JACC: CLINICAL ELECTROPHYSIOLOGY VOL. ■, NO. ■, 2018

ISSN 2405-500X/$36.00
https://doi.org/10.1016/j.jacep.2017.12.008

Early Versus Late Referral for Catheter Ablation of Ventricular Tachycardia in Patients With Structural Heart Disease

A Systematic Review and Meta-Analysis of Clinical Outcomes

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ABSTRACT

OBJECTIVES This was a meta-analysis of published studies to examine the impact of early referral on outcomes after catheter ablation for ventricular tachycardia (VT) in patients with structural heart disease.

BACKGROUND Patients are frequently referred for VT ablation after failure of antiarrhythmic drugs to control VT. Some studies have suggested that early referral might confer better outcomes.

METHODS An electronic search was performed using major databases. The primary outcomes were long-term VT recurrence and total mortality. Secondary outcomes were acute procedural success and acute complications.

RESULTS Three studies were included with a total of 980 patients (mean age 64 $\pm$ 12 years, 71% males). Mean follow-up was 29 $\pm$ 27 months. Early referral for VT ablation was associated with decreased VT recurrence and acute complications compared with late referral (relative risk: 0.69 [95% confidence interval: 0.58 to 0.82], $p < 0.0001$ and relative risk: 0.50 [95% confidence interval: 0.27 to 0.93], $p = 0.03$, respectively). There was no significant difference between early and late referral for total mortality and acute success.

CONCLUSIONS Late referral for VT ablation was associated with worse outcomes (VT recurrence and acute complications) in patients with structural heart disease, which suggests that early referral for VT ablation might be a reasonable consideration in this patient population. (J Am Coll Cardiol EP 2018;■:■–■) © 2018 the American College of Cardiology Foundation. Published by Elsevier. All rights reserved.

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All authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Clinical Electrophysiology* author instructions page.

Manuscript received August 28, 2017; revised manuscript received November 30, 2017, accepted December 4, 2017.

ABBREVIATIONS AND ACRONYMS

AAD = antiarrhythmic drug

CA = catheter ablation

CI = confidence interval

ICD = implantable cardioverter-defibrillator

ICM = ischemic cardiomyopathy

NICM = nonischemic cardiomyopathy

RR = risk ratio

VT = ventricular tachycardia

Ventricular tachycardia (VT) is a frequent cause of mortality in patients with structural heart disease, regardless of pathogenesis. The use of an implantable cardioverter-defibrillator (ICD) has been shown to reduce mortality in patients with ischemic cardiomyopathy (ICM) and nonischemic cardiomyopathy (NICM) by effectively terminating VT; however, recurrent defibrillator shocks are associated with poor quality of life and even increased mortality (1-5). Standard medical care includes the use of antiarrhythmic drugs (AADs) to reduce VT recurrences, but adjunctive percutaneous catheter ablation (CA) is even more efficacious in reducing VT burden (6,7). Additionally, amiodarone efficacy is moderate, and its use is associated with significant toxicity during long-term treatment (8-11).

Nonetheless, referral for CA as recommended by current guidelines is usually prompted by failure to control VT with AADs (12). Two prior studies suggested that earlier referral for CA might be associated with improved outcomes, including a substantial reduction in VT recurrences (13,14). Nevertheless, sample sizes were small, and these studies were hence underpowered to detect a mortality benefit (13,14).

In this study, we performed a systematic review and meta-analysis of published studies examining the impact of timing of referral for VT ablation on subsequent clinical outcomes in patients with structural heart disease.

METHODS

The present meta-analysis was performed according to Cochrane Collaboration and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statements (15).

SEARCH STRATEGY. We searched PubMed, Embase, and the Cochrane Central Register of Clinical Trials (Cochrane Library, issue 2, 2017) databases from 1990 through July 2017 to identify trials that assessed the impact of timing referral of CA on clinical outcomes in patients with structural heart disease. We used the terms (*VT* OR *ventricular tachycardia* OR *ventricular tachyarrhythmia*) AND (*catheter ablation* OR *radiofrequency ablation* OR *radiofrequency catheter ablation* OR *RFA* OR *ablation therapy*). No language restriction was applied. The reference lists of identified articles were also reviewed. No librarian assisted with the search process.

ELIGIBILITY CRITERIA. Studies with the following characteristics were considered eligible: 1) included patients with ICM or NICM, undergoing first CA therapy for VT; 2) reported clinical outcomes of ventricular arrhythmia recurrence, total mortality, acute complications, or success rates; 3) compared early to late referral of ablation therapy for VT. Abstracts, case reports, conference presentations, editorials, reviews, and expert opinions were excluded from our analysis.

PRIMARY AND SECONDARY OUTCOMES. The main outcomes studied in the present analysis were long-term VT recurrence and total mortality after ablation. Secondary outcomes were acute complications and acute success.

Acute success was defined using previous definitions (16), namely, as noninducibility of any VT (spontaneous [clinical] VT or nonspontaneous [nonclinical] VT) after CA. VT recurrence was defined as recurrence of any VT in follow-up. Finally, acute complications included the following: any major vascular complications that necessitated transfusion or endovascular or surgical treatment; any thromboembolic event (including stroke or systemic or pulmonary emboli); atrioventricular block (inadvertent or anticipated); pericardial effusion that required intervention; heart failure; electromechanical dissociation; and coronary artery or phrenic injury.

DATA EXTRACTIONS AND QUALITY APPRAISAL. Three investigators (J.R., J.C.D., and X.D.) independently screened all titles and abstracts and manually searched the full-text versions of all relevant studies that fulfilled the inclusion criteria. References of the retrieved articles were independently reviewed for further identification of potentially relevant studies. Disagreements were resolved arbitrarily (J.R. or S.K.), and consensus was reached after discussion. We extracted characteristics of each study, including methodology and baseline patient demographics, techniques for VT ablation, recurrence rate for all ventricular arrhythmias, and acute complications, for our analysis. If the abovementioned information was not readily available in the written article, the principal investigator of that particular study was contacted to supply pertinent information.

QUALITY ASSESSMENT. The quality and reporting of the studies were assessed using the Newcastle-Ottawa Scale (17). Three categories were included in the analysis, with some having subcategories for assessment, as follows: 1) selection criteria (representativeness of the exposed cohort, selection of nonexposed cohort, ascertainment of exposure, demonstration that outcome of interest was not present at start of study); 2) comparability criteria (study