University of Anbar
College of science
Department of biotechnology

Lectures of human physiology

Lec. 6

Blood, Heart, and Circulation

(Part 2)

By
Dr. Ali Mohammed Sameen

Heart Sounds

Closing of the AV and semilunar valves produces sounds that can be heard by listening through a stethoscope placed on the chest. These sounds are often verbalized as "lub-dub." The "lub," or **first sound,** is produced by closing of the AV valves during isovolumetric contraction of the ventricles. The "dub," or **second sound,** is produced by closing of the semilunar valves when the pressure in the ventricles falls below the pressure in the arteries. The first sound is thus heard when the ventricles contract at *systole*, and the second sound is heard when the ventricles relax at the beginning of *diastole*.

Heart Murmurs

Murmurs are abnormal heart sounds produced by abnormal patterns of blood flow in the heart. Many murmurs are caused by defective heart valves. Defective heart valves may be congenital, or they may occur as a result of rheumatic endocarditis, associated with rheumatic fever. In this disease, the valves become damaged by antibodies made in response to an infection caused by streptococcus bacteria (the bacteria that produce strep throat). people have small defects that produce detectable murmurs but do not seriously compromise the pumping ability of the heart. Larger defects, however, may have dangerous consequences and thus may require surgical correction.

Blood pressure

Blood pressure is formed as a result of the contraction of the muscular walls of the ventricle. By blood pressure, in the medical sense, it means the pressure within the systemic arteries, which include the aorta and its branches. In the physiological sense, the pressure within the four heart cavities during systole and diastole, and within the arteries, veins, and capillaries.

Human pressure is measured in the brachial artery by sphygmomanometer, which consists of a pressure bag (pressure cuff), and a stethoscope, a rubber bellows in the form of a rubber vesicle (bulb), and a mercury manometer.

- The pressure cuff is tied around the humerus above the elbow about an inch and the stethoscope is placed under the sac and above the artery.
- Inflate with a bulb until the pressure inside the bag is about 200 mm/Hg.
- Fortunately, because this pressure is higher than the arterial pressure in the brachial artery, it leads to blockage of the artery.
- After that, the pressure in the bag gradually decreases by opening the valve to get rid of the excess air.
- This continues until we hear a sound representing the passage of blood in the brachial artery after it was closed, and it is called the Korotkoff sound by the stethoscope that is placed on the brachial artery. The pressure read on the manometer represents the systolic pressure.
- After that, the pressure in the pressure cuff is gradually reduced, which makes the sound louder and higher until it suddenly subsides, and this is the diastolic pressure.
- When the left ventricle contracts, the pressure inside it rises to 120 mm/Hg. This is called systolic pressure.

Blood is pushed into the aorta artery and the pressure rises to 120 mm / Hg and is also called systolic pressure.

After that, the left ventricle starts with the low pressure inside it until it reaches almost zero. The pressure inside the aorta and the branching arteries began to reduce. When the pressure reaches about 80 mm /Hg mercury and shut down semilunar valve, so they are not reduced pressure in the arteries without this at all.

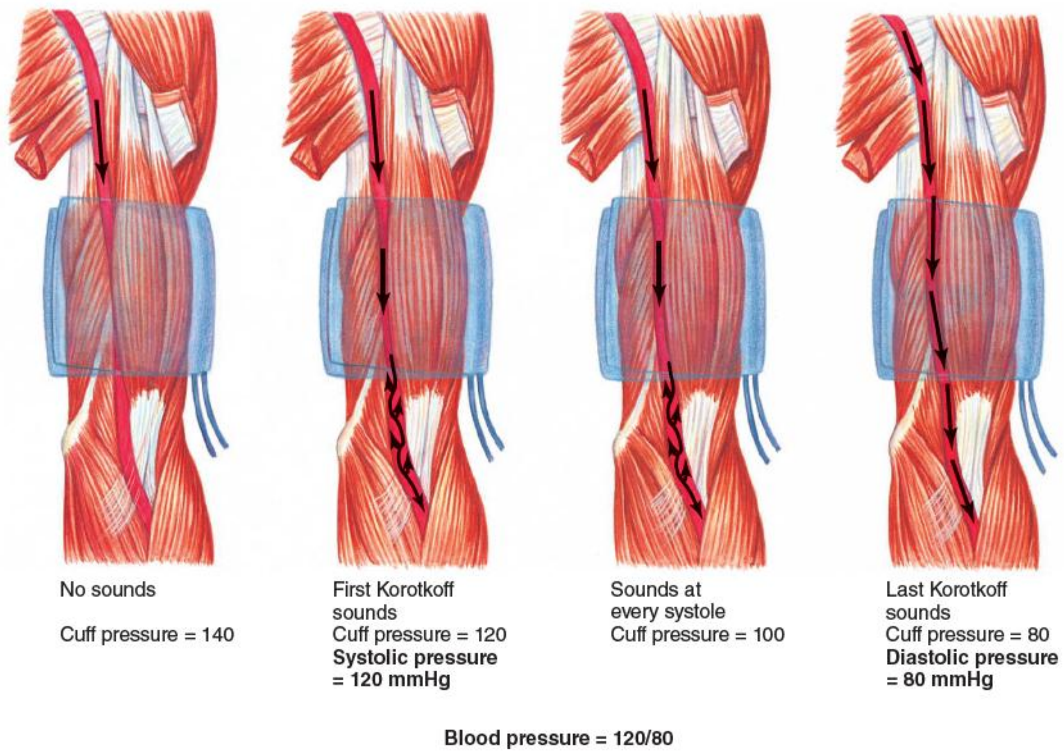

Figure 1. The blood flow and Korotkoff sounds during a blood pressure measurement

Factors affecting blood pressure:

1- Cardiac output: It depends on the heart rate and the stroke volume.

2- Peripheral resistance: It is affected by vascular diameters, blood volume, and blood viscosity.

The Electrocardiogram (ECG)

that the ECG is not a recording of action potentials, but it does result from the production and conduction of action potentials in the heart.

The spread of depolarization through the atria causes a potential difference that is indicated by an upward deflection of the ECG line. When about half the mass of the atria is depolarized, this upward deflection reaches a maximum value because the potential difference between the depolarized and unstimulated portions of the atria is at a maximum. When the entire mass of the atria is depolarized, the ECG returns to baseline because all regions of the atria have the same polarity. The spread of atrial depolarization thereby creates the P wave.

Conduction of the impulse into the ventricles similarly creates a potential difference that results in a sharp upward deflection of the ECG line, which then returns to the baseline as the entire mass of the ventricles becomes depolarized. The spread of the depolarization into the ventricles is thereby represented by the QRS wave. The plateau phase of the cardiac action potential is related to the S-T segment of the ECG. Finally, repolarization of the ventricles produces the T wave.

There are two types of ECG recording electrodes, or “leads.” The *bipolar limb leads* record the voltage between electrodes placed on the wrists and legs (fig. 2). These bipolar leads include lead I (right arm to left arm), lead II (right arm to left leg), and lead III (left arm to left leg). The right leg is used as a ground lead. In the *unipolar leads,* voltage is recorded between a single “exploratory electrode” placed on the body and an electrode that is built into the electrocardiograph and maintained at zero potential (ground). The unipolar limb leads are placed on the right arm, left arm, and left leg, and are abbreviated AVR, AVL, and AVF, respectively. The unipolar chest leads are labeled 1 through 6, starting from the midline position (fig. 2). Thus, a total of 12 standard ECG leads “view” the changing pattern of the heart’s electrical activity from different perspectives. This is important because certain abnormalities are best seen with particular leads and may not be visible at all with other leads.

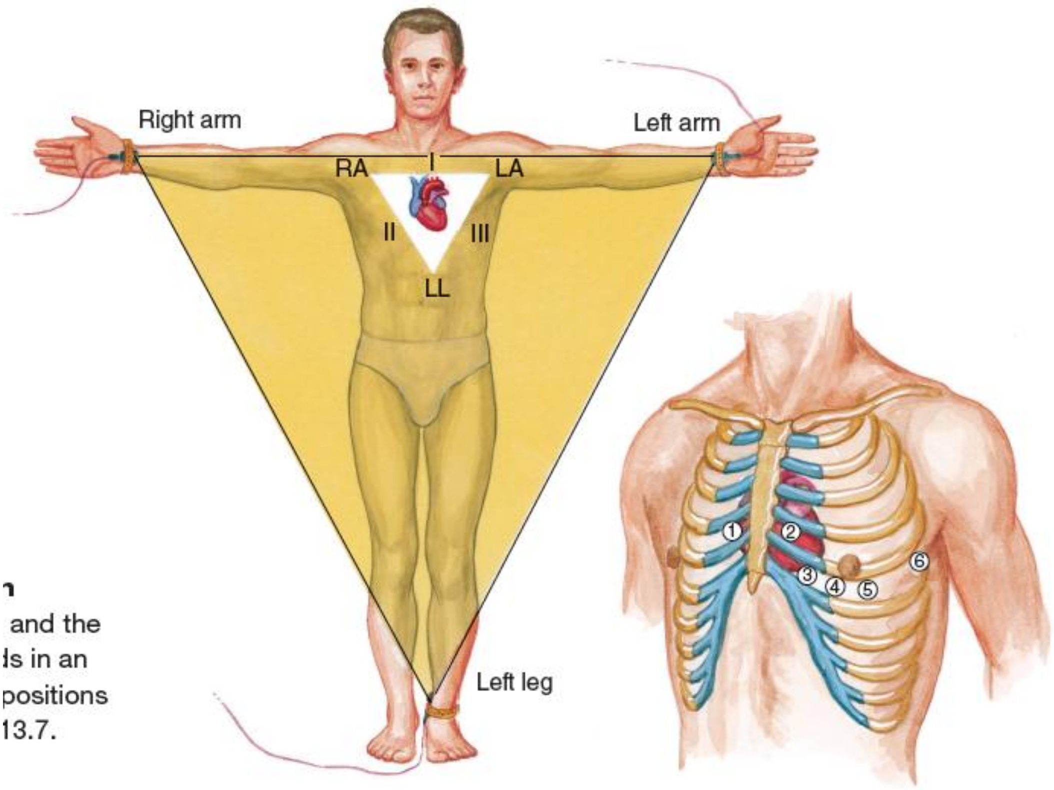

Fig. 2 **The electrocardiograph leads.**

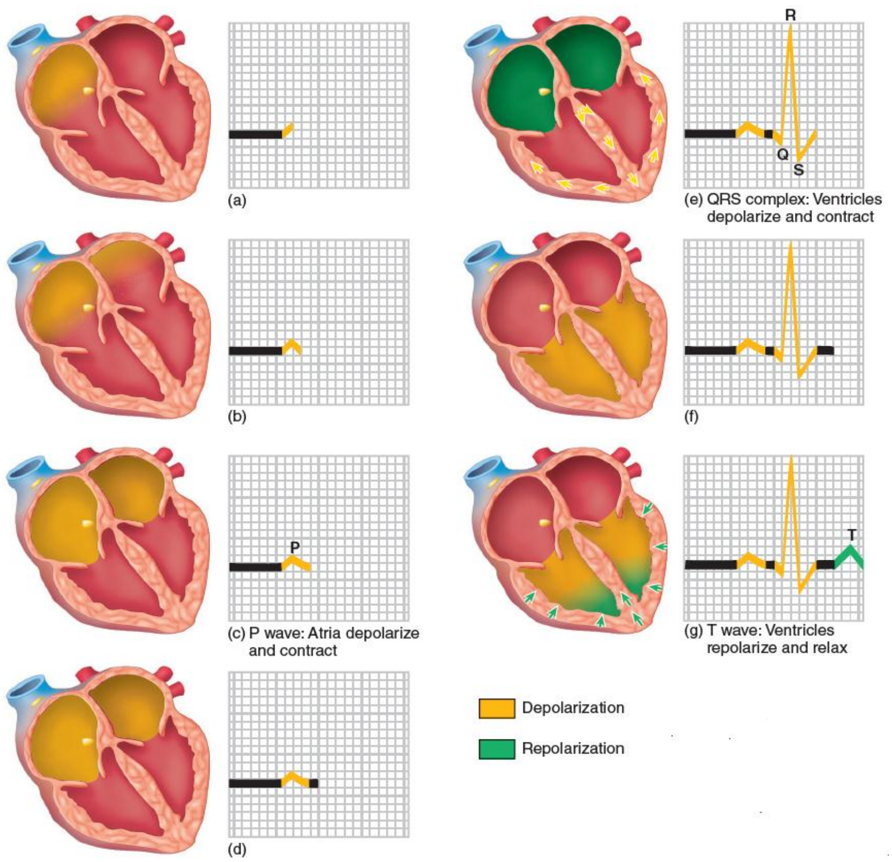

Figure 3 **The relationship between impulse conduction in the heart and the ECG.**

-Reference

Fox, S. I. (2014). Fox Human Physiology.