Department of Anesthesia Techniques

Title of the lecture: - DC.Shock

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DEFIBRILLATOR

This is a device that delivers electrical energy to the heart causing simultaneous depolarization of an adequate number of myocardial cells to allow a stable rhythm to be established.

Defibrillators can be divided into

the automated external defibrillators (AEDs)

and manual defibrillators

Components

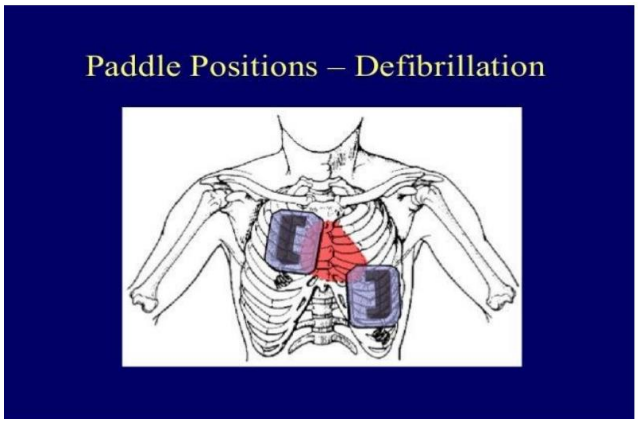
1. The device has an on/off switch, Joules setting control, charge and discharge buttons.

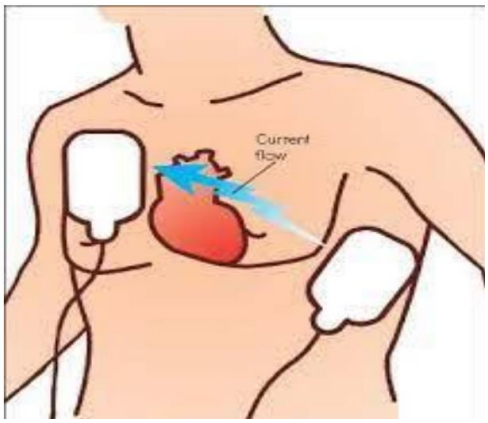
2. Paddles can be either external (applied to the chest wall) or internal (applied directly to the heart). The external paddles/pads are usually 8–8.5 cm in size.

The defibrillator paddle placement on the chest wall has two conventional positions:

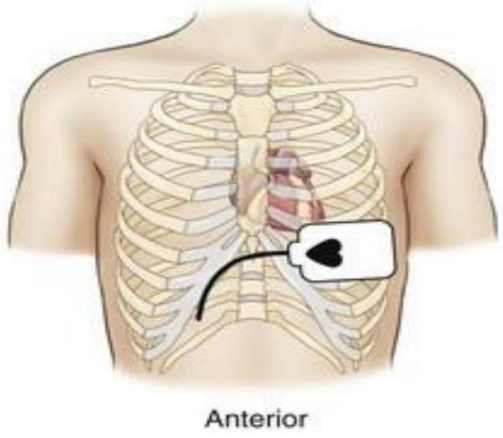
a) anterolateral and b) anteroposterior.

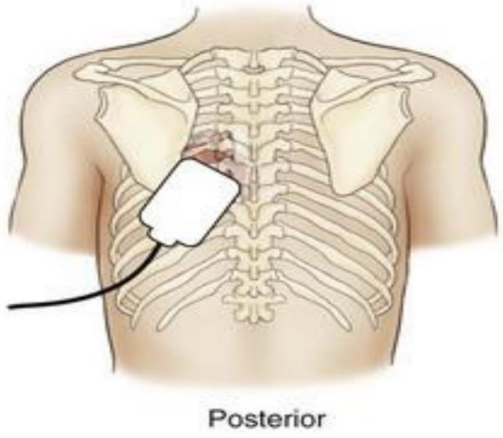
In the anterolateral position, a single paddle is placed on the left fourth or fifth intercostal space on the midaxillary line. The second paddle is placed just to the right of the sternal edge on the second or third intercostal space.





In the anteroposterior position, a single paddle is placed to the right of the sternum, as above, and the other paddle is placed between the tip of the left scapula and the spine.





Defibrillation is the term used when asynchronous electric energy is delivered to terminate life-threatening ventricular flutter or fibrillation.

Cardioversion is the term used when a synchronous direct current shock is used to restore sinus rhythm in various supraventricular and ventricular tachycardia.

Synchronization of the delivery of electric shock to the R wave is chosen for all tachycardias with well-defined and identifiable QRS complex, e.g. all supraventricular and monomorphic ventricular tachycardias.

Asynchronous shock is used for polymorphic ventricular tachycardia or ventricular flutter and fibrillation where there is no well-defined QRS complex.

Indications for asynchronous versus synchronous shock

Asynchronous shock (defibrillation) is used in the following situations

– Pulseless ventricular tachycardia

– Ventricular fibrillation

– Cardiac arrest due to or resulting in ventricular fibrillation

Indications for synchronized electrical shock (cardioversion) include the following:

– Monomorphic ventricular tachycardia

– Atrial fibrillation

– Atrial flutter

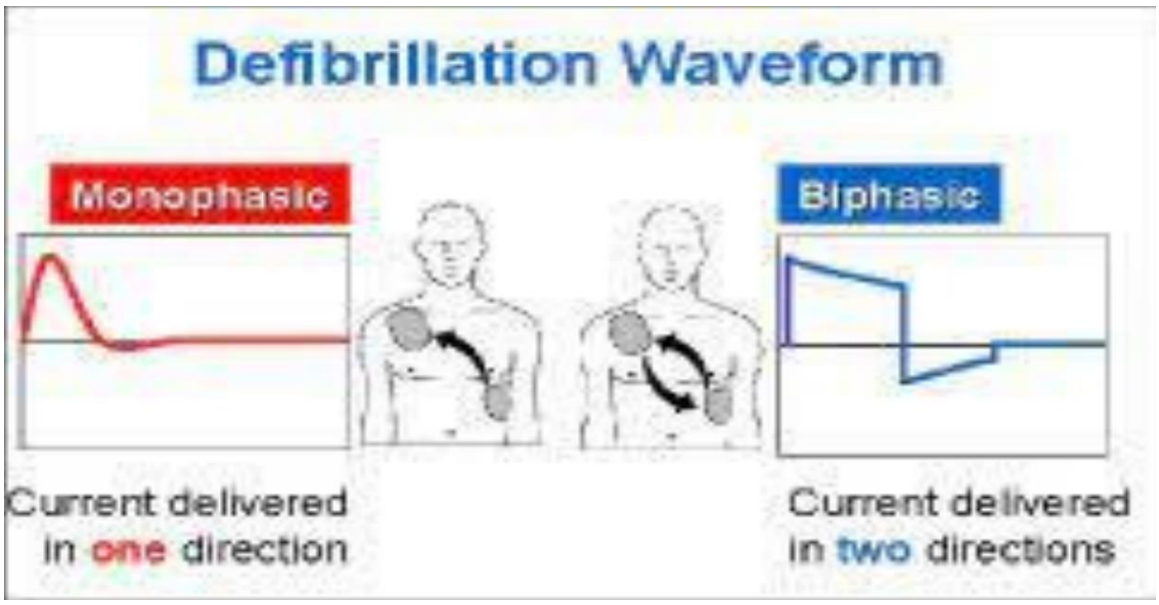
– Paroxysmal supraventricular tachycardia.

Waveforms

A) Monophasic defibrillators deliver current that is unipolar (i.e. one direction of current flow). They are not used in modern practice as they were likely to have waveform modification depending on transthoracic impedance (e.g. larger patients with high transthoracic impedance received considerably less transmyocardial current than smaller patients).

B) Biphasic defibrillators deliver a two-phased current flow in which electrical current flows in one direction for a specified duration, then reverses and flows in the opposite direction for the remaining milliseconds of the electrical discharge. Biphasic defibrillators compensate for the wide variations in transthoracic impedance by electronically adjusting the

waveform magnitude and duration to ensure optimal current delivery to the myocardium, irrespective of the patient's size.



Advantages of biphasic defibrillator over monophasic defibrillator

1- Less power – less trauma – less battery .
2- 2- Defibrillation more effective at low energy .
3- 3-Fewer burns .
4- 4-Less myocardial damage .
5- 5-First shock success , in cardiac arrest due to shockable rhythm Monophasic 60% . Biphasic 90% .

Energy Selection

-In case of life-threatening arrhythmias with cardiac arrest, highest energy shock (360 J monophasic or 200 J biphasic), asynchronous shock should be given.

-In the event of well defined QRS tachycardia, the defibrillator should be used in the synchronized mode.

-Atrial flutter and PSVT require less energy for correction: 50 J initially, then 100 J if needed.

-Cardioversion of VT requires shock of 50–100 J initially, then 200 J if the initial shock is unsuccessful.

-Energy requirements for correction of AF are higher at 100–200 J initially and 360 J for subsequent shocks.

-In children, smaller paddle size should be used (3 cm diameter) and also the energy selection is lower, i.e 0.5–2 J/kg for cardioversion and 2–4 J/kg for defibrillation.

Notes * Because the skin can conduct away a significant portion of the current, it is common practice to employ conductive gel or pregelled pads so as to ensure good contact.

Even in ideal circumstances, only 10–30% of the total current reaches the heart. * In patients with permanent pacemaker and intracardiac defibrillator implants, care should be taken such that the external defibrillator paddles should be at least 10 cm away from the implanted devices and the current vector of the external.

***Complications** resulting from the use of an external cardioverter defibrillator may include failure to shock, failure to sense or identify the rhythm, chest wall discomfort, and skin burns