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Does left atrial appendage (LAA) occlusion device alter the echocardiography and electrocardiogram parameters in patients with atrial fibrillation?☆

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ABSTRACT

Background: The alterations of echocardiography and electrocardiogram (ECG) in patients received left atrial appendage LAA occlusion therapy are still unclear. The present study was to evaluate the influence of LAA occlusion device on echocardiography and ECG changes in patients with atrial fibrillation (AF).
Methods: Seventy-three patients who had undergone Watchman, LAmbre and Lefort were enrolled in this study. Echocardiography and ECG results at pre- and post-operation were collected. Besides, echocardiography was also performed during follow-up visits at 1, 6 and 12 months after discharge.
Results: After LAA occlusion, a slight and measureable movement of QRS electric axis was observed in most patients. The significant differences were also observed in heart rate (HR) and the mean-mean QT interval between pre- and post-operation for all patients. There existed no significant difference in echocardiographic parameters between before and after device implantation. However, a larger left atrial (LA) diameter was detected by echocardiography during follow-up visit at 6 months when compared with pre-operation parameters. Similarly, aortic root diameter (ARD) was also larger during follow-up at 12 months than the baseline dimension in pre-operation.
Conclusions: LAA occlusion device resulted in a slightly movement in QRS axis, reduced HR and increased the mean-mean QT interval duration. In addition, LA diameter and ARD seemed to be larger after device implantation.

1. Introduction

The current prevalence of AF, in general, is in the range of 1% to 2% and predicted to increase continuously in the future [1,2]. Patients with AF have a significantly greater mortality than those without AF [3–5]. Moreover, AF is responsible for approximately 20% of all strokes and associated to a 3- to 5-fold risk of stroke [6,7].

Stroke prevention and care are crucial to the management of AF, and the main effective stroke prevention is oral anticoagulants (OACs). Although the OACs such as warfarin, factors Xa inhibitors, and direct thrombin inhibitors were the fundamental to prevent stroke in the patients with AF, OACs may cause several side effects, especially increased bleeding risk. Moreover, the employment of OACs is limited by low treatment rates, non-adherence and the bleeding risk as well [8,9].

Recently, percutaneous LAA occlusion, which possesses advantages such as minimal invasion, simpler process and high success rate, has been expected to replace the surgical closure for the patients who are unable or unwilling to adhere long-term anticoagulation. Studies have proved that patients with moderate-to-high risk of thromboembolism may benefit equivalently between percutaneous LAA occlusion and warfarin therapy [10]. Accordingly, in the 2012 European Society of Cardiology guideline on AF, the individuals with high stroke risk contraindications for long-run oral anticoagulation are suggested to choose LAA closure for stroke prevention (Class IIb recommendation) [7].

Echocardiography (ultrasonic cardiogram, UCG) was a regular tool to screen suitable candidates, guide the operation process and exclude migration or thrombus during patient follow-up. ECG was the standard and common method to record and reflect electric activity of the heart for all the patients. The changes of heart electric activities induced by cardiac implants, cardiac surgery and some threatening cardiovascular diseases can be detected by the ECG.

Recently, increasingly percutaneous LAA closure systems have been performed to prevent stroke in AF patients. However, most studies of the LAA closure device focused on the safety and efficacy when compared with warfarin. This present study was firstly to evaluate the

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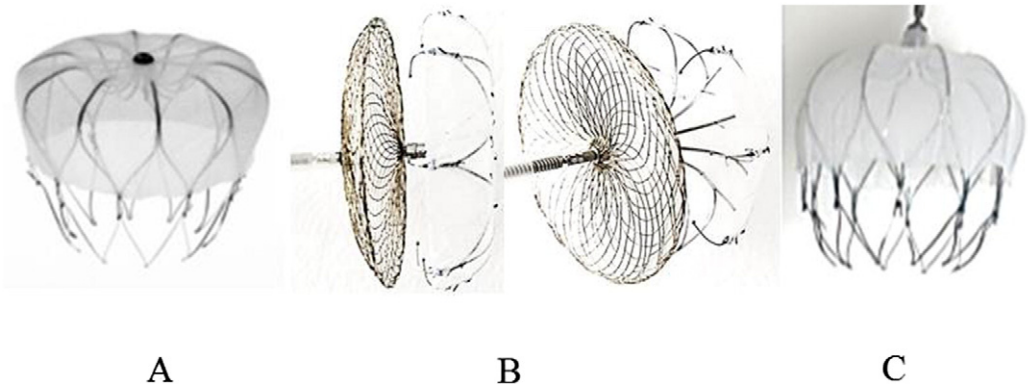

Fig. 1. LAA occlusion device. A. Watchman device. B. LAmbre device. C. Lefort device.

changes of ECG performance between pre- and post-operation, and compare echocardiographic parameters between pre-operation and follow-up visits, including 1-, 6- and 12 months after the LAA occlusion. The main aim of our study was to find out the influence of LAA occlusion device on LA size and ECG.

2. Methods

2.1. The study population

From January 2014 to October 2015, a total of 73 patients suffered with persistent or permanent AF ≥ 3 months were enrolled and followed up in this study. The basic characteristics, UCG and ECG results were collected for every patient who has undergone LAA occlusion with Watchman, LAmbre or Lefort device.

Patients were allowed for LAA occlusion if they were evaluated as follows: 1) non-valvular AF, 2) a history of previous bleeding, 3) high-risk of bleeding, 4) unable to be adherent with OACs, and 5) willing to accept the necessary follow-up, therapy and laboratory examinations. Before LAA occlusion was preformed, all the patients were evaluated by CHA_2DS_2 score and transesophageal echocardiography (TEE). Patients who were with left ventricular ejection fraction (LVEF) <30%, intracardiac thrombus or possible intracardiac thrombus formation, LAA diameter ≤12 mm or ≥30 mm, mitral valve stenosis (≤2 cm^2),were excluded. Each patient was followed up at 1, 6, and 12 months after discharge. The medical history was taken, as well as prescribed medications were evaluated by medical review. The institutional ethics committee of Shanghai Tenth People's Hospital approved the study, and all enrolled patients gave informed written consent to the study.

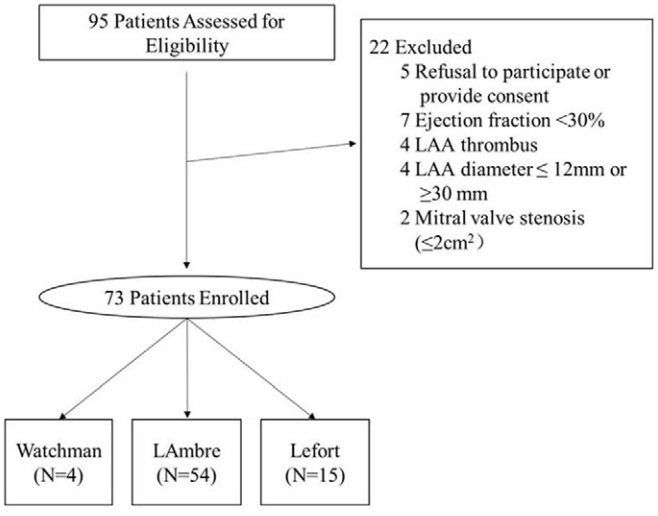

Fig. 2. Study flow diagram. LAA = left atrial appendage.

2.2. LAA occlusion device (Fig. 1)

2.2.1. Watchman device

The most common used technique for LAA occlusion in the world is Watchman (Boston Scientific, MA), which is designed in a special shape like a parachute and comprises a self-expanding Nitinol frame structure with fixation covered permeable polyester membrane on the atrial side that allows blooding flow into or out of the LAA that the thrombi cannot pass [11].

2.2.2. LAmbre device

LAmbre (Shenzhen Lifetech Scientific Company Limited, China), comprises an umbrella, cover and conveyor. The umbrella consists of multiple umbrellas and covered with the polyester membrane. Comparing with the Watchman and Amplatzer Cardiac Plug, the LAmbre system possesses relatively less sheath and allows for complete recapture and repositioning of the plant in the urgent situation [12].

Table 1
Demographic and baseline clinical characteristics of the study population according to type gender.

Variables	Total population (N = 73)	Male (N = 34)	Female (N = 39)	*p*
Age (years)	71.1 ± 9.1	70.32 ± 9.0	71.8 ± 9.1	0.406
SBP(mmHg)	133 ± 17	130 ± 14	136 ± 18	0.070
DBP(mmHg)	79 ± 13	76 ± 12	81 ± 14	0.053
persistent AF, n(%)	58(80)	27(79)	31(80)	0.364
CHF, n(%)	1 (1)	0(0)	1 (3)	0.347
Hypertension, n (%)	49(67)	21(62)	28(72)	0.363
Diabetes, n (%)	9 (12)	4 (12)	5 (13)	0.891
stroke/TIA, n (%)	44(60)	21(62)	23(59)	0.808
Hypercholesterolemia, n (%)	2 (3)	1 (3)	1 (3)	0.922
Warfarin, n (%)	18 (25)	7 (21)	11 (28)	0.451
Aspirin, n (%)	13 (18)	7 (21)	6 (15)	0.562
Clopidogrel, n (%)	5 (7)	2 (6)	3 (8)	0.760
Statins, n (%)	10 (14)	4 (12)	6 (15)	0.654
Nitrates, n (%)	3 (4)	1 (3)	2 (5)	0.639
Amiodarone, n (%)	6 (8)	2 (6)	4 (10)	0.497
ACEI/ARB, n (%)	36(49)	14(41)	22(56)	0.194
Beta-blocker, n (%)	11 (15)	4 (12)	7 (18)	0.461
Diuretics, n (%)	10 (14)	6 (18)	4 (10)	0.360
CCB, n (%)	16 (22)	7 (21)	9 (23)	0.798
digoxin, n (%)	5 (7)	1 (3)	4 (10)	0.217
$CHADS_2$ score	2.39 ± 1.28	2.29 ± 1.24	2.47 ± 1.35	0.321
Modified Rankin Scale	0.37 ± 0.87	0.42 ± 0.90	0.32 ± 0.84	0.259
NYHA	1.44 ± 0.73	1.30 ± 0.64	1.55 ± 0.80	0.282

SBP: systolic blood pressure, DBP: diastolic blood pressure, AF: atrial fibrillation, CHF: congestive heart failure, TIA: transient ischemic attack, ACEI: angiotensin-converting enzyme inhibitor, ARB: angiotensin receptor blocker, CCB: Calcium channel blockers, NYHA, New York Heart Association.