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CHALLENGES IN INTENSIVE CARE MANAGEMENT OF PATIENTS WITH PERIPARTUM CARDIOMYOPATHY

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Abstract. *Pregnancy is associated with significant physiological changes in the cardiovascular system. Among pregnancy-related cardiovascular complications,* ***peripartum cardiomyopathy (PPCM)*** *is a potentially life-threatening condition that develops in otherwise healthy women during the last month of pregnancy or in the first months postpartum. Distinguishing the pathological symptoms of PPCM (fatigue, dyspnea, and edema) from the normal postpartum discomfort experienced by healthy women remains a major challenge. Furthermore, conditions such as preeclampsia, myocarditis, or underlying genetic diseases can present with overlapping symptoms. These diagnostic difficulties, along with the challenge of differentiating PPCM from other pregnancy-associated pathologies, may explain why the condition is still underdiagnosed. In addition, the underlying pathophysiology is incompletely understood, reliable biomarkers are scarce, and therapeutic options remain limited. Long-term prognosis, treatment strategies, and experience with subsequent pregnancies are only beginning to emerge.*

This review focuses on new aspects of physiological and pathophysiological changes in the maternal cardiovascular system during pregnancy, by comparing normal pregnancy conditions with hypertensive complications, genetic factors, and infectious diseases. It also presents current clinical and basic science knowledge on PPCM, places it in context, and highlights promising new concepts in diagnostic tools, therapeutic approaches, and management.

Normal physiological changes during pregnancy. Hemodynamic changes in maternal circulation begin in the first trimester with a sharp decrease in systemic vascular resistance and a corresponding increase in cardiac output. Activation of the renin-angiotensin-aldosterone system helps maintain blood pressure and promotes salt and water retention in maternal systemic and renal cells, while arterial vasodilation creates a state of relative "underfilling" of the cardiovascular system. Pregnancy hormones such as estrogen, progesterone, and relaxin contribute to vascular relaxation. Cardiac remodeling leads to a significant increase in left ventricular mass and enhanced angiogenesis.

During delivery, maximal cardiac output results from increased heart rate, uterine contractions, elevated circulating catecholamines, and autotransfusion of 300–500 ml of blood from the uterus into the maternal circulation, increasing preload. The risk of thrombosis is 4–10 times higher during pregnancy, peaking at term due to increases in factors VII, X, VIII, fibrinogen, and von Willebrand factor.

Maternal metabolism is reprogrammed during pregnancy, shifting toward greater utilization of fatty acids, development of insulin resistance to some degree, and optimization of glucose concentration for the fetus. Oxidative stress increases during pregnancy, paralleled by a slight delay in antioxidant capacity.

Thus, pregnancy represents one of the most profound instances of hormonal, hemodynamic, and metabolic reprogramming throughout the body and requires further in-depth study.

Peripartum Cardiomyopathy: Definition and Epidemiology. Peripartum cardiomyopathy is a form of non-familial heart failure characterized as an idiopathic cardiomyopathy presenting with heart failure secondary to left ventricular (LV) systolic dysfunction toward the end of pregnancy or in the months following delivery, in the absence of any other identifiable cause (as proposed by the European Society of Cardiology [ESC] Heart Failure Association Working Group on Peripartum Cardiomyopathy). Clinically, PPCM resembles dilated cardiomyopathy

(DCM), although LV dilatation is not always present. The ejection fraction is almost always reduced below 45%.

The incidence of PPCM varies across geographic regions, with higher rates reported in Africa (1:100 to 1:1000) and Haiti (1:299). In Western societies, the incidence appears to be increasing (from 1:4350 in 1993 to 1:2229 in 2002 in the United States), likely related to sociodemographic changes (advanced maternal age, assisted reproductive technologies, and better diagnosis of multifetal pregnancies).

Diagnostic Challenges in Peripartum Cardiomyopathy Due to Variable Cardiac Phenotypes Diagnosis of PPCM relies heavily on a high index of suspicion, as it can present acutely with heart failure requiring intensive care or develop gradually over weeks. In particular, the slowly progressive form with non-specific symptoms of congestion (abdominal discomfort, pleuritic chest pain, palpitations) can sometimes be difficult to distinguish from normal peripartum discomfort.

Electrocardiography No specific ECG patterns are diagnostic for PPCM, but ECG abnormalities are common in affected patients. Minor subsets show intraventricular conduction abnormalities, such as left bundle branch block. Routine ECG is not performed in normal pregnancy, and comparison with pre-pregnancy ECG is often unavailable. However, ECG should be performed when heart failure symptoms are suspected, as it serves as an important tool in differential diagnosis to rule in or exclude pulmonary embolism or acute ischemic events.

Chest X-ray In acute cases, chest radiography may reveal signs of pulmonary congestion or edema with heart failure, sometimes complicated by pneumonia or pleural effusion.

Cardiac Catheterization / Myocardial Biopsy Although fully non-invasive investigations often eliminate the need for invasive diagnostics, in rare cases cardiac catheterization and myocardial biopsy may be required to identify ischemic or infectious causes of heart failure.

Similarities and Differences with Hypertensive Complications of Pregnancy Hypertensive disorders of pregnancy (new-onset or chronic

hypertension), including the most severe forms—preeclampsia and HELLP syndrome—affect up to 8% of pregnant women worldwide. Preeclampsia is a leading cause of preterm delivery and increases the risk of maternal, fetal, and neonatal morbidity and mortality. Cardiac involvement in preeclampsia often manifests as diastolic dysfunction with elevated filling pressures but preserved systolic function and cardiac output. Systolic heart failure is more commonly reported in preterm preeclampsia associated with proteinuria, edema, and abnormalities in liver, hematological, and cerebral function.

Preeclampsia and PPCM share several pathomechanisms, including endothelial damage and elevated serum levels of soluble fms-like tyrosine kinase-1 (sFlt-1). In some PPCM cohorts, hypertensive disorders and preeclampsia during pregnancy are highly prevalent, suggesting that preeclampsia may predispose to PPCM. While severe preeclampsia and PPCM both warrant timely delivery by an interdisciplinary team, postpartum management differs markedly. PPCM patients require long-term (months to years) cardiology follow-up and full heart failure therapy, whereas preeclampsia symptoms typically resolve rapidly postpartum, with blood pressure control being the primary treatment. Thus, close monitoring of the postpartum course in both groups is essential for optimal management, especially given the diagnostic overlap.

Pathomechanisms of Peripartum Cardiomyopathy We briefly summarize current knowledge of PPCM pathomechanisms (for more detail, refer to recent reviews). Potential contributing factors include low selenium levels, various viral infections, stress-activated cytokines, inflammation, autoimmune responses, pathological response to hemodynamic stress, and unbalanced oxidative stress. Cleavage of prolactin into its smaller, biologically active 16-kDa fragment via oxidative stress is considered a major triggering and driving factor in PPCM.

Thus, PPCM manifests as a disease arising from unbalanced oxidative stress, impaired cardioprotective and pro-angiogenic signaling, and overexpression of anti-angiogenic factors. As noted above, these mechanisms may already be initiated

during pregnancy in conditions such as severe gestational hypertension and infectious diseases.

Currently, NT-proBNP is the only commercially available marker effective for screening peripartum heart failure. However, it is not specific to PPCM and may be elevated in preeclampsia, pulmonary embolism, and other conditions.

Intensive Care Management of Peripartum Cardiomyopathy Management of heart failure during pregnancy, particularly PPCM, poses significant challenges for clinicians due to the lack of robust evidence-based data.

Currently, PPCM is treated according to ESC guidelines for heart failure in pregnancy. In brief, therapeutic interventions in late pregnancy must balance maternal and fetal well-being. Beta-blockers, thiazide diuretics, or furosemide may be required in some PPCM patients before delivery, but diuretic therapy should use the lowest possible doses, as it may impair placental perfusion and harm the fetus.

PPCM patients have an increased risk of sudden death and may benefit from implantable cardioverter-defibrillators (ICD) and cardiac resynchronization therapy (CRT). Since many PPCM patients recover or show significant improvement in LV systolic function, a wearable cardioverter-defibrillator serves as an alternative to immediate operative ICD or CRT-D implantation for primary prevention. We recommend the use of wearable devices.

In patients with acute heart failure, additional life-support systems may be employed for stabilization and/or transfer to a tertiary center. In severe cases without signs of recovery after several weeks, implantation of a left ventricular assist device (LVAD) may be considered. Given the generally favorable recovery prognosis within the first 6–12 months in most PPCM patients, heart transplantation is reserved as a last-resort option, and aggressive invasive therapies should not be pursued prematurely.

Conclusion In recent years, awareness of PPCM has increased for the benefit of these patients. Larger clinical datasets are being collected and analyzed, providing more insight into the pathophysiology and yielding important information for

diagnosis and treatment. Large clinical registries of peripartum heart failure, combined with experimental studies, are essential to further expand our understanding of PPCM with respect to its etiology, risk factors, diagnosis, and—most importantly—optimized treatment strategies and management.

REFERENCES:

1. Mebazaa A, Tolppanen H, Mueller C, Lassus J, di Somma S, Baksyte G, et al. Acute heart failure and cardiogenic shock: a multidisciplinary practical guidance. Intensive Care Med. 2016; 42(2): 147–63. doi: 10.1007/s00134-015-4041-5.

2. Sheppard R, Rajagopalan N, Safirstein J, Briller J. An update on treatments and outcomes in peripartum cardiomyopathy. Future Cardiol. 2014. 10(3), 435–47. doi: 10.2217/fca.14.23

3. Sliwa K, Damasceno A, Mayosi BM. Epidemiology and etiology of cardiomyopathy in Africa. Circulation. 2005;112:3577–83. doi: 10.1161/circulationaha.105.542894.

4. Sliwa K, Hilfiker-Kleiner D, Petrie MC, Mebazaa A, Pieske B, Buchmann E, et al. Current state of knowledge on aetiology, diagnosis, management, and therapy of peripartum cardiomyopathy: a position statement from Heart Failure Association of European Society of Cardiology Working Group on peripartum cardiomyopathy. Eur J Heart Fail. 2010; 12(8): 767-78. doi: 10.1093/eurjhf/hfq120

5. Stapel B, Kohlhaas M, Ricke-Hoch M, Haghikia A, Erschow S, Knuuti J, et al. Low STAT3 expression sensitizes to toxic effects of β-adrenergic receptor

stimulation in peripartum cardiomyopathy. Eur Heart J. 2016; ehw086. doi: 10.1093/eurheartj/ehw086.

6. Sliwa K, et al. Current state of knowledge on aetiology, diagnosis, management, and therapy of peripartum cardiomyopathy. Eur J Heart Fail, 2010; 12:767-778.

7. Fett JD. Viral infection as a possible trigger for peripartum cardiomyopathy. Int J Gynaecol Obstet, 2007; 97:149-150.

8. Mielniczuk LM, et al. Incidence of peripartum cardiomyopathy in the United States. J Am Coll Cardiol, 2006; 48:1657-1662.

9. Pierce J, et al. Peripartum cardiomyopathy. Am J Cardiol, 1963; 12:345-350.

10. Sliwa K, et al. EURObservational Research Programme: Peripartum cardiomyopathy registry. Eur Heart J, 2020; 41:3599-3606.

11. Likar.Info. Peripartum cardiomyopathy. 2013;

12. Compendium. Peripartum cardiomyopathy: Recent insights. Compendium, 2023;

13. Medicover Hospitals. Peripartum cardiomyopathy: Causes, symptoms, treatment. 2024;

14. Krasotaimedicina. Secondary cardiomyopathy. 2021;

15. Medelement. Peripartum cardiomyopathy: Clinical protocols. 2014; Available at: diseases.medelement.com.

16. IPAC Study. Prospective study on peripartum cardiomyopathy. 2013;

17. ESC Guidelines. Management of acute heart failure. Eur Heart J, 2021; 42:3599-3726.

18. ICH GCP. Molecular-genetic screening in peripartum cardiomyopathy. 2023; Available at: ichgcp.net.