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Permanent pacemaker implantation without fluoroscopy in a pregnant woman with complete atrioventricular block: A case report

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ABSTRACT

A 26-year-old pregnant woman in her first trimester presented with progressive fatigue. Her Electrocardiogram showed second degree heart block (Mobitz type II) with intermittent complete heart block. We decided to proceed with dual-chamber permanent pacemaker implantation using CARTO mapping system to avoid fluoroscopy exposure. A mapping catheter was inserted through the right femoral vein. An electro-anatomical map of cardiac chambers was created using the mapping catheter. Through left axillary vein access, the two pacemaker leads were successfully positioned guided by the electro-anatomical map. No complications were noted post procedure. Pacemaker was functioning appropriately at follow-up visits.

1. Introduction

Fluoroscopy is the main imaging technique currently used for various cardiovascular procedures. However, use of fluoroscopy in pregnant women constitutes substantial hazards to the fetus. We present a case of a young pregnant woman with a complete Atrioventricular (AV) block in whom a permanent pacemaker (PPM) insertion was performed without fluoroscopy using electro-anatomical mapping (EAM) system.

2. Case report

A 26-year-old pregnant woman in her first trimester presented with progressive fatigue and lightheadedness. Her past medical history was unremarkable. On presentation, she had regular heart rate of 38 beats-per-minute, blood pressure of 117/76 mmHg, respiratory rate of 16 breaths-per-minute, and temperature of 98.2 F. Pulse oximetry revealed an oxygen saturation level of 95% on room air. On physical examination she had bilateral 1 + pitting pedal edema. Lung exam showed normal breath sounds. Cardiac exam showed normal heart sounds with 2/6 ejection systolic murmur heard maximally at right upper sternal border with no radiations. The rest of the exam was unremarkable. Chest X-ray was normal. Electrocardiogram showed second degree heart block (Mobitz type II), right bundle branch block and intermittent third degree heart block (Fig. 1). Transthoracic echocardiogram (TTE) revealed normal left ventricular ejection fraction (65%), normal heart valves and normal right ventricular size and function. Pertinent laboratory studies revealed hemoglobin 13.8 g/dl, white blood count 7.2×10^3 cells/ul, negative troponin and normal metabolic panel.

Exercise tolerance test was done and revealed worsening degree of heart block with exercise confirming infra-nodal conduction disease. Patient met class I indication for PPM implantation, and decision was made to proceed with dual-chamber PPM insertion using CARTO mapping system (Biosense, Webster, Inc.) to avoid fluoroscopy exposure.

A mapping catheter (Biosense, Webster, Inc.) was inserted through the right femoral vein. An EAM of the inferior vena cava, superior vena cava, right atrium (RA), coronary sinus ostium, tricuspid valve annulus (TVA) and the right ventricle (RV) septum was created using the mapping catheter. The right brachiocephalic trunk and the left innominate vein anatomy were further defined with the mapping. Following this, we proceeded with pacemaker implantation. Under local anesthesia, an oblique infra-clavicular incision was made on the skin and the pocket was subsequently created in the left pectoral area. Using ultrasound guidance, the left axillary vein was punctured, and two 6 French venous sheaths were advanced over separate guide wires. A 58 cm Ingevity (Boston

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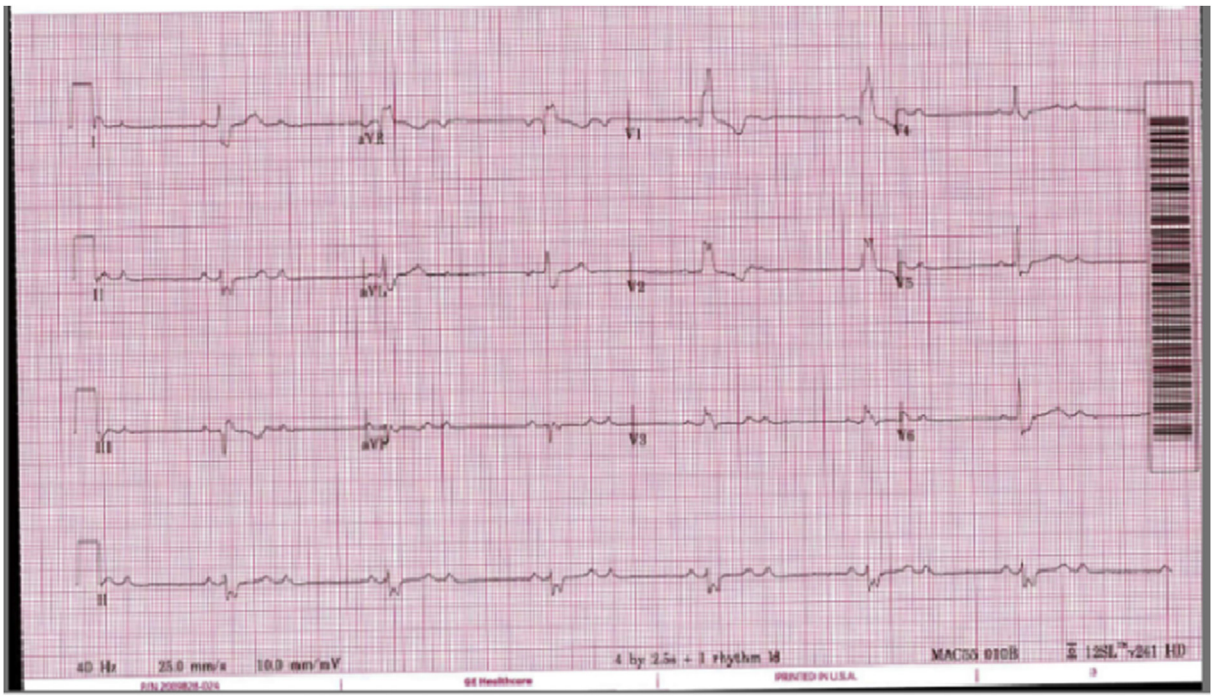

Fig. 1. Electrocardiogram showing second degree heart block (Mobitz type II).

Scientific) pace-sense lead was connected to the CARTO mapping system to allow visualization of the lead tip in relation to the EAM. The first lead was advanced through the axillary vein and using EAM guidance was advanced across the TVA and positioned on the RV septum. Once adequate R wave sensing was noted the active fixation screw was deployed. Similarly a 52 cm lead was advanced using EAM guidance into the RA and positioned in the region of the RA appendage. Acceptable sensing, threshold and impedances of both leads were confirmed. The leads were attached to the device, and the device was inserted into the pocket which was closed with sutures. No complications were noted post procedure. Fig. 2 shows successful placement of the pacemaker leads. Pacemaker was checked and was functioning appropriately at the follow-up visit.

3. Discussion

The incidence of heart block requiring PPM implantation in pregnancy is rare. Standard fluoroscopic-guided pacemaker implantation carries considerable radiation risk to the fetus [1]. To overcome this major adverse effect, various techniques have been investigated as alternative guiding tools. Trans-esophageal echocardiographic guidance have been suggested as an alternative to

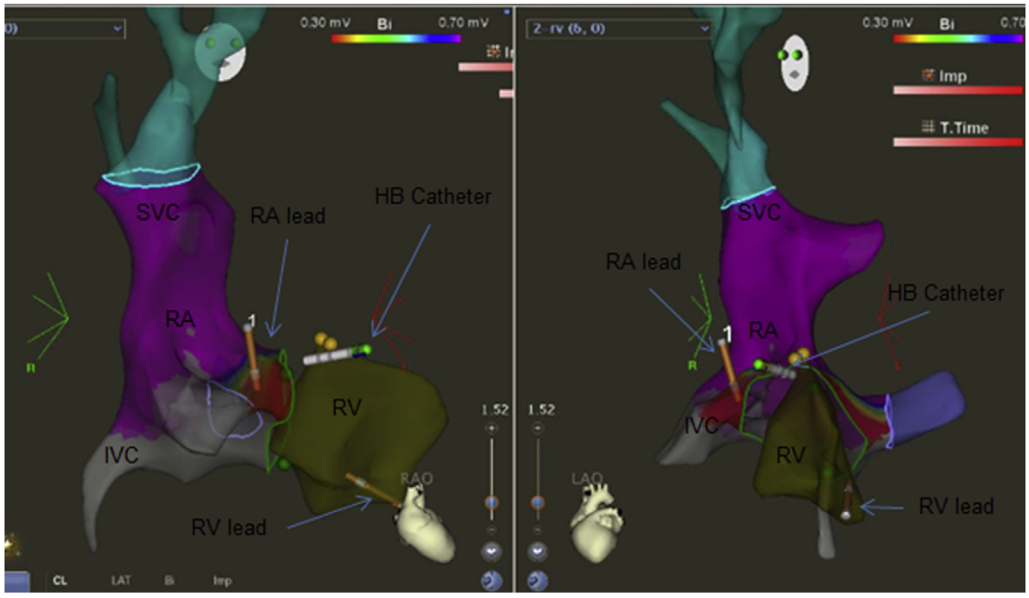

Fig. 2. Right and left anterior oblique views using CARTO, showing successful placement of pacemaker leads. SVC = superior vena cava; IVC = inferior vena cava; RA = right atrium; RV = right ventricle; HB: His-bundle.

fluoroscopy; however, it has the disadvantages of lengthening the procedure-time, risk of aspiration and lack of accurate visualization of pacemaker leads during procedure [2,3].The other promising technique was the use of electro-anatomical navigation systems. These are devices which can guide catheter movement inside cardiac chambers. They have been traditionally used for electrophysiological studies, and have been established to be effective and safe for these purposes [4]. Among the widely used EAM systems, is the Biosense Webster CARTO® system, which uses a magnetic field to help pinpointing the exact location and orientation of catheters in the heart during procedures [5]. In addition to avoiding the harms of fluoroscopy, EAM systems offer the advantage of creating a 3D image which can efficiently guide catheters through different cardiac chambers, compared to the 2D image offered by fluoroscopy [4].

We report a case of successful dual chamber PPM in a pregnant woman guided by non-fluoroscopic EAM system. Few case-series exist on using EAM guidance for PPM insertion in general population [4,6]. To the best of our knowledge this is the third case of dual chamber PPM in a pregnant women using EAM system [3,7]. The EAM helped creating a geometric image of cardiac chambers, and with help of intracardiac recordings and pacing maneuvers, we were able to navigate our catheters properly. Specifically, we didn't appreciate difficulty crossing tricuspid valve annulus with the right ventricular (RV) lead or in placing the lead in RV apex with optimal pacing settings.

In summary, we present a rare case of dual-chamber PPM implantation in a pregnant woman, guided by EAM using CARTO system. The EAM system helped in creating 3D image of the heart and in guiding the pacemaker leads positioning. This case demonstrates the use of EAM system as a safe alternative to fluoroscopy in pregnant women requiring PPM insertion.

Conflicts of interest

Authors have no conflicts of interest to declare.

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