Clinics in Surgery

Review Article
Published: 24 Jun, 2021

Percutaneous Left Atrial Appendage Occlusion in the Prevention of Ischemic Stroke in Patients with Nonvalvular Atrial Fibrillation

Chen F and Wu G2*

[1]*Department of Neurology, Institute of Neurology, Ruijin Hospital/Lu Wan Branch, Shanghai Jiao Tong University School of Medicine, China*

[2]*Department of Cardiology, The First Affiliated Hospital of Wenzhou Medical University, China*

Abstract

Atrial fibrillation is a common type of arrhythmia, which can lead to vascular embolism and ischemic stroke in patients. Nonvalvular Atrial Fibrillation (NVAF) is the main type of Atrial Fibrillation (AF), and thrombosis is mainly found in the left atrial appendage. Left atrial appendage closure can effectively reduce the risk of thrombosis in the left atrial appendage entering cerebral circulation. The effectiveness of left atrial appendage closure still needs to be confirmed by high-quality clinical studies. In addition, the occlusives should be upgraded to meet clinical needs. Preoperative and postoperative procedures of left atrial appendage closure still need to be improved. This article reviews the progress in the prevention of ischemic stroke in patients with Nonvalvular Atrial Fibrillation (NVAF) by left atrial appendage closure, and gives main points remain to be solved and discussed for LAAC applications.

Keywords: Left atrial appendage occlusion; Atrial fibrillation; NVAF

Introduction

Atrial Fibrillation (AF) is a common arrhythmia, which can be divided into valvular AF and non-valvular AF according to the presence or absence of valvular lesions. AF causes irregular atrial contraction, leading to atrial blood stasis, and then the formation of thrombus. The thrombus that is easy to detach is easy to block the cerebrovascular, resulting in ischemic stroke. These conditions are more likely to occur in patients with non-valvular AF. Non-valvular AF accounts for approximately 75% of AF, and 90% of the thrombus is from the left atrial appendage. It has been reported that the risk of ischemic stroke in patients with NVAF is 2 to 7 times that of the normal population [1]. Therefore, it is very important to prevent ischemic stroke in patients with NVAF. Oral anticoagulants are the main strategy for the prevention of ischemic stroke, but it is difficult to be widely used due to limited patient compliance and many contraindications to this therapy [2]. Percutaneous Left Atrial Appendage Closure (LAAC) has recently been viewed as an effective alternative to anticoagulant therapy in some patients with non-valvular AF. LAAC can prevent the thrombus in the left atrial appendage from entering the blood circulation and reduce the risk of ischemic stroke [3]. However, there are concerns that the clinical trial evidence supporting the use of LAAC is limited and that the procedure has some problems that need to be improved [4]. This article reviews the research progress of LAAC in preventing ischemic stroke in patients with non-valvular AF, and gives main points remain to be solved and discussed for LAAC applications.

Effectiveness of LAAC in the prevention of ischemic stroke in patients with nonvalvular AF

LAAC by the American Heart Association/American College of Cardiology/Heart Rhythm Society guidelines identified for the management of patients with nonvalvular AF II b level recommendation, in 2018 China's diagnosis and treatment of AF guidelines also recommend LAAC applies to have contraindications to oral anticoagulants treatment for a long time, people at high risk for thromboembolic, anticoagulant drugs is still based on the patients with thromboembolic [5,6]. The safety of LAAC has been supported by a large number of literatures, but its superior efficacy over anticoagulants remains to be supported and verified by clinical studies. A RCT study, Project AF, showed that the LAAC group had lower incidence of stroke, cardiovascular death and embolism than the warfarin group [7]. However, in addition to a meta-analysis of another

OPEN ACCESS

Correspondence:
Chen F, Department of Neurology, Institute of Neurology, Ruijin Hospital/Lu Wan Branch, Shanghai Jiao Tong University School of Medicine, Shanghai 200025, China, Tel: +86-18806872981;
E-mail: cfz970119@sjtu.edu.cn

Received Date: *10 May 2021*
Accepted Date: *15 Jun 2021*
Published Date: *24 Jun 2021*

Citation:
Chen F, Wu G. Percutaneous Left Atrial Appendage Occlusion in the Prevention of Ischemic Stroke in Patients with Nonvalvular Atrial Fibrillation. Clin Surg. 2021; 6: 3227.

RCT study, patients receiving LAAC or oral warfarin did not have a significant difference in the incidence of final stroke or embolism. Patients receiving LAAC had significantly lower rates of hemorrhagic stroke, cardiovascular event/unexplained death, and higher rates of ischemic stroke compared with warfarin [8]. In addition, there have been no studies comparing LAAC with an anticoagulant that is safer and has a lower risk of hemorrhagic stroke than warfarin. To address these issues, Champion and Catalyst, two RCT studies that will include more than 5,000 people, will again compare LAAC with oral anticoagulants to provide a higher level of evidence.

Anatomical limitations restrain LAAC and occluder progression

The left atrial appendage is the residual accessory structure of the original left atrium in the embryonic period, located between the left superior pulmonary vein and the free wall of the left ventricle, with great variation in size, shape, direction and lobulation, leading to the fact that the left atrial appendage may not be effectively sealed by the occlusion device in practical operation. There are 20% to 40% LAAC surgeries without complete occlusion of the left atrial appendage, and limited data on the prognostic effect of incomplete LAAC. It has been reported that 10% to 20% of patients with incomplete occlusion will also suffer from ischemic stroke or embolism [9]. In the Project AF trial, no association between incomplete LAAC and subsequent ischemic events was observed, but this was most likely due to the short follow-up time and the low overall incidence of ischemic events in the cohort. In addition, several studies have documented the use of coils and other methods to close the incomplete leakage after LAAC due to anatomic variation, but there is still a lack of long-term efficacy data to confirm the effectiveness of these methods [10,11]. As for the limitation of LAAC caused by the anatomical variation of the left atrial appendage, the hope of solving the problem is to rely on more advanced equipment to make up for it. The newly developed LAMBRE LAAC device from Shenzhen Life tech has two designs to meet the requirements of single and multi-lobed left atrial appendage occlusion. In addition, the second generation Watchman FLX device enhanced the sealing ability of the plugging device, achieving complete plugging in 92.6% of the cohort of patients in the Pinnacle FLX trial [12]. However, multiple plug devices with different jacket shapes can introduce additional operational complexity and potential hazards to the LAAC. In summary, the ideal occluder should be easy to operate, not overly dependent on operator experience, and able to cope with structural variations in the left atrial appendage.

Intrusiveness and procedures of LAAC

In the past, intraoperative transesophageal ultrasound was used to monitor LAAC. In most cases, it is recommended that patients receive preoperative transesophageal ultrasound to observe the structure of the left atrial appendage and evaluate the occluder and its completions. It is also recommended that transesophageal ultrasound should be performed 45 days after surgery and 1 year after surgery to observe whether the thrombus and the device are completely occluded. But such complex and relatively invasive procedures are not well accepted in elderly or infirm patients. Therefore, some new methods have been proposed. Some studies have found that compared with transesophageal ultrasound, CT scan more accurately display the anatomical structure of the patient's left atrial appendage, thus supporting the wider use of CT for evaluation [13]. In addition, compared with transesophageal ultrasound, the incidence of intraoperative problems, duration of surgery, and hospitalization cost of LAAC of the two methods are similar, but the aerosol procedure is subtracted, which is more suitable for hospital health needs in the post-COVID-2019 epidemic era [14]. Considering that a significant number of patients receiving transcatheter aortic valve implantation, mitral valve repair, or pulmonary vein dissection have nonvalvular AF and often have relative contraindications to oral antithrombotic agents, the combination of these procedures with LAAC, where appropriate, may further reduce the burden and risk of repeat surgery and imaging studies in these patients [15]. Several studies are also being conducted abroad to assess the safety and effectiveness of the combined procedure.

Adjuvant anticoagulation therapy after LAAC

Some patients receiving LAAC have contraindications to long-term oral anticoagulants, and there is no consensus on whether to anticoagulant or the optimal anticoagulant treatment strategy after LAAC. The most commonly used anticoagulant strategies were aspirin and clopidogrel. Warfarin needs to be used at least 45 days after the plug is implanted, according to the Watchman manufacturer. Warfarin can be discontinued if follow-up imaging shows no major leaks around the device and no device-related clots. For patients who are contraindicated to oral anticoagulants, continuing or restarting anticoagulant therapy is inherently risky, which poses a major challenge in the clinical practice of LAAC. A European study showed that the use of antiplatelet agents after LAAC was not associated with adverse events [16]. The European Heart Rate Society and European Society for Percutaneous Cardiovascular Intervention 2019 expert consensus on left atrial appendage occlusion recommends that for patients with low bleeding risk, oral warfarin should be discontinued 45 days after LAAC and clopidogrel should be taken orally for another 6 months. Warfarin is not recommended for patients with high blood risk, and new oral anticoagulants can be considered [17]. In conclusion, adjuvant anticoagulant drugs after LAAC are still in urgent need of progress and guidance in clinical practice.

Conclusion

LAAC is an effective method to prevent ischemic stroke in patients with non-valvular AF, but there is a lack of large-sample, high-quality, prospective randomized controlled clinical trials to support the use of LAAC. Current randomized clinical trials are also insufficient to show that LAAC is more effective than oral warfarin. In addition, in the Project-AF and PREVAIL trials, patients who had contraindications to oral warfarin were excluded, and the guidelines directed patients with such a condition to receive LAAC, which resulted in a conflict between the clinical trial results and the guidelines [18]. Since LAAC is considered an alternative to oral anticoagulants, randomized controlled trials comparing LAAC with novel oral anticoagulants are urgently needed. In addition, due to the structural variation of the individual left atrial appendage, there is an urgent need for an occlusion device that can better meet the clinical needs. At the same time, the optimal time to start and stop oral anticoagulants after LAAC is still controversial and needs further study.

References

1. Plicht B, Konorza TF, Kahlert P, Al-Rashid F, Kaelsch H, Jánosi RA, et al. Risk factors for thrombus formation on the amplatzer cardiac plug after left atrial appendage occlusion. JACC Cardiovasc Interv. 2016;6(6):606-13.

2. Lane CE, Eleid MF, Holmes DR Jr. An under-recognized high-risk atrial fibrillation population: Analyzing transcatheter mitral valve repair patients

for left atrial appendage closure device application. Catheter Cardiovasc Interv. 2019;94(2):274-79.

3. Holmes DR Jr, Alkhouli M, Reddy V. Left atrial appendage occlusion for the unmet clinical needs of stroke prevention in nonvalvular atrial fibrillation. Mayo Clin Proc. 2019;94(5):864-74.

4. Khan SU, Khan MZ, Alkhouli M. Reader's comments: Trends in the utilization of left atrial appendage exclusion in the United States. Am J Cardiol. 2020;126:106-107.

5. January CT, Wann LS, Calkins H, Chen LY, Cigarroa JE, Cleveland Jr JC, et al. 2019 AHA/ACC/HRS focused update of the 2014 aha/acc/hrs guideline for the management of patients with atrial fibrillation: A Report of the American college of cardiology/American heart association task force on clinical practice guidelines and the heart rhythm society in collaboration with the society of thoracic surgeons. Circulation. 2019;140(2):e125-e151.

6. Reddy VY, Doshi SK, Kar S, Gibson DN, Price MJ, Huber K, et al. 5-Year outcomes after left atrial appendage closure: From the PREVAIL and PROTECT AF Trials. J Am Coll Cardiol. 2017;70(24):2964-75.

7. Holmes DR, Reddy VY, Turi ZG, Doshi SK, Sievert H, Buchbinder M, et al. Percutaneous closure of the left atrial appendage versus warfarin therapy for prevention of stroke in patients with atrial fibrillation: A randomized non-inferiority trial. Lancet. 2009;374(9689):534-42.

8. Holmes DR Jr, Doshi SK, Kar S, Price MJ, Sanchez JM, Sievert H, et al. Left atrial appendage closure as an alternative to warfarin for stroke prevention in atrial fibrillation: A patient-level meta-analysis. J Am Coll Cardiol. 2015;65(24):2614-23.

9. Kanderian AS, Gillinov AM, Pettersson GB, Blackstone E, Klein AL. Success of surgical left atrial appendage closure: Assessment by transesophageal echocardiography. J Am Coll Cardiol. 2008;52(11):924-9.

10. Viles-Gonzalez JF, Kar S, Douglas P, Srinivas D, Feldman T, Horton R, et al. The clinical impact of incomplete left atrial appendage closure with the Watchman Device in patients with atrial fibrillation: A PROTECT AF (Percutaneous closure of the left atrial appendage versus warfarin therapy for prevention of stroke in patients with atrial fibrillation) substudy. J Am Coll Cardiol. 2012;59(10):923-9.

11. Alkhouli M. Management of peridevice leak after laao: Coils, plugs, occluders, or better understanding of the problem. JACC Cardiovasc Interv. 2020;13(3):320-22.

12. Alkhouli M, Holmes DR. Remaining challenges with transcatheter left atrial appendage closure. Mayo Clin Proc. 2020;95(10):2244-48.

13. Korsholm K, Berti S, Iriart X, Saw J, Dee Wang D, Coche H, et al. Expert recommendations on cardiac computed tomography for planning transcatheter left atrial appendage occlusion. JACC Cardiovasc Interv. 2020;13(3):277-92.

14. Alkhouli M, Chaker Z, Alqahtani F, Raslan S, Raybuck B. Outcomes of routine intracardiac echocardiography to guide left atrial appendage occlusion. JACC Clin Electrophysiol. 2020;6(4):393-400.

15. Krishnaswamy A, Wazni O, Kapadia SR. Left atrial appendage occlusion for patients with transcatheter aortic valve replacement, mitraclip, percutaneous coronary intervention, and ablation for atrial fibrillation: Optimizing long-term patient outcomes. Card Electrophysiol Clin. 2020;12(1):117-24.

16. Asmarats L, Rodés-Cabau J. Percutaneous left atrial appendage closure: Current devices and clinical outcomes. Circ Cardiovasc Interv. 2017;10(11):e005359.

17. Glikson M, Wolff R, Hindricks G, Mandrola J, Camm AJ, Lip GYH, et al. EHRA/EAPCI expert consensus statement on catheter-based left atrial appendage occlusion - an update. Euro pace. 2019;euz258.

18. Holmes DR Jr, Kar S, Price MJ, Whisenant B, Sievert H, Doshi SK, et al. Prospective randomized evaluation of the watchman left atrial appendage closure device in patients with atrial fibrillation versus long-term warfarin therapy: The PREVAIL trial. J Am Coll Cardiol. 2014;64(1):1-12.