JACC: CLINICAL ELECTROPHYSIOLOGY VOL. 1, NO. 3, 2015

ISSN 2405-500X/$36.00
PUBLISHED BY ELSEVIER INC. http://dx.doi.org/10.1016/j.jacep.2015.02.018

Catheter Ablation for Atrial Fibrillation in Heart Failure Patients

A Meta-Analysis of Randomized, Controlled Trials

Shadi Al Halabi, MD, MPH,* Mohammed Qintar, MD,* Ayman Hussein, MD,* M. Chadi Alraies, MD,† David G. Jones, MD,‡§ Tom Wong, MD,‡§ Michael R. MacDonald, MD,‖ Mark C. Petrie, MD,¶ Daniel Cantillon, MD,* Khaldoun G. Tarakji, MD, MPH,* Mohamed Kanj, MD,* Mandeep Bhargava, MD,* Niraj Varma, MD,* Bryan Baranowski, MD,* Bruce L. Wilkoff, MD,* Oussama Wazni, MD,* Thomas Callahan, MD,* Walid Saliba, MD,* Mina K. Chung, MD*

ABSTRACT

OBJECTIVES The objective of the study was to compare rate control versus atrial fibrillation (AF) catheter ablation strategies in patients with AF and heart failure (HF).

BACKGROUND Rhythm control with antiarrhythmic drugs (AADs) is not superior to rate control in patients with HF and AF, but AF ablation may be more successful at achieving rhythm control than are AADs. However, risks for both ablation and AADs are probably higher and success rates lower in patients with HF.

METHODS We conducted a meta-analysis of trials that randomized HF patients (left ventricular ejection fraction [LVEF] <50%) with AF to a rate control or AF catheter ablation strategy and reported changes in LVEF, quality of life, 6-min walk test, or peak oxygen consumption. Study quality and heterogeneity were assessed through the use of Jadad scores and Cochran's Q statistics, respectively. Mantel-Haenszel relative risks and mean differences were calculated through the use of random effect models.

RESULTS Four trials (N = 224) met inclusion criteria; 82.5% (n = 185) had persistent AF. AF ablation was associated with an increase in LVEF (mean difference, 8.5%; 95% confidence interval [CI]: 6.4% to 10.7%; $p < 0.001$) compared with rate control. AF ablation was superior in improving quality of life by Minnesota Living With Heart Failure (MLWHF) questionnaire scores (mean difference, -11.9; 95% CI: -17.2 to 6.6; $p < 0.001$). Peak oxygen consumption and 6-min walk distance increased in AF ablation compared with rate-control patients (mean difference, 3.2; 95% CI: 1.1 to 5.3; $p = 0.003$; mean difference, 34.8; 95% CI: 2.9 to 66.7; $p = 0.03$, respectively). In the persistent AF subgroup, LVEF and MLWHF were significantly improved with AF ablation. Major adverse event rates (risk ratio: 1.3; 95% CI: 0.4 to 3.9; $p = 0.64$) were not significantly different. No significant heterogeneity was evident.

CONCLUSIONS In patients with HF and AF, AF catheter ablation is superior to rate control in improving LVEF, quality of life, and functional capacity. Before accepting a rate-control strategy in HF patients with persistent or drug-refractory AF, consideration should be given to AF ablation. (J Am Coll Cardiol EP 2015;1:200–9) © 2015 by the American College of Cardiology Foundation.

From the *Department of Cardiovascular Medicine, Heart and Vascular Institute, Cleveland Clinic, Cleveland, Ohio; †Department of Cardiology, University of Minnesota, Minneapolis, Minnesota; ‡Royal Brompton and Harefield National Health Service Foundation Trust, London, United Kingdom; §National Heart and Lung Institute, Imperial College London, London, United Kingdom; ‖Changi, National Hospital, Glasgow, Scotland, United Kingdom; and the ¶Golden Jubilee National Hospital, Glasgow, Scotland, United Kingdom. Dr. Cantillon has received consulting/honoraria from St. Jude Medical. Dr. Tarakji has received speaker/consulting honorarium from Medtronic and Spectranetics. Dr. Chung was supported by NIH grant R01HL111314. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Manuscript received February 11, 2015; accepted February 26, 2015.

Atrial fibrillation (AF) and heart failure (HF) are 2 common cardiac conditions associated with substantial morbidity, mortality, and cost on health care systems (1–4). The 2 conditions frequently coexist, and each may promote the other. AF is present in up to 50% of patients with HF (5). AF in HF patients is associated with increased hospital stay, stroke, and mortality (6–8). This may be at least partially attributed to the hemodynamic effects of AF caused by loss of atrial contraction along with irregular and/or rapid ventricular rates, which can lead to left ventricular dysfunction and decreased cardiac output (9,10).

Rhythm control with anti-arrhythmic drugs (AADs) has failed to be superior to rate control in patients with HF and AF in terms of cardiovascular mortality or worsening of HF (11). The risk of adverse events associated with AADs and their limited efficacy in restoring sinus rhythm have triggered an increased interest in AF catheter ablation (12,13).

Several observational studies of AF catheter ablation in patients with HF have reported that maintenance of sinus rhythm by catheter ablation can significantly improve cardiac function (14–16).

The aim of our study was to determine if AF catheter ablation is superior to rate control in patients with AF and HF. We performed a meta-analysis of randomized, controlled trials that compared AF catheter ablation with rate control in patients with HF and AF.

METHODS

This meta-analysis of clinical trials was performed according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (17).

LITERATURE REVIEW. Relevant studies were selected by searching PubMed, Medline, Embase, Central, ClinicalTrials.gov, The Cochrane Library, and ISI Web of Science (January 1980 to February 2015). The search was independently conducted by 2 investigators (S.A. and M.Q.). Search key terms were atrial fibrillation, persistent atrial fibrillation, pulmonary venous isolation, catheter ablation, heart failure, left ventricular dysfunction, impaired left ventricular systolic function, reduced left ventricular systolic function, low ejection fraction, heart failure with reduced ejection fraction, functional capacity, and quality of life. Bibliographies of retrieved studies were hand-searched to identify relevant studies.

SELECTION CRITERIA AND QUALITY ANALYSIS. Prospective randomized, controlled trials published in English that compared rate control with AF catheter ablation were included.

Trials that included patients with left ventricular ejection fraction (LVEF) <50%, randomized to a rate-control strategy or AF catheter ablation and that reported at least one of the studied outcomes, were included. Studies had to fulfill the following criteria for inclusion: 1) prospective randomized, controlled trial design; 2) patients enrolled with LVEF <50% and history of AF; 3) randomization to AF catheter ablation versus rate control (pharmacologic or atrioventricular [AV] node ablation with biventricular or right ventricular pacing); and 4) study follow-up of at least 6 months. Studies that used AADs as rhythm control or that did not report at least one outcome of interest were excluded.

Quality of the studies was assessed independently by 2 reviewers (S.A. and M.Q.). Jadad's method was used to assess quality of the studies (18). The items assessed were blinding, randomization, and description of withdrawals or dropouts. All included studies had a quality score of 3. No studies attempted double-blinding. Therefore, weighting of the results was not performed.

DATA EXTRACTION AND OUTCOME MEASURES. Data were independently extracted by 2 investigators (S.A. and M.Q.), and discrepancies were resolved by unanimous consensus. Extracted data included number of patients in each intervention arm, characteristics of included patients, procedure characteristics, LVEF, quality-of-life parameters, and complications. Primary authors were contacted when data on studied outcomes were not reported.

The primary clinical endpoint was change in LVEF after 6 months. Secondary endpoints were Minnesota Living with Heart Failure (MLWHF) questionnaire scores, 6-min walk test distance, and peak oxygen consumption. Complications, adverse events, and deaths were also summarized.

Major adverse events were defined as death, intracranial hemorrhage, cardiac tamponade, pericardial effusion, pneumothorax, hemothorax, deep venous thrombosis or pulmonary embolism, sepsis, or pulmonary vein stenosis (>50%) requiring intervention. Procedural complications were defined as any complication that occurred in the 30-day postprocedural period. AF ablation was defined as pulmonary vein isolation with or without additional substrate modification and excluding AV junction ablation. Rate control was defined as the use of

ABBREVIATIONS AND ACRONYMS

AAD = anti-arrhythmic drug
AF = atrial fibrillation
HF = heart failure
LVEF = left ventricular ejection fraction
MLWHF = Minnesota Living With Heart Failure
NYHA = New York Heart Association
PVI = pulmonary vein isolation