

Cardioverter-defibrillator Implanted in a Cardiac Patient

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Editorial

An implantable cardioverter-defibrillator (ICD) or Automated Implantable Cardioverter Defibrillator (AICD) is a device that, depending on the kind, can do defibrillation, cardioversion, and heart pacing. The ICD is the first-line therapeutic and preventative therapy for people who are at risk of sudden cardiac death owing to ventricular fibrillation or ventricular tachycardia. Current device batteries last six to ten years; however, with technological breakthroughs (higher capacity batteries or maybe rechargeable batteries), this could be extended considerably further. The lead (the electrical line that connects the device to the heart) has a much longer average lifespan, albeit it may fail for a variety of causes, such as insulation failure or conductor fracture, needing replacement.

An ICD system is implanted in the same way that a pacemaker is implanted. ICDs are actually made up of two components: an ICD generator and cables. A computer chip or circuitry with RAM (memory), programmable software, a capacitor, and a battery, which is generally implanted under the skin in the left upper chest, is the first component, or generator. Similar to pacemakers, the second component of the system is an electrode wire or wires attached to the generator and passed through a vein to the heart's right chambers. The lead frequently lodges in the apex or septum of the right ventricle. ICDs, like pacemakers, can have one wire or lead in the heart (single chamber ICD in the right ventricle), two leads (dual chamber ICD in the right atrium and right ventricle), or three leads (triple chamber ICD in the right atrium and right ventricle) (biventricular ICD, one in the right atrium, one in the right ventricle and one on the outer wall of the left ventricle). Pacemakers and ICDs differ in that pacemakers can be used as temporary devices to treat slow heart rates, or bradycardia, but ICDs are frequently used as permanent protection against sudden life-threatening arrhythmias [1-3].

Mechanism of operation

ICDs keep monitoring the heart's rate and rhythm, and if the rate exceeds a set threshold, they can deliver therapy in the form of an electrical shock. Modern devices have software that attempts to discern between ventricular arrhythmias and Ventricular Tachycardia (VT), and in the case of VT, it may attempt to pace the heart faster than its inherent rhythm in order to break the tachycardia before it progresses to ventricular fibrillation. This is referred to as anti-tachycardia or overdrive pacing (ATP). ATP is only effective if the underlying beat is ventricular tachycardia. ATP is never helpful if the rhythm is ventricular fibrillation many modern ICDs employ a number of algorithms to determine if a rapid rhythm, supraventricular tachycardia, or ventricular tachycardia is acceptable. The rate of the ventricles (lower chambers of the

heart) is compared to the rate of the atria (upper chambers of the heart) (the atria). If the rate of the atria is faster than or equal to the rate of the ventricles, the rhythm is still most likely not ventricular and is therefore more benign. If this is the case, the ICD will either refuse or withhold therapy for a predetermined length of time.

Rhythm discrimination will be used to determine the regularity of a ventricular tachycardia. The tachycardia in the ventricles is usually regular. If the rhythm is abnormal, it's mostly certainly due to the transmission of an irregular rhythm that begins in the atria, such as atrial fibrillation. The image may show a case of torsade's de pointes, which is a kind of irregular ventricular tachycardia. In this case, the ICD will use rate rather than regularity to identify the correct diagnosis. The morphology of each ventricular beat is examined and compared to the morphology of a routinely conducted ventricular impulse for the patient, as established by the ICD. This normal ventricular impulse is often an average of a number of the patient's recent normal beats.

A person with a cardioverter-defibrillator can live a normal life. In most circumstances, the ICD does not improve the patient's quality of life, while it may give them a sense of security. Living with an ICD, like having a pacemaker, places limitations on one's lifestyle. According to a patient who had an ICD implanted in 2016 following cardiac arrest, the ICD is "half the size of your phone and a little thicker in my chest and has two cables connected to it... put into the bottom of your heart." You can't see it because it's hidden beneath my pectoral muscle, but you can see the wires in my chest if you want to [4,5].

Conflict of Interest

Author has no conflict of interest.

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