



A Case Report of Rare Complications after Epicardial Permanent Pacemaker Implantation in an Infant: Airway Compression, Skin Necrosis, and Bowel Perforation

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Insertion of an epicardial pacemaker is a useful treatment for pediatric patients with an abnormal heart rhythm. However, there are limitations and concerns when implanting epicardial pacemakers in infants and neonates due to their small body size. We report a patient who experienced rare complications after implantation of a permanent pacemaker.

Keywords: Artificial cardiac pacemaker, Infant, Postoperative complications

Case report

A neonatal patient was diagnosed with complex congenital heart disease, involving left isomerism; double outlet right ventricle; an unbalanced atrioventricular (AV) septal defect; AV valve regurgitation combined with pulmonary stenosis, which was adequate for protection of the pulmonary vascular bed; and complete AV block. He underwent implantation of a permanent pacemaker due to AV block with bradycardia (lowest rate: 48 beats/min) at 6 days of age and a body weight of 3.3 kg. Dual-chamber bipolar leads were placed in the atrium and ventricle apex, and a dual-chamber pacing generator was placed in the retrosternal space after near-total thymectomy because of a fragile-looking abdominal layer. However, the generator pocket was repositioned at 20 days of age because of airway compression (Fig. 1). In this operation, the posterior fascia of the patient's rectus muscle appeared too thin to support the device, so we placed the generator on the muscle layer. However, unfortunately, at 70 days of age, skin necrosis progressed due to compression of the generator. The generator was finally repositioned in the sub-rectus muscle layer, where it was not sutured because the peritoneal membrane seemed thicker than was observed in the previous opera-

tion. Subsequently, the patient showed tolerable growth without further complications. However, 7 months after the final repositioning, the patient was admitted to the emergency room with severe diarrhea accompanied by fever and poor oral intake. The patient's physical exam showed tenderness over the entire abdomen and his laboratory results showed mild leukocytosis with an elevated C-reactive protein level. An abdominal X-ray revealed that the pacemaker had migrated to the lower abdomen (Fig. 2A). Abdominal computed tomography confirmed that the generator was located in the pelvic cavity, with no definite signs of bowel perforation, such as free air (Fig. 2B).

Elective repositioning of the pacemaker generator was planned. Under general anesthesia, a sub-xyphoid to upper midline abdomen incision was made and the peritoneum was dissected along the previous leads. Once the abdominal cavity was opened, we found that the generator had perforated the transverse colon (with an opening of approximately 4 cm) and migrated to the rectum. The pacemaker was removed through the transverse colon perforation site. After primary repair of the perforation site and massive irrigation, a colostomy was made using the ascending colon in the right lower quadrant. Then, after a redo sternotomy, the previous atrial and ventricular leads



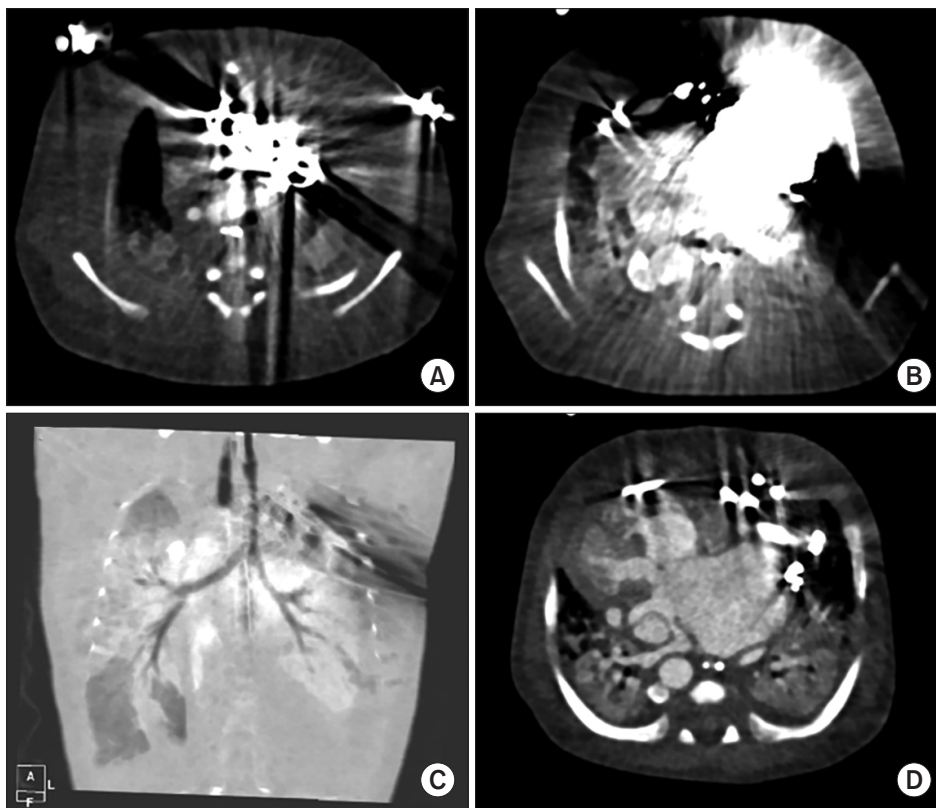


Fig. 1. Chest computed tomography after the first pacemaker insertion operation. (A) The generator was placed under the sternum. (B, C) The left main bronchus was compressed by the generator. (D) Bilateral lower lobe atelectasis due to airway compression.

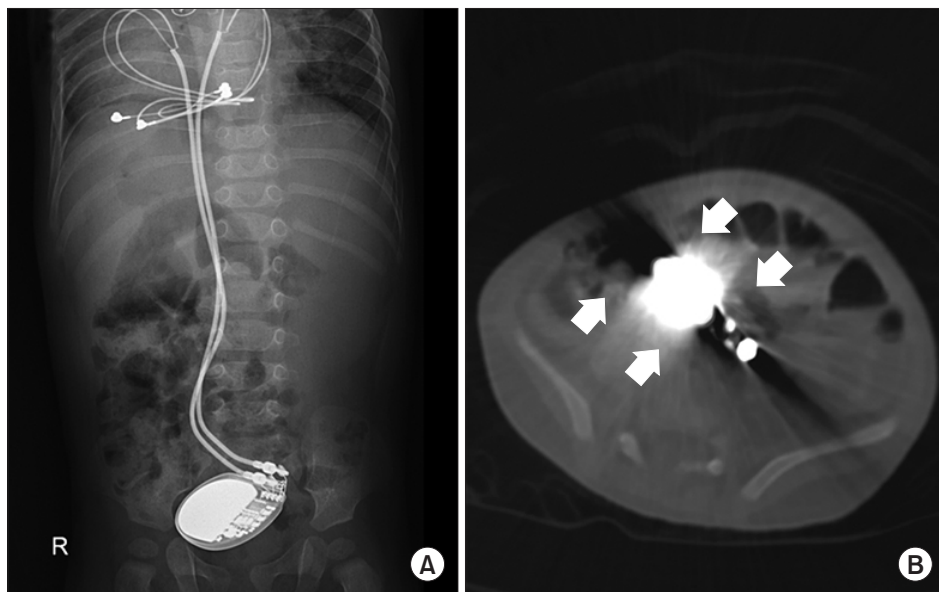


Fig. 2. (A) An abdominal X-ray scan showed migration of the pacemaker to the lower abdomen. (B) Abdominal computed tomography showed the pacemaker in the pelvic cavity, but there was no demonstrable evidence of bowel perforation, such as definite free air (arrows).

were removed and new leads were inserted. A new generator was connected and fixed to the left chest wall after the peritoneal and diaphragmatic defects were repaired with a 0.6-mm polytetrafluoroethylene (PTFE) patch (Gore-Tex cardiovascular patch; W. L. Gore & Associates Inc., Flag-

staff, AZ, USA) (Fig. 3). The wound was closed layer by layer.

The patient was transferred to the general ward from the intensive care unit on postoperative day 15. Oral feeding started on postoperative day 21. The patient was dis-

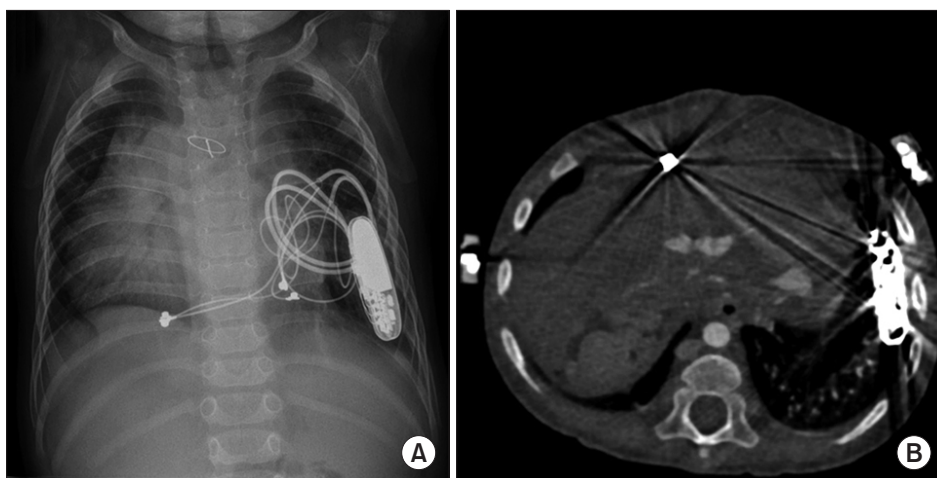


Fig. 3. The generator was placed in the left thorax, as shown on a chest X-ray (A) and chest computed tomography (B).

charged on postoperative day 56 after further intravenous antibiotic therapy. Before the operation for generator repositioning, we administered cefotaxime and metronidazole empirically, and postoperatively we added vancomycin, piperacillin/tazobactam, and caspofungin for *Escherichia coli*, *Klebsiella pneumonia*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, and *Candida albicans*, which were identified in the intraoperative and postoperative cultures. Elective colostomy repair was performed on postoperative day 79. The patient is currently well with no complications associated with the permanent pacemaker, and is awaiting palliative surgery for his original intracardiac defects.

The patient's parents agreed to publication of clinical details and images.

Discussion

Epicardial pacemakers have acceptable long-term durability and good clinical outcomes in pediatric patients with heart rhythm problems [1]. However, due to pediatric patients' small body size, growth potential, and fragility of supporting tissue, small infants and neonates may experience complications associated with generators or leads, such as skin erosion by the generator, abdominal pain, diarrhea, generator migration to the abdominal cavity, or lead fracture. In this case, a generator had migrated and perforated the bowel. A few cases of bowel perforation have been reported in adolescents and children [2,3], but it can happen even in infants.

Chaouki et al. [4] suggested that young age and low weight are more significant risk factors than device characteristics for epicardial pacemaker complications. Young

infants and neonates have more fragile tissues and smaller bodies than older children, and dual-chamber pacing type pacemaker generators are especially bulky for infants. Because their tissue cannot endure a heavy generator, it is possible for the generator to be dislodged from its original position and migrate to the intraperitoneal space. The baby in this case had many risk factors for complications involving the abdominal generator pocket, including a young age, low body weight, and thin and fragile tissue. We changed the location of the generator pocket twice due to thin tissue layers; one was a thin subcutaneous layer, and the other was a thin sub-rectus layer.

The rectus sheath is the most common location for generator pockets in pediatric patients. If the rectus sheath behind the muscle must be used, the rectus muscle may need supplemental reinforcement, such as a PTFE patch, and migration of the generator must also be considered when a patient shows unexplained gastrointestinal symptoms, such as diarrhea, ileus, abdominal pain, and fever, to prevent critical conditions such as septic shock, as in this case [4]. If we had added some material to reinforce the thin posterior fascia, peritoneal perforation might have been avoided. To prevent pacemaker generator complications, some authors have suggested inserting the generator in the subcutaneous tissue at the level of the upper quadrant, the external rib cage, or the space between the scapular muscles [2,3]. If rectus sheath seems to be too thin to endure the weight of the generator or another abdominal procedure is required, putting the generator under the sternum or in the thoracic cavity can be also an option [5]; nonetheless, we must consider airway obstruction due to external compression of the pacemaker generator, which is similar to the first complication described in this case study.

Epicardial pacemakers are very useful and, are sometimes an unavoidable option in pediatric patients with congenital cardiac diseases. However, the generator pocket site must be chosen with caution, especially in small infants or neonates due to their thin and fragile tissue layers.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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