Laparoscopic extraction of a migrated pacemaker in a 6-year-old child: a case report

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<table>
<thead>
<tr>
<th>Presentation</th>
<th>Imaging</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 6-year-old boy with epicardial ventricular pacemaker presented with abdominal pain and fever</td>
<td>The pacemaker in the pelvic cavity with a stretched cable</td>
<td>Laparoscopic extraction, repair of the left rectus fascia, and making a new pocket on the right side</td>
</tr>
</tbody>
</table>

The laparoscopic approach can provide a safe option with good results for extracting an uncomplicated migrated pacemaker in children.
Laparoscopic extraction of a migrated pacemaker in a 6-year-old child: a case report

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Central Message: Rare abdominal migration of a cardiac pacemaker can be safely managed using a laparoscopic approach
Abstract

Pacemaker migration is rare in children. We report a case of pacemaker migration into the pelvis in a 6-year-old boy. The child presented with abdominal pain and an abdominal x-ray and ultrasound confirmed the position of the pacemaker excluding visceral injury or fluid collections. The pacemaker was extracted laparoscopically, and the new pacemaker was implanted within the right sided rectus sheath. The patient was discharged home in good condition two days after the procedure.

Keywords: pacemaker migration; laparoscopy; complete heart block

Introduction

Pacemaker generator migration is a rare complication of permanent pediatric pacemaker implantation. Several issues are encountered during the implantation of a pediatric pacemaker, including size mismatch and the child's growth. Abdominal migration of pacemakers has been reported in pediatric patients before, and laparotomy has been the standard approach, especially for complicated cases. Data about the role of minimally invasive techniques for the extraction of migrated pacemakers in children are limited. We report a case of laparoscopic retrieval of a migrated pacemaker in a 6-year-old child.

Case description

The reported case is of a 6-year-old boy who had repair of a complete atrioventricular canal at the age of 6 months (IRB Approval number 2225149, approved May 29, 2022). Consent was obtained from the patient’s family to publish this report. Postoperatively, the patient developed complete heart block and was treated with an epicardial ventricular pacemaker. He had an uneventful follow-up for six years until he presented with mild intermittent lower abdominal
pain of nonspecific nature with fevers and no other symptoms. Furthermore, he failed to gain weight as he was charted within the 3rd percentile relative to his age.

Abdominal examination revealed a soft and lax abdomen. The device was not palpable in the abdomen nor the lower pelvis, and there was no tenderness nor skin changes. All routine blood work was within normal limits, including inflammatory markers. An abdominal X-ray showed the device located in his lower abdomen (Figure 1 A and B). An abdominal ultrasound showed the pacing cable extending directly posterior to the abdominal wall and the pacemaker in the pelvic cavity without signs of visceral injury or fluid collections (Figure 2). The pacemaker showed adequate function and preserved generator longevity. A review of the previous operative report revealed that the device was implanted in the left upper quadrant within the rectus sheath posterior to the rectus muscle without specifying any generator suture-anchoring technique.

The consensus was to explore the abdomen laparoscopically and replace the device with the assistance of the pediatric surgeons due to concerns of intraabdominal adhesions or erosion.
into vital structures. The lead was identified and released from surrounding adhesions using scissors and electrocautery. The device was traced caudally and identified within the pelvic cavity (Figure 3). After releasing the device and lead from adhesions, the epigastric incision was extended cephalad for a few centimeters for extraction (Figure 4).

Given that the pacemaker was previously placed within the left rectus sheath, a decision was made to repair the fascia on the left side after extracting the lead and form a new pocket on the right side for the new pacemaker. Upon completion and testing of the new device, the patient was extubated in the operating room. He had an uneventful postoperative course and was transferred to the Cardiovascular Telemetry Unit afterward. The wound healed well. Pacemaker analysis showed good function, and the patient was discharged home in good condition two days after the procedure.

Discussion

Pacemaker migration is rare in pediatric patients, and several risk factors may contribute to the displacement of the device from its pocket. These include an insufficient strength of the patient tissue due to poor growth, pocket infection, device-pocket size mismatch, or technical reasons while creating the pocket.

Abdominal placement of the generator is usually achieved by creating a supra or submuscular space within the rectus sheath in the subcostal region. Supramuscular placement has an inherent risk of device erosion to the skin, especially in small children with a thin subcutaneous layer. Contrary to supramuscular placement, submuscular placement might be complicated by herniation through the posterior fascia into the abdominal cavity, potentially causing a myriad of abdominal presentations that range from mild abdominal discomfort such as in our case to severe complications such as visceral erosion.³

In most reported pediatric cases, device retrieval was accomplished using an open laparotomy approach.¹³ Reports about minimally invasive techniques for migrated
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93 pacemaker extraction are scarce. Along with our case, Kravarusic and colleagues reported a
94 laparoscopic-assisted extraction of a migrated pacemaker in a 5-year-old patient.\textsuperscript{4} This
95 published report along with our report shows the feasibility of laparoscopic extraction of
96 uncomplicated migrated pacemakers in children.
97

98 \textbf{Conclusion}

99 The laparoscopic approach can provide a safe option with good results for extracting
100 an uncomplicated migrated pacemaker in children (Figure 5).
References:


Legend

Figure 1: A: Pacemaker sitting in the pelvic cavity, stretched cable and epicardial pacing wires, B: Pacemaker and cable posterior to the abdominal wall. Lead appears intact

Figure 2: Abdominal ultrasound showing pacemaker and cable immediately posterior to the abdominal wall in the midline abdomen and pelvis. No surrounding collection or tissue

Figure 3: A: Releasing the adhesions from the cable and the pacemaker laparoscopically, B: laparoscopic view of the pacemaker in the pelvis

Figure 4: Extracting the device through an epigastric incision

Figure 5: Graphical Abstract: The laparoscopic approach can provide a safe option with good results for extracting an uncomplicated migrated pacemaker in children
Central Figure: Pacemaker sitting in the pelvic cavity, stretched cable and epicardial pacing wires
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**Presentation**
A 6-year-old boy with epicardial ventricular pacemaker presented with abdominal pain and fever.

**Imaging**
The pacemaker in the pelvic cavity with a stretched cable.

**Treatment**
Laparoscopic extraction, repair of the left rectus fascia, and making a new pocket on the right side.

The laparoscopic approach can provide a safe option with good results for extracting an uncomplicated migrated pacemaker in children.