Atrial pacemaker implantation in an adult patient with Fontan circulation and chronotropic insufficiency

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A 22-year-old female with congenital heart disease was referred to our hospital with recurrent syncope and symptoms of worsening exercise tolerance. She had been born with right ventricular hypoplasia, an atrial septal defect, and a ventricular septal defect. The patient had undergone pulmonary artery banding, hemi-Fontan operation at one year of age, and fenestrated Fontan completion two years later.

Electrocardiographic (ECG) monitoring showed episodes of sinus bradycardia with normal atrioventricular conduction (Figure 1A). A spiroergometric test revealed an insufficient chronotropic response with the presence of severe dizziness, hypotension, and pre-syncope during exercise [1]. Considering the experience of our center in implanting pacemakers in patients with Fontan circulation, a collective decision was made to qualify the patient for an intravascular pacemaker [2]. Contrary to a previously described case, due to the lack of atrioventricular conduction disturbances, a plan was set to perform an intraprocedural assessment of fast atrioventricular conduction to exclude any distal conduction disturbances in

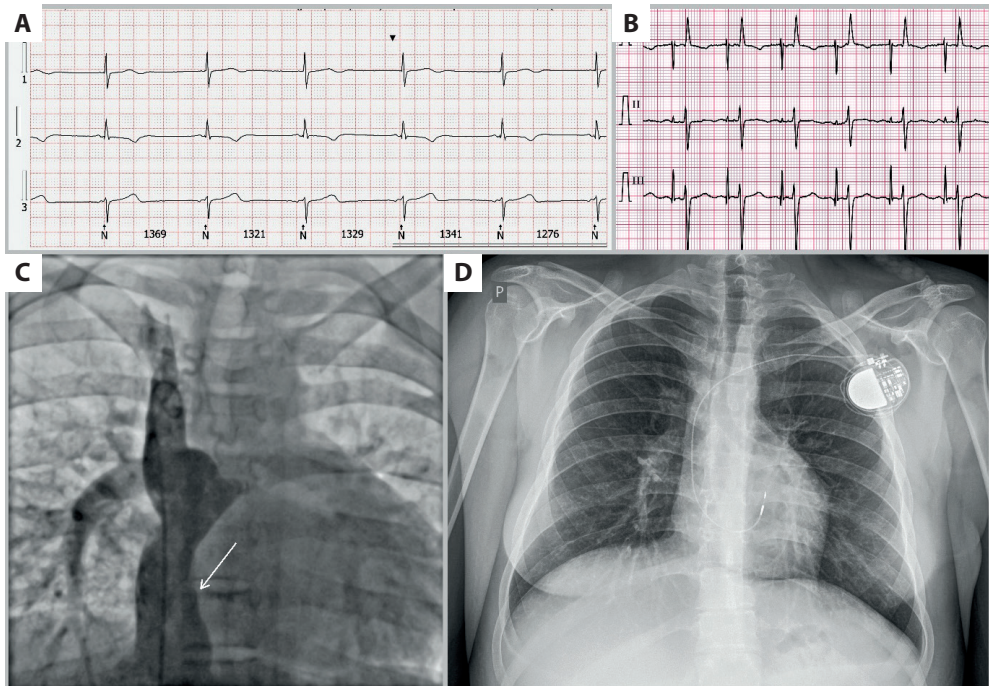

Figure 1. A. Electrocardiogram (ECG) monitoring with episodes of sinus bradycardia with normal atrioventricular conduction. **B.** ECG registration showing AAI pacing. **C.** Fluoroscopy of heart catheterization with detailed hemodynamic and angiographic evaluation of Fontan circulation. The arrow indicates fenestration between the Fontan circulation and the atrium. **D.** The chest radiograph after the procedure, showing the correct position of the atrial pacing lead

the His–Purkinje system. The aim was to avoid implantation of a ventricular pacing lead, which reduces the complexity of the procedure and minimizes the risk of complications associated with the implantation of a dual-chamber pacing system.

Pre-procedural planning included heart catheterization with detailed hemodynamic and angiographic evaluation (Figure 1C) and ECG-gated cardiac contrast-enhanced computed tomography. Pacemaker implantation was carried out under light analgosedation in a hybrid operating room. Venous access was gained by puncture of the left subclavian vein. Fenestration in the Fontan baffle was cannulated with the Medtronic Attain Command™ delivery system (Medtronic, Minneapolis, MN, US). The lumenless Medtronic SelectSecure™ 3830 lead was placed in the right atrium via the Medtronic C315HIS Delivery Catheter. We obtained the correct sensing and pacing parameters. Atrial pacing test showed normal atrioventricular conduction up to 150 heartbeats per minute well tolerated by the patient.

The procedure and postoperative period were uneventful. A chest radiograph showed the correct position of the atrial lead (Figure 1D). Pacing parameters were excellent, and appropriate pacemaker function was confirmed on ECG monitoring (Figure 1B). Echocardiography showed no intracardiac thrombi or pericardial effusion. Treatment with warfarin was introduced for thromboembolic prevention [3]. The pacing program was set to AAIR 60/min. At the 3-month follow-up visit, the patient reported an improvement in exercise tolerance, resolution of dizziness, and pre-syncope symptoms. Echocardiography showed normal blood flow through the fenestration tunnel with no intracardiac thrombi or pericardial effusion. The spiroergometric test showed improvement in exercise tolerance, without previously observed symptoms of severe dizziness, hypotension, and pre-syncope. Pacing parameters remained within the normal range (sensing: >5.6 mV, impedance: 405 oms, and pacing threshold: 1 V/0.4 ms). The percentage of atrial pacing was 72%. There were no arrhythmic events recorded in the pacemaker's memory.

Our moderate experience shows that transvenous pacemaker implantation can successfully and safely restore chronotropic competence in patients with hemi-Fontan circulation with subsequent fenestration. However, we still need large, prospective, and multicenter studies to objectively assess the effectiveness and safety of this pacing method in this group of patients.

Article information

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