Benefits and risks of catheter ablation in elderly patients with atrial fibrillation

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BACKGROUND The benefits of catheter ablation for elderly patients with atrial fibrillation (AF) with respect to mortality and stroke reductions remain unclear.

OBJECTIVE The purpose of this study was to evaluate the safety and efficacy, including long-term outcomes, of catheter ablation for maintaining normal sinus rhythm (NSR) in elderly patients with AF.

METHODS We evaluated 587 elderly patients (age ≥75 years) with AF. Of the 324 who were eligible for ablation, 261 (group 1) underwent ablation guided by complex fractionated atrial electrogram. The remaining 63 patients (group 2) either declined or were not suitable for ablation. The end-points were NSR, stroke, death, and major bleeding.

RESULTS Two hundred sixteen patients (83%) remained in NSR compared to only 14 group 2 patients (22%; mean follow-up 3 ± 2.5 years, $P < .001$). The 1- and 5-year survival rates for group 1 with NSR, group 1 with AF, and group 2 patients were 98% and 87%, 86% and 52%, and 97% and 42%, respectively ($P < .0001$). NSR was an independent favorable parameter for survival (hazard ratio [HR] 0.36; 95% CI, 0.02-0.63, $p = 0.0005$), whereas older age (HR 1.09, 95% CI 1.01–1.16, $P = .02$) and depressed ejection fraction <40% (HR 2.38, 95% CI 1.28–4.4, $P = .006$) were unfavorable. Warfarin therapy was discontinued in 169 of the 216 group 1 patients (78%) who maintained NSR and had only 3% 5-year stroke/bleeding rates compared to 16% in group 2 ($P < .001$).

CONCLUSION Elderly patients with AF benefit from AF ablation, which is safe and effective in maintaining sinus rhythm and is associated with lower mortality and stroke risks.

KEYWORDS Fibrillation; Ablation; Atrial flutter; Stroke; Anticoagulation

ABBREVIATIONS **AF** = atrial fibrillation; **AT** = atrial tachycardia; **CFAE** = complex fractionated atrial electrogram; **CI** = confidence interval; **EF** = ejection fraction; **HR** = hazard ratio; **IH** = intracranial hemorrhage; **INR** = international normalized ratio; **IS** = ischemic stroke; **LA** = left atrium; **NSR** = normal sinus rhythm; **PVI** = pulmonary vein isolation; **RF** = radiofrequency; **TIA** = transient ischemic attack

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Introduction

As the elderly population (age ≥75 years) grows, so does the burden of treating elderly patients with atrial fibrillation (AF).[1–3] Physicians have long known that treating such patients is a difficult task because AF is associated with increases in mortality and morbidity, especially stroke and thromboembolic risks in the elderly.[2,3] Treating the elderly with AF remains a major therapeutic challenge for physicians because antiarrhythmic drugs are not effective, and they pose significant risks.[4,5] Although anticoagulation with warfarin has proved to be effective in preventing ischemic stroke in this population, it also imposes a significant risk of major bleeding complications, especially intracranial hemorrhage [IH].[6,7]

Catheter ablation has recently emerged as an important therapeutic alternative to maintain normal sinus rhythm (NSR) in patients with AF.[8–11] However, the benefit of catheter ablation in elderly patients with AF has not been clearly elucidated. The objective of this observational study was to evaluate the safety and efficacy of catheter ablation for maintaining NSR in elderly patients with AF, as well as to evaluate the long-term clinical outcomes after ablation.

Methods

Study design

Our study is a retrospective analysis of prospectively collected data, which consisted of patients who were ≥75

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years old with symptomatic AF. Exclusion criteria were patients who were mentally unstable; who had alcoholism, myocardial infarction within 1 month of the study, terminal disease, or left atrial (LA) thrombus; who could not commit to participate in scheduled outpatient follow-up; or who preferred recently approved new anticoagulation drugs because of the small sample size and short follow-up period. All patients signed informed consent, which was approved by the Institutional Review Board.

Mapping and ablation of AF

After stopping antiarrhythmic drugs for 5 half-lives or after 3 months with amiodarone, the patients underwent non-fluoroscopic electroanatomic mapping with the CARTO system (Biosense Webster Inc, Diamond Bar, CA) as previously described.[9]

All maps were created during AF and associated atrial anatomy with complex fractionated atrial electrogram (CFAE) areas. Targeting these CFAE areas, radiofrequency (RF) ablations were delivered until AF was converted to NSR or all CFAE areas were ablated. When areas with CFAE were completely eliminated but the atrial arrhythmias (organized atrial flutter or atrial tachycardia [AT]) persisted, they were subsequently mapped and ablated (occasionally in conjunction with ibutilide 1–2 mg intravenously over 10–20 minutes). If the arrhythmias were not successfully reverted to NSR, external cardioversion was performed.

RF applications were delivered with a maximal temperature of 55°C to 60°C at the catheter tip (4-mm and 8-mm NaviStar catheters). The 4-mm and 8-mm NaviStar catheters were used until February 2006, when an irrigated-tip NaviStar catheter became available. Since then, we exclusively used the latter catheter for AF ablation. RF energy was delivered in the range between 20 and 50 W for 60 seconds, with maximal temperature at 43°C; however, at the posterior wall, RF was limited to maximal power of 35 W for only 20 seconds.

Clinical end-points

The primary end-points were maintenance of NSR, stroke or transient ischemic attack (TIA), major bleeding, systemic emboli, and all-cause mortality. All patients were followed up in our arrhythmia clinic every 3 months. For patients who had no implantable device, clinical success of ablation was determined based on patient clinical symptoms in conjunction with follow-up ECG every 3 months, 3-week continuous ECG monitoring before discontinuation of warfarin at 3 months after ablation and yearly thereafter unless the patient had recurrent symptoms, in which case continuous monitoring was commenced. The "blanking period" for arrhythmia recurrence assessment was 3 months from the date of the last ablation.

For patients with implanted devices in our study, assessment of AT/AF burden could be performed accurately and continuously. AT/AF burden was defined as the total duration of all spontaneous AT/AF episodes divided by the corresponding follow-up time. Device follow-up time was the time between device interrogations that occurred on consecutive follow-up visits.

Anticoagulation management

Anticoagulation management for our patients has changed over time. From 2001 to 2007, patients were treated with warfarin to maintain an international normalized ratio (INR) between 2 and 3 for at least 3 weeks before the ablation, as well as postablation. Warfarin was discontinued 4 days before the ablation. Patients with persistent or permanent AF were given enoxaparin sodium 1 mg/kg subcutaneously every 12 hours before the ablation. Both warfarin and enoxaparin were restarted immediately after the procedure, but enoxaparin was discontinued 3 days later.

At the beginning of 2008, we changed our approach to non-stopped anticoagulation and continued oral warfarin (INR 2–3). Heparin was also used during the procedure, with the aim of keeping the activated clotting time between 300 and 350 seconds.

If the patient remained in NSR 3 months after ablation, warfarin was discontinued, and aspirin, clopidogrel, or both were arbitrarily and immediately prescribed. Patients who developed recurrent AT/AF were restarted on warfarin if their clinical recurrent AT/AF episodes lasted longer than 12 hours or their estimated cumulative AF duration of all episodes averaged over the preceding 3 months was >60 minutes per day. The rationale for using a 12-hour or more duration of AF as a cutoff to resume warfarin treatment was based on our previous studies involving high-risk AF patients.[11]

The outcomes of the ablations, based on device interrogation, were classified as follows. AT/AF response I (Online Supplemental Figure 1) was defined as total suppression of AT/AF ($\leq 1\%$ AT/AF burden/day). AT/AF response II (Online Supplemental Figure 2) was defined as partial suppression (1%–5% AT/AF burden per day and <12-hour duration in any given episode. AT/AF response III (Online Supplemental Figure 3) was defined as insufficient suppression ($>5\%$ AT/AF burden per day or ≥ 12 hours in any given episode).

Statistical and data analysis

Data are reported as mean and standard deviation (SD) for continuous variables and as proportion (%) for categorical variables. Median and quartiles are presented for skewed data. Characteristics of patients were compared using the Student t test or Mann–Whitney test for continuous variables, and the Fisher exact test or χ^2 test for categorical data where applicable. Kaplan–Meier analysis was used to assess patient mortality, stroke rates, and major event end-points among different stratified groups. The estimates were evaluated with the log-rank test. Multivariate analysis of influences of factors, including NSR, congestive heart failure, hypertension, ejection fraction (EF) $\leq 40\%$, and female gender, were performed using Cox proportional hazards