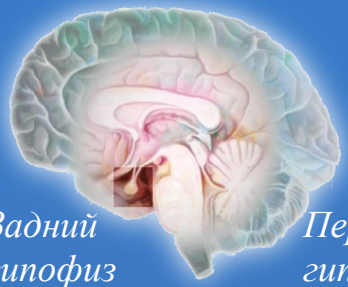
Применение утеротоников при операции кесарево сечения: между Сциллой и Харибдой

д. м. н. профессор
Е. М. Шифман

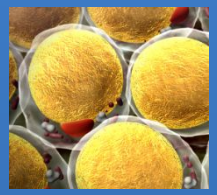
Множественные физиологические функции



Задний гипофиз

Передний гипофиз

Окситоцин



Жировая ткань

↑ Липолиз и β-окисление Жирной кислоты

Малые адипоциты

↓ Лептин

↑ Адипонектин

↑ Липопротеинлипаза Гормончувствительная

Липаза Fat, Pnpla2

Печень

Мышцы

↑ Чувствительность к инсулину

↑ Захват глюкозы

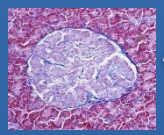
Фосфоиноситид-3 киназа, активированная протеинкиназа Са CAMKK

Поджелудочная железа

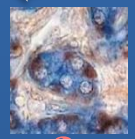
↑ Высвобождение инсулина

Протеинкиназа-с, PI

Островок Лангерганса

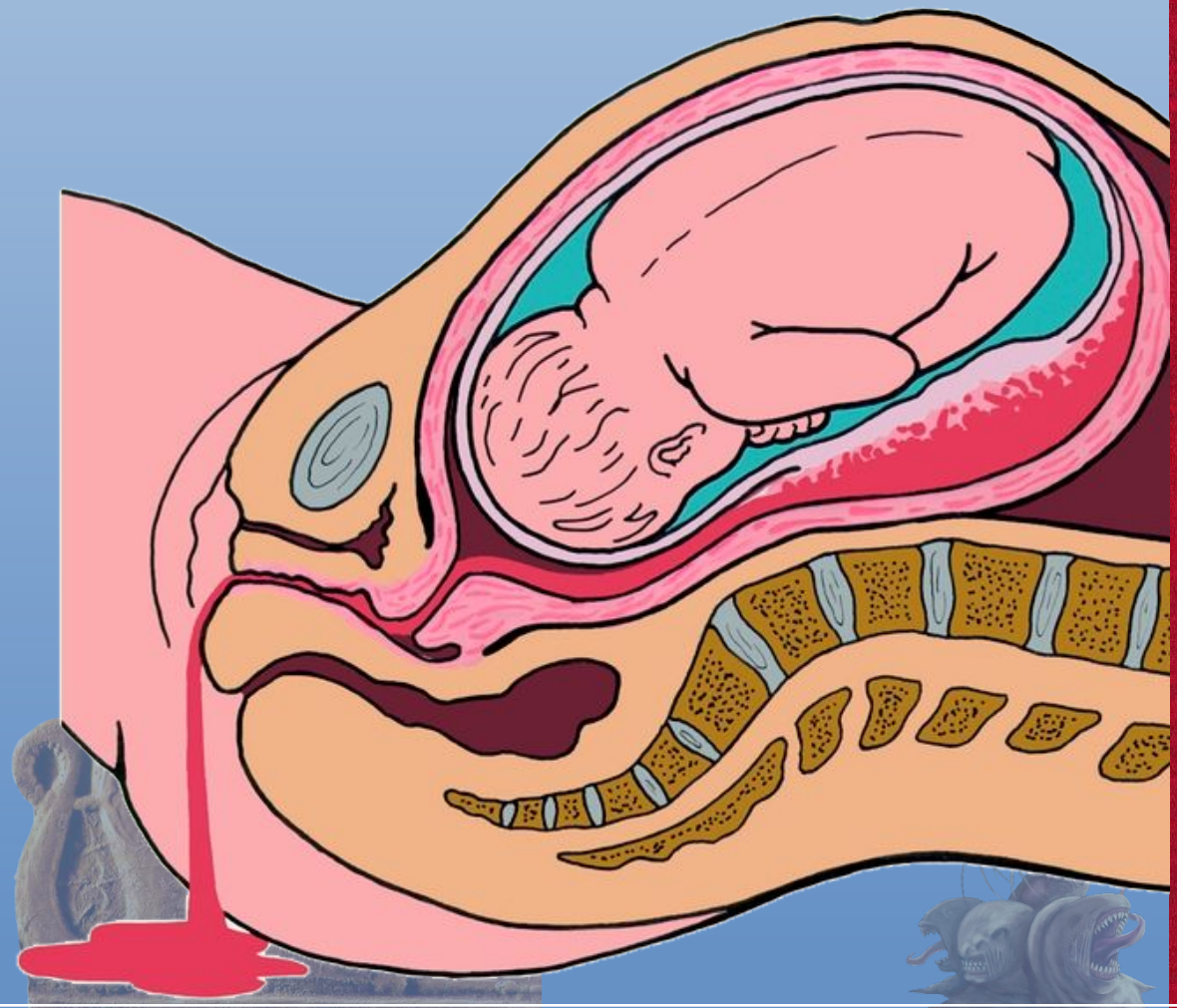


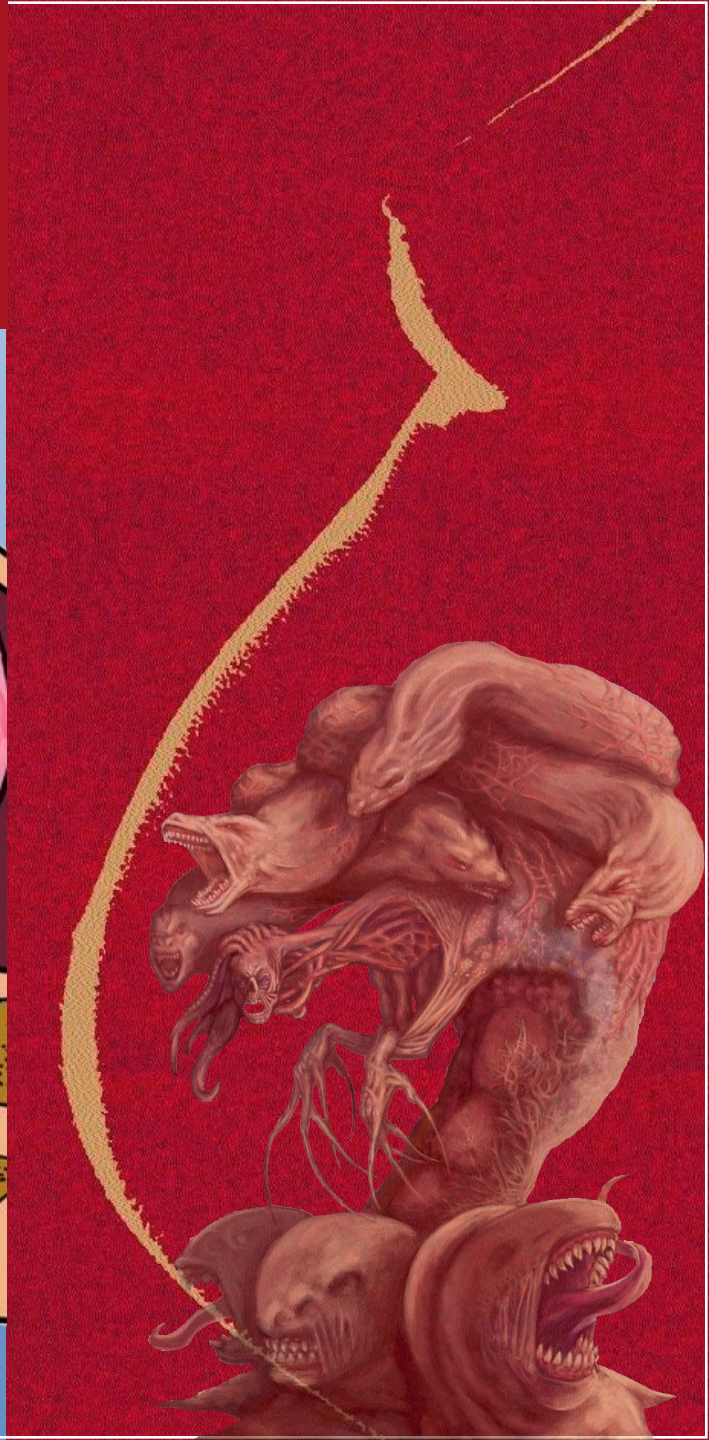
Регенерация β-клеток



?

Обязательно запомнить:
в 75–90% случаях
послеродовое кровотечение –
это гипо- или атоническое
маточное кровотечение!!!





Клинический случай

- Спинальная анестезия для кесарева сечения в связи со слабостью родовой деятельности
- Высокий спинальный блок
- Гипотония
- Placenta accreta – кровопотеря
- Окситоцин 10 ЕД болюсно
- Немедленная остановка сердца
- Безуспешная реанимация

Не читал, но осуждаю!

Не читал, но осуждаю!

ГНЕВ И ВОЗМУЩЕНИЕ

Советские люди осуждают действия Б. Пастернака

Голос московских писателей

Резолюция общего собрания писателей гор. Москвы, состоявшегося 31 октября 1958 года

Собрание московских писателей, обсудив позорную литературную и общественную деятельность Б. Пастернака, не совместимую со званием советского писателя и советского гражданина, всецело поддерживает решение руководящих органов Союза писателей о лишении Б. Пастернака звания советского писателя, об исключении его из рядов членов Союза писателей СССР.

Давно отгородившийся от жизни и от народа, самовлюбленный ретушер и эпигонствующий Б. Пастернак сейчас окончательно разоблачил себя как врага самого святого для каждого из нас, советских людей,— Великой Октябрьской социалистической революции и ее бессмертных идей.

Написав антисоветский, клеветнический роман «Доктор Живаго», Б. Пастернак передал его для опубликования за границу и совершил тем самым предательство по отношению к советской литературе, Советской стране и всем советским людям. Обманутый стан отщепенцев и изменников, Б. Пастернак послал телеграмму с благодарностью за эту подлую вылазку, протянул руку и продался проборжавшимся.

С негодованием и гневом мы узнали о позорных для советского писателя действиях Б. Пастернака.

Что делать Пастернаку в пределах Советской страны? Кому он нужен, чьи мысли он выражает? Не следует ли этому внутреннему эмигранту стать эмигрантом действительным?

Пусть незавидная судьба литературного отщепенца, предавшего интересы Родины, будет ему уроком!

Собрание обращается к правительству с просьбой о лишении предателя Б. Пастернака советского гражданства.

Ни один честный человек, ни один писатель — все, кому дороги идеалы гуманизма и мира, никогда не простят Пастернаку его гнусного предательства.

Из редакционной почты

ПРАВИЛЬНОЕ РЕШЕНИЕ

Только один наш колхоз продал государству в этом году 1 250 тысяч пудов хлеба и 200 тысяч пудов молока. Лишь за 9 месяцев от каждой коровы мы надоили по 2 070 литров молока. Со всей площади зерновых колосовых в 17 тысяч гектаров собрано в среднем по 24 центнера с гектара. Доход артели от животноводства и полеводства уже достиг 41 миллиона рублей...

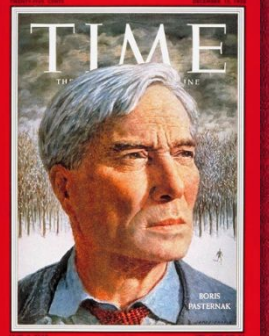
Какому эти цифры могут показаться скучными, а для нас они звучат, как музыкальная симфония. В них заключены небывалые в истории нашего села победы тружеников полей и животноводов, наших агрономов, зоотехников, инженеров, механиков, ветеринарных работников, нашей сельской интеллигенции, которая воспитана Коммунистической партией и служит делу родной и правой своему народу.

ЛИТЕРАТУРА в нашей стране — родное, кровное дело народа. Ни в какой стране писатель не окружен таким почетом всенародным вниманием и заботой, как у нас. Никогда не было такой массы читателей — добросовестных и взыскательных, живо заинтересованных в успехах литературы. В глазах советских читательской чести, высоко, святое не занятие моральным и гражданский облик писателя — народного слуги и народного водителя.

Вот почему такой широкий отклик получило решение литературной общественности об исключении Б. Пастернака из числа членов Союза писателей СССР за «предательство по отношению к советскому народу, к делу социализма, мира, прогресса, олицетворенное Нобелевской премией».

Письма и телеграммы в адрес «Литературной газеты» идут в эти дни буквально потоком. И в каждом таком отклике — выражение гнева и презрения, которым советские люди клеймят антипатриотические действия Б. Пастернака.

ПРЕКРАСНА НАША ДЕЙСТВИТЕЛЬНОСТЬ



- Смерть от кардиоваскулярных осложнений при введении 10 ЕД окситоцина была зафиксирована в *Confidential Enquiry into Maternal Deaths of the United Kingdom 1997–1999* когда пациентке был введен окситоцин при гиповолемии, вследствие кровопотери при операции кесарево сечение

Thomas TA, Cooper GM. Maternal deaths from anaesthesia. An extract from why mothers die 1997–1999, the confidential enquiries into maternal deaths in the United Kingdom. Br J Anaesth 2002;89:499–508.

BJA British Journal of Anaesthesia

British Journal of Anaesthesia **89** (3): 499–508 (2002)

BJA

REVIEW ARTICLE

Maternal deaths from anaesthesia. An extract from *Why Mothers Die 1997–1999*, the Confidential Enquiries into Maternal Deaths in the United Kingdom†

T. A. Thomas[1] and G. M. Cooper[2]*, on behalf of the Editorial Board of the Confidential Enquiries into Maternal Deaths in the United Kingdom‡

[1]*Department of Anaesthesia, St Michael's Hospital, Southwell Street, Bristol BS2 8EG, UK.* [2]*University of Birmingham, Department of Anaesthesia and Intensive Care, Queen Elizabeth Hospital, Edgbaston, Birmingham B15 2TH, UK*

**Corresponding author*

This article is reprinted from *Why Mothers Die 1997–1999*, the fifth report of the Confidential Enquiries into Maternal Deaths in the United Kingdom. RCOG Press, 2001; 134–49. Reproduced with permission from the Editorial Board.

Br J Anaesth 2002; **89**: 499–508

Keywords: anaesthesia, obstetric; anaesthetic techniques, epidural; anaesthesia, general; complications

The central assessors in anaesthesia reviewed the cases of all the women in this report identified as having received an anaesthetic for this triennium, some 142 cases. In looking at the individual cases the assessors were struck by the high standards of anaesthetic care generally provided, sometimes in difficult circumstances. In most cases the standard of record keeping was also high. However, there are areas of concern about the consistency of anaesthetic services between units. Reviewing the records showed that in some places the quality and quantity of anaesthesia service does not meet the declared standards of the relevant professional bodies.

In deciding the likely cause of death, the evidence had to be weighed up without the benefit of questioning all those involved in a patient's care. Much reliance is placed on the local assessors and their ability to make discreet enquiries. Sometimes, even after coroner's inquests, the cause of death was unclear. It was therefore a matter of judgement assigning a death as being a direct result of anaesthesia, or whether substandard care contributed to the demise. Key points of the cases illustrated here result from the central assessors' judgement, bearing in mind that the purpose of the exercise is to learn from errors and improve patient care in the future.

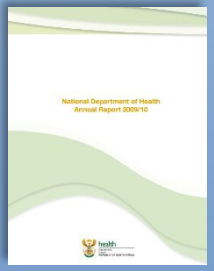
The challenges presented to the obstetric anaesthetist are increasing in number, complexity and severity. Many sick mothers have received anaesthetics safely and anaesthetists are accepting an increasing responsibility for aspects of mother's care that fall naturally within their competence and control. Anaesthetists are trained to recognize and treat major haemorrhage that they encounter in many areas of their professional practice. Obstetric haemorrhage is sometimes more difficult to manage appropriately. Nevertheless it is disappointing to record substandard aspects of anaesthetic care in seven deaths due to haemorrhage.

Conduct of anaesthesia includes preoperative preparation, delivery of anaesthesia, and postoperative recovery. In this triennium, there was one anaesthetic death ascribed as being directly due to the conduct of anaesthesia for Caesarean section, in particular to the administration of oxytocin in a compromised patient. Two other deaths are ascribed to anaesthetics given after prolonged and complex

†This article is accompanied by Editorial I.

‡Editorial Board: Gwyneth Lewis MSc, MRCGP, FFPHM, FRCOG, Director and Editor, James Drife MD, FRCOG, FRCPEd, FRCSEd, Clinical Director, Beverley Botting BSc Hon MFPHM, Christine Carson SRN SRM, PGDip MSc, Griselda Cooper FRCA, Marion Hall MD FRCOG, Catherine McCormick RN RM, James Neilson MD FRCOG, Margaret Oates FRCPsych, Robert Shaw MD FRCSEd, FRCOG, Michael de Swiet MD FRCP, Harry Millward-Sadler FRCPath, MHSM, Trevor Thomas FRCA, William Thompson MD FRCOG, Sheila Willatts MD FRCA FRCP

- В отчете *Report on Confidential Enquiries into Maternal Deaths in South Africa for the triennium 2005–2007* было зафикисировано две смерти при введении 10 ЕД окситоцина при операции кесарево сечения



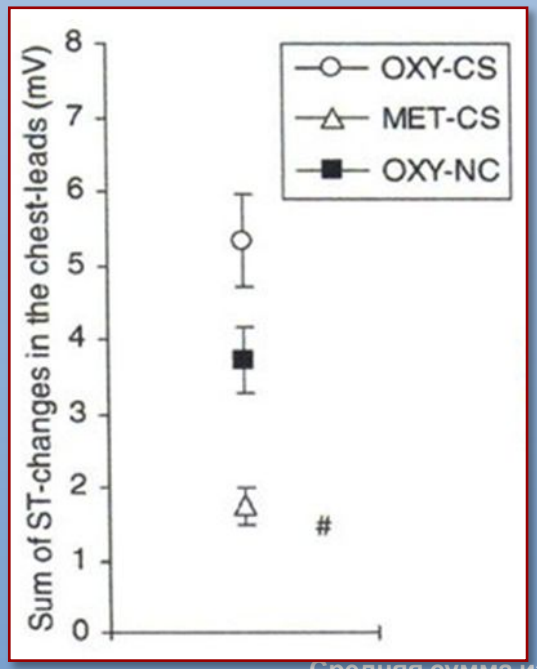
Lamacraft G. Anaesthesia related deaths. In Pattinson RC, ed. Saving mothers: fourth report on confidential enquiries into maternal deaths in South Africa. Department of Health, Pretoria, Republic of South Africa 2010: 137.

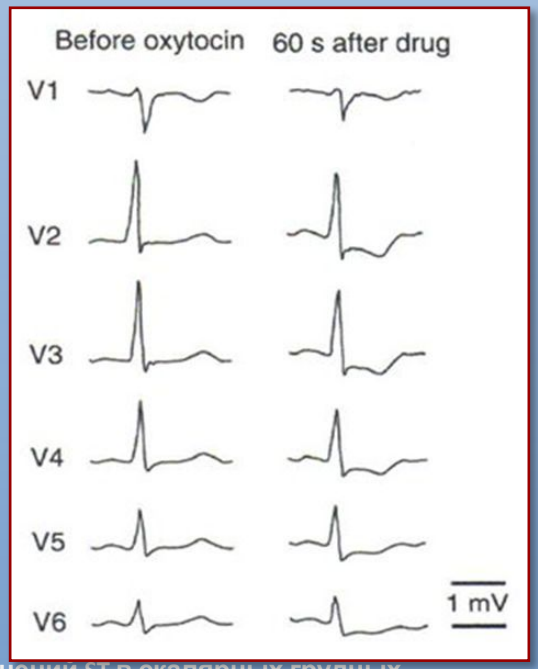
Saving Mothers 2005-2007:
Fourth Report on Confidential Enquiries into Maternal Deaths in South Africa

Expanded Executive Summary

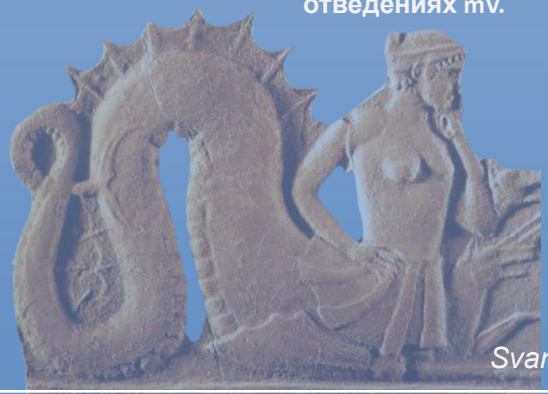
By
NCCEMD

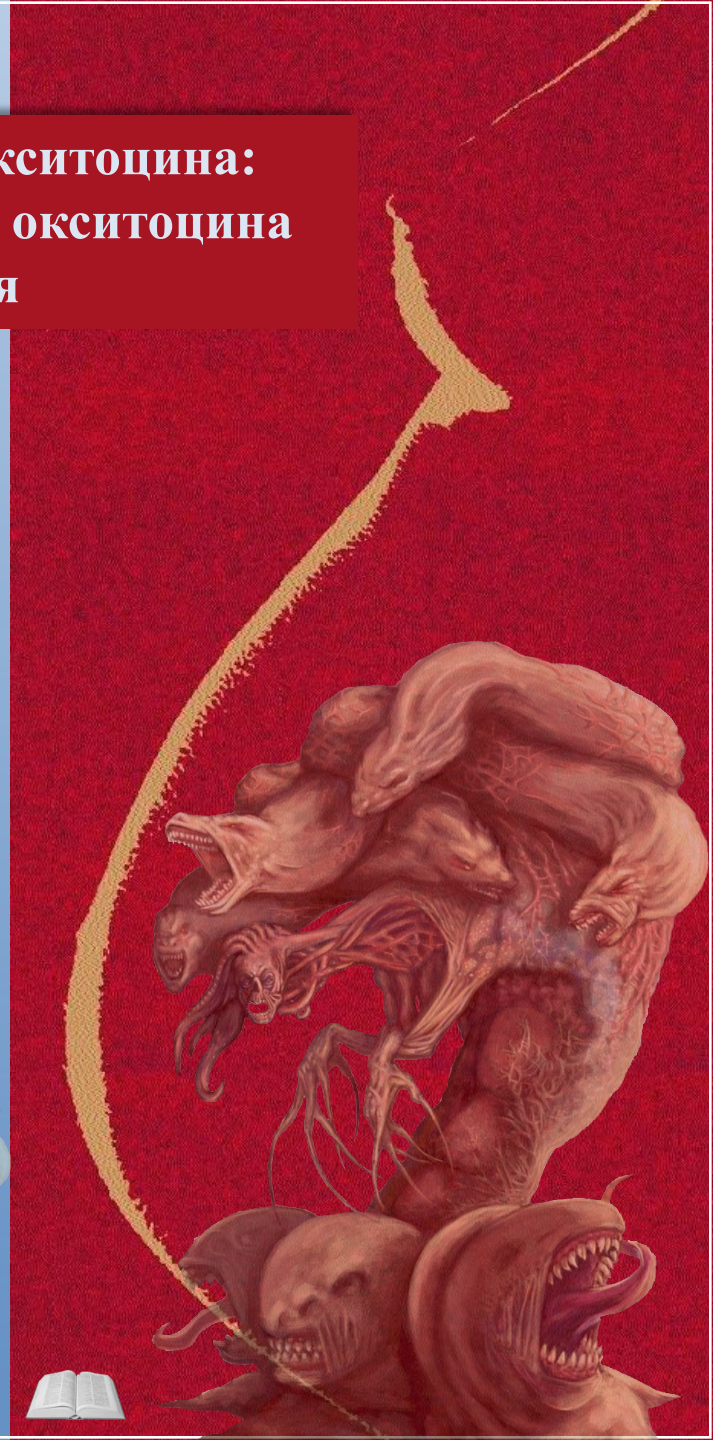
Признаки ишемии миокарда после введения окситоцина: рандомизированное, двойное слепое сравнение окситоцина и метилэргометрина во время кесарева сечения



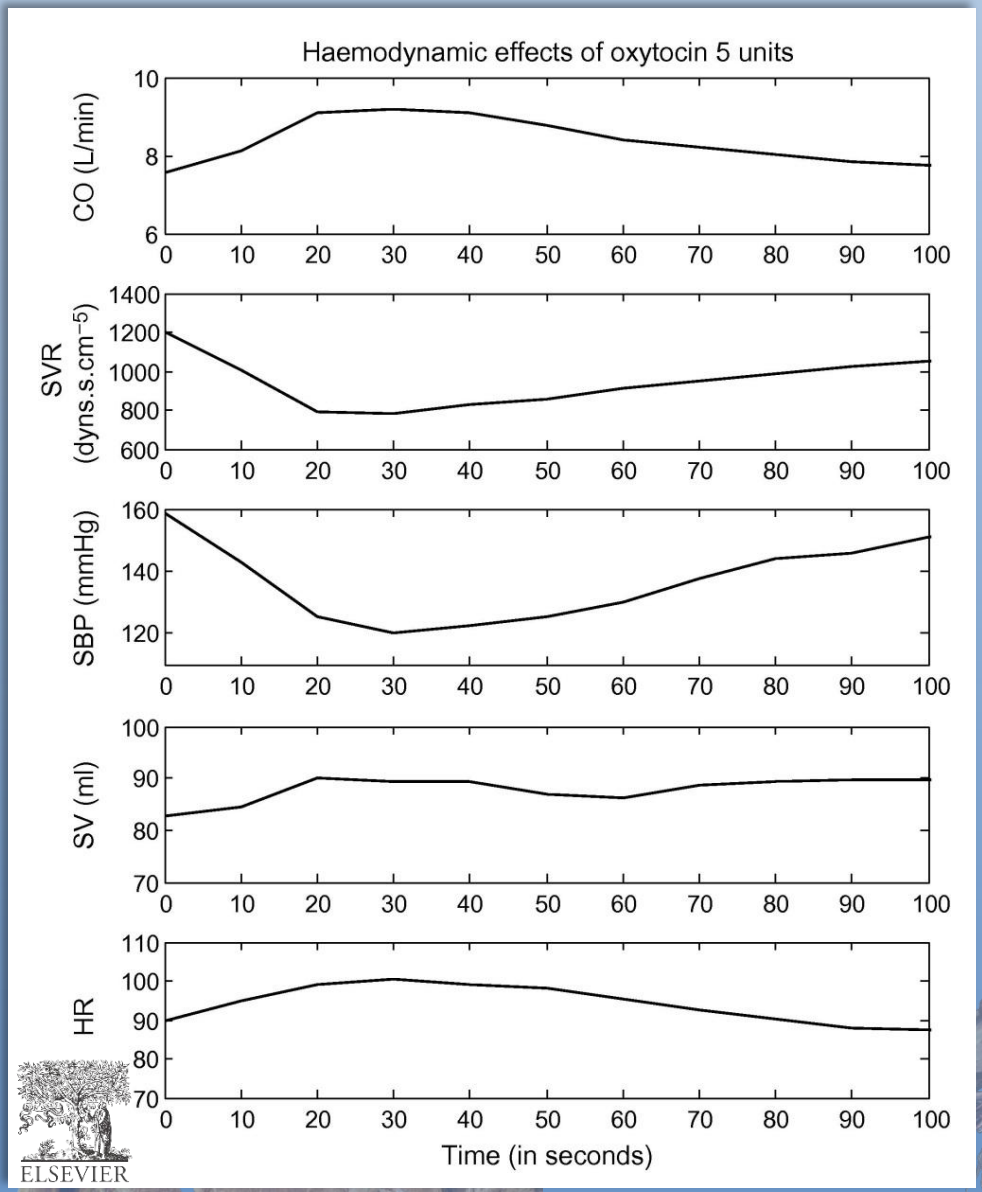


Средняя сумма изменений ST в скалярных грудных отведениях mV.

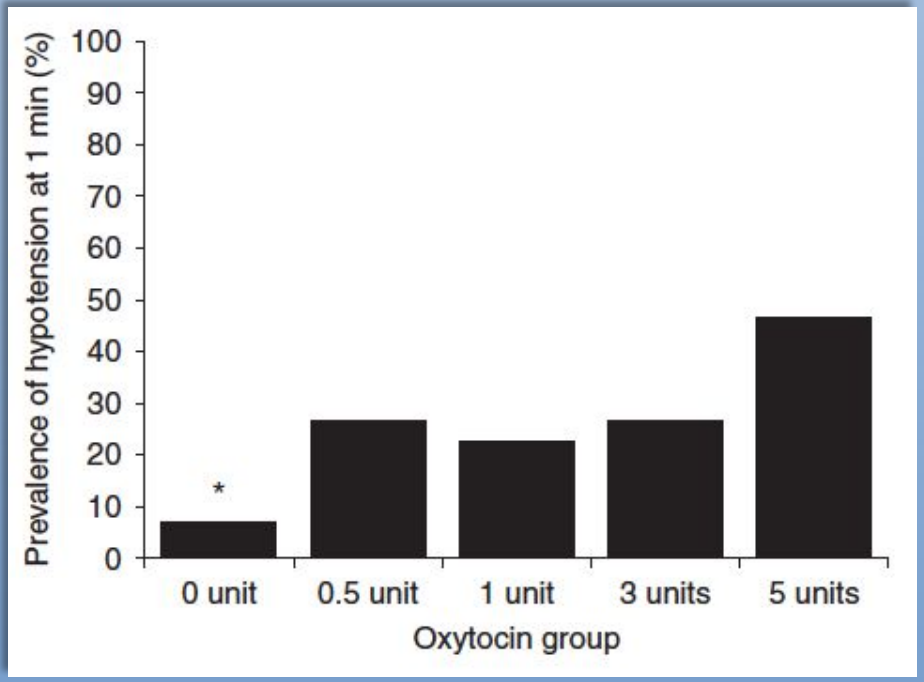




Svanstrom et al. Brit Anaesth 2008; 100, 683–689



International Journal of Obstetric Anesthesia 2011 20, 26-29DOI: (10.1016/j.ijoa.2010.10.004)



BJA
British Journal of Anaesthesia

British Journal of Anaesthesia **104 (3)**: 338–43 (2010)
doi:10.1093/bja/aeq004

BJA

OBSTETRICS

Minimum effective bolus dose of oxytocin during elective Caesarean delivery

A. J. Butwick*, L. Coleman, S. E. Cohen, E. T. Riley and B. Carvalho

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**Corresponding author: Department of Anesthesia (MC:5640), Stanford University School of Medicine, 300 Pasteur Drive, Stanford, CA 94305-5640, USA. E-mail: ajbut@stanford.edu*

Background. The aim of this study was to determine the lowest effective bolus dose of oxytocin to produce adequate uterine tone (UT) during elective Caesarean delivery (CD).

Methods. Seventy-five pregnant patients undergoing elective CD under spinal anaesthesia were randomized to receive oxytocin (0.5, 1, 3, 5 units) or placebo. UT was assessed by a blinded obstetrician as either adequate or inadequate, and using a verbal numerical scale score (0–10; 0, no UT; 10, optimal UT) at 2, 3, 6, and 9 min after oxytocin administration. Minimum effective doses of oxytocin were analysed (ED_{50} and ED_{95}) using logistic regression. Oxytocin-related side-effects (including hypotension) were recorded.

Results. There were no significant differences in the prevalence of adequate UT among the study groups at 2 min (73%, 100%, 93%, 100%, and 93% for 0, 0.5, 1, 3, and 5 units oxytocin, respectively). The high prevalence of adequate UT after placebo and low-dose oxytocin precluded determination of the ED_{50} and ED_{95}. UT scores were significantly lower in patients receiving 0 unit oxytocin at 2 and 3 min compared with 3 and 5 units oxytocin ($P<0.05$, respectively). The prevalence of hypotension was significantly higher after 5 units oxytocin vs 0 unit at 1 min (47% *vs* 7%; $P=0.04$).

Conclusions. The routine use of 5 units oxytocin during elective CD can no longer be recommended, as adequate UT can occur with lower doses of oxytocin (0.5–3 units).

Br J Anaesth 2010; **104**: 338–43

Keywords: anaesthesia, obstetric; Caesarean section; drug delivery, bolus; uterus, oxytocin

Accepted for publication: December 15, 2009

Oxytocin is routinely administered during elective Caesarean delivery (CD) to initiate and maintain adequate uterine contractility after placental delivery. The uterotonic effect of oxytocin is important in reducing blood loss from the site of placental attachment and decreasing the risk of postpartum haemorrhage. However, adverse haemodynamic effects are known to occur after i.v. oxytocin, notably tachycardia, hypotension, and ECG changes.[1–3] Although many practitioners use 5 units oxytocin during elective CD,[4] there is limited evidence to substantiate this practice. Smaller bolus doses of oxytocin are associated with reduced frequency of adverse effects;[2 3] however, few studies have investigated the dose-related effects of an oxytocin bolus for achieving adequate uterine tone (UT) during elective CD.[2 5 6]

The aim of this study was to estimate the minimum effective dose of oxytocin required to produce adequate UT at 2 min for 50% (ED_{50}) and 95% (ED_{95}) of patients undergoing elective CD with spinal anaesthesia.

Methods

After obtaining Institutional Review Board approval and written informed consent, 75 healthy term patients (≥37 weeks gestation) undergoing elective CD were enrolled in this randomized, double-blind, placebo-controlled, dose-ranging study. The study was conducted at Lucile Packard Children's Hospital (Stanford, CA, USA), and patients were enrolled over a 10-month period (July 2008–April 2009).

Inclusion criteria were ASA I or II, age between 18 and 40 yr, singleton pregnancies, and elective CD with a Pfannensteil incision. All enrolled patients received spinal

Butwick AJ, Coleman L, Cohen SE, Riley ET, Carvalho B: Minimum effective bolus dose of oxytocin during elective caesarean delivery. Br J Anaesth 2010; 104:338–43.

- Из-за структурной схожести с вазопрессином в больших дозах способен задерживать жидкость, провоцировать судороги и кому

Bergum D, Lonnee H, Hakli TF. Oxytocin infusion: acute hyponatraemia, seizures and coma. Acta Anaesthesiol Scand 2009;53:826–7.

Боли за грудиной и отек легких – встречаются редко и также связаны с быстрым и болюсном введении 10 ЕД окситоцина

International Journal of Obstetric Anesthesia (2008) 17, 247–254
0959-289X/$ - see front matter
doi:10.1016/j.ijoa.2008.03.003

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CASE REPORT

The hemodynamics of oxytocin and other vasoactive agents during neuraxial anesthesia for cesarean delivery: findings in six cases

T. L. Archer,* K. Knape, D. Liles, A. S. Wheeler, B. Carter
Department of Anesthesiology, University of Texas Health Science Center, San Antonio, Texas, USA

ABSTRACT
Oxytocin is a commonly used uterotonic that can cause significant and even fatal hypotension, particularly when given as a bolus. The resulting hypotension can be produced by a decrease in systemic vascular resistance or cardiac output through a decrease in venous return. Parturients with normal volume status, heart valves and pulmonary vasculature most often respond to this hypotension with a compensatory increase in heart rate and stroke volume. Oxytocin-induced hypotension at cesarean delivery may be incorrectly attributed to blood loss. Pulse power analysis (also called "pulse contour analysis") of an arterial pressure wave form allows continuous evaluation of systemic vascular resistance and cardiac output in real time, thereby elucidating the causative factors behind changes in blood pressure. Pulse power analysis was conducted in six cases of cesarean delivery performed under neuraxial anesthesia. Hypotension in response to oxytocin was associated with a decrease in systemic vascular resistance and a compensatory increase in stroke volume, heart rate and cardiac output. Pulse power analysis may be helpful in determining the etiology of and treating hypotension during cesarean delivery under neuraxial anesthesia.

Keywords: Oxytocin; Obstetrical hemorrhage; Pulse power analysis; Pulse contour analysis; PulseCO; LiDCO; Systemic vascular resistance; Cardiac output; Stroke volume; Hemodynamics of pregnancy

Archer TL, Knape K, Liles D, Wheeler AS, Carter B. The hemodynamics of oxytocin and other vasoactive agents during neuraxial anesthesia for cesarean delivery: findings in six cases. Int J Obstet Anesth 2008;17:247–54

Покраснение лица и груди, тошнота и рвота, головная боль, в том числе и раннем послеоперационном периоде тесно связаны с дозой и кратностью введения окситоцина.

BJA British Journal of Anaesthesia

British Journal of Anaesthesia 104 (3): 338–43 (2010)
doi:10.1093/bja/aeq004

BJA

OBSTETRICS

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Keywords: anaesthesia, obstetric; Caesarean section; drug delivery, bolus; uterus, oxytocin

Accepted for publication: December 15, 2009

Oxytocin is routinely administered during elective Caesarean delivery (CD) to initiate and maintain adequate uterine contractility after placental delivery. The uterotonic effect of oxytocin is important in reducing blood loss from the site of placental attachment and decreasing the risk of postpartum haemorrhage. However, adverse haemodynamic effects are known to occur after i.v. oxytocin, notably tachycardia, hypotension, and ECG changes.[1–3] Although many practitioners use 5 units oxytocin during elective CD,[4] there is limited evidence to substantiate this practice. Smaller bolus doses of oxytocin are associated with reduced frequency of adverse effects;[2 3] however, few studies have investigated the dose-related effects of an oxytocin bolus for achieving adequate uterine tone (UT) during elective CD.[2 5 6]

The aim of this study was to estimate the minimum effective dose of oxytocin required to produce adequate UT at 2 min for 50% (ED_{50}) and 95% (ED_{95}) of patients undergoing elective CD with spinal anaesthesia.

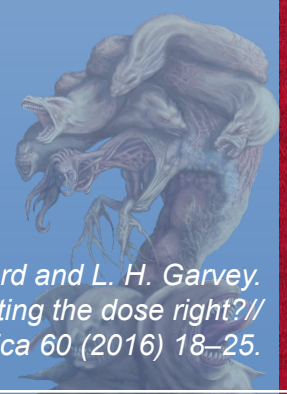
Methods

After obtaining Institutional Review Board approval and written informed consent, 75 healthy term patients (≥37 weeks gestation) undergoing elective CD were enrolled in this randomized, double-blind, placebo-controlled, dose-ranging study. The study was conducted at Lucile Packard Children's Hospital (Stanford, CA, USA), and patients were enrolled over a 10-month period (July 2008–April 2009).

Inclusion criteria were ASA I or II, age between 18 and 40 yr, singleton pregnancies, and elective CD with a Pfannensteil incision. All enrolled patients received spinal

Butwick AJ, Coleman L, Cohen SE, Riley ET, Carvalho B: Minimum effective bolus dose of oxytocin during elective caesarean delivery. Br J Anaesth 2010; 104:338–43.

Многочисленные исследования реакции рожениц на назначение больших доз окситоцина (10 ЕД внутривенно капельно после извлечения плода), показали различные проявления гемодинамических и других эффектов **мимикрии с анафилактоидными реакциями**. Необходим срочный пересмотр протоколов назначения окситоцина во время операции кесарево сечения.



Acta Anaesthesiologica Scandinavica
AN INTERNATIONAL JOURNAL OF ANAESTHESIOLOGY AND INTENSIVE CARE, PAIN AND EMERGENCY MEDICINE

ORIGINAL ARTICLE

Oxytocin use during Caesarean sections in Denmark – are we getting the dose right?

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Conflicts of interest
The authors have no conflicts of interest.

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Kjær BN, Krøigaard M, Garvey LH. Oxytocin use during Caesarean sections in Denmark – are we getting the dose right?. Acta Anaesthesiologica Scandinavica 2015

doi: 10.1111/aas.12603

Background: In Denmark, an iv bolus of 10 IU oxytocin was traditionally given after delivery to prevent atony during caesarean sections. Randomized controlled trials have shown that lower iv bolus doses have same efficacy with fewer side effects and many countries now recommend a 5 IU maximum dose. The aims of this study were to investigate whether patients referred for allergy testing after oxytocin exposure had dose-related side effects to oxytocin rather than true allergic reactions and to investigate whether updated international recommendations on lower bolus doses had been implemented in practice.
Methods: Medical notes of patients tested with oxytocin as part of investigations in the Danish Anaesthesia Allergy Centre from May 2004 to January 2014 were reviewed retrospectively. A telephone survey of on-duty obstetricians at all Danish obstetric departments was performed and most recent online recommendations from the Danish societies of obstetrics and anaesthesia about the use of oxytocin were identified.
Results: In total 30 women were tested with oxytocin as part of investigations. None were allergic to oxytocin but 19 had symptoms consistent with dose-related side effects on iv provocation. The telephone survey revealed that iv doses of 10 IU oxytocin were still used and recommendations on the websites were not updated.
Conclusion: Too high oxytocin doses are still used in Denmark leading to dose-related side effects mimicking allergic reactions. Coordination between obstetricians and anaesthesiologists on producing common updated guidelines on the administration of oxytocin and dissemination of this information to obstetric and anaesthetic departments in Denmark is needed.

Editorial comments: what this article tells us
Major adverse responses to oxytocin in obstetric anaesthesia use were examined in this study in a Danish cohort, with a focus on possible allergic responses. None were found to have demonstrated allergies at later testing. High doses of oxytocin seem to remain common, with predictable adverse effects.

Acta Anaesthesiologica Scandinavica 60 (2016) 18–25

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Carvalho et al. В своих исследованиях показали, что ED90 окситоцина составляет 0.35 IU (95% ДИ, 0.18 до 0.52 ДИ).

Carvalho JC, Balki M, Kingdom J, Windrim R: Oxytocin requirements at elective cesarean delivery: A dose-finding study. Obstet Gynecol 2004; 104 (5 Pt 1):1005–10.

OBSTETRICS & GYNECOLOGY
Wolters Kluwer

Oxytocin Requirements at Elective Cesarean Delivery: A Dose-Finding Study

José C. A. Carvalho, MD, PhD, Mrinalini Balki, MD, John Kingdom, MD, and Rory Windrim, MD

OBJECTIVE: Oxytocin is frequently used by intravenous bolus and infusion to minimize blood loss and prevent postpartum hemorrhage at cesarean delivery. Current dosing regimens are arbitrary whereas large doses may pose a serious risk to the mother. The purpose of this study was to estimate the minimum effective intravenous bolus dose of oxytocin (ED_{90}) required for adequate uterine contraction at elective cesarean in nonlaboring women.

METHODS: A randomized, single-blinded study was undertaken in 40 healthy term pregnant women presenting for elective cesarean under spinal anesthesia. Oxytocin was administered by bolus according to a biased coin up-and-down sequential allocation scheme with increments or decrements of 0.5 IU. Uterine contraction was assessed by the obstetrician, who was blinded to the dose of oxytocin, as either satisfactory or unsatisfactory. After achieving sustained uterine contraction, an infusion of 40 mU/min of oxytocin was started. Oxytocin-induced adverse effects and intraoperative complications were recorded and blood loss was estimated. Data were interpreted by parametric analysis based on logistic regression model and nonparametric analyses at 95% confidence intervals (CIs).

RESULTS: The ED_{90} of oxytocin as determined by logistic regression model fitted to the data was estimated to be 0.35 IU (95% CI 0.18–0.52 IU), with nonparametric estimates of 97.1% (95% CI 84.9–99.8%) response rate at 0.5 IU, and 100% (95% CI 92.2–100%) at 1.0 IU. The estimated blood loss was 693 ± 487 mL (mean ± standard deviation).

CONCLUSION: The bolus dose of oxytocin used at elective cesarean deliveries in nonlaboring women can be significantly reduced while maintaining effective uterine contraction. Alteration in practice will likely reduce the potential adverse effects of this drug when given in large bolus doses, but may require modification of the techniques to remove the placenta. (Obstet Gynecol 2004;104:1005–10. © 2004 by The American College of Obstetricians and Gynecologists.)

In many institutions, oxytocin is routinely administered by intravenous bolus and infusion at cesarean delivery after delivery of the fetus. Oxytocin promotes uterine contraction, thereby reducing blood loss from the placental site. However, when given in large doses and as a rapid bolus, oxytocin is associated with various adverse effects, including hypotension, nausea, vomiting, chest pain, headache, flushing, and myocardial ischemia.[1,2] For these reasons, the manufacturer's instructions do not recommend bolus administration.

A variety of regimens for administration of oxytocin have been described previously but appear to be empirical.[3–6] Furthermore, the minimum effective dose of oxytocin at cesarean delivery has not yet been established. The purpose of our study was therefore to estimate the minimum effective dose (ED_{90}) of oxytocin required to produce adequate uterine contraction at elective cesarean delivery in nonlaboring women.

MATERIALS AND METHODS

After obtaining approval from the Research Ethics Board at Mount Sinai Hospital, a randomized, single-blinded study was performed with 40 healthy term pregnant women scheduled for elective cesarean delivery. Patients were recruited between October 1, 2003, and January 21, 2004, and 20 surgeons were involved in the study. All patients with conditions that predispose to uterine atony and postpartum hemorrhage such as placenta previa, multiple gestation, preeclampsia, macrosomia, hydramnios, uterine fibroids, history of uterine atony and postpartum bleeding, or bleeding diathesis were excluded from the study. A written informed consent was obtained from the patients before enrollment in the study. All patients received 30 mL of 0.3 mol/L sodium citrate orally, 30 minutes before the institution of spinal anesthesia. Baseline blood pressure (BP) and heart rate were calculated as the mean of 3 readings, 2 minutes apart, recorded in the admitting unit using an automated noninvasive BP device. An 18G peripheral intravenous line was inserted and 10 mL/kg of lactated Ringer's solution was given as preload.

After skin disinfection and local infiltration, a subarachnoid puncture was performed in the sitting position at L_{2-3} or L_{3-4} interspace using a 27G Whitacre needle. Anesthetic blockade of up to a T_4 dermatomal level was

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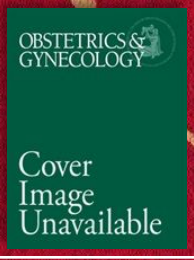
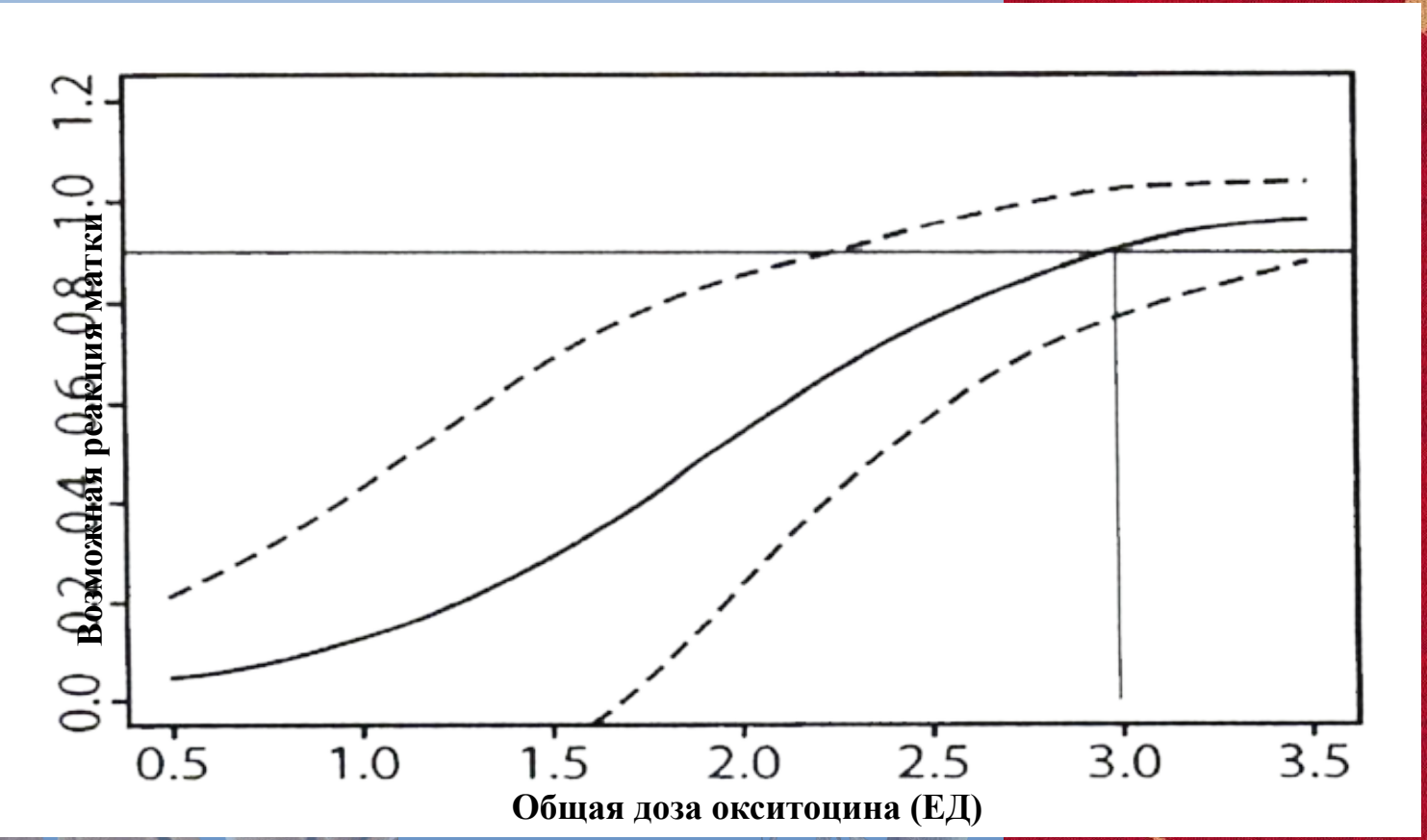


Минимальная потребность в окситоцине после кесарева сечения для остановки родов

Mrinalini Balki, MD, Michael Ronayne, MD, Sharon Davies, MD, Shafagh Fallah, PhD, John Kingdom, MD, Rory Windrim, MD, Jose C. A. Carvalho, MD, PhD



Balki et al. Obstet Gynecol 2006: 107, 45–50

Введение 60 пациенткам во время операции кесарево сечения 3 ЕД окситоцина одномоментно настолько же эффективно, как 30 ЕД в 500 мл кристаллоидов внутривенно капельно.

ANESTHESIOLOGY
The Journal of the American Society of Anesthesiologists, Inc.

A Randomized, Double-blinded Trial of a "Rule of Threes" Algorithm *versus* Continuous Infusion of Oxytocin during Elective Cesarean Delivery

Vesela P. Kovacheva, M.D., Ph.D., Mieke A. Soens, M.D., Lawrence C. Tsen, M.D.

ABSTRACT

Background: The administration of uterotonic agents during cesarean delivery is highly variable. The authors hypothesized a "rule of threes" algorithm, featuring oxytocin 3 IU, timed uterine tone evaluations, and a systematic approach to alternative uterotonic agents, would reduce the oxytocin dose required to obtain adequate uterine tone.

Methods: Sixty women undergoing elective cesarean delivery were randomized to receive a low-dose bolus or continuous infusion of oxytocin. To blind participants, the rule group simultaneously received intravenous oxytocin (3 IU/3 ml) and a "wide-open" infusion of 0.9% normal saline (500 ml); the standard care group received intravenous 0.9% normal saline (3 ml) and a "wide-open" infusion of oxytocin (30 IU in 0.9% normal saline/500 ml). Uterine tone was assessed at 3, 6, 9, and 12 min, and if inadequate, additional uterotonic agents were administered. Uterine tone, total dose and timing of uterotonic agent use, maternal hemodynamics, side effects, and blood loss were recorded.

Results: Adequate uterine tone was achieved with lower oxytocin doses in the rule *versus* standard care group (mean, 4.0 *vs.* 8.4 IU; point estimate of the difference, 4.4 ± 1.0 IU; 95% CI, 2.60 to 6.15; $P < 0.0001$). No additional oxytocin or alternative uterotonic agents were needed in either group after 6 min. No differences in the uterine tone, maternal hemodynamics, side effects, or blood loss were observed.

Conclusion: A "rule of threes" algorithm using oxytocin 3 IU results in lower oxytocin doses when compared with continuous-infusion oxytocin in women undergoing elective cesarean delivery. (ANESTHESIOLOGY 2015; 123:92-100)

UTERINE atony can result in severe postpartum hemorrhage, gravid hysterectomy, and maternal mortality.[1] Oxytocin is the most commonly used agent for the prevention and treatment of uterine atony during cesarean delivery[2]; however, rapid administration and increasing doses can result in hemodynamic instability,[3–6] cardiovascular collapse, and death.[7] Moreover, the persistent use of oxytocin results in desensitization and down-regulation of its receptor, resulting in decreased uterine contractile response over time.[8,9] Despite the demonstration of adequate uterine tone after cesarean delivery with oxytocin in low doses (<3 IU),[10,11] the prevailing practice is the continuous infusion of doses greater than 20 to 40 IU.[6,12,13] The recommended dose, timing, and rate of administration of oxytocin, as well as alternative second-line uterotonic agents, from major obstetric texts and professional obstetric societies are vague or nonexistent.[14–16] The administration of oxytocin and additional uterotonic agents has been associated with significant maternal, fetal, and neonatal adverse effects.[17] These side effects, particularly those associated with oxytocin, can be related to the dose and rate of administration.[18,19]

Recently, improvements in perioperative patient outcomes have been demonstrated with the use of algorithms and more effective communication patterns.[20] Attention fixation on particular tasks, such as closing the uterus or responding to uterine bleeding, may lead to inattention to the dose and pattern of uterotonic agent use. The adoption of algorithms with drugs administered on a timed basis (*i.e.*, advanced cardiac life saving) has been observed to result in improved outcomes.[21] Moreover, active communication in the form of inquiry, the process by which information is elicited in the form of question,[22] expedites the cocreation of plans and responses among health team members.[20]

In response to these observations, we originated a clinical "rule of threes" oxytocin algorithm, which incorporates oxytocin and alternative uterotonic agents, for use during

What We Already Know about This Topic

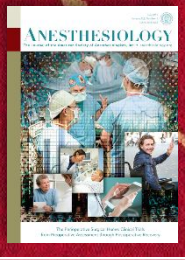
- The dosage of uterotonic agents, primarily oxytocin, at cesarean delivery is highly variable and may frequently exceed that necessary to obtain adequate uterine tone

What This Article Tells Us That Is New

- In 60 women randomized to treatment at cesarean delivery, a single intravenous bolus of 3 IU at delivery was as effective as continuous, wide-open infusion of oxytocin, 30 IU/500 ml despite less total oxytocin delivered
- Groups did not differ in side effects associated with oxytocin

This article is featured in "This Month in Anesthesiology," page 1A.

Submitted for publication July 9, 2014. Accepted for publication March 6, 2015. From the Brigham and Women's Hospital, Department of Anesthesiology, Perioperative, and Pain Medicine, Harvard Medical School, Boston, Massachusetts.



Vesela P. Kovacheva, M.D., Ph.D., Mieke A. Soens, M.D., Lawrence C. Tsen, M.D. A Randomized, Double-blinded Trial of a "Rule of Threes" Algorithm versus Continuous Infusion of Oxytocin during Elective Cesarean Delivery// Anesthesiology 2015; 123:92-100.

IOJA 2010 editorial
Oxytocin protocols during cesarean delivery: time to acknowledge the risk/benefit ratio?

L. Tsen & M. Balki

- 3 ед. ударная доза
- 3 мин. Оценка
- 3 ед. доза спасения
- 3 общих дозы (1 ударная, 2 спасения)
- 3 ед/л @ 100 мл/час поддержка

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EDITORIAL

ELSEVIER
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Oxytocin protocols during cesarean delivery: time to acknowledge the risk/benefit ratio?

A hormone discovered and synthesized over 50 years ago, oxytocin is currently used in the majority of births in developed countries and a growing number of births in the developing world.[1] Commonly employed to induce or augment the process of labor to effect vaginal delivery, oxytocin is also used as the first line drug to restore uterine tone and minimize postpartum blood loss following cesarean delivery. The purpose of this editorial, which is echoed in the review article by Dyer and colleagues in this issue of IJOA,[2] is to illuminate the risks associated with large intravenous (i.v.) bolus doses of oxytocin administered during cesarean delivery and to advocate an evidenced-based, infusion approach to dosing.

The administration of oxytocin is associated with significant maternal, fetal, and neonatal adverse events. Maternal arrhythmias, hypotension, uterine hyperstimulation and hyponatremia,[3,4] fetal decreases in oxygen saturation (SaO_2) related to contraction frequency,[5,6] and neonatal seizures, hyperbilirubinemia, or retinal hemorrhage[7,8] have been reported following oxytocin use. During cesarean delivery, with oxytocin administered following delivery, maternal morbidity and mortality are the most relevant concerns. The 1997–99 triennial audit of the Confidential Enquiries into Maternal Deaths in the United Kingdom (UK), reported the deaths of two women from cardiovascular instability following an i.v. bolus of oxytocin 10 IU.[9] Awareness of these deaths resulted in a dose reduction in the UK to an i.v. bolus of 5 IU;[2] however, even this dose, and the method of administration, may cause hypotension, tachycardia, decreased free water clearance, peripheral flushing, nausea, emesis and signs of myocardial ischemia.[10–13]

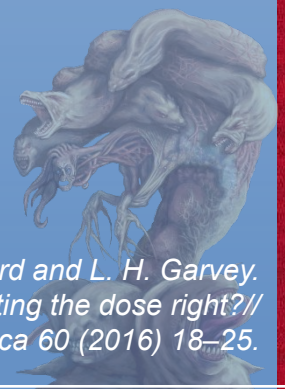
Although practitioners may be aware of these risks, the associated professional liability is the proverbial mountain hidden in plain sight: oxytocin remains *the* drug most commonly associated with preventable adverse events during childbirth, and *the* drug implicated in nearly half of all paid obstetric litigation claims.[14] Moreover, the United States Food and Drug Administration (FDA) has placed a black box warning restricting oxytocin use (during labor) to *medical* indications.[15] Furthermore, the Institute for Safe Medication Practices (ISMP), an independent, nonprofit organization whose recommendations are utilized by groups including the Joint Commission in evaluating medication safety, recently added oxytocin to the list of *high-alert* medications.[16] This distinction, which identifies drugs "bearing a heightened risk of harm when used in error" that may "require special safeguards to reduce the risk of error", has been applied to only 11 other specific drugs.[16]

In an effort to improve patient safety, the *cause célèbre* of the contemporary medical community, practitioners have questioned the high-dose, non-standardized oxytocin practices currently in use.[17–19] The re-evaluation of oxytocin acknowledges the unpredictable therapeutic index (in which a given dose can result in either hypertonic contractions or no discernable effect), use of excessive starting doses, lack of a predetermined, lock-step protocol that predicates increasing doses on determination of insufficient lower doses, and practices that contribute to normalization of deviance (degradation of professional or technical standards based on individual experience).[17–19] Interestingly, this call to action stops abruptly at the door of the operating room, despite literature demonstrating that common clinical practices result in unnecessary, excessive oxytocin doses. In non-laboring women undergoing cesarean delivery, a 'ceiling effect' of oxytocin 5 IU is witnessed, beyond which no further improvement in uterine tone and blood loss is observed;[20] in laboring women, high doses of oxytocin did not obviate the need for additional uterotonic agents.[21] Interestingly, a small loading dose of oxytocin (ED 90 = 0.35 IU) has been determined to be sufficient in producing adequate uterine contractions during elective cesarean deliveries in non-laboring women;[22] a similarly low loading dose (ED 90 = 2.99 IU) is required in laboring women.[23] Women who have received oxytocin augmentation for labor have greater blood loss despite higher oxytocin doses; this appears to originate from signal attenuation and desensitization of the oxytocin receptors, in a time and concentration dependent manner.[24–27] Similarly, continued high-dose oxytocin exposure in the postpartum period may also lead to acute receptor desensitization and render the myometrium less responsive to additional oxytocin.[27]

The current guidelines for the administration of oxytocin during cesarean delivery are diverse, empiric, and vague. The most recent editions of major obstetric

J Obstet Anesth. 2010 Jul;19(3):243-5

Многочисленные исследования реакции рожениц на назначение больших доз окситоцина (0 ЕД внутривенно капельно после извлечения плода), показали различные проявления гемодинамических и других эффектов мимикрии с анафилактоидными реакциями. **Необходим срочный пересмотр протоколов назначения окситоцина во время операции кесарево сечения**.



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B. N. Kjær[1], M. Krøigaard[2] and L. H. Garvey[2]

[1]Department of Anaesthesia, Aalborg University Hospital, Aalborg, Denmark
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ANESTHESIOLOGY
The Journal of the American Society of Anesthesiologists, Inc.

From: Changes in Blood Pressure and Cardiac Output during Cesarean Delivery: The Effects of Oxytocin and Carbetocin Compared with Placebo

Anesthesiology. 2013; 119(3):541–551. doi:10.1097/ALN.0b013e31829416dd

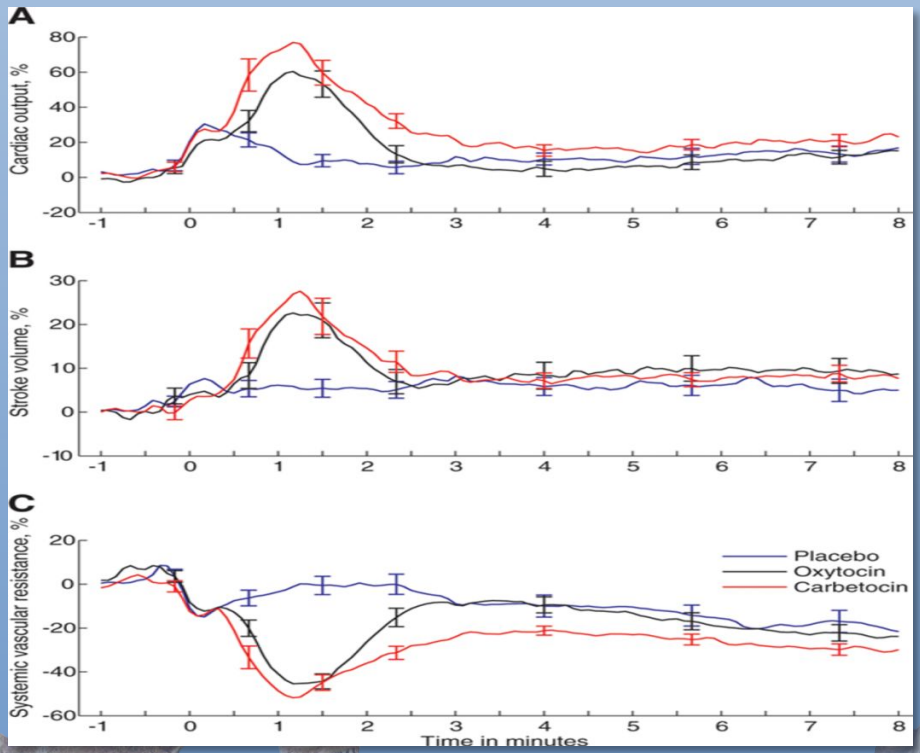

Figure Legend:
Estimated cardiac output (A), stroke volume (B), and systemic vascular resistance (C) in the three treatment groups the minute before and 8 min after intervention (intervention = time 0) presented as the percentage change from baseline representing measurements from the last 30 s before uterotomy.

ANESTHESIOLOGY
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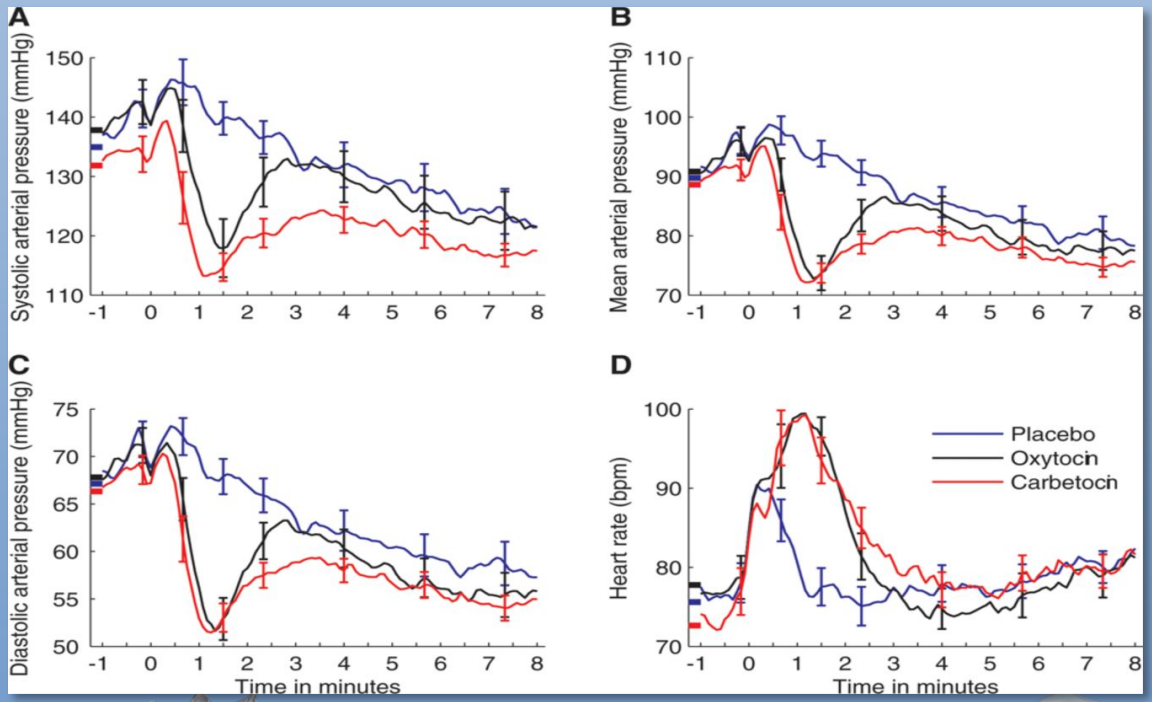
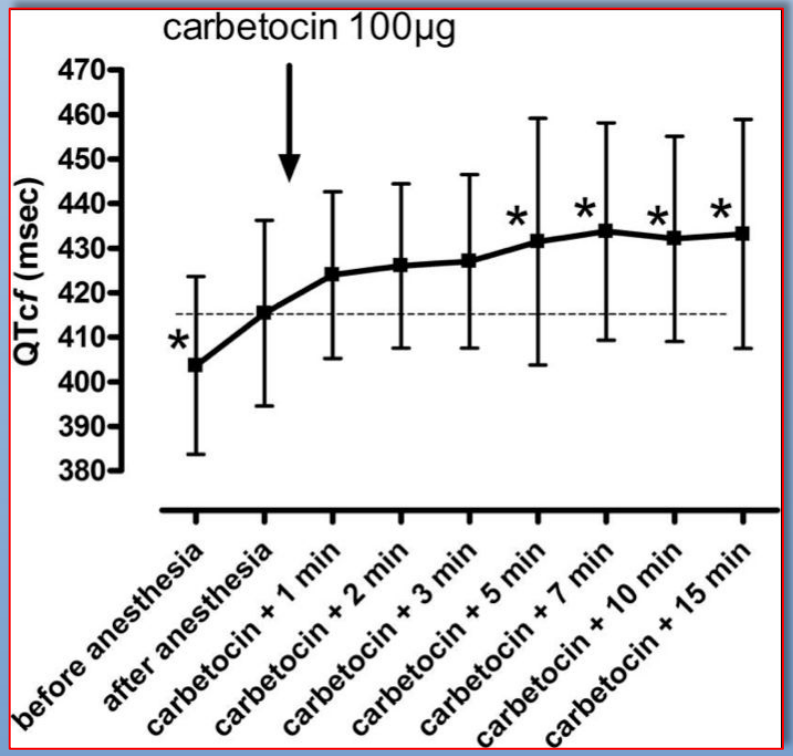


Figure Legend:

Invasive hemodynamic variables are presented as mean (SD) in the three treatment groups 1 min before and 8 min after intervention (intervention = time 0). The group means of the measurements in the last 30 s before uterotomy are indicated on the y-axis with horizontal lines. (A) Systolic arterial pressure, (B) mean arterial pressure, (C) diastolic arterial pressure, and (D) heart rate.



methylergometrine during caesarean section. *Br J Anaesth* 2008;**100**:683–9.
6. Jonsson M, Hanson U, Lidell C, Nordén-Lindeberg S. ST depression at caesarean section and the relation to oxytocin dose. A randomised controlled trial. *BJOG* 2010;**117**:76–83.

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http://dx.doi.org/10.1016/j.ijoa.2013.10.005

QT interval prolongation following carbetocin in prevention of post-cesarean delivery hemorrhage

Carbetocin is a new synthetic analog of human oxytocin that is used in the prevention of postpartum hemorrhage during cesarean delivery.[1] It is longer lasting than oxytocin;[2] however, it decreases arterial blood pressure and increases heart rate in similar proportions. Oxytocin has been shown to cause a transient increase in the QT interval,[3] and cause changes in T-wave morphology that may predispose to cardiac arrhythmia.[4] These effects may be caused by a direct action on conduction tissue but may also be related to indirect sympathetic effects such as a decrease in arterial blood pressure and an increase in heart rate.[3,5,6]

This observational study assessed the electrocardiographic and hemodynamic effects of carbetocin administered during cesarean delivery. After umbilical cord clamping, an intravenous bolus of carbetocin 100 µg (Pabal®, Ferring GmbH, Kiel, Germany) was administered over 10 s. A digital 12-lead electrocardiogram was obtained before induction of anesthesia, 3 min after stable anesthesia had been obtained, and then at 1, 2, 3, 5, 7, 10 and 15 min after carbetocin injection. The QT interval was measured semi-manually by a single observer and was corrected according to Fridericia's correction formula ($QTcf = QT/RR$). Sample size was calculated in order to detect a QT*cf* change >10 ms using a β risk at 0.20. QT*cf*, RR intervals and arterial blood pressure were compared by ANOVA for repeated measures and, if significant, using post-hoc analyses.

Among the 20 women enrolled (age: 31 ± 6 years, weight: 78 ± 14 kg), 85% underwent an elective procedure. Gestational age was 37 weeks and 3 days ± 7 days. Cesarean delivery was performed because of previous cesarean delivery ($n = 7$), placenta previa ($n = 3$), cervical dystocia ($n = 2$), twin pregnancy ($n = 2$), breech presentation ($n = 2$), intrauterine growth restriction ($n = 2$), fetal cardiac rhythm abnormality ($n = 1$) and HIV infection ($n = 1$). Spinal, combined spinal–epidural and epidural anesthesia were used in 10, five and five patients, respectively. Hyperbaric 0.5% bupivacaine was used in 15 cases, 2% lidocaine in four cases and both drugs combined in one case. Fifteen women required vasopressor support with ephedrine ($n = 10$, mean total dose 9 ± 11 mg) or phenylephrine ($n = 7$, mean total dose 60 ± 91 µg). Baseline hemodynamic characteristics before anesthesia were systolic blood pressure 134 ± 14 mmHg, diastolic blood pressure 79 ± 9 mmHg, heart rate 89 ± 14 beats/min and QT*cf* 403 ± 19 ms. Apgar scores were 10 in 75% [range 8–10] and 10 in 85% [range 9–10] at 1 and 5 min, respectively. Arterial blood gas measurement was obtained in 12 newborns: median pH was 7.31 [range 7.14–7.40]. Mean QT*cf* interval values over time are shown in Fig. 1. QT*cf* duration was significantly longer from the post-anesthesia measurement from 5 min until the last recorded value at 15 min after carbetocin administration. The maximal increase was observed at 7 min (+ 18 ± 4 ms, $P = 0.01$). Compared to the pre-anesthesia baseline measurements, all QT*cf* values were significantly prolonged with a maximal rise at 7 min (+ 30 ± 4 ms, $P < 0.0001$). No arrhythmia occurred during the study period. Carbetocin did not modify heart rate but was associated with a 19% drop of arterial blood pressure. Compared with post-anesthesia values, the nadir was found at 15 min after carbetocin administration: −23 ± 4 and −22 ± 3 mmHg for systolic and diastolic blood pressure, respectively (both $P < 0.0001$).

Although this observational study lacked a control group, the observed QT prolongation and hemodynamic changes following carbetocin are likely to be drug-related. Firstly, the observed decrease in arterial blood pressure is close to that reported in previous studies, supporting external validity;[7] secondly, data obtained in observational and placebo-controlled studies usually show similar drug-induced QT prolongation.[8] However, we cannot exclude that the prolongation in QT interval might have been related to other QT prolonging factors. Apart from case

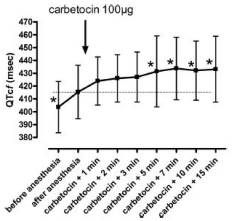


Fig. 1 Mean QT*cf* (±SD) during cesarean delivery. * $P < 0.05$ versus level after anesthesia.

M. Bruyere, N. Ait Hamou, D. Benhamou. QT interval prolongation following carbetocin in prevention of post-cesarean delivery hemorrhage. International Journal of Obstetric Anesthesia. 2016 Vol. 23, (1), P. 88–89

РЕЦЕНЗИЯ Еще одной трагедии

- **Хронология событий**
  - *Из индивидуальной карты беременной:*

В 29 нед. пациентка ночью поступила в экстренном порядке в акушерское отделение 1-го уровня с жалобами на головокружение, тошноту, рвоту.

На этапе транспортировки в стационар АД 240/120 мм рт. ст., бригадой СМП пациентке введена нагрузочная доза 5 г магния сульфата. Контроль АД 200/110 мм рт. ст.

При поступлении АД 210/110 мм рт. ст., пульс 88 уд/мин, температура тела 36.5°С. Заторможена. Зрачки ОД больше ОС.

Общее состояние тяжелое, обусловленное очаговой и общемозговой симптоматикой.

РЕЦЕНЗИЯ Еще одной трагедии

- **Хронология событий**

✔ *Из индивидуальной карты беременной:*

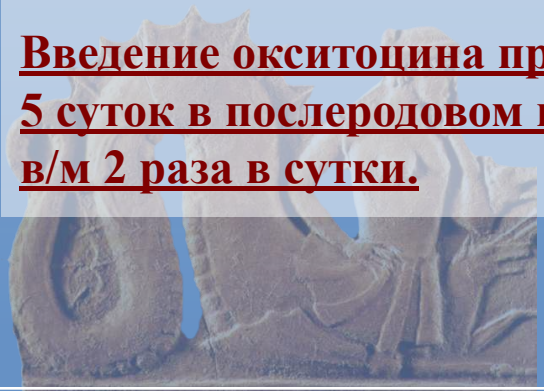
В 00 час. 10 мин. за паховые сгибы согласно биомеханизму родов в тазовом предлежании извлечен плод женского пола массой 1100 гр.,
ростом 35 см в асфиксии 3 степени
с оценкой по Апгар 3 балла,
передана неонатологу.

Продолжительность операции составила 50 мин.

Общая кровопотеря 500,0 мл.

Для профилактики кровотечения в/в введено 10 МЕ окситоцина.

Введение окситоцина продолжено в течение 5 суток в послеродовом периоде в/м 2 раза в сутки.



РЕЦЕНЗИЯ Еще одной трагедии

По санавиации для определения тактики дальнейшего ведения, решения вопроса о маршрутизации пациентки вызваны анестезиолог, нейрохирург, гинеколог. Учитывая, что родильница нетранспортабельна, коллегиально решено перевести женщину РАО МБУЗ ЦГБ для лечения и проведения спиральной компьютерной томографии.

По заключению СКТ подтвержден геморрагический инсульт в СМА справа с прорывом крови в желудочковую систему, с формированием гематомы, без дислокации срединных структур, с кровоизлиянием в ствол мозга, отек мозга.

Заключение нейрохирурга при повторном осмотре консультантами санавиации: оперативное лечение (наложение вентрикулярного дренажа) не показано.

Запланирован перевод в 3-й уровень.

- **Хронология событий**
  - *Из индивидуальной карты беременной:*

РЕЦЕНЗИЯ Еще одной трагедии

- **Патологоанатомический диагноз:**

✔ **Основной:**

Кровоизлияние с формированием гематомы в области подкорковых узлов, промежуточного мозга и частично среднего мозга справа.

Фоновый: Гипертоническая болезнь, кризовое течение. Ожирение II ст.

Осложнения: Прорыв крови в желудочки мозга. Отек, набухание и дислокация головного мозга. Острое венозное полнокровие внутренних органов. Альвеолярный отек легких. Серозный бронхит. Посткатетеризационный пневмоторакс слева, дренирование левой плевральной полости.

Сопутствующий: Состояние после кесарева сечения при беременности 29–30 недель.

- **Хронология событий**

✔ *Из индивидуальной карты беременной:*

РЕЦЕНЗИЯ Еще одной трагедии

На основании клинических и патологоанатомических данных обнаружено, что больная страдала гипертонической болезнью, на фоне которой развилось кровоизлияние с формированием гематомы в области подкорковых узлов, промежуточного мозга и частично среднего мозга справа (дм 6 см).

Кровоизлияние в головной мозг осложнилось прорывом крови в желудочки мозга, отеком, набуханием и дислокацией головного мозга, что и явилось непосредственной причиной смерти.

Заключение:

Смерть больной, страдавшей гипертонической болезнью, наступила от обширного глубокого кровоизлияния в головной мозг с прорывом в желудочки.

Непосредственная причина смерти – отек и набухание головного мозга с его дислокацией.

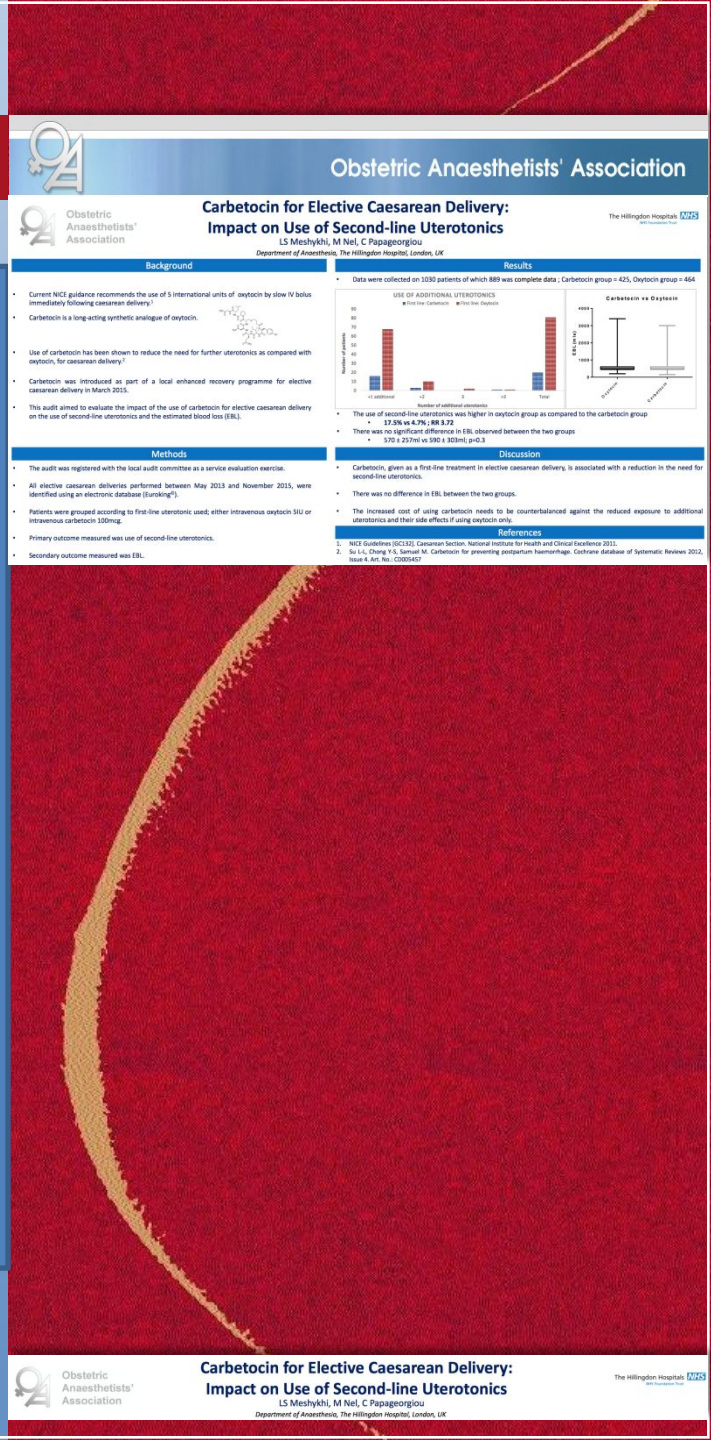
- **Патологоанатомический эпикриз**

✔ *Из индивидуальной карты беременной:*

При введении **карбетоцина**, как препарата первой очереди при плановом КС, отмечалось снижении потребности в повторных введениях утеротоников

Не отмечено разницы по объему кровопотери в группах (*окситоцин* и *карбетоцин*)

Увеличение стоимости при лечении карбетоцином сопоставимо с уменьшением дополнительного применения утеротоников второй очереди и побочными эффектами применения только окситоцина


Obstetric Anaesthetists' Association

Carbetocin for Elective Caesarean Delivery: Impact on Use of Second-line Uterotonics

LS Meshykhi, M Nel, C Papageorgiou

Department of Anaesthesia, The Hillingdon Hospital, London, UK

Background

- Current NICE guidance recommends the use of 5 international units of oxytocin by slow IV bolus immediately following caesarean delivery[1]
- Carbetocin is a long-acting synthetic analogue of oxytocin.
- Use of carbetocin has been shown to reduce the need for further uterotonics as compared with oxytocin, for caesarean delivery[2]
- Carbetocin was introduced as part of a local enhanced recovery programme for elective caesarean delivery in March 2015.
- This audit aimed to evaluate the impact of the use of carbetocin for elective caesarean delivery on the use of second-line uterotonics and the estimated blood loss (EBL).

Methods

- The audit was registered with the local audit committee as a service evaluation exercise.
- All elective caesarean deliveries performed between May 2013 and November 2015, were identified using an electronic database (Euroking®).
- Patients were grouped according to first-line uterotonic used; either intravenous oxytocin 5IU or intravenous carbetocin 100mcg.
- Primary outcome measured was use of second-line uterotonics.
- Secondary outcome measured was EBL.

Results

- Data were collected on 1030 patients of which 889 was complete data ; Carbetocin group = 425, Oxytocin group = 464

USE OF ADDITIONAL UTEROTONICS

Carbetocin vs Oxytocin

- The use of second-line uterotonics was higher in oxytocin group as compared to the carbetocin group
  - 17.5% vs 4.7% ; RR 3.72
- There was no significant difference in EBL observed between the two groups
  - 570 ± 257ml vs 590 ± 303ml; p=0.3

Discussion

- Carbetocin, given as a first-line treatment in elective caesarean delivery, is associated with a reduction in the need for second-line uterotonics.
- There was no difference in EBL between the two groups.
- The increased cost of using carbetocin needs to be counterbalanced against the reduced exposure to additional uterotonics and their side effects if using oxytocin only.

References

1. NICE Guidelines (GC132). Caesarean Section. National Institute for Health and Clinical Excellence 2011.
2. Su L-L, Chong Y-S, Samuel M. Carbetocin for preventing postpartum haemorrhage. Cochrane database of Systematic Reviews 2012, Issue 4. Art. No.: CD005457

Carbetocin for Elective Caesarean Delivery: Impact on Use of Second-line Uterotonics

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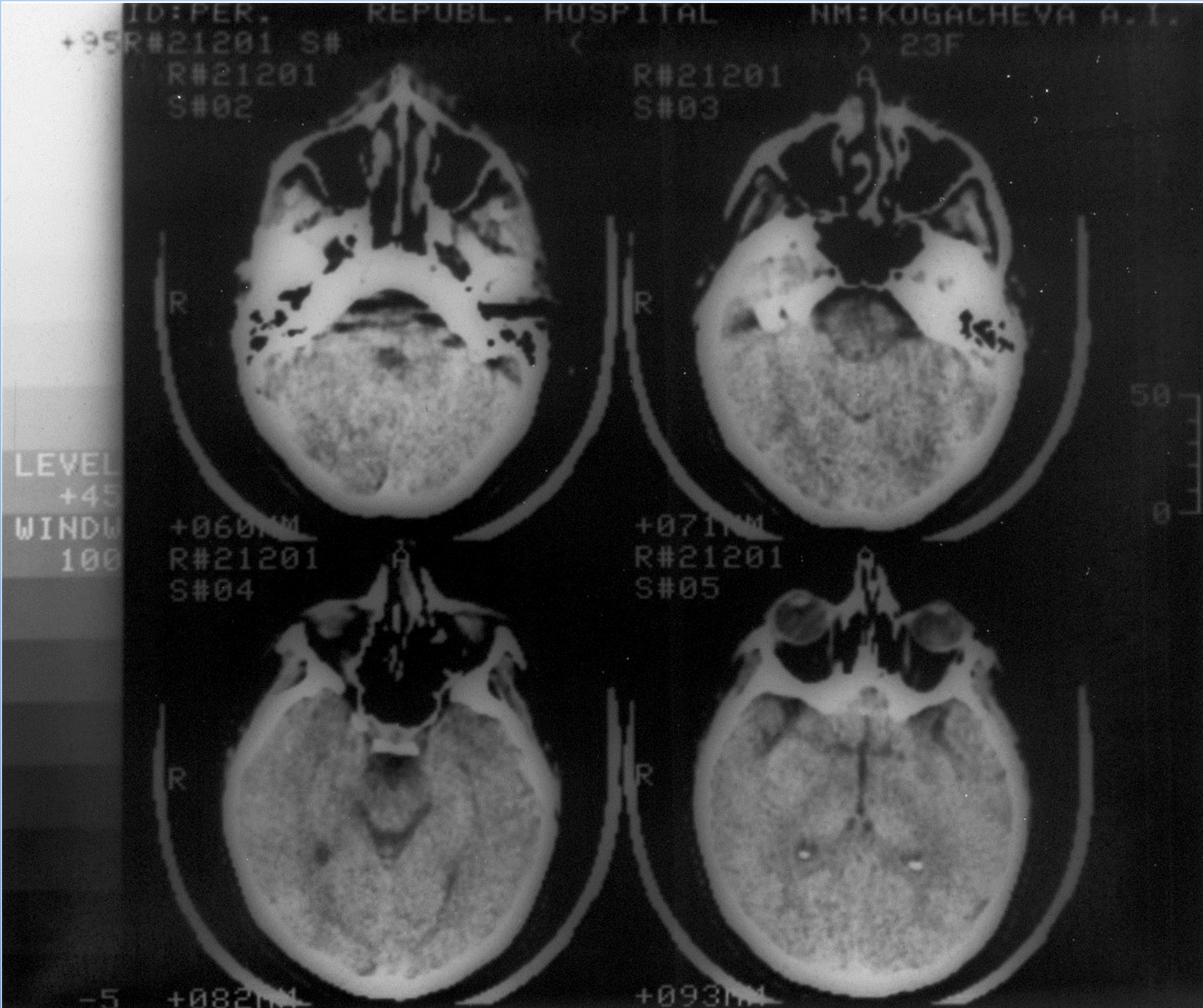
Department of Anaesthesia, The Hillingdon Hospital, London, UK

Meshylhi L.S., Nel M., C. Papageorgiou. Carbetocin for Elective Caesarean Delivery: Impact on Use of Second –line Uterotonics. OAA meeting May 2016, P. 12

Метилэргометрин

- Действие опосредовано через α-рецепторы
- Гипертензия, особенно при предшествующем применении вазопрессоров
- Коронарный вазоспазм, инфаркт миокарда
- Тошнота и рвота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S#05
LEVEL
+060MM
+071MM
+082MM
+093MM
50
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-5

Метилэргометрин и near miss

Пациентка Л. 32 лет, и/б № 154, находилась в роддоме № 15 с 03.03.2012 по 19.03.2012.

Диагноз при поступлении: Беременность 37–38 недель. Бихориальная биамниотическая двойня. Тазовое предлежание I плода. Многоводие. ПМК 1ст. Синусовая тахикардия. Rh – отрицательная кровь без явлений сенсибилизации.

Экстрагенитальная патология: С 1992 г. Миопия слабой степени.

12.03.2012 в плановом порядке произведена лапаротомия по Джоэл-Кохену. Кесарево сечение в нижнем маточном сегменте.

В 11ч 02 мин извлечена 1 живая доношенная девочка (3020/50), ***Апгар 7/8 баллов***

В 11ч 03 мин извлечена 2 живая доношенная девочка (2610/47), ***Апгар 7/8 баллов***

В/в болюсно введен метилэргометрин, 5 ед. окситоцина.

В 11ч 05 мин у появились жалобы на чувство нехватки воздуха, сухой кашель. При осмотре отмечен акроцианоз, бледность кожных покровов.

Аускультативно: в легких жесткое дыхание, тоны сердца приглушены.

АД 108/70, **PS – 68 в мин.**

В 13 ч на ЭКГ признаки перегрузки правых отделов сердца.

На Rg грудной клетки – **признаки отека легких.**

Аускультативно: в легких жесткое дыхание, тоны сердца приглушены. При осмотре – акроцианоз, бледность кожных покровов.

АД 130/80, **PS – 60 в мин.**

Еще в 1990 г. был описан тотальный спазм трех коронарных артерий при введении метилэргометрина, подтвержденный и верифицированный ангиографически

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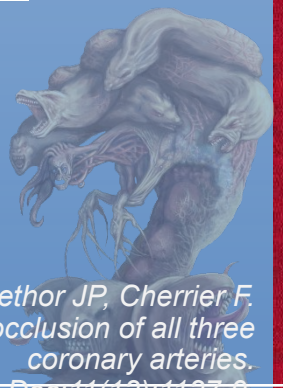
Methylergometrine-induced coronary artery spasm causing total occlusion of all three coronary arteries

N. DANCHIN, CH. SELTON-SUTY, Y. JUILLIERE, J.-P. LETHOR, F. CHERRIER

DOI: http://dx.doi.org/ 1127-1129 First published online: 2 December 1990



Danchin N, Selton-Suty C, Juilliere Y, Lethor JP, Cherrier F. Methylergometrine-induced coronary artery spasm causing total occlusion of all three coronary arteries.

Применение метилэргометрина увеличивает риск развития ОИМ

Метилэргометрин должен вводиться строго по показания, с обязательным информированием анестезиолога-реаниматолога.

Тактика ведения акушерских пациенток с ОИМ зависит от его патогенеза. В описанном нами случае, при вазоспастическом (нетромботическом патогенезе) ОИМ, проведение тромболизиса или экстренной коронароангиографии нецелесообразно… .

УДК 617-089.844+ 615.211:616-089.888.61

ИНФАРКТ МИОКАРДА ПОСЛЕ ОПЕРАЦИИ КЕСАРЕВА СЕЧЕНИЯ ПРИ СПИНАЛЬНОЙ АНЕСТЕЗИИ НА ФОНЕ ПРИМЕНЕНИЯ МЕТИЛЭРГОМЕТРИНА И ОКСИТОЦИНА (КЛИНИЧЕСКОЕ НАБЛЮДЕНИЕ)

С.В. Письменский, А.В. Пырегов

Федеральное Государственное Бюджетное Учреждение «Научный Центр Акушерства, Гинекологии и Перинатологии имени академика В.И.Кулакова» Минздравсоцразвития России. Москва, Россия.

MYOCARDIAL INFARCTION AFTER CESAREAN SECTION UNDER SPINAL ANESTHESIA DURING TREATMENT WITH OXYTOCIN AND METILERGOMETRIN (CLINICAL OBSERVATION)

S.V. Pismensky, A.V. Pyregov

Резюме

В статье приводится клиническое наблюдение инфаркта миокарда после операции кесарево сечение, выполненного под спинальной анестезией с применением утеротоников. Считаем, что использование метилэргометрина увеличивает риск развития острого инфаркта миокардка (ОИМ), а назначение препарата должно осуществляться строго по показания, с обязательным информированием анестезиолога-реаниматолога. Тактика ведения акушерских пациенток с ОИМ зависит от его патогенеза. В описанном нами случае, при вазоспастическом (нетромботическом патогенезе) ОИМ, проведение тромболизиса или экстренной коронароангиографии нецелесообразно, в остальном терапия стандартная.

***Ключевые слова:** острый инфаркт миокарда, метилэргометрин, тромболизис*

Abstract

The article presents a clinical observation of myocardial infarction after cesarean section performed under spinal anesthesia with the use of uterotonics. We believe that the use of metilergometrina increases the risk of acute myocardial miokardka (AMI), and use of the drug should be carried out strictly according to the testimony, with the obligatory informing Anaesthetist. Management of obstetric patients with AMI depends on its pathogenesis. In the case described by us, in vasospastic (netromboticheskom pathogenesis) of AMI, thrombolysis or emergency coronary angiography is impractical in the rest of the standard therapy.

***Keyworlds:** acute myocardial, metilergometrin, thrombolysis*

Введение

У женщин детородного возраста острый инфаркт миокарда случается достаточно редко. Частота его развития во время беременности не превышает от 2 до 5 случаев на 100 000 женщин [1, 2]. Принимая во внимание тенденцию к увеличению среднего возраста беременных, а также воздействия таких распространенных ныне факторов риска, как курение, сахарный диабет и стресс, можно ожидать возрастание удельного веса данной патологии. Напомним, что беременность сама по себе способна увеличивает вероятность развития ОИМ в несколько раз [3].

Известно, что ОИМ может развиться на любой стадии беременности. Наиболее распространенная локализация инфаркта - передняя стенка и верхушка левого желудочка. Частая причина возникновения ИМ в пред- и послеродовом периоде - спонтанное расслоение стенки проксимального отдела левой передней венечной артерии. Считают, что в основе этого процесса лежат структурные и биохимические изменения стенки сосуда, обусловленные избытком прогестерона, а также эозинофилия и недостаточность плазматического фактора, стимулирующего синтез простациклина и увеличение концентрации липопротеинов [4, 5, 6]. Литературные данные свидетельствуют, что до введения в рутинную практику первичных интервенционных методик лечения, смертность в остром периоде заболевания (преимущественно в III

Письменский С.В., Пырегов А.В. Инфаркт миокарда после операции кесарева сечения при спинальной анестезии на фоне применения метилэргометрина и окситоцина (клиническое наблюдение) // ТОЛЬЯТТИНСКИЙ МЕДИЦИНСКИЙ КОНСИЛИУМ. 2015. №5-6.59-63.

II Пленум Правления

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