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Mini Review

Left atrial appendage closure with device for atrial fibrillation

Benedetto Massimo[1] and Fazio Giovanni[2*]

[1]*Department of Cardiology, Civico Hospital, Palermo, Italy*
[2]*Department of Cardiology, Internal medicine, Angiology and long term care, Triolo Zancla Hospital, Italy*

Correspondence
Fazio Giovanni
Department of Cardiology, Internal medicine, Angiology and long term care – Triolo Zancla Hospital, Palermo, Italy
Tel: +393334439962
E-mail: Faziogiova@gmail.com

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Abstract
Atrial fibrillation is the most common observed arrhythmia in clinical practice and it represents an important risk factor for cardio-embolism and cardio-embolic stroke. Atrial fibrillation patients have a 5 fold increase in stroke events. In non-valvular atrial fibrillation over 90% of thrombus formation is within the left atrial appendage and therefore prevention of embolization to systemic circulation and in particular to cerebral circulation goes through a therapy that has the left atrial appendage as the main target. Several anatomo-pathological studies and observations during open heart surgery confirm these data and give a rational basis to this point of view.

Atrial fibrillation is the most common observed arrhythmia in clinical practice and it represents an important risk factor for cardio-embolism and cardio-embolic stroke. Atrial fibrillation patients have a 5 fold increase in stroke events. In non-valvular atrial fibrillation over 90% of thrombus formation is within the left atrial appendage [1-2] and therefore prevention of embolization to systemic circulation and in particular to cerebral circulation goes through a therapy that has the left atrial appendage as the main target. Several anatomo-pathological studies and observations during open heart surgery3 confirm these data and give a rational basis to this point of view.

Considering that left atrial appendage is the main origin of thrombi in non valvular atrial fibrillation patients it was consequential that in patients with contraindication to warfarin the idea of left atrial appendage closure arised as a possible and good option of care.

Therefore left atrial appendage closure has been a prophylactic strategy for thromboembolic events in patients with non valvular atrial fibrillation and has been performed for decades; in a first phase during mitral valve repair open heart surgery4 and, in a more recent time, via percutaneous procedures in non valvular atrial fibrillation patients with high cardio-embolic risk with associated high bleeding risk who are not feasible for oral anticoagulants.

This percutaneous option of left atrial appendage closure was made possible first of all by the great evolution in cardiac access interventional techniques and then by the incredible growth of specific devices made for atrial appendage closure that can be implanted via a percutaneous access, avoiding open heart surgery.

The Plaato device by Appriva was the first one specifically developed for left atrial appendage closure at the end of the last century and tested by Horst Sievert [5]. It was made of a nitinol frame covered with a PTFE membrane in order to make it occlusive. This device demonstrated that the idea of left atrial appendage closure was feasible, but not free of several complications such as cardiac tamponade, residual leaks and thrombus formation on the device [6]; therefore in 2005 the device was abandoned and no longer used, not only because of clinical problems but also for financial problems encountered by the company. But this experience did not go lost and was very important for the further development of the procedure.

At the moment we have mainly two devices that are mostly used in clinical practice: the Watchman Flex device (evolution of the first Watchman device) by Boston Scientific and the Amplatzer Amulet device (evolution of the Amplatzer Cardiac Plug device) by ABBOTT (previously by St Jude Medical). It is interesting how the first Watchman device had a design completely different from the Watchman Flex, being the former essentially a cube shaped device with no lid that needed a left atrial appendage deep enough to embed it, while the Flex device now is essentially a

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lobe that has much less this problem, still being with no lid. The Amulet device on the other hand is since its launch on the market a device made of a lobe that embeds in the left atrial appendage with a lid that closes the ostium of the appendage itself; the evolution of the device is not a revolution in shape, that remains faithful to the first version, but rather a perfection of certain details. All this to say that since the beginning in my idea of atrial appendage closure the devices with a lobe structure were the future in the development of the procedure. Let's think about the left atrial appendage like a bottle and the lobe of the device like a cap that has to close the bottle, where the bottle can be of any shape you can imagine, but the cap that closes any bottle will be the same in shape. This is of capital importance when we talk about left atrial appendage, an anatomic part of the heart that can have countless shapes and designs; we just have to seek for the right measure of the cap to close the ostium and don't have to take into account whatever is distal to the ostium. This is of key importance to simplify a procedure that remains in any case among the most complicated in interventional cardiology.

Since anatomy and sizing is so important in performing left atrial appendage closure, transesophageal echocardiogram is mandatory in order to plan and execute a safe and efficient procedure [7]. This is true across all the phases from patient selection, to intra procedural guidance during device deployment, from ruling out intra procedural complications to short and long term follow up post procedure.

In our very busy cathlabs it is not always easy to coordinate many figures as the interventional cardiologist, the anesthetist and the echocardiographer. Recently we deemed intra cardiac echocardiography to be safe and feasible [8-9] and this gives us the possibility to have in the cathlab only the interventional cardiologist who manages the intra cardiac echocardiographic probe and the deep sedation; not having anymore the need for transesophageal echocardiogram, tracheal intubation is no more a must and deep sedation with dexmedetomidine and midazolam is enough [10]. In this way we have a great simplification and less need of human resources. The other side of the coin is that it is all up to the operator to manage the sedation, the imaging and the procedure and this can be very challenging.

In our cathlab we have started since one year this approach with the Acunav system by Biosence Webster and we have had very good results, comparable to our previous procedures with standard transesophageal echocardiogram guidance and all supported by clinical evidence [11-13]. Naturally this is a program that is feasible and safe in a high grade experience cathlab and with high grade experience operators, otherwise it is not recommended. Left atrial appendage closure is a procedure that is intended to prevent complications from natural history of non valvular atrial fibrillation, it is not curing any acute disease and therefore has to be performed in the safest way possible, avoiding any adjunctive risk to the procedure and consequently to the patient.

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