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Incidence of Atrial Fibrillation After Atrial Flutter Ablation

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ABSTRACT

OBJECTIVES This study was conceived to perform a comprehensive systematic review and meta-analysis of the available evidence to compute the incidence of atrial fibrillation (AF) after successful atrial flutter (AFL) catheter ablation, defined by targeting for bidirectional block, using different types of follow-up modalities and durations.

BACKGROUND Cavotricuspid-isthmus dependent AFL is usually initiated by short bursts of AF. The incidence of AF after AFL ablation is variable. We evaluated the variation in the reported incidence of AF depending on the type and duration of follow-up, and AF incidence in patients with prior AF versus no prior AF.

METHODS A systematic review and meta-analysis of published studies between January 1996 and April 2015 and abstracts in the last 2 years describing patients who underwent AFL ablation and the subsequent incidence of AF was performed.

RESULTS Forty-eight studies were included (8,257 patients, ablation success rate: 96%, 79% male). Incidence of new-onset AF correlated with follow-up duration (29% for a weighted mean follow-up duration of 30 months). New-onset AF incidence with <2 years follow-up was 12.4% among group 1 (electrocardiogram and symptoms-driven evaluation, n = 759), 19% for group 2 (outpatient Holter monitoring for 1 day to 7 days/year, n = 315), and 45% for group 3 (>7 days/year Holter monitoring or by implanted cardiac devices, n = 178). Mean follow-up duration was 15.3 months, 18.5 months, and 16.3 months, respectively. In patients with and without prior AF, the incidence for AF after AFL ablation was 35.3% during mean follow-up duration of 29.7 months. In studies with <2 years follow-up duration, AF incidence was 54% in patients with prior AF versus 13.9% without prior AF (odds ratio: 7.43, 95% confidence interval: 4.96 to 11.11; p <0.00001). In studies with >2 years follow-up duration, AF incidence was 51.3% in patients with prior AF versus 26.2% without prior AF (odds ratio: 2.93, 95% confidence interval: 2.42 to 3.56; p < 0.00001).

CONCLUSIONS The incidence of AF after AFL ablation is high especially in patients with prior AF when compared to those without prior AF. The detection of AF in patients without prior AF significantly increases with more frequent monitoring and/or longer follow-up duration. (J Am Coll Cardiol EP 2016;■:■–■) © 2016 by the American College of Cardiology Foundation.

Atrial fibrillation (AF) is the most common cardiac arrhythmia, and its association with systemic thromboembolism is well established (1,2). Right atrial cavotricuspid isthmus (CTI) dependent atrial flutter (AFL) and AF are frequently seen in the same patient in clinical practice. This association generally reflects a similar arrhythmogenic substrate. AFL is almost always initiated by variable length bursts of AF (3,4).

Because of the well-defined anatomic substrate of AFL and the disappointing efficacy of antiarrhythmic drug therapy in treating AFL, catheter ablation of the

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ABBREVIATIONS AND ACRONYMS

AF = atrial fibrillation

AFL = atrial flutter

CTI is a common procedure. Catheter ablation of the CTI is successful in the long-term for approximately 91% of patients with AFL if bidirectional CTI block was achieved, and 76% if bidirectional block was not achieved (5,6). Bidirectional block is considered the standard for successful AFL ablation in current practice. However, long-term freedom from atrial arrhythmias after CTI AFL ablation may be compromised by the occurrence of AF. The reported incidence rate of AF after AFL ablation is variable (3). Some have suggested that AF could possibly be initiated by AFL itself (3); whereas others have shown that successful ablation of lone AFL might not improve the natural history of AF progression by comparing patients with lone AFL who did and did not have ablation (7).

We performed a comprehensive systematic review and meta-analysis of the available evidence to compute the true incidence of AF after successful AFL catheter ablation, defined by targeting for bidirectional block, using different types of follow-up modalities and durations.

METHODS

DATA SOURCES AND SEARCH STRATEGY. We searched online databases including PubMed, Cochrane CENTRAL, EMBASE, Web of Science, and CINAHL databases for English language studies published between January 1996 (when bidirectional block started to become the standard for successful AFL ablation) and April 2015 describing patients who underwent typical AFL catheter ablation with and without prior AF. We used the following keywords: "atrial fibrillation," "atrial flutter," "ablation," "bidirectional block," and "recurrence." Three reviewers (W.M., M.P., and O.L.) identified studies that met the following inclusion criteria: 1) clinical studies published in the English language; 2) either full-length article or conference abstract (only from the last 2 years); 3) adult patients who underwent typical AFL ablation only (no pulmonary vein isolation) and targeting for bidirectional block; 4) length of follow-up was at least 30 days; 5) the presence or absence of AF before AFL ablation was well documented; and 6) reporting occurrence of AF lasting >30 s (if the duration was mentioned in the study) after AFL ablation.

Studies were excluded if they met any of the following criteria: 1) if patients other than typical AFL were included; 2) if bidirectional block was not the target for successful ablation; 3) if follow-up duration was not documented; 4) if all the patients in the study had AF; or 5) if there were duplicate published data. In addition, we manually searched clinical trial databases, reviews, meta-analyses, and reference lists of all retrieved reports for potential relevant studies not found in our initial electronic database search.

STUDY SELECTION, ENDPOINTS, AND DEFINITIONS. We used the MOOSE (Meta-analysis of Observational Studies in Epidemiology) checklist to select studies for this review (8). We also followed the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines for reporting systematic reviews and meta-analyses (9,10). Objective assessment of the trials was performed using the method specified in the Cochrane Handbook of Systematic Reviews and the Newcastle-Ottawa scale for case control studies (11,12). Primary outcome of interest was incidence of AF after AFL ablation detected by electrocardiogram (ECG), Holter monitor, loop recorder, or implantable recorder. We performed meta-analysis for the incidence of AF after AFL ablation in patients with and without prior AF, we also evaluated AF incidence in patients who had AFL ablation and no prior AF based on duration of follow-up and who were followed up by ECGs, clinic visits, symptom-driven evaluation, and routine Holter monitoring for ≤7 days per year. We also evaluated AF rates in studies with <2 years follow-up based on type of follow-up by categorizing them into 3 groups: group 1 included ECG, clinical follow-up, and symptom-driven evaluation; group 2 additionally included scheduled 24-hour outpatient Holter monitoring for ≤7 days per year regardless of symptoms; and group 3 included scheduled >7 days outpatient Holter monitoring per year or patients with implanted cardiac devices. We also evaluated possible risk factors of AF development after AFL ablation in patients with no prior AF.

STATISTICAL ANALYSIS. Outcomes are reported as odds ratio (OR) and their respective 95% confidence intervals (CIs) for each study and for the meta-analysis of all studies. We assessed heterogeneity using the Cochran Q test and the Higgins I^2 test. A Cochran's Q p value <0.10 and I^2 >50% were considered to demonstrate heterogeneity in this meta-analysis. Random effects model described by Der-Simonian and Laird was used for the main analysis (13). Statistical analysis was performed with Review Manager (RevMan, Cochrane Collaboration, version 5.2). Results were considered statistically significant at $p < 0.05$. p value for interaction was