DEFIBRILLATOR

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JMCON

SPECIFIC OBJECTIVES

- Define defibrillator
- List down the indications of defibrillator
- Discuss the principles of defibrillator
- Explain the types of defibrillator
- Describe the nursing management of defibrillator

DEFINITION

- ™ Defibrillator is a device that deliver a therapeutic dose of electrical energy (electric shock) to the affected heart (fibrillated heart or other shockable rhythm) to force the heart to produce more normal cardiac rhythm.

Cont….

- Application of a preset electrical current across the myocardium to cause synchronous depolarization of the cardiac muscle with the aim of converting a dysrhythmia into normal sinus rhythm.

Cont….

- Defibrillation is a process in which an electronic device sends an electric shock to the heart to stop an extremely rapid, irregular heartbeat, and restore the normal heart rhythm.

Cont…..

- Defibrillation is a common treatment for life threatening cardiac dysrhythmias, ventricular fibrillation, and pulse less ventricular tachycardia.

Cont…..

- Defibrillator Does not re-start the heart.
- Stops all electrical activity.
- If heart is still viable its natural pace maker will take over.

INDICATIOS

- Definitive treatment of life threatening cardiac arrhythmias – **VENTRICULAR FIBRILLATION** **PULSELESS VENTRICULAR TACHYCARDIA**

- Ventricular fibrillation- Irregular contraction of muscle fibres

Ineffective pumping of blood from left ventricle

Steep fall in Cardiac output

Cont…..

- The longer the duration of fibrillation, the greater the deterioration of the myocardium, because a fibrillating heart consumes a very large amount of oxygen.
- Defibrillators deliver a brief electric shock to the heart, which enables the heart's natural pacemaker to regain control and establish a normal sinus rhythm .

PRINCIPLES OF DEFIBRILLATION

- Energy storage capacitor is charged at relatively slow rate from AC line.
- Energy stored in capacitor is then delivered at a relatively rapid rate to chest of the patient.

Cont…..

- Simple arrangement involve the discharge of capacitor energy through the patien ’ s own resistance.

TYPES

1. Manual external defibrillator

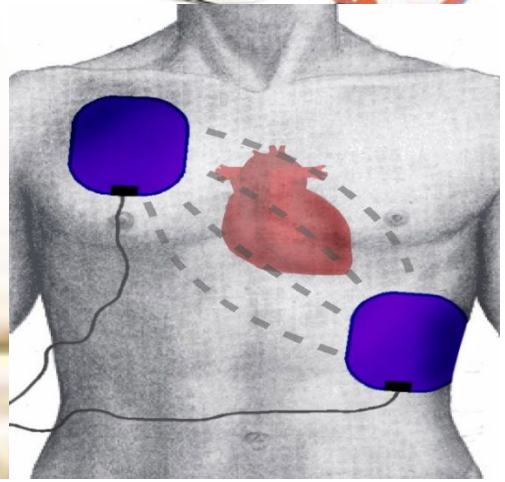
- Electrodes placed directly around the heart area of chest. Higher Voltage required than internal defibrillator. Classified as - Monophasic Biphasic

2. Manual Internal

- Same as manual external except pads are in direct contact with the heart
- Usually found in operating rooms

3. Automated External (AED)

- Uses computer to analyze heart then suggest whether a shock is needed or not
- Usually found in public places
- Made simpler for anyone to use

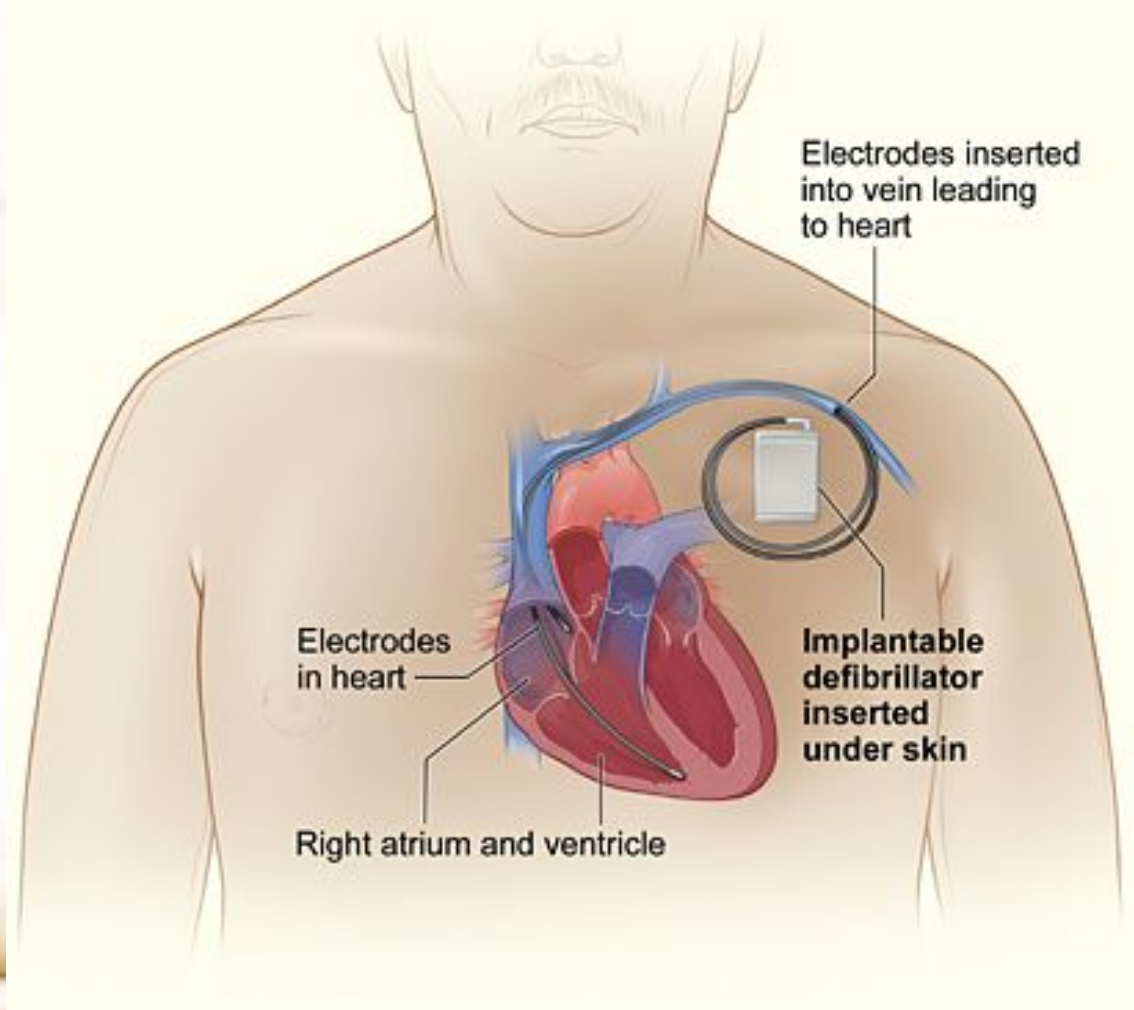


Cont….

- AED is a portable type of external defibrillator that automatically diagnoses the ventricular fibrillation in a patient.
- Automatic refers to the ability to autonomously analyze the patient's condition.
- AED is provided with self-adhesive electrodes instead of hand held paddles.

4.Implantable Cardioverter

- Similar to pacemakers, constantly monitor patients heart and administer shocks when needed
- Limitation – cannot distinguish when heartbeat changes due to exercise and other activities


Electrodes inserted into vein leading to heart
Electrodes in heart
Implantable defibrillator inserted under skin
Right atrium and ventricle

5. Wearable Cardiac

- Portable defibrillator that is worn as a vest, monitors heart
- Not as common as others

- **Types of Defibrillator electrodes:**
- a)Spoon shaped electrode: Applied directly to the heart.
- b) Paddle type electrode :Applied against the chest wall
- c) Pad type electrode : Applied directly on chest wall

CLASSES OF DISCHARGE WAVEFORM

- There are two general classes of waveforms: a) mono-phasic waveform : Energy delivered in one direction through the patient's heart

b) Biphasic waveform: Energy delivered in both direction through the patient's heart

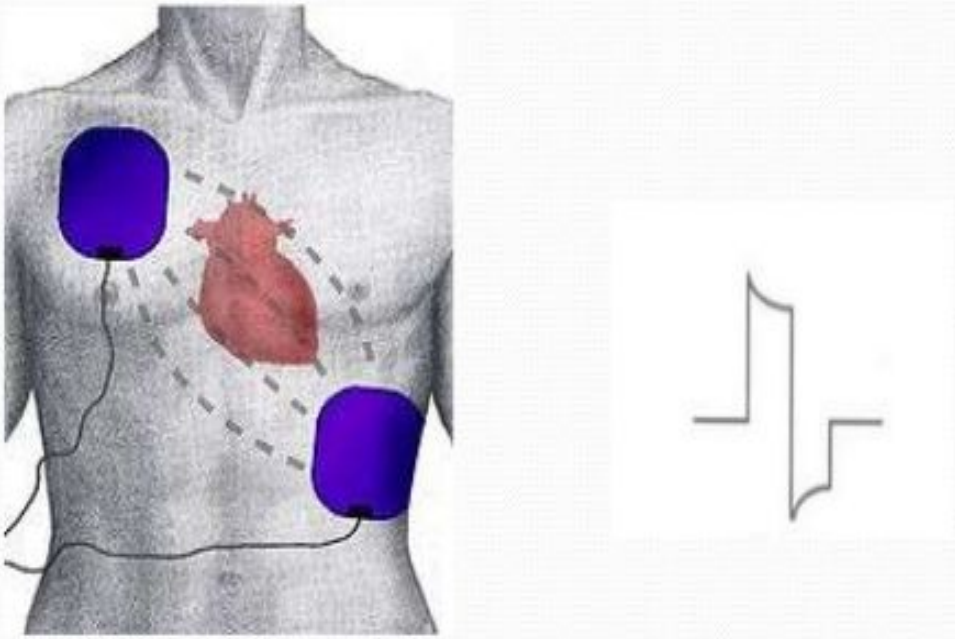


Fig:- Generation of bi-phasic waveform

Cont.....

- A monophasic type, give a high-energy shock, up to 360 to 400 joules due to which increased cardiac injury and in burns the chest around the shock pad sites.
- A biphasic type, give two sequential lowerenergy shocks of 120 - 200 joules, with each shock moving in an opposite polarity between the pads.

Paddle placement

4 Positions ----

- Anterior-lateral > most convenient
- Anterior-posterior
- Anterior-left infrascapular
- Anterior-right infrascapular

Cont….

- Anterior-lateral position ---- one – right of sternum below clavicle (2nd & 3rd ICS) other – left 4th or 5th ICS mid axillary line

Efficacy of Defibrillation

- Trans – thoracic resistance is the major factor

Which depends upon:

- Chest width & configuration
- Ventilatory phase
- Electrode skin interface

Cont…..

- Electrode position
- Electrode size
- Force of electrode application
- Energy level
- Time between & no. of shocks

NURSING CARE

PRE-CARE

Immediately before defibrillatioin, do the following:

- Call for immediate assistance
- Call for defibrillator and crash cart

Cont…..

- Assess CAB
- Perform CPR until the defibrillator in place
- Check the ECG to verify the presence of VF or pulseless VT: confirm in two leads
- Check leads for any loose connections
- Remove any nitroglycerine patch

INTRACARE

- The paddles are lubricated with electrode gel or conducting pads to enhance conduction and prevent burning of the skin
- Paddles must lie flat against the chest
- To ensure safe defibrillation people who perform it always announce when they are about to shock

Cont….

- The phrase “ One. I am clear. Two. You are clear. Three. All clear” is recommended

POST CARE

- The clinician immediately assesses the ECG and pulse after defibrillation
- If the first counter shock is unsuccessful, immediate defibrillation must be performed again at a higher energy level

Cont……

- Monophasic DF may be applied up to three times if needed for persistent VF and Pulseless VT
- CPR should be continued till restoration of sinus rhythm

DOCUMENTATION

- Pre-procedure rhythm
- Times and voltage of shocks delivered
- Post DF rhythm pattern
- Names, times of administration, and doses of administered medications
- Other haemodynamic data available before, during, and after DF

SYNCHRONIZED CARDIOVERSION

- -is therapy of choice for the patient with ventricular tachyarrhythmia's(eg. VT with pulse) or supraventricular tachydysrhythmias (eg. AF with a rapid ventricular response)

Cont…..

- A synchronized circuit in the DF delivers a shock that is programmed to occur on the R wave of the QRS complex of the ECG
- The synchronizer switch must be turned on when cardioversion is planned

Cont….

- The synchronization prevents the discharge from occurring during the vulnerable period of repolarization (T wave), which could result in VT or ventricular fibrillation.

Cont….

- When the synchronizer is on, no electrical current will be delivered if the defibrillator does not discern a QRS complex

Cont….

- If the cardioversion is elective, anticoagulation for a few weeks before cardioversion may be indicated

Cont….

- Digoxin is usually withheld for 48 hours before cardioversion to ensure the resumption of sinus rhythm with normal conduction

Cont….

- The patient is instructed not to eat or drink for at least 8 hours before the procedure.
- Gel-covered paddles or conductor pads are positioned front and back (anteroposteriorly) for cardioversion.

Cont….

- Before cardioversion, the patient receives intravenous sedation as well as an analgesic medication or anesthesia

Cont…..

- Respiration is then supported with supplemental oxygen delivered by a bag-mask-valve device with suction equipment readily available

Cont…..

- Indications of a successful response are conversion to sinus rhythm, adequate peripheral pulses, and adequate blood pressure.

Cont…..

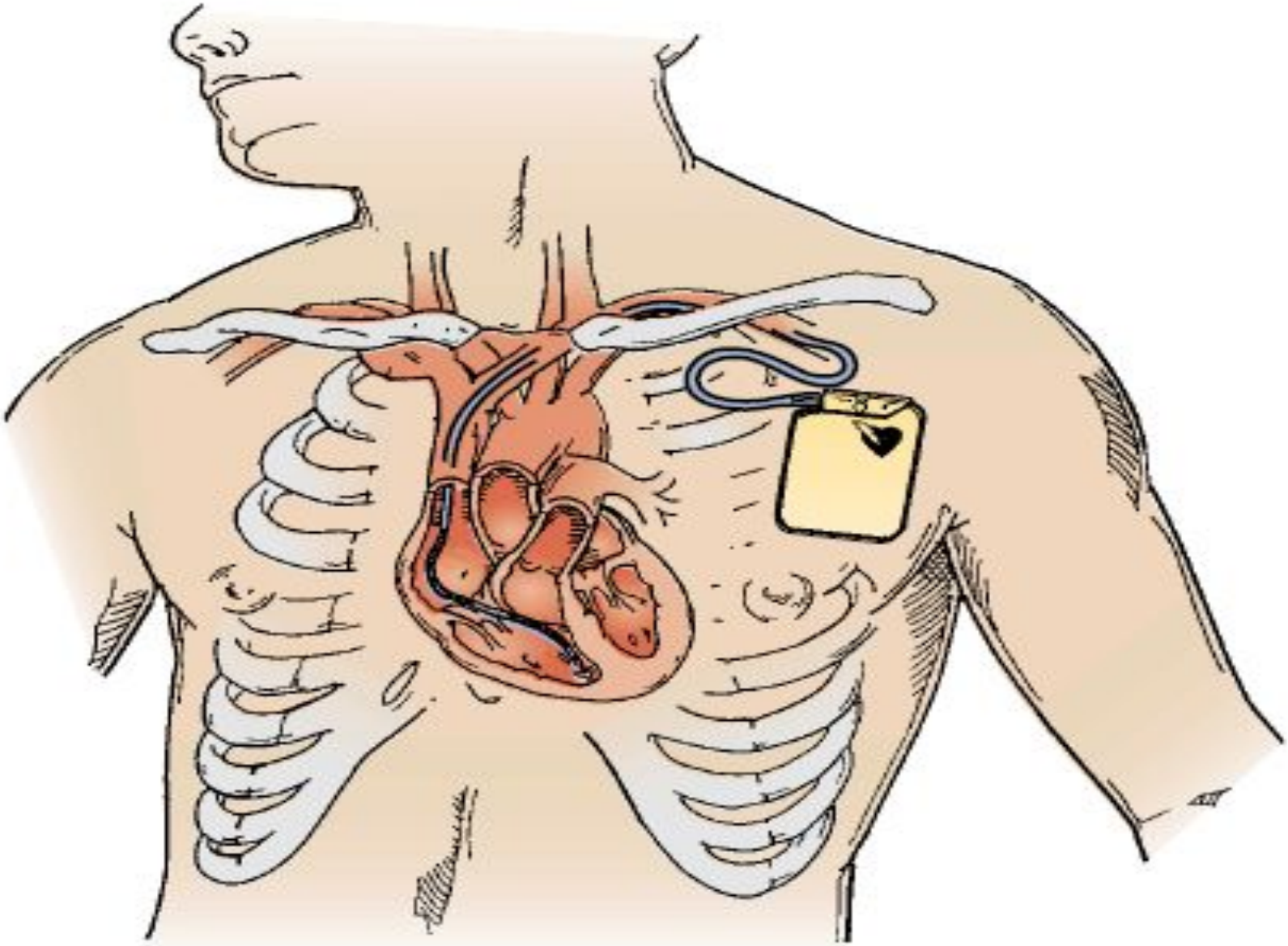
- Because of the sedation, airway patency must be maintained and the patient ’ s state of consciousness assessed.

Cont….

- Vital signs and oxygen saturation are monitored and recorded until the patient is stable and recovered from sedation and the effects of analgesic medications or anesthesia.
- ECG monitoring is required during and after cardioversion.

IMPLANTABLE CARDIOVERTER DEFIBRILLATOR

- The **implantable cardioverter defibrillator (ICD) is a device** that detects and terminates life-threatening episodes of VT or ventricular fibrillation in high-risk patients



Cont……

- Patients at high risk are those who have survived sudden cardiac death syndrome, usually caused by ventricular fibrillation, or have experienced symptomatic VT (syncope secondary to VT).

Cont…..

- In addition, an ICD may be indicated for patients who have survived an MI but are at high risk for cardiac arrest.

Cont…..

- An ICD consists of a generator and at least one lead that can sense intrinsic electrical activity and deliver an electrical impulse.
- The device is usually implanted much like a pacemaker .

Cont….

- ICDs are designed to respond to two criteria: a rate that exceeds a predetermined level, and a change in the isoelectric line segments.
- When a dysrhythmia occurs, rate sensors take 5 to 10 seconds to sense the dysrhythmia.

Cont…..

- Then the device takes several seconds to charge and deliver the programmed charge through the lead to the heart.

Cont….

- Battery life is about 5 years but varies depending on use of the ICD over time.
- The battery is checked during follow-up visits.

Cont….

- Nursing interventions for the patient with an ICD are provided throughout the preoperative, perioperative, and postoperative phases

Cont….

CARDIOVERSION	DEFIBRILLATION
Elective planned procedure	Emergency life saving procedure
Synchronized shock	Un-sychronized shock
Low energy shock	High energy shock
There can be some delay	No delay, immediate

Cont….

Anti-coagulation needed	No anti-coagulation needed
Less damage to myocardium	More damage to myocardium

REFERENCE

- Woods SL, Bridges EJ. Cardiac nursing. Sixth edition. Phialadephia: Lippincot Williams and wilkins puplication
- Black JM. Medical surgical nursing clinical management for positive outcomes. Seventh edition. Newdelhi : Elsevier publications. Volume2.
- Chintamani. Lewi ' s Medical- surgical Nursing. First edition. Haryana: Elsevier publications.

THANK YOU