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.2015.04.005

NEW RESEARCH PAPERS

Multicenter Outcomes for Catheter Ablation of Idiopathic Premature Ventricular Complexes

Rakesh Latchamsetty, MD,* Miki Yokokawa, MD,* Fred Morady, MD,* Hyungjin Myra Kim, ScD,† Shibu Mathew, MD,‡ Roland Tilz, MD,‡ Karl-Heinz Kuck, MD,‡ Koichi Nagashima, MD, PhD,§ Usha Tedrow, MD,§ William Gregory Stevenson, MD,§ Ricky Yu, MD,‖ Roderick Tung, MD,‖ Kalyanam Shivkumar, MD,‖ Jean-Francois Sarrazin, MD,¶ Arash Arya, MD,# Gerhard Hindricks, MD,# Rama Vunnam, MD,** Timm Dickfeld, MD,** Emile G. Daoud, MD,†† Nishaki M. Oza, MD,†† Frank Bogun, MD*

ABSTRACT

OBJECTIVES This study reports multicenter outcomes and complications for catheter ablation of premature ventricular complexes (PVCs) and investigates predictors of procedural success, as well as development of PVC-induced cardiomyopathy.

BACKGROUND Catheter ablation of frequent idiopathic PVCs is used to eliminate symptoms and treat PVC-induced cardiomyopathy. Large-scale multicenter outcomes and complication rates have not been reported.

METHODS This retrospective cohort study included 1,185 patients (55% female; mean age 52 ± 15 years; mean ejection fraction 55 ± 10%; mean PVC burden 20 ± 13%) who underwent catheter ablation for idiopathic PVCs at 8 centers between 2004 and 2013. The following factors were evaluated: patient demographics, procedural characteristics, complication rates, and clinical outcomes.

RESULTS Acute procedural success was achieved in 84% of patients. In centers at which patients were followed up routinely with post-ablation Holter monitoring, continued success at clinical follow-up without use of antiarrhythmic drugs was 71%. Including the use of antiarrhythmic medications, the success rate at a mean of 1.9 years of follow-up was 85%. In a multivariate analysis, the significant predictors of acute success were PVC location and number of distinct PVC configurations ($p < 0.03$). The only significant predictor of continued success at clinical follow-up was a right ventricular outflow tract PVC location ($p < 0.01$). In 245 patients (21%) with PVC-induced cardiomyopathy, the mean ejection fraction improved from 38% to 50% ($p < 0.01$) after ablation. Independent predictors for development of PVC-induced cardiomyopathy were male gender, PVC burden, lack of symptoms, and epicardial PVC origin ($p < 0.05$). The overall complication rate was 5.2% (2.4% major complications and 2.8% minor complications), and complications were most commonly related to vascular access (2.8%). There was no procedure-related mortality.

CONCLUSIONS Catheter ablation of frequent PVCs is a low-risk and often effective treatment strategy to eliminate PVCs and associated symptoms. In patients with PVC-induced cardiomyopathy, cardiac function is frequently restored after successful ablation. (J Am Coll Cardiol EP 2015;1:116–23) © 2015 by the American College of Cardiology Foundation.

From the *Division of Electrophysiology, Department of Medicine, University of Michigan, Ann Arbor, Michigan; †Biostatistics Department, School of Public Health, University of Michigan, Ann Arbor, Michigan; ‡Division of Electrophysiology, Department of Medicine, Asklepios Klinik St. Georg, Hamburg, Germany; §Division of Electrophysiology, Department of Medicine, Brigham and

In addition to causing potentially debilitating symptoms, idiopathic premature ventricular complexes (PVCs) can cause significant left ventricular (LV) dysfunction or dilation (1). Single-center studies have demonstrated that catheter ablation is superior to pharmacological therapy for decreasing PVC burden and improving cardiac function (2–4).

SEE PAGE 124

Larger scale multicenter studies evaluating the safety and efficacy of ablation have been lacking. Furthermore, data are limited on the relationship between specific PVC sites of origin or the number of PVC foci and outcomes. The purpose of this multicenter study was to assess outcomes and complications of catheter ablation of idiopathic PVCs and to determine the predictors of acute and long-term efficacy.

METHODS

We retrospectively analyzed 1,185 patients who underwent radiofrequency catheter ablation for frequent idiopathic PVCs at 8 international centers between 2004 and 2013. The presence of structural heart disease was evaluated by echocardiogram, exercise stress testing, cardiac catheterization, and/or cardiac magnetic resonance imaging (MRI). Patients with a history of prior infarcts or delayed enhancement identified by cardiac MRI were excluded. Patients with decreased LV ejection fraction or LV dilation without a known cause other than the PVCs were included in the study. Patient demographics, ejection fraction, PVC burden, medical therapy, the number and origin of PVCs, procedural details, complications, and outcomes were collected. Data regarding antiarrhythmic drug use after ablation were also collected. Beta-blockers and calcium channel blockers were not included in the antiarrhythmic medications in this study.

A baseline ejection fraction <50% was considered to be evidence of a PVC-induced cardiomyopathy. The origin of PVCs was classified as right ventricular outflow tract (RVOT), aortic cusps, epicardium, or papillary muscles. If PVCs did not originate from any of these locations, they were defined as having "other" origin. An epicardial origin was considered to be present if there was an early activation time or a matching pace map within the coronary venous system or the epicardial space as accessed through a subxyphoid puncture. Complications were classified as major or minor. Major complications included any complication that required procedural intervention, blood transfusion, or prolonged hospitalization or resulted in long-term clinical effects. All other complications were considered minor.

Acute procedural success was defined as the elimination of the targeted PVC(s) at the termination of the procedure at least 30 min after the last ablation. Clinical success was evaluated at centers where 24- to 48-h Holter monitoring was performed routinely during follow-up and was defined as at least an 80% decrease in PVC burden. Holter monitoring was performed 3 to 6 months post-ablation, and further monitoring was performed at the discretion of the clinician based on symptom recurrence or finding of PVCs on an electrocardiogram (ECG).

STATISTICAL ANALYSIS. Continuous variables were expressed as mean ± SD. Discrete variables were compared using the Fisher exact test or by chi-square

ABBREVIATIONS AND ACRONYMS

CI = confidence interval

ECG = electrocardiogram

LV = left ventricular

MRI = magnetic resonance imaging

OR = odds ratio

PVC = premature ventricular complex

RVOT = right ventricular outflow tract

Women's Hospital, Boston, Massachusetts; ||Division of Electrophysiology, Department of Medicine, University of California, Los Angeles; ¶Division of Electrophysiology, Department of Medicine, Institut Universitaire de Cardiologie et Pneumologie de Quebec, Quebec, Canada; #Division of Electrophysiology, Department of Medicine, University Leipzig Heart Center, Leipzig, Germany; **Division of Electrophysiology, Department of Medicine, University of Maryland, Baltimore, Maryland; and the ††Division of Electrophysiology, Department of Medicine, The Ohio State University Wexner Medical Center, Columbus, Ohio. Dr. Tilz has received research grants from Hansen and St. Jude Medical; travel grants from St. Jude Medical, Topera, Biosense Webster, Daiichi-Sankyo, and Sentreheart; and speakers bureau honoraria from Biosense Webster, Biotronik, Pfizer, Topera, Bristol-Myers Squibb, Bayer, and Sanofi Aventis. Dr. Kuck has received research grants and speakers bureau honoraria from St. Jude Medical, Medtronic, and Abbott Vascular; and has served as a consultant to St. Jude Medical. Dr. Tedrow has received minor honoraria from St. Jude Medical, Medtronic, and Boston Scientific. Dr. Stevenson has a patent for needle ablation consigned to Brigham and Women's Hospital, with no financial benefit at present. Dr. Hindricks has received research grants from St. Jude Medical, Biotronik, and Boston Scientific. Dr. Daoud is a member of the advisory board for Medtronic; a member of the advisory board for Biosense Webster; and a research investigator for St. Jude Medical, Biosense Webster, Medtronic, and Biotronik. Dr. Bogun is supported by the Leduqu Foundation. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Manuscript received March 26, 2015; accepted April 9, 2015.