Journal of Arrhythmia 30 (2014) 134–138

Contents lists available at ScienceDirect

Journal of Arrhythmia

journal homepage: www.elsevier.com/locate/joa

Case report

Permanent pacemaker implantation in a patient with situs solitus, dextrocardia, and corrected transposition of the great arteries using a novel angiographic technique

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ARTICLE INFO

Article history:
Received 27 October 2013
Received in revised form
7 December 2013
Accepted 26 December 2013
Available online 4 February 2014

Keywords:
Permanent pacemaker implantation
Complete heart block
Congenital heart disease
Situs inversus
Dextrocardia

ABSTRACT

Complex congenital heart diseases involving abnormalities of the atrial situs and cardiac malpositions like dextrocardia can pose a considerable challenge to transvenous permanent pacemaker implantation (PPI). Literature describing transvenous PPI techniques in patients with complex cardiac anomalies is scarce. In this report, we describe a novel angiography-guided technique for the implantation of a dual chamber transvenous pacemaker in a patient with complete heart block with situs solitus, dextrocardia, and congenitally corrected transposition of the great arteries.

1. Introduction

Complex congenital heart diseases involving abnormalities of the atrial situs and cardiac malpositions like dextrocardia can pose a considerable challenge to transvenous permanent pacemaker implantation (PPI). The difficulty can be compounded by the presence of abnormal atrioventricular connections. The abnormal relationship of the cardiac chambers and the altered fluoroscopic orientation makes transvenous lead placement extremely challenging. Literature describing transvenous PPI techniques in patients with complex cardiac anomalies is scarce. In this report, we describe a novel angiography-guided technique for the implantation of a dual chamber transvenous pacemaker in a patient with complete heart block (CHB) with situs solitus, dextrocardia, and congenitally corrected transposition of the great arteries (CCTGA).

2. Case report

A 52-year-old male with known dextrocardia and CCTGA presented with a 2-month history of recurrent presyncope and effort intolerance. His examination revealed a resting pulse rate of 52 beats/min (bpm) and a blood pressure of 130/80 mmHg. The apex beat and heart sounds were appreciated on the right side of the sternum, whereas gastric tympany was noted below the left diaphragm. A 12-lead electrocardiogram (ECG) revealed sinus rhythm with an atrial rate of 80 bpm, complete atrioventricular block, and a narrow QRS escape with a rate of 50 bpm. The normal P wave axis (+60°) indicated normal atrial situs, the progressive decrease in the height of the R waves from V1 to V6 suggested dextrocardia, and the absence of septal q waves in the lateral leads was suggestive of CCTGA (Fig. 1). A posteroanterior chest radiograph confirmed dextrocardia with situs solitus. A transthoracic echocardiogram confirmed the diagnosis of situs solitus, dextrocardia, and CCTGA with adequate systemic ventricular function and no other associated abnormality. The temporary pacemaker lead, which was inserted from the right femoral vein just prior to PPI, was seen to course along a right-sided inferior vena cava, further confirming the atrial situs as solitus. Under local anesthesia using 1% lignocaine hydrochloride, a 3-cm long incision was made one fingerbreadth below the right clavicle across the deltopectoral groove such that two-thirds of the incision was medial and one-third was lateral to the groove, and an attempt was made to isolate the cephalic vein. Since the cephalic vein was not of adequate caliber, venous access was obtained through two separate extra-thoracic axillary venous punctures using an 18 G needle and two guide wires that were inserted into the venous system. A 7F active

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http://dx.doi.org/10.1016/j.joa.2013.12.005

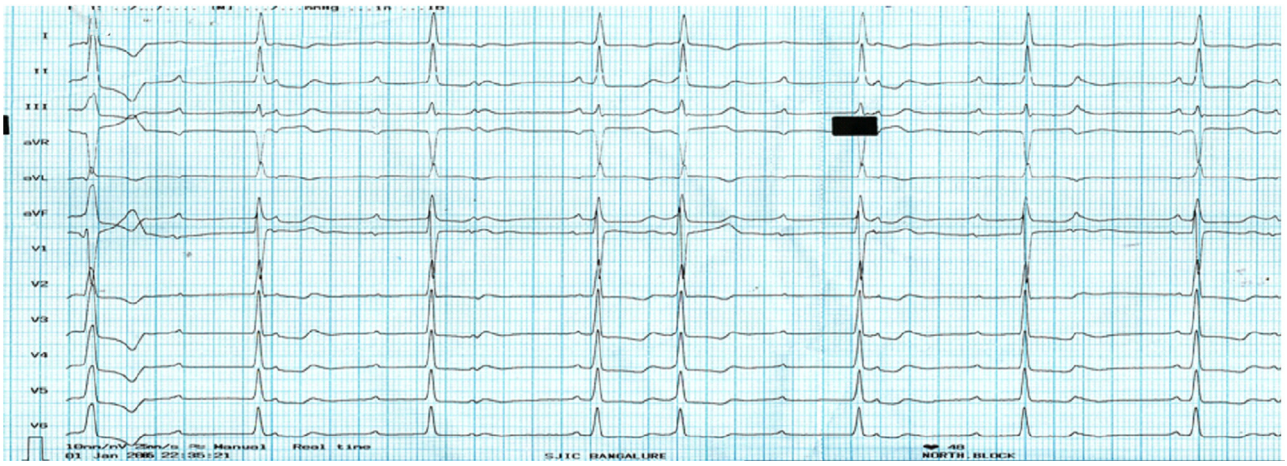

Fig. 1. Pre-procedural ECG. Demonstrating normal sinus rhythm with complete heart block. Note the normal P wave axis, the decreasing amplitude of R waves across leads V2–V6, and the absence of septal q waves.

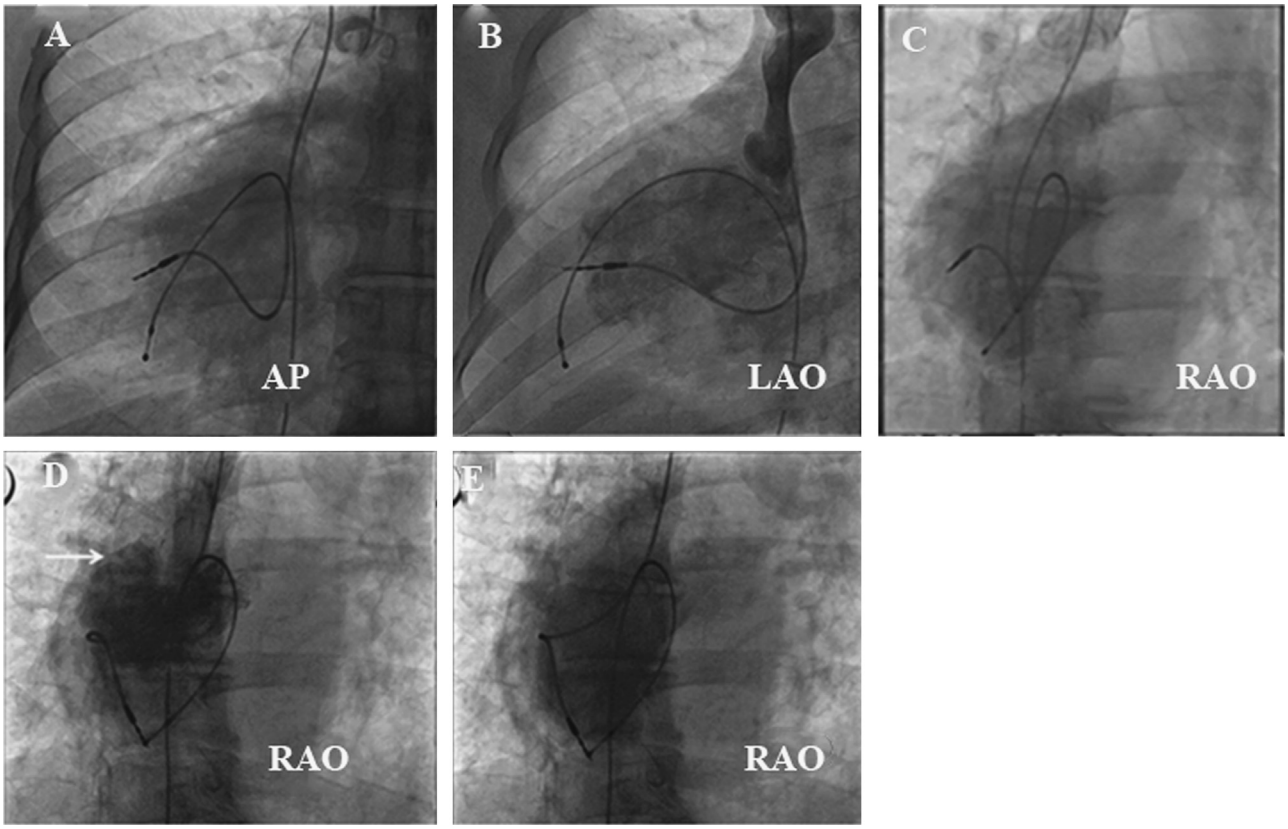

Fig. 2. Right subclavian venous angiography. (A, B) AP and LAO views showing the septum and lateral walls of the ventricle. In both views, the permanent pacemaker lead appears to be midseptal in position. The temporary pacemaker lead is also seen. (C) RAO view. The lead is seen to be pointing away from the septum and towards the lateral wall. (D, E) RAO view showing the RAA (arrow in D) and the morphologic left ventricle (E). Note the normal position of the right atrial appendage in situs solitus. Also note that the morphologic left ventricle is smooth and devoid of trabeculations. The permanent lead has been repositioned and screwed to the apex (AP, Anteroposterior; RAO, Right Anterior Oblique; LAO, Left Anterior Oblique; and RAA, Right Atrial Appendage.).

fixation lead (model 4076, 58 cm, Medtronic Inc., Minneapolis, MN, USA) was inserted through a 7F peel-away introducer (Medtronic Inc., Minneapolis, MN, USA) over one guide wire. The lead was manipulated into the pulmonary artery over a stillette that was given a distal curvature. The lead withdrawn from the pulmonary artery into the venous ventricle acquired a position that appeared to be septal in the anteroposterior (AP) view, but appeared to point laterally in the right anterior oblique view (RAO). Since the true position of the lead was not quite clear, angiographic delineation of the right heart chambers was considered an option. Through the second access that was meant for the atrial lead, a 6F valved introducer with a side port (AVANTI®+, Cordis Corporation, Miami, FL, USA) was inserted, and the distal tip was positioned in the superior vena cava. Through the side port, 10 mL of non-ionic intravenous contrast (iohexol) was rapidly injected by hand, and cine films were acquired in the AP, left anterior oblique (LAO), and RAO views. This was performed to define the position of the venous atrium and its appendage, the relationship of the venous atrium to the venous ventricle, and anatomical details of the venous ventricle.