

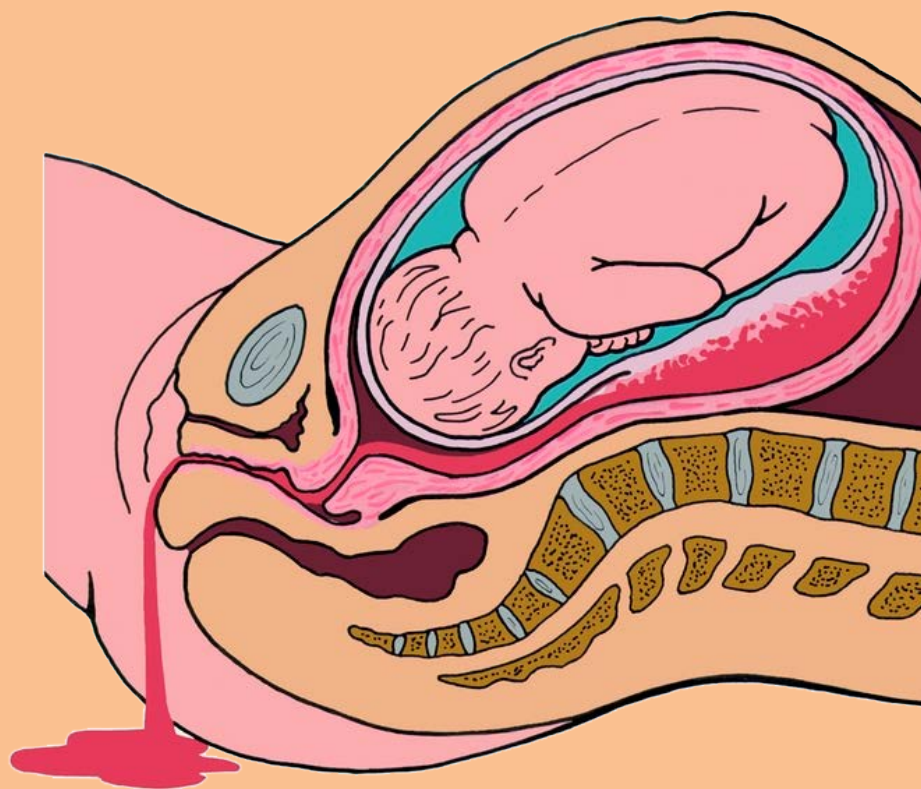
Утеротоники – проблемы?



д. м. н. профессор Е. М. Шифман



**Обязательно запомнить:
в 75–90% случаях
послеродовое кровотечение –
это гипо- и атонические маточные
кровотечения!!!**

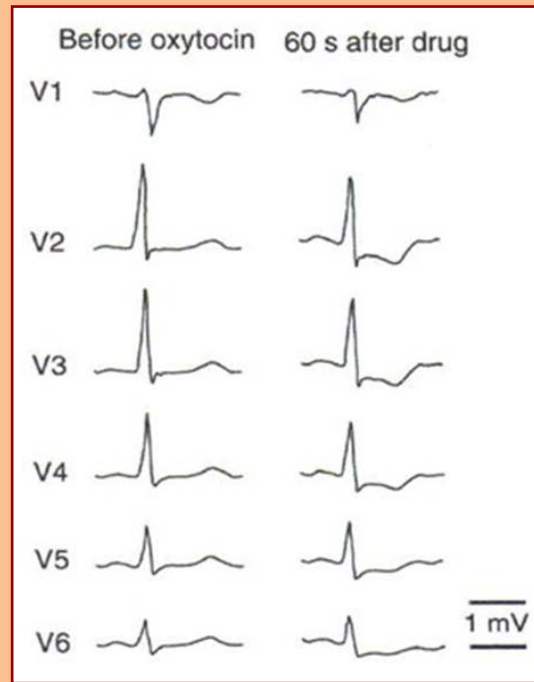
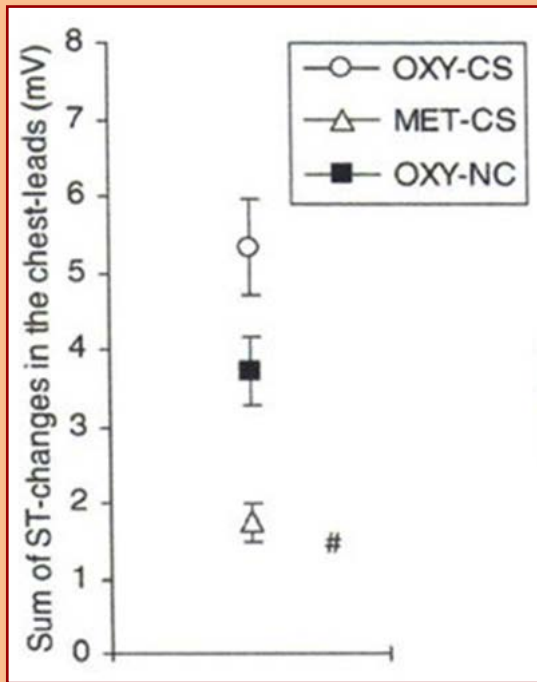


Клинический случай

- 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



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

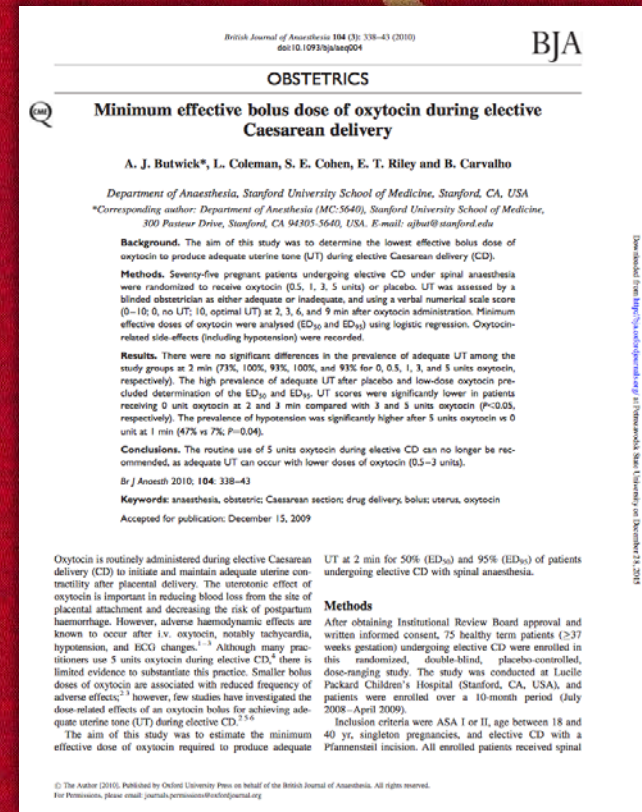


Средняя сумма изменений ST в скалярных грудных отведениях mV.



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

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.



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

International Journal of Obstetric Anesthesia (2008) 17, 247–254
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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

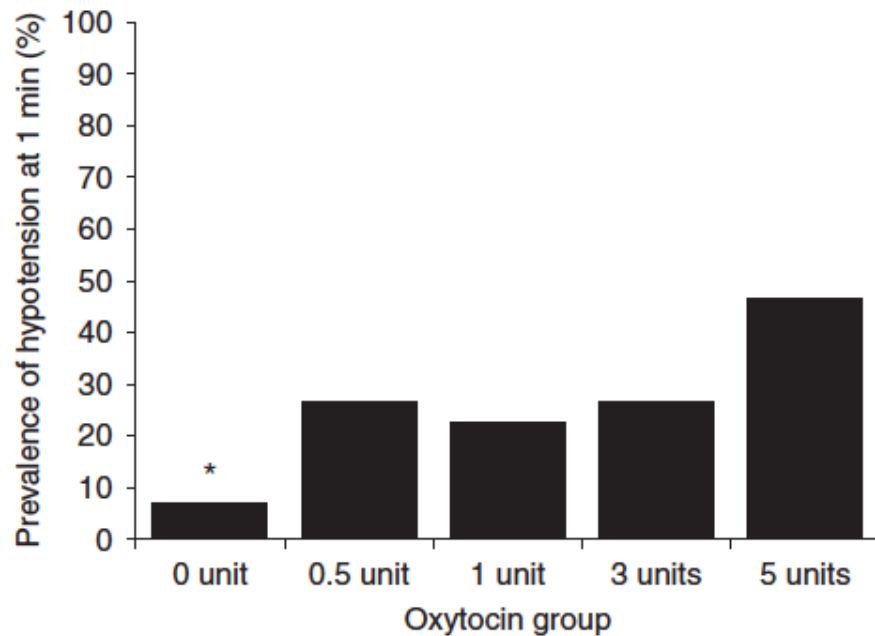
ABSTRACT

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.

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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*



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.

OBSTETRICS

Minimum effective bolus dose of oxytocin during elective Caesarean delivery

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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 (ED₅₀ and ED₉₅) 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 ED₅₀ and ED₉₅. 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 uterine 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;⁵ 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% (ED₅₀) and 95% (ED₉₅) 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 Pfannenstiel incision. All enrolled patients received spinal



- Давление в легочной артерии значительно увеличивается и остается таковым в течение **10 минут** после внутривенного введения **10 ЕД** окситоцина во время операции кесарево сечения. Этот эффект наиболее значим при митральном-, аортальном стенозах и при гиповолемии

Secher NJ, Arnsbo P, Wallin L.

Haemodynamic effects of oxytocin (syntocinon) and methyl ergometrine (methergin) on the systemic and pulmonary circulations of pregnant anaesthetized women.

Acta Obstet Gynecol Scand 1978;57:97-103.



Acta Obstet Gynecol Scand 57:97-103, 1978

HAEMODYNAMIC EFFECTS OF OXYTOCIN (SYNTOCINON®) AND METHYL ERGOMETRINE (METHERGIN®) ON THE SYSTEMIC AND PULMONARY CIRCULATIONS OF PREGNANT ANAESTHETIZED WOMEN

N. J. Secher, P. Arnsbo and L. Wallin

From the Department of Gynecology & Obstetrics, the Department of Clinical Physiology and the Department of Anaesthetics, Odense University Hospital, Odense, Denmark

Abstract. The haemodynamic effects of oxytocin (Syntocinon®) and methyl ergometrin (Methergin®) were studied in 9 healthy females in the first trimester of pregnancy. The patients were anaesthetized with sodium thiomibumal, pethidine and pancuronium bromide and ventilated on a Manley respirator. 10 i.u. oxytocin given as an i.v. bolus brought about a fall in femoral arterial pressure of 40%, systemic resistance 59% and pulmonary resistance 44% 30 sec after injection. However, the heart rate increased 31% and stroke volume 17%, so that the cardiac output increased by 54%. The pulmonary arterial pressure and wedge pressure were increased by 35% and 35%, respectively 150 sec after injection. No changes were seen in the haemodynamic parameters during infusion of 80 ml oxytocin for 10 min. 0.2 mg Methergin brought about an increase in the femoral arterial pressure of 11%, pulmonary arterial pressure 27% and wedge pressure 31%, with no changes in the other measured parameters. The use of oxytocic drugs in patients with compromised circulation is discussed.

pare the changes with those found in the systemic circulation.

The patients were examined in the first trimester of pregnancy in order to exclude the circulatory changes caused by autotransfusion from the uterus during contraction at term.

MATERIAL AND METHODS

The aim of the study and the experimental procedure was explained in detail to the patients. At the same time it was stressed that there would be no therapeutic benefit from participating in the study. Thereafter, all the patients consented to take part. The material consists of 9 healthy women age 20-37 years (mean 28) referred to the clinic for abortion in the 10th to 12th weeks of gestation. The patients were anaesthetized with sodium thiomibumal, pethidine and pancuronium bromide. They were intubated and ventilated on a Manley respirator adjusted according to the Radford nomogram. Ventilation was carried out with N₂O-O₂ in a ratio of two to one so as to obtain as stable and reproducible circulation as possible. The ECG was registered continuously and the pressure in the femoral artery measured continuously through an indwelling catheter. A Swan-Ganz flow directed thermomodulation catheter (93A-118-7F) was introduced into the pulmonary artery through an antecubital vein. The pulmonary artery pressure, the pulmonary wedge pressure and the femoral pressure were measured using pressure transducers (Etema-Schölander, type BMT 35). The results were registered on a recorder (Mingograph 81 Etema-Schölander). The transducers used were calibrated before and after each series of measurements. The output of the pulmonary and wedge pressure transducer were averaged electrically to obtain the mean pressure. All the measurements were performed with the patient in the supine position, and the level of the zero reference point of the pressure recordings was defined as the midaxillary line. The thermistor in the Swan-Ganz catheter was connected to a cardiac output computer (Edwards 9510), the output, of which was registered on a recorder (Servogor RE 520). Any abnormal curves were disregarded. The

- 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.



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. Thomas¹ and G. M. Cooper^{2*}, on behalf of the Editorial Board of the Confidential Enquiries into Maternal Deaths in the United Kingdom‡

¹Department of Anaesthesia, St Michael's Hospital, Southwell Street, Bristol BS2 8EG, UK, ²University 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

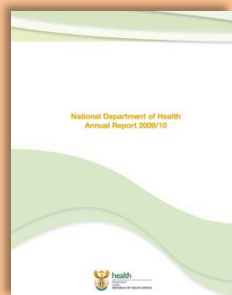
mothers have received anaesthetics safely and anaesthetists are accepting an increasing responsibility for aspects of mother's care that fall naturally within their competence and control. Anaesthetists are trained to recognize and treat major haemorrhage that they encounter in many areas of their professional 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, MRCP, FFPHM, FRCOG, Director and Editor, James Dribe MD, FRCOG, FRCPed, FRCS(Ed), Clinical Director, Beverley Botting BSc, Hon MFPHM, Christine Carson SRM, PGDip MSc, Griselda Cooper FRCA, Marion Hall MD FRCOG, Catherine McCormick RN RM, James Neilson MD FRCOG, Margaret Oates FRCPsych, Robert Shaw MD FRCS(Ed), FRCOG, Michael de Swart MD FRCP, Harry Millward-Sadler FRCPsych, MChM, 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 зафиксировано две смерти при введении 10 ЕД окситоцина при операции кесарево сечения

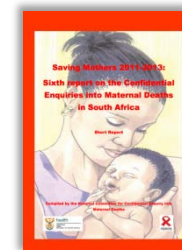
Lamacraft G. Anaesthesia related deaths. In Pattinson RC, ed. Saving mothers: fourth report on confidential enquiries into maternal deaths in South Africa. Department of Health, Pretoria, Republic of South Africa 2010: 137.



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

Expanded Executive Summary

By
NCCEMD



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.

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 (ED₅₀) 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 ED₅₀ 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 603 ± 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 technique 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 pla-

cental 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.^{3–9} 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 (ED₅₀) of oxytocin required to produce adequate uterine contraction at elective cesarean delivery in nonlaboring women.

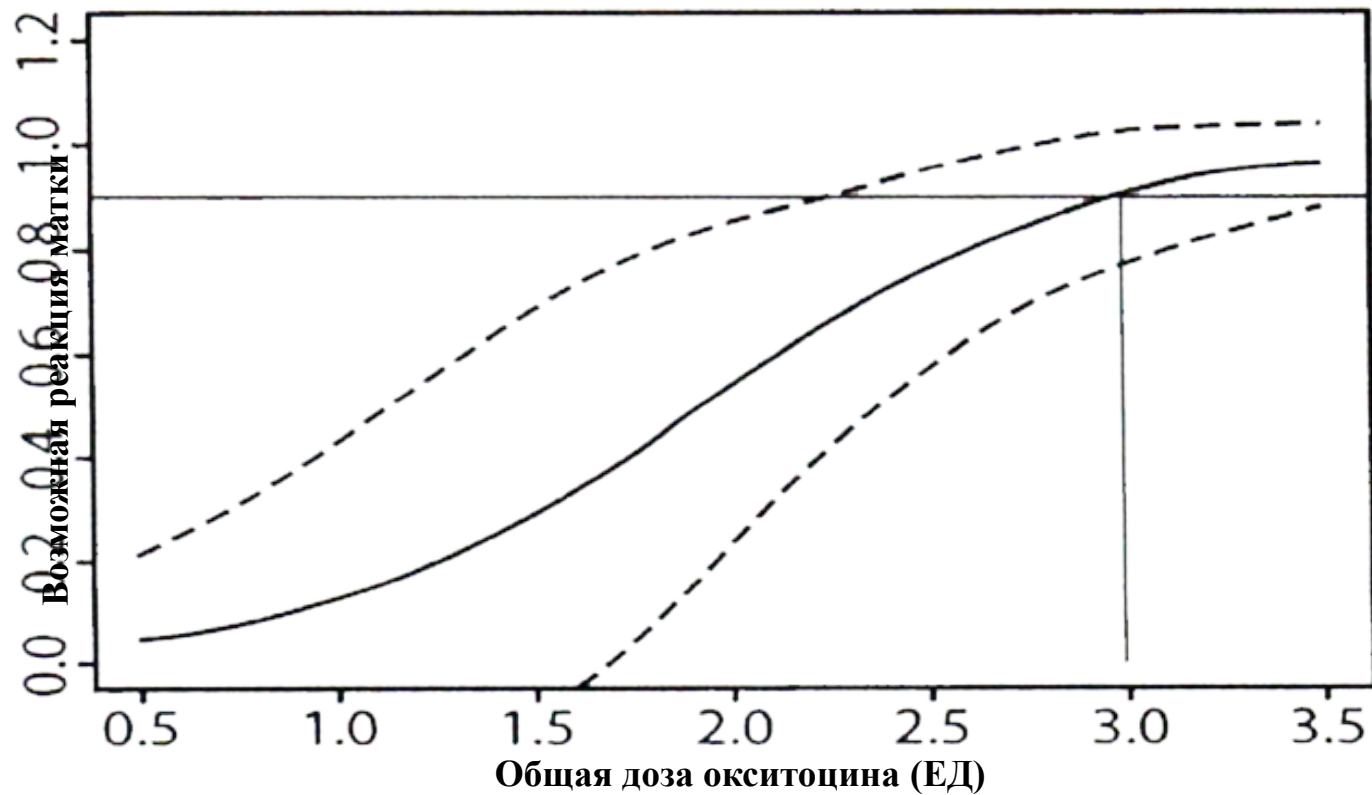
MATERIALS AND METHODS

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, preclampsia, 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.

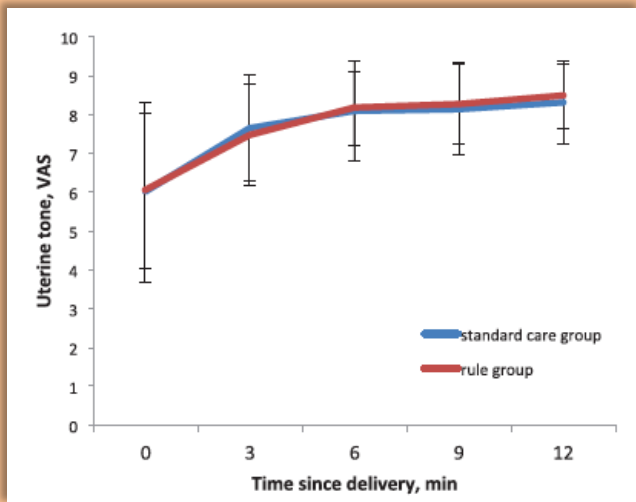
After skin disinfection and local infiltration, a subarachnoid puncture was performed in the sitting position at L₂₋₃ or L₃₋₄ interspace using a 27G Whitacre needle. Anesthetic blockade of up to a T₄ dermatomal level was

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*



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



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.

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,³⁻⁵ cardiovascular collapse, and death.⁶ 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.^{8,12,13} 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 non-existent.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

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

fiation 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

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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.
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Наиболее желательный алгоритм применения утеротоников, как при плановой, так и при срочной операции кесарево сечения, снижающий вероятность назначения неоправданно больших доз утеротоников и неразборихи в академических образовательных программах, — «правило троек».

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.

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

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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.^{8,12,13} 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 non-existent.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

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

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

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. Copyright © 2015, the American Society of Anesthesiologists, Inc. Wolters Kluwer Health | Inc. All Rights Reserved. Anesthesiology 2015; 123:92-100



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

Советские писатели, обсуждая деятельность писателя Б. Пастернака, во всем согласны со значением советского писателя в советском гражданстве, который поддерживает решение руководящих органов Союза писателей о лишении Б. Пастернака звания советского писателя, об исключении его из рядов членов Союза писателей СССР.

Такого стремления от жителя и от народа социалистической России и знающего Б. Пастернака только негоднотельно разоблачил себя как враг своего народа для каждого из нас, советских людей. — Великий исторический социалистический революционер и со-бессмертный вождь.

Великий литературный, критический роман «Доктор Живаго», Б. Пастернак передал 400 для опубликования за границу и совершил тем самым предательство по отношению к советской литературе, Советской стране и всем совет-

ским гражданам. Он отказывается от гражданства и исключается из рядов членов Союза писателей СССР. Б. Пастернак подал заявление о лишении его звания и исключении из рядов членов Союза писателей СССР.

Что делать Пастернаку в проклятой Советской стране? Быть со своим, как всегда он выказался? Он следует ли своему патристическому имперскому гонимому работничеству?

Пусть великая судьба литературы, искусства, предельно интересны России, будет ему уделом!

Обращаясь к гражданам с просьбой о лишении писателя Б. Пастернака советского гражданства.

Во имя честной борьбы, за единую победу — все, что может сделать гражданин и жена писателя до падения

ПРАВИЛЬНОЕ РЕШЕНИЕ

Только один наш автор писал о Пастернаке в этот раз 1 250 тысяч раз, а в 1958 году 200 тысяч раз. Мы знаем, что за 3 месяца от нашей страны вышло 2 070 листов газеты. Со всей страны вышло 17 тысяч листов газеты. В среднем по 24 строки в газете. Этот автор не написал ни одного слова. Он написал 41 миллион рублей.

Почему эти цифры могут показаться смешными, а для нас они звучат, как зловещий сигнал? В них заключены огромные и истинные победы советского народа и его культуры, жизни, здоровья, счастья, свободы, мира, прогресса, оздоровления. Писатель Б. Пастернак не написал ни одного слова. Он написал 41 миллион рублей.

Почему эти цифры могут показаться смешными, а для нас они звучат, как зловещий сигнал? В них заключены огромные и истинные победы советского народа и его культуры, жизни, здоровья, счастья, свободы, мира, прогресса, оздоровления. Писатель Б. Пастернак не написал ни одного слова. Он написал 41 миллион рублей.

Из редакционной почты

Литература в нашей стране — родное, дорогое дело народа. Не в какой стране писатели не окружены таким постоянным вниманием и заботой, как у нас. Писателя не было такой массы читателей — добровольцев и энтузиастов, было заинтересованных и успешных литературных и других советских читателей, как у нас. Литература в нашей стране — родное, дорогое дело народа. Не в какой стране писатели не окружены таким постоянным вниманием и заботой, как у нас. Писателя не было такой массы читателей — добровольцев и энтузиастов, было заинтересованных и успешных литературных и других советских читателей, как у нас.

Вот почему такой широкий отклик получило решение литературной общественности об исключении Б. Пастернака из числа членов Союза писателей СССР за «предательство во отношении к советскому народу, к делу социализма, мира, прогресса, оздоровления. Писатель Б. Пастернак не написал ни одного слова. Он написал 41 миллион рублей.

Письма и телеграммы в адрес «Литературной газеты» идут и эти дни буквально потоком. И в каждом таком письме — высказана мысль и предложение, народная совесть осуждает предательские действия Б. Пастернака.

ПРЕКРАСНА НАША ДЕЙТЕЛИТЕЛЬНОСТЬ

Голос и настроение читателей нашей «Литературной газеты»

И установление вей СССР, было признано врагом СССР и врагом народа. Б. Пастернак не написал ни одного слова. Он написал 41 миллион рублей.

Жаль, что мы не знаем, где он сейчас. Мы ждем. Но это не должно быть для нас препятствием. Мы ждем. Но это не должно быть для нас препятствием. Мы ждем. Но это не должно быть для нас препятствием.

Жаль, что мы не знаем, где он сейчас. Мы ждем. Но это не должно быть для нас препятствием. Мы ждем. Но это не должно быть для нас препятствием. Мы ждем. Но это не должно быть для нас препятствием.

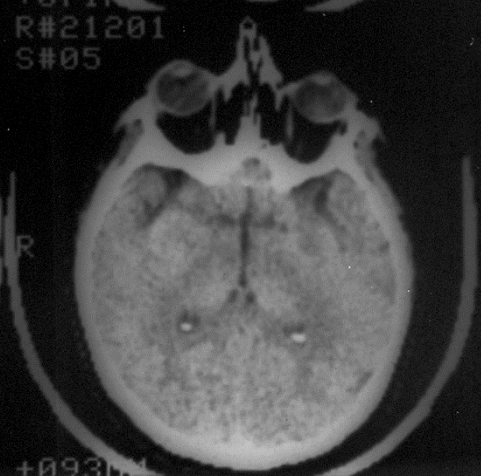
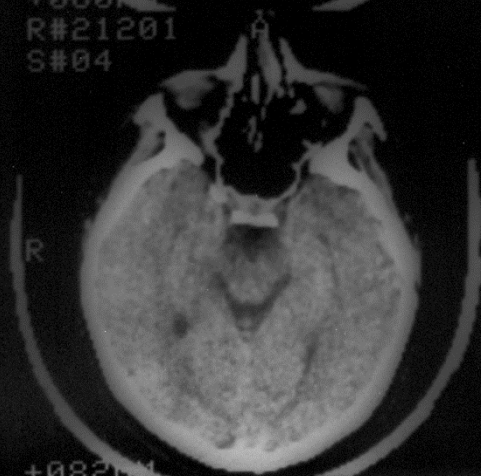
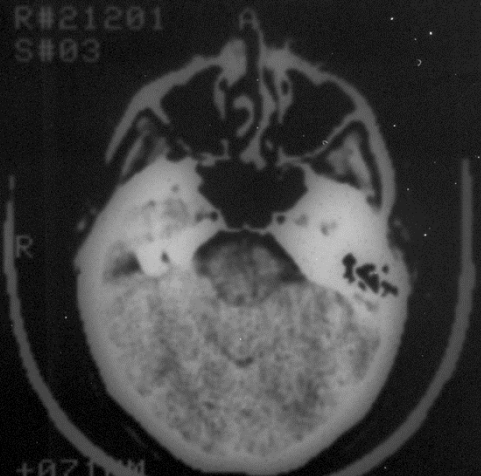
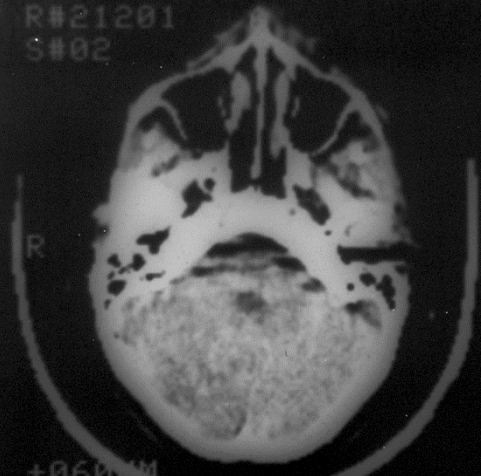


Метилэргометрин

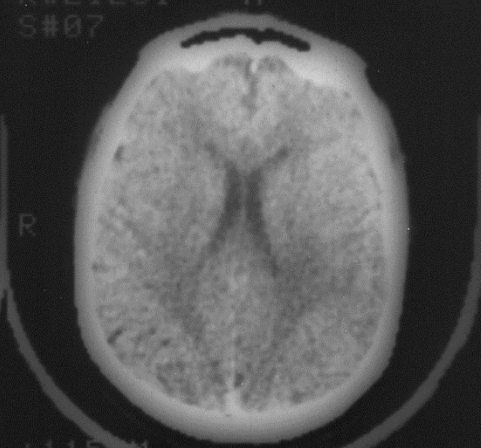
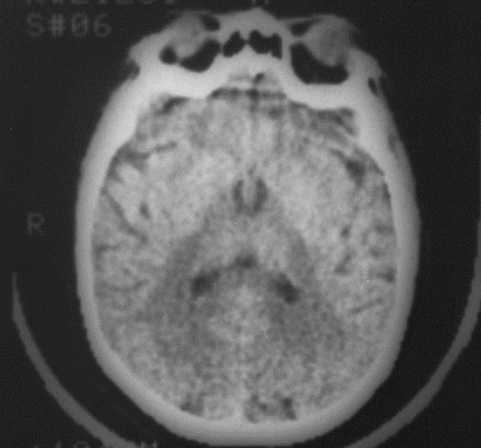
- Действие опосредовано через α -рецепторы
- Гипертензия, особенно при предшествующем применении вазопрессоров
- Коронарный вазоспазм, инфаркт миокарда
- Тошнота и рвота



ID: PER. REPUBL. HOSPITAL NM: KOGACHEVA A. I.
+95R#21201 S# R#21201 S#23F
R#21201 S#02 R#21201 S#03

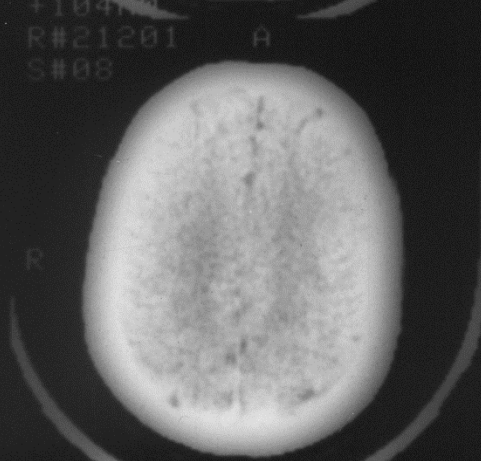


ID: PER. REPUBL. HOSPITAL NM: KUGACHEVA A. I.
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R#21201 A S#06



50
0

LEVEL
+45
WINDW
100



-5 +128mm +141mm



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.

Из анамнеза: данная беременность 3-я, наступила самопроизвольно.

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.



Метилэргометрин и near miss

В 18 ч при МСКТ грудной полости: данных за тромбоэмболию легочных артерий не выявлено. Малый двусторонний гидроторакс. Признаки гиповентиляции обоих легких.

Аускультативно: в легких жесткое дыхание, тоны сердца приглушены.

При осмотре – акроцианоз, бледность кожных покровов.

АД 115/70, PS – 74 в мин.

Введено 50 мг преднизолона.

В 23-00 Аускультативно: в легких жесткое дыхание, тоны сердца приглушены. При осмотре – бледность кожных покровов.

АД 116/66, PS – 40 в мин.

Консультирована кардиологом – данных за о. инфаркт миокарда нет.

13.03.2012 в 12-00 переведена в АФО.

19.03.12 Консультация кардиолога: Аневризма МПП без сброса крови. ПМК 2 ст. МР 1 ст. **Гидроперикард. Гидроторакс.**

Нарушения ритма по типу вегетативной дисфункции синусового узла, синдром тахи-бради, пароксизмальной формы наджелудочковой тахикардии.

Данные анализов крови и мочи в пределах нормы.



Применение метилэргометрина увеличивает риск развития ОИМ

Метилэргометрин должен вводиться строго по показаниям, 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 тромболиза или экстренной коронароангиографии нецелесообразно... .

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.

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» Минздрава 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 кесарева сечения, выполненного под спинальной анестезией с применением утеротоников. Считаем, что использование метилэргометрина увеличивает риск развития острого инфаркта миокарда (ОИМ), а назначение препарата должно осуществляться строго по показаниям, 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 тромболиза или экстренной коронароангиографии нецелесообразно, в остальном терапия стандартная. **Ключевые слова:** острый инфаркт миокарда, метилэргометрин, тромболиз

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 infarction (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. **Keywords:** acute myocardial, metilergometrin, thrombolysis

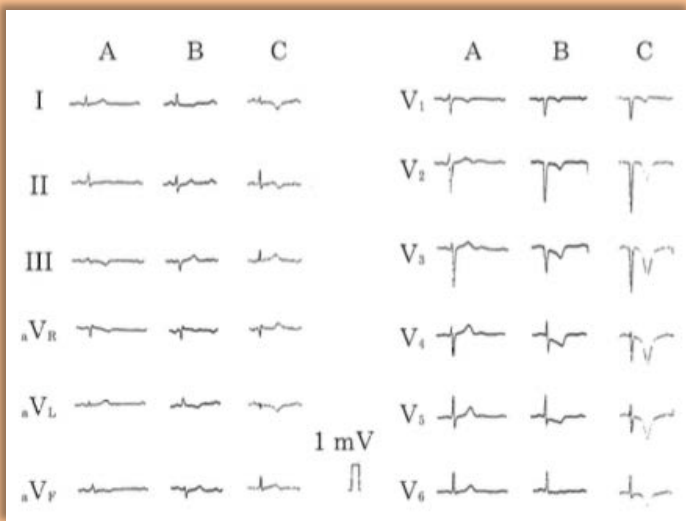
Введение

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 увеличивать 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 эстрофилия и недостаточность плазматического фактора, стимулирующего синтез протаклина и увеличение концентрации липопротеинов [4, 5, 6]. Литературные данные свидетельствуют, что до введения в рутинную практику первичных интервенционных методов лечения, смертность в остром периоде заболевания (преимущественно в III



- Случай обширного инфаркта миокарда с фатальным отеком легких после введения метилэргометрина у пациентки с преэклампсией

Hayashi Y, Ibe T, Kawato H et al. Postpartum acute myocardial infarction induced by ergonovine administration. Intern Med 2003; 42:983–6.



□ CASE REPORT □

Postpartum Acute Myocardial Infarction Induced by Ergonovine Administration

Yuji HAYASHI, Toshio IBE, Hiroaki KAWATO*, Noriaka FUTAMURA*,
Sukenari KOYABU**, Uichi IKEDA*** and Kazuyuki SHIMADA***

Abstract

We report a primigravida woman with acute myocardial infarction caused by coronary artery spasm induced by intravenous administration of methyl ergometrine maleate just after delivery. Despite the frequent usage of ergot derivatives to promote uterine contractions, cardiac complications related to this drug are rare. Myocardial infarction may be overlooked in young women in the early postpartum period. Careful monitoring and prompt evaluation should be performed when this drug is administered for obstetrical purposes.
(Internal Medicine 42: 983–986, 2003)

Key words: myocardial infarction, pregnancy, vasospasm, ergonovine

She was healthy and had no coronary risk factors such as hypertension, diabetes mellitus, hyperlipidemia, obesity, coagulative disorder, or smoking, with the exception of her family history. Her mother had angina pectoris, but it was not confirmed by cardiac catheterization. She had a passive smoking history in her family and occupational environment. She had no history of migraine headache. After admission, tocolytic treatment with ritodrine hydrochloride was given intravenously for seven days. However, at 36 weeks, her cervix dilated, and a healthy boy was delivered vaginally. Due to excessive uterine bleeding, methyl ergometrine maleate (0.2 mg) was administered intravenously. Within minutes, the patient complained of chest oppression, palpitation, and nausea. Chest oppression and nausea persisted for 4 hours and were treated symptomatically. An internal medicine consultation was obtained 5 hours after the onset of chest oppression, and an electrocardiogram at that time showed deep ST segment depression in anterior precordial leads (Fig. 1). The ST segment depression was not improved by nitrate administration. Serum activity of creatine phosphokinase (CK) peaked (928 IU/l, CK-MB isoenzyme; 66 IU/l) 18 hours after the onset of symptoms. Echocardiography revealed akinesis of anteroseptum. She was diagnosed with antero-septal myocardial infarction. Pulmonary congestion was not noted. She was treated with intravenous nitrate, but thrombolytic and anticoagulation therapies were withheld immediately after delivery. Her recovery was uncomplicated.

Introduction

Ergonovine is known to induce coronary artery spasm and is typically used in cardiac catheterization laboratories for provoking vasospasm. However, this agent may precipitate acute myocardial infarction in some patients by induction of prolonged spasms. While ergot derivatives are frequently administered after delivery to promote uterine contractions, serious ischemic cardiac events related to this drug have rarely been described. We report a case of acute myocardial infarction just after delivery caused by coronary artery spasm induced by methyl ergometrine maleate administered intravenously.

Case Report

A 25-year-old woman primigravida was admitted to our

After the onset of acute myocardial infarction, we attempted to obtain her medical history in detail, and discovered that she had felt chest oppression at rest early in the morning, which quickly disappeared, three times a year since she was 23 years old. Whether her symptom was angina pectoris or not was unclear, and had not been documented by electrocardiography.

Three months after myocardial infarction, cardiac cath-

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**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**

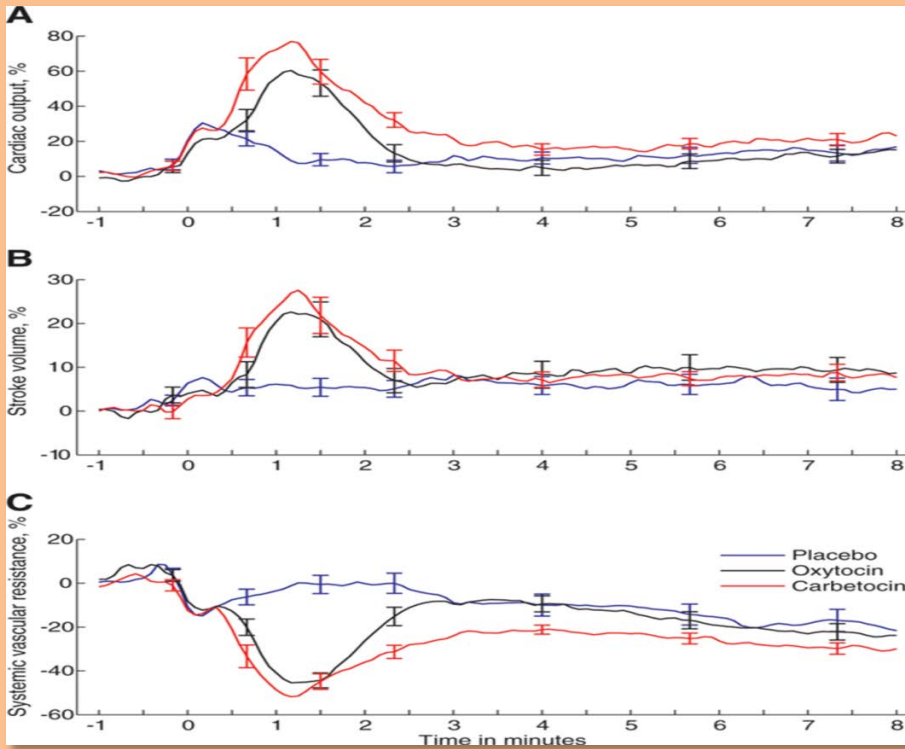
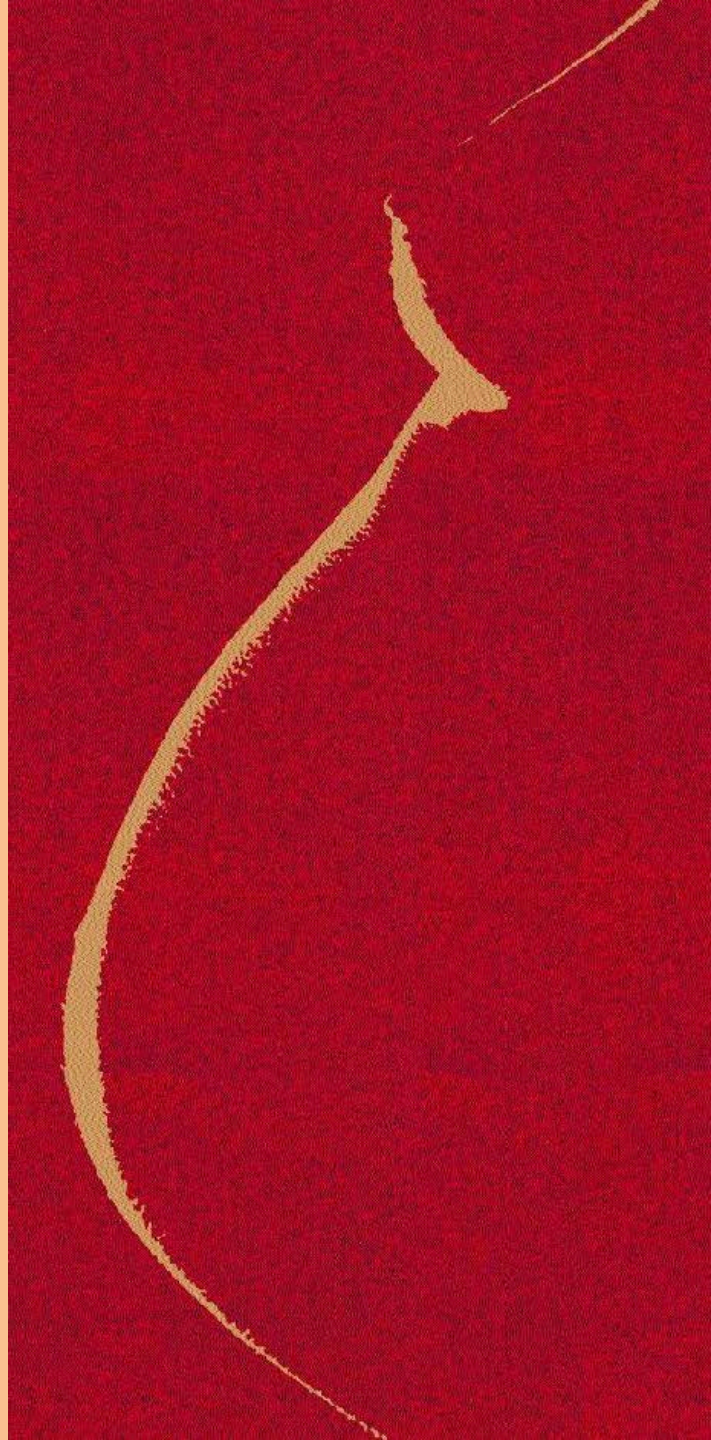


Figure Legend:

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.



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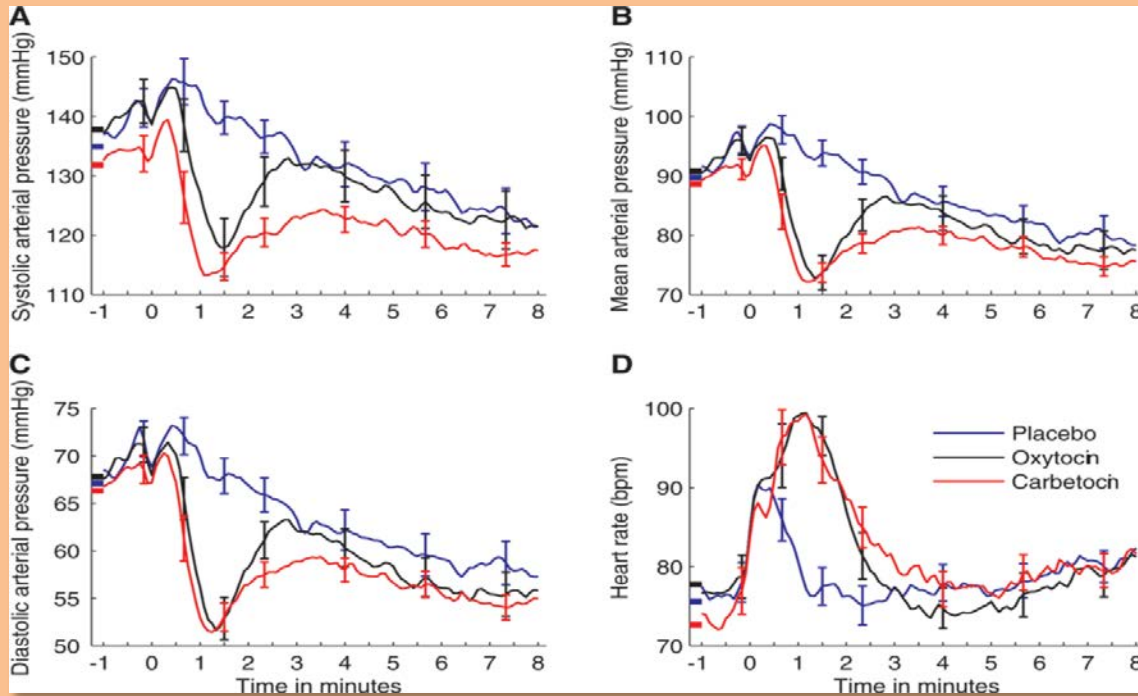
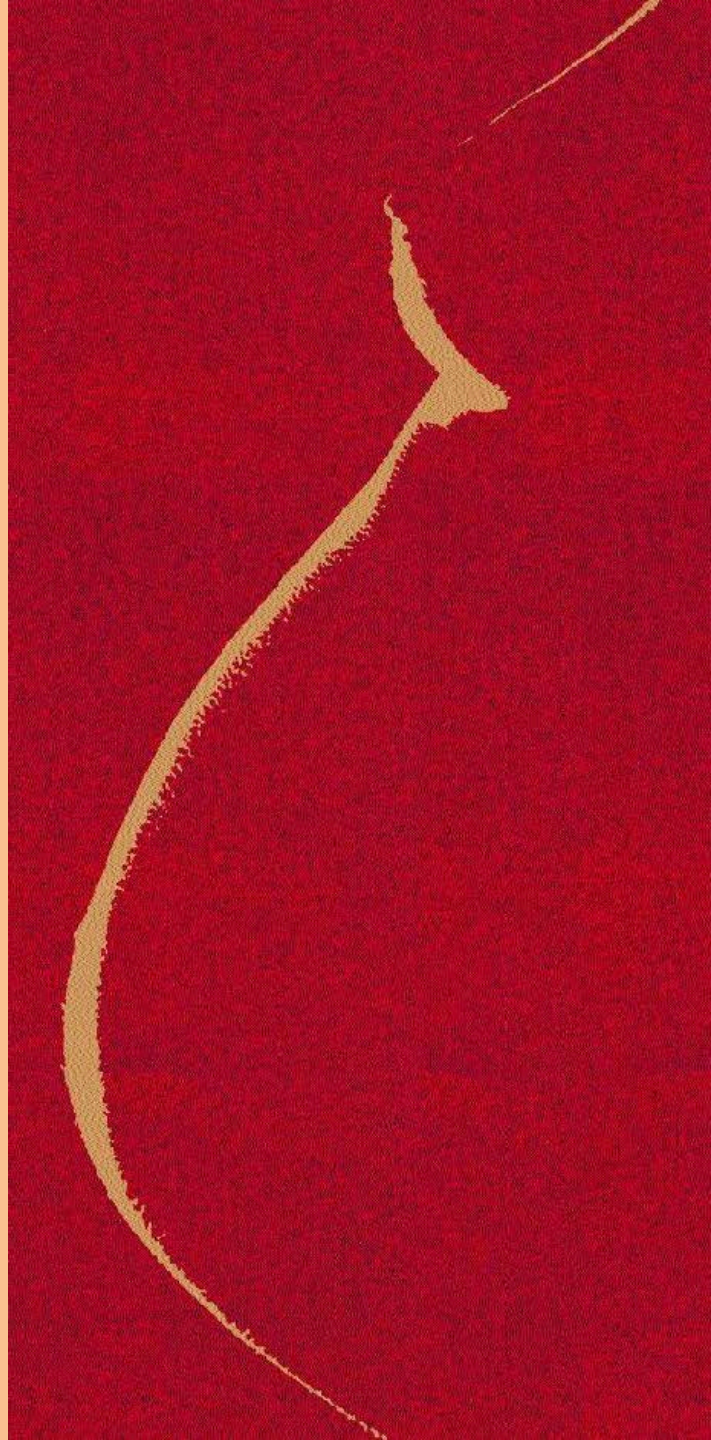


Figure Legend:

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.



Выводы

- Карбетоцин уменьшает частоту применения дополнительных доз окситоцина после КС по сравнению лицензированной дозой окситоцина (5МЕ)
- Меньшая частота побочных эффектов (неблагоприятных, негативных воздействий)



**MANAGEMENT OF
POST-PARTUM HEMORRHAGE**



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Благодарю за внимание!

