Leadless pacing combined with extraction of an infected epicardial single chamber pacemaker in an 11-year-old girl

Maciej Kempa[1], Przemysław Mitkowski[2], Rafał Pawlaczyk[3], Radosław Jaworski[4], Szymon Budrejko[1], Ludmiła Daniłowicz-Szymanowicz[1], Grzegorz Romanowicz[5], Joanna Kwiatkowska[4]

[1]Department of Cardiology and Electrotherapy, Faculty of Medicine, Medical University of Gdansk, Gdańsk, Poland
[2]1st Department of Cardiology, Chair of Cardiology, Poznan University of Medical Sciences, Poznań, Poland
[3]Department of Cardiac Surgery, Faculty of Medicine, Medical University of Gdansk, Gdańsk, Poland
[4]Department of Pediatric Cardiology and Congenital Heart Defects, Faculty of Medicine, Medical University of Gdansk, Gdańsk, Poland
[5]Division of Nuclear Medicine, Faculty of Medicine, Medical University of Gdansk, Gdańsk, Poland

Correspondence to:
Szymon Budrejko, MD, PhD,
Department of Cardiology
and Electrotherapy
Faculty of Medicine,
Medical University of Gdansk,
Smoluchowskiego 17,
80–214 Gdańsk, Poland
phone: +48 58 584 47 60,
e-mail: budrejko@gumed.edu.pl

DOI: 10.33963/v.phj.104480

Received:
December 9, 2024

Accepted:
January 8, 2025

Early publication date:
January 21, 2025

An eleven-year-old girl (150 cm, 37 kg, body mass index 16 kg/m^2) was admitted to our clinic for a pacemaker exchange. She had received an epicardial single chamber pacemaker for a congenital complete atrioventricular block in the first month of life. Four years later, she underwent box exchange. Apart from the elective replacement indicator, we observed correct pacing parameters and lack of intrinsic cardiac activity. A new Vitatron SR pacemaker was connected to the existing lead under general anesthesia and placed in the abdominal pocket.

Two weeks later, the patient returned due to a superficial infection of the wound. The swab was negative. Empiric antibiotic therapy was initiated with amoxicillin and clavulanic acid, and surgical intervention was postponed because of the SARS-CoV-2 infection. We performed surgical revision of the infected wound as soon as the isolation was completed. *Pseudomonas aeruginosa* was found in the culture from the pocket. We started local treatment with vacuum dressing and targeted antibiotic treatment (ceftazidime and cefepime). Pacemaker extraction was planned. Due to complete atrioventricular block with no intrinsic rhythm and a high risk of infection, we chose to implant a leadless system in line with the available guidelines [1, 2]. Ultrasound assessment of possible access veins was performed. The femoral veins were 3 and 4 mm in diameter (right and left, respectively). The common iliac veins were 7 and 3 mm (right, left). The right internal jugular vein was 8 mm in diameter. Therefore, we decided to choose the jugular approach. A Leadless Micra AV pacemaker (Medtronic, US) was implanted under general anesthesia (Figure 1). A detailed description of the device selection process is provided in the Supplementary material. Appropriate pacing and sensing parameters were achieved in the first attempted location (R wave — 10 mV, threshold — 1.13 V/0.24 ms, impedance — 680 Ohm) with no complications. The radiation dose was 5 mGy, and the fluoroscopy time was 3.4 min. The vascular access site was closed with hemostatic subcutaneous and cutaneous sutures.

Extraction of the infected epicardial pacing system was planned 2 weeks later to stabilize pacemaker parameters (R wave 11 mV, threshold 0.63 V/0.24 ms, impedance 630 Ohm, poor atrioventricular synchrony due to low atrial mechanical signals). The subxyphoid approach was chosen to avoid sternotomy. The pacemaker and a part of the epicardial lead were removed. Complete lead extraction was not possible due to anatomical limitations.

Three months later, a positron emission tomography scan of the mediastinum revealed an ongoing infective process along the remnants of the lead. Another surgical procedure with sternotomy was undertaken, and all the remnants of the epicardial lead were removed. The bacteriological culture was again positive for *Pseudomonas aeruginosa* (the carbapenem-resistant strain, CRPA+). Antibiotic therapy with ceftazidime (6 weeks)

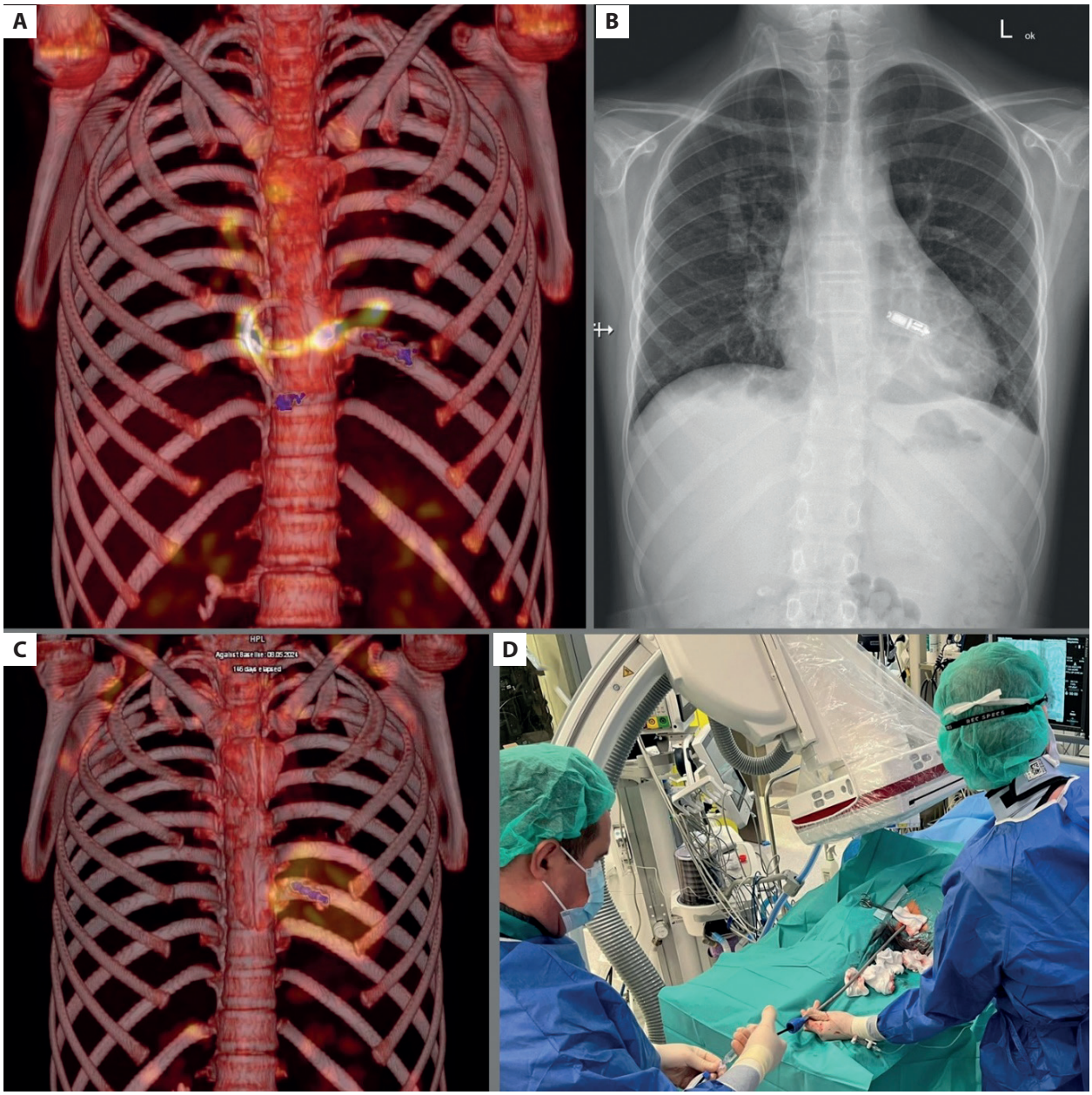

Figure 1. A. Positron emission tomography (PET) scan of the thorax with signs of infection spreading along the remnants of the epicardial pacing lead. **B.** X-ray of the thorax in the postero-anterior view with a leadless pacemaker implanted in the right ventricle. **C.** PET scan of the thorax with no signs of persistent mediastinal infection after the last surgical procedure and with the leadless pacemaker visible in the projection of the right ventricle. **D.** Modified organization of the operating room for leadless pacemaker implantation using the right jugular approach

and amikacin (4 weeks) was then continued along with hyperbaric oxygen therapy (4 weeks). Seven weeks later, no infection was found in the mediastinum on another positron emission tomography scan. The stability of pacemaker parameters was confirmed ten months after leadless pacemaker implantation. Atrioventricular synchrony could not be obtained; therefore, the device operated in VVI mode.

This clinical case shows the feasibility of leadless pacing in children using the jugular approach. It is the first such procedure performed in Poland [3].

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

Conflict of interest: PM received honoraria for lectures and travel grants from Medtronic. The other authors declare no conflict of interest.

Funding: None.

REFERENCES

1. Glikson M, Nielsen JC, Kronborg MB, et al. 2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy. Eur Heart J. 2021; 42(35): 3427–3520, doi: 10.1093/eurheartj/ehab364, indexed in Pubmed: 34455430.
2. Kempa M, Mitkowski P, Kowalski O, et al. Expert opinion of a Working Group on Leadless Pacing appointed by the National Consultant in Cardiology and the Board of the Heart Rhythm Section of the Polish Cardiac Society. Kardiol Pol. 2021; 79(5): 604–608, doi: 10.33963/KP.15982, indexed in Pubmed: 34125944.
3. Shah MJ, Borquez AA, Cortez D, et al. Transcatheter leadless pacing in children: A PACES collaborative study in the real-world setting. Circ Arrhythm Electrophysiol. 2023; 16(4): e011447, doi: 10.1161/CIRCEP.122.011447, indexed in Pubmed: 37039017.