Approaches to Left Atrial Appendage Exclusion

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Atrial fibrillation (AF) is the most common cardiac arrhythmia and is associated with a substantial risk of stroke and mortality. Strokes in patients with AF are associated with a greater disability and poorer outcomes than strokes in patients in sinus rhythm. Patients with AF are at increased risk of bleeding, especially if they use anticoagulant therapy. Recent research in the field of anticoagulation has led to development of new anticoagulants for stroke prevention in addition to antiplatelet agents and warfarin. This review discusses the role of AF as a risk factor for stroke and evaluates the role of various schemes for predicting the risk of stroke and bleeding in patients with AF.

The left atrial appendage (LAA) is a long tubular structure that opens into the left atrium. In patients with atrial fibrillation, the LAA develops mechanical dysfunction and fibroelastotic changes on the endocardial surface. The complex anatomy of the LAA makes it a good site for relative blood stasis. In addition, systemic factors exacerbate the hypercoagulable state, eventually resulting in endothelial dysfunction, release of tissue factor, and production of inflammatory cytokines and oxidative free radicals, and eventually initiating the coagulation cascade. Thus, the LAA is susceptible to thrombus formation and is the most common source of systemic thromboembolism.

Left atrial appendage (LAA) is the source of most systemic emboli in patients with atrial fibrillation. Oral anticoagulant therapy reduces stroke risk by two-thirds. New oral agents have advantages over warfarin but are associated with bleeding and drug intolerance. Device therapy for atrial appendage ligation or occlusion is an alternative to drug therapy, without the cumulative incidence of bleeding or the need for anticoagulation. In the more than half century since the early reports of surgical LAA excision, the author has added considerable detail to our understanding of the rationale for LAA exclusion, which constitutes the subject of this article.

Left atrial appendage closure with transcatheter-delivered devices is an evolving story of compelling randomized data and the potential to dramatically reduce the incidence of stroke and improve the quality of life among patients with atrial fibrillation. Oral anticoagulation is the standard of care for stroke prevention.
in atrial fibrillation but falls short of providing an adequate solution to this common threat when considered from efficacy and safety perspectives. The robust series of Watchman device trials has demonstrated the Watchman device to provide stroke prevention efficacy similar to that of warfarin and by extension provides proof of concept of LAA closure.

Catheter-based Epicardial Closure of the Left Atrial Appendage
Francesco Santoro, Luigi Di Biase, Pasquale Santangeli, Rong Bai, Stephan Danik, Conor Barrett, Rodney Horton, J. David Burkhardt, and Andrea Natale

This article reviews novel techniques in stroke prevention based on epicardial closure of the left atrial appendage, illustrating the features of the first endo-epicardial device currently available and those of devices still in development. It also provides further information about early clinical experience with the endo-epicardial device.

Managing the Left Atrial Appendage in the Era of Minimally Invasive Surgery
Alessandro Montecalvo and Ralph J. Damiano Jr

Videos of stapler resection of the left atrial appendage through the left thoracotomy and of the AtriClip Gillinov-Cosgrove atrial exclusion device accompany this article

Atrial fibrillation (AF) is the most prevalent arrhythmia encountered in clinical practice with greater than 2.2 million people in the United States being affected. Oral anticoagulant therapy has been used to reduce risk of stroke in patients with nonvalvular AF who are at a high risk of thromboembolism. Alternative treatment strategies to prevent thromboembolism have been tested in patients with AF. This article examines the history of left atrial appendage occlusion and the efficacy of the various surgical techniques and provides a brief overview of the minimally invasive surgical strategy adopted to manage the left atrial appendage.

Device- and LAA-Specific Characteristics for Successful LAA Closure: Tips and Tricks
Wen-Loong Yeow and Saibal Kar

Transcatheter left atrial appendage closure for stroke prevention with nonvalvular atrial fibrillation is an emerging alternative to oral anticoagulation. Several devices and approaches have been developed to achieve optimal closure. This article describes in detail the key procedural steps and the tips and tricks required to succeed in this transcatheter technique. The 4 devices covered are the WATCHMAN, AMPLATZER Cardiac Plug, Coherex WaveCrest generation 1.3, and the LARIAT suture delivery device.

Role of Transesophageal Echocardiography in Left Atrial Appendage Device Closure
David M. Dudzinski, Shmuel Schwartzengberg, Gaurav A. Upadhyay, and Judy Hung

Left atrial appendage (LAA) occlusion or ligation by percutaneously implanted devices is increasingly an alternative management option for atrial fibrillation, particularly for patients who are intolerant or have contraindications for anticoagulation. Echocardiography plays an important part in screening, guidance of implantation, and after-device assessment. Assessment of LAA anatomy suitable for device implantation, thrombus exclusion, guidance of transseptal puncture, localization of catheter, guidance of device deployment, and after-device assessment are all important functions of echocardiography. This article reviews the role of echocardiography in device-based LAA occlusion or ligation.
Pericardial Access for LARIAT Left Atrial Appendage Closure
Miguel Valderrábano

Anterior pericardial puncture requires intimate knowledge of the mediastinal anatomy and careful review of the individual anatomic characteristics of each patient. Familiarity with the procedure’s anatomic foundations and with the basic principles of each procedural step are critical, but once this is achieved, the procedure is safe and, in most cases, preferable to a standard inferior puncture. An uncomplicated and properly placed pericardial puncture is the basis of a successful of LARIAT suture delivery device procedure. Operators must master the intricacies of the anterior pericardial puncture before embarking on LARIAT left atrial appendage ligation.

Clinical Results with Percutaneous Left Atrial Appendage Occlusion
Zoltan G. Turi

Closure of the left atrial appendage (LAA) in patients with non-valvular atrial fibrillation is associated with reduction in embolic events. There is an initial hazard associated with closure methodologies; once successful closure is achieved, the results appear to be superior to those of anticoagulation. The evidence base is largely limited to the safety and efficacy of LAA occlusion in patients who are candidates for anticoagulation as well, and the risk/benefit ratio of competing closure technologies has not been determined. LAA occlusion plus antiplatelet therapy seems to have an acceptable therapeutic and safety profile.

Prevention and Management of Complications of Left Atrial Appendage Closure Devices
Matthew J. Price

Atrial fibrillation is associated with an ongoing risk of thromboembolic stroke and systemic embolism due to stasis and thrombus formation within the left atrial appendage (LAA). Transcatheter occlusion or ligation of the LAA represents a potential paradigm shift in the management of stroke prevention in at-risk patients with atrial fibrillation. This review summarizes the types and rates of procedural complications that have been observed with LAA occlusion and ligation; describes strategies that can be implemented to minimize these complications; and discusses management approaches that may limit the impact of these complications on long-term morbidity.

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Preface

Approaches to Left Atrial Appendage Exclusion

Atrial fibrillation is currently the most prevalent arrhythmia in the United States, and its prevalence is projected to increase significantly. The most severe consequence of atrial fibrillation is cardioembolic stroke. The mainstay of the prevention of stroke has been warfarin therapy. However, due to the difficulty of maintaining adequate anticoagulation levels, multiple interactions with food and other medications, and the risk of bleeding events, alternative therapies have been established. Despite the development of newer oral anticoagulation agents, problems with side effects, compliance, and bleeding still occur.

The left atrial appendage is a prominent source of cardioembolic stroke in patients with nonvalvular atrial fibrillation. This issue of Interventional Cardiology Clinics is dedicated to the role of catheter-based left atrial closure for the treatment of patients with nonvalvular atrial fibrillation who are at risk for cardioembolic events. Articles in this issue provide an overview of the magnitude of the problem of stroke in patients with atrial fibrillation, the role of the left atrial appendage in thrombus formation, and the rationale for exclusion of the left atrial appendage with devices. Different approaches for excluding the left atrial appendage, tips and tricks for successful left atrial appendage exclusion, and review of the clinical evidence for percutaneous left atrial appendage exclusion are discussed. Special attention is paid to the use of transesophageal echocardiography and how to obtain pericardial access as part of the procedure in performing left atrial appendage closure. Finally, a section is dedicated to prevention and management of complications.

The editors would like to thank all the authors who contributed to this comprehensive overview of device therapy for left atrial appendage exclusion.

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Stroke and Bleeding Risks in Patients with Atrial Fibrillation

Abhishek Maan, MD, Jeremy N. Ruskin, MD, E. Kevin Heist, MD, PhD*

INTRODUCTION

AF is the most common cardiac arrhythmia encountered in clinical practice.1 The presence of this arrhythmia is an independent risk factor for stroke/thromboembolism and death, with an estimated 5-fold higher risk.2,3 Anticoagulation with OACs and antiplatelet agents is the mainstay for stroke prophylaxis in patients with AF. A meta-analysis by Hart and colleagues4 demonstrated that dose-adjusted warfarin resulted in 64% reduction of stroke and a 26% reduction in all-cause mortality compared with placebo, and antiplatelet therapy resulted in 22% reduction in stroke with no significant reduction in mortality. Recent conclusion of major clinical trials has led to the Food and Drug Administration approval of newer OACs, which has expanded the armamentarium of anticoagulation options for stroke prophylaxis in patients with AF.

Stoke risk is closely related to bleeding risk in AF patients.5 Many risk factors for thromboembolism, such as advanced age, uncontrolled hypertension, ischemic heart disease, and cerebrovascular disease, have also been identified as risk factors for bleeding.6,7 Bleeding risk is especially higher with the use of vitamin K antagonists (VKAs) due to their narrow therapeutic window and drug-drug and drug-food interactions.8 This article reviews the risk of stroke and various risk-prediction schemes to predict stroke risk and bleeding complications in patients with AF and evaluates the role of OACs and antiplatelet agents for stroke prevention.

KEY POINTS

- Atrial fibrillation (AF) is associated with a substantially increased risk of thromboembolic stroke.
- Antiplatelet agents have some effect in reducing the stroke risk associated with AF but are less effective than anticoagulants, such as warfarin, in this regard.
- Newer oral anticoagulants (OACs)—dabigatran, rivaroxaban, and apixaban—are at least as effective as warfarin in reducing AF-associated stroke.
- Anticoagulants used for stroke prevention in AF cause an increased risk of bleeding. Scoring systems are available to better estimate an individual patient’s bleeding risk.

KEYWORDS

- Atrial fibrillation • Anticoagulant therapy • Stroke

INTRODUCTIONS

AF is the most common cardiac arrhythmia encountered in clinical practice.1 The presence of this arrhythmia is an independent risk factor for stroke/thromboembolism and death, with an estimated 5-fold higher risk.2,3 Anticoagulation with OACs and antiplatelet agents is the mainstay for stroke prophylaxis in patients with AF. A meta-analysis by Hart and colleagues4 demonstrated that dose-adjusted warfarin resulted in 64% reduction of stroke and a 26% reduction in all-cause mortality compared with placebo, and antiplatelet therapy resulted in 22% reduction in stroke with no significant reduction in mortality. Recent conclusion of major clinical trials has led to the Food and Drug Administration approval of newer OACs, which has expanded the armamentarium of anticoagulation options for stroke prophylaxis in patients with AF.

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Dr E.K. Heist is the senior author in this article.

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