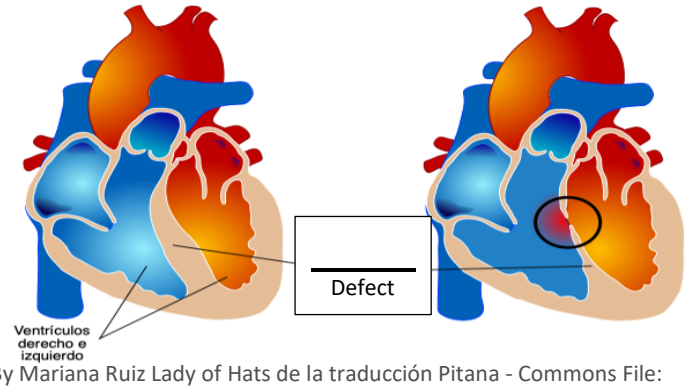
SVC & IVC → _Right atrium_ (name the chamber)→ _**Tricuspid**_ valve → _ **Right ventricle** _ (name the chamber) → _**Pulmonary**_ trunk → _Pulmonary_ artery→ __Lungs _ (name the organ)→ _ Pulmonary veins→ _Left Atrium_ (chamber)→ _Bicuspid_ valve → _Left Ventricle_ (chamber) → _Aortic_ valve → Aorta

- The red arrow inside the heart picture represents the blood flow.
  - Does it differ from the blood flow you described on the previous question? Explain your answer.

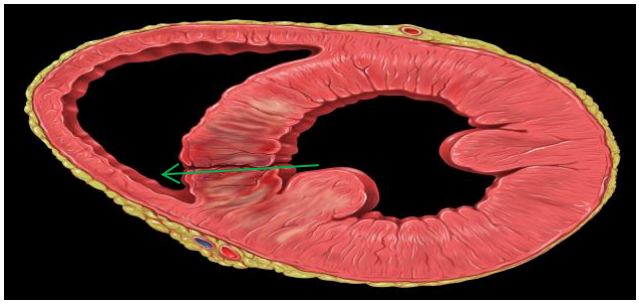
Yes, it differs. Blood flows between both atria disrupting the normal flow.

- Look at your dissected heart and mention what chamber(s) might be affected.
  The atria
- Would you expect any changes in volume and/or pressure? Explain your answer.
  Yes, I would expect changes. An increase blood volume and pressure in the rights chambers and lungs.

Heart Pictures:



By Mariana Ruiz Lady of Hats de la traducción Pitana - Commons File: Ventricular septal defect.svg, CC BY-S 4.0,https://commons.wikimedia.org/w/index.php?curid=121076551



Patrick J. Lynch, medical illustrator - Patrick J. By Patrick J. Lynch, medical illustrator - Patrick J. Lynch, medical illustrator, CC BY 2.5, https://commons.wikimedia.org/w/index.php?curid=1488251

Clinical Cases:

Ventricular Septal Defect

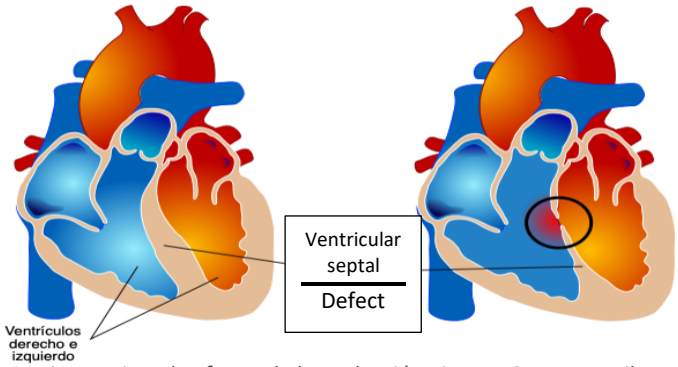
A 6-month-old female infant is brought to the pediatrician due to poor weight gain and frequent respiratory infections. The parents report that she seems to tire easily during feedings and occasionally turns slightly blue (cyanotic) during exertion.

- Vital signs: Tachycardia, fast respiratory rate and low oxygen levels in blood
- General appearance: Smaller than average, mild respiratory distress.
- Auscultation: A loud murmur best heard during systole at the left sternal border

Conceptual Study Questions:

- Look at your dissected heart.
  - What structure is affected?
- What is the function of this structure?
- Is the blood on the right side of the heart oxygenated or deoxygenated? On the left side?
- Look at your dissected heart and identify the responsible structure.
  - What chambers of the heart might be affected?
- The green arrow inside the heart picture represents the usual blood flow that happens on this condition.
  - Does it differ from the normal blood flow inside the heart? Explain your answer.
- Would you expect any changes in volume and/or pressure? Explain your answer.
- In severe cases of VSD the flow can be reverted. How may that fact affect the oxygen delivered to the system?

Heart Pictures:



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- Vital signs: Tachycardia, fast respiratory rate and low oxygen levels in blood
- General appearance: Smaller than average, mild respiratory distress.
- Auscultation: A loud murmur best heard during systole at the left sternal border

Conceptual Study Questions:

- Look at your dissected heart.
  - What structure is affected?

    Ventricular septum
- What is the function of this structure?

  The ventricular septum separates the right and left ventricles. It maintains the proper blood flow through the heart, will keep the deoxygenated blood from the body to be pumped into the lungs and the oxygenated blood to be pumped into the system (body)

- Is the blood on the right side of the heart oxygenated or deoxygenated? On the left side?

  Right side deoxygenated and Left side oxygenated

- Look at your dissected heart and identify the responsible structure.
  - What chambers of the heart might be affected?

    The Right and Left ventricles will be affected.
- The green arrow inside the heart picture represents the usual blood flow that happens on this condition.
  - Does it differ from the normal blood flow inside the heart? Explain your answer.

Yes, it does differ from the normal blood blow. The oxygenated blood will go back to the lungs instead that heading to the system (body).

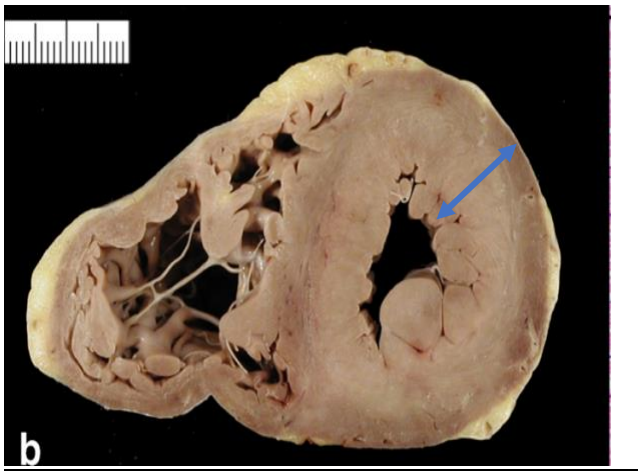
- Would you expect any changes in volume and/or pressure? Explain your answer.

  Yes, I would expect changes in volume and pressure. More blood would flow into the right ventricle and eventually the pulmonary circulation leading to an increase blood pressure in the lung arteries.

- In severe cases of VSD the flow can be reverted. How may that fact affect the oxygen delivered to the system?

  Some of the oxygenated blood will return to the right side. The body might not receive enough oxygen.

Heart Picture:



Basso C, Michuad, k, d'Amati,G et al. Cardiac hypertrophy at autopsy. Virchows Arch 479. 79-94 (2021)

Clinical Case:

Left Ventricular Hyperplasia

A 62-year-old male presents to the clinic for a routine follow-up. He has been suffering of poorly controlled hypertension for the past 10 years. He reports occasional chest discomfort, especially with exertion, and has noticed worsening fatigue over the past few months. He also mentions occasional headaches and blurred vision.

- Vital signs: Normal Heart Rate, Blood Pressure 180/100 (Normal 120/80) Body Mass Index: 40 (Normal: 18.5-24.9)
- General appearance: Obese
- Auscultation: No murmur, an additional sound is heard during auscultation

Conceptual Study Questions:

- Look at the blue arrow in the heart picture.
  - What structure is affected?
  - What chambers of the heart might be affected?
  - What is the function of this structure? Of the chamber.
- Compare the dissected heart's wall thickness from the heart picture and name at least one difference.
  - How might the function be affected?
  - Which of the patient's conditions might be responsible for her cardiac changes?
- Long term, would you expect any changes in volume and/or pressure? Explain your answer.

CLINICAL CASE 4: **ERM**

Heart Picture:

Basso C, Michuad, k, d'Amati,G et al. Cardiac hypertrophy at autopsy. Virchows Arch 479. 79-94 (2021)

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- Vital signs: Normal Heart Rate, Blood Pressure 180/100 (Normal 120/80) Body Mass Index: 40 (Normal: 18.5-24.9)
- General appearance: Obese
- Auscultation: No murmur, an additional sound is heard during auscultation

Conceptual Study Questions:

- Look at the blue arrow in the heart picture.
  - What structure is affected?
    The myocardium.
  - What chambers of the heart might be affected?
    The Left ventricle
  - What is the function of this structure? Of the chamber?
    The myocardium is responsible for the contractile function of the heart. The left ventricle pumps oxygenated blood throughout the body.

- Compare the dissected heart's wall thickness from the heart picture and name at least one difference.
  In the picture:
  - Myocardium is wider (thicker).
  - Lumen is narrower.
  - How might the function be affected?
    -The relaxation might be compromised making it harder to fill the ventricle and to contract.

    -The wider the muscle the more oxygen it might need from the coronary system to function.
  - Which of the patient's conditions might be responsible for her cardiac changes?
    Hypertension

- Long term, would you expect any changes in volume and/or pressure? Explain your answer.
  Yes, I would expect lower volumes and higher filling pressures, because the contraction will get affected.

Heart Picture:

By Mikael Häggström, M.D. Author info- Reusing images- Conflicts of interest :None Mikael Häggström, M.D.Consent note: Consent

Clinical Case:

Myocardial infarction

Case of 58 y/o male that presents to the emergency department with severe chest pain that started 30 minutes ago while he was sitting at his desk at work. He describes the pain as crushing, radiating to his left arm and jaw, with associated shortness of breath and sweating. He rates the pain as 9/10 in intensity. He used to smoke 20 pack-year (quit 5 years ago) and have a medical history of poor controlled high blood pressure, high cholesterol levels, and Type 2 Diabetes. All conditions poor controlled even with the use of medications. His father had a myocardial infarction at age 60, mother had diabetes and hypertension.

- Vital signs: Blood Pressure 160/98 (Normal 120/80), HR: 110 (Nl:60-100)
- General appearance: Distressed, sweating and anxious.
- Auscultation: No murmurs or additional sounds.

Conceptual Study Questions:

- Look at your dissected heart and compare its walls with the heart picture.
  - What structure is affected?
  - What chambers of the heart is affected?
  - What is the function of this structure?
  - Is this the anterior or the posterior wall?
  - What does the color change might represent?
  - How might the affected structure's function be affected?
  - Could these changes disrupt the conduction pathway? Explain your answer. (HINT:EKG electrocardiogram is used to diagnose MI)
- The white arrow in the heart picture represents the area of concern.
  - What is the name of the circulation that supplies blood into this structure of the heart?
  - Name the vessel(s) of that circulation that supply this chamber of the heart.

CLINICAL CASE 5: **ERM**

Heart Picture:

By Mikael Häggström, M.D. Author info- Reusing images- Conflicts of interest :None Mikael Häggström, M.D.Consent note: Consent

Clinical Case:

Myocardial infarction

Case of 58 y/o male that presents to the emergency department with severe chest pain that started 30 minutes ago while he was sitting at his desk at work. He describes the pain as crushing, radiating to his left arm and jaw, with associated shortness of breath and sweating. He rates the pain as 9/10 in intensity. He used to smoke 20 pack-year (quit 5 years ago) and have a medical history of poor controlled high blood pressure, high cholesterol levels, and Type 2 Diabetes. All conditions poor controlled even with the use of medications. His father had a myocardial infarction at age 60, mother had diabetes and hypertension.

- Vital signs: Blood Pressure 160/98 (Normal 120/80), HR: 110 (Nl:60-100)
- General appearance: Distressed, sweating and anxious.
- Auscultation: No murmurs or additional sounds.

Conceptual Study Questions:

- Look at your dissected heart and compare its walls with the heart picture.
  - What structure is affected?
    The myocardium.
  - What chambers of the heart is affected?
    The Left ventricle
  - What is the function of this structure? The myocardium is responsible for the contractile function of the heart.
  - Is this the anterior or the posterior wall?
    Posterior wall
  - What does the color change might represent?
    Ischemia, dead tissue, scar tissue.
  - How might the affected structure's function be affected?
    The myocardium ability of contract and relax.
  - Could these changes disrupt the conduction pathway? Explain your answer. (HINT:EKG electrocardiogram is used to diagnose MI)
    Yes, the damage to the muscle, due to the lack of blood flow, can affect the electrical signals that coordinate heart contractions. Those changes can be identified in the EKG.
- The white arrow in the heart picture represents the area of concern.
  - What is the name of the circulation that supplies blood into this structure of the heart?
    Coronary Circulation
  - Name the vessel(s) of that circulation that supply this chamber of the heart.
    Posterior Interventricular artery (Left circumflex artery in some humans)