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Case Report

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Epicardial pacemaker extrusion in a pediatric patient with congenital heart disease: A rare complication

Abstract

Epicardial pacemaker implantation is a standard approach for managing complete atrioventricular block in pediatric patients following congenital heart surgery. Although complications related to epicardial pacing are relatively common, pacemaker extrusion remains a rare and potentially serious event, particularly in children with Down syndrome. We report the case of a 15-month-old boy with Down syndrome who developed epicardial pacemaker extrusion six months after initial implantation. After infection control with intravenous antibiotics, the pacemaker system was surgically explanted and successfully re-implanted without postoperative complications. This case underscores the importance of vigilant follow-up and timely surgical management to prevent adverse outcomes in similar high-risk patients.

Keywords: Down syndrome, atrioventricular septal defect, epicardial pacemaker, cardiac surgery

INTRODUCTION

Down syndrome is frequently associated with congenital heart defects, and complete atrioventricular septal defect (AVSD) remains one of the most common lesions requiring early surgical repair. Despite advances in congenital cardiac surgery, postoperative conduction abnormalities—particularly complete atrioventricular block—may still occur and often necessitate permanent pacemaker implantation. In infants and young children, the epicardial approach is generally preferred due to anatomical limitations and the technical challenges of transvenous pacing in this age group (1).

Epicardial pacemaker implantation is usually safe and effective; however, several complications may be encountered in the postoperative period. Infection, lead-related problems, and wound-healing disturbances constitute the majority of device-related issues in pediatric patients (2). Although rare, pacemaker generator extrusion represents one of the most serious complications, as it increases the risk of systemic infection and invariably requires explantation and re-implantation of the device. Long-term pacing outcomes in children are influenced not only by surgical technique but also by patient-related factors such as nutritional status, syndromic conditions, and the thickness of subcutaneous tissue (3,4).

Here, we present a rare case of epicardial pacemaker extrusion in a child with Down syndrome following complete AVSD repair and discuss contributing risk factors, clinical management, and preventive considerations.

CASE REPORT

Patient Information

The patient is an 8-month-old male infant diagnosed with Down syndrome and complete atrioventricular septal defect (AVSD). Down syndrome, also known as trisomy 21, is a genetic disorder commonly associated with cardiac anomalies. The patient's AVSD was characterized by balanced ventricles, a large inlet-type ventricular septal defect (VSD), a large primum-type atrial

septal defect (ASD), and a common AV valve insufficiency consistent with Rastelli Type A. Additionally, a secundum ASD and systemic pulmonary hypertension (PH) were identified.

Surgical Intervention

Following the surgical council's discussion, the patient underwent surgical intervention for the repair of the complete AVSD. During the surgery, large VSD and ASD patches were placed, and the AV valves were divided and reconstructed appropriately. Postoperative echocardiography confirmed that the VSD and ASD patches were intact, with no residual defects, but minimal right and left AV valve insufficiency persisted. In the postoperative period, the patient developed complete atrioventricular block, which became permanent after three weeks. Consequently, a permanent epicardial pacemaker in VVI mode was implanted. A bipolar epicardial pacemaker system (Medtronic, USA) was implanted via a subxiphoid approach under general anesthesia. The atrial and ventricular leads were sutured to the epicardium, and the generator was placed in a subrectus abdominal pocket.

Complication Development

Six months after the epicardial pacemaker implantation, the pacemaker generator was observed to be gradually protruding from the skin (Figure 1). The patient, residing in another country, was not properly dressed and did not receive antibiotic treatment. One month later, when the patient was 15 months old, he presented to our hospital with the complaint that the pacemaker generator and its cables were protruding from the skin (Figure 2). Upon admission, the patient had elevated infection markers, and there was significant infection at the pacemaker insertion site (Figure 3). However, further investigations did not reveal any serious conditions such as endocarditis. Despite the extrusion, the pacemaker was functioning properly.

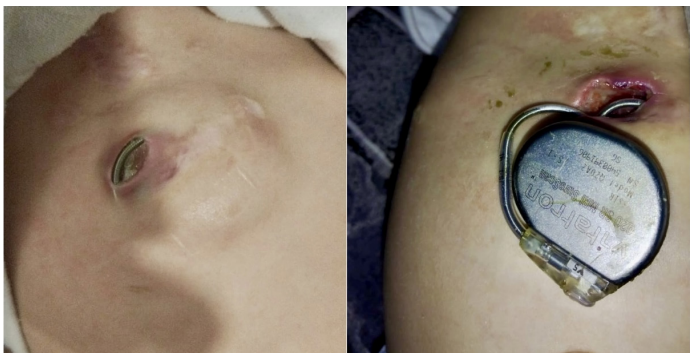

Figure 1. Progressive epicardial pacemaker generator protrusion and subsequent cutaneous extrusion. The left image demonstrates early protrusion of the generator toward the skin surface, whereas the right image shows complete extrusion of the pacemaker through a dehiscent wound.

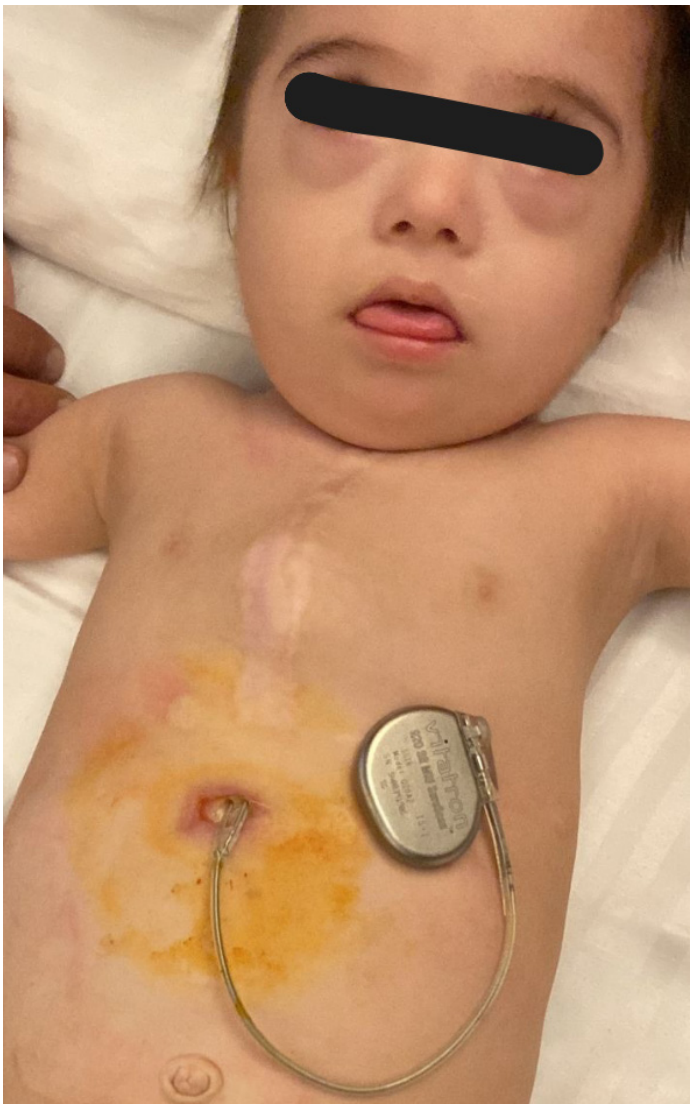

Figure 2. Hospital presentation with complete extrusion of the epicardial pacemaker generator and infection at the wound site.

Treatment and Follow-Up

The patient received intravenous dual antibiotic therapy (broad-spectrum antibiotics) for three weeks. During this period, infection markers were closely monitored, and a positive response to treatment was observed; the infection regressed (1). After the infection was controlled, the old pacemaker was surgically removed, and a new epicardial pacemaker was implanted. The patient was monitored in the intensive care unit after the operation, and no postoperative complications occurred (2). Once the patient's overall condition stabilized, he was discharged without complications.

DISCUSSION

Although complications such as lead fracture or infection are not uncommon after epicardial pacemaker implantation, generator extrusion remains a rare event in pediatric patients, particularly in those with syndromic conditions or limited subcutaneous

tissue (3,4). Epicardial pacemaker implantation is a common method for managing permanent arrhythmias in pediatric patients (5). However, pacemaker extrusion, a rare complication, is particularly challenging in pediatric patients. It typically results from wound healing problems, infection, or mechanical trauma (3). In pediatric patients, several additional factors may contribute to pacemaker extrusion. Thin subcutaneous tissue, especially in low-weight infants, provides limited coverage for the generator and leads, increasing mechanical stress on the incision site (4). Moreover, high physical activity and frequent arm or chest movements in active children can cause microtrauma to the wound area (3). Impaired wound healing due to malnutrition or syndromic conditions such as Down syndrome may further predispose these patients to extrusion (2).

In Down syndrome, a combination of immune dysfunction, altered collagen structure, and increased skin sensitivity may lead to delayed wound healing and higher susceptibility to infection (6). Therefore, the placement, fixation, and follow-up of pacemakers in these patients should be managed with additional care, ensuring a deeper generator pocket, meticulous asepsis, and closer postoperative monitoring. Permanent epicardial pacing remains the preferred approach for postoperative atrioventricular block in pediatric patients (7).

To our knowledge, while pacemaker extrusion has been reported in a child with Down syndrome as an unusual rectal externalization of an abdominally placed device, cutaneous generator extrusion in pediatric Down syndrome has not been specifically documented. Our case therefore adds to the literature by highlighting DS-related vulnerability with cutaneous device exposure (8).

Preventive measures play a crucial role in reducing the risk of pacemaker extrusion in pediatric patients. Careful selection of the generator pocket site—preferably a deeper and well-protected submuscular location—together with meticulous surgical asepsis and perioperative antibiotic prophylaxis are essential. Regular postoperative follow-up to assess wound healing and early signs of infection is also critical to avoid late complications. In patients with syndromic conditions or thin subcutaneous tissue, individualized surgical planning and reinforced wound closure techniques may further reduce the risk of generator exposure (3, 4,9).

Overall, awareness of predisposing factors and early identification of pocket-related complications are essential for improving outcomes in pediatric pacing. Close multidisciplinary collaboration between cardiologists and surgeons ensures timely decision-making and prevents severe consequences of device extrusion.

CONCLUSION

This case highlights that epicardial pacemaker extrusion, although rare, represents a serious complication in pediatric patients with Down syndrome and congenital heart disease. Beyond its rarity, it underscores the importance of vigilant long-term follow-up after pacemaker implantation to detect early signs of infection or wound dehiscence. Effective infection control, individualized surgical planning, and prompt reintervention are essential to prevent recurrence. Multidisciplinary follow-up and preventive strategies may improve long-term outcomes and reduce device-related morbidity (9).

Conflict of Interests: The authors declare that there are no conflict of interests.

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Patient Informed Consent: Written informed consent was obtained from the patient's legal guardian for publication of this case and accompanying images.

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