Evaluation of the Clinical Relevance of Baseline Left Ventricular Ejection Fraction as a Predictor of Recovery or Persistence of Severe Dysfunction in Women in the United States With Peripartum Cardiomyopathy

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ABSTRACT

Background: Baseline left ventricular ejection fraction (LVEF) has been shown to be associated with likelihood of recovery in patients with peripartum cardiomyopathy (PPCM). The clinical relevance of this association for individual patients is unclear.

Methods and Results: We analyzed baseline parameters of LVEF in 187 PPCM patients with ≥6 months follow-up data in an attempt to detect the value of baseline LVEF as a predictor of early recovery or persistence of severe LV dysfunction. Recovery of LV function (LVEF ≥50%) at 6 months after diagnosis was found in 115 patients (61%). Multivariate analysis identified baseline LVEF >30% as a significant predictor for recovery (odds ratio 5.2, 95% confidence interval 1.96−7.70; $P > .0001$). Recovery of LV function was 6.4-fold higher in women with baseline LVEF ≥ 30% (group III) and 3.9-fold higher in women with LVEF 20%−29% (group II) compared with those with LVEF 10%−19% (group I). Failure to achieve full recovery was seen in 63% of group I patients, 32% of group II ($P = .03$), and 21% of group III ($P = .02$ vs group I). Failure to achieve LVEF ≥30% was seen in 30% of group I patients and 13% of group II ($P = .09$).

Conclusions: Early recovery in patients with PPCM is significantly related to the degree of myocardial insult at time of diagnosis. Baseline LVEF however, has a limited sensitivity for prediction of failure to improve in individual patients and can not be used as an indication for premature use of aggressive therapy including devices or cardiac transplantation. (*J Cardiac Fail 2011;17:426−430*)

Key Words: Peripartum, cardiomyopathy, left ventricle, function, recovery, predictors.

Peripartum cardiomyopathy (PPCM) is a disease of unknown etiology that affects women during pregnancy or post partum and characterized by the development of heart failure due to marked left ventricular (LV) systolic dysfunction.[1−3] PPCM remains an important cause of pregnancy-related maternal morbidity and mortality in the USA.[4−7] Early reports as well as recent studies have revealed strong relationships between the degree and persistence of LV dysfunction and the incidence of major complications.[7,8] The ability to identify predictors for early recovery or persistent LV dysfunction would have important implications in the management strategies of this condition and could possibly alter its prognosis by allowing early interventions. A number of studies have suggested a relationship between the degree of LV dysfunction at the time of diagnosis and the likelihood of recovery.[9−11] Those studies have been limited, however, by a relatively small number of patients or information obtained in other countries where clinical presentation and outcome may be different.[2,10,11]

Although the disease is uncommon, its incidence has been increasing[14] and is estimated to involve between 1,000 to

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2,000 new cases per year in the USA alone.[12−16] The condition usually presents with a marked depression of LV systolic function, and recent data have clearly demonstrated a strong relationship between the severity and persistence of LV dysfunction and the incidence of morbidity and mortality due to progressive heart failure and sudden death.[7,8,12,17] The ability to predict early recovery of LV function or persistent dysfunction could therefore have an important impact on early management strategy of these patients. The present analysis was performed in an attempt to further evaluate whether baseline LVEF at the time of diagnosis is predictive of persistent dysfunction in a large number of patients with PPCM diagnosed in the USA.

Methods

Data Collection

The patient population included 217 women diagnosed with PPCM defined as: 1) development of heart failure in the last part of pregnancy or within 5 months postpartum; 2) absence of demonstrable cause of heart failure; 3) absence of demonstrable heart disease before last part of pregnancy; and 4) LVEF <45%.[3] Exclusion criteria were patients with an identifiable etiology for their heart failure and patients who were unable to provide both initial and subsequent echocardiogram reports. Baseline and ≥6-month values of echocardiographic LVEF were available in 187 women and were used for the purpose of this study.

Patients were included from 3 different sources to represent a wide spectrum of patients with PPCM diagnosed and treated in the USA from 1994 to 2004. One hundred fifty-three patients were part of the data base established at the University of Southern California (1994−2004),[6,7] 34 patients were diagnosed and cared for at LouisianaState University Health Science Center, Shreveport, Louisiana (1993−2000), and 30 patients were recruited via the internet (1997−2007) as part of a web-based registry in collaboration with PPCM education and support (www.amothersheart.org [AMH]).[12] A detailed description of the study was featured on the AMH website describing the purpose, methods, and goals of the study, and prospective subjects initiated the enrollment process by downloading informed consent and health insurance forms. After signing the consent and insurance documents, patients were enrolled. Each patient was required to complete standardized questionnaire via website or in paper format detailing information, including echocardiography reports.

All patients were divided into 2 groups: the recovery group and the nonrecovery group with persistent LV dysfunction. We defined recovery as LVEF ≥50%, which has been used in earlier studies of patients with PPCM.[2,6,7] We further divided the patients arbitrarily into 3 groups: group I: LVEF 10%−19%; group II: LVEF 20%−29%; and group III: LVEF 30%−45%.

This retrospective study was conducted with approval of the respective Institutional Review Boards.

Statistical Analyses

Variables of interest were selected a priori for their potential to be predictive factors of LVEF recovery which was defined as LVEF ≥50% at ≥6 months after the diagnosis. Continuous variables were examined in their continuous form and as grouped terms based on their distribution in the population. The variables examined included baseline LVEF (continuous; <30% vs ≥30%), race (black vs other), age at diagnosis (continuous; <30 y vs ≥30 y), gravidity (continuous; 1 vs ≥2), multiple pregnancy (yes vs no), history of hypertension (any vs none), tocolysis (yes vs no), delivery mode (cesarean section vs vaginal delivery); baseline LV diastolic diameter (LVDD) (continuous; ≥55 mm vs <55 mm) and diagnosis of PPCM at the antepartum versus postpartum period. Complete information on medical therapy was not available in many of the patients and therefore was not included in the analysis. Simple analyses using chi-square tests for categoric variables and *t* tests for continuous variables were used to evaluate associations between each variable and LVEF recovery. Variables with *P* values of <.10 were retained for further examination in a multivariable model. Pairwise correlation coefficients and corresponding *P* values were computed to determine whether potentially related clinical variables identified by the simple analyses were significantly correlated. A backward stepwise approach to model building was used to identify the best predictive model of LVEF recovery while examining multiplicative interactions between variables. Logistic regression methods were used to model the outcome "recovery" by the predictor variables. LVDD was not available in all patients and was not evaluated in the main stepwise multivariable Cox proportional hazards model. Variables were retained in the multivariable model with a Wald *P* value of <.05.

In addition, recovery of LVEF to >30% or ≥50% in the various subgroups of patients were analyzed using the Fisher exact test, and *P* <.05 was considered to be statistically significant.

Results

Clinical Characteristics of All PPCM Patients

Clinical characteristics of the entire group are presented in Table 1. The average age was 30 ± 6 years, 64% of the patients were caucasian, 25% were African American, and the remainder were Hispanic, Native American, or Asian. The average gravidity was 2.7 ± 2.0 pregnancies, 18% of patients had either twin or triplet pregnancies, gestational hypertension was present in 41% , tocolysis was used in 13%, and 44% of the patients had cesarean delivery. Mean baseline LVEF was 28 ± 10% and LVDD (92 patients) 58 ± 8 mm; at ≥6 months, mean LVEF was 47 ± 14% and LVDD 49 ± 17 mm. Some data on medical treatment were available in 143 patients: 118 (82.5%) were treated with angiotensin-converting enzyme inhibitors; 83 (58.0%) with β-blockers; 12 (8.3%) received anticoagulation, and 37 (25.8%) were on digitalis.

Differences in Baseline Clinical Characteristics Between Patients With LV Recovery and Those With Persistent LV Dysfunction

Mean echocardiographic follow-up was 8.8 ± 4.9 months (6−12 months follow-up in 181 patients, 20−48 months in 6 patients). Of the 187 patients with PPCM, 115 (61%) demonstrated recovery of LV function (LVEF