

DEFIBRILLATOR

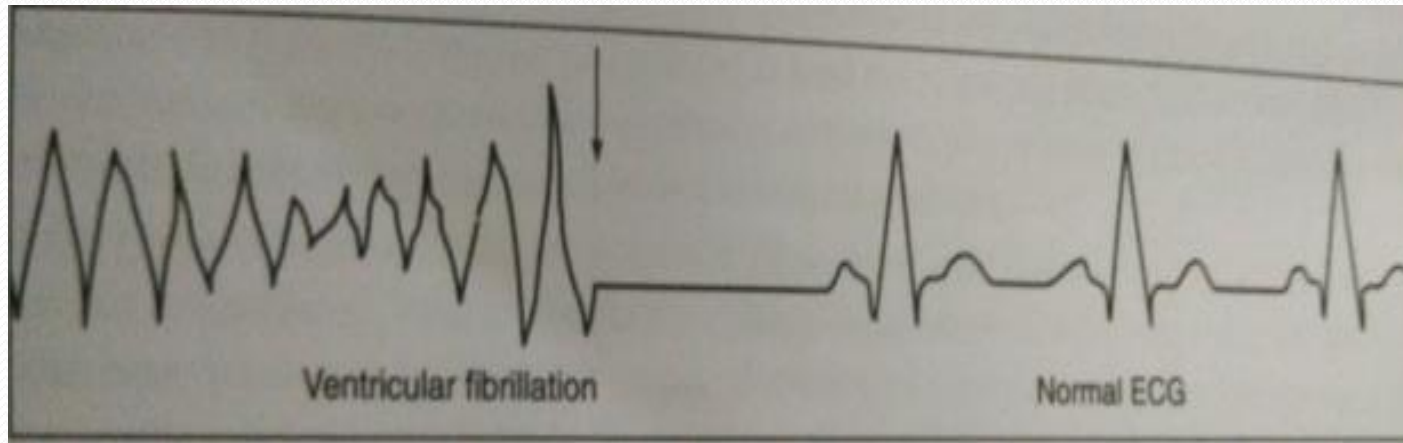
Need for Defibrillator

- Ventricular fibrillation is a serious cardiac emergency resulting from asynchronous contraction of the heart muscles
- Ventricular fibrillation can be converted into a more efficient rhythm by applying a high energy shock to the heart. This sudden surge across the heart causes all muscle fibres to contract simultaneously
- The instrument for administering the shock is called a defibrillator.

DEFIBRILLATOR

DEFINITION:

A defibrillator is a device that delivers high energy shock to the heart muscle undergoing a fatal arrhythmia, by means of electrode.



POWER OF DEFIBRILLATION

- Higher voltages are required for external defibrillation than for internal defibrillation.
- A corrective shock of 750-800 volts is applied within a tenth of a second.
- That is the same voltage as 500-533 no of AA batteries!

Types of Defibrillator

Based on electrode placement

- The shock can be delivered to the heart by means of electrodes placed on the chest of the patient (external defibrillation)
- the electrodes may be held directly against the heart when the chest is open (internal defibrillation).
Higher voltages are required for external defibrillation than for internal defibrillation.

TYPES OF DEFIBRILLATOR

➤ AC defibrillator:

- 5 to 6A of 60 Hz
- Duration-250 to 100ms
- Useful for atrial fibrillation

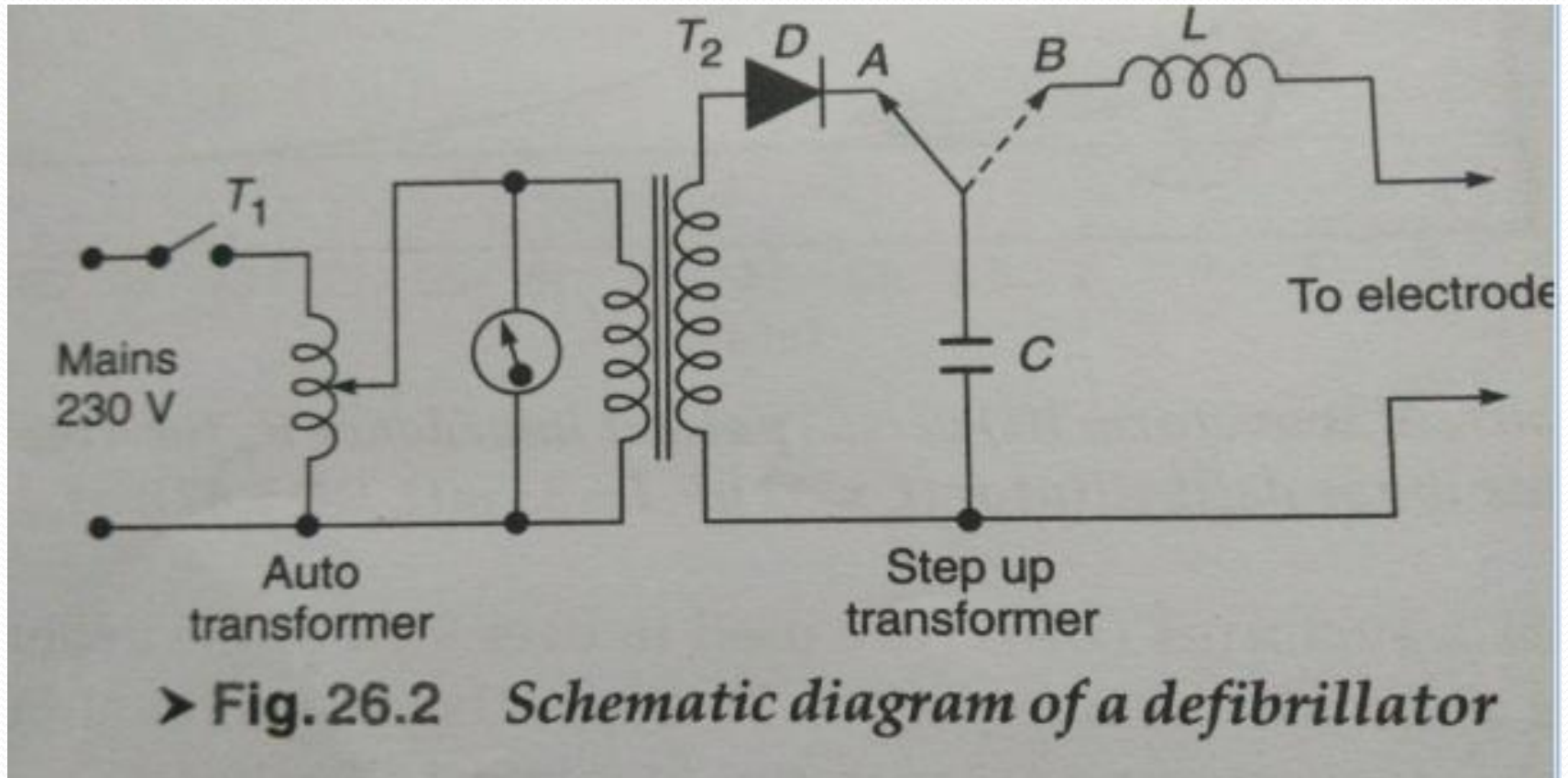
Disadvantage

- High risk of ventricular fibrillation. So it is not highly recommended.

Continuation..

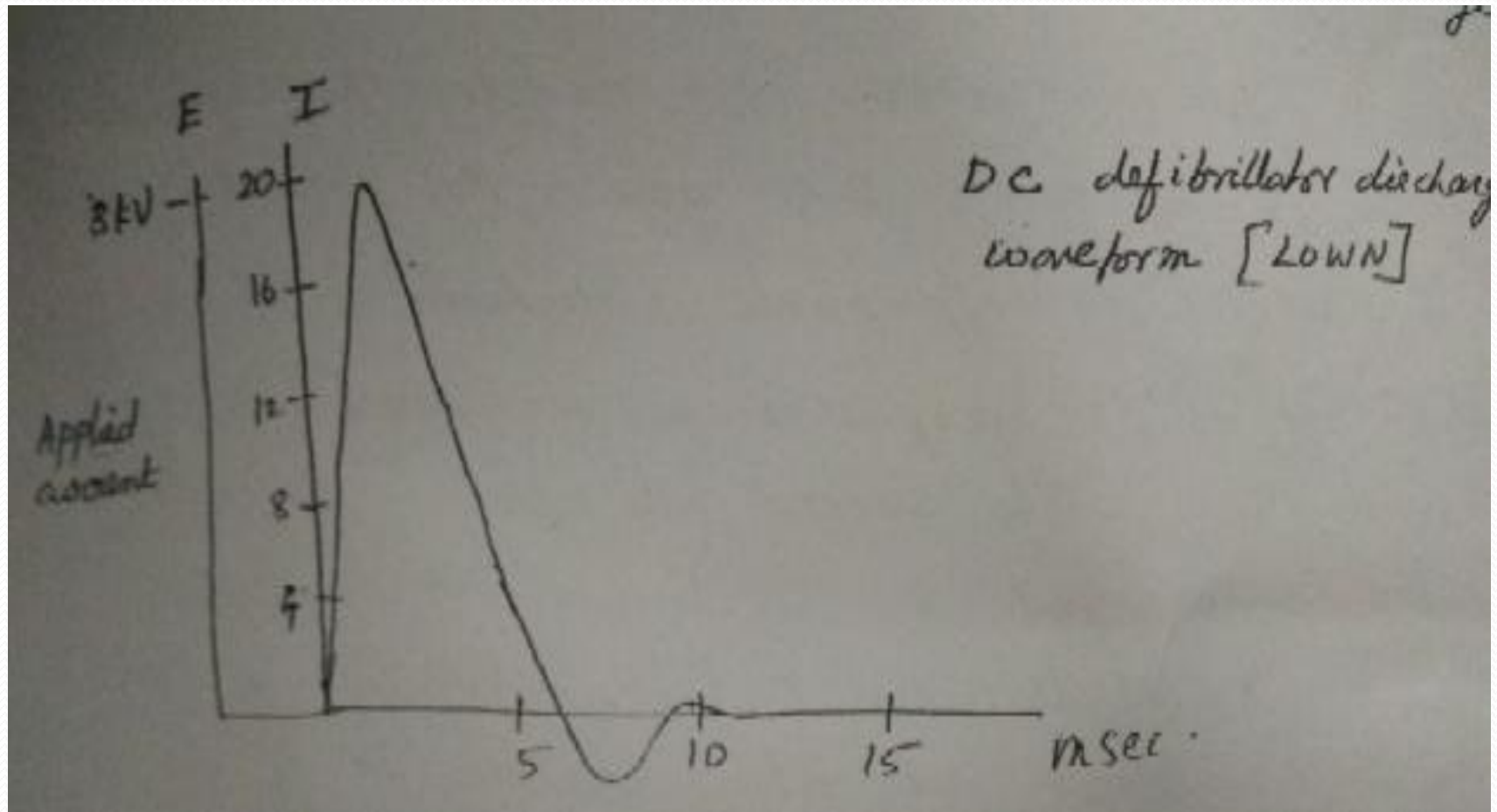
- DC defibrillator(unsynchronized)
- Capacitor is charged to a high dc voltage and then rapidly discharged through acrosss the chest of the patient
- Most common wave forms are monopulse,lown,trapezoidal waveform

Simplified block diagram



Energy stored in
capacitor $E = \frac{1}{2} CV^2$

Defibrillator discharge waveform



Sequence of events

- Operator turns the set energy control to the described level and presses the charge button.
- Capacitor begins charging and continue to charge until voltage across the capacitor equal to the supply.
- The operator positions paddle electrodes on the patients chest & presses the discharge button
- The switch disconnects the capacitor for the power supply and then connects it to the output circuit.
- Capacitor discharges its energy and into the patient through LR & the paddle electrode. This action occurs for 4-6ms

Types of electrodes

- Internal electrodes.
- External electrodes.
- Disposable electrodes.

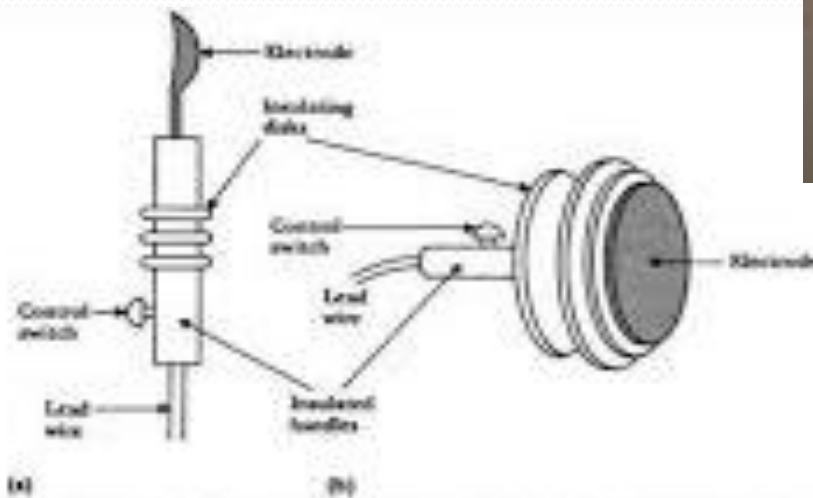
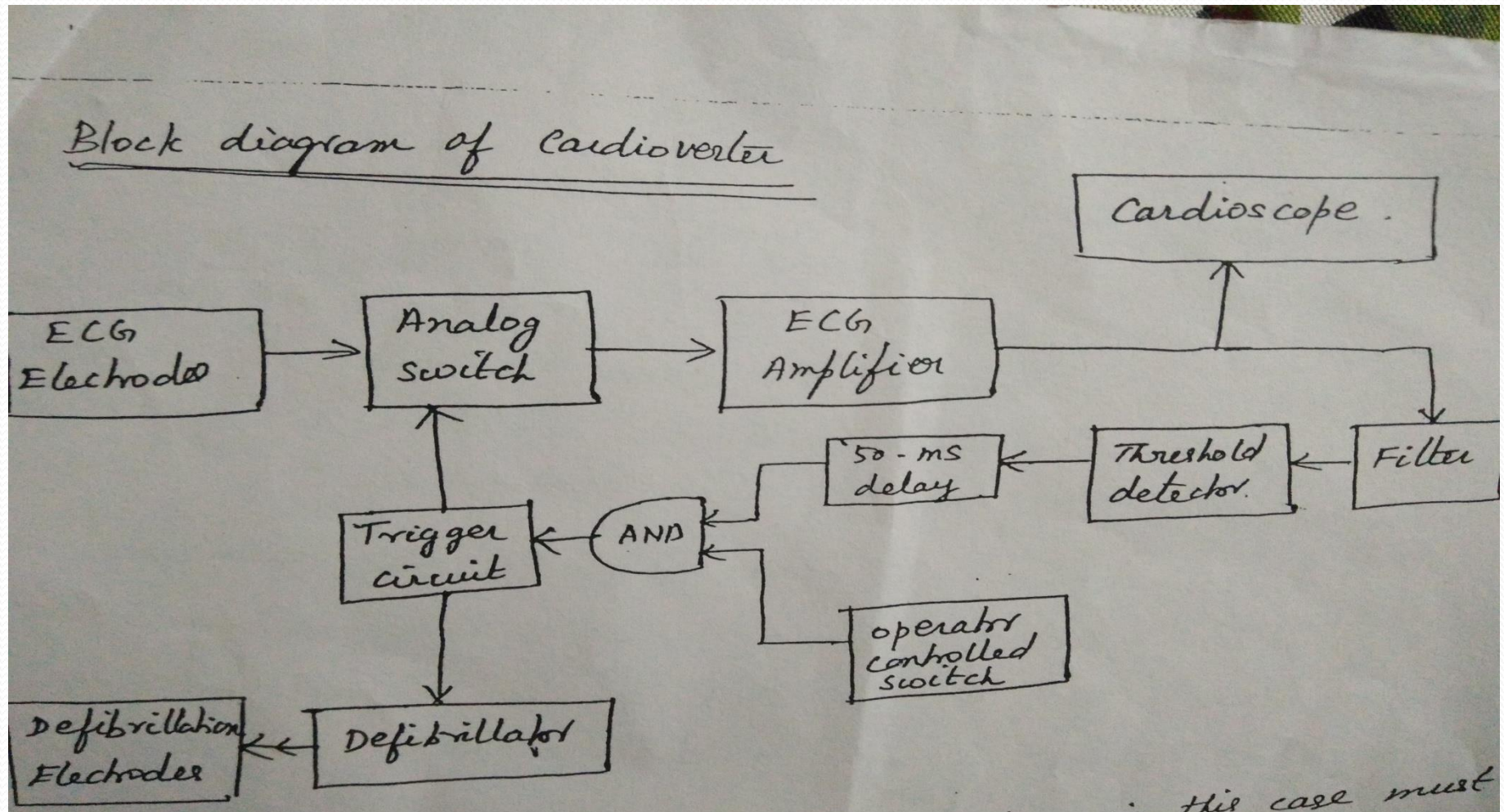


fig: Electrodes used in defibrillator (a) a spoon shaped internal electrode that is applied directly to the heart. (b) a paddle type electrode applied against the anterior chest wall,

DC defibrillator with synchroniser (cardioverter)

- It is a synchronized administration of shock during the R waves or QRS complex of a cardiac cycle.
- It is conversion of atrial fibrillation to normal rhythm by defibrillation.
- ECG of the patient is fed to the defibrillator and shock is given automatically at the right moment.

Block diagram of cardioverter



Description

- The device is a combination of the cardiac monitor and the defibrillator.
- Ecg electrodes are placed on the patient in the location that provides the highest 'R' wave with respect to the T wave.
- Signal from these electrodes passes through a switch that is normally closed, connecting the electrodes to amplifier.
- The output of the amplifier is displayed in cardioscope , so that operator can observe the patients ecg results simultaneously.

Continuation...

- The output from the amplifier is filtered and then passed through a threshold detector that detects the R wave. This activates a delay circuit(30ms) followed by trigger circuit that opens the switch connecting ecg electrodes and amplifier.
- At same time it discharge the capacitor through defibrillator electrodes to the patient.
- The R wave controlled switch discharges the defibrillator only once after the operator activates the defibrillator switch.

Continuation...

- After discharge of the defibrillator ,the switch connecting the ecg electrodes to the amplifier is again closed, so that operator can observe the cardiac rhythm on the cardioscope to determine the effectiveness of the therapy.

AUTOMATIC EXTERNAL DEFIBRILLATOR

