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Case Report

Pacemaker Leads: A Bad Break

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Abstract

On June 25, 2024, I published an article in this journal, AJBSR, titled "Living with My Seventh Pacemaker." My readers may want to go back and review that article about how I have lived for over 40 years with a pacemaker. I ended that article with a short paragraph mentioning that I had just received a biventricular pacemaker. It has now been 16 months since the biventricular was implanted. Unfortunately, somewhere along the line, a wire going to the left ventricle broke and had to be replaced. In this article I explain the difference between a more traditional pacemaker and a biventricular pacemaker, and what I experienced in having a broken lead replaced.

Keywords: Biventricular Pacemaker, Cardio Resynchronization Therapy, Broken Pacemaker Lead, Implantable Defibrillator, Pacemaker Dependency

Introduction

In January of 2023, I received my seventh pacemaker. It is called a biventricular pacemaker (also known as Cardio Resynchronization Therapy). It resides under the muscles in my upper left chest in what is called a subcutaneous pocket and has common pacemaker capabilities. Plus, it contains a defibrillator capability as well as the ability to stimulate the left ventricle directly. All of these capabilities make the housing, or "can" as it is called, much bigger than a traditional pacemaker. The length of the can is about the size of my open hand, for example. The increased size of the pacemaker took some getting used to. It will have a six to12 year life depending on how often it is used.

Pacemakers can perform a variety of functions. My pacemaker is used to prevent my heart from beating too slowly. It bypasses an area of my heart where an electrical stimulus will no longer travel naturally. It collects a wealth of data on how my heart is functioning. It stores that data in its small internal computer, and that data is available to my physician using a programming device to interrogate the pacemaker. Also, it synchronizes my heart beats. So, any news about it not working properly is bad news indeed.

I had more stamina 16 months ago after the pacemaker was installed, so at first, I was pleased with the results. However, my stamina slowly began to fade. During 2024, I visited my pacemaker physician almost every month, twice with the pacemaker company technical representative in attendance, and several times they made adjustments to the pacemaker.

Despite these adjustments, I realized that my stamina was decreasing significantly. I sort of wrote my lack of energy off to old age and other comorbidities. I was vacationing for the month of January on the Central Coast of California, and that delayed even longer my seeking treatment for my lack of energy and need to rest for air. I was still walking about a mile a day in January of 2025, but I was having to stop and rest several times during the walk. Upon returning from my January vacation, I made an appointment in early February to see my regular Cardiologist, and he assured me my heart health was good and not the cause of my lack of air.

I still suspected that the pacemaker could be involved with my lack of energy, because I had made so many visits to my pacemaker physician and because the company technical representative kept making adjustments to it. I kept being told that it was working even though one time they needed to jiggle it to make it work. After my vacation trip to the Central Coast of California, I visited my pacemaker physician in February of 2025. He told me he had bad news for me. My pacemaker had a broken wire and was not working properly. In short, no voltage at all was going through the lead into my left ventricle.

You might wonder, how could I live with a broken lead, because I am pacemaker-dependent and needed the pacemaker to operate at all times. Fortunately, the lead into the right ventricle continued to function and was giving me voltage similar to a traditional pacemaker. However, I had lost all added benefit from my biventricular pacemaker. Also, my pacemaker dependency is primarily in my ventricles, so it is likely that I would get some natural beats in my atrium even if the pacemaker was not working at all. I have a condition known as bundle branch block, and the signal for the heart to beat cannot travel from the atrium to the ventricles. However, even if the pacemaker were to quit working completely, it is likely that the ventricles would continue to produce some beats on their own. I would no doubt pass out and get mighty sick, but if gotten to the emergency room of a hospital in time it is likely I would live.

At least now I had a likely explanation for my lack of air even though I was getting weaker by the day. Surgery to replace the broken wire was scheduled for March 2025. By this time, I was having trouble getting enough air to breathe even for short walks.

The Difference Between a Traditional Pacemaker and a Biventricular Pacemaker

To understand what I have been going through for the past 16 months, it's necessary to visit the difference between a standard pacemaker and a biventricular pacemaker. To preface my remarks, I want to point out that there are different kinds of pacemakers with different kinds of leads or wires running from the pacemaker into the heart. So, my description of the operation of a standard pacemaker does not fit all pacemakers in all details. Additionally, newer pacemakers have a lot of "bells and whistles." They are programmable and have many settings to help the pacemaker physician get the beat right for each individual patient. In fact, there is now a wireless or leadless pacemaker on the market that is implanted in the right ventricle of the heart. It has many advantages over the traditional pacemaker but also has disadvantages. Nonetheless, it is estimated that around 50,000 leadless pacemakers have been implanted in the last four years.

In a traditional pacemaker, typically there are two leads. The leads are placed inside the heart as the physician inserts the leads through a vein in the upper chest just below the collar bone. The leads are attached to the heart wall by either a small hook or a small screw. One lead is attached to the heart wall in the right atrium, and a second lead is attached to the heart wall in the right ventricle.

Each lead has an electrode on the tip of the lead that is attached to the heart. Each lead has two wires inside the lead. Each lead detects whether or not the heart has sent a natural signal to either the upper part of the heart (atrial) or lower part of the heart (ventricular). If the heart's natural signal to beat is not received by the electrode, then the pacemaker generator is commanded by a programmable small chip or computer inside the pacemaker to send a brief (milliseconds) electrical charge to the heart to cause it to beat. Remember, all of this is typically happening 70 beats per minute and is possible only due to the chip operating as a small computer.

The atrial electrical charge runs the show so to speak. If it does not fire naturally, then the pacemaker commands it to fire. The ventricular charge follows the atrial electrical charge no matter if naturally or signalled by the pacemaker. If the ventricular lead detects an electrical discharge following a signal from the atrium, it does nothing. If no electrical discharge is detected, then the pacemaker is commanded to send an electrical impulse to the bottom part of the heart, the right ventricle. The heart's own nerves carry the signal from the right ventricle to the left ventricle. As you may imagine, the left ventricle beats just a fraction of a second behind the beat in the right ventricle. This delay causes the heart to rock slightly and lose some of its pumping capability. In my case, I have had a pacemaker for over 40 years, and my heart capacity was beginning to diminish.

The biventricular pacemaker has a third wire that goes into the coronary sinus area of the heart near the left ventricle. This allows for the left ventricle to beat at exactly the same time as the right ventricle and makes for a synchronous heartbeat very much like a fully natural heartbeat. No more rocking of the heart. Insertion of this lead is tricky, and it requires the skill of a Clinical Cardiac Electrophysiologist. There are some studies that suggest that the heart may actually change shape and improve functioning even more over time following the implant of a biventricular pacemaker or Cardio Resynchronization Therapy, although the studies of this are nonconclusive at this time.

The Procedure to Replace the Lead

I found the procedure to replace the lead similar to getting a replacement pacemaker. I arrived at the hospital at 9:30 a.m. and went into the operating room about 1 p.m. I had general anesthesia, and a temporary pacemaker placed in my heart by going through a vein in my groin and running a catheter into my heart. The surgeon made his entry incision and removed the broken lead. He then threaded a new lead into place and tested the results. When satisfied, the incision was closed. The procedure took about two hours, and I spent about two hours in the recovery unit. I went home that night at about 5:30 p.m. I did not notice a difference in how I felt in terms of having more energy and more air, and I was becoming alarmed.

I began to worry as to whether or not the broken lead had been my problem or whether I had other issues.

Upon visiting with my pacemaker physician a week following the surgery, he explained to me that during the procedure, I had a bout of atrial flutter. He was concerned that if this happened again that my pacing of the ventricles would try to follow the flutter. So, he had turned off the feature of my pacemaker where it speeds up my heart rate with movement and set the pacemaker at a steady 60 beats per minute. Also, he set the pacemaker in what is known as a DDI mode so that the bottom part of the pacer would ignore any atrial flutter. The result was that even though I had a biventricular pacemaker, it was operating like a really old-fashioned pacemaker. Upon seeing that I had no further bouts of atrial flutter, he set the pacemaker in a mode called DDD, and it began to beat more synchronously. I have been slowly regaining my strength and air capacity.

Lessons Learned

Pacemakers with their leads can be complex. We lay folk cannot be expected to know the ins and outs of the pacemaker world. That is the job of physicians. However, reading articles like this about the experiences of a pacemaker patient can help us lay folk be our own best advocates. Likewise, physicians can benefit from seeing how pacemaker patients are thinking and feeling.

Acknowledgement

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Conflict of Interest

None.