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A Rare Case of Recurrent Pacemaker Allergic Reaction

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Abstract

Allergic reactions to pacemaker device components are uncommon. However, when they occur, they usually mimic pacemaker infection, which results in multiple device replacements and increased morbidity burden. Here we present a 40-year-old female with pacemaker insertion due to complete heart block and who had multiple device replacements because of allergic sensitivity to various pacemaker component-encasing materials, confirmed by allergic testing to these materials. She had complete resolution of her symptoms after replacement with gold-plated device, to which she was not allergic.

Keywords: Allergic reaction, pacemaker, recurrent

INTRODUCTION

Apacemaker is an important device used to help control abnormal heart rhythms. However, there are instances when a person can develop an allergic reaction to pacemaker compounds. This is a very rare complication. There is a tendency for clinicians to suspect a low-grade bacterial infection prior to performing an allergy test to confirm the presence of an allergy. We report this case of a woman who developed recurrent allergic reactions to pacemaker compounds and required multiple pacemaker battery and wire changes with different materials. After confirming the allergy to titanium, epoxy, and silicone by skin patch testing, she had a special gold-plated pacemaker with polyurethane leads implanted. The patient successfully recovered and she suffered no further complications.

CASE REPORT

A 40-year-old Puerto Rican-born female presented to the emergency department with a 2-day history of subjective low-grade fever and pleuritic left-sided chest pain localized to the pacemaker site. She reported chills and rigors as well as swelling with redness at the pacemaker site associated with left arm pain. She had a history of multiple pacemaker battery and wire exchanges utilizing pacemaker compounds made up of different metal materials in the past, with the last replacement done 2 weeks prior. In light of her history of multiple drug allergies (including penicillin, ciprofloxacin, daptomycin, sulfa drugs, linezolid, and metochlopropamide), she took azithromycin empirically to treat a possible cellulitis prior to presentation to the emergency department. Her medical history was significant for complete heart block, hypertension, migraine, and inherited thrombophilia (Prothrombin Gene Mutation G20210A), with a history of recurrent deep venous thrombosis and pulmonary embolism, the last one being 1 year ago. Her twin brother also had complete heart block with multiple pacemaker rejections, which had improved only after having a gold-plated pacemaker implanted.

Physical examination revealed a non-toxic looking female, who did not appear to be in any acute distress, with a maximal temperature of 96.9 F, pulse of 64/min, blood pressure of 104/64 mmHg, and respiratory rate of 18/min. A pacemaker was palpable on the left chest area, with overlying tenderness and fluctuant erythema around the skin.

Leukocyte count was 5,900/ μ L, with 43% polymorphonuclear cells and 49% lymphocytes, hemoglobin was 11.9, and platelet was 253, 000/ μ L. Results of her complete metabolic panel were within normal limits without any white cells, bacteria, nitrites, or esterase in her urinalysis. Chest x-ray and chest computed tomography scans with contrast were essentially unremarkable except for a left-sided pacemaker with atrioventricular leads. Electrocardiogram was normal sinus at a rate of 76 bpm with normal axis and no ST or T wave abnormality. She was initially managed as possible recurrent pacemaker infection and was started on intravenous ceftriaxone and vancomycin, which was discontinued after 2 sets of blood cultures and microbiology testing of removed pacemaker leads failed to demonstrate the growth of any microorganism.

She subsequently had an extensive metal and substance allergy testing, which revealed an allergic sensitivity to titanium, epoxy, and silicone. A course of steroid therapy without any response was prescribed. Keeping in mind the brother's similar pacemaker history, a special order for a gold-plated permanent pacemaker was made. It was subsequently implanted and resulted in the resolution of the symptom related to recurrent pacemaker allergic reactions.

DISCUSSION

A pacemaker is an artificial device for stimulating the heart muscle and regulating its contractions. It is made up of three major components: Device pulse generator, device controller-monitor, and leads. These components are usually coated with various materials to reduce infections and reaction.[1,2,3] Since the introduction of the first implantable pacemaker in humans in the 60s, several advancements have been made including titanium encasement replacing epoxy resins and silicone rubber covers that have significantly reduced external electromagnetic interference and reactivity.[4]

Generally, most generators are covered with titanium capsule, and the leads are attached to the capsule via the pacemaker's headers, which are composed of either polymethylmethacrylate and silicone rubber or sometimes entirely of silastic material.[4] The pacemaker leads carry pacing information to-and-fro from the heart to the generator stimulating the heart via the electrodes when required. These leads are flexible insulated wires composed of MP35N alloy composed of nickel, cobalt, chromium, and molybdenum.[4] However, there have been several reported cases of allergic sensitivity to these encasing materials including silastic, titanium, nickel, polyurethane, epoxy, mercury, cadmium, chromate, silicone, polychloroparaxylene, and cobalt.[1,2,3,5,6]

Allergic sensitivity to pacemaker components is an uncommon complication of pacemaker insertion, [1,2,5,6] amongst a few, with an incidence of about 571 per 1 million in 1997.[1] The etiology of this complication is unknown, likely related to genetics or HLA, as sensitivity is usually to multiple encasing materials.[1,2,6] Clinical presentation includes cutaneous eruption, pruritus, pain, erythema, and swelling at the site of pacemaker insertion,[1,3] similar to pacemaker infection, a relatively more common and serious complication, thus must be excluded. However, pacemaker allergy should always be considered with such a presentation,[1] especially in the absence of fever, leucocytosis, and negative blood cultures.[3] Although most reported cases are related to recurrence[1,2,3,5,6], onset can be early or delayed.[6]

Diagnosis often involves allergy testing to various pacemaker components based on the manufacturer lot, which is highly specific in eliminating components to be avoided in subsequent replacements. However, this is not sensitive especially with titanium, where reaction still occurs despite negative results on allergy testing.[1,4,6] Alternative methods of evaluating titanium allergy that have been reported includes lymphocyte proliferation tests, intradermal testing with serum incubated for titanium, and X-ray energy dispersive spectroscopy (EDAX) on skin biopsy of the involved area.[4,5]

Although there are no defined guidelines to the management of pacemaker sensitivity due its rarity, replacement of the pacemaker with non-allergic components based on the sensitivity reports has been the

pivot of treatment,[1,2,3,4,5,6] with gold-coated pacemakers shown to be more superior.[3,4,6] Other reported treatment options are topical and systemic steroids in mild cases and wrapping the device in polytetrafluoroethylene sheet.[4] It is also important to note that these reactions can lead to device malfunction attributed to excessive power source drain due to fluid collection in pacemaker pocket from allergic reactions.[2,4]

CONCLUSION

Even though this is a rare phenomenon, it is important to realize the importance of a pacemaker allergy. When a patient keeps returning with similar symptoms despite multiple antibiotics and infection has been ruled out, the next step is to think about an allergy to the pacemaker. Therefore, an allergy test can be done with specific skin testing and the next step will be to use replacements to which the patient is not allergic. As seen in this case, the patient test was positive for allergies, and a special order gold-plated pacemaker was implanted and all her symptoms resolved.

Footnotes

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Conflict of Interest: None declared.

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