CASE REPORT

Percutaneous closure of left atrial appendage to prevent thromboembolism in atrial fibrillation

FERNANDO CURA[MTSAC, 1], MARIANO ALBERTAL[1], GERARDO NAU[MTSAC, 1], SEBASTIÁN PERALTA[1], RICARDO RONDEROS[2], GUSTAVO AVEGLIANO[2], GUSTAVO SÁNCHEZ[2], JORGE BELARDI[MTSAC, 1]

Received: 10/22/2010
Accepted: 08/02/2011

Address for reprints:
Fernando Cura, M.D.
Department of Interventional Cardiology and Endovascular Therapeutics (ICBA)
Blanco Encalada 1543
(1428) Buenos Aires
Phone: +5411 4787-7570
Fax: +5411 4787-7571
E-mail:
fcura@icba-cardiovascular.com.ar

ABSTRACT

Background

Embolic stroke is a major concern in atrial fibrillation (AF), and anticoagulation is the therapy of choice to prevent it. Around 20% of patients with AF have contraindications for anticoagulation (OAC). The left atrial appendage (LAA) has been identified as the most common place of thrombosis in patients with AF, particularly in those with non-valvular AF or impaired ventricular function. LAA occlusion reduces the incidence of embolic events in these patients. This article describes a case of percutaneous closure of LAA with the Amplatzer Cardiac Plug device. The patient was at high risk of embolism and had absolute contraindication for OAC. The procedure was performed at the cardiac catheterization laboratory under general anesthesia with fluoroscopic guidance and transesophageal echocardiography, and complete closure of the LAA was achieved. During the procedure, no complications were reported. The patient remained event-free at three-month follow-up, with complete exclusion of LAA. No embolic events have been reported.

Rev Argent Cardiol 2012;80:310-313. http://dx.doi.org/10.7775/rac.v80.i4.1493

Key words > Left Atrial Appendage - Percutaneous Closure - Atrial Fibrillation

Abbreviations >

AOAC	Anticoagulation	**AF**	Atrial fibrillation
ACP	Amplatzer Cardiac Plug	**LAA**	Left atrial appendage
TEE	Transesophageal echocardiography	**ACT**	Activated coagulation time
TTE	Transthoracic echocardiography		

BACKGROUND

Atrial fibrillation (AF) is the most common arrhythmia (1) and is responsible for 15-20% of all ischemic strokes. (2) Most strokes in patients with AF are due to thromboembolism in the left atrial appendage (LAA), (3) and anticoagulant therapy is the first treatment of choice. However, a large number of patients have contraindications to anticoagulation (OAC). (4) Different techniques have been developed to prevent thromboembolism, such as surgical ligation, amputation or exclusion of the LAA, with disappointing results. In recent years, some devices have been developed for percutaneous closure of the LAA, namely, the Percutaneous LAA Transcatheter Occlusion (PLAATO, ev3, Plymouth MN, currently discontinued) (5, 6), and the WATCHMAN LAA system (Altritech Inc., Plymouth, MN), (7) which have shown high rates of success and safety. Recently, a novel device for LAA closure has been designed (ACP, Amplatzer Cardiac Plug), AGA Medical, Plymouth, Minnesota, USA), which seems to be safer and adaptable to different LAA morphologies; however, there is scarce information regarding this device. This presentation describes the case of a patient with permanent AF and contraindication for OAC who successfully underwent percutaneous LAA closure with ACP.

CASE REPORT

A 65 year-old patient with recent episodes of hemoptysis due to pulmonary tuberculosis was referred to our department because of permanent AF. His risk factors for embolic events were: type 2 diabetes and hypertension, resulting in CHADS2 score 2. Percutaneous closure of the LAA was the treatment of choice due to high embolic risk and contraindication for OAC. This patient had had several episodes of spontaneous pulmonary hemorrhage due to tuberculosis sequelae.

Complementary tests

Transthoracic echocardiogram (TTE): normal left ventricular systolic function and moderate increase in left atrial size. A 2D and 3D transesophageal

[MTSAC] Full Member of the Argentine Society of Cardiology
[1] Department of Interventional Cardiology and Endovascular Therapeutics, Instituto Cardiovascular de Buenos Aires (ICBA). Buenos Aires, Argentina
[2] Department of Diagnostic Imaging, Instituto Cardiovascular de Buenos Aires (ICBA). Buenos Aires, Argentina

echocardiography (TEE) was performed showing reduced velocity in the LAA (43cm/sec) and absence of thrombus in that chamber (Figure 1). LAA morphology showed that it was a single-lobed appendage, with an oval orifice measuring 22 by 19 mm. The complementary angiotomography showed the association of the LAA with several adjacent anatomical structures, such as the circumflex artery, mitral valve, and right superior pulmonary vein (see Figure 1).

Percutaneous treatment

Aspirin (100 mg) and clopidogrel (75 mg) were administered during the week prior to the procedure. After the intervention, the patient received aspirin for 30 days, and clopidogrel for 3 months. A transseptal puncture through the fossa ovalis (guided by angiography and TEE) was performed under general anesthesia, according to previous description. (8) After the puncture, the patient received intravenous heparin to maintain ACT ≥ 250 seconds throughout the procedure. LAA angiography using a pigtail catheter showed a 22 mm wide neck and 12 mm depth (Figures 2 A & B). Based on these measurements and those of the TEE, a 24 mm ACP was chosen. An Amplatz extra-stiff wire guide (0.035 inches, 260 mm long, with a 1.5 mm-long flexible tip) was placed in the LAA, and then a 13 Fr sheath (approximately 10 mm distal to the LAA neck) was carefully advanced. Next, the device was progressed through the sheath up to the point in which both platinum markers of the device were distal to the radiopaque marker of the sheath. The sheath was immediately removed to expose the device and its release continued once optimal stability and appropriate shape of the device were observed (Figure 2 C). After implantation, angiography (Figure 2 D) and TEE assessment discarded paraprosthetic leak and confirmed the correct placement of the device. At 3-month follow-up, 2D and 3D TEE confirmed complete appendage closure (Figure 3).

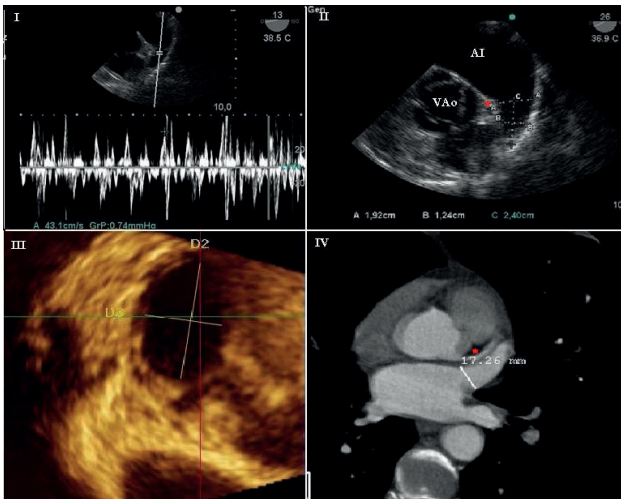

Fig. 1. Top, left: Transesophageal Doppler examining LAA flow (velocity 42 cm/sec). Top, right: 2D echocardiographic image, which is very useful to measure the ostial diameter **(dotted line A)**, as well as the LAA extension **(dotted line B)**. Down, left: three-dimensional reconstruction of the LAA ostium. Down, right: angiotomography LAA image; notice the association between LAA and the circumflex artery.

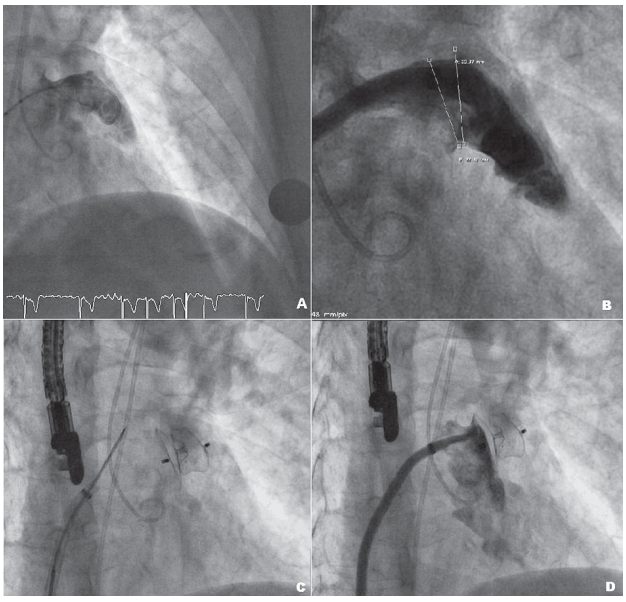

Fig. 2. A-B. Angiographic LAA images used to measure LAA size and select the working projection. Notice the gray sphere used for calibration. **C.** Release of the device. **D.** Final angiographic assessment that shows complete LAA closure.

DISCUSSION

OAC is the recommended therapy to prevent cardioembolic strokes in patients with AF. However, this therapy is underutilized due to its difficult administration and drug adherence, as well as its inherent risk of bleeding. (4) In our case, a high CHADS2 score required the use of OAC, but it was contraindicated due to recent active bleeding episodes. Percutaneous closure of the LAA has proved to be effective in preventing embolic stroke. (6, 8) The first percutaneous available devices, such as PLAATO and WATCHMAN, occluded the LAA as if it were a ball that fits tightly into a hole. On the other hand, the ACP utilizes the same concept other Amplatzer devices use for the occlusion of interatrial and interventricular septal defects, which is more familiar to the operators who are used to this type of procedures. The ACP consists of a disc that is placed outside the LAA and a 6.5 mm-length lobe with different diameters, which is impacted in the proximal end of the LAA. The fixed length of its lobe enables its adaptation to various LAA anatomies. Moreover, the advanced ACP design facilitates its repositioning in case of unsatisfactory result. On the other hand, as the use of ACP requires a detailed and accurate anatomical evaluation, TEE becomes imperative. Although the utilization of the ACP device was approved by the European Union (CE

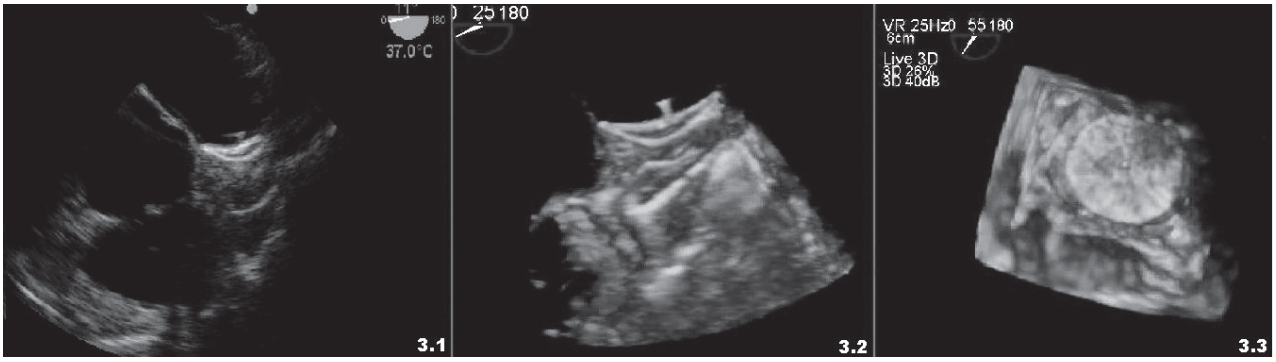

Fig. 3. 2D (left) and 3D (center and right) echocardiographic images at 3 months, showing a properly implanted device in the LAA with complete exclusion.

Mark) in 2008, it has not yet been approved for use in the United States. Left atrial appendage closure is contraindicated in patients with thrombosis in the heart chambers, especially the left atrium, in case of endocarditis when the depth of the implantation site is less than 10 mm, and when LAA necks are too small or too wide (< 12.6 mm or > 28.5 mm, respectively), since the diameter of the device lobe varies between 16 and 30 mm. There are other relative contraindications, such as severe impairment of ventricular function, or associated valve disease, because thrombus formation would not be restricted to the atrial appendage. Besides, the available information about this technique with this device for LAA closure is purely anecdotal, and its role as preventive therapy compared with anticoagulant therapy is the goal of a randomized study, which is still at an early stage. Potential associated complications are related to transseptal puncture, stroke during the procedure due to catheter thrombosis, inadvertent bubble injection, or appendage perforation. Echocardiographic control should be performed to assess that the device generates complete LAA closure, and does not interfere with surrounding structures, such as the mitral valve, the circumflex artery and the left superior pulmonary vein opening.

For the moment, this technique should be used only in cases of high embolic risk and absolute contraindication to anticoagulant therapy.

RESUMEN

Cierre percutáneo de la orejuela izquierda para prevención de tromboembolia en la fibrilación auricular

Introducción

El accidente vascular encefálico embólico constituye la complicación más importante de la fibrilación auricular (FA) y el tratamiento anticoagulante es de elección para su prevención. Alrededor del 20% de los pacientes con FA presentan contraindicaciones de anticoagulación (ACO). La orejuela izquierda (OI) se ha identificado como el principal sitio de formación de trombos en la FA, especialmente en pacientes sin enfermedad valvular y sin deterioro de la función ventricular. La oclusión de la OI reduce la incidencia de eventos embólicos en este tipo de pacientes. En esta presentación se describe un caso de cierre percutáneo de la OI, con empleo del dispositivo Amplatzer Cardiac Plug. El paciente tenía riesgo embólico alto y contraindicación absoluta de ACO. El procedimiento se realizó en el Laboratorio de Hemodinamia, bajo guía radioscópica y ecocardiografía transesofágica, con anestesia general; se logró la oclusión completa de la OI. No se presentaron complicaciones durante el procedimiento y luego de un seguimiento de 3 meses, la OI se encuentra totalmente excluida y no se han evidenciado eventos embólicos.

Palabras clave > Orejuela izquierda - Cierre percutáneo - Fibrilación auricular

REFERENCES

1. Go AS, Hylek EM, Phillips KA, Chang Y, Henault LE, Selby JV, Singer DE. Prevalence of diagnosed atrial fibrillation in adults: national implications for rhythm management and stroke prevention: the AnTicoagulation and RIsk factors in Atrial fibrillation (ATRIA) Study. JAMA 2001;285:2370-5.

2. Fuster V, Ryden LE, Cannom DS, Crijns HJ, Curtis AB, Ellenbogen KA, et al. ACC/AHA/ESC 2006 Guidelines for the Management of Patients with Atrial Fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Revise the 2001 Guidelines for the Management of Patients With Atrial Fibrillation): developed in collaboration with the European Heart Rhythm Association and the Heart Rhythm Society. Circulation 2006;114:e257-354.

3. Blackshear JL, Odell JA. Appendage obliteration to reduce stroke in cardiac surgical patients with atrial fibrillation. Ann Thorac Surg 1996;61:755-9.

4. Onalan O, Lashevsky I, Hamad A, Crystal E. Nonpharmacologic stroke prevention in atrial fibrillation. Expert Rev Cardiovasc Ther 2005;3:619-33.

5. Block PC, Burstein S, Casale PN, Kramer PH, Teirstein P, Williams DO, et al. Percutaneous left atrial appendage occlusion for patients in atrial fibrillation suboptimal for warfarin therapy: 5-year results of the PLAATO (Percutaneous Left Atrial Appendage Transcatheter Occlusion) Study. JACC Cardiovasc Interv 2009;2:594-600.

6. Ostermayer SH, Reisman M, Kramer PH, Matthews RV, Gray WA, Block PC, et al. Percutaneous left atrial appendage transcatheter occlusion (PLAATO system) to prevent stroke in high-risk patients with non-rheumatic atrial fibrillation: results from the international multi-center feasibility trials. J Am Coll Cardiol 2005;46:9-14.

7. Holmes DR, Reddy VY, Turi ZG, Doshi SK, Sievert H, Buchbinder M, et al. Percutaneous closure of the left atrial appendage versus warfarin therapy for prevention of stroke in patients with atrial fibrillation: a randomised non-inferiority trial. Lancet 2009;374:534-42.

8. Onalan O, Crystal E. Left atrial appendage exclusion for stroke prevention in patients with nonrheumatic atrial fibrillation. Stroke 2007;38:624-30.