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Peripartum Cardiomyopathy

Predictors of Recovery and Current State of Implantable Cardioverter-Defibrillator Use

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Objectives The purpose of this study was to identify the predictors of left ventricular (LV) recovery in patients with peripartum cardiomyopathy (PPCM) and to record rates of implantable cardioverter-defibrillator (ICD) use.

Background PPCM is a rare, life-threatening disease. The use of ICDs has not been clearly understood in this patient group. Identification of the predictors of persistent LV dysfunction can help select patients at risk for sudden cardiac death.

Methods A retrospective study was conducted at 2 academic centers between January 1, 1999, and December 31, 2012. Clinical and demographic variables and delivery records of patients with a diagnosis of PPCM (*International Classification of Diseases, 9th Revision* code 674.5) were reviewed. Improvement in LV function was noted from echocardiography reports.

Results The total sample comprised 100 patients, of whom 55% were African Americans, 39% were Caucasians, and 6% were Hispanic, with a mean age of 30 ± 6 years. Mean left ventricular ejection fraction (LVEF) at diagnosis was 28 ± 9%. Forty-two percent of patients showed improvement in LVEF over a mean duration of 33 ± 21 months. Postpartum diagnosis (hazard ratio: 3.0; $p = 0.01$) and Caucasian/Hispanic race (hazard ratio: 2.2; $p = 0.01$) were predictors of improvement in LVEF. Only 7 of the 58 patients (12%) who did not have improvement in their LVEF had an ICD implanted. There were 11 deaths, with a trend toward higher mortality in those who did not display improved LV function (15% vs. 5%; $p = 0.1$).

Conclusions More than one-third of women with PPCM improve LV function with delayed recovery noted in the majority of these patients. Caucasians and those diagnosed in the postpartum period appear to be the most likely to recover. The rate of ICD implantation for primary prevention of sudden cardiac death in this patient group is low. (J Am Coll Cardiol 2014;63:2831–9) © 2014 by the American College of Cardiology Foundation

Peripartum cardiomyopathy (PPCM) is a rare, idiopathic cardiomyopathy characterized by the development of systolic heart failure toward the end of pregnancy or in the months after delivery (1,2). The reported incidence shows significant geodemographic variation, from 1 in 500 live births in Haiti to 1 in 4000 live births in the United States (3–6). Identified risk factors for PPCM include multiparity, advanced maternal age, twins, preeclampsia, gestational hypertension, and African-American race (1,2,7–9).

Despite the recognition of this disease as a separate entity in 1937, the mortality rates are not yet well characterized (8–19), ranging from 4% to 50% (2,8–19). At least one-fourth of deaths in PPCM are sudden cardiac deaths presumed to be caused by ventricular tachyarrhythmias (16). Sudden cardiac death in these young women could potentially be averted by insertion of an implantable cardioverter-defibrillator (ICD), and cardiac resynchronization therapy devices (CRTDs) may reduce progression to end-stage myocardial dysfunction. The American College of Cardiology Foundation/American Heart Association 2009 guidelines recommend implantation of an ICD for primary prevention of sudden cardiac death in all patients with ischemic and nonischemic cardiomyopathy with ejection fraction (EF) ≤35% in patients with New York Heart Association (NYHA) functional class II and III and EF <30% in patients with NYHA class I if there is no improvement in EF after 3 to 6 months of guideline-directed

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Abbreviations and Acronyms

CRTD = cardiac resynchronization therapy device

ICD = implantable cardioverter-defibrillator

NYHA = New York Heart Association

PPCM = peripartum cardiomyopathy

optimal medical therapy (20). To date, no studies have reported the use of ICDs for primary prevention in this patient group. PPCM is also presumed to be associated with a higher likelihood of recovery of left ventricular (LV) function than cardiomyopathy attributable to other causes (2,10,17,19,21). Thus, prediction of who will recover from the disease helps determine who might best benefit from an ICD. Previous studies have shown that baseline LV EF >30%, LV end-diastolic diameter <5.5 cm, older age, and Caucasian race predicted recovery of LV function (22–29). However, either these were single-center studies with small sample sizes of ≤55 patients, or the information was obtained from other countries and surveys that were subject to ascertainment, recall, and selection bias or were not controlled for other covariates.

We thus wanted to study the mortality and LV recovery rates and examine ICD implantation rates at tertiary academic centers that offer a good mix of patients of different ethnicities. We sought to identify the predictors for LV recovery and the current rates of ICD use.

Methods

This was a retrospective study conducted at 2 large tertiary care academic centers, the University of Kansas (Kansas City, Kansas) and the Detroit Medical Center (Detroit, Michigan), where cardiovascular and high-risk pregnancy services are available. Approval was obtained from the institutional review boards at both institutions.

Patients

All patients >18 years of age who were diagnosed with postpartum/peripartum cardiomyopathy at the 2 centers were studied. The medical records of these patients were identified by use of International Classification of Diseases-9th Revision diagnostic codes for PPCM (674.50, 674.51, 674.52, 674.53, and 674.54) that were used for discharge diagnoses from the hospital or ambulatory clinic visits. At the University of Kansas, medical records were obtained for patients diagnosed between January 1, 2004, and August 31, 2010. At the Detroit Medical Center, records were obtained for patients who were diagnosed with PPCM between January 1, 1999, and December 31, 2010. All delivery records and follow-up encounters were reviewed for clinical and demographic information. Patients with a history of prior cardiomyopathy attributable to other causes or structural heart disease were excluded. Each patient was followed up until December 2012 for any improvement in EF. Time to recovery was noted for patients who had improvement in LV function. For those without any improvement in EF, the date of the last echocardiogram was used to measure the period during which no improvement in EF was observed. ICD implantation was also noted. All-cause mortality was obtained from the Social Security Death Index and confirmed by chart review when available. For mortality analysis, time to death was used for those who died, and December 2012 was used as the last follow-up date for all those who survived.

Assessment of EF. EFs at the time of diagnosis of PPCM were recorded and considered baseline EFs. Each patient was followed up over time to assess EF, and the EF from the last echocardiogram report was noted for those without LV improvement. For patients who had an improvement in EF, the EF and the time to improvement in EF were noted.

Definition of improvement. An EF >50% at follow-up was considered complete recovery. If the EF remained <35%, it was considered no improvement. If the follow-up EF was between 35% and 50%, the improvement was considered partial provided that there was a >10% absolute increase from baseline (e.g., from 35% to >45%). If patients had either partial or complete improvement, they were included in the "any improvement" category used for the analysis.

Statistical Analysis

Statistical analysis of the data was performed with SAS version 9.3 (SAS Inc., Cary, North Carolina). The chi-square test was used for comparisons of categorical data and Student *t* test for continuous parameters. A Cox proportional hazards model was used to assess the predictors of any improvement in EF after adjustment for significant covariates. Univariate predictors were initially obtained, and

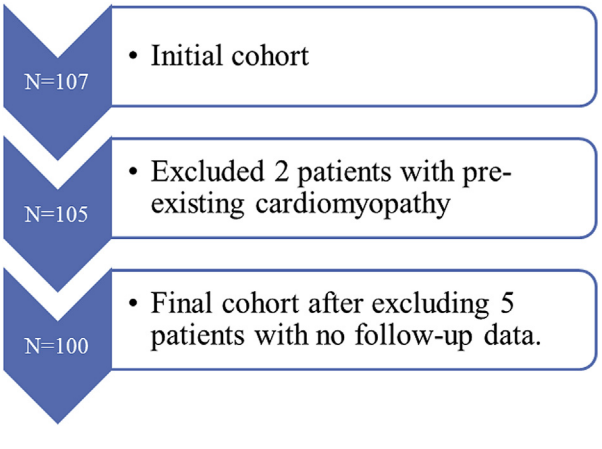

Figure 1 Flow Chart of Patient Cohort

Seven patients were excluded, which yielded a total of 100 patients in the final cohort.