A serious complication in the puerperium: peripartum cardiomyopathy

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Two women, aged 27, presented with different symptoms shortly after giving birth to their first child. Peripartum cardiomyopathy (PPCM) was diagnosed. PPCM is a rare form of cardiac failure occurring late in pregnancy or in the postpartum period. Many women experience dyspnoea, fatigue, and pedal oedema in the last month of pregnancy or postpartum, symptoms which are identical to early congestive heart failure. Therefore, the diagnosis of PPCM requires vigilance. A high mortality rate and overall poor clinical outcome has been reported in a high percentage of these patients. Subsequent pregnancies remain controversial. (*Neth Heart J* 2008;16:415-8.)

Keywords: peripartum cardiomyopathy, complications, puerperium

Peripartum cardiomyopathy (PPCM) is a rare and sometimes fatal form of heart failure that affects women late in pregnancy or in the early puerperium. The morbidity and mortality are high. However, outcome differs widely between reports. At the moment the LEMMoN study is obtaining information about maternal morbidity and the CMS (Committee Maternal Mortality) is collecting data concerning maternal

mortality in the Netherlands. The results of these studies will follow.

In the last month of pregnancy or postpartum, many women experience dyspnoea, fatigue and pedal oedema, symptoms identical to early congestive heart failure. Therefore the diagnosis of PPCM requires vigilance.

We present two cases to illustrate the symptoms and various presentations of maternal morbidity and mortality associated with PPCM.

Patient A, a 27-year-old gravida 1, para 0 was admitted to hospital at a gestational age of 39+1 weeks with preeclampsia. Her blood pressure was 140/95 mmHg; the laboratory investigations were normal, except for proteinuria. The cardiotocographies were normal. There was no intrauterine growth restriction. Because of increasing blood pressure and proteinuria, labour was induced using intravenous oxytocin. A healthy girl was born. Postpartum, she suffered a blood loss of 1200 ml due to an atonic uterus. Sulprostone was not effective and subsequently the patient underwent a curettage. A small placental rest was removed. The total blood loss was 3000 ml for which she received transfusions of blood products. Postoperatively acute respiratory failure developed. She was treated in the intensive care unit by tracheal intubation and diuretics, as we made the diagnosis of postpartum lung oedema associated with preeclampsia and possibly a sulprostone effect. She recovered quickly and returned to the maternity ward after two days.

Five days after delivery the patient experienced dyspnoea. Her blood pressure was 145/110 mmHg, pulse rate 110 beats/min with a peripheral oxygenation of 89%. Lung auscultation revealed early crackles. Heart auscultation revealed no abnormalities. Laboratory investigations showed a combined metabolic acidosis and respiratory alkalosis with a severe hypoxaemia. A mild leucocytosis and elevated lactate dehydrogenase were also seen. Urinary sediment was unremarkable.

She was admitted to the intensive care unit with severe heart failure. The chest X-ray showed signs of pulmonary oedema. Echocardiography demonstrated a dilated left ventricle with normal valves. Based on

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history, physical examination and further examination the diagnosis of peripartum cardiomyopathy was made. Treatment included sodium and fluid restriction, ACE inhibitor and low-dose β -receptor antagonists. She was discharged after eight days. Left ventricular ejection fraction was 40 to 45%. Seven weeks postpartum the echocardiography showed a normal right and left ventricular function with no valvular abnormalities. The patient would like to become pregnant again.

Patient B, a 27-year-old gravida 2, para 0, was admitted to the delivery ward with maternal haemorrhage during delivery. The first and second stages of labour progressed uneventfully with normal maternal bleeding. A healthy son was born. They were discharged the same day.

Three days later the patient was re-admitted with malaise, dyspnoea and confusion. Initially the symptoms were interpreted as a postnatal depression. However, no evident psychiatric disorder was found. A consulting specialist in internal medicine diagnosed cardiac shock and the patient was admitted to the intensive care unit. She had experienced progressive shortness of breath during the second half of her pregnancy.

Physical examination revealed cold acra and cyanosis. The blood pressure was 85/65 mmHg. Her temperature was 37.9 °C and she had a tachypnoea of 40/min with a peripheral saturation of 95% with 4 litres of oxygen. Auscultation of the lungs was normal and a gallop rhythm was heard over the heart. A heave was seen at the cardiac apex. The liver was not palpable. The chest X-ray showed an enlarged heart, which was confirmed by echocardiography. It displayed a dilated left ventricle, a reduction in both right and left ventricular function and a mitral insufficiency (grade III/IV). The electrocardiogram showed a sinus tachycardia with normal conduction, but diffuse ST-T segment abnormalities. The patient was treated with ACE inhibitors, enoximone, nitroglycerine and anti-coagulants. The patient stabilised, but a critical circulation persisted and multiple organ dysfunction syndrome developed. Shortly after intubation she developed pulmonary oedema following left ventricle failure and mitral insufficiency. She was treated with high doses of inotropics and diuretics. Initially she reacted positively to the treatment. However, after several days the low-output syndrome deteriorated. A biventricular assist device (BiVAD) was implanted as 'bridge-to-transplant.' In the following days the patient was prepared for heart transplantation. However, despite the BiVAD system, the cardiac silhouette increased in size. A month after delivery her situation deteriorated severely and she was no longer considered a candidate for heart transplantation. She rapidly developed a multiple organ failure and died as a consequence.

Peripartum cardiomyopathy is a rare form of heart failure of unknown aetiology, which affects previously

healthy women late in pregnancy or in the early puerperium. The diagnosis is defined on the basis of four criteria, adapted from work by Demakis et al. in 1971:¹ 1) Development of cardiac failure in the last month of pregnancy or within five months of delivery, 2) Absence of an identifiable cause for the cardiac failure, 3) Absence of recognisable heart disease prior to the last month of pregnancy, 4) Left ventricular systolic dysfunction demonstrated by classic echocardiographic criteria such as depressed shortening fraction or ejection fraction.

The reported incidence rates range from 1 per 100 to 1 per 15,000 live births.² In the United States an accepted incidence is 1 per 3000 to 1 per 4000 live births.

Although the aetiology of PPCM remains unclear, a number of potential risk factors have been proposed: multiparity, women of African descent, age greater than 30 years, pregnancy with multiple foetuses, a history of preeclampsia, eclampsia, or postpartum hypertension, association with maternal cocaine abuse or selenium deficiency, long-term (>4 weeks) oral tocolytic therapy with β -adrenergic agonists.^{3,4} Patient A had a history of preeclampsia. Patient B had none of the risk factors mentioned above.

Multiple studies have endeavoured to clarify a distinct aetiology of PPCM; however, the cause remains unknown. Myocarditis, an abnormal immune response, stress-activated cytokines and a genetic aetiology possibly play a role in the pathogenesis of PPCM.^{3,4,6-8}

The symptoms of PPCM are similar to those of other forms of heart failure and cardiomyopathy, and can be mild. Most patients develop symptoms in the first four months after delivery (78%). Only 9% present in the last month of pregnancy, and 13% present either more than one month before delivery or more than four months postpartum.⁵ Another study showed that 90% exhibited symptoms in the first two months postpartum, and only 3.5% antepartum.⁹ Many women experience fatigue, dyspnoea and oedema in the last month of pregnancy; symptoms identical to heart failure. This can thwart the diagnosis of PPCM, as is shown in the cases described above. In the case of patient A the dyspnoea and pulmonary oedema were attributed to preeclampsia, with a possible sulprostone effect. The symptoms of patient B were ascribed to a psychiatric disorder. Other symptoms of heart failure are orthopnoea, paroxysmal nocturnal dyspnoea, chest pain, cough, neck vein distension, murmurs and crackles.

The chest X-ray shows cardiac enlargement and increased pulmonary vascularity.⁵ This was also seen in both patient A and patient B. The ECG shows sinus tachycardia, non-specific ST and T wave abnormalities and voltage abnormalities. However, it can be completely normal.² Echocardiography can confirm the diagnosis. It reveals left ventricular enlargement and a reduced ejection fraction.^{3,7,11} Infectious, toxic, meta-

bolic disorders and underlying ischaemic or valvular heart disease must be excluded as causes of cardiomyopathy.^{6,7} Although viral causes were not excluded in the two cases described here, the sequence of delivery and heart failure renders other causes unlikely.

In the absence of systematic studies comparing therapeutic approaches in PPCM, standard heart failure therapy should be initiated. Sodium restriction and diuretics are given for preload reduction. Digoxin is recommended for maximising contractility and rate control. After-load reduction via hydralazine is safe during pregnancy and in case of breastfeeding. ACE inhibitors are contraindicated in the antepartum period due to teratogenicity. However, they should be considered the mainstay of treatment in the postpartum period.

There is increasing evidence of a benefit of β -blockers in dilated cardiomyopathy. It is recommended to start with β -blockers in the postpartum period when patients continue to have symptoms and echocardiographic evidence of left ventricular dysfunction despite standard heart failure management.³ Due to both the hypercoagulable state of pregnancy and the stasis of blood in the left ventricle secondary to left ventricle dysfunction, the patients with PPCM are predisposed to thrombo-embolic phenomena. Based on the severity of left ventricular dilation, anti-coagulants should be started. Immunosuppressive therapy may be considered in patients with myocarditis, documented by endomyocardial biopsy, who fail to improve spontaneously within two weeks of initiation of standard heart failure therapy.³

For women who do not respond to maximal medical therapy, heart transplantation is the last option.

In the United States mortality ranges from 25 to 50%, with nearly 50% of deaths occurring in the first three months postpartum.^{2,3,6,7} In the Netherlands exact figures are not yet known. We hope to gain more insight into the maternal morbidity and mortality rates when the results from the LEMMoN study and the CMS are presented. In the period 1983 to 1992, there were 215 maternal deaths in the Netherlands, three of which were caused by peripartum cardiomyopathy. Two women died in the puerperium and one woman died 80 days postpartum.¹² Between 1993 to 2002 three women died following peripartum cardiomyopathy.¹³

The prognosis depends on the normalisation of left ventricular size and function within six months after delivery.^{14,15} Up to 50% of patients with PPCM recover without complications.

Currently there is no consensus regarding recommendations for future pregnancy after PPCM. Elkayam et al. examined 44 women diagnosed with PPCM who had 60 subsequent pregnancies.^{16,17} More complications occurred in women with persistent left ventricular dysfunction. In this group symptoms of heart failure occurred in 44%, 25% had a decrease of

more than 20% in left ventricular ejection fraction and the maternal mortality rate was 19%. These complications were also seen in the group where the ventricular function had returned to normal. These data coincide with earlier publications.^{1,18,19} The information obtained by the investigations mentioned above demonstrates a high risk associated with subsequent pregnancies and persistent left ventricular dysfunction after PPCM. In this situation a new pregnancy should be discouraged and avoided. Subsequent pregnancies in women with peripartum cardiomyopathy with recovered left ventricular function suggest a low likelihood of mortality. The persistent reduction of left ventricular ejection fraction after subsequent pregnancy seen in some of these patients may, however, lead to late complications.

Peripartum cardiomyopathy is a rare and sometimes even fatal form of heart failure, of unknown aetiology, that affects women late in pregnancy or in the early puerperium. The maternal mortality rate is considerable; more insight into the maternal morbidity and mortality rate concerning the situation in the Netherlands is soon expected. Many women in the last month of pregnancy or postpartum experience dyspnoea, fatigue and pedal oedema, symptoms identical to early congestive heart failure. Therefore the diagnosis of PPCM requires vigilance. In the postpartum period therapy is identical to other forms of heart failure. Cardiac transplantation is a last option. Preconception counselling in a patient after PPCM is important because there is often an increased risk for subsequent pregnancy. ■

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