Complex percutaneous left atrial appendage closure using the LAmbré™ device in a patient with previous atrial septal defect repair surgery

Oclusão percutânea complexa do apêndice atrial esquerdo com o dispositivo LAmbré™ em paciente com antecedente de correção cirúrgica de comunicação interatrial

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ABSTRACT – Percutaneous left atrial appendage closure is an invasive option for cardioembolic event prevention and it is indicated for patients presenting non-valvular atrial fibrillation and oral anticoagulation therapy failure or contraindication. There is limited data addressing the technical success of percutaneous left atrial appendage closure in patients with complex anatomy and history of previous atrial septal defect repair surgery. We report a case of left atrial appendage closure performed with the LAmbré™ device (LifeTech Scientific, Shenzhen, China) in a patient with a left atrial appendage of complex anatomy, and history of previous surgery for atrial septal defect repair.

Keywords: Atrial fibrillation; Atrial appendage; Embolism; Stroke; Anticoagulants; Ultrasonography, interventional; Thrombosis

RESUMO – A oclusão percutânea do apêndice atrial esquerdo é uma opção invasiva para a prevenção de eventos cardioembólicos indicada em pacientes com fibrilação atrial não valvar com contraindicação ou falha na terapia com anticoagulação oral. Há poucos dados disponíveis sobre o sucesso técnico do fechamento percutâneo do apêndice atrial esquerdo com anatomia complexa e história de cirurgia prévia para correção de comunicação interatrial. Esta é a descrição de um caso de oclusão de apêndice atrial esquerdo realizado com o dispositivo LAmbré™ (LifeTech Scientific, Shenzhen, China) em um paciente com apêndice atrial esquerdo de anatomia complexa e história prévia de correção cirúrgica de comunicação interatrial.

Descritores: Fibrilação atrial; Apêndice atrial; Embolia; Acidente vascular cerebral; Anticoagulantes; Ultrassonografia de intervenção; Trombose

BACKGROUND

Atrial fibrillation (AF) is the most common sustained arrhythmia in clinical practice. AF is diagnosed in 2 to 3% of the general population and it increases four to five-fold the risk of stroke.^{1,2} It is estimated that 15 to 20% of all strokes are related to AF and when compared to strokes due to other etiologies, strokes of AF etiology are more severe.³ AF causes blood stasis in the atrial chamber, leading to the formation of thrombi. To date, the use of oral anticoagulation (OAC) is the treatment of choice, reducing the risk of stroke and all-cause death in patients with AF.⁴ Studies with autopsies and echocardiography in patients with non-valvular AF demonstrate that more than 90% of thrombi are located in the left atrial appendage (LAA).^{5,6} LAA closure

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has been implemented as an alternative strategy for stroke prevention in patients with non-valvular AF when OAC is contraindicated or OAC therapy has failed.⁷ In this context, percutaneous LAA closure seems to have satisfactory results decreasing the number of cardioembolic events, with a low rate of procedure-related complications and a high procedure success rate.^{8,9} However, in some patients, percutaneous LAA closure may become a technical challenge, mainly due to LAA anatomy variation.

The LAmbré™ (LifeTech Scientific, Shenzhen, China) is a new device specially designed to adapt to the several variations of LAA anatomy and to ease device implantation. It is a self-expanding device made of nitinol and polyester and consists of two components: the umbrella, which has eight small distal hooks that engage into the LAA wall and eight “U”-shaped end caps that attach to the trabecular portion of the LAA (dual stabilization); and a disc covering the LAA ostium. Studies have shown that the LAmbré™ device is effective in preventing cardioembolic events and that it has high implant success rates, with rare cases of embolization.^{10,11}

We report the case of a patient presenting with non-valvular AF and an episode of stroke during appropriate use of OAC, submitted to percutaneous LAA closure with the LAmbré™ device. It is the first procedure using a LAmbré™ device published in Brazil so far. The case report shows the feasibility of implanting the LAmbré™ prosthesis in a LAA with complex anatomy, and the possibility of performing transseptal puncture in a patient with a history of surgical correction of atrial septal defect (ASD). The study was approved by the Human Research Ethics Committee of the Institute of Neurology and Cardiology of Curitiba (CAEE 07659219.7.0000.5227).

CASE REPORT

A 64-year-old male with a history of hypertension, diabetes, surgical repair of ASD with a bovine pericardial patch 8 years previously, AF, acute myocardial infarction with circumflex marginal branch angioplasty 2 years previously, and ischemic stroke in March 2018.

On October 15, 2018, he returned to the service with sudden right hemiparesis, right facial paresis and aphasia. Brain imaging studies revealed a new ischemic stroke in the left middle cerebral artery territory. The patient was on continuous use of 150mg of dabigatran every 12 hours since hospital discharge in March 2018.

Due to the recurrence of stroke during the appropriate use of OAC, performing percutaneous closure of the LAA was decided after discussion between the neurology and cardiology teams. The calculated risk of cardioembolic events by the CHA₂DS₂VASc score was 5 points (high risk) and the risk of bleeding by the HAS-BLED score was 3 points (high risk).

The preoperative transesophageal echocardiogram (TEE) revealed dense spontaneous echo contrast in the LAA and left atrium (LA), absence of thrombi, and LAA emptying rate of 16.9cm/s. The largest measurements of the ostium and device landing zone were, respectively, 3.0cm and 2.9cm. The largest dimension of the ostium and landing zone measured by angio-tomography were, respectively, 4.3cm and 3.7cm, and the mean diameter of the landing zone was 3.4cm. Computed tomography angiography (CTA) assessment described the LAA as of windsock morphology (Figure 1).

The percutaneous LAA closure procedure was performed under general anesthesia, guided by TEE and fluoros-

Figure 1. Left atrial appendage measurements using transesophageal echocardiography and computed tomography angiography for pre-procedure programming of left atrial appendage closure.

copy. Venous access was performed via right femoral vein, and transseptal puncture was performed in the inferior and posterior positions of the interatrial sept (IAS), using the Brockenbrough technique with an 8F sheath and transseptal puncture needle. Simultaneously to IAS puncture, the TEE image showed IAS with a native aspect. After IAS puncture and confirmation of LA placement, intravenous unfractionated heparin was given at a dose of 100IU/kg. LAA angiography was performed in right anterior oblique projection with cranial and caudal views, with the aid of the pigtail catheter and simultaneous injection through the sheath to evaluate the anatomy and to measure the diameters of the ostium and of the landing zone of the LAA.

The LAMbre™ LT-LA-3640 device, which corresponds to the diameter of the 36mm umbrella and the 40mm disc, was chosen based on the measurements performed by TEE, angio-tomography and angiograms. Manufacturer instructions and current experience recommend the umbrella size to be 2 to 6mm larger than the mean diameter of the LAA landing zone, and a disk not less than the largest measurement of the LAA ostium diameter.¹² The 10F delivery system was positioned at the level of the LAA ostium, and the umbrella was advanced to the LAA distal portion, while holding the

sheath in position. After confirming the umbrella was fully open distal to the left circumflex artery, the sheath was withdrawn and the disc opened, occluding the LAA ostium proximally to the left circumflex (Figure 2).

Correct positioning of the prosthesis was confirmed by TEE and control angiography. The umbrella was implanted distal to the left circumflex artery and it was fully open (hooks at the same level as the radiopaque marking of the connector), the alignment was accurate and there was minimum periprosthetic lower edge leak (less than 3mm). At the end, the device anchorage was tested by pulling and releasing the delivery cable (Tug test). Once the ostium closure and the stability of the system were confirmed, the prosthesis was released. The TEE observed a slight periprosthetic flow of 2.9mm on color Doppler at the lower edge of the disc (Figure 3). No adverse events were reported throughout the procedure and adjacent structures were preserved.

The patient was extubated in the cathlab and transferred to the coronary care unit. He was discharged after 48 hours on 150mg of dabigatran every 12 hours with a request for a control TEE in 45 days.

Figure 2. Fluoroscopic image of angiogram of the left atrial appendage and of the LAMbre™ device implant technique in the left atrial appendage.

Figure 3. Transesophageal echocardiography and fluoroscopy images before and after the release of the LAmbré™ device in the left atrial appendage.

DISCUSSION

Vitamin K antagonists and direct OAC are effective in reducing thromboembolic events. However, there is a relatively high percentage of patients who discontinue OAC, others have contraindication for OAC use, often due to increased risk of bleeding, and there are also patients who present recurrence of cardioembolic events in the presence of correct use of OAC. The Brazilian AF guideline recommends percutaneous LAA closure for patients with contraindication to OAC or with cardioembolic stroke despite the correct use of an OAC, as class IIa (weight of evidence/opinion is in favor of usefulness/efficacy).¹³ The PROTECT AF study (*WATCHMAN left atrial appendage system for embolic PROTECTION in patients with atrial fibrillation*) showed that percutaneous closure of the LAA with the WATCHMAN device (Boston Scientific, Natick, Massachusetts) was superior to warfarin in patients with non-valvular AF for preventing stroke, systemic embolism, cardiovascular death, and death from all causes after 3.8 years of follow-up.¹⁴ We chose to maintain OAC after LAA closure because the patient had no contraindication to OAC use, but presented a high thromboembolic risk. Although observational studies have demonstrated the

safety of antiplatelet use after LAA closure, the original protocol of the PROTECT AF study maintained the use of OAC for at least 45 days after LAA closure in patients who did not have contraindications to OAC use. In such cases, the use of OAC should be reassessed after the completion of control TEE in 45 days.

The LAmbré™ device was recently registered with the Agência Nacional de Vigilância Sanitária (ANVISA) for percutaneous LAA closure. Until the recent registration, Amplatzer Cardiac Plug devices (AGA Medical Corporation, Minneapolis, MN, USA) and WATCHMAN were available in Brazil. However, the two above mentioned prostheses present limited use for the closure of large LAA. Our patient had a large LAA, with a mean diameter of the landing zone of 3.4cm measured by cardiac CTA. Thus, we decided to implant the LAmbré™ device, because it is larger than the available prostheses and it offers a dual stability system, which provides great assistance in more complex LAA anatomy, like the present case. We believe the residual leakage of 2.9mm resulted from the oval-shaped LAA ostium, which measured 43mm in its longest axis, while the disc size of the chosen device was 40mm - the largest available.

In the case reported, the LAA was occluded safely, and at the end of the procedure the device complied

with all criteria for correct positioning with great stability, leaving only a small periprosthetic leak <3mm. A recent study in China, which included 152 patients with non-valvular AF who performed LAA closure with the LAmbré™ device, reported a 1-year follow-up stroke incidence of 1.97% while the estimated risk based on the CHA₂DS₂-VASc was 5.2%. The success rate of the procedure was 99.4%, with a low rate of complications and no cases of device embolization reported.¹⁰

We have reported that transseptal puncture, in patients with a history of ASD surgical repair, in order to perform LAA closure can be safe and without complications. In the present case, after positioning the sheath for the transseptal puncture in the IAS lower and posterior area, TEE revealed the septum with a native appearance, offering no greater difficulties for puncture. In patients with IAS surgical repair, the puncture can be performed through native tissue, the pericardium patch or Dacron, although that is not the case for the Gore-Tex patch (WL Gore, Flagstaff, Arizona) because of the resistance to puncture offered by the material.¹⁵ We reported the first case in Brazil of LAA closure with complex anatomy using the LAmbré™ device in a patient with a history of ASD surgical repair.

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None.

CONFLICT OF INTEREST

The authors declare there are no conflicts of interest.

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