Atrial fibrillation (AF) is the most common type of cardiac arrhythmia which affects 33 million individuals worldwide.\[1\] It is associated with many adverse outcomes, including stroke, dementia, heart failure (HF), and mortality.\[2\] Based on a growing body of evidence illustrating its efficacy and safety, catheter ablation (CA) has become an important treatment strategy for symptomatic AF.\[3\] Most centers have progressively moved from performing paroxysmal AF to more complex long-standing persistent AF or patients with more comorbidities.

**Indications and Patient Selection**

Multiple clinical trials have established the superiority of CA over antiarrhythmic drug therapy (AAD) for the maintenance of sinus rhythm and improvement of quality of life. The European Society of Cardiology (ESC) and the American Heart Association/American College of Cardiology/Heart Rhythm Society guidelines both recommend CA in patients with symptomatic recurrences of AF on AAD therapy (I, A for paroxysmal; IIa, C for persistent).\[2,4\] Several studies even support that CA might be used as a first-line rhythm control strategy before the use AAD.\[5,6\] However, the effectiveness of CA is less well established for patients with long-standing persistent AF.\[7\]

Assessment of CA for appropriate AF patients depends on multiple variables including AF type, left atrial (LA) size, the severity of symptoms, the presence of associated cardiovascular disease, and patient preference. Although with higher risk of AF recurrence and adverse events, the benefits of CA could extend to a wide range of patients such as elderly or patients with structural heart disease. Several retrospective cohort studies demonstrated that CA was safe and effective in maintaining sinus rhythm for elderly patients and associated with lower mortality and stroke risks.\[8,9\]

The recent trial (AATAC-AF study) randomized patients with persistent AF and HF to AF ablation or treatment with amiodarone. The results showed that CA was more effective than amiodarone in preventing recurrent AF and was associated with a lower rate of hospitalization and mortality.\[10\] The results of these studies suggest that CA of AF is safe and effective in elderly and patients with HF. However, robust data from larger sample size and longer follow-up studies are still needed to further clarify the benefits and risks of CA for these patients.

The assessment of atrial fibrosis is a promising method for patient selection.\[11\] The feasibility of delayed-enhancement magnetic resonance imaging (DE-MRI) to provide a noninvasive means of assessing LA myocardial tissue in AF patients has recently been demonstrated. Using DE-MRI, Marrouche et al.\[12\] categorized the degree of atrial fibrosis into four stages (Utah I–IV) and reported that patients with a greater extent of delayed enhancement in the LA wall might suffer much higher recurrence rates after pulmonary vein isolation for AF. They proposed a scheme based on DE-MRI for personalized treatment of AF which recommended medical management instead of CA for patients with Utah IV.\[13\]

**Outcomes**

An important unanswered question regarding AF ablation is whether it improves survival and the long-term risk of
stroke. A number of retrospective studies with limited sample size have investigated whether CA affects the prognosis of AF. A propensity-matched analysis of medically treated and ablated patients from the US Market Scan Research Database Data (801 pairs matched) confirmed that CA was associated with a reduced risk of stroke/TIA compared with the control group (hazard ratio [HR]: 0.62, 95% confidential interval [CI]: 0.44–0.86).[14] Data from Swedish health registries[15] showed that CA was associated with lower risk of ischemic stroke (HR: 0.69, 95% CI: 0.51–0.93) and with lower mortality risk (HR: 0.50, 95% CI: 0.37–0.62). Ongoing large randomized clinical trials, such as Catheter Ablation vs. Anti-arrhythmic Drug Therapy for Atrial Fibrillation Trial (NCT00911508) and Early Therapy of Atrial Fibrillation for Stroke Prevention Trial (NCT01288352), will provide new insights and establish whether AF ablation provides a significant reduction in stroke, death, and HF compared with standard management.

**Complications**

Although AF ablation is generally effective and safe, it is associated with a variety of complications. In the second worldwide survey by Cappato et al.,[16] complications have been observed in 4.5% of patients undergone AF ablation. The most serious complications of ablation for AF are cardiac tamponade, stroke, pulmonary vein stenosis, phrenic nerve paralysis, and atrioesophageal fistula.[17] However, the risk of death is acceptable with an overall mortality rate of approximately 1 per 1000.[18] The recent data from ESC-EHRA AF ablation long-term registry showed that in-hospital complications occurred in 7.8% and only one patient died due to an atrioesophageal fistula.[19] There was a significant association between operator and hospital volume on adverse outcomes. Annual operator (<25 procedures) and hospital volume (<50 procedures) were significantly associated with complications.[20] A reduction in complications rates could be expected with improvement of ablation technique and operator experience.

**Safety Improvement Initiative for Atrial Fibrillation Ablation**

With the rapid development of CA in China, the number of AF ablation performed in China has increasing from 11 cases in 1998 to more than 30,000 cases in 2016. The next critical step in future is continuous quality improvement of AF ablation in our country. The Chinese Heart Rhythm Society (CHRS) put forward the “AF catheter ablation safety improvement initiative,” and put “Restore normal rhythm with doubled safety” as this year’s conference theme for CHRS 2017. Starting in July 2017, the initiative will compare AF ablation-related complication rates between 2017 and 2022, by conducting rigorously designed sample survey in different levels of hospitals across the country. More than half of AF ablation-related severe complications, including death, stroke, cardiac tamponade in need of drainage or surgical treatment, LA-esophageal fistula in need of surgical treatment, are expected to be prevented by the end of the periods.

To achieve the goal, a systematic project is needed: (1) Take all possible measures to strengthen education and help to embed safety concept into every aspect of AF ablation management. (2) Establish a new highly efficient web-based training platform to provide content-rich training courses (including detailed interpretation of guidelines and technical maneuvers, and more than a thousand teaching cases) and to enable daily live operation demonstration from large-scale AF center, 24-h real-time video consultation between large-scale centers and general centers. (3) Establish multidisciplinary thoracic surgery teams, including cardiologists, cardiac surgeons, anesthetists, cardiopulmonary bypass professionals, to help complete emergency thoracotomy within 1 h after severe AF ablation complications. (4) Establish AF CA safety and quality assessment system. All hospitals and doctors are encouraged to get involved in the system, and safety performance will be evaluated and compared monthly with timely feedback to hospitals and doctors in the system.

**Summary**

CA has become a cornerstone in the management of AF. As new strategies and technologies are implemented to improve the success rates, prevention of complications will be the pivotal issue of this procedure. “AF catheter ablation safety improvement initiative” proposed by CHRS will provide continuous quality improvement of AF ablation in the future.

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