Percutaneous Left Atrial Appendage Occlusion – Case Report

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Resumo

Anticoagulation with warfarin is effective in reducing the risk of cardioembolic events in patients with atrial fibrillation, however, several factors may limit its use. The percutaneous closure of the left atrial appendage is a minimally invasive method that may have results similar to warfarin in the prevention of cardioembolic events in high risk patients. We describe the transesophageal echocardiographic features in a patient with persistent atrial fibrillation, with repeated thromboembolic episodes and difficulty in achieving adequate laboratory control with the use of oral anticoagulation, submitted to percutaneous occlusion of the left atrial appendage.

Keywords: Percutaneous occlusion of the left atrial appendage; Oral anticoagulation; Atrial Fibrillation; Transesofageal echocardiographic

Introduction

Atrial fibrillation (AF) is responsible for over 15% of all strokes[1]. Anticoagulation with warfarin is effective in reducing the risk of thromboembolic events in patients with AF[2,3], but requires regular laboratory monitoring, may have changed their effects due to interactions with certain foods and drugs, as well as being associated with an increased risk of bleeding (1% - 2% per year of major bleeding events)[4]. Therefore, despite the great benefits already well documented, alternative treatments have been proposed.

Most of thrombi in the left atrium have their origin in the left atrial appendage, and thus the occlusion of this structure would be a logical approach to reduce the incidence of the cardioembolic phenomena[5,6].

The percutaneous occlusion of the left atrial appendage (LAA) is a minimally invasive procedure that can have results similar to warfarin in the prevention of cardioembolic events in patients at increased risk[5]. Transesophageal echocardiography (TEE) is the main method used not only in the assessment of patients eligible for percutaneous occlusion of the LAA, but also as a guide during the procedure[6].

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We describe aspects of TEE in a patient with permanent AF, with repeated thromboembolic episodes and difficult in achieving adequate laboratory control by using oral anticoagulation, undergoing percutaneous occlusion of the LAA.

Case Report

A 70 year old female, white, married, farmer, born and resident in Asuncion, Paraguay, with a history of cardiomyopathy of unknown etiology, permanent AF, on oral anticoagulation, with inadequate laboratory control (INR < 2), high blood pressure, breast malignant neoplasm, miliary tuberculosis under treatment, and episode of peripheral arterial embolism in the right lower limb about 6 months earlier, treated surgically.

Currently, she presents frequent episodes of tachycardia, rare episodes of presyncope, and progressive dyspnea, and six days earlier there was a new episode of peripheral arterial embolism (left lower limb), treated surgically (embolectomy). One day past she presented left hemiparesis, with tomographic diagnosis of ischemic stroke, being successfully subjected to thrombolytic therapy.

Due to the difficult in achieving therapeutic levels of anticoagulation, we opted for interventional treatment for AF ablation and percutaneous occlusion of the LAA.

TEE and cardiac MRI were performed, showing evidence of moderate left atrial enlargement, significant systolic dysfunction of the left ventricle due to diffuse hypokinesis and hypocontractile

LAA with spontaneous contrast of small intensity inside without evidence of thrombus. The procedure was entirely guided by TEE, performing measurements of LAA with the transducer in the middle esophagus in the following incidences: five-chamber 0°, 60° at the aortic valve level, two-chamber 90°, and longitudinal axis 120º. The largest measurements of the ostium and the landing zone were 2.61 cm and 2.64 cm, respectively. A measurement of the diameter of the landing zone was taken 10 mm away from the ostium, distally from to the circumflex coronary artery, visualized in the transverse axis, at the atrioventricular junction (Figure 1). These measurements were similar to those obtained by angiographic study.

We opted for the Amplatzer device number 28. After transseptal puncture, the device implantation was performed (Figure 2).

It was observed proper alignment, landing, and stability of the device, with complete occlusion of the appendage, evidenced by the absence of flow at color Doppler and angiography. The entire procedure was performed without adverse events, with preservation of adjacent structures, particularly the left superior pulmonary vein (Figure 3), mitral valve, and circumflex coronary artery. At the end of the procedure, minimal residual discontinuity was detected following the puncture of the atrial septum, with flow directed from the left atrium to the right atrium (Figure 4). The patient developed hemodynamically stable, under sinus rhythm, and with significant symptomatic improvement.

Discussion

The AF significantly increases the risk of cardioembolic events (approximately 4.5% per year)[1,2]. In this group of patients, usually the left atrium is dilated, promoting potential blood stasis and potential thrombus formation, particularly in the LAA, which in such condition is often hypocontractile with reduced emptying rate of blood flow[5].

In non-rheumatic patients, the vast majority (86% to 91%) of thrombi in the left atrium arise from the LAA[5-9].

Anticoagulation with warfarin is effective in reducing the risk of thromboembolic events in patients with AF[2,3]. However, the need for rigorous laboratory monitoring, dietary and drug interactions, difficult in achieving therapeutic levels regularly, and increased risk of bleeding events limit its use[2,3]. A therapeutic option for patients who cannot receive treatment with warfarin or who have difficult in achieving adequate control with oral anticoagulation is the occlusion of the LAA, removing thus a thrombogenic focus[5,6,10].

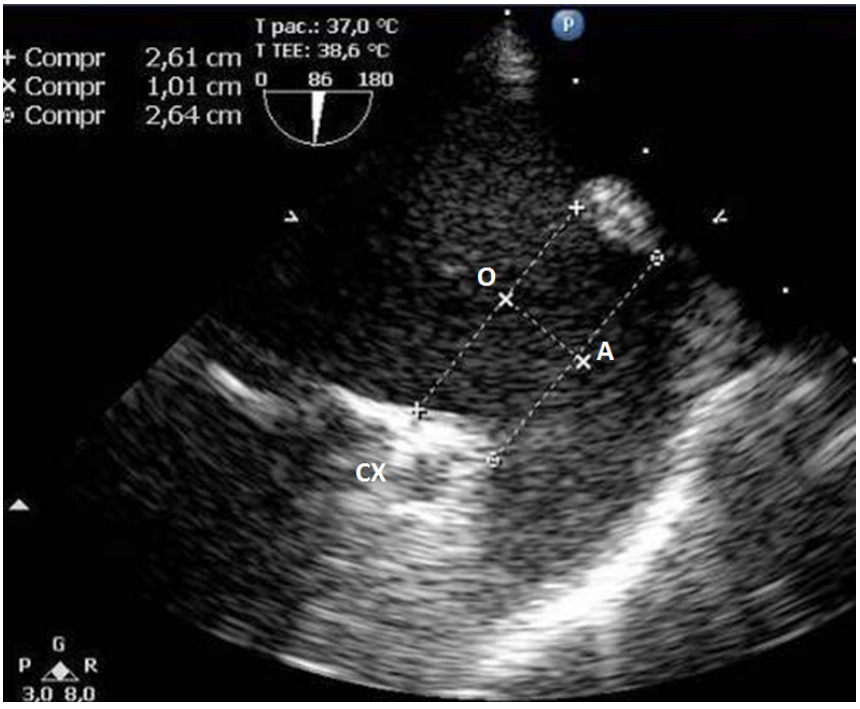

Figure 1 - *Measurements of the LAA ostium (O) and landing zone (A) of the device 10 mm away from the ostium measurement. CX: circumflex coronary artery visualized in the transverse axis, at the atrioventricular junction.*

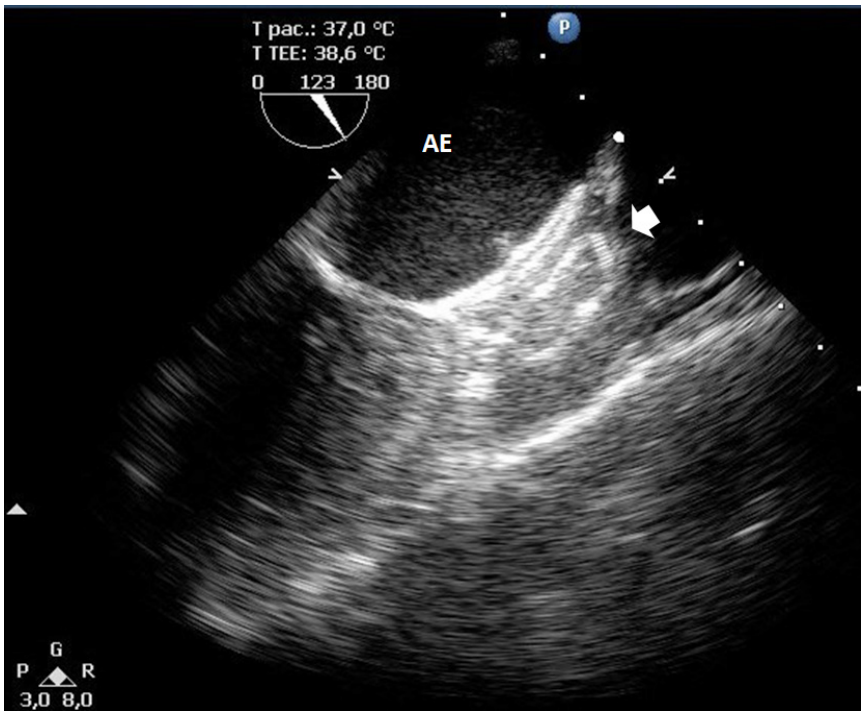

Figure 2 - *Amplatzer device (arrow) occluding the LAA. AE: left atrium.*

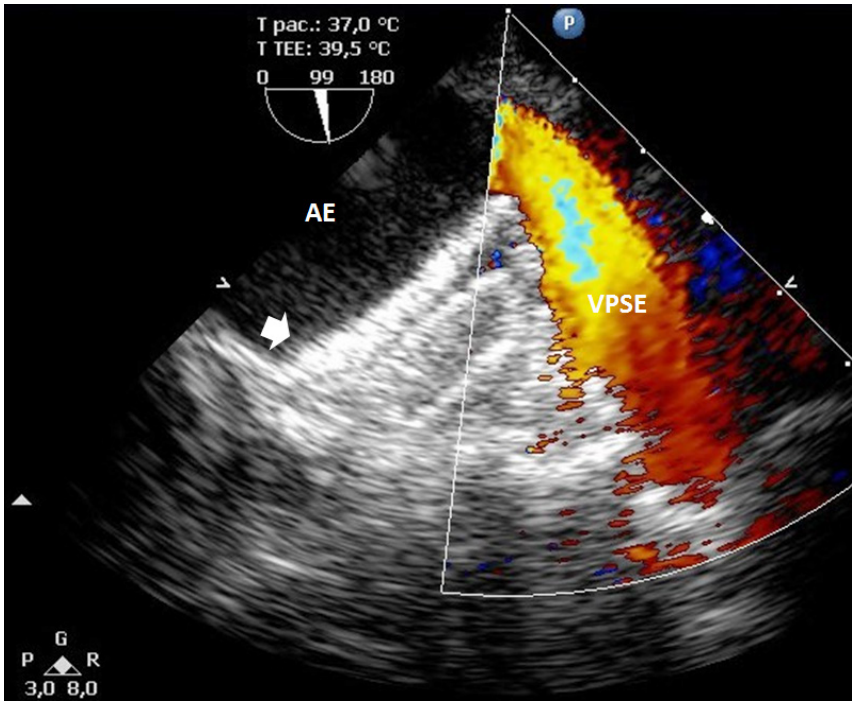

Figure 3 - *Relationship between the Amplatzer occlusion device (arrow) and the left superior pulmonary vein (VPSE). It is observed laminar venous flow, indicating no obstruction. AE: left atrium.*

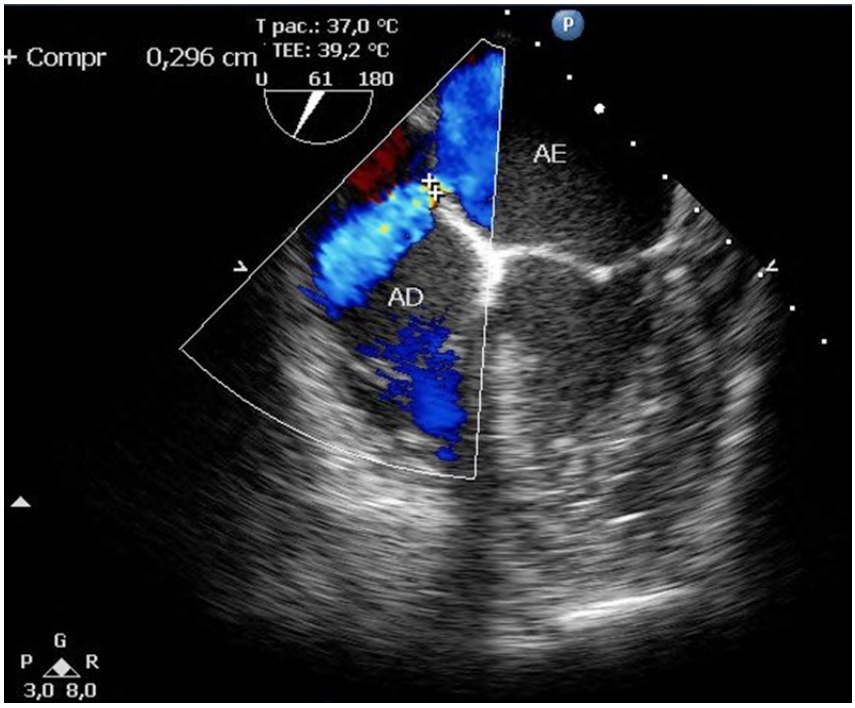

Figure 4 - *Minimal residual discontinuity (0.29 cm) following puncture of the atrial septum with mild flow directed from the left atrium (AE) to right atrium (AD).*

The direct surgical amputation of the LAA is performed mainly in patients who undergoing surgical repair of the mitral valve, most commonly in rheumatic heart disease[7,11]. Several methods have been developed to perform this occlusion, percutaneous or transpericardial route, in order to prevent the entry of blood flow in the LAA. The percutaneous occlusion has the advantage of being a minimally invasive method and may have results similar to warfarin in patients with moderate to high risk of thromboembolic phenomena[5,6,10].

The transcatheter device for percutaneous occlusion of the LAA, called PLAATO (Covidien, Plymouth, MN, USA) was the first to be used in 2002, and studies have shown low risk of complications associated with its implantation and reduced strokes in 5 years[5,6]. However, it was withdrawn for commercial reasons[6]. Currently, there are two commercially available devices: WATCHMAN (Boston Scientific Natick, MA, USA) and Amplatzer cardiac plug or ACP (St Jude Medical Inc., MN, USA)[6,10].

Multiplane TEE is the main method used in the evaluation of patients indicated for percutaneous occlusion of the LAA. The main echocardiographic criterion for exclusion is the presence of thrombus in the appendage, although the presence of spontaneous contrast or significant valve disease should be individually analyzed[6, 12].

TEE can evaluate the morphology and function of the LAA, and determine a series of measures that will form the basis for the procedure. The size of the appendage ostium must be previously measured, since together with the angiographic analysis they will determine the optimal size of the device to be implanted. Typically, a device with a diameter slightly larger than the ostium is selected to ensure a proper landing and stability. Additional measurements are performed for positioning of the ACP device, as the device landing zone, which should be performed at about 10 mm away from the ostium measurement. The maximum length of the dominant lobe must also be measured[6].

Other parameters that should be carefully evaluated, since they can be changed after the implantation of the device, are the anatomy (diameter) and the flow of the left superior pulmonary vein, mitral valve anatomy and flow, and the relationship of the device position with the circumflex coronary artery which in rare situations may be compressed[5,6]. During the procedure, the echocardiographic study should guide the transseptal puncture, device implantation, and their relationship with the left atrial wall, guiding their proper alignment and stability, to promote complete occlusion of the LAA, in addition to exclude possible interferences with adjacent structures[6].

The degrees of residual leakage can be quantified by color Doppler with Nyquist limit set to 20-30 cm/s, as follows: grade 1 - important leakage with multiple jets or free flow from appendage to atrium; grade 2 - moderate leakage with jet larger than 3 mm; grade 3 - slight leakage with jet between 1mm and 3 mm; grade 4 - minimal leakage with jet smaller than 1 mm; and grade 5 - no leakage[6.8].

Successful procedure is considered when the grade of leakage is equal to or greater than 3. Complications arising from transseptal puncture (residual atrial septal defect), device implantation (embolization or migration), emergence of hemopericardium, thrombi, and abnormalities in segmental contractility of the left ventricle must be identified[5.6]. In general, it is recommended to repeat the transesophageal echocardiographic study at 1 month, 6 months, and annually after the procedure[6].

We reported the case of a patient with permanent AF and difficult in maintaining adequate levels of INR with warfarin and recurrent thromboembolic episodes, undergoing percutaneous occlusion of the LAA, successfully. The case description shows up relevant because it is a relatively recent and increasingly common procedure in our setting, emphasizing the importance of TEE in its various stages, from a careful prior analysis, identifying possible exclusion criteria, as well as the measurements that will define the size of the device to be implanted, and guiding the entire procedure, recognizing their success and potential complications, in addition to subsequent follow-up essential to ensure the effectiveness of the device.

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