Defibrillator

BiomedGuy

Medtronic Physiocontrol LifePak 10

Introduction

- This life-support system is used by paramedic, hospital staff, and other trained authorized healthcare providers.
- Provides, ECG, synchronized cardioversion, noninvasive and pacing
- LCD displays heart rate and pacing fucntions

Clinical Applications

- **Defibrillation** is a common treatment for life-threatening cardiac arrhythmias, ventricular fibrillation and pulseless ventricular tachycardia.
- Defibrillation consists of delivering a therapeutic dose of electrical energy to the affected heart with a device called a **defibrillator**. This depolarizes a critical mass of the heart muscle, terminates the arrhythmia, and allows normal sinus rhythm to be reestablished by the body's natural pacemaker, in the sinoatrial node of the heart.
- Defibrillators can be external, transvenous, or implanted, depending on the type of device used or needed. Some external units, known as automated external defibrillators (AEDs), automate the diagnosis of treatable rhythms, meaning that lay responders or bystanders are able to use them successfully with little, or in some cases no training at all.

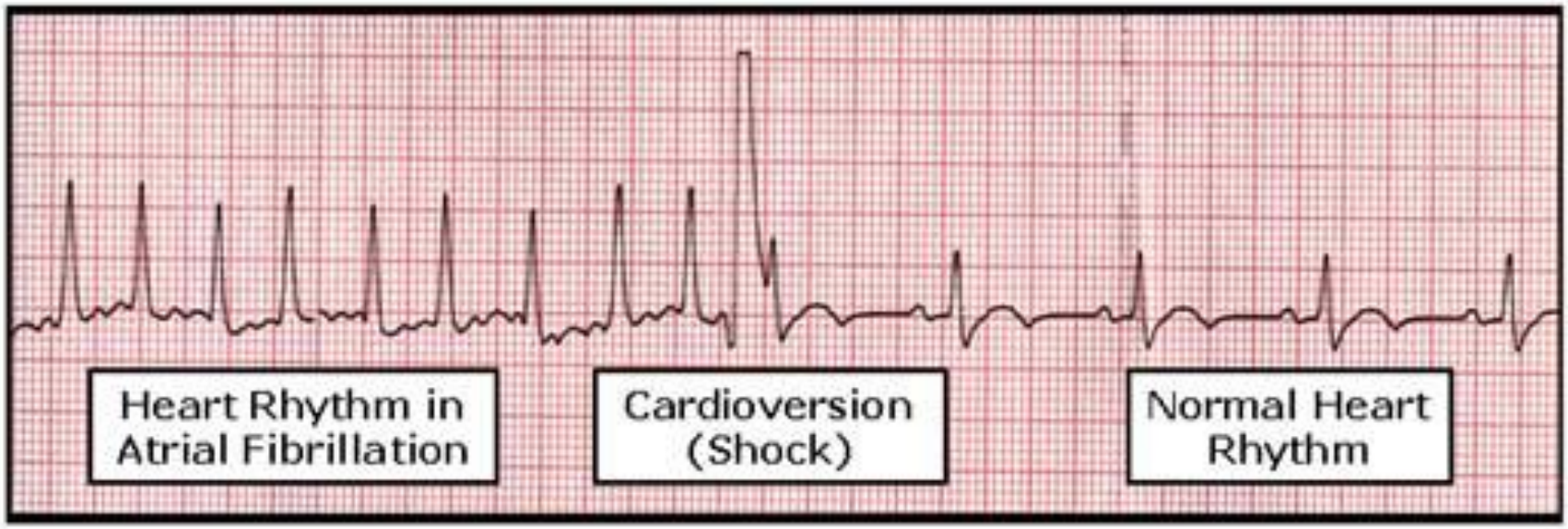
Specification data

- **Energy: 0, 5, 10, 20, 50, 100, 200, 300, 360J**
- **Synchronizer: Delivers energy discharge within 20msec**
- **Paper speed: 25mm/sec**
- 0.05 to 100Hz, -3dB (diagnostic freq. resp.)
- **ECG output: 60, 120 Normal Sinus Rhythm (NSR)**
- **Battery: 3 NiCad batteries, 12V, 1.0 amp hours each -** 25 discharges at 360 joules per Battery Pak

synchronized cardioversion

- **Cardioversion** is a medical procedure by which an abnormally fast heart rate or cardiac arrhythmia is converted to a normal rhythm, using electricity or drugs.
- **Synchronized cardioversion** uses a therapeutic dose of electric shock to the heart, at a specific moment on the down stroke of the R wave in the cardiac cycle.

Cardioversion cont.



Electrode placement

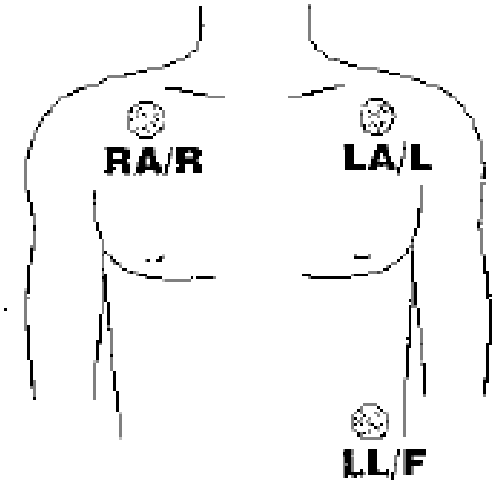


Figure 2-1 Electrode placement

AHA Labels	
RA	Right Arm
LA	Left Arm
LL	Left Leg

IEC Labels	
R	Right
L	Left
F	Foot

Electrode placement cont.

- Prepare patients skin for electrode placement.
- Ensure dry skin – no profuse sweating
- Shave hairy chest
- Oily chest clean with alcohol pads
- Ensure electrodes/paddles are not expired
- Make sure gel is in tact otherwise discard

QRS detection

- QRS detection serves as the basis for the automated determination of the heart rate and ECG analysis algorithms.
- The detection of a QRS complex is accomplished by comparing the feature against a threshold.
- Typical frequency components of a QRS complex range from about 10 Hz to about 25 Hz. (IEEE Medicine and Biology, January/February 2002)

Pacemaker

- A pacemaker is a small device that's placed in the chest or abdomen to help control abnormal heart rhythms. This device uses electrical pulses to prompt the heart to beat at a normal rate.
- Pacemakers are used to treat arrhythmias (ah-RITH-me-ahs). Arrhythmias are problems with the rate or rhythm of the heartbeat. During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm.
- A heartbeat that's too fast is called tachycardia (TAK-ih-KAR-de-ah). A heartbeat that's too slow is called bradycardia (bray-de-KAR-de-ah).

Routine Testing

- Monitor/Recorder
- ECG output
- Defibrillator output
- Cardioversion
- Noninvasive pacemaker
- Battery maintenance and testing

Battery reconditioning

- Reconditioning is a succession of discharging/charging cycles performed by the battery support system.
- Helps prevent or reverse side effects of voltage depression (memory) as well as tracks battery capacity
- Perform usually every 3 months. Discard battery with a capacity reading of less than 80%.

Recycle batteries

- When properly reconditioned and maintained these NICAD batteries shelf life is approx. 2 years.
- Recycle batteries when…
  - Capacity less than 80%
  - A fault has occurred
- Are hazardous and must be disposed according to national and local regulations.

PM tasks

- Chassis/Housing
- AC Plug/Receptacle
- Strain Reliefs /line cord
- Cables /connectors
- Paddles/Electrodes
- Controls/Switches
- Pitted/damaged paddles
- Clean Exterior
- Check battery
- Battery/Charger
- Indicators/Displays
- CRT Display
- Alarms (Heart Rate)
- Audible Signals (Charge Tone)
- Gel/Pads/Electrodes
- Recorder / Direct Writer
- Internal Discharge of Stored Energy

Calibration tasks

- Output Energy (+/-4 joules or 15%) – 5,10,20,30,50,100,200,300,360
- Energy After 60 Seconds (> or = 85%)
- Tenth Repeated Charge Time (< or = 15 sec)
- Tenth Repeated Max Energy Discharge (+/- 4 joules or 15%)
- Rate Calibration (+/-5% or 5 bpm @ 60 and 120 bpm)
- Rate Alarm (+/-5% or 5 bpm @ 40 and 120 bpm)
- Paper Speed (+/- 2%)
- Frequency Response (monitor, 0.5 - 40 Hz; diagnostic, 0.05 - 100 Hz)

references

- http://www.nhlbi.nih.gov/health/dci/Diseases/hb/hb_understanding.html