A Hybrid Dual-Chamber Pacemaker in Mechanical Tricuspid Valve Prosthesis

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ABSTRACT. Implantation of dual-chamber pacemaker is a challenging issue in the presence of mechanical tricuspid valve prosthesis. This report presents a new method using both epicardial and endocardial approaches to achieve this goal.

KEYWORDS. complete heart block, Ebstein’s anomaly, permanent pacemaker, tricuspid valve replacement.

Introduction

Complete heart blocks needing permanent pacemaker implantation are a common complication after tricuspid valve replacement (TVR). If indicated, endocardial placement of a right ventricular (RV) lead is precluded in the presence of mechanical TVR. In these cases, the ventricular lead usually is implanted via the epicardial approach during valve surgery or via the coronary sinus. Implantation of dual-chamber pacemakers has remained a challenging issue in such patients. In this report, we present an alternative method to upgrade a single-chamber epicardial pacemaker to dual chamber using the endocardial approach.

Case presentation

The presented case is a 16-year-old young man, a known case of Ebstein’s anomaly, who underwent epicardial single-chamber permanent pacemaker (PPM) implantation; a generator was placed in the epigastric area because complete heart block (CHB) had occurred after repair of atrial septal defect (ASD) and mechanical TVR when he was 9 years old. He had been complaining of headache, dyspnea on exertion, palpitation, and dizziness for a year. A general physical examination was normal except for blood pressure of 90/60 mmHg, a metallic sound in the tricuspid area, and jugular vein cannon A waves. Figure 1a shows the 12-lead electrocardiogram (ECG). Echocardiography showed a left ventricular ejection fraction of 50%, mild transvalvular metallic tricuspid valve regurgitation, severe right atrial (RA) enlargement, and no residual ASD. Pacemaker analysis showed the following parameters: ventricular lead impedance, 389 ohms; pacing threshold, 0.75 V at 0.5 ms, R-wave amplitude, 5.3 mV; and generator longevity of less than 5 months. Assuming that the patient’s problem was related to a pacemaker syndrome, we decided to upgrade the single-chamber pacemaker to a dual-chamber one. After temporary pacemaker implantation via the femoral vein, and under local anesthesia the single-chamber pulse generator was removed from the epigastric region pocket. Then we passed a 58-cm bipolar lead through the left subclavian vein to the right atrium and placed it on the interatrial septum, which was the best site for atrial lead placement in the patient’s huge RA cavity. Then the atrial lead was subcutaneously tunneled from the left subclavian area passing over the left chest wall to the epigastric pocket. Then the previous epicardial ventricular lead and the new endocardial atrial lead were connected to the dual-chamber generator, which was to be implanted in the epigastric pocket (Figure 2). Figure 1b shows the 12-ECG after completion of the procedure.

Discussion

Placement of an endocardial RV lead is contraindicated in the presence of mechanical TVR. Therefore, implantation of a dual-chamber pacemaker is also a challenging issue in this situation. There are few alternative approaches to perform dual-chamber pacemaker implantation. One method is to...
position both atrial and RV leads epicardially during surgery. In a formerly reported procedure, the RV lead was positioned in the coronary sinus venous branch and the atrial lead was placed endocardially via a transvenous approach. In a case of previously implanted endocardial pacemaker, the RV lead could be sutured outside the swing ring during valve surgery. In this report, we upgraded the previous epicardially implanted single-chamber pacemaker by transvenous endocardial implantation of an atrial lead resulting in a hybrid epicardial-endocardial dual-chamber pacemaker.

References

Figure 1: 12-lead electrocardiogram.

Figure 2: 12-ECG after completion of the procedure.