Defibrillators

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Defibrillation is a method used to counter life-threatening cardiac arrhythmias such as ventricular fibrillation and ventricular tachycardia/bradycardia. A cardiac arrhythmia is a deviation in the normal heartbeat of an individual. In ventricular fibrillation the ventricular muscle twitches altering the rhythm of the heart which can cause a failing blood supply to the heart and body, resulting in death. Ventricular tachycardia/bradycardia is an increased/decreased rhythm of the heart, if sustained can lead to no pulse and cardiac arrest.

A defibrillator is a device that uses this method of defibrillation to treat cardiac conditions. The device administers a dose of electricity that shocks the effected heart. The "shock" depolarizes a mass of the heart and allows the sinoatrial node in the heart to reestablish the normal heart rate for the individual. This shock is delivered to the heart by a pair of paddles that are actually electrodes which conduct an electric current.

There are several types of defibrillators. The Manual Internal Defibrillator was the first to be developed, and required that the chest cavity was to be opened and that the electrode paddles were to deliver the shock directly to the heart. The External Manual Defibrillator was developed around the 1950's and was capable of applying a shock to the heart by placing the electrode paddles on the chest itself. The Automated External Defibrillator and Self-Automated Defibrillator are variation of the MED. The Implantable Cardioverter-Defibrillator is one the most important develops in the ability to stabilize these heart conditions effectively. The unit no larger than a pack of cigarettes is implanted under the skin of the chest by a small incision made just below the collarbone. From here, surgeons are able to guide to wires, referred to as leads, into the heart where they attach to the ventricles. The implant is able to monitor the patient's heart rate and rhythm at all times. When the implant detects a digression between the normal rate and current rate the generator, issues a shock that stabilizes the heart.

A newer development is the biventricular defibrillator/pacemaker. This device is used in Cardio Resynchronization Therapy or CRT. The device is implanted and leads are attached to both ventricles, another lead goes to the atrium, and two other are used for electrical equipment. The Defibrillator sends impulses to the ventricles causing them to contract simultaneously creating a normal heart rate. This allows for an effective blood flow to be circulated and thus prevent cardiac arrest.

A main direction in which the technology involving the defibrillator is a way to decrease the size of the entire mechanism to make it less irritating and noticeable. The problem arising from this is to create a small enough battery that can still remain effective for long periods of time.

Sources:

- http://healthguide.howstuffworks.com/implantable-cardioverter-defibrillator-dictionary.htm
- http://healthlink.mcw.edu/article/1031002456.html
- http://www.clevelandclinic.org/heartcenter/pub/guide/tests/procedures/biventricular_pm.htm