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CASE REPORT
Adult congenital heart disease

Single puncture approach guided by transesophageal echocardiography for atrial fibrillation ablation in a patient with prior percutaneous septal closure: case report

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Background Atrial septal defect (ASD) is associated with a risk of developing atrial fibrillation (AF) higher than in the general population, even after percutaneous or surgical septal closure. Catheter ablation is an effective treatment strategy for preventing recurrences and reducing the AF burden. However, electrophysiologists are faced with technical difficulties and the risk of complications with the left atrium access in patients with prior ASD percutaneous closure.

Case summary We report a case of a patient with highly symptomatic paroxysmal AF, with an ASD, closed percutaneously many years before, who underwent a successful catheter AF ablation, using a single transeptal (TSP) approach guided by transesophageal echocardiography (TEE).

Discussion In patients with ASD and an occluder device implanted, there is a potential risk for septal tear during the TSP passage, device dislodgement, or thrombus formation on the device. Atrial fibrillation ablation in this subset of patients has often been protracted and scarcely reported. TEE and intra-cardiac echocardiography have been increasingly used for interventional procedure guidance during AF ablation. As described here, AF ablation using a simplified single TSP guided by TEE is feasible, safe, and effective after device ASD closure.

Keywords Atrial septal defect • Percutaneous device closure • Atrial fibrillation ablation • Case report

ESC Curriculum 9.7 Adult congenital heart disease • 5.3 Atrial fibrillation • 2.2 Echocardiography

Learning Points

- AF ablation (PVI) performed using a simplified single transeptal puncture after atrial septal closure, even with a large closure device
- The usefulness of real-time TEE imaging in catheter AF ablation after atrial septal defect closure
- Safety and feasibility of catheter AF ablation after percutaneous device atrial septal defect closure
- Emphasis on the fact that there is no reason to delay AF ablation decision in patients with prior percutaneous septal closure

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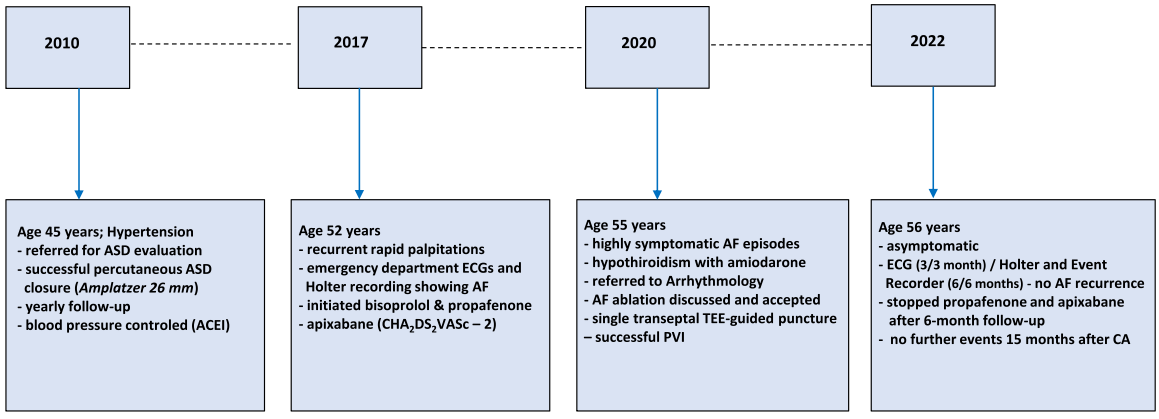
Introduction

Atrial septal defect (ASD) is associated with a prevalence of atrial fibrillation (AF) higher than in the general population, a risk that persists after percutaneous or surgical septal closure.[1] Catheter ablation is an effective treatment strategy for preventing recurrences and reducing the AF burden.[2] However, electrophysiologists are faced with technical difficulties and the risk of complications with the left atrium (LA) access in patients with prior ASD percutaneous closure. This challenge usually protracts the option of AF ablation in the population with an implanted ASD closure device. We report a case of a patient with highly symptomatic paroxysmal AF, with an ASD, closed percutaneously many years before, submitted to a successful AF ablation using a single transeptal approach.

Timeline

TIMELINE - Single puncture approach guided by transesophageal echocardiography for atrial fibrillation ablation in a patient with prior percutaneous septal closure – case report



ASD – atrial septal defect; ACEI – angiotensin converting enzyme inhibitor; ECG – electrocardiogram; AF – atrial fibrillation; PVI – pulmonary veins isolation; CA – catheter ablation

Case description

A 55-year-old female with a history of a previous successful ASD closure with an Amplatzer 26 mm occluder device (St. Jude Medical) 10 years before presented recurrent episodes of chest discomfort and rapid palpitations for the last three years due to paroxysmal AF. She maintained frequent symptoms despite medication with beta-blocker combined with propafenone, and amiodarone was interrupted due to ineffectiveness and hypothyroidism. She presented with well-controlled hypertension (medicated with 5 mg perindopril QD), had a CHA_2DS_2-Vasc score of 2, and was anticoagulated with apixaban. On physical examination, S1 and S2 on cardiac auscultation were rhythmic, with no murmur; blood pressure was 135/75 mmHg, pulmonary auscultation was normal, and there was no oedema of the lower limbs.

Transthoracic echocardiogram showed an occluder device well-positioned, slight LA dilation (38 mL/m^2), and a left ventricle ejection fraction of 60%, without valvular abnormalities. The cardiac computed tomography visualized the device position, provided information for the anatomical map of two right pulmonary veins (PV) and two left PV, and excluded intra-cardiac thrombus (*Figure 1*).

AF ablation

The procedure was performed under general anaesthesia, with propofol and fentanyl for induction, followed by neuromuscular blocking with rocuronium and by laryngeal mask. Right femoral vein access was obtained to place a 6 Fr decapolar catheter into the coronary sinus.

TEE (TEE) was used to guide transseptal puncture (TSP). A small portion of the native atrial septum immediately posteroinferior to the Amplatzer occluder device was identified as the site to cross to the LA (*Figure 2*). A single TSP was done, and an 8.5 Fr deflectable bi-directional sheath (Agilis NxT, St. Jude Medical) was gently positioned toward the LA, with exchanges of a circular catheter (Advisor™ FL, Abbott) and the ablation catheter (Tacticath™, Abbott) made through the same sheath.

Heparin administration reached an ACT level of >300 s during the procedure.

Left atrium geometry was collected with the circular catheter using the Ensite Velocity electroanatomic mapping system (Abbott) (*Figure 3*).

The ablation strategy consisted of PV isolation using antral circumferential radiofrequency (RF) lesions (30–35 W power). The endpoint was the elimination of the local bipolar electrograms or attaining a force-time integral >400 g/s. A lower power (20–25 W) and lower duration settings were used for ablation on the posterior LA wall adjacent to the PV. Real-time contact force was continuously monitored in order to achieve a mean contact force of 10 g during RF application.

The patient was admitted to the laboratory in AF, having converted to sinus rhythm during isolation of the right superior PV (*Figure 4*). Elimination of PV potentials with isolation of all PV was obtained without procedural complications. Apixaban was continued on the same day. During a period of 12-month follow-up, there were no palpitations, and the event recordings were free from AF.

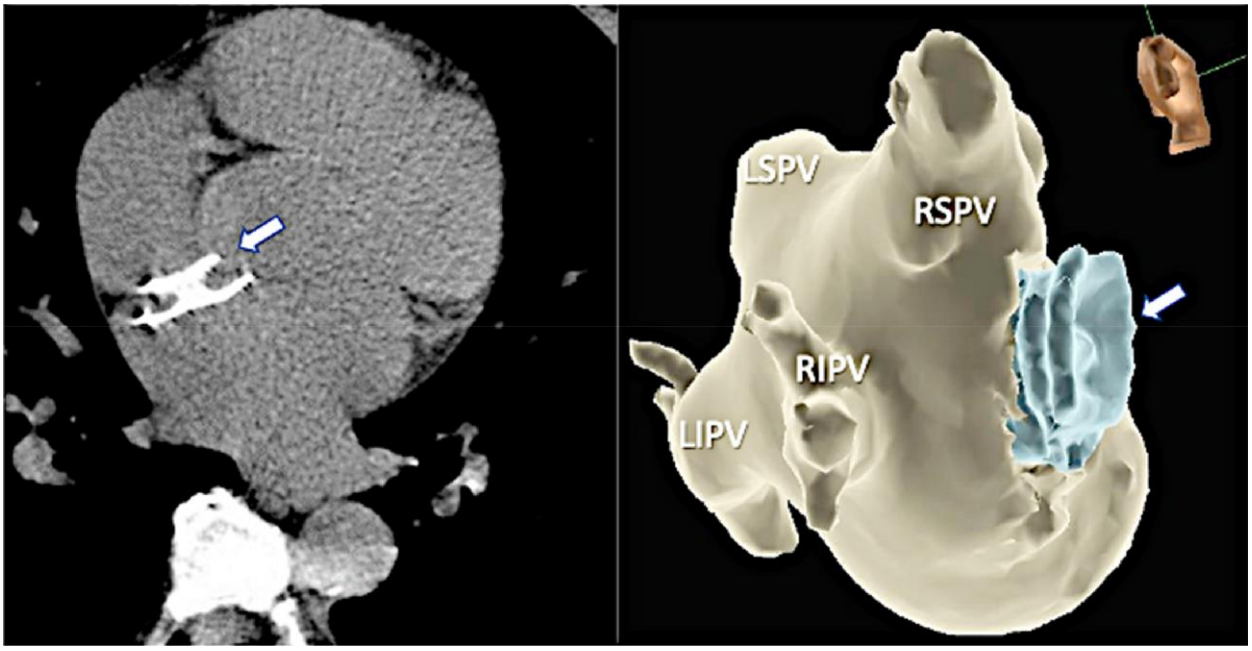


Figure 1 Reconstruction images of computed tomographic angiography of the left atrium showing the location of the Amplatzer septal occluder device (white arrow). LSPV, left superior pulmonary vein; LIPV, left inferior pulmonary vein; RIPV, right inferior pulmonary vein; RSPV, right superior pulmonary vein.

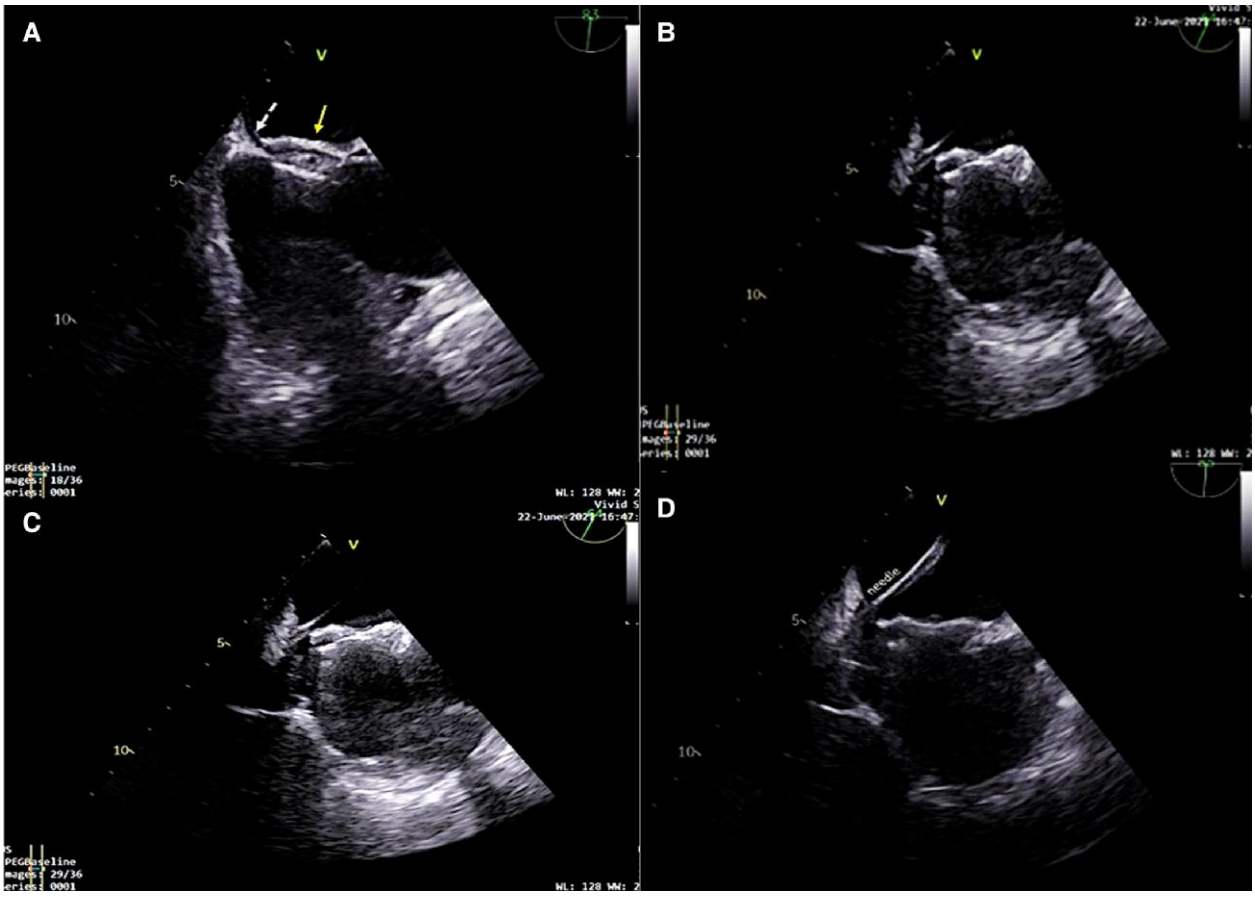


Figure 2 Sequence of transesophageal echocardiography images showing the Amplatzer device location (*A*, unbroken arrow), the site to perform the transeptal puncture (*A*, dashed arrow), and the Brockenbrough needle progression (Medtronic, Minneapolis, MN) (*B*, *C*, and *D*).

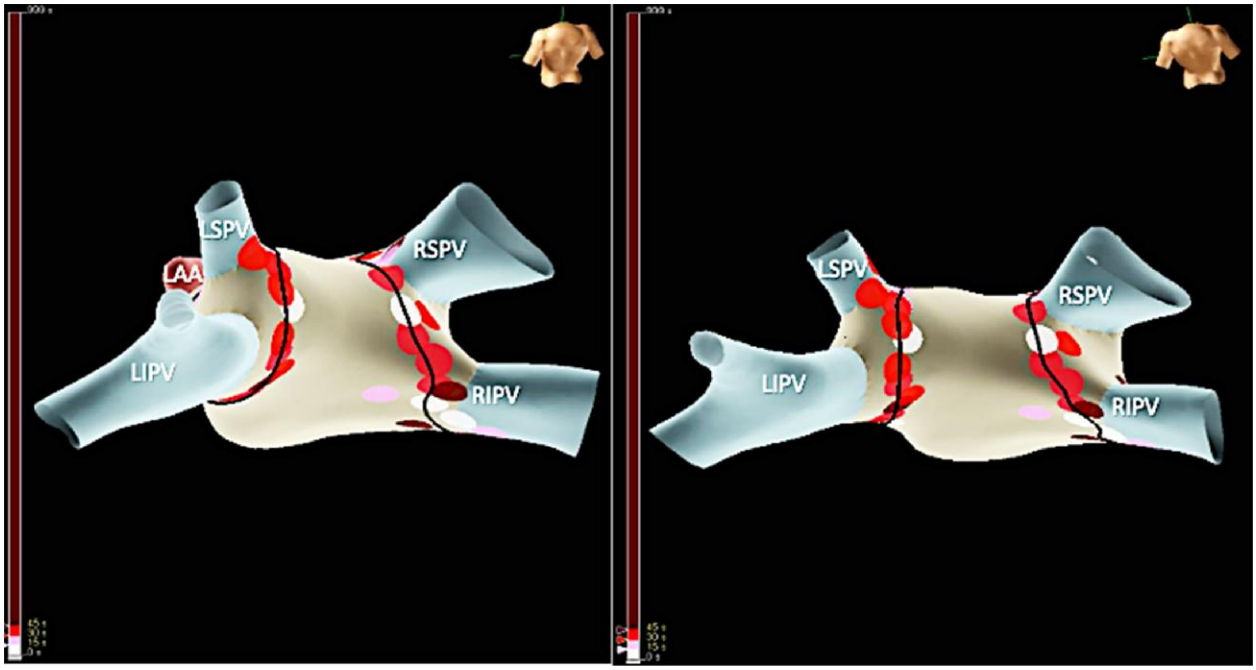


Figure 3 Three-dimensional electroanatomic maps of the left atrium (*A* and *B*—posterior views) illustrating the ablation lesions encircling the four pulmonary veins. LSPV, left superior pulmonary vein; LIPV, left inferior pulmonary vein; RIPV, right inferior pulmonary vein; RSPV, right superior pulmonary vein; LAA, left atrial appendage.

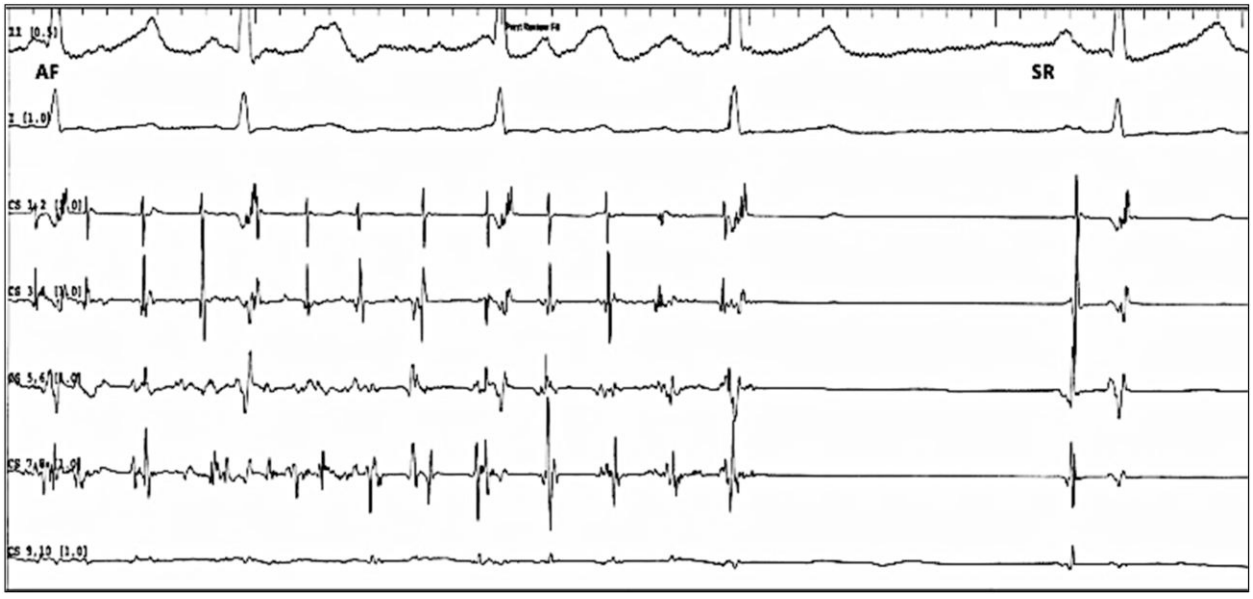


Figure 4 Conversion of atrial fibrillation to sinus rhythm during radiofrequency applications in the antrum of the right superior pulmonary vein isolation documented by electrocardiogram (ECG) (leads I and II) and intra-cardiac electrograms from a decapolar catheter positioned into the coronary sinus. AF, atrial fibrillation; SR, sinus rhythm.

Discussion

TSP catheterization is routinely performed in AF ablation, either with a single or double puncture.[3] It is an important step in the procedure of PV isolation, with a low risk of complications, when undertaken by experienced operators. In the growing population of patients with atrial septal occluders, due to atrial septal defects or patent foramen ovale, AF is a common finding, but TSP puncture and sheath manipulation became challenging, particularly in identifying an ideal space outside the

implantable device to perform a safe puncture. In these patients, there is a potential risk for septal tear during the transeptal passage, device dislodgement, or thrombus formation on the device. Because of the difficult LA access and risk of complications, AF ablation in this subset of patients has been often been protracted and scarcely reported.

TEE and intra-cardiac echocardiography (ICE) have been increasingly used for detailed anatomical assessment and interventional procedure guidance for atrial septal closure and AF ablation. In a recent systematic review using ICE guidance, there were no acute procedural related complications, and the pooled incidence of long-term freedom from AF was 77.7%.[4] Therefore, the decision for undergoing AF ablation should not be delayed in patients with prior percutaneous septal closure. In this case report, with a 26 mm occluder device implanted many years before, we selected TEE, considering the expertise of one of the operators and the higher cost of ICE catheters. As described here, AF ablation using a simplified single TSP guided by TEE is feasible, safe, and effective in patients after device ASD closure, although this is a complex procedure that should be performed by experienced operators.

Lead author biography

Professor at Lisbon Faculty of Medicine and head of the Electrophysiology Unit at Hospital Santa Marta and of the Heart Center, at Hospital CUF Tejo, in Lisbon. PhD thesis—Molecular and Electrophysiological Basis of Autonomic Nervous System Influence in the Genesis and Maintenance of Paroxysmal AF. Major research—ANS and arrhythmogenesis. Past vice-president of the Portuguese Society of Cardiology, past-president of the Portuguese Association of Arrhythmology, Pacing and Electrophysiology, and member of the EHRA National Cardiac Societies Committee. Associate Editor of the Portuguese Journal of Cardiology and reviewer of international journals. He has delivered >300 lectures and authored 150 papers, >500 abstracts, and 40 scientific prizes.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports*.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The authors confirm that written informed consent for submission and publication of this case report, including the images and associated text, has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

Funding: None declared.

Data availability

The data underlying this article are available in the article and in its online supplementary material.

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