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Can multi-slice computed tomography of the heart be useful in patients with epicardial leads?

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Abstract

New visualization methods are helpful in the noninvasive diagnosis of heart diseases. However, sometimes epicardial and endocardial leads can cause problems due to a large number of artifacts. Based on the presented case, we conclude that it is possible to perform multi-slice computed tomography of coronary arteries despite the coexistence of transvenous and epicardial leads. (Cardiol J 2013; 20, 1: 87–89)

Key words: implantable cardioverter-defibrillator, patch electrodes, lead, multi-slice computed tomography

The first human implanted cardioverter-defibrillator (ICD) was invented in 1980 in Baltimore by the team of Michel Mirowski, Morton Mower, and William Staewen [1]. Approval for clinical use was granted by the American Food and Drug Administration in 1985. Early devices consisted of a pulse generator implanted in the abdominal cavity and patch electrodes for defibrillation placed directly on the heart. Implant procedures required thoracotomy and had a mortality rate of about 4% [2]. In most implanted patients, an upgrade of the above characterized system to a transvenous system with endocardial leads was performed after a long period of time.

Multi-slice computed tomography (MSCT) is a noninvasive method for the visualization of coronary vessels [3]. However, the question as to whether it is possible to perform MSCT in patients with epicardial patch electrodes remains current.

We present a case study of an 81 year-old patient who was implanted in 1987 due to a ventricular fibrillation (secondary prevention of sudden cardiac death) with an automated ICD (Ventak-P, Pacesetters Inc, St. Jude Medical, St. Paul, MN, USA). The device was implanted to the abdominal cavity with patch defibrillation leads (no data about the type of leads was available) placed by thoratocomy. After a few years, the system was upgraded — the device was re-implanted to the left subclavian area using transvenous leads. At the same time, the ICD was extracted from the abdominal cavity while the patch leads were left in the heart. Presently, the patient has Epic TM + VR Model V-196 (St. Jude Medical, St. Paul, MN, USA), implanted in 2007.

In 2000, the patient had coronaro-angiography due to a suspicion of coronary artery disease (CAD). This suspicion was based on clinical symptoms such as chest pain, shortness of breath during vigorous activities, and other typical/atypical symptoms coexisting. The result of examination was a subcritical 30% stenosis in proximal left anterior descending artery. After ten years (September 2010), we decided to perform MSCT of the heart to evaluate progress of the CAD — insignificant intensification of CAD clinical symptoms had been observed in the previous few months. We were afraid that the coexistence of epicardial and endocardial leads

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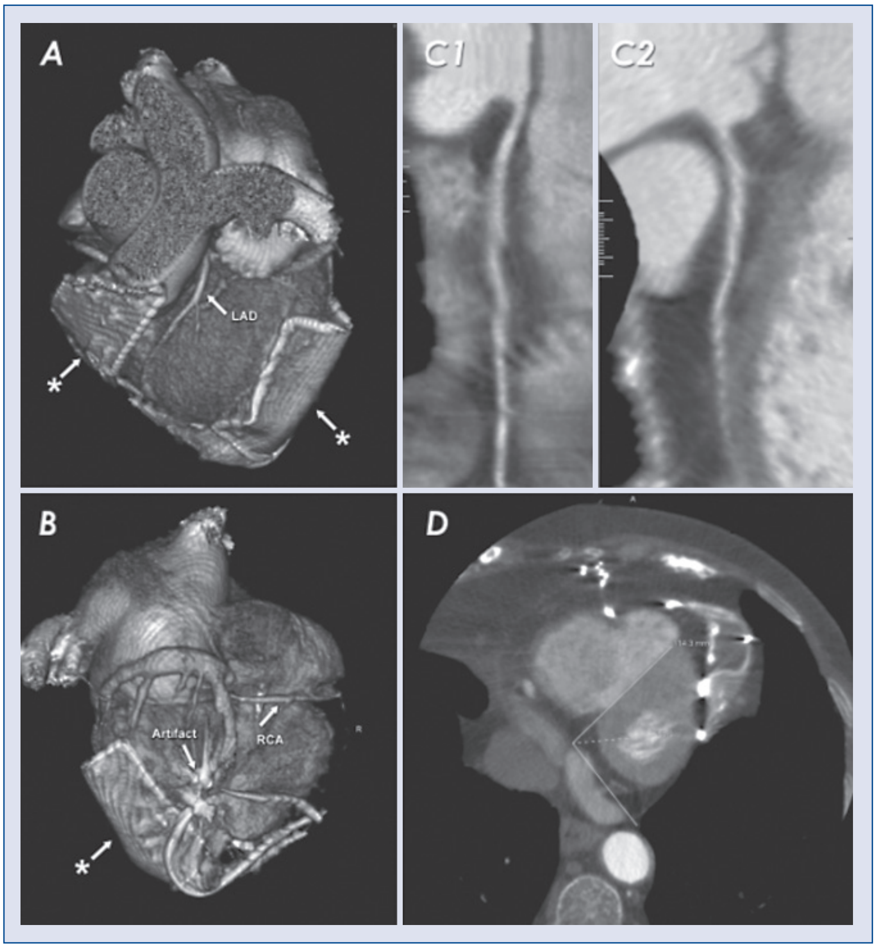

Figure 1. Multi-slice computed tomography (MSCT) images of patient with coexistence of transvenous (active) and epicardial (not active) leads; **A, B.** Three-dimensional images of the heart; *visible patch electrodes; **C1, C2.** Diagnostic visualization of the coronaries (LAD — left anterior descending artery, RCA — right coronary artery) despite the presence of both types of lead; **D.** Multi planar reformatted reconstruction with visible artifacts from the leads.

might cause significant limitation of the usefulness of MSCT.

Computed tomography was performed using an Aquilion 64 scanner (Toshiba Medical Systems, Japan). Scanning with retrospective ECG-gating was performed during a breath-hold using 64 slices with a collimated slice thickness of 0.5 mm. A breath-hold examination was performed to adjust the scanner settings. The helical pitch was 12.8 in best mode and the rotation time was 0.4 s. The tube voltage was 135 kV at 380 mA. We used a pre-selected region of interest in the descending aorta. Triggering started at 180 Hounsfield units; 90 mL of non-ionic contrast agent (Ultravist 370, Schering, Germany) was given at a rate of 4.5 mL/s. The contrast agent was given in three phases: 90 mL of contrast agent (average), then 24 mL of contrast agent followed by 16 mL of saline flush (60%/40%), and finally 30 mL of saline. During scanning, the patient had native stable rhythm of 60 bpm.

Reconstructions of data were performed on Vitrea 2 workstations (Vital Images, Minnetonka, MN, USA; software version 5.1). Three-dimensional volume rendering reconstructions, and multi planar reformatted reconstructions were created.

The result of this examination did not show progression of changes in the coronaries (Fig. 1). Artifacts occurred near the leads (Figs. 1B, D). It was possible to evaluate all coronary arteries without artifacts (Fig. 1C).

An atrial lead (absent in this patient) could constitute a potential problem with right coronary artery visualization in MSCT [4]. An important observation is that it was possible to obtain diagnostic images of coronary arteries despite the presence of old patch defibrillation leads coexisting with a transvenous defibrillation lead.

It is possible to perform MSCT of coronary arteries despite the coexistence of transvenous and epicardial leads.

Conflict of interest: none declared

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