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SCIENTIFIC ARTICLE - CASE REPORT

BALANCED GENERAL ANESTHESIA IN A PATIENT WITH CARDIAC PACEMAKER EXTRUSION: A CASE REPORT

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ABSTRACT

Pacemaker (PM) generator extrusion is a rare complication, and may be associated with local infections, skin fragility, and local trauma. Treatment may involve simple surgical repair of the device site or, in more severe cases, removal of the entire system, requiring anesthetic support. This article reports the anesthetic management of a 79-year-old patient with complete PM extrusion after a fall from a standing position, followed by PM site infection, requiring surgical removal of the device. The patient underwent balanced general anesthesia with intraoperative transesophageal echocardiography monitoring, which revealed significant findings that changed the case's outcome.

Keywords: General anesthesia, Artificial pacemaker, Lead extraction, Echocardiography, Transesophageal, Surgical wound infection.

INTRODUCTION

Pacemaker (PM) extrusion is a rare complication, with an approximate prevalence of 1%, usually associated with skin fragility, local infections (surgical site infections), local trauma (including scratching), or a small subcutaneous surgical pocket.[1,2,3]

Between 32% and 42% of local infections involving PM generators are associated with device extrusion; however, it is important to note that most of these cases are also linked to some degree of patient immunodeficiency (for example, corticosteroid users or poorly controlled diabetics), poor local hygiene, or cognitive impairment.[1,2]

Treatment generally consists of antibiotic therapy and removal of the device, followed by reimplantation on the contralateral side. In more subtle cases (such as erosions without signs of infection), surgical exploration with preservation of the generator in its original site may be attempted. Preventive measures include adequate management of concomitant diseases (such as diabetes mellitus), strict perioperative asepsis, and appropriate postoperative local hygiene.[1,2]

CASE REPORT

The patient was a 79-year-old male with a significant medical history, including systemic arterial

hypertension and prostate cancer. He also had a history of previous surgical procedures, such as laparoscopic cholecystectomy, hernia repair, and two valve replacement surgeries: the first in 1990 with implantation of a mechanical valve, and the second in 2021, when the mechanical valve was replaced with a biological prosthesis. Additionally, in 2021, he underwent pacemaker implantation. He was admitted to a hospital service with a complaint of a condition that had begun approximately five months earlier. After a fall from standing height, he started physiotherapy. Since then, he developed ulceration and purulent discharge at the site of the cardiac pacemaker, progressing to extrusion of the device in the left hemithorax (Figure 1).

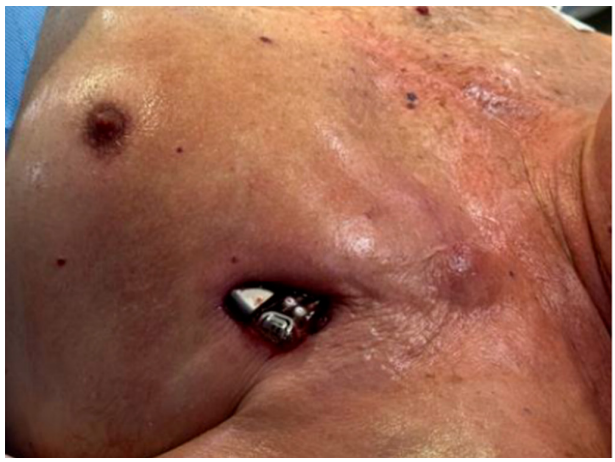

Figure 1. Pacemaker generator extrusion in the left hemithorax region, associated with local inflammatory signs.

After evaluation by the multidisciplinary team, it was decided to proceed with the removal of the pacemaker system under general anesthesia. During the procedure, the patient was subjected to multiparameter monitoring, including pulse oximetry, electrocardiogram, and invasive blood pressure, the latter obtained by right radial artery puncture with a 20G catheter guided by ultrasonography. Pre-oxygenation was performed with 100% oxygen. The anesthetic induction consisted of 20 mg of ketamine, 100 mcg of fentanyl, 100 mg of 2% lidocaine, 150 mg of propofol, and 50 mg of rocuronium. Direct laryngoscopy was performed, classified as Cormack 2a, followed by orotracheal intubation (OTI) with an 8.0 cuffed tube, properly secured. Anesthetic maintenance was achieved with 2% sevoflurane and remifentanil in a target-controlled infusion (TCI) pump. At the end of the procedure, 200 mg of sugammadex was administered, and extubation occurred without complications. The patient was then transferred to the Intensive Care Unit (ICU).

During the procedure, the transesophageal echocardiogram (TEE) revealed significant findings: a left atrium (LA) with a sessile thrombus and a right atrium (RA) with two serpentine, mobile images, suggestive of a thrombus or endocarditis (Figure 2). Given these findings, subcutaneous enoxaparin 80 mg every 12 hours was initiated for the probable thrombus, and an empirical antibiotic regimen with ampicillin, oxacillin, and gentamicin was started for the suspected endocarditis.

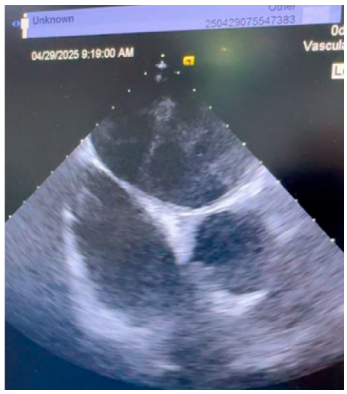

Figure 2: Transesophageal echocardiogram (TEE) image in the mid-esophageal plane showing a sessile thrombus in the left atrium (LA) and serpentine images in the right atrium (RA).

In the days following pacemaker (PM) removal, the patient developed a subcutaneous collection in the left breast region, associated with soft tissue swelling and pleural effusion. A chest computed tomography (CT) scan performed three days after PM removal confirmed the presence of a hematoma at the surgical site, leading to suspension of enoxaparin. Two days after the diagnosis, the hematoma was drained and enoxaparin was reintroduced. Despite the intervention, the patient remained prostrate and anorexic. Culture of the intracardiac pacemaker lead tip grew Pseudomonas aeruginosa, although blood cultures were negative. In view of the culture result and the unsatisfactory clinical course, the infectious disease team evaluated the case and decided to discontinue the empirical endocarditis regimen and initiate cefepime 2 g every 8 hours, with a planned treatment duration of 21 days.

One day after the infectious disease evaluation, the patient experienced significant clinical deterioration, developing acute kidney injury and hypotension, requiring return to the ICU. A sepsis protocol was initiated, with escalation of antimicrobial therapy to meropenem and vancomycin. An abdominal CT scan revealed partial intestinal obstruction due to an adhesion/internal hernia. Over the following two days, the patient's condition progressively worsened, requiring placement of a central venous catheter (CVC), invasive arterial blood pressure monitoring, initiation of total parenteral nutrition (TPN), and orotracheal intubation (OTI). During intubation, the patient suffered a cardiac arrest, with return of spontaneous circulation after three cycles of resuscitation. Approximately eight hours after the first cardiac arrest, the patient experienced a second arrest, this time refractory to resuscitative efforts, and died 18 days after the pacemaker removal procedure.

DISCUSSION

Cardiac pacemakers are widely used devices for the treatment of symptomatic bradyarrhythmias and sinoatrial node (SAN) dysfunction, resulting in improvement of patient hemodynamics compromised by low heart rate. Pacemakers are traditionally composed of a generator and one or more leads, which stimulate the myocardium (Figure 3). More recently, so-called leadless pacemakers have been developed, in which both subunits (generator and electrodes) are integrated into a single device.[1]

Figure 3: Pacemaker composed of a generator and leads.

The generators are the component of the pacemaker that contain the device battery and where the electrical impulses transmitted through the leads are generated. They are most commonly placed in the infraclavicular region of the anterior chest wall. The leads originate from the generator and are advanced via the transvenous route to the myocardium.[1] Alternative configurations include epicardial generator placement; lead positioning in the His bundle or left bundle branch; and, in the case of leadless pacemakers, the entire unit being housed within the right ventricle (RV).[1]

One of the complications that may occur after pacemaker implantation is generator extrusion associated with erosion of the thoracic wall. This is a rare complication, with a prevalence of approximately 0.8%, and is mainly associated with local infections (most commonly caused by Staphylococcus species), fragile skin (particularly in elderly patients), impaired immunity, cognitive deficits, trauma caused by scratching, and thin subcutaneous tissue with an inadequately sized pocket for the device.[2,3] The first two factors were present in the patient described in our case, as evidenced by inflammatory signs at admission and advanced age.

Local infection may manifest as involvement of the generator pocket or as an exclusively intravascular process. Isolated pocket infection accounts for approximately 60% of device-related infections and usually results from contamination during surgery or subsequent manipulation. This infectious process may progress to skin erosion, contributing to device extrusion.[4]

Definitive diagnosis of pacemaker-related infection is primarily based on the presence of three findings: purulent collection or externalization of the device, microorganism growth in blood cultures, and the presence of vegetations on the tricuspid valve or on leads and electrodes as demonstrated by transesophageal echocardiography (TEE). In the present case, all three major criteria were met. When these criteria are insufficient to establish the diagnosis, additional imaging studies, such as PET-CT, may be required.[4]

Additionally, a case report published in Malaysia in 2011 described pacemaker EXTRUSION following minor trauma to the chest wall (the patient's grandchild had jumped onto his chest), with the onset of pain, edema, and skin erosion occurring within two days after the incident.[5] It is therefore reasonable to hypothesize that, in our case, symptom onset may have followed the fall from standing height experienced by the patient. Could local trauma have occurred at that time, even if not reported by the patient?

In general, treatment of pacemaker extrusion may follow two approaches: surgical revision of the device pocket without system removal, or, in more severe cases—such as the present one, with complete generator extrusion and signs of infection—extraction of the entire system, as it is

considered contaminated.[6]

Regarding intraoperative management, the use of sevoflurane for maintenance of anesthetic depth was controversial when compared with a Danish cohort study published in 2007, in which propofol demonstrated superiority over inhalational agents in patients with cardiovascular instability or undergoing emergency surgery/acute events.[7] Thus, total intravenous anesthesia with propofol could have been considered instead of sevoflurane in this case.

Furthermore, a 2023 editorial published in the Journal of the American College of Cardiology emphasized that cases of endocarditis related to cardiac implantable electronic device infection require device removal as the gold-standard treatment, as mortality risk may reach up to 66%. Device extraction is associated with low complication rates, whereas delayed removal is linked to increased mortality and higher rates of adverse events.[8]

Finally, regarding the use of TEE in the intraoperative setting, its application has been shown to reduce 30-day mortality, shorten hospital length of stay, and significantly contribute to intraoperative decision-making in cardiopulmonary bypass, valvular, and aortic surgeries.[9] Although its routine use for pacemaker implantation or removal is not yet formally recommended, in this specific case it proved to be critically important for identifying and documenting images suggestive of thrombus/endocarditis, which completely altered the clinical management and ultimate outcome of the patient.

CONCLUSION

Pacemaker extrusion is a rare event, usually associated with local infections and physiological and/or biopsychosocial aspects of the individual. Once diagnosed, its treatment is based on device removal in addition to antibiotic therapy, since its complications may even lead to death. In this context, this case report brings to light the discussion of a dramatic clinical scenario in which, from an anesthesiology perspective, propofol could have been better employed than sevoflurane for anesthetic maintenance. Furthermore, the use of transesophageal echocardiography (TEE) provided a broad spectrum of findings and guidance for subsequent management throughout the course of the case, despite the fact that its use in this type of surgical approach still lacks sufficient evidence for formal recommendation.

REFERENCES

1. Sazzad, F., Ibrahim, F. B., & Khan, M. S. R. (2020). Skin Erosion and Exteriorisation of a Cardiac Implantable Electronic Device: Modified Surgical Approach. Journal of Bangladesh College of Physicians and Surgeons, 38(3), 155–157.

2. Yuksel S, Demir S, Sahin M. Total extrusion of a normally functioning pacemaker. Tex Heart Inst J. 2012;39(1):156-7.

3. Nichev J, Balabanski T. A case of total pacemaker extrusion. Europace. 2009 May;11(5):670.

4. Teixeira RA, Fagundes AA, Baggio Junior JM, Oliveira JC de, Medeiros P de TJ, Valdigem BP, et al. Diretriz Brasileira de Dispositivos Cardíacos Eletrônicos Implantáveis – 2023. Arq Bras Cardiol [Internet]. 2023;120(1):e20220892.

5. Yew KL, Steven A, Razali F. Pacemaker extrusion from innocuous direct impact to the chest wall. Heart Asia. 2013 Jun 21;5(1):100.

6. Gur DO, Gur O. Pacemaker extrusion: a rare clinical problem mainly in elderly adults. J Am Geriatr Soc. 2013 Oct;61(10):1844-5.

7. Jakobsen CJ, Berg H, Hindsholm KB, Faddy N, Sloth E. The influence of propofol versus sevoflurane anesthesia on outcome in 10,535 cardiac surgical procedures. J Cardiothorac Vasc Anesth. 2007 Oct;21(5):664-71.

8. Hussein AA, Wazni OM, Wilkoff BL. Cardiac Implantable Electronic Devices and Infective Endocarditis: A Call to Arms.... J Am Coll Cardiol. 2023 May 2;81(17):1726-1728.

9. Rong LQ, Shore-Lesserson L, Belani K, Faloye A, Garcia-Sayan E, Lawton J, Maus T, Miller-Hance W, Nicoara A, Sheu R; American Heart Association Council on Cardiovascular Surgery and Anesthesia; and Council on Basic Cardiovascular Sciences. Considerations of Intraoperative Transesophageal Echocardiography During Adult Cardiac Surgery: A Scientific Statement From the American Heart Association. Circulation. 2025 Jul 15;152(2):129-145.
patient with asthma. J Med Life Sci. 2019;16(2):43–5.

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EDITORIAL AND REVIEW

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