

Does periprocedural anticoagulation management of atrial fibrillation affect the prevalence of silent thromboembolic lesion detected by diffusion cerebral magnetic resonance imaging in patients undergoing radiofrequency atrial fibrillation ablation with open irrigated catheters? Results from a prospective multicenter study

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BACKGROUND Silent cerebral ischemia (SCI) has been reported in 14% of cases after catheter ablation of atrial fibrillation (AF) with radiofrequency (RF) energy and discontinuation of warfarin before AF ablation procedures.

OBJECTIVE The purpose of this study was to determine whether periprocedural anticoagulation management affects the incidence of SCI after RF ablation using an open irrigated catheter.

METHODS Consecutive patients undergoing RF ablation for AF without warfarin discontinuation and receiving heparin bolus before

transseptal catheterization (group I, n = 146) were compared with a group of patients who had protocol deviation in terms of maintaining the therapeutic preprocedural international normalized ratio (patients with subtherapeutic INR) and/or failure to receive pretransseptal heparin bolus infusion and/or ≥ 2 consecutive ACT measurements < 300 seconds (noncompliant population, group II, n = 134) and with a group of patients undergoing RF ablation with warfarin discontinuation bridged with low molecular weight heparin (group III, n = 148). All patients underwent preablation and postablation (within 48 hours) diffusion magnetic resonance imaging.

RESULTS SCI was detected in 2% of patients (3/146) in group I, 7% (10/134) in group II, and 14% (21/148) in group III ($P < .001$). "Therapeutic INR" was strongly associated with a lower prevalence of postprocedural silent cerebral ischemia (SCI). Multivariable analysis demonstrated nonparoxysmal AF (odds ratio 3.8, 95% confidence interval 1.5–9.7, $P = .005$) and noncompliance to protocol (odds ratio 2.8, 95% confidence interval 1.5–5.1, $P < .001$) to be significant predictors of ischemic events.

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CONCLUSION Strict adherence to an anticoagulation protocol significantly reduces the prevalence of SCI after catheter ablation of AF with RF energy.

KEYWORDS Atrial fibrillation; Ablation; Radiofrequency; Stroke; Silent cerebral ischemia; Warfarin; Periprocedural

ABBREVIATIONS **ACT** = activated clotting time; **AF** = atrial fibrillation; **CA** = catheter ablation; **CI** = confidence interval;

dMRI = diffusion magnetic resonance imaging; **INR** = international normalized ratio; **IU** = international unit; **LA** = left atrium; **NPAF** = nonparoxysmal atrial fibrillation; **OR** = odds ratio; **PAF** = paroxysmal atrial fibrillation; **PV** = pulmonary vein; **RF** = radiofrequency; **RFCA** = radiofrequency catheter ablation; **SCI** = silent cerebral ischemia; **TIA** = transient ischemic attack

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Introduction

Atrial fibrillation (AF) is the most frequent supraventricular arrhythmia and has been associated with an increased risk of death, stroke, and hospitalization.^{1–5} Radiofrequency (RF) catheter ablation (CA) has proven to be an effective treatment strategy for AF.⁶ However, the ablation procedure itself is associated with a potential risk for iatrogenic periprocedural stroke.^{6–10} Advancements in ablation catheters and strategies and improvements in periprocedural anticoagulation management have reduced such complications and have also improved the procedural success.^{6–10} Nevertheless, because of the invasive and complex nature of CA, the incidence of thromboembolic events in ablation cases is still 1% to 5% (depending on ablation catheter used, anticoagulation strategy in the periprocedural period, and type of patients included in the study).^{10,11}

In addition to stroke/transient ischemic attack (TIA), silent cerebral ischemia (SCI) represents an emerging complication of CA.¹² Therefore, stroke and TIA may represent only the tip of the iceberg.^{7,8,10,11} Gaita et al¹² performed diffusion magnetic resonance imaging (dMRI) before and after RFCA. They demonstrated that SCI was more prevalent than clinical periprocedural thromboembolic events, reporting a SCI prevalence of up to 14%. Furthermore, a significant correlation between SCI and reduced cognitive performance has recently been reported.¹³ Although the effects of symptomatic stroke are notably dramatic for patients, SCI also is worrisome because it significantly increases the likelihood of further cerebral damage in a patient population that already is at higher risk for cerebral embolism and dementia.^{5,14} This implication is notable for physicians because patients undergoing RFCA procedures will undergo repeat ablations in 30% to 50% of cases, raising the possibility for cumulative damage.¹⁵ The energy source and ablation technology used seem to influence the prevalence of SCI, which is as high as 38% in some cases.^{12,16–22}

Periprocedural thromboembolic complications potentially could be prevented by making adjustments to the management of anticoagulation before and after CA.^{10,11} At present, data on treatment of SCI using any energy source or technology have been reported for periprocedural anticoagulation management that includes warfarin discontinuation before the procedure and a “bridge” with low molecular weight heparin 3 to 5 days before the procedure and then restart with warfarin after the procedure.^{12,16–22} The role of

periprocedural anticoagulation management in SCI prevention has not been widely investigated. Because stroke and TIA rates during AF ablation have been dramatically reduced with the performance of CA for AF without warfarin discontinuation,^{10,11} we sought to assess whether strict periprocedural anticoagulation management could affect the prevalence of SCI after RFCA using open irrigated catheters.

Methods

Consecutive patients undergoing RFCA for symptomatic and drug-refractory AF and under “therapeutic” warfarin were included in this prospective multicenter study. All patients included in the study were matched with a control population of consecutive patients undergoing RFCA in the same time period at each enrolling institution but with warfarin discontinuation before CA that was bridged with low molecular weight heparin.¹⁰ Anticoagulation treatment before ablation was decided by the treating electrophysiologist based on his or her preference. The definitions of AF followed those of the American Heart Association and the Heart Rhythm Society.²³

All patients underwent preablation and postablation (within 48 hours) dMRI. Exclusion criteria were age <18 years or >80 years, valvular heart disease with surgical indication, acute coronary syndrome <3 months, or other contraindications to dMRI. All patients provided written informed consent. The study was approved by the Institutional Review Board of each institution.

Periprocedural anticoagulation management

Patients undergoing ablation without warfarin discontinuation (on warfarin)

Warfarin was initiated 4–6 weeks before the ablation procedure, and a “therapeutic international normalized ratio (INR) range” for 4 weeks before the procedure was requested. Warfarin was not stopped the night before the procedure and was taken the night of the procedure. Transesophageal echocardiography was performed only in patients without sinus rhythm the day of the procedure and if they presented to the electrophysiology laboratory with a subtherapeutic INR on the day of procedure. Patients with a subtherapeutic INR on the day of the procedure were included in the study. If INR was >3.5, patients were given 1 to 2 units of fresh frozen plasma before the procedure.

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