

Scientific letters

Multidetector Computed Tomography Usefulness in Infective Endocarditis**Utilidad de la tomografía computarizada con multidetectores en la endocarditis infecciosa****To the Editor,**

Infectious endocarditis (IE) still carries high morbidity and mortality. Currently, transesophageal echocardiography (TEE) is the reference imaging technique for the diagnosis and assessment of IE and its complications, but a series of noteworthy results have been published with multidetector computed tomography (MDCT) for presurgical assessment of IE.^{1–3} The new European Guidelines⁴ reinforce the role of MDCT both in suspected IE and in confirmed cases for assessment of complications with an extension of the major diagnostic criteria to include paravalvular lesions in MDCT. The European Society of Cardiology⁵ recommends preoperative assessment of coronary artery disease prior to surgery in selected patients; however, in the context of IE, invasive coronary angiography is associated with a nonnegligible risk of embolism.

We conducted a prospective study with the objective of assessing the utility of MDCT in IE. The study included 27 consecutive patients who met the diagnostic criteria for possible IE (41%) or definite IE (59%) according to the modified Duke criteria.⁴ A 64-detector device (thickness/cut increment 0.6/0.3 mm, electrocardiogram-gated, field of view extended to the upper abdomen) was used with 80 mL of intravenous contrast (350 mg/mL, 5.5 mL/s).

The results were compared with the findings from TEE and surgery in patients who underwent an intervention (Table).

Five of the patients (18.5%) had device-associated IE (3 lead-associated and 2 central-catheter-associated) and 22 had valve-associated disease (57% associated with the native valve, 29% with a bioprosthesis, and 14% with mechanical valves).

Of note among the MDCT findings was the following:

- Suspected aortic fistula to the pulmonary trunk was ruled out and 2 suspected periaortic abscesses were appropriately assessed. These turned out to be pseudoaneurysms (Figure), in all cases associated with mechanical aortic valve prosthesis.
- Supracoronary prosthetic graft was assessed and a large hematoma was appropriately characterized in the graft region, without leaks or endocardial complications; a graft from the right ventricle to the pulmonary artery was assessed, with exact determination of the diameter of the ascending aorta in a patient who finally required implantation of a valve tube.
- Four of the 6 abscesses of the mitral-aortic junction were diagnosed with TEE and confirmed by surgery. One of these abscesses, which was an extensive lesion, could not be evaluated by echocardiography. Tomography was able to adequately define the limits of the abscess, which extended to the aortopulmonary window and which encompassed the coronary artery origin.
- In 77% of the patients, the native coronary arteries or the bypass were assessed.
- In all patients who had undergone a repeat procedure, the distance from the apex of the right ventricle or bypass to the sternum was determined.
- In 70% of the patients, extracardiac findings were reported. This is particularly important as these are minor criteria for peripheral arterial embolic events (26%), pulmonary infarction (7.4%), and mycotic aneurysms (3.7%).

Table
Clinical Characteristics, Type of Endocarditis, Presence of Vegetation, Complications, and Coronary Anatomy

Patient	Sex, age, y	Probability of IE	Heart disease/underlying condition	Vegetation observed in TEE	Vegetation observed in MDCT	Complication diagnosed in TEE	Complication diagnosed in MDCT	Coronary arteries in MDCT	Extracardiac findings in MDCT
1	F, 74	Possible	Mechanical mitral and aortic valve prostheses	No	No	Periaortic abscess Suspected fistula	Pseudoaneurysm Fistula ruled out	No lesions	Mycotic aneurysm in superior mesenteric artery
2	M, 81	Possible	No	No	No	No	No	Two-vessel disease	Mural thrombus in ascending aorta
3	M, 62	Definite	No	Yes (native aortic)	No	No	No	Unassessable Intense calcification	Embolization in spleen and psoas
4	M, 76	Definite	Biological aortic valve prosthesis + ACBS	Yes (aortic biological)	Yes	MAJ abscess	No	Single-vessel disease Patent bypass	
5	M, 41	Definite	No Intravenous drug user	Yes (native tricuspid)	No	No	No	No lesions	Pulmonary infarction
6	F, 82	Possible	Biological aortic valve prosthesis + ACBS	Yes (native mitral)	No	No	No	Unassessable Intense calcification	
7	M, 65	Definite	ACBS	Yes (native aortic)	Yes	No	Perforated leaflet	Three-vessel disease Patent bypass	Bilateral pleural effusion

Table (Continued)

Clinical Characteristics, Type of Endocarditis, Presence of Vegetation, Complications, and Coronary Anatomy

Patient	Sex, age, y	Probability of IE	Heart disease/ underlying condition	Vegetation observed in TEE	Vegetation observed in MDCT	Complication diagnosed in TEE	Complication diagnosed in MDCT	Coronary arteries in MDCT	Extracardiac findings in MDCT
8	M, 59	Definite	Mechanical aortic valve prosthesis	Yes (mechanical aortic)	No	No	No	No lesions	Pleural effusion
9	F, 80	Possible	ICD-CRT	Yes (lead)	No	No	No	Unassessable Intense calcification	
10	M, 30	Possible	ICD	Yes (lead)	Yes	No	No	No lesions	
11	F, 66	Definite	Mechanical aortic valve prosthesis and pacemaker	Yes (lead)	No	No	No	No lesions	
12	M, 68	Definite	No	Yes (native mitral and aortic)	Yes	Perforated aortic leaflet Mitral chord rupture	Mitral chord rupture	No lesions	Splenic infarction Pleural effusion
13	M, 48	Possible	Aortic prosthetic tube	No	No	No	Assessment aortic tube	No synchronization	Periaortic hematoma
14	F, 51	Possible	Central catheter	Yes (catheter)	Yes	No	No	Not assessable due to contrast failure	Subclavian vein thrombosis
15	M, 84	Possible	Central catheter	Yes (catheter)	No	No	No	Three-vessel disease	Pulmonary consolidation Jugular thrombosis
16	M, 60	Definite	No	Yes (native mitral)	Yes	No	No	Right coronary and circumflex artery not assessable	Splenic infarction
17	F, 57	Definite	Obstructive hypertrophic cardiomyopathy	Yes (native mitral)	Yes	MAJ abscess	MAJ abscess	No lesions	
18	M, 70	Definite	Biological aortic valve prosthesis	Yes (aortic biological and native mitral)	Yes	MAJ abscess Prosthesis removal	MAJ abscess Prosthesis removal	No lesions	Aneurysm of ascending aorta Pleural effusion
19	M, 76	Definite	Biological aortic valve prosthesis + ACBS	Yes (biological aortic)	Yes	MAJ abscess	MAJ abscess	LMCA disease + 3 vessels Patent bypass	Splenic infarction Pleural effusion
20	F, 79	Definite	Biological aortic valve prosthesis	Yes (MAJ)	Yes	MAJ abscess	MAJ abscess	No lesions	
21	M, 32	Definite	Subaortic ventricular septal defect	Yes (native aortic)	Yes	No	No	No lesions	Splenic infarction
22	M, 60	Definite	No	Yes (native mitral)	No	MAJ thickening	No	No lesions	Splenic infarction
23	F, 23	Definite	Tetralogy of Fallot. Right ventricle to pulmonary artery conduit	Yes (biological pulmonary)	Yes	No	No	No lesions Assessment right ventricle-pulmonary artery conduit	Pulmonary thromboembolism
24	M, 39	Possible	Bicuspid aortic valve	Yes (native aortic)	Yes	No	No	No lesions	Paraseptal emphysema
25	M, 78	Definite	Biological aortic valve prosthesis	Yes (native mitral)	Yes	No	No	No lesions	Pleural effusion
26	M, 81	Definite	Biological aortic valve prosthesis	No	No	Periaortic abscess	Periaortic abscess that infiltrates MAJ and encompasses LMCA, LADA, and CxA	LADA not assessable due to calcification Remaining arteries without lesions	Splenic infarction Pleural effusion
27	M, 59	Definite	Mechanical aortic valve prosthesis	Yes (aortic root)	Yes	Periaortic abscess	Pseudoaneurysm in the sinus of Valsalva	No lesions	

ACBS, aortocoronary bypass surgery; CRT, cardiac resynchronization therapy; CxA, circumflex artery; ICD, implantable cardioverter device; IE, infectious endocarditis; F, female; LADA, left anterior descending artery; LMCA, left main coronary artery; M, male; MAJ, mitral-aortic junction; MDCT, multidetector computed tomography; TEE, transesophageal echocardiography.

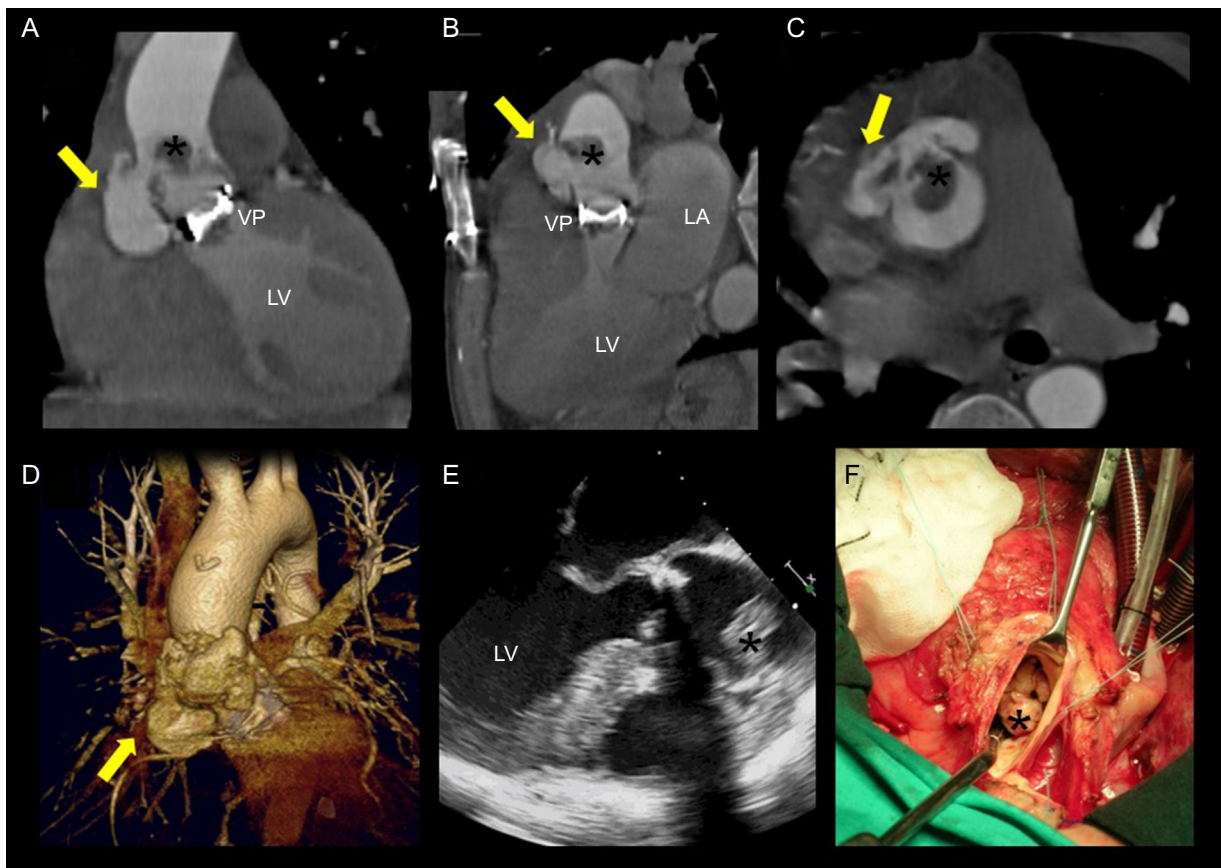


Figure. Mechanical aortic-valve-prosthesis-associated endocarditis with pseudoaneurysm of the aortic root. Multidetector computed tomography identified a pseudoaneurysm in the right sinus of Valsalva (yellow arrow) in the coronal (A), sagittal (B), and axial (C) plane, and in the 3-dimensional reconstruction (D), along with a large vegetation affixed to the proximal ascending aorta (*). The vegetation was observed in transesophageal echocardiography (E), but the pseudoaneurysm was not detected. These findings were confirmed during surgery (F). LA, left atrium; LV, left ventricle; VP, mechanical aortic valve prosthesis.

- Of the 17 vegetations detected in TEE, 12 were valve-associated (both native and prosthetic) in the MDCT and an additional 3 device-associated vegetations were detected. The thread-like and hypermobile vegetations were those not detected.

The use of MDCT in IE, reinforced in the new guidelines,⁴ has not yet been assessed in Spain. In the present study, based on an extensive series, we would highlight several conclusions:

- In valvular IE, MDCT is key for visualizing the aortic wall, which is usually incompletely assessed with echocardiography. This structure is often affected by fistulas, pseudoaneurysms, and abscesses. The greatest advantage is apparent in IE associated with mechanical aortic valve prosthesis, in which complications are frequently present. Assessment with TEE can be particularly complicated given the presence of acoustic shadows.
- In addition, the technique allows assessment of the coronary artery and estimation of the distance from the right ventricular apex or coronary bypass to the sternum in patients with prior surgery and is also useful in right-sided IE for diagnosis of pulmonary embolism.
- However, in our experience, the information provided by MDCT is less relevant both for assessment of vegetations (mainly thread-like ones) and for device-associated IE, given that in the latter case, local complications are not usually present and major surgery is not required, and so assessment of coronary anatomy is not necessary.

Currently, with the development of a range of different imaging modalities, it is the responsibility of the cardiologist to be aware of the advantages of each technique to achieve the highest diagnostic accuracy. We believe that MDCT undoubtedly complements TEE in the management of IE.

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Two-incision Technique for Subcutaneous Cardioverter-defibrillator Implantation: Method of Choice?



Técnica de dos incisiones para implante de desfibrilador subcutáneo: ¿técnica de elección?

To the Editor,

Subcutaneous implantable cardioverter-defibrillators (S-ICD) are becoming established as an effective and safe therapy for a broad spectrum of patients.^{1,2} These devices do not require placement of endovascular leads in or around the heart and allow the sensing and appropriate treatment of malignant ventricular arrhythmias.³ Implantation is relatively simple, and the procedure times and results are very predictable. Nonetheless, physicians require a learning curve of about 13 implants in order to minimize potential complications.⁴ The implantation procedure recommended by the manufacturer involves 3 incisions (Figure A). A pocket incision on the lateral chest wall houses the pulse generator, and 2 parasternal incisions are made to position the defibrillation electrode: an inferior incision close to the xiphoid process and a superior incision to position the distal electrode parasternally at the level of the sternal angle.³ To minimize the risks associated with making 3 incisions, Knops et al⁵ developed a simplified implantation technique that omits the superior parasternal incision (Figure B). This incision is a frequent cause of discomfort, is difficult to suture, and is cosmetically unappealing to patients. In their series, Knops et al reported excellent results with this technique; however, their center has more experience with S-ICD implantation than any other in the world, and there are no other data in the literature. Here, we report our experience at a center with a less established track record with the 2-incision technique, used as first-line treatment in all patients from an early phase in the experience of the center.

Since October 2013, our team has implanted 17 S-ICDs in 17 patients, with follow-up for at least 1 month. For both the 3-incision and the 2-incision techniques, implantation was guided by anatomical landmarks, and fluoroscopy was not used in any procedure. The first 5 implantations were performed with the 3-incision technique. Subsequently, the 2-incision technique was selected as the first-line approach, with the option to revert to the 3-incision technique if difficulties were encountered in achieving a satisfactory implant. For the 2-incision technique, the insertion tool supplied with the S-ICD system was used in combination with an 11 Fr peel-away sheath of the type commonly used for transvenous lead placement.³ After the device-pocket and xyphoid incisions were made, the sheath was mounted over the insertion tool and the combined structure was tunneled parasternally. The insertion tool was then removed, leaving the peel-away sheath in place, and the electrode was introduced into the sheath. Once the electrode tip emerged subcutaneously from the sheath opening, it was held in place manually to prevent downward displacement, and the sheath was peeled away, leaving the distal sensing electrode in the desired position.⁵ The proximal sensing electrode was then secured at the paraxiphoid level, the pulse generator was connected, and both incisions were closed. The 2-incision technique was performed satisfactorily in all 12 patients in whom it was attempted, with no need for reversion to the 3-incision technique. General patient characteristics are shown in the Table. A ventricular fibrillation induction test was performed, and sustained arrhythmia was induced in 11 patients. Of these patients, 10 were adequately defibrillated with a single 65 J shock, and 1 patient required a second 65 J shock with reversed polarity. The mean treatment time for the 11 episodes of induced ventricular fibrillation was 16.6 ± 3.4 s, and the mean effective-shock impedance was $81.5 \pm 13.6 \Omega$. Mean total procedure time (58.25 ± 17.5 min) was notably shorter than for the 5 patients who underwent the 3-incision procedure (107.8 ± 31 min); however, this

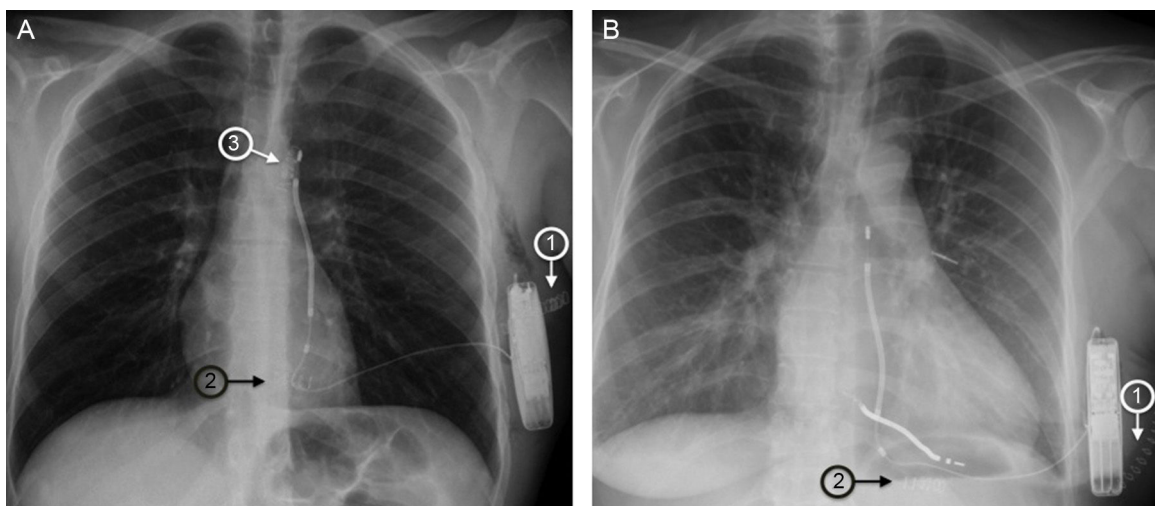


Figure. Chest X-rays showing automatic subcutaneous implantable cardioverter-defibrillators implanted by the 3-incision method (A) and the 2-incision method (B).