

Setup and Interpretation of the Electrocardiogram



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Setup and Interpretation of the Electrocardiogram

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After studying the information presented, the reader should be able to:

- Discuss cardiac anatomy and physiology.
- Identify influences on heart rate.
- Describe the cardiac cycle.
- Understand the ECG graph and lead placement.
- Recognize the characteristic waves or deflections recorded by the ECG.
- Interpret an ECG strip, recognizing normal sinus rhythm as well as common dysrhythmias.

This course reviews cardiac anatomy and physiology. The basic setup for an electrocardiogram is described, and the common anomalies encountered in monitoring the ECG are presented.

The occupational demands placed on today's radiologic technologists are increasing and changing. Additionally, with the development of the registered radiologist assistant (R.R.A.) physician extender profession, technologist roles are expanding to those of direct patient care providers. Regardless of whether you are a technologist or R.R.A., however, employers are now expecting these medical imaging professionals to possess increasingly broad skills and knowledge, enabling them to be more versatile.

One knowledge area that typically has been left out of radiologic science education involves the electrocardiogram (ECG). An understanding of the ECG is essential for both radiologic technologists and R.R.A.s performing cardiovascular procedures. For example, serious complications from cardiac catheterization and iodinated contrast media injection can include ventricular fibrillation and asystole.¹ For this rea-

son, either technologists assisting with, or R.R.A.s performing, a procedure involving iodinated contrast media injection may be expected to prepare a patient for and monitor the ECG.

Cardiac Anatomy Location of the Heart

The cardiovascular system is the first major organ system to become functional in the fetus. In fact, the human heart begins beating regularly by the fourth week of gestation.² This muscular organ is essentially a 4-chambered pump, somewhat the same size and shape as a person's closed fist. In the average adult, it is located in the mediastinum with two-thirds of its mass to the left of the median plane and one-third to the right side. The base, or upper portion, lies at the level of the second rib. The apex, or lower portion, is a blunted point lying on the diaphragm at the level of the interspace of the fifth and sixth rib.⁴ The right ventricle occupies most of the anterior

cardiac surface, with the inferior border located below the junction of the sternum and xiphoid process. The left ventricle sits partially behind the right ventricle and forms the left margin of the heart. The right atrium forms the right cardiac border, and the left atrium, sitting primarily posteriorly, contributes partially to the upper left portion of the cardiac border, seated between the pulmonary artery and left ventricle³ (see **Figure 1**). Having a good understanding of the location of the cardiac chambers aids in correct placement of the ECG leads.

Structures of the Heart

Coverings

The heart is covered by a double-walled, loose-fitting sac called the pericardium (see **Figure 2**). The tough, outer portion is called the fibrous pericardium. The smooth, moist inner membrane is known as the serous pericardium. The serous pericardium is subdivided into 2 portions: the parietal and visceral layers. The parietal layer is the portion of the serous pericardium attached to the fibrous section. The visceral layer is attached to the actual heart and forms the outermost layer of the heart wall (epicardium). The pericardial space, a gap filled with a lubricating fluid, is found between the parietal and visceral layers.

The other 2 sections of the heart wall are the myocardium and endocardium. The myocardium is the thickest section and is the actual muscular portion of the heart. The contractile cells making up the myocardium form striated involuntary muscle. The endocardium is the innermost section of the heart wall. This tissue lines the interior of the myocardium as a protective covering.

Chambers

The superior, receiving chambers of the heart are the atria. The right atrium receives unoxygenated blood from the superior and inferior venae cavae and a small amount from the coronary veins. The left atrium receives oxygenated blood from the pulmonary veins (see **Figure 3**). Both atria contract and relax simultaneously to receive blood from the vessels and to push it into the next set of chambers, the ventricles. The lower chambers are larger and have thicker myocardial walls than the atria because they are the primary pump-

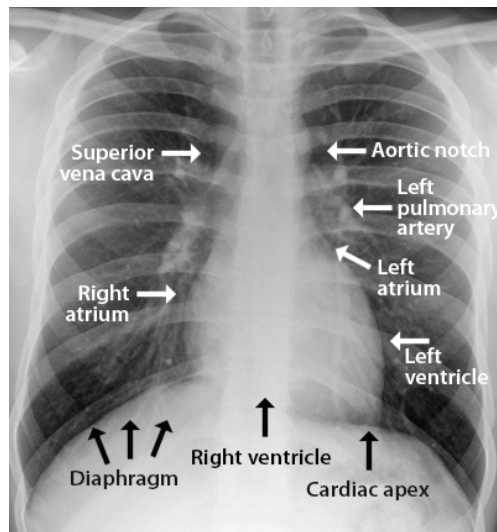


Figure 1.

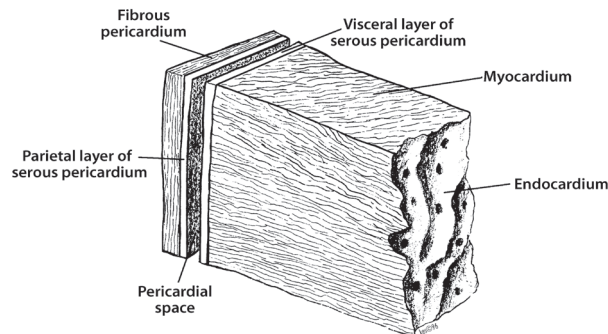


Figure 2. Coverings and tissue layers of the heart. Copyright © 1996 White Hart Designs.

ing chambers of the heart.² The right ventricle pumps unoxygenated blood through the pulmonary artery to the lungs for oxygenation. The left ventricle pumps the oxygenated blood out through the aorta to the systemic and coronary circulation. These chambers contract and relax virtually simultaneously (see **Figure 4**).

Valves

The heart valves, like other mechanical valves, allow blood to flow only in 1 direction.² The heart contains