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Review article – Special issue: Acute Ischemic Stroke

Percutaneous closure of left atrial appendage for stroke prevention



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ABSTRACT

Transcatheter left atrial appendage closure (LAAC) is an alternative therapy for stroke prevention in atrial fibrillation (AF) patients. There are increasing data supporting this “local” prevention of thromboembolism in the patients with high-risk CHA₂DS₂-VASc score. LAAC might be a very important alternative in patients with limitations/contraindication to the anticoagulation therapy. Two main randomized clinical trials data indicated the utility and safety of Watchman LAAC device for stroke prevention in patients with AF as a non-inferior treatment strategy. Despite overall effectiveness showed for all currently used mechanical occluders (prospective, multicentric studies), clear profit of these devices could be limited by: (a) residual tamponade rate of 1–3%; (b) lack of complete 100% closure in one-third of patients. To improve the outcome, the new generations of these devices are designed to present: (i) a less traumatic implanting procedure; (ii) better placement and coverage of the LAA orifice. The present article summarizes the rationale, clinical data, devices, implantation techniques and follow-up drug regimens.

In conclusion, we need more data and more studies to prove the LAAC principle specifically in the new era of direct oral anticoagulation therapy.

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Introduction

Atrial fibrillation (AF) is the most common arrhythmia in the elderly population. The prevalence of AF in the general population is around 0.9, but in the age of 65 years, it reaches 5.9%. The average age of the patients with documented AF is 75 years. For example, in the US, the projected number of subjects with AF is expected to rise to between 5.6 and 12 million in 2050 from 2.7 to 6.1 million in 2010 [1,2]. The Framingham study proved that AF is associated with a four- to five-fold increased risk of thromboembolic events and that the percentage of strokes secondary to AF increases dramatically from 1.5% at 50 years of age to 23.5% at 80 years of age [3]. Furthermore, the adjusted stroke rate based on the CHADS₂ index score ranges from 1.9% to 18.2%. Recently, EHRA guidelines recommend the CHA₂DS₂-VASc score over the original CHADS₂ score to assess stroke risk in patients with AF. Among the patients aged 65–95 years old with non-valvular atrial fibrillation, very few (<7%) will be classified as low risk according to the CHA₂DS₂-VASc score. Left atrial appendage (LAA) was originally considered as an innocent and non-functional anatomic cardiac structure, and only two decades ago, it was identified as the location of thrombus formation [4]. Moreover, it is documented by several studies that approximately 92% of thrombi in non-valvular AF are localized in the LAA; in the four major transesophageal echocardiography (TEE) studies, detection of the thrombus in LAA was even greater – 98% [5]. In the last 15 years, the LAA came to be the structure of interest for many investigators who have investigated this structure from different perspectives. We need to understand better its anatomy and physiology, as well as recommend different imaging modalities and techniques to assess its shape, size, and blood flow patterns (the Doppler signal velocity), detect echocontrast formation or exclude presence of thrombus. To eliminate the risk of devastating thromboembolic event (stroke/TIA), different devices or approaches for LAA exclusion were developed in order to stop entry, keep permanent occlusion and, even more, reach electrical isolation. The LAA is a highly complex and dynamic structure with very effective contraction and relaxation specifically during sinus rhythm. This contraction capability decreases during AF [6]. The main advantage of recent development in imaging technology transesophageal echocardiography – TEE, computed tomography (CT), and magnetic resonance imaging (MRI) included is detailed visualization of LAA structure that markedly varies in shape and size (volumes, length, width, and orifice size) [7]. Majority of LAA morphologies are composed of two sometimes up to three lobes [8]. Several LAA morphologies have been described but the four most common represent different clinical outcome as recently described Di Biase [9]. He and co-authors have documented LAA morphology as the independent risk factor for stroke/TIA in

patients with AF. In this very first study, patients with chicken wing morphology were less likely to have a thromboembolic event than other three morphologies. Incidence of described morphologies: chicken wing (48%), cactus (30%), windsock (19%), and cauliflower (3%) (Fig. 1). LAA neurohumoral activity has been shown as important parameter in volume homeostasis; atrial natriuretic factor and inclusive brain natriuretic peptide are produced and secreted in significant amounts. This might have clinical implications when LAA exclusion is indicated in patients with dilated cardiomyopathy [10].

Left atrial appendage exclusion

Oral anticoagulation Warfarin (Coumadin) domination has significantly decreased the incidence of thromboembolic

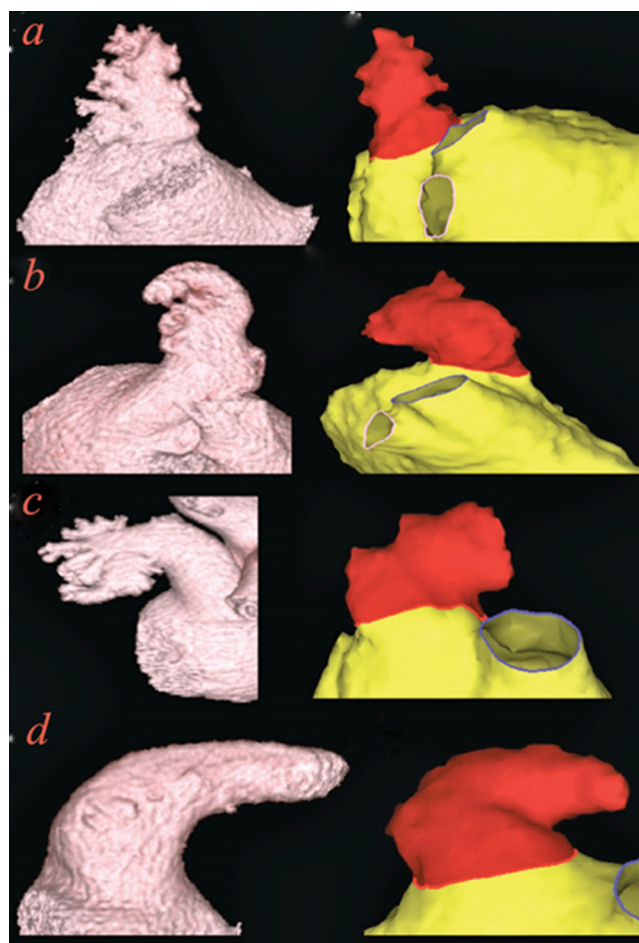


Fig. 1 – Four dominant LAA morphologies which may represent different levels of risk for stroke in patients with atrial fibrillation.

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