

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



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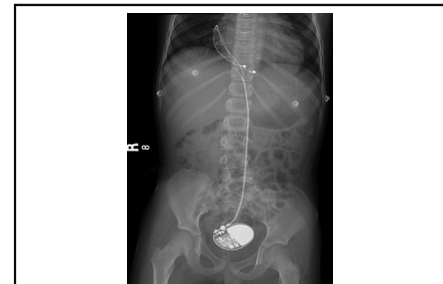
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Pacemaker generator migration is a rare complication of permanent pediatric pacemaker implantation. Several issues are encountered during the implantation of a pediatric pacemaker, including size mismatch and the child's growth.¹ Abdominal migration of pacemakers has been reported in pediatric patients before, and laparotomy has been the standard approach, especially for complicated cases.² 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 (institutional review board 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 6 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 third 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 radiograph showed the device located in his lower abdomen



Pacemaker sitting in the pelvic cavity, stretched cable and epicardial pacing wires.

CENTRAL MESSAGE

Rare abdominal migration of a cardiac pacemaker can be safely managed using a laparoscopic approach.

(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

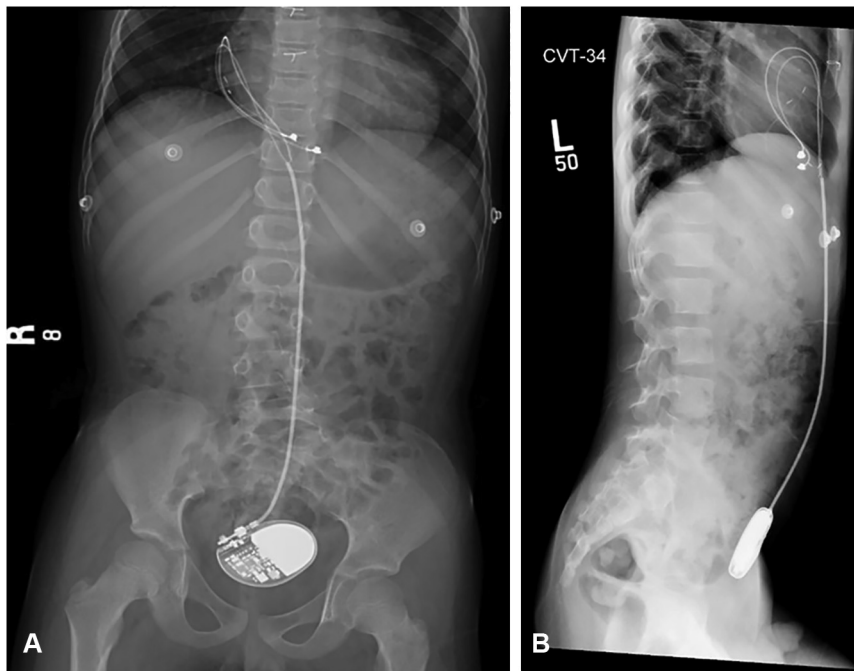


FIGURE 1. A, Pacemaker sitting in the pelvic cavity, with stretched cable and epicardial pacing wires. B, Pacemaker and cable posterior to the abdominal wall. The lead appears intact.

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 2 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

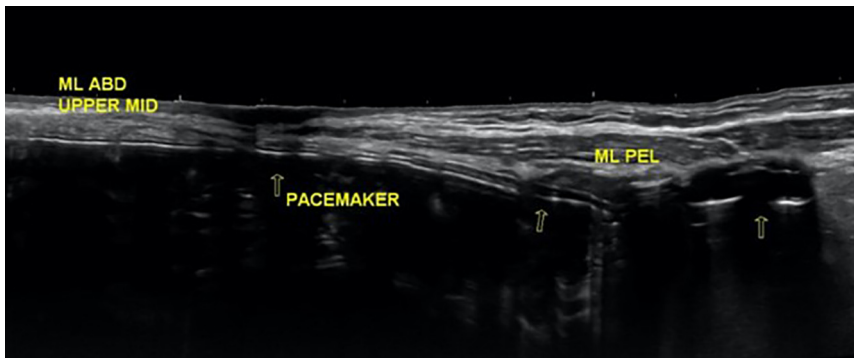


FIGURE 2. Abdominal ultrasound showing the pacemaker and cable immediately posterior to the abdominal wall in the midline abdomen and pelvis. No surrounding collection or tissue was found. *ML ABD*, Midline abdomen; *ML PEL*, midline pelvis.

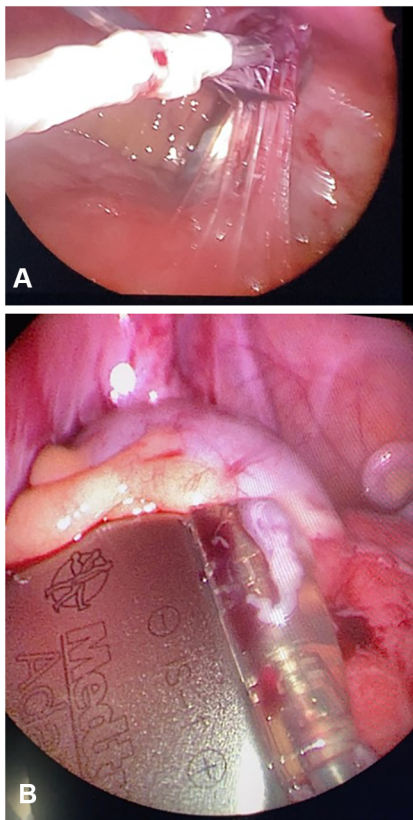


FIGURE 3. A, Releasing the adhesions from the cable and the pacemaker laparoscopically. B, Laparoscopic view of the pacemaker in the pelvis.

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.^{1,3} Reports about minimally invasive techniques for migrated pacemaker extraction are scarce. Along with our case, Kravarusic and colleagues⁴ reported a laparoscopic-assisted extraction of a migrated pacemaker in a 5-year-old patient. This published report along with our report shows the feasibility of laparoscopic extraction of uncomplicated migrated pacemakers in children.



FIGURE 4. Extracting the device through an epigastric incision.

CONCLUSIONS

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

References

1. Al Sabti H, Menon RG, Maddali MM, Valliattu J. Wandering permanent pacemaker generators in children: a case series. *J Med Case Rep.* 2008;2:163.
2. Koch AME, Singer H. Unusual pacemaker migration. *Eur Heart J.* 2005;26:1941. <https://doi.org/10.1093/eurheartj/ehi488>
3. Dodge-Khatami A, Backer CL, Meuli M, Prêtre R, Tomaske M, Mavroudis C. Migration and colon perforation of intraperitoneal cardiac pacemaker systems. *Ann Thorac Surg.* 2007;83:2230-2.
4. Kravarusic D, Chirdan L, Freud E. Laparoscopic-assisted retrieval of migrated intra-abdominal pacemaker generator. *Pediatr Cardiol.* 2011;32:1196-8.


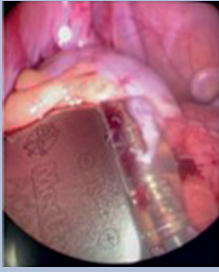
Laparoscopic extraction of a migrated pacemaker in a 6-year-old child: a case report		
Presentation	Imaging	Treatment
<p>A 6-year-old boy with epicardial ventricular pacemaker presented with abdominal pain and fever</p>	 <p>The pacemaker in the pelvic cavity with a stretched cable</p>	 <p>Laparoscopic extraction, repair of the left rectus fascia, and making a new pocket on the right side</p>
<p>The laparoscopic approach can provide a safe option with good results for extracting an uncomplicated migrated pacemaker in children</p>		

FIGURE 5. The laparoscopic approach can provide a safe option with good results for extracting an uncomplicated migrated pacemaker in children.