

CHAPTER 17:

ELECTRICAL MANAGEMENT OF ARRHYTHMIAS:

DEFIBRILLATION, CARDIOVERSION, PACEMAKERS, IMPLANTABLE CARDIOVERTER DEFIBRILLATORS, ELECTROPHYSIOLOGY STUDIES, RADIOFREQUENCY ABLATION

This chapter focuses on the electrical management of cardiac arrhythmias, including defibrillation and cardioversion for terminating tachyarrhythmias; single and dual chamber pacemaker concepts; and implantable cardioverter defibrillators (ICD) in sudden cardiac death (SCD) survivors and patients at high risk for SCD. Pacemakers and ICDs have become very complicated, and it is increasingly difficult for nurses to keep up with new technology and feel comfortable dealing with these devices. This chapter focuses on basic concepts of single and dual chamber pacemakers and ICDs, but does not attempt to cover all technology associated with these devices.

DEFIBRILLATION

Defibrillation is the delivery of electrical energy to the myocardium to terminate ventricular fibrillation (VF) and pulseless ventricular tachycardia (pVT). The defibrillating shock depolarizes all cells in the heart simultaneously, stopping all electrical activity and allowing the sinus node to resume its function as the normal pacemaker of the heart. Early defibrillation is the only treatment for VF or pVT, and should not be delayed for any reason when a defibrillator is available. If a defibrillator is not immediately available, cardiopulmonary resuscitation (CPR) should be started until a defibrillator arrives.

Defibrillation is usually done transcutaneously, using two paddles applied to the skin in the anterolateral position (Figure 17.1). The procedure can also be done through hands-free adhesive pads in either the anterolateral or the anteroposterior position (Figure 17.2), but this method is usually only used in patients with frequent, recurrent VF requiring repeated shocks. Defibrillation can also be done via transvenous electrodes as part of an ICD system, which is covered later in this chapter.

Electrical output used for defibrillation (and for cardioversion) is quantified in joules (J) or watt-seconds. Traditional machines utilize a monophasic waveform that delivers energy in one direction through the myocardium. Newer machines utilize a biphasic waveform that delivers the initial energy in one direction and the last portion of energy in the opposite direction. Biphasic waveforms are more effective than monophasic waveforms in terminating arrhythmias. At this time there is no consensus on how biphasic waveform energy relates to monophasic waveform energy. The current Advanced Cardiac Life Support (ACLS) guidelines from the American Heart Association indicate that defibrillation with a 120j – 150j biphasic shock is at least as effective as higher energy monophasic shocks (Hamdan, Dorostkar, & Scheinman, 2000).

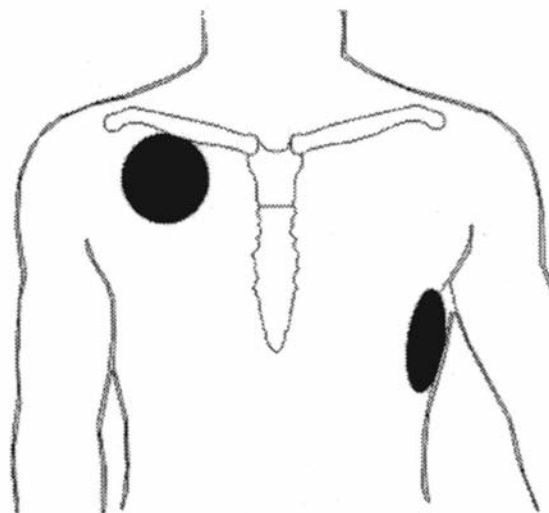


Figure 17.1: Anterolateral position for placing paddles or hands-free adhesive pads for defibrillation.