Journal of the American College of Cardiology
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Published by Elsevier Inc.

Vol. 59, No. 14, 2012
ISSN 0735-1097/$36.00
doi:10.1016/j.jacc.2011.11.051

Impact of Metabolic Syndrome on Procedural Outcomes in Patients With Atrial Fibrillation Undergoing Catheter Ablation

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Objectives The aim of this study was to investigate impact of metabolic syndrome (MS) on outcomes of catheter ablation in patients with atrial fibrillation (AF) in terms of recurrence and quality of life (QoL).

Background MS, a proinflammatory state with hypertension, diabetes, dyslipidemia, and obesity, is presumed to be a close associate of AF.

Methods In this prospective study, 1,496 consecutive patients with AF undergoing first ablation (29% with paroxysmal AF, 26% with persistent AF, and 45% with long-standing persistent AF) were classified into those with MS (group 1; n = 485) and those without MS (group 2; n = 1,011). Patients were followed for recurrence and QoL. The Medical Outcomes Study SF-36 Health Survey was used to assess QoL at baseline and 12 month after ablation.

Results After 21 ± 7 months of follow-up, 189 patients in group 1 (39%) and 319 in group 2 (32%) had arrhythmia recurrence (p = 0.005). When stratified by AF type, patients with nonparoxysmal AF in group 1 failed more frequently compared with those in group 2 (150 [46%] vs. 257 [35%], p = 0.002); no difference existed in the subgroup with paroxysmal AF (39 [25%] vs. 62 [22%], p = 0.295). Group 1 patients had significantly lower baseline scores on all SF-36 Health Survey subscales. At follow-up, both mental component summary (Δ5.7 ± 2.5, p < 0.001) and physical component summary (Δ9.1 ± 3.7, p < 0.001) scores improved in group 1, whereas only mental component summary scores (Δ4.6 ± 2.8, p = 0.036) were improved in group 2. In the subgroup with nonparoxysmal AF, MS, sex, C-reactive protein ≥0.9 mg/dl, and white blood cell count were independent predictors of recurrence.

Conclusions Baseline inflammatory markers and the presence of MS predicted higher recurrence after single-catheter ablation only in patients with nonparoxysmal AF. Additionally, significant improvements in QoL were observed in the post-ablation MS population. (J Am Coll Cardiol 2012;59:1295–301) © 2012 by the American College of Cardiology Foundation

Metabolic syndrome (MS), a proinflammatory state, is a cluster of cardiovascular risk factors including obesity, hypertension, diabetes, and dyslipidemia (1). As earlier studies have implicated many components of MS, namely, hypertension, diabetes, and obesity, to be prominent risk factors for atrial fibrillation (AF), a strong association between MS and AF is well evident (2). A fully efficient treatment strategy for AF is yet to be established, because of limited understanding of the complex pathophysiology of the disease (3). The most commonly used therapeutic options are antiarrhythmic drugs (AADs) and catheter ablation using radiofrequency (RF) energy. Catheter ablation provides an alternative therapy in patients with symptomatic drug-refractory AF. However, the rate of success

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Manuscript received August 22, 2011; revised manuscript received November 2, 2011, accepted November 22, 2011.

Abbreviations and Acronyms

AAD = antiarrhythmic drug
AF = atrial fibrillation
AFL = atrial flutter
AT = atrial tachycardia
BMI = body mass index
CI = confidence interval
CRP = C-reactive protein
HR = hazard ratio
MCS = mental component summary
MS = metabolic syndrome
NPAF = nonparoxysmal atrial fibrillation
PAF = paroxysmal atrial fibrillation
PCS = physical component summary
PV = pulmonary vein
QoL = quality of life
RF = radiofrequency
WBC = white blood cell

in maintaining long-term sinus rhythm after ablation seems to vary widely, ranging from <30% to 85% (4,5). Both MS and AF, as stand-alone conditions, trigger physical, mental, and psychosocial problems, which greatly impair quality of life (QoL) (6). In this prospective study, we aimed to analyze the impact of coexistent MS on long-term outcomes of catheter ablation, such as recurrence-free survival and QoL, in patients with AF.

Inflammation is a common denominator for both MS and AF. It is known to play a significant role in AF genesis and perpetuation. Moreover, a proinflammatory state evidenced by elevated levels of C-reactive protein (CRP) is commonly observed in patients with MS. Therefore, we additionally sought to explore the role of inflammatory markers such as CRP and total white blood cell (WBC) count at baseline in predicting AF recurrence after RF catheter ablation.

Methods

A total of 1,496 consecutive patients with AF (439 [29%] with paroxysmal atrial fibrillation [PAF], 393 [26%] with persistent AF, and 664 [44%] with long-standing persistent AF) undergoing their first catheter ablations were enrolled in this prospective study. Patients were classified into 2 groups: group 1, those with MS (n = 485; mean age 64 ± 8 years; 77% men; mean left ventricular ejection fraction, 55 ± 12%), and group 2, those without MS (n = 1,011; mean age 62 ± 11 years; 72% men; mean left ventricular ejection fraction 57 ± 9%). Baseline fasting blood samples were obtained from all patients for the measurement of blood glucose, lipid profile, CRP (Dimension RXL, Siemens Healthcare, Erlangen, Germany), and total WBC count (DXH 800, Beckman-Coulter, Brea, California). The CRP cutoff value was set at 0.9 mg/dl, with values below and above this cutoff considered normal and high, respectively. Follow-up event recording and 7-day Holter monitoring were performed at 3, 6, 9, and 12 months to check AF recurrence.

The Medical Outcomes Study SF-36 Health Survey was used to assess QoL at baseline and 12 months after ablation. Self-administration mode was strictly followed for QoL surveys; patients completed the survey in the privacy of their homes, without any interference or help from the hospital staff members or physicians.

The SF-36 Health Survey assesses 8 different domains of health status, namely physical functioning, role limitations due to physical health, mental health, role limitations due to emotional problem, social functioning, bodily pain, general health, and vitality.

Two composite scores, physical component summary (PCS) and mental component summary (MCS), were computed from the SF-36 Health Survey subscales (PCS included physical functioning, role limitations due to physical health, bodily pain, and general health, and MCS included vitality, social functioning, role limitations due to emotional problem, and mental health). All responses were scored on a scale ranging from 0 to 100, with 100 representing the best possible functional status.

The following criteria were used to define different components of MS (1,7): hypertension (blood pressure 130/85 mm Hg or current antihypertensive medication use), diabetes (fasting blood glucose ≥ 100 mg/dl or antidiabetic medication use), dyslipidemia (high-density lipoprotein 40 mg/dl in men and <50 mg/dl in women and serum triglycerides ≥150 mg/dl), and obesity (body mass index [BMI] ≥25 kg/m^2 or abdominal obesity, defined as waist circumference >102 cm in men and >88 cm in women). According to the World Health Organization, diabetes plus any 2 other risk factors is sufficient for the diagnosis of MS (1).

AF type was categorized into 2 main groups for the study purpose: PAF and nonparoxysmal atrial fibrillation (NPAF), which included persistent and long-standing persistent AF.

Ablation procedure. A standard catheter ablation protocol was followed, as described in previous publications from our group (8,9). Periprocedural anticoagulation management was done with continuous warfarin therapy before, during, and after the procedure, with the aim of maintaining the international normalized ratio at >2 to 3.

AADs were discontinued 4 to 5 half-lives before ablation. A circular mapping catheter (Lasso, Biosense Webster, Diamond Bar, California) and a 3.5-mm open–irrigation tip catheter (Thermocool, Biosense Webster) were used for ablation. In patients with PAF, the pulmonary vein (PV) antrum, the posterior wall between the PVs, and the area anterior to the right PVs along the left atrial septum were ablated using RF energy. The superior vena cava was also isolated if PV-like potentials were recorded in that region. In patients with NPAF, the PV antrum, the posterior wall down to the coronary sinus, and the left septal wall were isolated using RF energy. Additionally, the left atrium was mapped to identify complex fractionated atrial electrograms, which were ablated as well. Complex fractionated atrial electrograms were defined as electrograms composed of 2 or more deflections and/or with continuous baseline activity or electrograms with cycle lengths ≤120 ms.

After ablation, in all patients, isoproterenol (up to 30 μg/min) challenge was performed to locate any non-PV triggers or to ensure electrical disconnection. All sites showing firings were ablated.