Pacemakers and AICDs: The ABCs

August 25, 2015
By Steven Brent Deutsch, MD [1] and Eric Lawrence Krivitsky, MD [2]

Back to basics here on pacemakers and automated implantable cardioverter defibrillators so that the next time you place a consult for cardiology, you will know how to best manage the patient and support your consult decision.

An estimated 4.5 million persons worldwide have cardiac implantable electronic devices (CIEDs). In the United States alone, close to 400,000 CIEDs are placed each year.

In reviewing numerous studies from 1990-2015, we found fundamental facts all hospitalists should know about pacemakers versus automated implantable cardioverter defibrillators (AICDs). In this 3-part article, we discuss the basics so that the next time you place a consult for cardiology you will know how to best manage the patient and support your consult decision.

Here we distinguish between pacemakers and AICDs and offer clues to identifying the implanted device. Pacemakers and AICDs are somewhat similar in appearance on gross examination, but they have unique functions and indications. Pacemakers are small devices that, once implanted in the chest, help control the normal heart rate and treat arrhythmias. They use electrical impulses to maintain a regular rhythm in instances when the heart’s inherent electrical conduction system is malfunctioning.

Defibrillators are small implantable devices placed in patients at risk for sudden cardiac death secondary to certain arrhythmias. They are programmed to deliver an electrical impulse when a specific arrhythmia is detected. These devices can detect arrhythmias that present from the atria or ventricles. Like pacemakers, some AICDs also can pace the heart. Even so, providers (and even patients) may become confused about which device was implanted.

Clues to Identifying the Device

A few clues may provide the answer. The most striking difference on initial examination is the size. The average pacemaker weighs about 15 g and is about the size of 2 silver dollars stacked. A defibrillator typically weighs about 70 g and is 200% to 250% the size of a pacemaker. These devices are rarely seen ex-vivo, but this difference can be appreciated by palpating the pocket site, especially on thin patients.

A second clue is the patient history. Most defibrillators in the US are implanted for primary prevention of sudden cardiac death secondary to certain arrhythmias. They are programmed to deliver an electrical impulse when a specific arrhythmia is detected. These devices can detect arrhythmias that present from the atria or ventricles. Like pacemakers, some AICDs also can pace the heart. Even so, providers (and even patients) may become confused about which device was implanted.

Consequently, if you encounter a patient with a history of ischemic or nonischemic cardiomyopathy and an ejection fraction of less than 35% who has a device, it is most likely a defibrillator (or the patient requires upgrade). However, caution must be exercised because patients with seemingly normal cardiac function may have an ICD. They may have had a previous cardiomyopathy that has resolved or a condition that places them at high risk, such as Brugada syndrome, hypertrophic cardiomyopathy, or prolonged QT interval, or they may have had an idiopathic cardiac arrest and were implanted for secondary prevention indications.
Pacemakers and AICDs: The ABCs
Published on Physicians Practice (http://www.physicianspractice.com)

Figure. This EKG demonstrates high degree heart block.
Pacemakers may be implanted in anyone who has symptomatic bradycardia. The typical symptom is fatigue; however, syncope or presyncope may overlap with symptoms caused by ventricular arrhythmias leading to ICD implantation. Thus, this strategy may not be as helpful for distinguishing them.6

A third and telling distinction is the chest x-ray film, which helps differentiate between pacemakers and AICDs. Imaging of both can offer identifiers of the product manufacturer and device function. ICD generators traditionally were larger than pacemakers, but current ICDs may be smaller than older pacemakers. ICDs are best distinguished from pacemakers on CXR by coils that appear as thickened radio-opaque structures on the lead. There may be just 1 coil, in the RV portion of the lead, or 2 coils, in the RV and SVC portions of the lead. These coils serve to deliver high-energy therapy to effect defibrillation.

In contrast, a pacemaker lead does not have coils because the device is incapable of delivering high-voltage energy. Lead orientation offers insight into device function and capabilities. For example, a single chamber ventricular pacemaker/defibrillator typically has 1 lead near the RV apex. A dual chamber device has an additional lead, typically in the RA appendage. A biventricular device has 3 leads—a third lead is placed in the coronary sinus, which paces the LV for resynchronization. Companies often place logos on devices to help the physician identify the type of product.7 For example, St Jude Medical has the descriptor “SJM” on the generator and Medtronic has “M.”

Subcutaneous ICDs—defibrillators that recently gained FDA approval—have a typical pulse generator, but the lead is implanted subcutaneously and no part of the system is intracardiac or intravascular. This allows for easier extraction in high-risk patients and reduces some complications associated with standard leads, such as crush fracture dislodgement. However, these devices essentially are incapable of pacing function in the current models.8

The EKG in the Figure above shows evidence of high degree heart block. There appears to be sensing of P waves with subsequent ventricular pacing, suggesting a DDD system.

Next: Nomenclature, Malfunction, and Pseudomalfunction
In part 2 of this article, we will discuss pacemaker nomenclature and device function and address malfunction and pseudomalfuction.

References:


Source URL:

Links: