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Case Report

Left Atrial Appendage Closure with "Mother and Child" Double WATCHMAN FLX: A Case Report, a New Perspective

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Abstract

Background: *Left atrial appendage (LAA) closure (LAAC) is an alternative to anticoagulant therapy to prevent thromboembolic events in selected patients affected by atrial fibrillation. In some rare cases of very complex anatomy, a complete closure may not always be obtained with a single device. We report and discuss a case of a bilobated LAA with a very large ostium successfully closed with two devices in a "mother and child" fashion.*

Case presentation: *An 81-year-old man, affected by permanent atrial fibrillation, with a high thromboembolic risk and high hemorrhagic risk (and history of major bleedings during non–vitamin K antagonist oral anticoagulants therapy) was referred to our center for LAAC. We performed a pre-procedural transesophageal echocardiographic (TEE) examination, that documented an enlarged left atrium without an intracardiac thrombus, bilobated LAA with a "broccoli" morphology and a large ostium with a diameter range of 24-27 mm. We did not deem a computed tomography (CT) scan to be necessary since the TEE provided all the necessary information. Both the devices were successfully implanted using the same delivery sheath. Angiogram and TEE showed a good sealing of the ostium and no evidence of residual LAA blood flow.*

Conclusion*: In conclusion, our case suggests that the LAAC with "one-step double-device strategy" and "mother and child" fashion could be safe and feasible. Further data are needed to confirm this evidence and investigate long-term outcomes.*

Keywords: Left atrial appendage closure, atrial fibrillation, double device, double WATCHMAN FLX, mother and child.

Abbreviations

CT: Computed tomography

LAA: Left atrial appendage

LAAC: Left atrial appendage closure

PET: Polytetrafluoroethylene

TEE: Transesophageal echocardiograpy

Background:

Left atrial (LA) appendage (LAA) closure (LAAC) is an invasive procedure to prevent stroke in patients with non-valvular atrial fibrillation who have a contraindication to anticoagulant therapy, previous hemorrhagic events, or a high bleeding risk (1-4). In some anecdotical cases of very complex anatomy, a complete closure may not always be obtained with a single device (5-10). We report the case of a bilobated LAA with a very large ostium successfully closed with two devices in a "mother and child" fashion. Furthermore, we discuss the importance of a careful evaluation of the LAA anatomy to obtain a good position of the devices and reduce the risk of embolization, deformation and interdevice residual flow.

Case presentation:

A 81-year-old male with clinical history of permanent atrial fibrillation, arterial hypertension, obstructive coronary disease treated by coronary artery bypass graft surgery, chronic obstructive pulmonary disease, gastrointestinal angiodysplasia with major bleedings during anticoagulation with apixaban, was referred for LAAC (CHA_2DS_2-VASc 4; HAS-BLED 3). The pre-procedural transesophageal echocardiographic (TEE) examination documented an enlarged left atrium (LA) without an intracardiac thrombus, bilobated LAA with a "broccoli" morphology and a large ostium with a diameter range of 24-27 mm, measured in the principal projections. Therefore, we planned the procedure to exploit the adaptability of the WATCHMAN FLX, aiming to achieve LAAC closure with a device from 27 to 35 mm. We did not deem a computed tomography (CT) scan to be necessary since the TEE provided all the necessary information. The procedure was performed under general anesthesia, by femoral vein approach, and with continuous TEE guidance. The patient was pre-treated with a clopidogrel loading dose of 300 mg and aspirin 100 mg the day before. After transseptal puncture, intraprocedural angiography was used in the 30° right anterior oblique - 20° caudal view. Contrast medium injection through a 14F dual-curve delivery sheath confirmed a very large ostium, over 30 mm, and a bilobated LAA with a major superior and a minor inferior lobe. Therefore, a single device implantation would have been unable to cover the whole ostium and a double device strategy was decided. The TEE section

at 98° showed a depth of the upper major lobe that was suitable for a 31 mm "mother" device, whereas the TEE section at 133° revealed a ridge-like pectinate muscle separating the two lobes and confirmed a depth of the lower and smaller lobe large enough to fit a 20 mm "child" device. After the first implant of the 31 mm "mother" device in the upper major love, a pigtail catheter was carefully delivered to the uncovered inferior lobe with the curved tail on the opposite side of the first device, which helped prevent contact by the tail hook. After the angiographic control confirmed the correct position of the sheath into the inferior lobe, the pigtail was gently removed and the 20 mm "child" device was placed in the smaller lobe next to the "mother" with a small contact between the ridges, excluding blood flow. Both the devices were successfully implanted using the same delivery sheath. Angiogram and TEE showed a good sealing of the ostium and no evidence of residual LAA blood flow (Fig.1).

The patient was discharged the third day with no complications, on 100 mg of aspirin and clopidogrel 75 mg for 1 month. At the 45th day following implantation procedure the patient was feeling good and reported no symptoms of dyspnea, palpitation or chest pain. The device placement was assessed with TEE and with a CT scan. The transesophageal examination confirmed the correct positioning of the two devices with complete endothelialization and the absence of blood flow detectable by the color Doppler (Fig.2). CT imaging with contrast showed correct positioning of the devices verifying the anatomical relationships (Fig.3). After these examinations it was considered safe to continue therapy with a single antiplatelet agent. Dual antiplatelet therapy was stopped, and the patient continued with clopidogrel 75 mg daily.

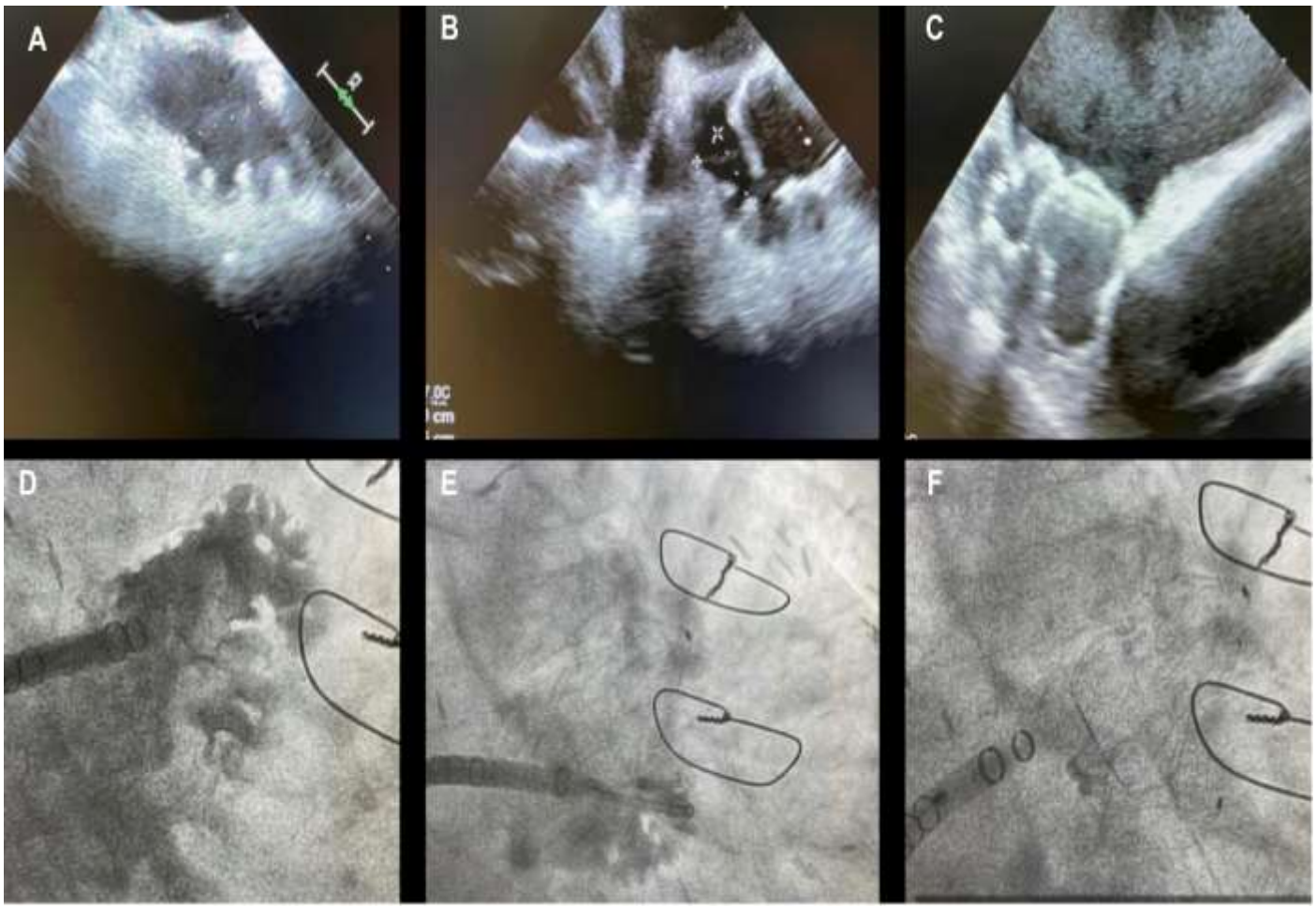

Figure 1: Imaging of left atrial appendage (LAA) closure procedure with a double "mother and child" WATCHMAN FLX in one-step. TEE imaging is showed in A, B and C panes. Angiography imaging is showed in D, E and F panels. A: Large dimension of the ostium and bilobated LAA with a major superior and a minor inferior lobe. B: First implant of the mother device; C: "Mother and child" in contact; D: Cauliflower morphology of LAA; E: Imaging after first device implantation; F: Double WATCHMAN device implantation.

Figure 2: Transesophageal echocardiographic images. A: 3D reconstruction of the two endothelized devices. B: The devices on the same plan. C: No evidence of color Doppler flow trans-device.

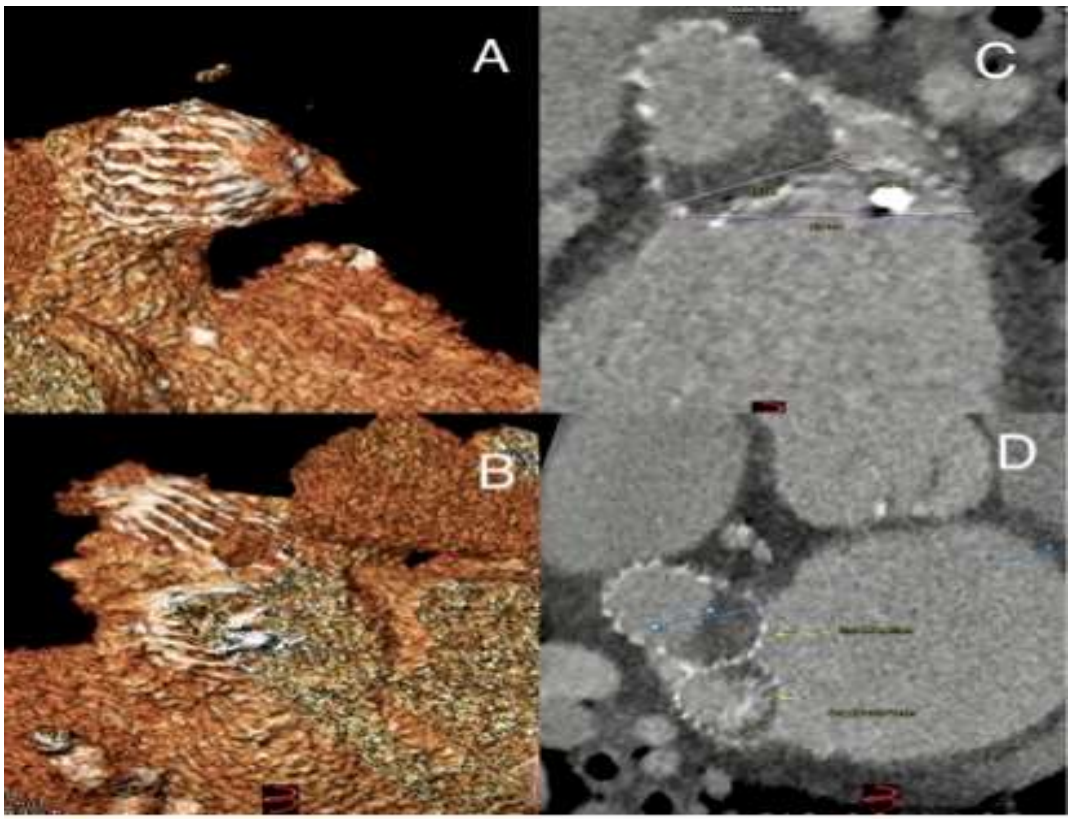

Figure 3: Computed tomography (CT) images. A and B: 3D reconstruction to verify the anatomical relationship. C and D: CT slice to confirm the correct position of the two devices.

Discussion and conclusion:

LAAC is slowly becoming a valid alternative to anticoagulant therapy and in most cases the procedure is performed with a single device (1-5). However, because of potential complex structures and variability of LAA anatomy, a complete closure may not always be achievable with a single device (6). In complex cases, including the "cauliflower" or "broccoli" morphology, a big common ostium (>30 mm), two big lobes and a short distance to the common ostium from each lobe, it is very challenging and almost impossible to close the LAA with one single device. So, as described in previous case reports (7-10), a strategy with double devices to seal the LAA may be indicated. A previous study reported double LAAC device implantation with Amplatzer cardiac plug and Amplatzer septal occluder after implantation of the first device to achieve complete LAA occlusion for complex LAA anatomies, with favorable results during follow-up (8). A more recent study reported LAAC of 7 patients with a double Watchman device implantation using the "kissing

watchman" technology with good results during follow-up encouraging the possibility of a one-step strategy (9-10).

We describe a case of LAAC with a "one-step double-device strategy" using the WATCHMAN FLX (Atritech, Inc., Boston Scientific, Plymouth, MA). This is the new generation parachute-shaped device, composed by a nitinol cage and a polytetrafluoroethylene (PET) membrane with several innovations useful for double technique implantation. A soft, atraumatic distal portion and a double row of 18 anchors (one for each strut), providing optimal apposition of the PET fabric to the LAA and an optimal conformity to various and challenging LAA anatomies, allowing to occlude ostium dimensions from 14 to 32 mm. The double device strategy is a promising option for the treatment of multilobate LAA with very large ostium, where one device is not sufficient (9-10). Some problems could occur, such as the persisting residual flow between devices, the potential injury of the PET membrane by the anchors of the nearby device, resulting in residual flow between LAA and LA. Finally, late complications like perforation or embolization secondary to mechanical interaction between the devices are unknown. Therefore, it is very important to accurately evaluate the LAA morphology before planning the procedure with a double device strategy, in order to predict the optimal sizing and positioning, a correct kissing between the ending surfaces of the devices (avoiding the contact with anchors), a complete sealing of the ostium and no residual flow into the LAA. In this setting, a CT scan might have an important role in integrating anatomical details of the complex LAA and to acquire new data on the follow-up of the double strategy.

In conclusion, we presented a case of LAA closure with two WATCHMAN FLX devices in a one-step procedure and "mother and child" fashion with an optimal result. By means of an accurate preliminary imaging, this strategy was safe and feasible to allow the complete closure of a LAA with a very large ostium and a complex morphology. Further data are needed to investigate long-term outcomes and CT imaging can be a valid tool to patient device selection, patient device delivery system selection, and long-term patient device follow-up, especially in complex cases like this presented.

Declarations

-Ethics approval and consent to participate Not applicable.

-Consent for publication

Written informed consent for publication of their clinical details and clinical images was obtained from the patient. A copy of the consent form is available for review by the Editor of this journal.

-Availability of data and material

The sources of the presented materials are available from the corresponding author on reasonable request.

-Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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