

Clinical Research

Clinical Characteristics and Long-term Predictors of Persistent Left Ventricular Systolic Dysfunction in Peripartum Cardiomyopathy

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Background: Peripartum cardiomyopathy (PPCM) is a potentially life-threatening dilated cardiomyopathy that occurs in previously well women during pregnancy or postpartum. The predictors of persistent left ventricular (LV) systolic dysfunction (LVSD) in PPCM are poorly understood and were the subject of this study.

Methods: Patients with PPCM (n = 71), who were admitted to Beijing Friendship Hospital from 2004 to 2011, were retrospectively analyzed. Data including electrocardiographic and echocardiographic measurements at diagnosis (baseline) and at the last follow-up visit were collected. Data on plasma brain natriuretic peptide (BNP) and C-reactive protein (CRP) levels were also collected at baseline. A receiver operating characteristic curve was used to determine the cutoff values. Univariate and multivariate analyses were used to assess the significant predictive variables for persistent LVSD.

Results: Thirty-one patients (44%) did not recover completely at the last follow-up visit (LV nonrecovery group), and 40 patients (56%) had good LV recovery (LV recovery group). Baseline BNP level was positively

RÉSUMÉ

Introduction : La cardiomyopathie du péripartum (CMPP) est une cardiomyopathie dilatée mettant potentiellement la vie en danger qui survient durant la grossesse ou le post-partum chez les femmes qui étaient auparavant en bonne santé. L'objet de l'étude qui porte sur les prédicteurs de la dysfonction systolique du ventricule gauche (DSVG) persistante lors de CMPP est mal compris.

Méthodes : Les patients souffrant de CMPP (n = 71), qui étaient admis au Beijing Friendship Hospital de 2004 à 2011, faisaient l'objet d'une analyse rétrospective. Les données, y compris les mesures électrocardiographiques et échocardiographiques au moment du diagnostic (initial) et à la dernière visite de suivi étaient recueillies. Les données sur les concentrations plasmatiques du peptide natriurétique de type B (BNP: *brain natriuretic peptide*) et de la protéine C réactive étaient également recueillies au début. Une courbe caractéristique d'efficacité du récepteur était utilisée pour déterminer les valeurs seuils. Les analyses univariées et multivariées étaient utilisées pour évaluer les variables prédictives significatives du DSVG.

Peripartum cardiomyopathy (PPCM) is a dilated cardiomyopathy of uncertain origin that occurs in women during pregnancy or postpartum with no preexisting heart disease. According to the criteria for diagnosis established by Demakis and Rahimtoola¹ and the National Heart, Lung, and Blood Institute and Office of Rare Diseases of the National Institute of Health,² PPCM can be defined as heart failure due to demonstrable left ventricular (LV) systolic dysfunction (LVSD) that occurs between the last month of pregnancy and up to 5 months postpartum. However, this strict timescale has recently been shown to be more variable and many women present with the symptoms of PPCM in early pregnancy.³

The clinical presentation of PPCM differs widely and the rates of recovery of LV function also differ from 23% to 66% with regard to study size, race, and follow-up duration.⁴ To date, most of the studies that pertain to PPCM have been performed in the United States, Haiti, and South Africa, and the clinical data are much more limited in the rest of the world including China.

PPCM might lead to serious heart failure, malignant arrhythmias, thromboembolism, and death.⁵ It is important to identify predictors for persistent LVSD in risk stratification and for use in reasonable management strategies.⁶ However, Fett et al.⁷ reported that LV echocardiographic features were unable to predict LV recovery in rural Haiti. More recently, studies have reported that decreased systolic heart function at diagnosis means less recovery from PPCM.⁸⁻¹³

It is well known that brain natriuretic peptide (BNP), a biomarker for increased ventricular stretch or wall tension, is a useful clinical predictor of heart failure and has good diagnostic and prognostic value. C-reactive protein (CRP), a simple biomarker for detection of low-grade inflammation,

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correlated with LV end-diastolic diameter ($r = 0.559$; $P < 0.001$), and inversely correlated with LV ejection fraction (LVEF) ($r = -0.548$; $P < 0.001$) and fractional shortening ($r = -0.542$; $P < 0.001$). There was no difference in CRP levels between the 2 groups. Receiver operating characteristic curves indicated the cutoff value in terms of predicting persistent LVSD was 34% for LVEF, 64 mm for LV end-diastolic diameter, 16% for fractional shortening, and 1860 pg/mL for BNP. Univariate and multivariate analyses confirmed that LVEF $< 34\%$ (95% CI, 1.38-7.30; $P = 0.007$) and BNP > 1860 pg/mL (95% CI, 1.18-6.99; $P = 0.020$) were independent prognostic factors in predicting persistent LVSD.

Conclusions: LVEF and plasma BNP levels have good predictive value in long-term cardiac dysfunction.

has been shown to be associated with adverse prognosis in patients with idiopathic dilated cardiomyopathy. However, the prognostic values of BNP and CRP as independent determinants of long-term prognosis in PPCM are not clearly understood.

The present study was aimed to evaluate the predictors of persistent LVSD in women with PPCM in a Chinese population.

Methods

Patients with PPCM ($n = 71$), who were admitted to Beijing Friendship Hospital affiliated to Capital Medical University, China between 2004 and 2011, were retrospectively analyzed. According to clinical and echocardiographic criteria, PPCM was defined as an occurrence of unexplained heart failure in a previously healthy woman between the last month of pregnancy and up to 5 months postpartum, with LV ejection fraction (LVEF) $< 45\%$ or fractional shortening (FS) $< 30\%$.^{1,2} Patients who met the diagnostic criteria for PPCM were included in the study. The study exclusion criteria were as follows: (1) significant organic valvular heart disease; (2) diagnosis before pregnancy of systemic hypertension, diabetes mellitus, or thyroid dysfunction; and (3) alcohol or cigarette use including smoking before pregnancy and malignancy. Clinical data were obtained from the patients' medical records. All patients were followed-up for at least 12 months after diagnosis. All patients had undergone electrocardiogram (ECG) and echocardiographic measurements at baseline (at the time of diagnosis) and the last follow-up visit. Echocardiographic parameters (including LVEF, LV end-diastolic diameter [LVEDD], FS) and ECG parameters (including wide QRS complex, QTc interval, and ST segment depression) were recorded for statistical analysis. Recovery of LV function was defined as the presence of LVEF $\geq 50\%$. Blood was collected at baseline to determine BNP, CRP,

Résultats : Trente et un patients (44 %) n'avaient pas complètement récupéré à la dernière visite de suivi (groupe de non-récupération de la fonction ventriculaire gauche), et 40 patients (56 %) avaient eu une bonne récupération de la fonction ventriculaire gauche (groupe de récupération de la fonction ventriculaire gauche). La concentration initiale du BNP était positivement corrélée au diamètre télédiastolique du ventricule gauche ($r = 0,559$; $P < 0,001$), et inversement corrélée à la fraction d'éjection ventriculaire gauche (FEVG; $r = -0,548$; $P < 0,001$) et à la fraction de raccourcissement ($r = -0,542$; $P < 0,001$). Aucune différence dans les concentrations de la protéine C réactive n'était observée entre les 2 groupes. Les courbes caractéristiques d'efficacité du récepteur qui indiquaient la valeur seuil en matière de prédiction du DSVG persistant était de 34 % pour la FEVG, de 64 mm pour le diamètre télédiastolique du ventricule gauche, de 16 % pour la fraction de raccourcissement et de 1860 pg/ml pour le BNP. Les analyses univariées et multivariées confirmaient que la FEVG $< 34\%$ (intervalle de confiance [IC] à 95 %, 1,38-7,30; $P = 0,007$) et que le BNP > 1860 pg/ml (IC à 95 %, 1,18-6,99; $P = 0,020$) étaient des facteurs pronostiques indépendants de la prédiction du DSVG persistant.

Conclusions : La FEVG et les concentrations plasmatiques du BNP offrent une bonne valeur prédictive de la dysfonction cardiaque à long terme.

hemoglobin, albumin, and creatinine levels. LVEF was measured using transthoracic echocardiography with the modified Simpson rule.¹⁴ Standard, 2-dimensional, 'M-mode,' and Doppler echocardiographic measurements were performed in all patients. LV internal dimensions at end-diastole and end-systole were measured according to American Society of Echocardiography guidelines.

Table 1. Baseline characteristics of patients with PPCM ($n = 71$)

Characteristic	Value
Age, years	28 $\pm$ 6
Gravidity	1.9 $\pm$ 1.2
Primiparous	57 (80)
Hypertension	38 (54)
Premature delivery	42 (59)
Cesarean section	60 (85)
Onset of clinical symptoms antepartum	48 (68)
Systolic blood pressure, mm Hg	139.6 $\pm$ 26.7
Diastolic blood pressure, mm Hg	89.6 $\pm$ 18.4
ECG parameters	
QRS, ms	80.2 $\pm$ 22.8
QTc, s	0.44 $\pm$ 0.05
ST segment depression	19 (27)
LVEF, %	36.1 $\pm$ 6.6
LVEDD, mm	60.7 $\pm$ 5.2
FS, %	18.4 $\pm$ 3.9
Anemia	32 (45)
Proteinuria	38 (54)
Albumin, g/L	29.3 $\pm$ 5.7
Creatinine, μ mol/L	95.1 $\pm$ 121.4
CRP, g/L	31.5 $\pm$ 22.1
BNP, pg/mL	1583.5 $\pm$ 1510.2

Data are presented as mean $\pm$ SD or n (%).

BNP, brain natriuretic peptide; CRP, C-reactive protein; ECG, electrocardiogram; FS, fractional shortening; LVEDD, left ventricular end diastolic dimension; LVEF, left ventricular ejection fraction; PPCM, peripartum cardiomyopathy.

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