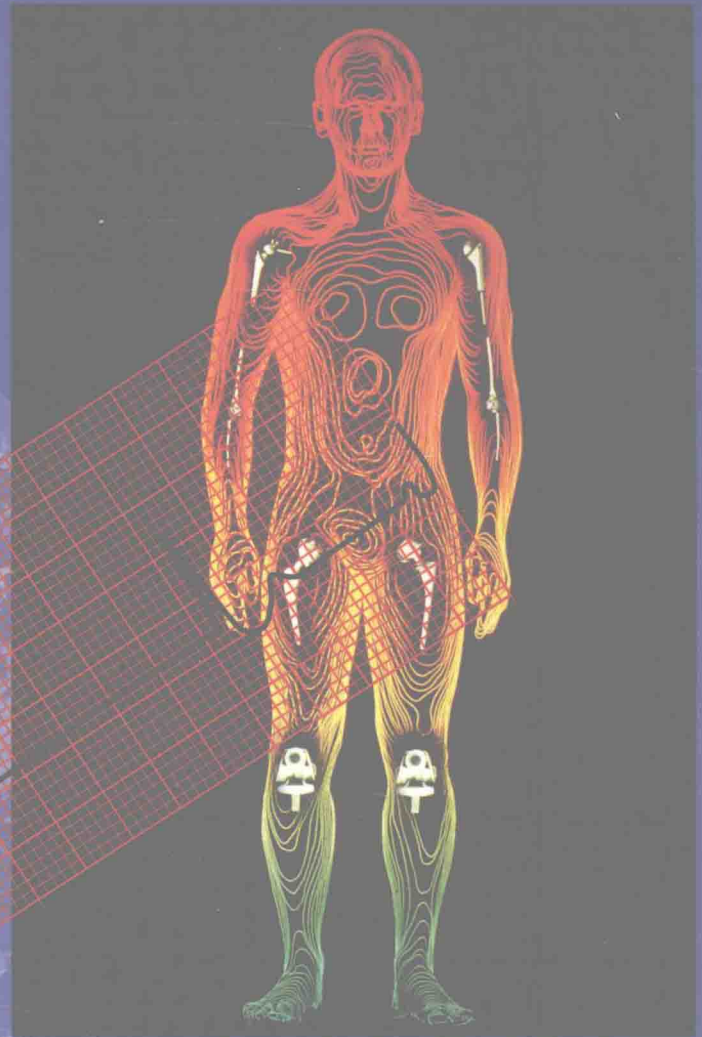


ECGs MADE EASY



BARBARA AEHLERT, RN



ECGs Made Easy

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Illustrations (except ECGs and those otherwise noted) by Kimberly Battista



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PREFACE

This book is designed for use by paramedic and medical students, ECG monitor technicians, nurses and other allied health personnel working in emergency departments, critical care units, postanesthesia care units, operating rooms and telemetry units wishing to master the skill of basic ECG recognition. This book may be used alone or as part of a formal course of instruction in basic dysrhythmia recognition.

This material focuses on the essential information needed to interpret basic dysrhythmias and understand their significance. A description of each dysrhythmia is provided with possible patient signs and symptoms related to the dysrhythmia. Where appropriate, current recommended treatment for the dysrhythmia is discussed.

After discussion of each dysrhythmia, a sample rhythm strip is displayed. Additional rhythm strips are provided for practice at the conclusion of each chapter related to dysrhythmia recognition (chapters 3-5, 7-9). Answers for each rhythm are provided in the appendix. All rhythm strips shown in this text were recorded in lead II unless otherwise noted.

Every attempt has been made to provide information that is consistent with current literature including the American Heart Association guidelines, however, the reader is advised to learn and follow local protocols as defined by his/her medical advisors.

I hope you find this text of assistance and welcome your comments and suggestions.

Barbara Aehlert, R.N.

For

Kathryn M. Lewis, R.N., PhD

my mentor and friend.

Your wealth of knowledge and gift for teaching are a blessing to all of us.

My sincere thanks for everything you have taught me.

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ABOUT THE AUTHOR

Barbara Aehlert, R.N., is currently the President of Southwest EMS Education in Glendale, Arizona. She has been a registered nurse for over 20 years with clinical experience in medical/surgical and critical care nursing and more than 10 years experience in prehospital education. As an active ACLS Instructor and ACLS Regional Faculty member Barbara regularly teaches ACLS courses and takes a special interest in teaching basic dysrhythmia recognition in paramedic education programs.

In addition to this text and the accompanying *ECG's Made Easy Pocket Reference*, Barbara is the author of the following Mosby publications: *ACLS Quick Review Study Guide*, *ACLS Quick Review Study Cards*, *ACLS Quick Review Slide Set*, *Mosby's ACLS Test Generator*, and *PALS Pediatric Advanced Life Support Study Guide*. Barbara has also acted as a consultant on other Mosby educational materials, including the *American Heart Association ACLS Video Series*, a reviewer of several EMT-B texts, and a contributor to several ACLS CD-ROM projects.

ECGs Made Easy

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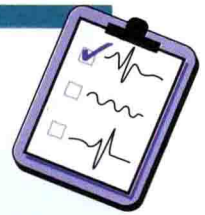
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Anatomy and Physiology

OBJECTIVES



Upon completion of this chapter, you will be able to:

1. Describe the location of the heart.
2. Distinguish between the apex and base of the heart.
3. Describe the surfaces of the heart.
4. Describe the structure and location of the pericardium, epicardium, myocardium, and endocardium.
5. Identify and describe the chambers of the heart.
6. Name and identify the location of the atrioventricular valves.
7. Name and identify the location of the semilunar valves.
8. Beginning with the right atrium, describe the flow of blood through the normal heart and lungs to the systemic circulation.
9. Define the term "atrial kick."
10. Name the primary branches of the right and left coronary arteries.
11. Identify the portions of the myocardium and conduction system supplied by the right and left coronary arteries.
12. Explain the clinical significance of the first and second heart sounds.
13. Define the terms "preload" and "afterload."
14. Contrast the effects of sympathetic and parasympathetic stimulation of the heart.
15. Describe the role of baroreceptors in controlling heart rate.
16. Name the primary neurotransmitter of the parasympathetic division of the autonomic nervous system and describe its effects on the heart.
17. Name the primary neurotransmitter of the sympathetic division of the autonomic nervous system and describe its effects on the heart.



KEY TERMS

AFTERLOAD: the pressure or resistance against which the ventricles must pump to eject blood

APEX OF THE HEART: bottom of the heart, approximately the level of the fifth left intercostal space

ATRIA: upper chambers of the heart

ATRIAL KICK: blood pushed into the already full ventricles as a result of atrial contraction

ATRIOVENTRICULAR (AV) VALVE: valve located between each atrium and ventricle; the tricuspid separates the right atrium from the right ventricle, the mitral (bicuspid) separates the left atrium from the left ventricle

BASE OF THE HEART: top of the heart located at approximately the level of the second intercostal space

CARDIAC OUTPUT: the amount of blood ejected by the left ventricle into the aorta in one minute

CHORDAE TENDINEAE: thin strands of fibrous connective tissue that extend from the AV valves to the papillary muscles that prevent the AV valves from bulging back into the atria during ventricular systole (contraction)

CHRONOTROPIC EFFECT: refers to a change in heart rate

DIASTOLE: the phase of the cardiac cycle in which the atria and ventricles relax between contractions and blood enters these chambers

DROMOTROPIC EFFECT: refers to a change in the speed of conduction through the AV junction

ENDOCARDIUM: the innermost layer of the heart that lines the inside of the myocardium and covers the heart valves

EPICARDIUM: also known as the visceral pericardium; the external layer of the heart wall that covers the heart muscle

GREAT VESSELS: pulmonary arteries, pulmonary veins, aorta, superior and inferior vena cavae

INOTROPIC EFFECT: refers to a change in myocardial contractility

MEDIASTINUM: located in the middle of the thoracic cavity; contains the heart, great vessels, trachea, and esophagus, among other structures. Extends from the sternum to the vertebral column.

MYOCARDIUM: the middle and thickest layer of the heart. Contains the cardiac muscle fibers that cause contraction of the heart and contains the conduction system and blood supply.

PERICARDIUM: the protective sac that surrounds the heart

PRELOAD: the force exerted by the blood on the walls of the ventricles at the end of diastole

SEMILUNAR VALVES: valves shaped like half-moons that separate the ventricles from the aorta and pulmonary artery

STROKE VOLUME: the amount of blood ejected by either ventricle during one contraction

SYSTOLE: contraction of the heart (usually referring to ventricular contraction) during which blood is propelled into the pulmonary artery and aorta

VAGAL MANEUVER: methods used to stimulate the vagus nerve in an attempt to slow conduction through the AV node, resulting in slowing of the heart rate

VENOUS RETURN: the amount of blood flowing into the heart from the systemic circulation

VENTRICLES: the lower chambers of the heart

LOCATION AND LAYERS OF THE HEART

The heart lies in the middle of the thoracic cavity (mediastinum) behind the sternum and between the lungs. It is surrounded by a protective sac (pericardium) and is attached to the thorax by the great vessels (pulmonary arteries and veins, aorta, superior and inferior vena cavae). The heart is cone-shaped and is approximately 5 inches (12 cm) long, 3½ inches (9 cm) wide, and 2½ inches (6 cm) thick.

The apex (bottom) of the heart is formed by the tip of the left ventricle. It lies just above the diaphragm to the left in an anterior position, at the fifth intercostal space, midclavicular line. The base (top) of the heart is at approximately the level of the second intercostal space. The anterior (front, sternocostal) surface of the heart consists primarily of the right ventricle. The inferior (diaphragmatic) surface is formed by the right and left ventricles (predominantly the left).

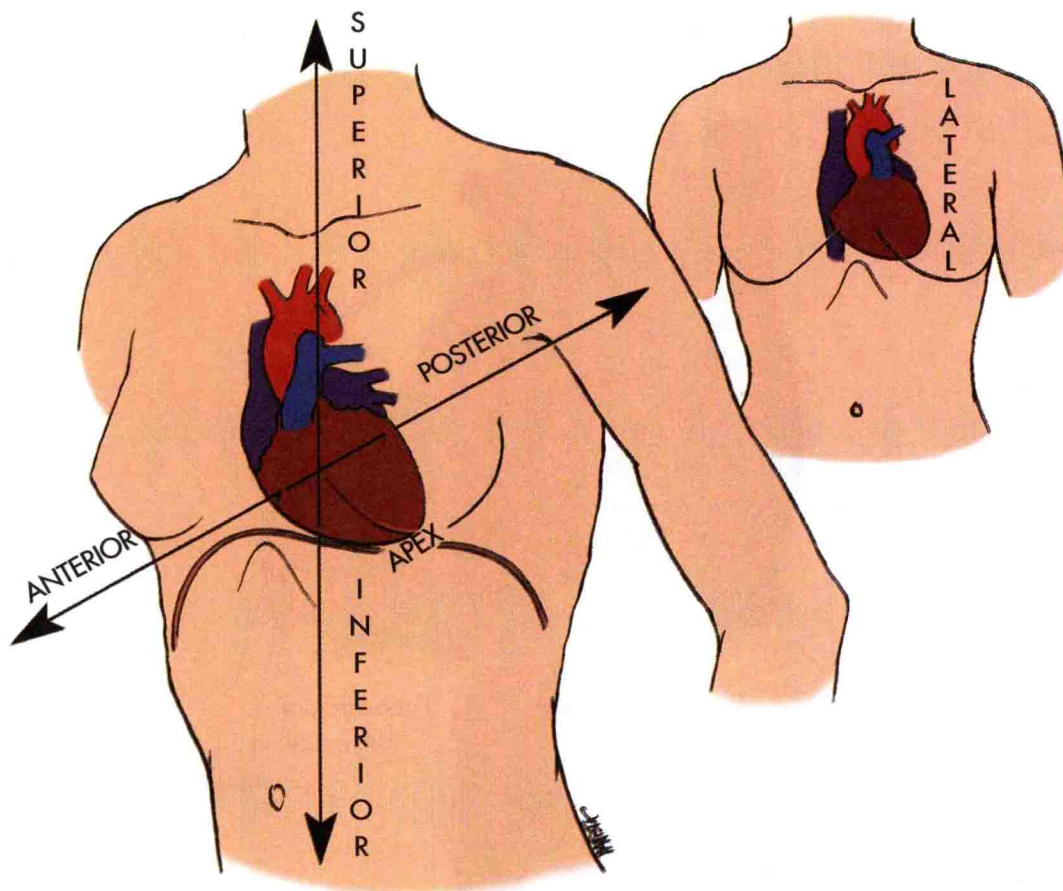


Figure 1-1. The surfaces of the heart.

The heart is enclosed by a double-walled membranous sac called the pericardium. The pericardium consists of two layers — the parietal and visceral layers. The parietal pericardium is the outer, fibrous layer. The inner layer covers the heart muscle and is called the visceral pericardium (or epicardium). Between these layers is approximately 10 ml of serous fluid that acts as a lubricant, preventing friction as the heart beats.

The heart wall is made up of three layers. The epicardium (visceral pericardium) is the external layer. Coronary blood vessels that supply arterial blood to the heart cross this layer before entering the myocardium. The myocardium (heart muscle) is the middle and thickest layer of the heart. It contains the cardiac muscle fibers that cause contraction of the heart and contains the conduction system and blood supply. The endocardium (innermost layer) is a smooth layer of connective tissue that lines the chambers of the heart and covers the heart valves. The endocardium is continuous with the innermost layer of the large blood vessels.

In acute myocardial infarction (MI), different terms are used to describe the extent of injury. In a **transmural** myocardial infarction, the entire thickness of the ventricular wall (endocardium to epicardium) is involved. In a **subendocardial** MI, the inner ventricular wall layer is involved; injury does not extend through to the epicardial wall.

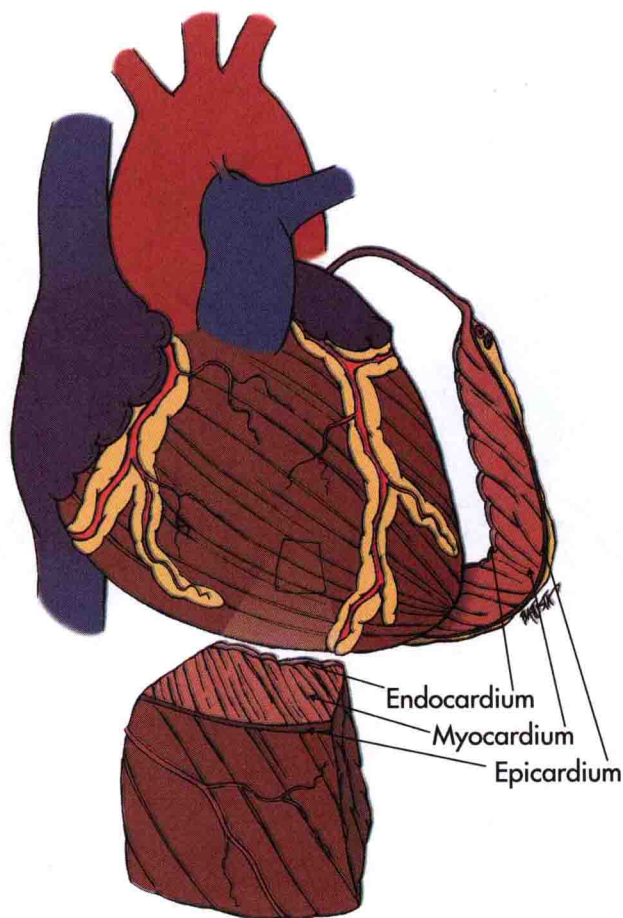


Figure 1-2. The layers of the heart wall.

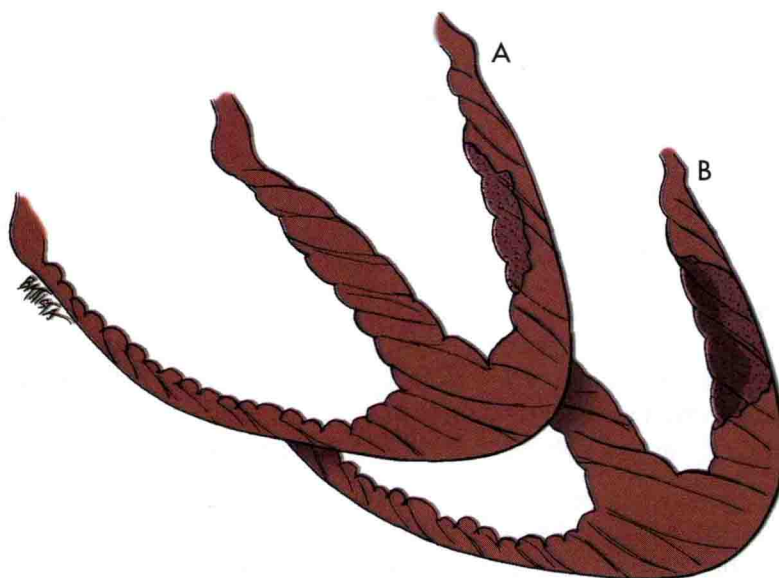


Figure 1-3. (A) Subendocardial and (B) transmural myocardial infarction.

TABLE 1-1. The Layers of the Heart Wall.

Epicardium (visceral pericardium)	External layer of the heart Coronary arteries are found in this layer
Myocardium	Middle and thickest layer of the heart Responsible for contraction of the heart
Endocardium	Innermost layer of the heart Lines the inside of the myocardium Covers the heart valves

HEART CHAMBERS

The heart is divided into four chambers. The two upper chambers are the right and left atria and the two lower chambers are the right and left ventricles. The atria are thin-walled, low-pressure chambers that **receive** blood from the systemic circulation and lungs. The atria are separated by a wall of myocardium called the interatrial septum.