

Echocardiographic diagnosis of temporary pacemaker lead in left ventricle

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Este artículo también está disponible en español

ARTICLE INFORMATION

Received: March 29, 2016

Accepted: May 5, 2016

Competing interests

The authors declare no competing interests

Acronyms

AF: atrial fibrillation

LA: left atrium

LV: left ventricle

RV: right ventricle

On-Line Versions:

Spanish - English

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ABSTRACT

Temporary cardiac pacing is used to restore electrical and hemodynamic normality. It consists of the generation of an electrical impulse that would trigger the depolarization of the myocardial cells and the consequent mechanical activity. Despite being a technique with a little complex learning curve, it is not without complications, many of them serious. The case of a patient in the postoperative period of cardiac surgery is presented, where she underwent excision of a left atrial myxoma and in her evolution presented atrioventricular block requiring transient stimulation, during which the implantation of the endocardium electrode in the left ventricle was presented as a complication, with which adequate cardiac stimulation was achieved. The Echocardiography proved to be a useful tool for diagnosis.

Key words: Artificial cardiac pacing, Pacemaker, Complications, Echocardiography

Diagnóstico ecocardiográfico de electrodo de marcapasos transitorio en ventrículo izquierdo

RESUMEN

La estimulación cardíaca transitoria se utiliza para restaurar la normalidad eléctrica y hemodinámica. Consiste en la generación de un impulso eléctrico que desencadena la despolarización de las células miocárdicas y la actividad mecánica consecuente. A pesar de tratarse de una técnica con una curva de aprendizaje poco compleja, no está exenta de complicaciones, muchas de ellas graves. Se presenta el caso de una paciente en el postoperatorio de una cirugía cardiovascular, donde se realizó exéresis de un mixoma atrial izquierdo y en su evolución presentó bloqueo aurículo-ventricular con necesidad de estimulación transitoria, durante la cual se presentó como complicación la implantación del electrodo endocárdico en el ventrículo izquierdo, con el que se logró una estimulación cardíaca adecuada. El ecocardiograma resultó una herramienta útil para llegar al diagnóstico.

Palabras clave: Estimulación cardíaca artificial, Marcapasos, Complicaciones, Ecocardiografía

INTRODUCTION

Transient cardiac pacemaker is used to restore normal and compromised hemodynamics by brady or tachyarrhythmias. Temporary transvenous endocardial pacing was first described by Furman and Robinson in 1958¹. Although there are different types of temporary cardiac stimulation (transcutaneous, transesophageal), transvenous (through peripheral puncture and cardiac placement of an electrode in the right cavities) is the most widely used.

The final aim of the pacemaker is to improve the cardiac output. Basically, it consists in the generation of an electrical impulse that would trigger the depolarization of the myocardial cells and the consequent mechanical activity. When it comes to the placement of a transvenous pacemaker, it refers to placing an electrocatheter through a central venous access, in order to reach the apex of the right ventricle (RV), from where the depolarization induced by the pacemaker should be triggered. Although it is a technique with a rather complex learning curve, it is not without complications, many of them serious², among which can be found: detection and stimulation mistakes, or both, drilling of RV or interventricular *septum*, diaphragmatic stimulation, insertion in the coronary sinus, introduction by persistent left superior vena cava, injury of nerve structures, pneumothorax, puncture of an unwanted vessel, insertion of the catheter in the pulmonary artery, supraventricular and ventricular extrasystole, tachycardia of the same source, and infections, among others^{3,4}.

Arterial puncture and placement of the pacemaker's electrode in the left ventricle (LV) is not a common complication due to the easy detection –in normal conditions– of arterial puncture; however, it can be observed during the course of a procedure in emergency situations.

CASE REPORT

A 58-years-old woman and white skin was admitted to the Perioperative Room of the Cardiocentro Ernesto Che Guevara in Santa Clara, Cuba, diagnosed with left atrial myxoma. This patient was performed a cardiovascular surgery in which the mass of the left atrium (LA) of myxomatous aspect was removed; during the postoperative evolution a paroxysmal atrial fibrillation (AF) took place, which was treated with a bolus of amiodarone 300 mg, that caused a complete atrioventricular block needing temporary epicardial pacing.

Several days later the AF repeated with very rapid response, which was refractory to drug treatment and several electrical cardioversions; thus, an amiodarone injection of 10 mcg/kg/min was indicated. At night time the patient began with dyspnea, hypotension, bradycardia, distal coldness and oliguria. When carrying out the physical examination, rhythmic, bradycardic, and low intensity heart sounds were found, blood pressure 70/30 mmHg, and systolic murmur II/VI in mitral focus. The electrocardiogram showed a blocked AF with heart rate of 30 beats per minute; the arterial blood gases yielded

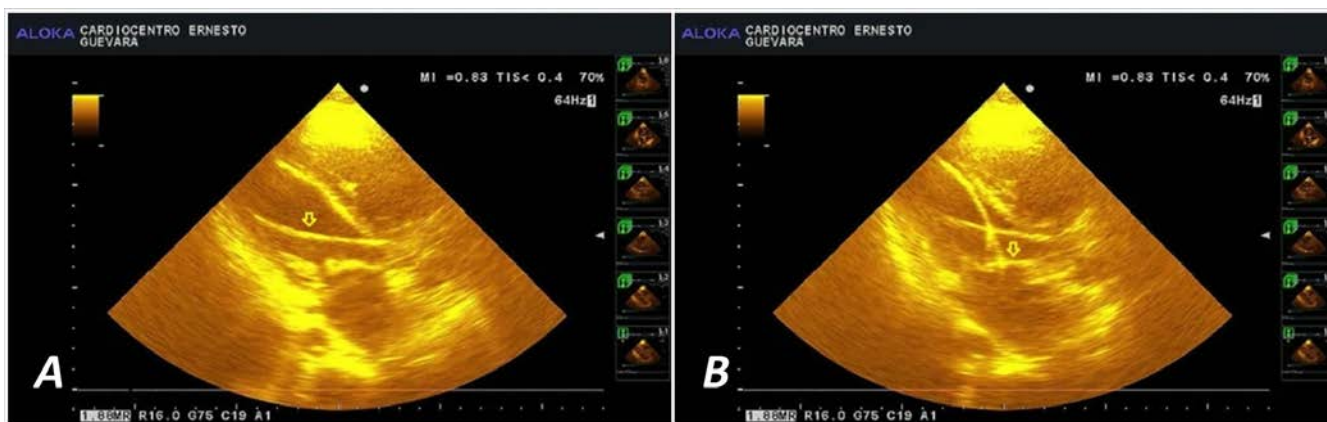


Figure 1. Parasternal long axis view. **A.** Pacemaker's electrode entering through the ascending aorta and passing through the aortic valve into the left ventricle (arrow). **B.** Electrode rolled up into the ventricle, which interferes in the movement of the anterior leaflet of the mitral valve (arrow).

hypoxemia (PO_2 50 mmHg with FiO_2 of 0.3), and the patient had deep stupor. Dobutamine 20 mcg/kg/min and endotracheal intubation for mechanical artificial ventilation were indicated, and the transient pacemaker was immediately connected to the epicardial electrode; but there was stimulation failure, despite the use of 20 mV; for this reason, a transient endocardial electrode was decided to be placed through the right femoral vein, bringing immediate connection with stimulus threshold of 2 mV, and a heart rate of 80 beats per minute was programmed.

It was noticed that the QRS morphology was not of left bundle branch block, therefore an echocardiogram was indicated to check the correct placement of the endocardial electrode. In the parasternal long axis view was observed the transient pacemaker's electrode which entered from the ascending aorta and passed through the aortic valve into the LV (**Figure 1A**). Another sonographic section, of the same view (**Figure 1B**), showed the electrode rolled up into the LV, colliding with the anterior valve of the mitral, which was also observed in the apical 4-chamber view (**Figure 2A**). In addition, the electrode could clearly be seen inside the LV, in the short parasternal axis (**Figure 2B**).

The next step was the placement of a new electrode in the RV, via the right jugular vein and the one placed in LV was retired. In the 4-chamber view (**Figure 3**) the transient pacemaker's electrode is observed correctly placed in the RV and the LV free.

COMMENT

Temporary pacemaker stimulation is used in

situations of extreme urgency and often implanted in elderly who offered little cooperation. The implantation is usually done in situations of hemodynamic or electric instability, or both, which sometimes does not allow a perfect positioning, and involves greater morbidity and mortality⁵. This favors the development of minor or significant complications, as cardiac plugging tamponade, which could even cause the patient's death². In the case presented, the transient pacemaker was implanted in a woman, at the postoperative stage of a cardiovascular surgery, where one left atrial myxoma was removed, and at the time of placement, the patient presented obvious signs of cardiogenic shock, marked hypoxemia, which had great influence at the time of the blood vessel/vascular channeling as being in a state of low cardiac output and low blood oxygen saturation; it was not that evident to realize the arterial catheterization rather than venous.

The diagnosis means most commonly used to determine the location of the electrode are the thorax chest radiograph and fluoroscopy; however, due to the conditions that presented the patient and the identification in the electrocardiogram of a QRS morphology that was not typical of stimulation in RV, it is was decided to carry out an echocardiographic study, with which the diagnosis of a transient pacemaker's electrode inserted in LV was confirmed.

In the reviewed bibliography, complications vary according to different series, as the authors use different definitions. In the year 2006, McCann⁶ analyzed 15 studies which included 3700 patients in the period 1973-2004, with the idea of standardizing the results and concluded that the failure in the venous access was the most frequent complication found

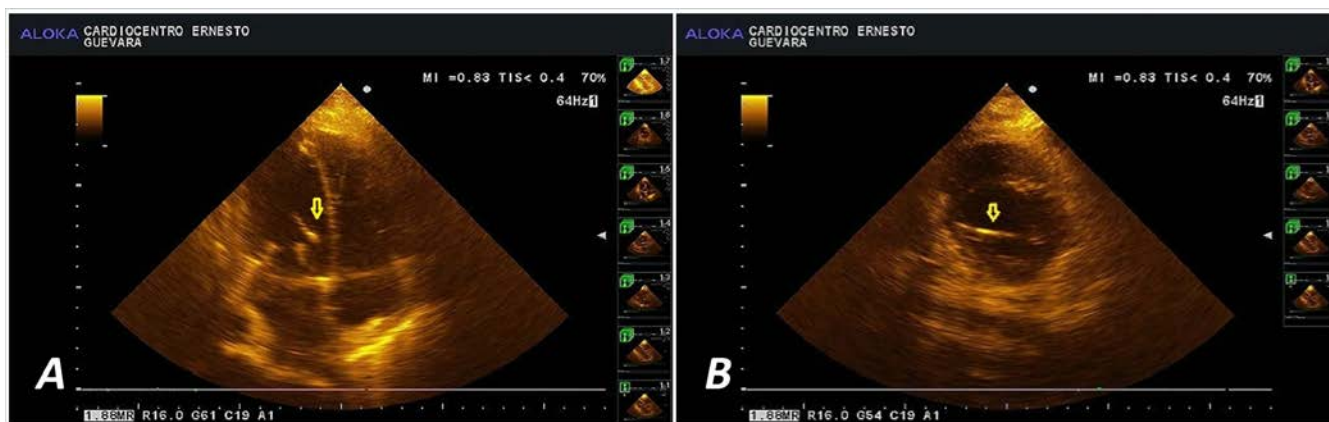


Figure 2. A. The electrode into the left ventricle passes under the anterior mitral leaflet (arrow), the right ventricle is free. B. Paraesternal short axis clearly showing the electrode inside the left ventricle (arrow).

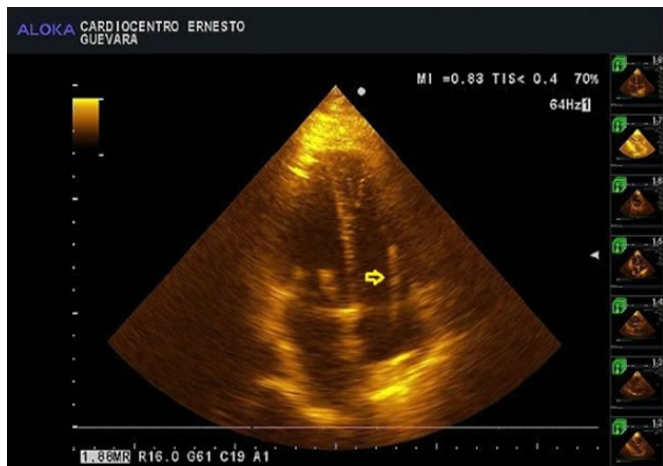


Figure 3. Temporary pacemaker's electrode correctly placed in the right ventricle (arrow), and left ventricle free after removing the first electrode.

(15%), following the capture failure for bad position of the electrode in the RV (10%), sepsis of the puncture site (9%), myocardial or lung puncture (2%), and arrhythmias (1%); the arterial puncture was found just in 4% of cases; however, in any series is communicated the number of electrodes placed in the LV and how many of these achieve an adequate stimulation as in the case presented.

It is important to comment that in order to avoid this complication, the central venous puncture guided by ultrasound is very useful, because several studies have shown to reduce the incidence of failures in venous catheterization and risk of other related complications with the implantation of a temporary pacemaker⁷.

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