Биомаркеры

при критических состояниях в акушерстве

Проф. Е. М. Шифман

Заболевания сердца на сегодняшний день –
наиболее частая косвенная причина смертности вообще
и материнской смертности в частности.

Заболевание сердца и беременность

Lewis G., ed. The Confidential Enquiry into Maternal and Child Health (CEMACH). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer-2003–2005. The Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. London: CEMACH, 2007.

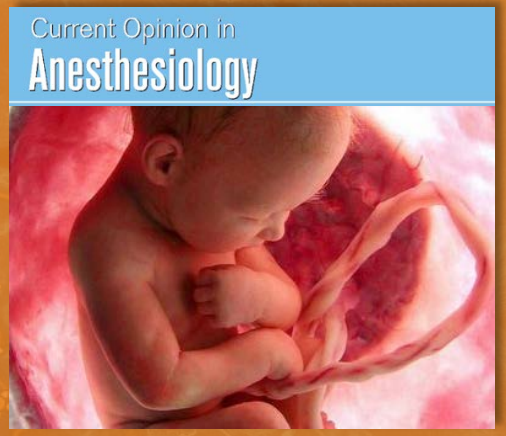
Влияние беременности на состояние сердца

Параметр	Изменения
Ro-графия грудной клетки	Заметная кардиомегалия (увеличение поперечного диаметра)
	Увеличение предсердия (боковая проекция)
	Увеличение границ сосудов
	Выпрямление левой границы сердца
	Выпот в плевру (справа) после родов
ЭКГ	ЧСС
	Отклонение оси сердца вправо
	Блокада правой ножки п. Гиса.
	Депрессия сегмента ST на 1 мм в левом предкардиальном отведении. Ритм: Зубец Q в III-м отведении снижается исчезает, инверсия зубца T в III-м отведении, V2, и V3 отведениях при глубоком дыхании. Интервалы: небольшое уменьшение интервалов PR и QT (в зависимости от ЧСС). Ось: Ротация на ± 15 градусов (QRX).
Эхо-КГ	Тривиальная трикуспидальная регургитация (43–945 при доношенной беременности). Регургитация на легочной артерии (945 при доношенном сроке). Увеличение конечно-диастолического размера ЛЖ (на 12–14%). Увеличение размера левого предсердия (на 12–14%). Противоречивое увеличение толщины ЛЖ. Митральная регургитация при доношенной беременности. Перикардиальный выпот (у 40% в послеродовом периоде).

Из: Gei A. F. & Hankins G. D. (2001). Cardiac diseases and pregnancy. Obstet. Gynecol. Clin. North. Ann., 28,473

Obstetrics & Gynecology Clinics

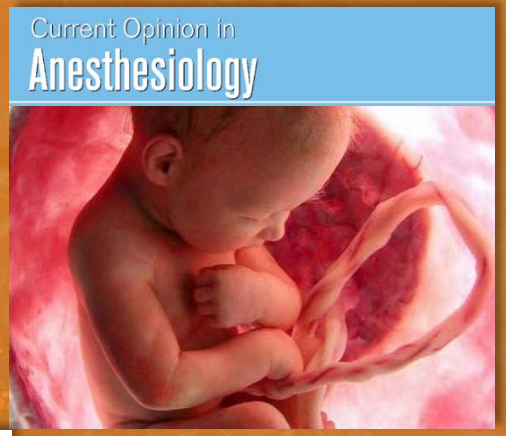
Ключевые точки

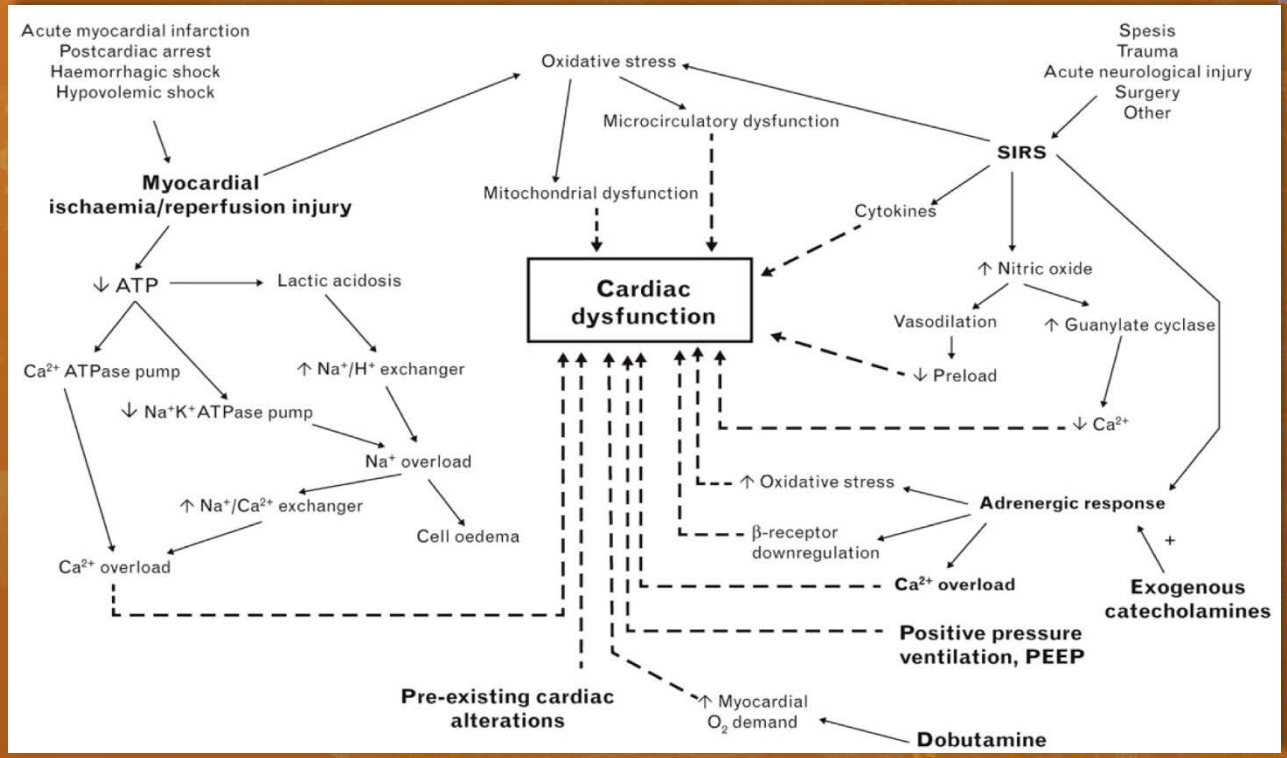


- Нарушение функции миокарда в группе больных в критическом состоянии – частое осложнение, которое способствует развитию гипоперфузии и негативному исходу.
- Определяющим для нарушения функции миокарда может быть первичная ишемия/нарушение реперфузии сердца, влияние воспалительного или адренергического ответа организма на критическое состояние, а так же эффекты, оказываемые препаратами, на миокард.
- Существует двустороннее взаимодействие между сердцем и другими органами, изменения в которых способствуют развитию полиорганной дисфункции.

Donati A., Carsetti A., Damiani E. The role of cardiac disfunction in multiorgan disfunction
Current Opinion in Anesthesiology 29(2):172-177, April 2016

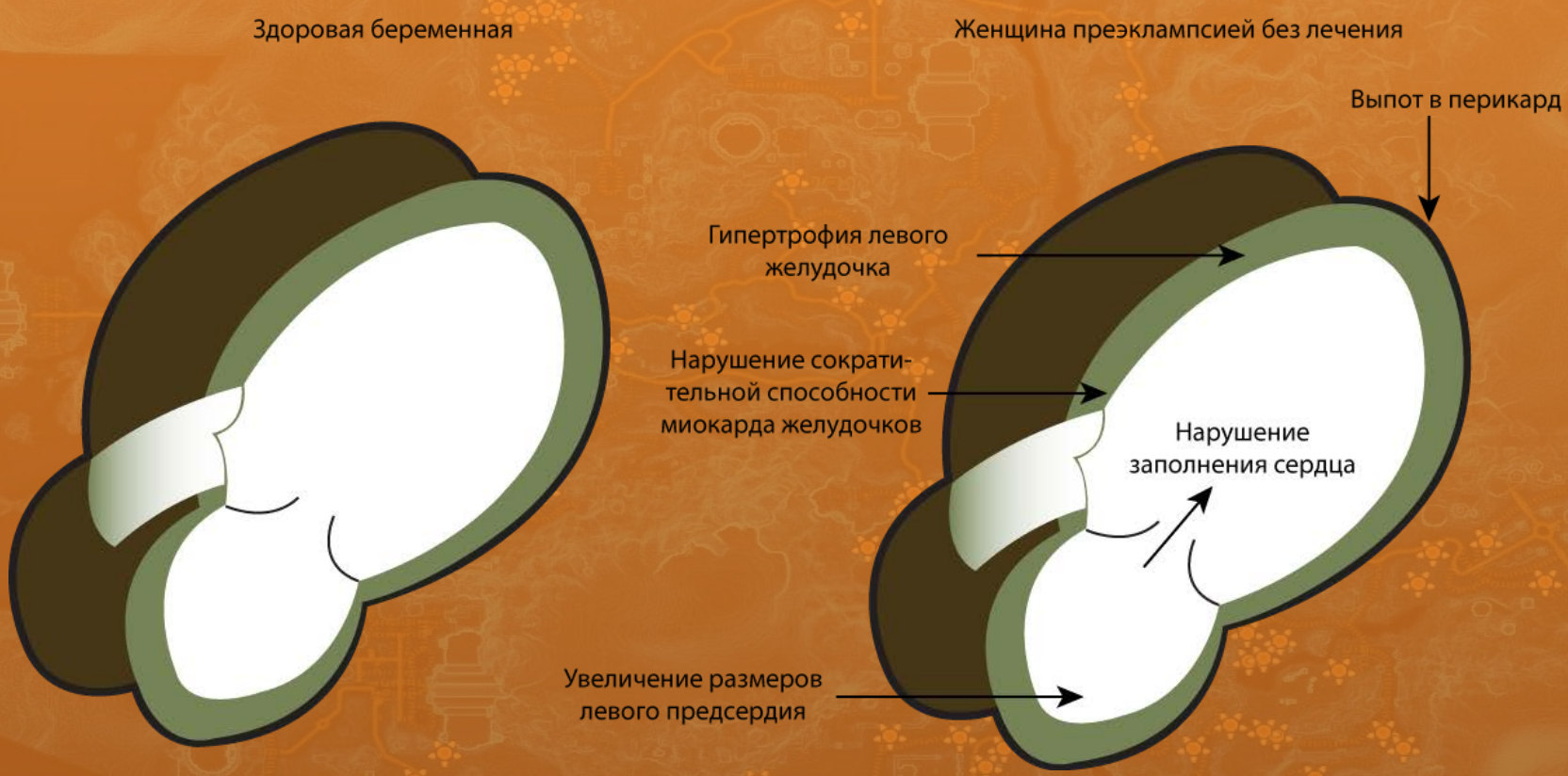
Основные определяющие факторы нарушений функции миокарда у больных в критическом состоянии



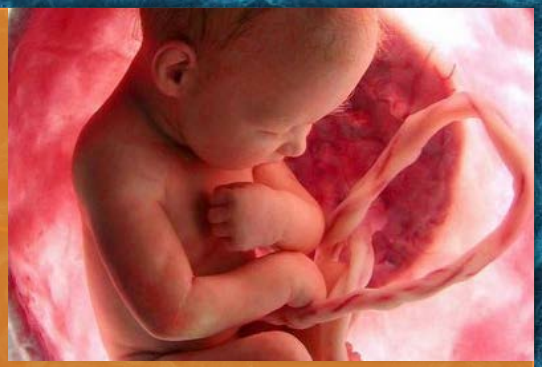


Donati A., Carsetti A., Damiani E. The role of cardiac disfunction in multiorgan disfunction Current Opinion in Anesthesiology 29(2):172-177, April 2016

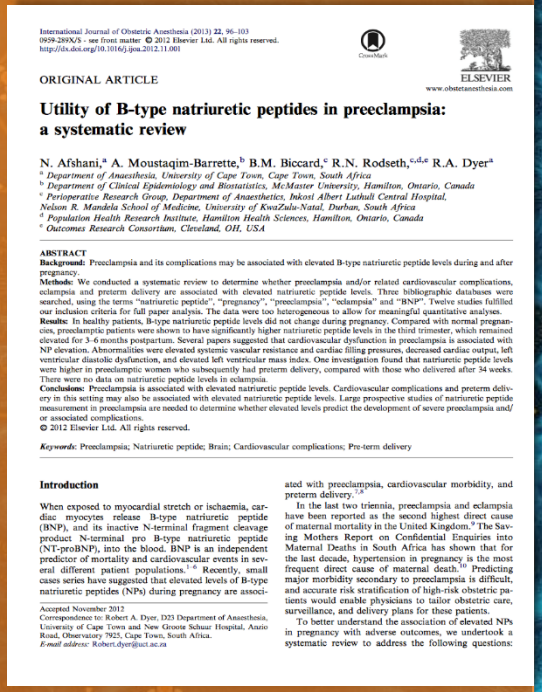
Диастолические и структурные изменения



Сердечно-сосудистые осложнения при преэклампсии и повышенные уровни натрий-уретического пептида типа В



В высококачественном сравнительном исследовании (женщины с преэклампсией и здоровые беременные) несколько эхо-кардиографических признаков диастолической дисфункции левого желудочка **сопровождались повышением NP**



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ORIGINAL ARTICLE

Utility of B-type natriuretic peptides in preeclampsia: a systematic review

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ABSTRACT
Background: Preeclampsia and its complications may be associated with elevated B-type natriuretic peptide levels during and after pregnancy.
Methods: We conducted a systematic review to determine whether preeclampsia and/or related cardiovascular complications, eclampsia and preterm delivery are associated with elevated natriuretic peptide levels. Three bibliographic databases were searched, using the terms "natriuretic peptide", "pregnancy", "preeclampsia", "eclampsia" and "BNP". Twelve studies fulfilled our inclusion criteria for full paper analysis. The data were too heterogeneous to allow for meaningful quantitative analyses.
Results: In healthy patients, B-type natriuretic peptide levels did not change during pregnancy. Compared with normal pregnancies, preeclamptic patients were shown to have significantly higher natriuretic peptide levels in the third trimester, which remained elevated for 3–6 months postpartum. Several papers suggested that cardiovascular dysfunction in preeclampsia is associated with NP elevation. Abnormalities were elevated systemic vascular resistance and cardiac filling pressures, decreased cardiac output, left ventricular diastolic dysfunction, and elevated left ventricular mass index. One investigation found that natriuretic peptide levels were higher in preeclamptic women who subsequently had preterm delivery, compared with those who delivered after 34 weeks. There were no data on natriuretic peptide levels in eclampsia.
Conclusions: Preeclampsia is associated with elevated natriuretic peptide levels. Cardiovascular complications and preterm delivery in this setting may also be associated with elevated natriuretic peptide levels. Large prospective studies of natriuretic peptide measurement in preeclampsia are needed to determine whether elevated levels predict the development of severe preeclampsia and/or associated complications.

Keywords: Preeclampsia; Natriuretic peptide; Brain; Cardiovascular complications; Pre-term delivery

Introduction

When exposed to myocardial stretch or ischaemia, cardiac myocytes release B-type natriuretic peptide (BNP), and its inactive N-terminal fragment cleavage product N-terminal pro B-type natriuretic peptide (NT-proBNP), into the blood. BNP is an independent predictor of mortality and cardiovascular events in several different patient populations.[1–6] Recently, small cases series have suggested that elevated levels of B-type natriuretic peptides (NPs) during pregnancy are associated with preeclampsia, cardiovascular morbidity, and preterm delivery.[7,8]

In the last two triennia, preeclampsia and eclampsia have been reported as the second highest direct cause of maternal mortality in the United Kingdom.[9] The Saving Mothers Report on Confidential Enquiries into Maternal Deaths in South Africa has shown that for the last decade, hypertension in pregnancy is the most frequent direct cause of maternal death.[10] Predicting major morbidity secondary to preeclampsia is difficult, and accurate risk stratification of high-risk obstetric patients would enable physicians to tailor obstetric care, surveillance, and delivery plans for these patients.

To better understand the association of elevated NPs in pregnancy with adverse outcomes, we undertook a systematic review to address the following questions:

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Давление заклинивания в капиллярах легких
и диастолическое легочное давление
при нелеченой преэклампсии коррелируют
с уровнями NP

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journal homepage: www.elsevier.com/locate/ejogrb

Amino-terminal pro-brain natriuretic peptide (NT-proBNP) is a biomarker of cardiac filling pressures in pre-eclampsia

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ABSTRACT

Objective: To evaluate if amino-terminal pro-brain natriuretic peptide (NT-proBNP) plasma levels reflect intracardiac filling pressures in pre-eclamptic patients.
Study design: In a cross-sectional study we investigated 22 untreated critically ill pre-eclamptic women between 22 and 34 weeks gestation. All patients underwent intra-arterial blood pressure and central hemodynamic measurements and NT-proBNP was determined in stored plasma. Baseline characteristics, plasma NT-proBNP concentrations and relevant laboratory variables were investigated for correlations with hemodynamic values using Spearman's rank correlation test.
Results: No significant correlations were demonstrated between NT-proBNP concentrations and variables associated with the severity of the pre-eclampsia. We found significant positive correlations between NT-proBNP and diastolic pulmonary pressure ($r = 0.59$; $p = 0.005$) and pulmonary capillary wedge pressure (PCWP) ($r = 0.51$; $p = 0.015$). Multiple linear regression analysis showed that the association between NT-proBNP and PCWP was not affected by creatinine level.
Conclusion: NT-proBNP is a biomarker of left ventricular cardiac filling pressures in untreated pre-eclamptic patients.

1. Introduction

Antihypertensive treatment to prevent further vascular and circulatory damage forms a mainstay of clinical management of pre-eclampsia [1]. The elevated arterial blood pressure is associated with vasoconstriction and increased left ventricular afterload, reduced cardiac output, hypovolemia and low to normal, or slightly increased, cardiac filling pressures [2,3]. This makes vasodilators the drugs of choice for antihypertensive treatment, but the expansion of vascular space may induce hypotension and a further reduction of cardiac output with adverse effects on perfusion of maternal organs, including the kidney and the uteroplacental unit [1,4]. For that reason plasma volume expansion prior to vasodilating antihypertensive treatment has been recommended, in particular with the use of fast-acting intravenous medication [4,5].

Such hemodynamic treatment in critically ill pre-eclamptic patients requires assessment of cardiovascular risk and monitoring of hemodynamic responses. Central hemodynamic monitoring using flow-directed balloon-tipped pulmonary artery (Swan-Ganz) catheterization provides the most reliable means of assessing cardiac afterload and filling pressures, but it carries significant risks and should be reserved for critically ill patients [6]. Because non-invasive methods for cardiac monitoring have limitations, in particular with regard to measurement of left cardiac filling pressures [7], there is a need for reliable biomarkers of cardiac function and risk assessment.

In non-pregnant patients with a wide range of hemodynamic disturbances, circulating levels of atrial natriuretic peptides, in particular amino-terminal pro-brain natriuretic peptide (NT-proBNP), were shown to be independently associated with cardiac stress and risk of progressive heart failure and death [8,9]. Results of most studies indicate that circulating levels of atrial natriuretic peptides, including NT-proBNP, are increased in healthy pregnancies compared with non-pregnant controls and are higher in pre-eclampsia than in normotensive pregnancies, although not all studies agree [10–13].

We hypothesized that NT-proBNP could reflect the impaired hemodynamics associated with pre-eclampsia, which could make

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doi:10.1016/j.ejogrb.2010.06.011

Speksnijder L, Rutten JH, van den Meiracker AH, et al. Aminoterminal pro-brain natriuretic peptide (NT-proBNP) is a biomarker of cardiac filling pressures in pre-eclampsia. Eur J Obstet Gynecol Reprod Biol 2010;153:12–5.

von Dadelszen P. с соавторами применили комбинацию клинических и лабораторных фактов для выделения среди женщин с преэклампсией группы высокого риска по развитию фатальных или жизнеугрожающих осложнений.

Как значимые показатели оценивались срок беременности, боли в грудной клетке или диспноэ, сатурация кислородом, число тромбоцитов, уровни креатинина и аспартат-трансаминазы.

Prediction of adverse maternal outcomes in pre-eclampsia: development and validation of the fullPIERS model

Peter von Dadelszen, Beth Payne, Jing Li, J Mark Ansermino, Fiona Broughton Pipkin, Anne-Marie Côté, M Joanne Douglas, André Grudin, Jennifer A Hutcheon, K S Joseph, Phillipa M Kyle, Tang Lee, Pamela Loughna, Jennifer M Menzies, Mario Merialdi, Alexandra L Millman, M Peter Moore, Jean-Marie Moutquin, Annie B Ouellet, Graeme N Smith, James J Walker, Keith R Walley, Barry N Walters, Mariana Widmer, Shoo K Lee, James A Russell, Laura A Magee, for the PIERS Study Group

Summary

Background Pre-eclampsia is a leading cause of maternal deaths. These deaths mainly result from eclampsia, uncontrolled hypertension, or systemic inflammation. We developed and validated the fullPIERS model with the aim of identifying the risk of fatal or life-threatening complications in women with pre-eclampsia within 48 h of hospital admission for the disorder.

Methods We developed and internally validated the fullPIERS model in a prospective, multicentre study in women who were admitted to tertiary obstetric centres with pre-eclampsia or who developed pre-eclampsia after admission. The outcome of interest was maternal mortality or other serious complications of pre-eclampsia. Routinely reported and informative variables were included in a stepwise backward elimination regression model to predict the adverse maternal outcome. We assessed performance using the area under the curve (AUC) of the receiver operating characteristic (ROC). Standard bootstrapping techniques were used to assess potential overfitting.

Findings 261 of 2023 women with pre-eclampsia had adverse outcomes at any time after hospital admission (106 [5%] within 48 h of admission). Predictors of adverse maternal outcome included gestational age, chest pain or dyspnoea, oxygen saturation, platelet count, and creatinine and aspartate transaminase concentrations. The fullPIERS model predicted adverse maternal outcomes within 48 h of study eligibility (AUC ROC 0·88, 95% CI 0·84–0·92). There was no significant overfitting. fullPIERS performed well (AUC ROC >0·7) up to 7 days after eligibility.

Interpretation The fullPIERS model identifies women at increased risk of adverse outcomes up to 7 days before complications arise and can thereby modify direct patient care (eg, timing of delivery, place of care), improve the design of clinical trials, and inform biomedical investigations related to pre-eclampsia.

Funding Canadian Institutes of Health Research; UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development, and Research Training in Human Reproduction; Preeclampsia Foundation; International Federation of Obstetricians and Gynecologists; Michael Smith Foundation for Health Research; and Child and Family Research Institute.

Introduction

Pre-eclampsia, more than being proteinuric gestational hypertension alone, is a state of exaggerated systemic inflammation and remains a leading direct cause of maternal morbidity and mortality worldwide.[1] Reduction of the burden of illness associated with pre-eclampsia[2] will address in part the aims of Millennium Development Goal 5.[3,4] In high-income countries, this excess maternal morbidity and mortality relates to both uncontrolled hypertension and the pulmonary and hepatic consequences of systemic inflammation.[5,6] The only cure for pre-eclampsia is delivery. For pre-eclampsia arising remote from term, supportive and temporising measures (expectant management) are used to improve perinatal outcomes. However, the magnitude of the maternal risks associated with expectant management is unclear.[7] The perinatal benefits of expectant management near term are even less clear.[7] Concerns around maternal risk have caused experts to hesitate in recommending expectant management either remote from or close to term.[7] At term, maternal benefits derive from a policy of effecting delivery.[7]

The best method of risk assessment in pre-eclampsia pregnancies being managed expectantly or during induction of labour remains unclear.[7] Currently, assessment is directed by expert opinion-based guidelines that perform poorly when tested for their ability to predict adverse maternal outcomes.[8] A validated tool that allows real-time maternal risk stratification is needed to guide care (eg, expectant management both remote from term or during induction of labour). Previous modelling was unsuccessful for prediction of adverse outcomes occurring at any time after admission with pre-eclampsia.[9,10] However, being able to predict adverse maternal outcomes within a timeframe that would inform and guide clinical care (eg, 48 h to 7 days) would optimise both the management of women admitted with pre-eclampsia and the use of resources.

Standardisation of antenatal and postnatal assessment and surveillance of pre-eclampsia with protocols that

Lancet 2011; 377: 219–27

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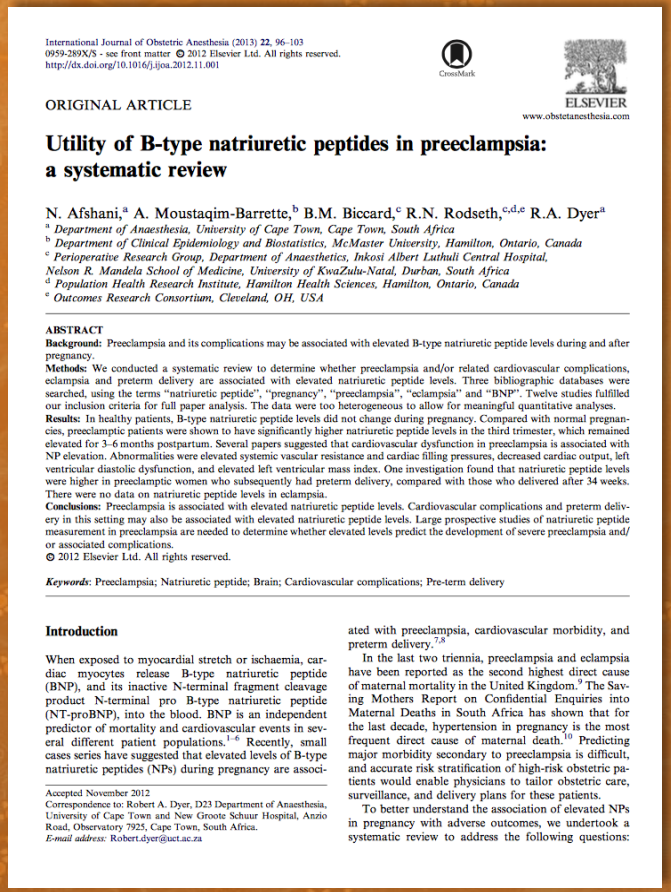
See Comment page 185

Department of Obstetrics and Gynaecology (P von Dadelszen MBChB, B Payne BSc, J Li MSS, J A Hutcheon PhD, Prof K S Joseph MD, T Lee MSc, J M Menzies MSc, A L Millman BSc, L A Magee MD), School of Population and Public Health (P von Dadelszen, Prof K S Joseph, L A Magee), Department of Medicine (Prof K R Walley MD, Prof J A Russell MD, L A Magee), Department of Anesthesiology, Pharmacology, and Therapeutics (J M Ansermino MBBCh, M J Douglas MD), and the CFRI Reproduction and Healthy Pregnancy Cluster (P von Dadelszen, B Payne, J Li, J M Ansermino, J A Hutcheon, Prof K S Joseph, T Lee, J M Menzies, L A Magee), University of British Columbia, Vancouver, BC, Canada; Department of Obstetrics and Gynaecology, University of Ottawa, Ottawa, ON, Canada (A Grudin MD); Département de Médicine (A-M Côté MD) and Département d'Obstétrique-Gynécologie (Prof J-M Moutquin MD, A B Ouellet MD), Université de Sherbrooke, Sherbrooke, QC, Canada; Department of Obstetrics and Gynaecology, Queen's University, Kingston, ON, Canada (Prof G N Smith MD); Department of Paediatrics, University of Toronto, Toronto, ON, Canada (Prof S K Lee MBBS); Department of Obstetrics and Gynaecology (Prof P M Kyle MBChB) and Department of Medicine (M P Moore MBChB), University of Otago, Christchurch,

von Dadelszen P, Payne B, Li J, et al. Prediction of adverse maternal outcomes in pre-eclampsia: development and validation of the full PIERS model. Lancet 2011;377:219–27.

ПЭ сопровождается более высокими значениями NP по сравнению со здоровыми беременными.

Следовательно, **вполне возможно что** определение уровней NP во время беременности обладает потенциалом выявления пациенток группы высокого риска задолго до выраженного прогрессирования процесса.



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ORIGINAL ARTICLE

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N. Afshani,[a] A. Moustaqim-Barrette,[b] B.M. Biccard,[c] R.N. Rodseth,[c,d,e] R.A. Dyer[a]
[a] *Department of Anaesthesia, University of Cape Town, Cape Town, South Africa*
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Keywords: Preeclampsia; Natriuretic peptide; Brain; Cardiovascular complications; Pre-term delivery

Introduction

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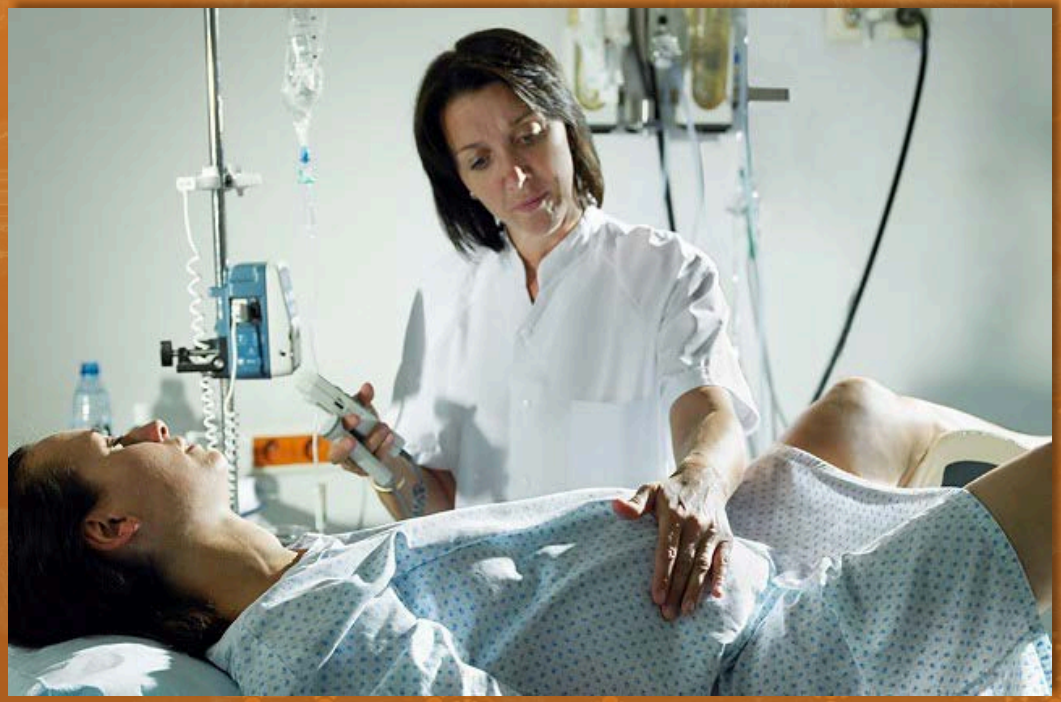
N. Afshani, A. Moustaqim-Barrette, B.M. Biccard, R.N. Rodseth, R.A. Dyer Utility of B-type natriuretic peptides in preeclampsia: a systematic review. International Journal of Obstetric Anesthesia (2013) 22, 96–103

У здоровых беременных уровни NP

не меняются



American Journal of Obstetrics and Gynecology (2005) **193**, 450–4

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American Journal of Obstetrics & Gynecology
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Evaluation of B-type natriuretic peptide (BNP) levels in normal and preeclamptic women

Jamie L. Resnik, MD,* Christina Hong, MD, Robert Resnik, MD, Radmila Kazanegra, MD, Jennifer Beede, BA, Vikas Bhalla, MD, Alan Maisel, MD

Division of Cardiology and Endocrinology and the Department of Medicine, Veteran's Affairs Medical Center and University of California, San Diego, and Department of Reproductive Medicine, University of California, San Diego, San Diego, CA

Received for publication August 23, 2004; revised November 19, 2004; accepted December 2, 2004

KEY WORDS
Preeclampsia
B-natriuretic peptide
BNP
Pregnancy
Left ventricular dysfunction

Objective: B-type natriuretic peptide (BNP) is synthesized in cardiac ventricles in response to volume expansion. This study evaluated BNP levels to determine trends during pregnancy, and to assess BNP as a diagnostic tool in preeclampsia.
Study design: We studied 163 BNP levels in 118 pregnant women, ranging from first trimester to term. An additional 34 patients with preeclampsia were studied and compared to 25 normal control patients at term. Plasma BNP values were determined using a standard assay.
Results: The median BNP levels during the 1st, 2nd, 3rd trimester, and at term were equivalent (18.4, 17.9, 15.5, and 17.8 pg/mL, respectively, $P = .796$). The median BNP levels in normal patients, mild preeclamptics, and severe preeclamptics were 17.8, 21.1, and 101 pg/mL, respectively, with the severe group being significantly higher than the mild group ($P = .003$) and any phase of normal pregnancy ($P < .001$ in each case). A BNP cut-off of <40.6 pg/mL had a negative predictive value of 92% in excluding preeclampsia.
Conclusion: In normal pregnancies, median BNP values are <20 pg/mL, and stable throughout gestation. In severe preeclampsia BNP levels are elevated. This may reflect ventricular stress and/or subclinical cardiac dysfunction associated with preeclampsia.

Preeclampsia is one of the most common disorders of pregnancy, affecting about 5% of pregnancies, and resulting in substantial maternal and neonatal morbidity and mortality.[1,2] Untreated preeclampsia is characterized by a marked increase in peripheral vascular resistance, which, in turn, causes an increase in blood pressure.[3,4] This increase in afterload is superimposed upon the existing volume overloaded hemodynamic state of pregnancy.

B-type natriuretic peptide (BNP) is synthesized in cardiac ventricular tissue in response to volume expansion and pressure overload. It is an approved marker for the diagnosis of congestive heart failure (CHF) in patients with dyspnea in an acute care setting.[5,6] BNP levels

Principal Investigator was Jamie L. Resnik, MD (grant RCO91H-RESNIK).
Supported by an Academic Senate Grant, University of California, San Diego.
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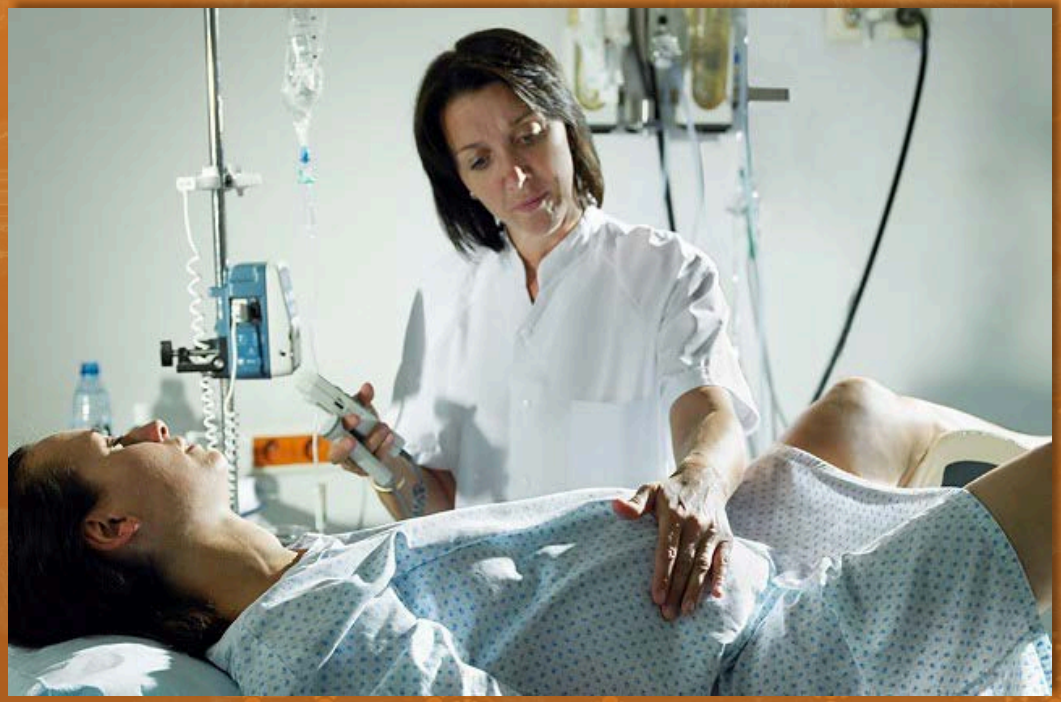
Resnik JL, Hong C, Resnik R, et al. Evaluation of B-type natriuretic peptide (BNP) levels in normal and preeclamptic women. Am J Obstet Gynecol 2005;193:450–4.

У беременных с преэклампсией нарастание уровней NP происходит соответственно степени тяжести ПЭ



American Journal of Obstetrics and Gynecology (2005) 193, 450–4

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American Journal of Obstetrics & Gynecology
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Evaluation of B-type natriuretic peptide (BNP) levels in normal and preeclamptic women

Jamie L. Resnik, MD,* Christina Hong, MD, Robert Resnik, MD, Radmila Kazanegra, MD, Jennifer Beede, BA, Vikas Bhalla, MD, Alan Maisel, MD

Division of Cardiology and Endocrinology and the Department of Medicine, Veteran's Affairs Medical Center and University of California, San Diego, and Department of Reproductive Medicine, University of California, San Diego, San Diego, CA

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KEY WORDS
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doi:10.1016/j.ajog.2004.12.006

Moghbeli N, Srinivas SK, Bastek J, et al. N-terminal pro-brain natriuretic peptide as a biomarker for hypertensive disorders of pregnancy. Am J Perinatol 2010;27:313–9.

Resnik JL, Hong C, Resnik R, et al. Evaluation of B-type natriuretic peptide (BNP) levels in normal and preeclamptic women. Am J Obstet Gynecol 2005;193:450–4.

ПЭ сопровождается повышением уровней NP, **а дальнейшее повышение уровней** может быть предиктором преждевременных родов и сердечно-сосудистых осложнений у пациенток с ПЭ.

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ORIGINAL ARTICLE

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Utility of B-type natriuretic peptides in preeclampsia: a systematic review

N. Afshani,[a] A. Moustaqim-Barrette,[b] B.M. Biccard,[c] R.N. Rodseth,[c,d,e] R.A. Dyer[a]
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[e] *Outcomes Research Consortium, Cleveland, OH, USA*

ABSTRACT
Background: Preeclampsia and its complications may be associated with elevated B-type natriuretic peptide levels during and after pregnancy.
Methods: We conducted a systematic review to determine whether preeclampsia and/or related cardiovascular complications, eclampsia and preterm delivery are associated with elevated natriuretic peptide levels. Three bibliographic databases were searched, using the terms "natriuretic peptide", "pregnancy", "preeclampsia", "eclampsia" and "BNP". Twelve studies fulfilled our inclusion criteria for full paper analysis. The data were too heterogeneous to allow for meaningful quantitative analyses.
Results: In healthy patients, B-type natriuretic peptide levels did not change during pregnancy. Compared with normal pregnancies, preeclamptic patients were shown to have significantly higher natriuretic peptide levels in the third trimester, which remained elevated for 3–6 months postpartum. Several papers suggested that cardiovascular dysfunction in preeclampsia is associated with NP elevation. Abnormalities were elevated systemic vascular resistance and cardiac filling pressures, decreased cardiac output, left ventricular diastolic dysfunction, and elevated left ventricular mass index. One investigation found that natriuretic peptide levels were higher in preeclamptic women who subsequently had preterm delivery, compared with those who delivered after 34 weeks. There were no data on natriuretic peptide levels in eclampsia.
Conclusions: Preeclampsia is associated with elevated natriuretic peptide levels. Cardiovascular complications and preterm delivery in this setting may also be associated with elevated natriuretic peptide levels. Large prospective studies of natriuretic peptide measurement in preeclampsia are needed to determine whether elevated levels predict the development of severe preeclampsia and/or associated complications.

Keywords: Preeclampsia; Natriuretic peptide; Brain; Cardiovascular complications; Pre-term delivery

Introduction

When exposed to myocardial stretch or ischaemia, cardiac myocytes release B-type natriuretic peptide (BNP), and its inactive N-terminal fragment cleavage product N-terminal pro B-type natriuretic peptide (NT-proBNP), into the blood. BNP is an independent predictor of mortality and cardiovascular events in several different patient populations.[1–6] Recently, small cases series have suggested that elevated levels of B-type natriuretic peptides (NPs) during pregnancy are associated with preeclampsia, cardiovascular morbidity, and preterm delivery.[7,8]

In the last two triennia, preeclampsia and eclampsia have been reported as the second highest direct cause of maternal mortality in the United Kingdom.[9] The Saving Mothers Report on Confidential Enquiries into Maternal Deaths in South Africa has shown that for the last decade, hypertension in pregnancy is the most frequent direct cause of maternal death.[10] Predicting major morbidity secondary to preeclampsia is difficult, and accurate risk stratification of high-risk obstetric patients would enable physicians to tailor obstetric care, surveillance, and delivery plans for these patients.

To better understand the association of elevated NPs in pregnancy with adverse outcomes, we undertook a systematic review to address the following questions:

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E-mail address: Robert.dyer@uct.ac.za

N. Afshani, A. Moustaqim-Barrette, B.M. Biccard, R.N. Rodseth, R.A. Dyer Utility of B-type natriuretic peptides in preeclampsia: a systematic review. International Journal of Obstetric Anesthesia (2013) 22, 96–103

По данным литературы, у пациенток с преэклампсией увеличение системного сосудистого сопротивления и давления наполнения сердечных камер, наличие диастолической дисфункции левого желудочка на ЭХО-КГ и депрессия сердечного выброса сопровождаются повышением уровней NP.

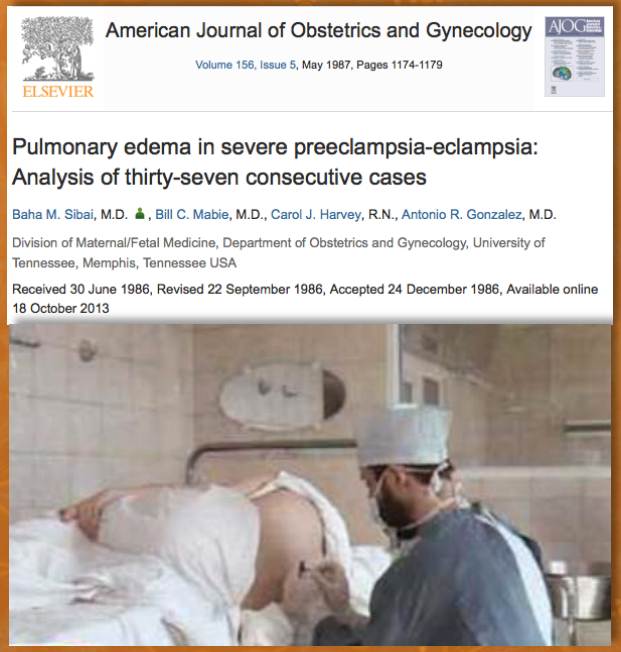
Кроме того, выявленные подъемы могут наблюдаться у пациенток с риском быстрой систолической декомпенсации.

Folk JJ, Lipari CW, Nosovitch JT, Silverman RK, Carlson RJ, Navone AJ. Evaluating ventricular function with B-type natriuretic peptide in obstetric patients. J Reprod Med 2005;50:147–54.

The Journal of Reproductive Medicine®

Ранние исследования показали, что частота отека легких у больных с тяжёлой преэклампсией относительно низкая (около 2,9%, из них 30% развивается до родов, а 70% после родов).

В недавних исследованиях частота практически не изменилась – 3%



American Journal of Obstetrics and Gynecology

Volume 156, Issue 5, May 1987, Pages 1174-1179

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Pulmonary edema in severe preeclampsia-eclampsia: Analysis of thirty-seven consecutive cases

Baha M. Sibai, M.D., Bill C. Mabie, M.D., Carol J. Harvey, R.N., Antonio R. Gonzalez, M.D.

Division of Maternal/Fetal Medicine, Department of Obstetrics and Gynecology, University of Tennessee, Memphis, Tennessee USA

Received 30 June 1986, Revised 22 September 1986, Accepted 24 December 1986, Available online 18 October 2013

Sibai BM, Mabie BC, Harvey CJ, Gonzalez AR. Pulmonary edema in severe preeclampsia-eclampsia: analysis of thirty-seven consecutive cases. Am J Obstet Gynecol 1987;156:1174–9.
Tajik P, Oude Rengerink K, Ganzevoort W, Zwinderman AH, Mol BW, Bossuyt PM. Prediction of pre-eclampsia complications. Lancet 2011;377:1313.

По достоверности прогноза больших сердечных катастроф после некардиохирургических вмешательств NP **значительно выше**, нежели традиционно используемые факторы риска.

Prediction of adverse maternal outcomes in pre-eclampsia: development and validation of the fullPIERS model

Peter von Dadelszen, Beth Payne, Jing Li, J Mark Ansermino, Fiona Broughton Pipkin, Anne-Marie Côté, M Joanne Douglas, André Gruslin, Jennifer A Hutcheon, K S Joseph, Phillipa M Kyle, Tang Lee, Pamela Loughna, Jennifer M Menzies, Mario Merialdi, Alexandra L Millman, M Peter Moore, Jean-Marie Moutquin, Annie B Ouellet, Graeme N Smith, James J Walker, Keith R Walley, Barry N Walters, Mariana Widmer, Shoo K Lee, James A Russell, Laura A Magee, for the PIERS Study Group

Summary

Background Pre-eclampsia is a leading cause of maternal deaths. These deaths mainly result from eclampsia, uncontrolled hypertension, or systemic inflammation. We developed and validated the fullPIERS model with the aim of identifying the risk of fatal or life-threatening complications in women with pre-eclampsia within 48 h of hospital admission for the disorder.

Methods We developed and internally validated the fullPIERS model in a prospective, multicentre study in women who were admitted to tertiary obstetric centres with pre-eclampsia or who developed pre-eclampsia after admission. The outcome of interest was maternal mortality or other serious complications of pre-eclampsia. Routinely reported and informative variables were included in a stepwise backward elimination regression model to predict the adverse maternal outcome. We assessed performance using the area under the curve (AUC) of the receiver operating characteristic (ROC). Standard bootstrapping techniques were used to assess potential overfitting.

Findings 261 of 2023 women with pre-eclampsia had adverse outcomes at any time after hospital admission (106 [5%] within 48 h of admission). Predictors of adverse maternal outcome included gestational age, chest pain or dyspnoea, oxygen saturation, platelet count, and creatinine and aspartate transaminase concentrations. The fullPIERS model predicted adverse maternal outcomes within 48 h of study eligibility (AUC ROC 0·88, 95% CI 0·84–0·92). There was no significant overfitting. fullPIERS performed well (AUC ROC >0·7) up to 7 days after eligibility.

Interpretation The fullPIERS model identifies women at increased risk of adverse outcomes up to 7 days before complications arise and can thereby modify direct patient care (eg, timing of delivery, place of care), improve the design of clinical trials, and inform biomedical investigations related to pre-eclampsia.

Funding Canadian Institutes of Health Research; UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development, and Research Training in Human Reproduction; Preeclampsia Foundation; International Federation of Obstetricians and Gynecologists; Michael Smith Foundation for Health Research; and Child and Family Research Institute.

Lancet 2011; 377: 219–27

Published Online December 24, 2010 DOI:10.1016/S0140-6736(10)61351-7

See Comment page 185

Department of Obstetrics and Gynaecology (P von Dadelszen MBChB, B Payne BSc, J Li MSS, J A Hutcheon PhD, Prof K S Joseph MD, T Lee MSc, J M Menzies MSc, A L Millman BSc, L A Magee MD), School of Population and Public Health (P von Dadelszen, Prof K S Joseph, L A Magee), Department of Medicine (Prof K R Walley MD, Prof J A Russell MD, L A Magee), Department of Anesthesiology, Pharmacology, and Therapeutics (J M Ansermino MBBCh, M J Douglas MD), and the CFRI Reproduction and Healthy Pregnancy Cluster (P von Dadelszen, B Payne, J Li, J M Ansermino, J A Hutcheon, Prof K S Joseph, T Lee, J M Menzies, L A Magee), University of British Columbia, Vancouver, BC, Canada; Department of Obstetrics and Gynaecology, University of Ottawa, Ottawa, ON, Canada (A Gruslin MD); Département de Medicine (A-M Côté MD) and Département d'Obstétrique-Gynécologie (Prof J-M Moutquin MD, A B Ouellet MD), Université de Sherbrooke, Sherbrooke, QC, Canada; Department of Obstetrics and Gynaecology, Queen's University, Kingston, ON, Canada (Prof G N Smith MD); Department of Paediatrics, University of Toronto, Toronto, ON, Canada (Prof S K Lee MBBS); Department of Obstetrics and Gynaecology (Prof P M Kyle MBChB) and Department of Medicine (M P Moore MBChB), University of Otago, Christchurch,

von Dadelszen P, Payne B, Li J, et al. Prediction of adverse maternal outcomes in pre-eclampsia: development and validation of the full PIERS model. Lancet 2011;377:219–27.

Уровень **BNP < 100 pg/ml** у женщин
с преэклампсией и заболеваниями клапанного аппарата сердца дает 100 % негативный прогноз развития сердечных осложнений
во время беременности, показывая
100% чувствительности
и **70%** специфичности

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Biomarkers

B-Type Natriuretic Peptide in Pregnant Women With Heart Disease

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Matthias Greutmann, MD,* Rachel M. Wald, MD,* John D. Parker, MD,* Mathew Sermer, MD,*
Jack M. Colman, MD,* Candice K. Silversides, MD, SM*

Toronto and London, Ontario, Canada

Objectives The objectives of this study were to examine: 1) B-type natriuretic peptide (BNP) response to pregnancy in women with heart disease; and 2) the relationship between BNP levels and adverse maternal cardiac events during pregnancy.

Background Pregnancy imposes a hemodynamic stress on the heart. BNP might be a useful biomarker to assess the ability of the heart to adapt to the hemodynamic load of pregnancy.

Methods This was a prospective study of women with structural heart disease seen at our center. Serial clinical data and plasma BNP measurements were obtained during the first trimester, third trimester, and after delivery (>6 weeks).

Results Seventy-eight pregnant women were studied: 66 women with heart disease (age 31 ± 5 years), and 12 healthy women (age 33 ± 5 years). During pregnancy, the median peak BNP level was higher in women with heart disease compared with control subjects (median 79, interquartile range 51 to 152 pg/ml vs. median 35, interquartile range 21 to 43 pg/ml, $p < 0.001$). In women with heart disease, those with subaortic ventricular dysfunction had higher BNP levels ($p = 0.03$). A BNP >100 pg/ml was measured in all women with events during pregnancy ($n = 8$). Sixteen women had increased BNP levels during pregnancy but did not have clinical events. None of the women with BNP ≤100 pg/ml had events. BNP ≤100 pg/ml had a negative predictive value of 100% for identifying events during pregnancy.

Conclusions Many pregnant women with heart disease have increased BNP levels during pregnancy. Incorporating serial BNP levels in into clinical practice can be helpful, specifically in adjudicating suspected adverse cardiac events during pregnancy. (J Am Coll Cardiol 2010;56:1247–53) © 2010 by the American College of Cardiology Foundation

Pregnancy is characterized by a number of adaptive hemodynamic changes, including increases in plasma volume, heart rate, and cardiac output. The increased volume loading is thought to be a central mechanism underlying the pathogenesis of adverse maternal cardiac events during pregnancy. In the nonpregnant state, B-type natriuretic peptide (BNP) increases in response to these types of volume loading conditions and predicts the risk of adverse outcomes in a variety of cardiac conditions (1–6). Although clinical and echocardiographic predictors of adverse cardiac events during pregnancy have been identified (7,8), risk stratification is incomplete, and current risk stratification does not include evaluation of the adequacy of maternal cardiac adaptation during pregnancy. Furthermore, because the signs and symptoms of pregnancy can mimic those of cardiac decompensation, clinical recognition of heart disease is more difficult during pregnancy and, therefore, there might be a role for additional markers such as serum BNP levels to detect decompensation. The objectives of this study were: 1) to prospectively study BNP levels in pregnant women with structural heart diseases compared with those without heart disease; and 2) to determine the relationship between BNP levels and adverse cardiac events during pregnancy.

From the *University of Toronto Pregnancy and Heart Disease Research Program, Mount Sinai and Toronto General Hospitals, Toronto, Ontario, Canada; and the †Division of Cardiology, University of Western Ontario, London, Ontario, Canada. This work was supported by operating grants from the Heart and Stroke Foundation of Canada (NA 5927, NA 5662) and Canadian Institutes of Health Research (53030, 93722). The University of Toronto Pregnancy and Heart Disease Research Program acknowledges a generous donation from Mrs. Josephine Rogers. Dr. Siu is supported by the Ratnoy Gunton Professorship in Cardiology of the Schulich School of Medicine and Dentistry. All other authors report that they have no relationships to disclose.

Manuscript received September 15, 2009; revised manuscript received February 9, 2010, accepted February 25, 2010.

Methods

Study design. The study prospectively enrolled pregnant women with heart disease and healthy pregnant women (control subjects) receiving obstetric and cardiac care at our center. All women with structural congenital or acquired heart disease followed during pregnancy in our clinic between November 2006 and June 2008 were asked to

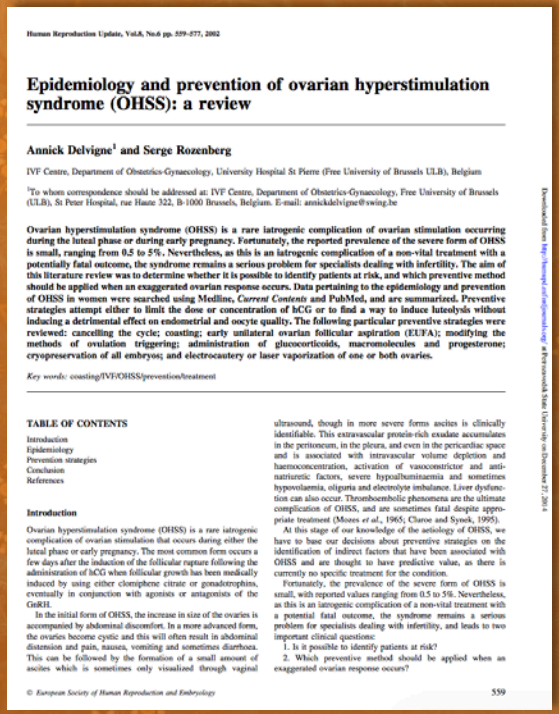
Tanous D, Siu SC, Mason J, et al. B-type natriuretic peptide in pregnant women with heart disease. J Am Coll Cardiol 2010;56:1247–53.

1. Кесарево сечение – независимый фактор риска инсульта с временным интервалом 1 год после родов
2. Риск инсульта на 44% выше в течение 3-х месяцев после родов у женщин с кесаревым сечением по сравнению с родами через естественные родовые пути

Lin S-Y., Hu C-J., Lin H-C. Increased risk of stroke in patients who undergo cesarean section delivery: a nationwide population-based study. Am. J. Obstet. & Gynecol. 2008; April:391–393.
Исследование выполнено на Тайване

Механизм развития риска сердечно-сосудистых осложнений при гиперстимуляции яичников

- Заметное увеличение яичников
- Скопление жидкости в интерстиции и третьем пространстве
- Выпот в перикард, плевральный и перитонеальный выпот
- Состояние гиперкоагуляции
- Прямая овариальная фолликулярная активация ренин-ангиотензин-альдостероновой системы
- Гиперконцентрация
- Увеличение проницаемости сосудов и эндотелиальная дисфункция
- Почечная недостаточность
- Гипотензия
- Легочно-сердечная недостаточность



Human Reproduction Update, Vol.8, No.6 pp. 559–577, 2002

Epidemiology and prevention of ovarian hyperstimulation syndrome (OHSS): a review

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Ovarian hyperstimulation syndrome (OHSS) is a rare iatrogenic complication of ovarian stimulation occurring during the luteal phase or during early pregnancy. Fortunately, the reported prevalence of the severe form of OHSS is small, ranging from 0.5 to 5%. Nevertheless, as this is an iatrogenic complication of a non-vital treatment with a potentially fatal outcome, the syndrome remains a serious problem for specialists dealing with infertility. The aim of this literature review was to determine whether it is possible to identify patients at risk, and which preventive method should be applied when an exaggerated ovarian response occurs. Data pertaining to the epidemiology and prevention of OHSS in women were searched using Medline, *Current Contents* and PubMed, and are summarized. Preventive strategies attempt either to limit the dose or concentration of hCG or to find a way to induce luteolysis without inducing a detrimental effect on endometrial and oocyte quality. The following particular preventive strategies were reviewed: cancelling the cycle; coasting; early unilateral ovarian follicular aspiration (EUFA); modifying the methods of ovulation triggering; administration of glucocorticoids, macromolecules and progesterone; cryopreservation of all embryos; and electrocautery or laser vaporization of one or both ovaries.

Key words: coasting/IVF/OHSS/prevention/treatment

TABLE OF CONTENTS

Introduction

Ovarian hyperstimulation syndrome (OHSS) is a rare iatrogenic complication of ovarian stimulation that occurs during either the luteal phase or early pregnancy. The most common form occurs a few days after the induction of the follicular rupture following the administration of hCG when follicular growth has been medically induced by using either clomiphene citrate or gonadotrophins, eventually in conjunction with agonists or antagonists of the GnRH.

In the initial form of OHSS, the increase in size of the ovaries is accompanied by abdominal discomfort. In a more advanced form, the ovaries become cystic and this will often result in abdominal distension and pain, nausea, vomiting and sometimes diarrhoea. This can be followed by the formation of a small amount of ascites which is sometimes only visualized through vaginal ultrasound, though in more severe forms ascites is clinically identifiable. This extravascular protein-rich exudate accumulates in the peritoneum, in the pleura, and even in the pericardiac space and is associated with intravascular volume depletion and haemoconcentration, activation of vasoconstrictor and anti-natriuretic factors, severe hypoalbuminaemia and sometimes hypovolaemia, oliguria and electrolyte imbalance. Liver dysfunction can also occur. Thromboembolic phenomena are the ultimate complication of OHSS, and are sometimes fatal despite appropriate treatment (Mozes *et al.*, 1965; Charoe and Synek, 1995).

At this stage of our knowledge of the aetiology of OHSS, we have to base our decisions about preventive strategies on the identification of indirect factors that have been associated with OHSS and are thought to have predictive value, as there is currently no specific treatment for the condition.

Fortunately, the prevalence of the severe form of OHSS is small, with reported values ranging from 0.5 to 5%. Nevertheless, as this is an iatrogenic complication of a non-vital treatment with a potential fatal outcome, the syndrome remains a serious problem for specialists dealing with infertility, and leads to two important clinical questions:

1. Is it possible to identify patients at risk?
2. Which preventive method should be applied when an exaggerated ovarian response occurs?

Hum. Rep. Update 2002; 8(6):559–577

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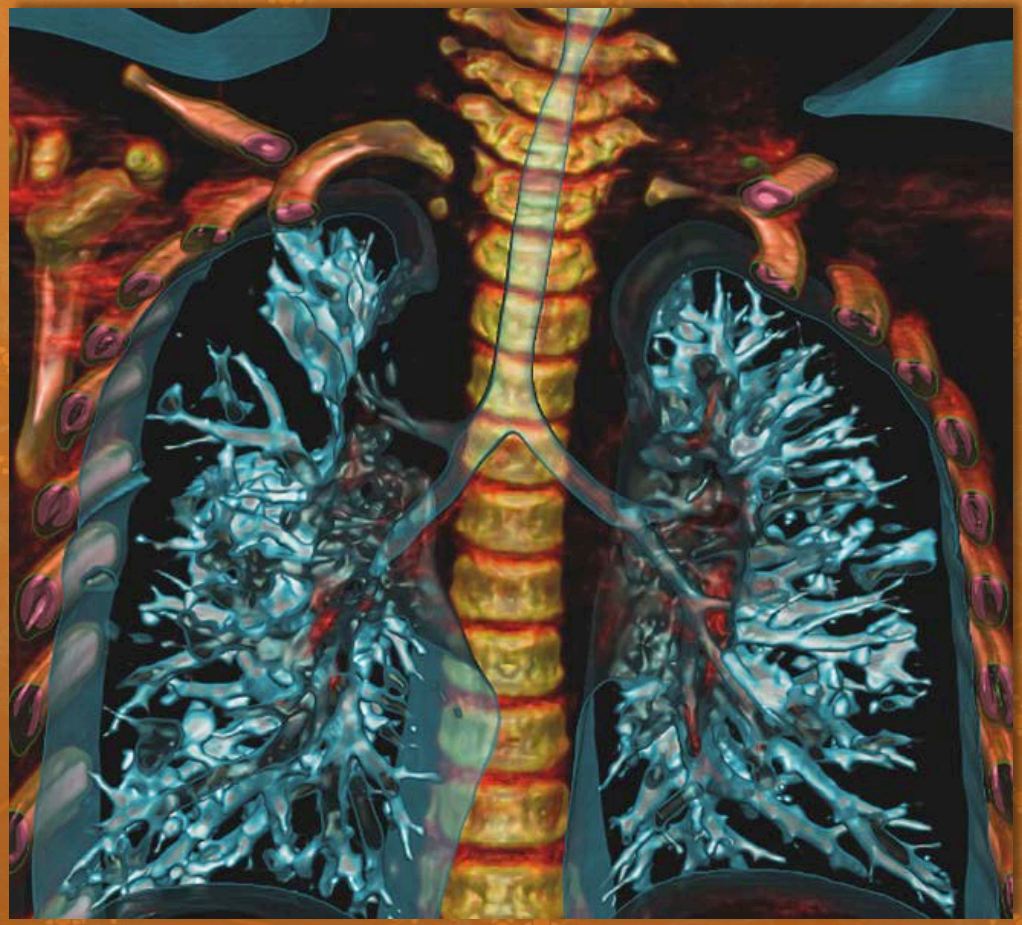

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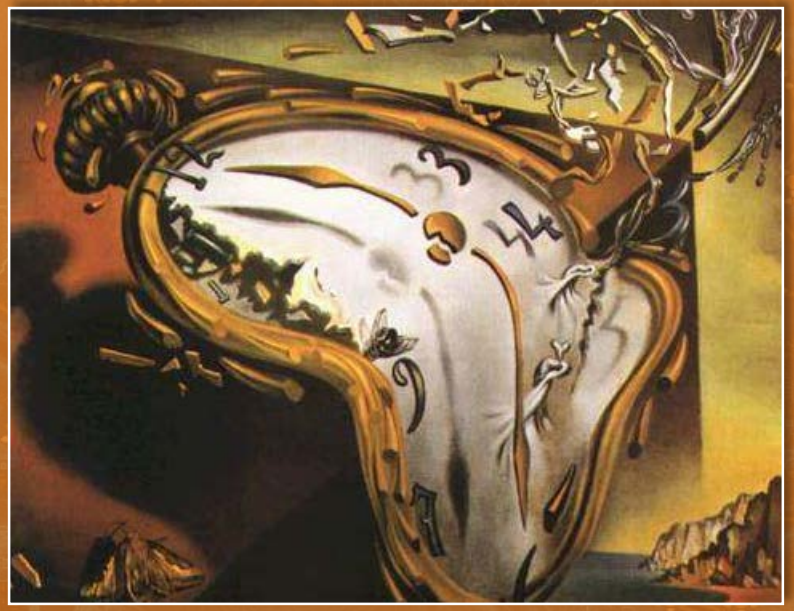
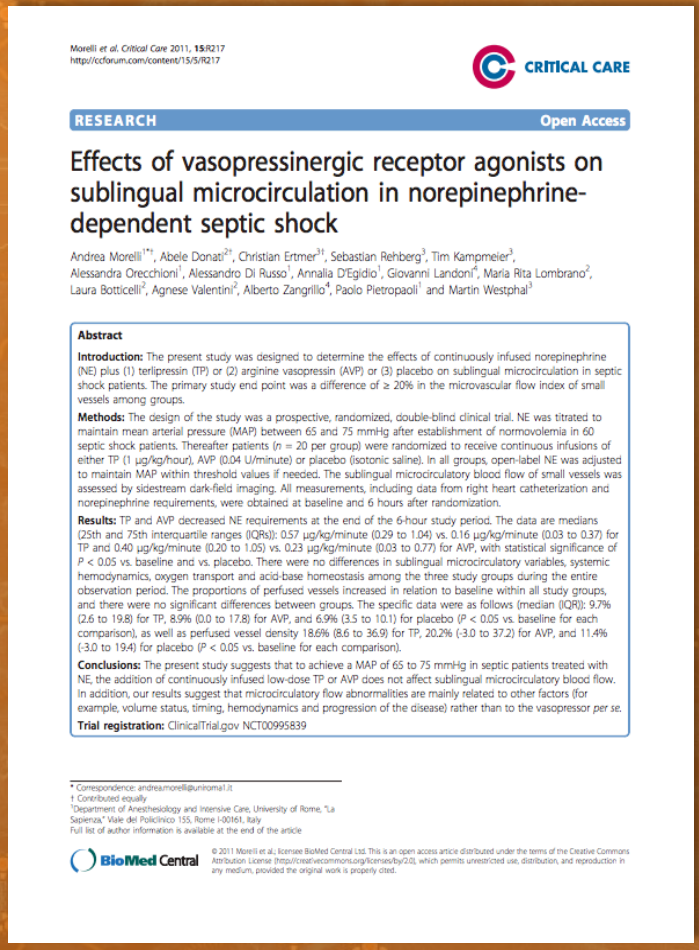


Заключение:

...результаты дают основание сделать вывод что нарушение микроциркуляции преимущественно связаны с другими факторами *(например, состояние объема, гемодинамика, прогрессирование заболевания)*, чем с вазопрессорами как таковыми.



Morelli et al. Critical Care 2011, 15:R217
http://ccforum.com/content/15/5/R217

CRITICAL CARE

RESEARCH Open Access

Effects of vasopressinergic receptor agonists on sublingual microcirculation in norepinephrine-dependent septic shock

Andrea Morelli[1*†], Abele Donati[2†], Christian Ertmer[3†], Sebastian Rehberg[3], Tim Kampmeier[3], Alessandra Orecchioni[1], Alessandro Di Russo[1], Annalia D'Egidio[1], Giovanni Landoni[4], Maria Rita Lombrano[2], Laura Botticelli[2], Agnese Valentini[2], Alberto Zangrillo[4], Paolo Pietropaoli[1] and Martin Westphal[3]

Abstract

Introduction: The present study was designed to determine the effects of continuously infused norepinephrine (NE) plus (1) terlipressin (TP) or (2) arginine vasopressin (AVP) or (3) placebo on sublingual microcirculation in septic shock patients. The primary study end point was a difference of ≥ 20% in the microvascular flow index of small vessels among groups.

Methods: The design of the study was a prospective, randomized, double-blind clinical trial. NE was titrated to maintain mean arterial pressure (MAP) between 65 and 75 mmHg after establishment of normovolemia in 60 septic shock patients. Thereafter patients (n = 20 per group) were randomized to receive continuous infusions of either TP (1 μg/kg/hour), AVP (0.04 U/minute) or placebo (isotonic saline). In all groups, open-label NE was adjusted to maintain MAP within threshold values if needed. The sublingual microcirculatory blood flow of small vessels was assessed by sidestream dark-field imaging. All measurements, including data from right heart catheterization and norepinephrine requirements, were obtained at baseline and 6 hours after randomization.

Results: TP and AVP decreased NE requirements at the end of the 6-hour study period. The data are medians (25th and 75th interquartile ranges (IQRs)): 0.57 μg/kg/minute (0.29 to 1.04) vs. 0.16 μg/kg/minute (0.03 to 0.37) for TP and 0.40 μg/kg/minute (0.20 to 1.05) vs. 0.23 μg/kg/minute (0.03 to 0.77) for AVP, with statistical significance of $P < 0.05$ vs. baseline and vs. placebo. There were no differences in sublingual microcirculatory variables, systemic hemodynamics, oxygen transport and acid-base homeostasis among the three study groups during the entire observation period. The proportions of perfused vessels increased in relation to baseline within all study groups, and there were no significant differences between groups. The specific data were as follows (median (IQR)): 9.7% (2.6 to 19.8) for TP, 8.9% (0.0 to 17.8) for AVP, and 6.9% (3.5 to 10.1) for placebo ($P < 0.05$ vs. baseline for each comparison), as well as perfused vessel density 18.6% (8.6 to 36.9) for TP, 20.2% (-3.0 to 37.2) for AVP, and 11.4% (-3.0 to 19.4) for placebo ($P < 0.05$ vs. baseline for each comparison).

Conclusions: The present study suggests that to achieve a MAP of 65 to 75 mmHg in septic patients treated with NE, the addition of continuously infused low-dose TP or AVP does not affect sublingual microcirculatory blood flow. In addition, our results suggest that microcirculatory flow abnormalities are mainly related to other factors (for example, volume status, timing, hemodynamics and progression of the disease) rather than to the vasopressor *per se*.

Trial registration: ClinicalTrial.gov NCT00995839

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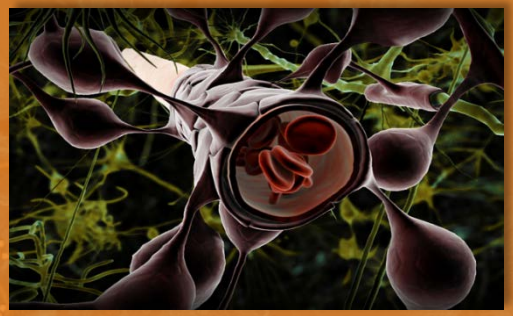
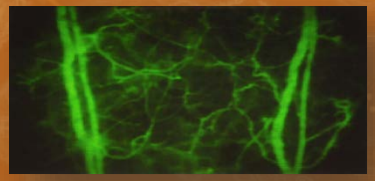
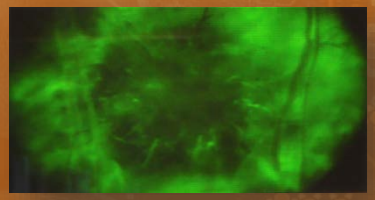
Синдром "капиллярной утечки" при сепсисе, РДСВ и шоке



Тяжелый синдром "капиллярной утечки" играет важную роль в патогенезе нескольких воспалительных синдромов, включая сепсис, острое повреждение легких и шок

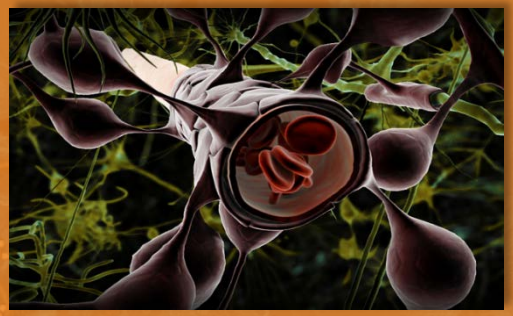




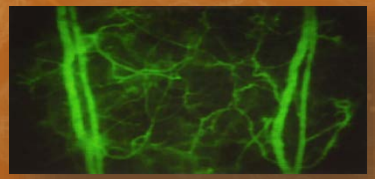
Микроваскулярная «утечка» обусловлена увеличением проницаемости эндотелия

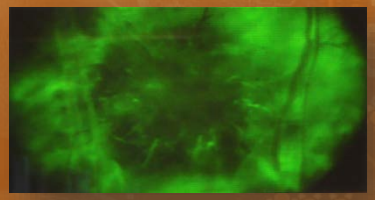
Медиаторы воспаления дестабилизируют эндотелиальные развязки, вызывая отек ткани с потенциально опасным воздействием на оксигенацию тканей и функцию органов

Синдром "капиллярной утечки" при сепсисе, РДСВ и шоке



Выраженный синдром "капиллярной утечки"





Как оценить?

Как лечить?

- Работа группы по исследованию лактата и ее протоколы привели к снижению риска госпитальной смерти (соотношение рисков 0,61, (CI 0.43–0.87), с поправкой на предопределенные факторы риска.
- Мониторинг лактата
  - ✓ Улучшение вентиляции *(HR 0.72; 95% CI 0.5–0.98)*
  - ✓ Уменьшение потребности в инотропной поддержке *(HR 0.65; 95% CI 0.42–1.00)*
  - ✓ Ранний перевод из отделения интенсивной терапии *(HR 0.65; 95% CI 0.5–0.85)*

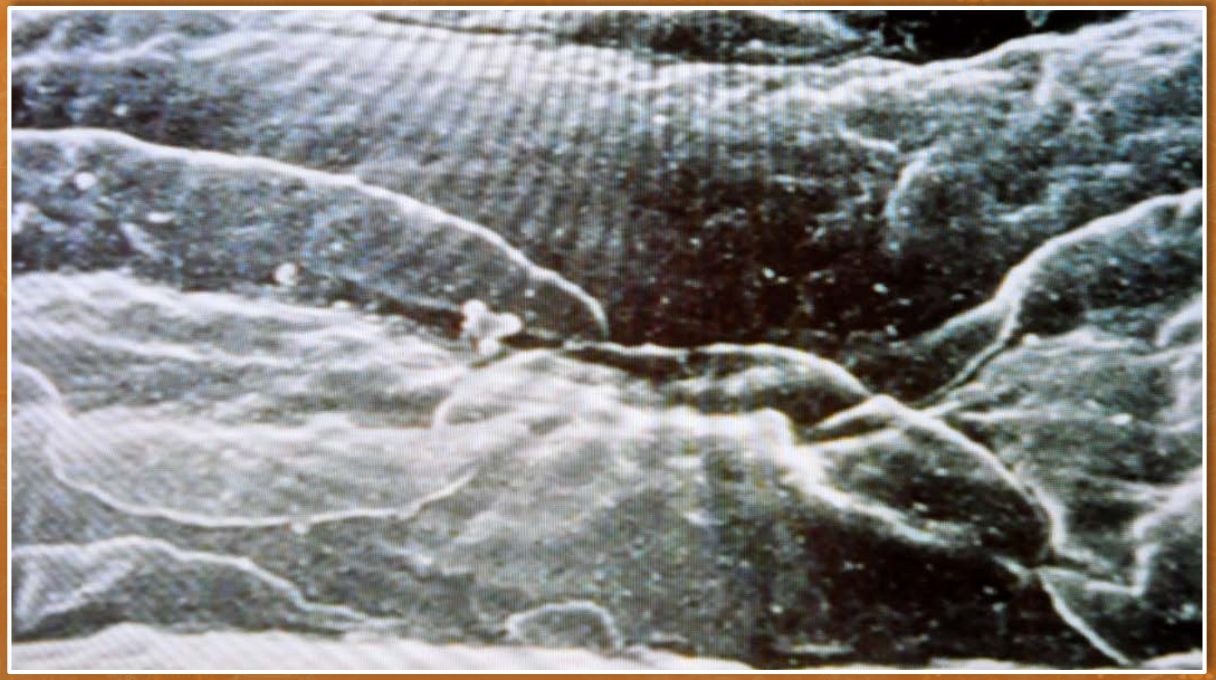

Editorials

Palliative Care for Pulmonary Patients

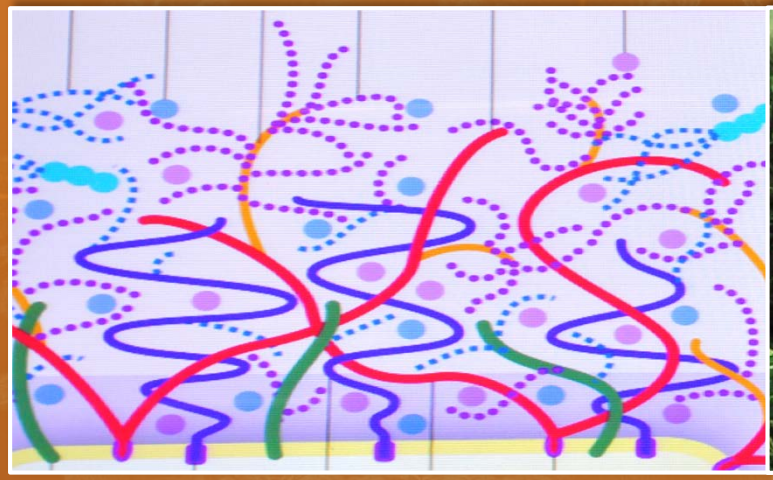
Am J Resp Crit Care Med 2010; 182: 752

Эндотелий – это то, о чем необходимо заботиться

Эндотелий – не обнаженная поверхность



Гликокаликс – затерянный в джунглях



Маркеры сепсиса

Клиническое применение

- **Выявление инфекции**
  - *Действительно ли у пациента имеется инфекция?*
    - ✓ Антибиотики, хирургическое вмешательство
- **Показатели тяжести**
  - *Относится ли пациент к группе высокого риска*
    - ✓ Прогноз, (новые) методы лечения сепсиса
- **Мониторинг ответа пациента на терапию**
  - *Улучшается ли состояние пациента?*
    - ✓ Повторная хирургическая операция, изменение режима антибактериальной терапии

Некоторые маркеры сепсиса

Resistin lactoferrin

Фибриноген

Неоптерин

Фосфолипаза

Копептин

Гелзолин

Gas6

Остеопонтин

ИЛ-13

ИЛ-10

sPLA2

СРБ

Эластаза

sCD163

TREM

Альфа амилоид

Факторы комплемента

Фосфолипаза

CD 64

ИЛ-6

Нитриты/нитраты

Рецепторы фактора некроза опухоли

Группа протеина высокой мобильности-1

sCD14

Фактор некроза опухоли

Прокальцитонин

Эндотелиальная молекула адгезии лейкоцитов-1

Миелоид, относящийся к протеину (MRP) 8 и 14

Альфа1антитрипсин

sIL-1 рецепторы

Церулоплазмин

Протеин С

Интерферон-γ

Рецепторы ИЛ-2

Эндотелин-1

Гранзим К

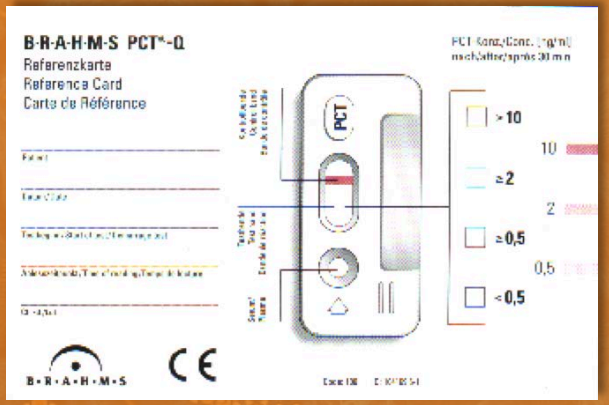
ИЛ-8

Е-селектин

Маркеры сепсиса

Некоторые из предложенных маркеров сепсиса

- Количество лейкоцитов
- С-реактивный белок
- Прокальцитонин
- Пресепсин *(soluble CD14 subtype)*



- *Эндотоксин, Цитокины – IL-1, IL-2, IL-4, IL-6, IL-8, IL-10, TNF, IFN-γ, PAF, TNF-рецепторы, Антагонисты рецептора IL-1, рецепторы IL-1, Компоненты системы комплемента, Эндотелин-1, ICAM-1, VCAM-1, Фосфолипаза A_2, PG E_2, Нитраты/нитриты, Лактоферрин, Эластаза, Неоптерин…*

Vincent J. L., Habib A. M., Verdant C., Bruhn A. Sepsis diagnosis and management: work in progress Minerva Anestesiol. 2006;72:87-96

- У здоровых людей уровни прокальцитонина очень низкие. При системных инфекциях, включая сепсис, уровни обычно выше 0,5–2 нг/мл и часто превышают уровень > 10 нг/мл, что коррелирует с тяжестью заболевания и плохим прогнозом.

N. J. Soni, D. J. Samson, J. L. Galaydick, V. Vats, E. S. Huang, N. Aronson, D. L. Pitrak
Procalcitonin-Guided Antibiotic Therapy: A Systematic Review and Meta-analysis.
Journal of Hospital Medicine, V. 8, № 9, September 2013

Effective Health Care Program

Comparative Effectiveness Review
Number 78

Procalcitonin-Guided Antibiotic Therapy

Gu and Liu *Critical Care* 2014, 18:427
http://ccforum.com/content/18/3/427

CRITICAL CARE

LETTER

Procalcitonin-guided therapy in severe sepsis and septic shock

Wan-Jie Gu and Jing-Chen Liu*

Hindawi Publishing Corporation
Critical Care Research and Practice
Volume 2014, Article ID 819034, 7 pages
http://dx.doi.org/10.1155/2014/819034

Clinical Study

Procalcitonin Clearance for Early Prediction of Survival in Critically Ill Patients with Severe Sepsis

Mohd Basri Mat Nor and Azrina Md Ralib

Department of Anaesthesiology and Intensive Care, Kulliyyah of Medicine, International Islamic University Malaysia, Jalan Hospital Campus, 25000 Kuantan, Pahang, Malaysia

Correspondence should be addressed to Mohd Basri Mat Nor; basri.matnor@gmail.com

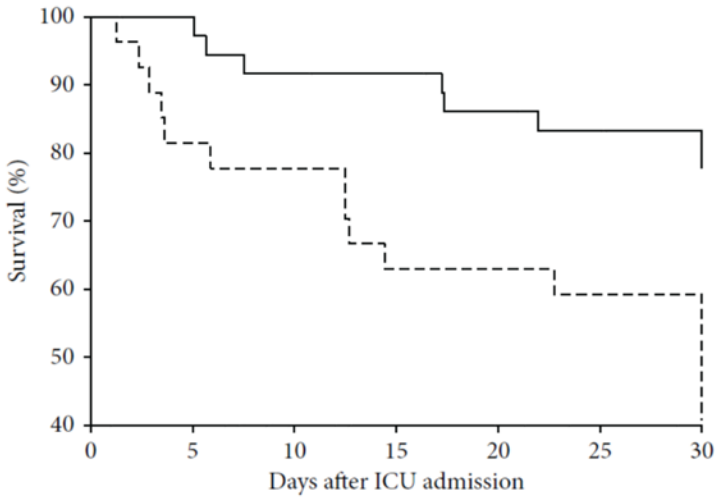


FIGURE 3: Kaplan Meier 30-day survival curve for groups 1 and 2. Log Mantel Cox Test ($P = 0.002$).

Температура,
частота сердечных
сокращений,
артериальное давление

Боль в грудной клетке,
частота сердечных
сокращений,
артериальное давление

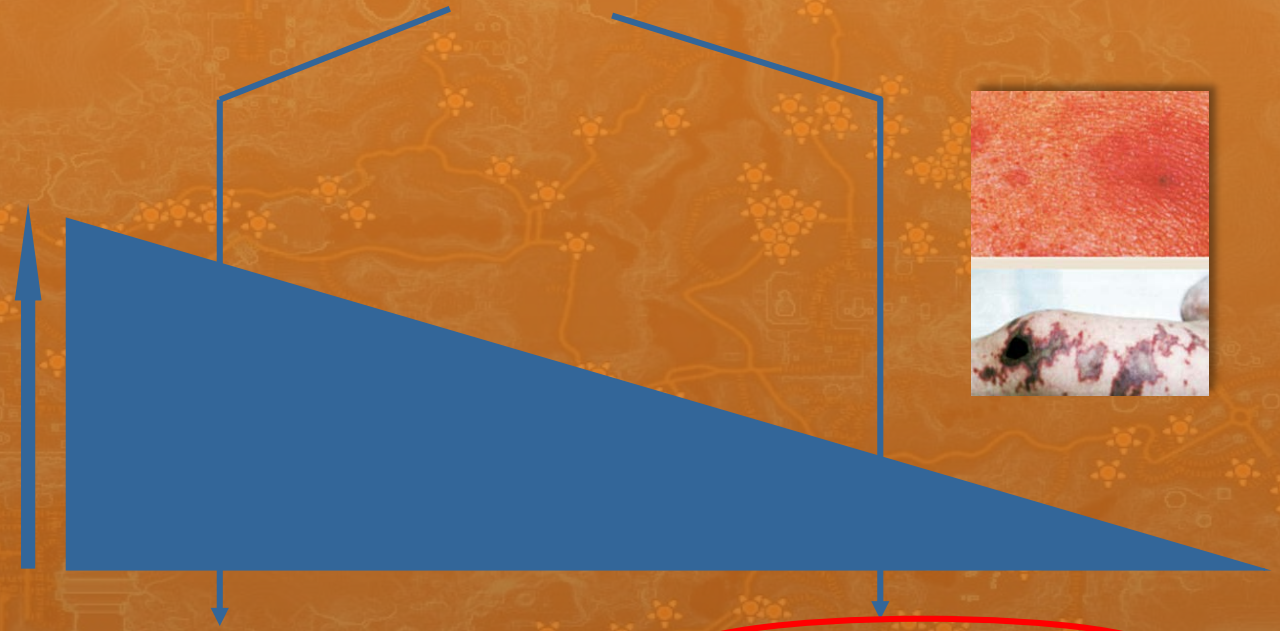
СЕПСИС

ИНФАРКТ МИОКАРДА

Тропониновый тест при сепсисе

Маркеры сепсиса

Лихорадка, гиперкинетическое состояние,
тахикардия, учащенное дыхание



Лейкоциты,
С-реактивный белок,
прокальцитонин и т. д.

Сепсис вероятен
антибиотики,
хирургическое вмешательство
(контроль источника инфекции)

Сепсис маловероятен
(не назначать антибиотики,
не принимать дополнительные меры)

Маркеры сепсиса

Фактор некроза опухоли, интерлейкин – 1, интерлейкин – 6

Показатели острофазовых реакций

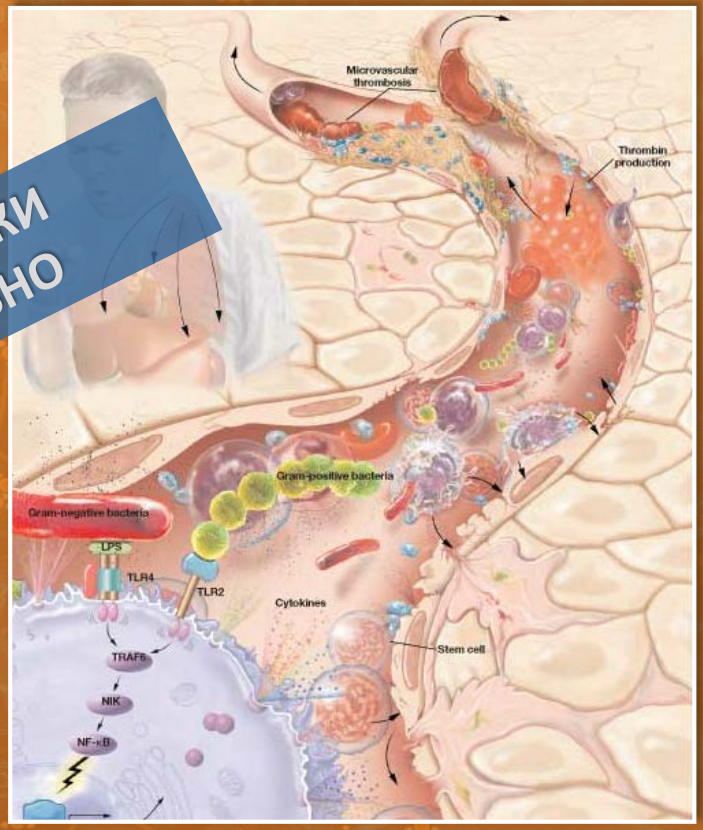
С-реактивный белок, амилаза сыворотки, прокальцитонин, альфа-1 кислый гликопротеин (орсомукоид), фибриноген, гаптоглобин, ингибитор альфа-1 протеиназы, альфа-2 макроглобулин

Альбумин, трансферрин

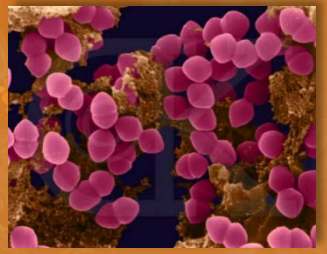
Маркеры сепсиса

- Лейкоцитоз
- Инфекция
- Травма
- Ожог
- Ишемия/репефузия
- Отек легких

ПРАКТИЧЕСКИ БЕСПОЛЕЗНО



Прокальцитонин



Лучше, чем С-реактивный белок?

- Более чувствительный прогностический фактор исхода при сепсисе, по сравнению с клиническими критериями?

  Bossnik et al, Clin Infect Dis 29: 398–407, 2000

- Более чувствительный прогностический фактор при сепсисе по сравнению с С-реактивным белком и интерлейкином-6?

  Muller et al Crit Care Med 28: 977–983, 2000

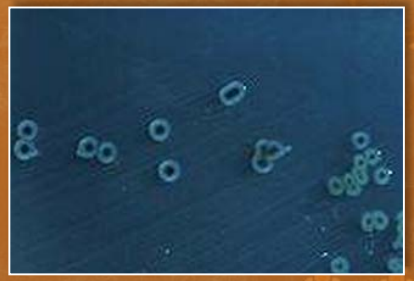
- Более точный прогностический фактор по сравнению с уровнями интерлейкина- 6 и интерлейкина – 8

  Harbarth et al., Am J Respir Crit Care Med 164; 396–402, 2001

Кишечная транслокация?

Терроризм?

20 г эндотоксина в одном человеческом теле способны убить миллионы людей (*в дозе 10 нг/кг внутривенно*)



Journal of
HOSPITAL MEDICINE

Review

Procalcitonin-guided antibiotic therapy: A systematic review and meta-analysis

Nilam J. Soni MD[1,*], David J. Samson MS[2], Jodi L. Galaydick MD[3], Vikrant Vats PhD[2], Elbert S. Huang MD, MPH[4], Naomi Aronson PhD[2] and David L. Pitrak MD[5]

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Issue

Journal of Hospital Medicine

Volume 8, Issue 9, pages 530–540, September 2013

N. J. Soni, D. J. Samson, J. L. Galaydick, V. Vats, E. S. Huang, N. Aronson, D. L. Pitrak Procalcitonin-Guided Antibiotic Therapy: A Systematic Review and Meta-analysis. Journal of Hospital Medicine, V. 8, No 9, September 2013

- Уровни прокальцитонина **снижаются до < 0,25 нг/мл** при разрешении инфекционного процесса и снижение уровня может способствовать решению о прекращении антибиотикотерапии.

N. J. Soni, D. J. Samson, J. L. Galaydick, V. Vats, E. S. Huang, N. Aronson, D. L. Pitrak
Procalcitonin-Guided Antibiotic Therapy: A Systematic Review and Meta-analysis.
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Спасибо за внимание!