# The Cardio-VASCULAR System

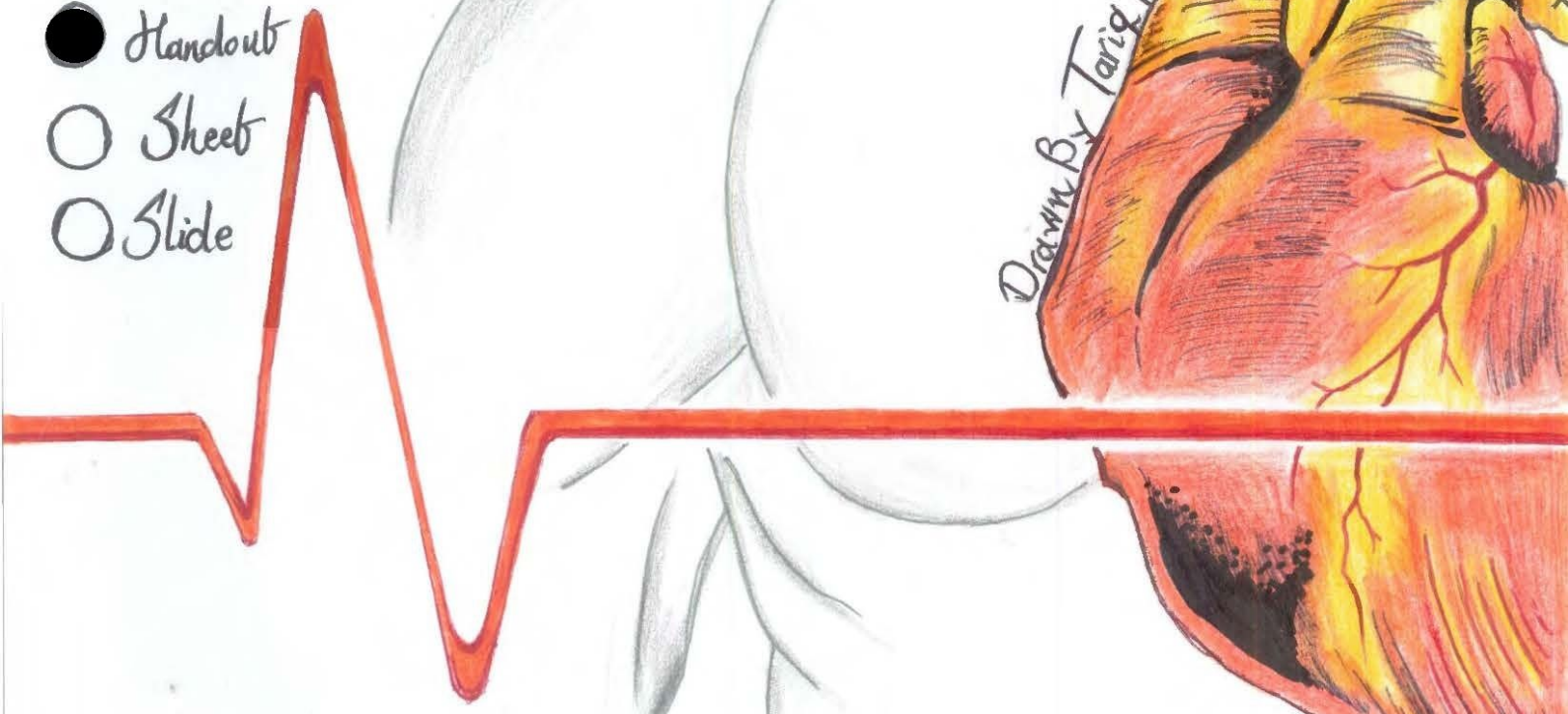
- ● Anatomy
- ○ Histology
- ○ Pathology
- ○ Pharmacology
- ○ Physiology
- ○ Microbiology

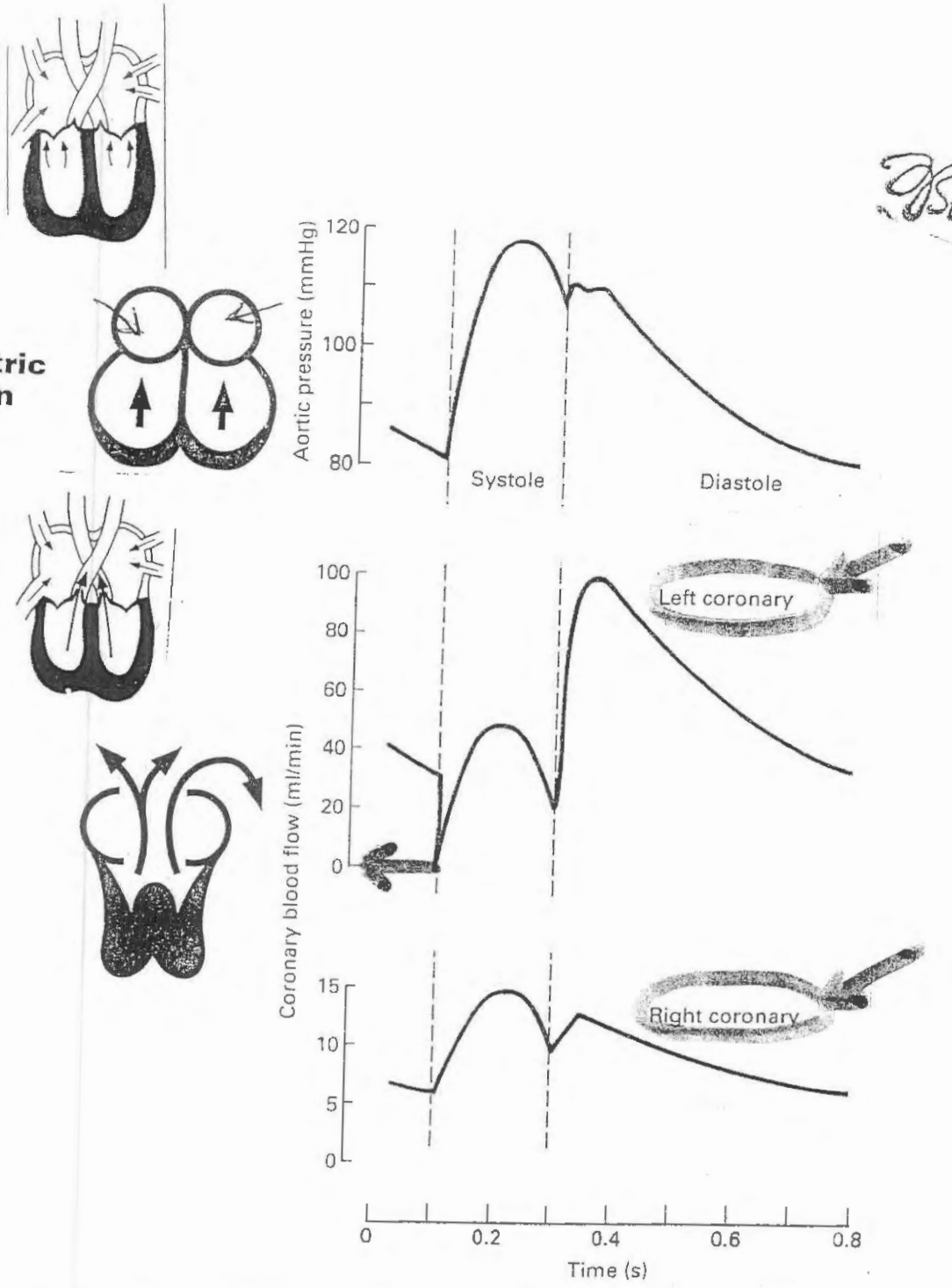
Lec #: 5

Dr. Name: Dr.Faraj

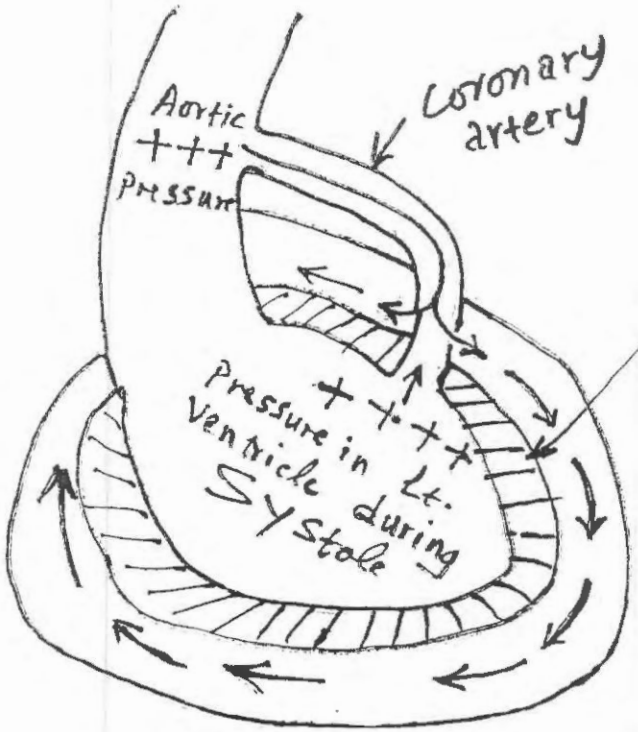
Done By:

- ● Handout
- ○ Sheet
- ○ Slide






a) **In the left coronary artery,** the blood flow generally follows the aortic pressure. In the isometric contraction phase, it is markedly decreased (& may reach zero) due to both compression of the coronary vessels by the contracting myocardium & the low aortic pressure. It then gradually increases in the maximum ejection phase (due to rise of the aortic pressure, which pushes some blood in the vessels inspite of the compressing effect of the contracting muscle), then it is decreased again during the reduced ejection phase (due to drop of the aortic pressure). This is followed by a maximal flow during **early diastole (in the isometric relaxation phase),** which then decreases again with the gradual decrease of the aortic pressure (figure 65).




Subendocardial part of Lt. ventricle → DOES NOT RECEIVE BLOOD DURING SYSTOLE
↓
Ischaemic damage
↓
common site of MI

D Bhutani

Because the pressure inside the left ventricle during systole slightly exceeds the aortic pressure (i.e. it is greater than the coronary A.B.P.), the blood flow in the coronary arteries supplying the **subendocardial part** of the left **ventricle stops completely during systole and occurs only during** diastole (while the flow in the superficial part still occurs to some extent during systole). For such reason, this part is liable to ischaemic damage and is the most common site of myocardial infarction.

b) **In the right coronary artery,** the blood flow is not much affected during ventricular systole because the force of right ventricular contraction is much weaker than that of the left ventricle (so the pressure inside the right ventricle during systole is considerably lower than the aortic pressure). Accordingly, the coronary blood flow in the right ventricle (& also in the atria) is continuous throughout the cardiac cycle → both during systole & diastole

↓ i.e

In the Rt. ventricle & both atria, coronary flow is better (than the Lt. ventrick) due to the GREATER PRESSURE GRADIENT between these chambers and the aorta

**Left Heart Failure (LHF)**: occurs when the left side of the heart is unable to pump the total volume of blood it receives from the right side of the heart

As a result the the pulmonary circulation becomes congested with blood (backward effect) that cannot be moved forward and the systemic blood pressure falls (forward effect).

The most common cause of left heart failure is **MI** (myocardial infarction); other causes include systemic hypertension, valvular (stenosis or insufficiency)

**Backward effects**

↓ emptying of lt. ventricle

↑ end-diastolic volume & pressure in lt. ventricle

↑ volume (Pressure) in the lt. atrium

↑ volume in Pulmonary veins

↑ volume in Pulmonary capillary bed

Transudation of fluid from capillaries into the interstitial spaces around the alveoli & finally into the alveoli

chronic!! ↓ (Acute) Pulmonary oedema

impair gas exchange which can be life-threatening

Affected individuals exhibit dyspnea & orthopnea → inability to breath in the supine position

Sustain!

**Forward effects**

↓ cardiac output → systemic blood pressure

↓ perfusion of body tissues

↓ blood flow to Kidneys and glands

Renin-angiotensin-aldosterone system is stimulated → further vasoconstriction & $Na^+$ and $H_2O$ retention

↑ extracellular fluid volume

↑ total blood volume

↑ systemic blood Pressure

Pt. c/o → Easy fatigue weakness & dizziness

occurs when hypoxia of body tissues occurs because of ↓ cardiac output and ↓ $O_2$ saturation of the blood

weakness → loss of $K^+$ by ↑ levels of aldosterone

dizziness → caused by brain hypoxia

Right heart failure (RHF) occures when the output of the right ventricle is less than the input from the systemic venous circulation (venous return). → As a result the systemic venous circulation is congested (backward effects) and the output to the lungs decreases (forward effects)

The major cause of RHF ↓ is LHF ⟹ the right ventricle fails because of the excessive pulmonary pressure generated by failure of the left heart *

other causes include COPD !!, congenital heart defects especially those that involve ↑ blood flow to the lungs and pulmonary hypertension

Backward effects (diastolic dysfunction)

↓ emptying of Rt. ventricle

↑ volume and end-diastolic pressure in Rt. ventricle

↑ volume (Pressure) in Rt. atrium (central venous pressure) CVP

↑ volume and Pressure in the great veins (CVP)

↑ volume in the systemic venous circulation

↑ volume in distensible organs (hepatomegaly & splenomegaly)

↑ pressure at capillary line

[Dependent ↓ oedema]

Forward effects (systolic dysfunction)

↓ volume from the right ventricle to the lungs

↓ blood return to the Lt. atrium and subsequent ↓ cardiac output

All the forward effects of left heart failure

↑ blood volume and vasoconstriction

Mustafa