ANESTEZIE K CÍSAŘSKÉMU ŘEZU

JAN BLÁHA

Klinika anesteziologie, resuscitace a intenzivní medicíny

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CEEA Košice 2018

Současné postupy v porodnické anestezii I. – peroperační péče u císařského řezu

Bláha Jan[1, 2], Nosková Pavlína[1, 2], Klozová Radka[1, 3], Seidlová Dagmar[1, 4], Štourač Petr[1, 5], Pařízek Antonín[6]

[1]Expertní skupina porodnické anestezie a analgezie ČSARIM
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Anest. intenziv. Med., 24, 2013, č. 2, s. 91–101

Současné postupy v porodnické anestezii II. – celková anestezie u císařského řezu

Bláha Jan[1, 2], Nosková Pavlína[1, 2], Klozová Radka[1, 3], Seidlová Dagmar[1, 4], Štourač Petr[1, 5], Pařízek Antonín[6]

[1]Expertní skupina porodnické anestezie a analgezie ČSARIM
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Anest. intenziv. Med., 24, 2013, č. 3, s. 186–192

Současné postupy v porodnické anestezii III. – regionální anestezie u císařského řezu

Bláha Jan[1, 2], Nosková Pavlína[1, 2], Klozová Radka[1, 3], Seidlová Dagmar[1, 4], Štourač Petr[1, 5], Pařízek Antonín[6]

[1]Expertní skupina pro porodnickou anestezii a analgezii ČSARIM
[2]Klinika anesteziologie, resuscitace a intenzivní medicíny, 1. LF UK v Praze a Všeobecná fakultní nemocnice v Praze
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[4]II. anesteziologicko-resuscitační oddělení Fakultní nemocnice Brno
[5]Klinika anesteziologie, resuscitace a intenzivní medicíny, LF MU a Fakultní nemocnice Brno
[6]Gynekologicko-porodnická klinika, 1. LF UK v Praze a Všeobecná fakultní nemocnice v Praze

Anest. intenziv. Med., 25, 2014, č. 1, s. 29–39

Česká společnost anesteziologie, resuscitace a intenzivní medicíny

SPAA

Současné postupy v porodnické anestezii IV. – anesteziologické komplikace u císařského řezu

Štourač Petr[1, 2], Bláha Jan[1, 3], Nosková Pavlína[1, 5], Klozová Radka[1, 4], Seidlová Dagmar[1, 5]

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[3]Klinika anesteziologie, resuscitace a intenzivní medicíny, 1. lékařská fakulta Univerzity Karlovy v Praze a Všeobecná fakultní nemocnice v Praze
[4]Klinika anesteziologie a resuscitace, 2. lékařská fakulta Univerzity Karlovy v Praze a Fakultní nemocnice v Motole
[5]II. anesteziologicko-resuscitační oddělení, Fakultní nemocnice Brno

Anest. intenziv. Med., 25, 2014, č. 2, s. 123–134

PŘEHLEDOVÝ ČLÁNEK

Současné postupy v porodnické anestezii V. – pooperační péče po císařském řezu

Bláha Jan[1, 2], Klozová Radka[1, 3], Nosková Pavlína[1, 2], Seidlová Dagmar[1, 4], Štourač Petr[1, 5], Pařízek Antonín[6]

[1]Sekce porodnické anestezie a analgezie ČSARIM
[2]Klinika anesteziologie, resuscitace a intenzivní medicíny, 1. lékařská fakulta Univerzity Karlovy v Praze a Všeobecná fakultní nemocnice v Praze
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[6]Gynekologicko-porodnická klinika, 1. lékařská fakulta Univerzity Karlovy v Praze a Všeobecná fakultní nemocnice v Praze

Anest. intenziv. Med., 26, 2015, č. 2, s. 87–98

Císařský řez, ale jaká anestezie?

J. Bláha, I. Kolníková, P. Nosková

Klinika anesteziologie, resuscitace a intenzivní medicíny, 1. LF UK a VFN v Praze

Porodnická anestezie – Česká republika versus svět

Jan Bláha

Klinika anestezie, resuscitace a intenzivní medicíny 1. LF UK a VFN, Praha, přednosta doc. MUDr. Martin Stříteský, CSc.
Expertní skupina porodnické anestezie a analgezie při ČSARIM

KARIM
Všeobecná fakultní nemocnice v Praze

Preeklampsie, eklampsie, HELLP syndrom z pohledu anesteziologa

Nosková Pavlína[1,2], Klozová Radka[1,3], Bláha Jan[1,2], Seidlová Dagmar[1,4], Štourač Petr[1,5]

[1]Expertní skupina porodnické anestezie a analgezie ČSARIM
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Anest. intenziv. Med., 24, 2013, č. 5, s. 350–356

Anafylaxe v těhotenství

Jan Bláha, Ivana Kolníková

Klinika anesteziologie, resuscitace a intenzivni mediciny, 1. LF UK a VFN v Praze

PŘEHLEDOVÝ ČLÁNEK

Děložní hypotonie a přístup anesteziologa

Nosková P.[1,2], Bláha J.[1,2], Klozová R.[1,3], Seidlová D.[1,4], Štourač P.[1,5], Pařízek A.[6]

[1]Sekce porodnické anestezie a analgezie ČSARIM
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[3]Klinika anesteziologie a resuscitace, II. LF UK a FN Motol
[4]II. anesteziologicko-resuscitační oddělení FN Brno
[5]Klinika dětské anesteziologie a resuscitace, LF MU a FN Brno
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Anest. intenziv. Med., 26, 2015, č. 3, s. 145–151

Tromboprofylaxe u císařského řezu

Jan Bláha[1], Kateřina Bláhová[2], Ivana Kolníková[1], Pavlína Nosková[1]

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[2] Gynekologicko-porodnická klinika 1. LF UK a VFN v Praze

PŘEHLEDOVÝ ČLÁNEK

Postpunkční cefalea v porodnictví

Nosková Pavlína[1,2], Bláha Jan[1,2], Klozová Radka[1,3], Seidlová Dagmar[1,4], Štourač Petr[1,5], Pařízek Antonín[6]

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Anest. intenziv. Med., 25, 2014, č. 3, s. 194–202

PŘEHLEDOVÝ ČLÁNEK

Tromboprofylaxe a neuroaxiální anestezie v porodnictví

Bláha Jan[1], Nosková Pavlína[1], Kolníková Ivana[1], Bláhová Kateřina[2]

[1]Klinika anesteziologie, resuscitace a intenzivní medicíny 1. LF UK a VFN v Praze
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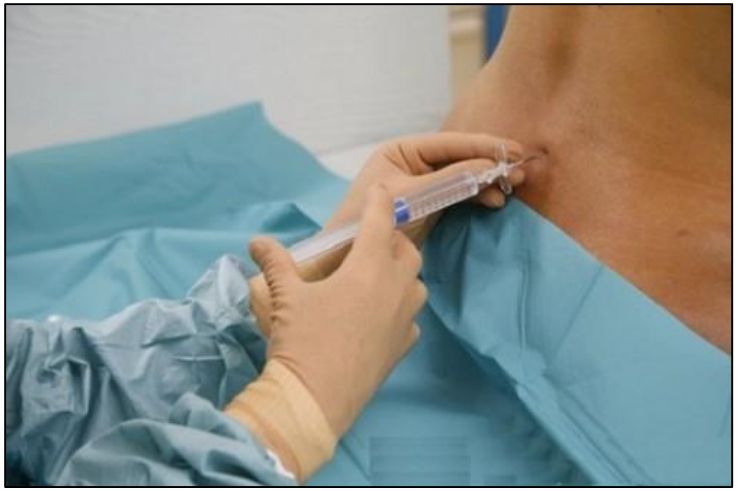
Česká společnost anesteziologie, resuscitace a intenzivní medicíny

SPAA

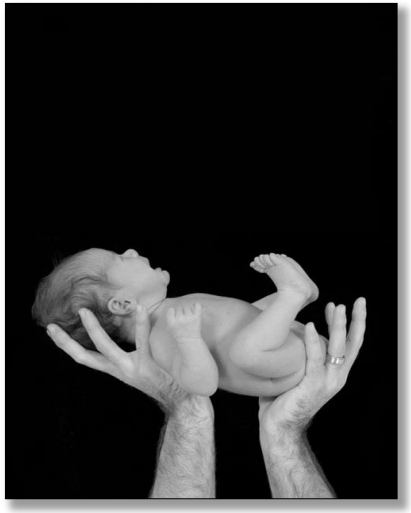
MOŽNÝ STŘET ZÁJMŮ: ŽÁDNÝ

X



CELKOVÁ ANESTEZIE je u císařského řezu indikována pouze tehdy, je-li REGIONÁLNÍ ANESTEZIE kontraindikována.

PROČ VLASTNĚ NE CELKOVOU ANESTEZII?



Retrospektivní 3letá studie srovnávající celkovou, epidurální a spinální anestézii z hlediska respiračního distresu plodu.

Není signifikantní rozdíl mezi jednotlivými typy anestézie.

Sigalas et al: Clin Exp Obstet Gynecol. 2006; 33(1):10-12

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Authors' conclusions

There is no evidence from this review to show that RA is superior to GA in terms of major neonatal outcomes. Further research to evaluate neonatal morbidity and maternal outcomes, such as satisfaction with technique, will be useful.

Afolabi BB. Cochrane Database Syst Rev. 2012 Oct 17;10:CD004350

Anaesthesia, 2005, **60**, pages 636–653

Anaesthesia for Caesarean section and neonatal acid-base status: a meta-analysis*

F. Reynolds[1] and P. T. Seed[2]

1 Emeritus Professor of Obstetric Anaesthesia, Department of Anaesthesia, St Thomas' Hospital, London SE1 7EH, UK
2 Lecturer in Medical Statistics, Division of Reproductive Health, Endocrinology and Development, King's College, London SE1 7EH, UK

Table 8 Difference between umbilical artery acid-base values with type of anaesthesia for Caesarean section: results of meta-analysis.

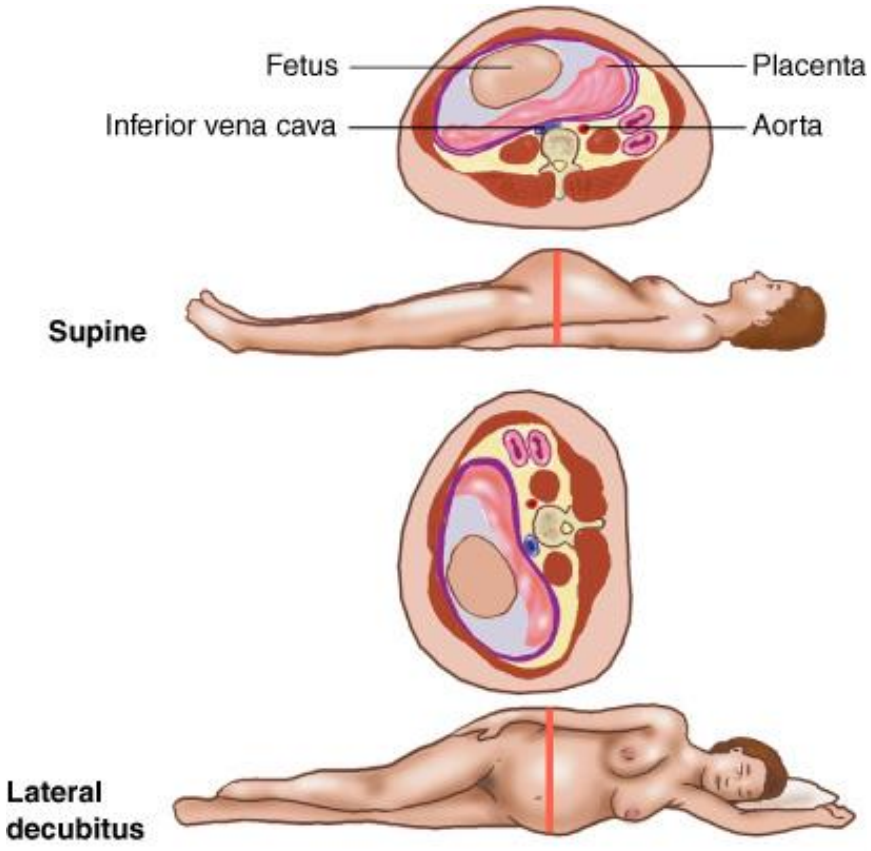
		All studies				Randomised trials only			
	Comparison	#	Difference	95% CI	p	#	Difference	95% CI	p
pH	spinal – general	13	−0.015	−0.029 to −0.001	0.038	5	−0.027	−0.051 to −0.002	0.034
	spinal – epidural	11	−0.013	−0.024 to −0.002	0.025	7	−0.010	−0.022 to 0.01	0.074
	epidural – general	13	−0.006	−0.016 to 0.005	0.317	4	0.001	−0.023 to 0.025	0.938
Base deficit ($mEq.l^{-1}$)	spinal – general	7	1.109	0.434 to 1.784	0.001	2	1.235	−0.821 to 3.290	0.239
	spinal – epidural	7	0.910	0.222 to 1.598	0.010	4	0.834	−0.192 to 0.859	0.111
	epidural – general	8	0.137	−0.198 to 0.471	0.424	2	−0.018	−1.026 to 0.990	0.972

= number of studies.

Summary

Spinal anaesthesia is generally preferred for Caesarean section, but its superiority for the baby is often assumed. Umbilical artery acid-base status provides a valid index of fetal welfare. Twenty-seven studies reporting neonatal acid-base data with different types of anaesthesia were used to compare umbilical artery or vein pH and base deficit, using random-effect meta-analysis. Cord pH was significantly lower with spinal than with both general and epidural anaesthesia. Larger doses of ephedrine contributed to the latter effect (p = 0.023). Sixteen studies reported a base deficit, which was significantly higher for spinal than for general and epidural anaesthesia.

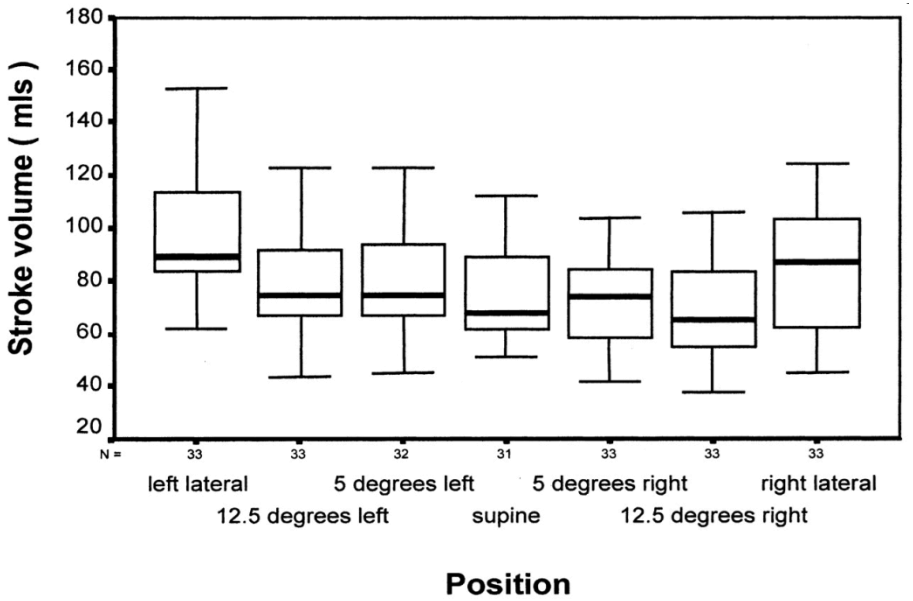
Spinal anaesthesia cannot be considered safer than epidural or general anaesthesia for the fetus.



SEMILATERÁLNÍ POLOHA

naklonění trupu o 5-15 stupňů

= prevence aortokavální komprese



Bamber, J. H. et al. Anesth Analg 2003;97:256-258

International Journal of Obstetric Anesthesia (2013) **22**, 124–128
0959-289X/$ - see front matter
http://dx.doi.org/10.1016/j.ijoa.2012.12.005

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ORIGINAL ARTICLE

A comparison of the haemodynamic effects of lateral and sitting positions during induction of spinal anaesthesia for caesarean section

B.I. Obasuyi, S. Fyneface-Ogan, C.N. Mato
Department ... hesia, University of Port Harcourt Teaching Hospital, Port Ha...

ABSTRA...
Backgrou... ... during spinal anaesthesia occurs commonly in parturients. ... ocal anaesthetic, matern... peed of onset of sensory block and thus the haemod... this study was to de... esia for caesarean section using plain bupiv... uld result in ... sition.
Ar... sthesiologists physical status I an... e caesarean ... the lateral position (Gr... p S). Using ... upivacaine, 10 m... which they were ... left uterine displace... every minute ... eafter. Hyp... stolic b... essure >20% ... lic blood ... .2 ± 8.9 mm ... with ... west recorded mean ... essure was ... p L ... = 0.025). The inci... was ... p L ... hypotension wa... ups. ... hesia for ... ivacaine was ... duced with ... r the lo... l pressure we... greater but ... lar for r... n group.

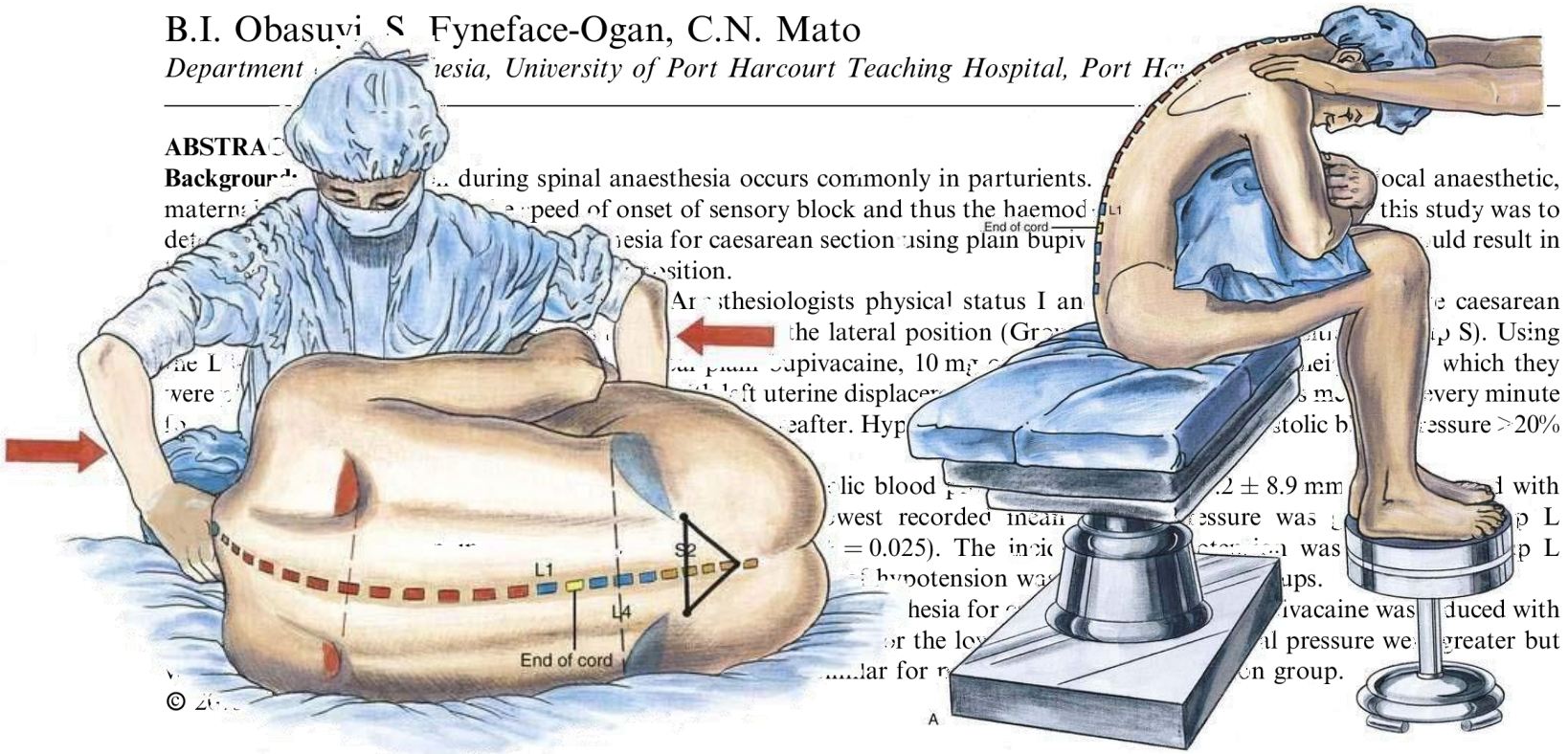


Table 3 Haemodynamic data, ephedrine use and intraoperative blood loss

	Group L (n = 50)	Group S (n = 50)	*P* value
Baseline SBP (mmHg)	122.4 ± 8.6	124.2 ± 9.9	0.3
Baseline MAP (mmHg)	93.0 ± 7.8	91.8 ± 8.9	0.4
Baseline heart rate (beats/min)	91.4 ± 8.5	92.3 ± 11.4	0.6
Incidence of hypotension	17 (34%)	28 (56%)	0.027
Time from IT injection to first hypotension (min)	11.8 ± 10.7	9.8 ± 8.2	0.5
Lowest SBP within 30 min of IT injection (mmHg)	99.2 ± 8.9	95.4 ± 12.3	0.08
Lowest MAP within 30 min of IT injection (mmHg)	72.9 ± 11.2	68.2 ± 9.6	0.02
Lowest heart rate within 30 min from IT injection (beats/min)	83 ± 11	79 ± 10	0.05
Incidence of ephedrine use	3 (6%)	5 (10%)	0.4
Total dose of ephedrine (mg)	5 ± 0	5 ± 0	1
SBP <90 mmHg	7 (14%)	14 (28%)	0.08
Blood loss (mL)	631 ± 171	697 ± 241	0.1

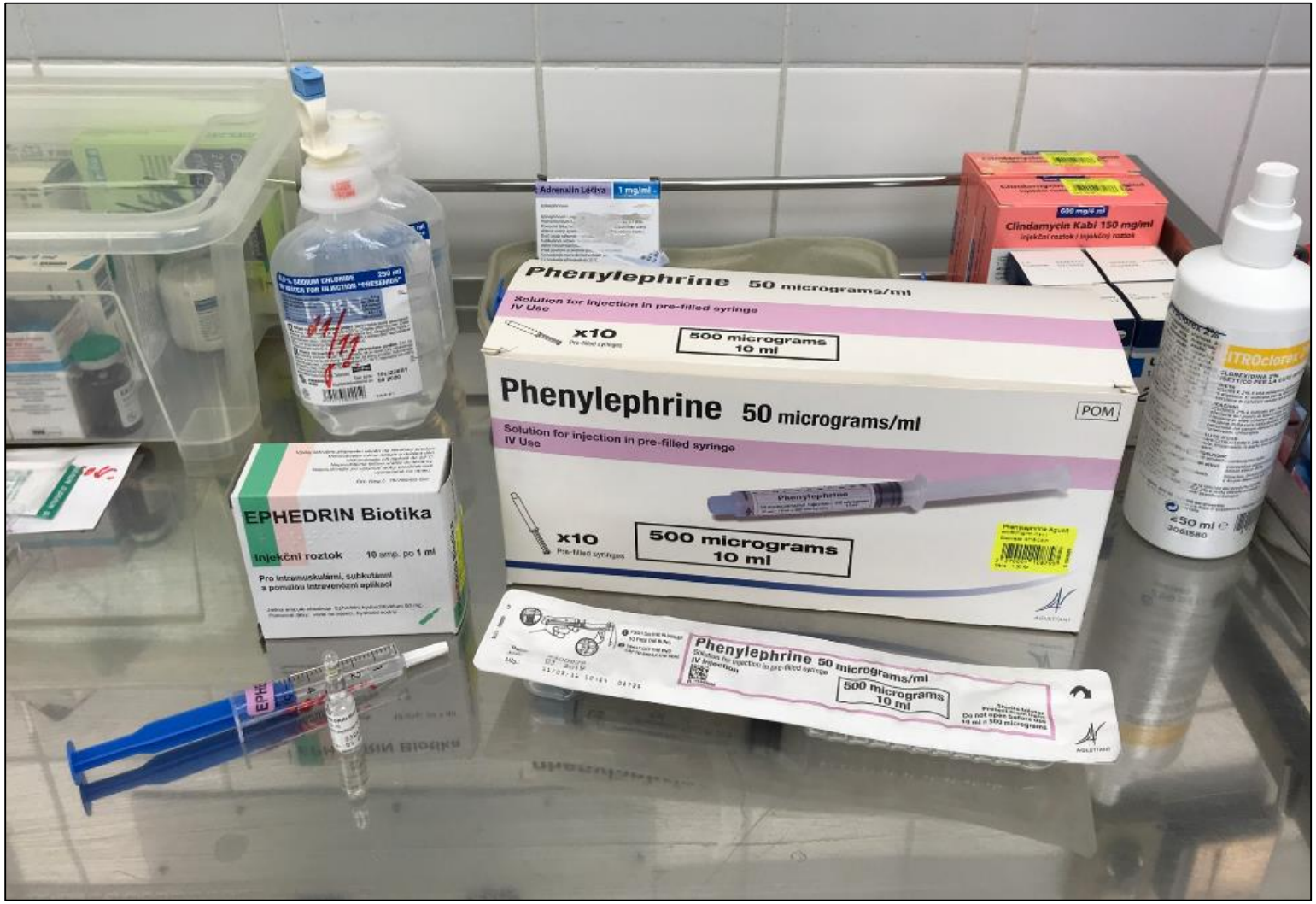
Data are mean ± SD or as number (%). SBP: systolic blood pressure; MAP: mean arterial pressure; IT: intrathecal.

Table 5 Incidence of complications

	Group L (n = 50)	Group S (n = 50)	*P* value
Nausea	2 (4%)	4 (8%)	0.4
Vomiting	0 (0%)	1 (2%)	0.3
Shivering	7 (14%)	11 (22%)	0.2
Dizziness/sleepiness	3 (6%)	5 (10%)	0.4
Respiratory distress	2 (4%)	7 (14%)	0.08

Data are number (%).

SAB aplikovaný v sedě má častější výskyt hypotenze než při aplikaci na boku

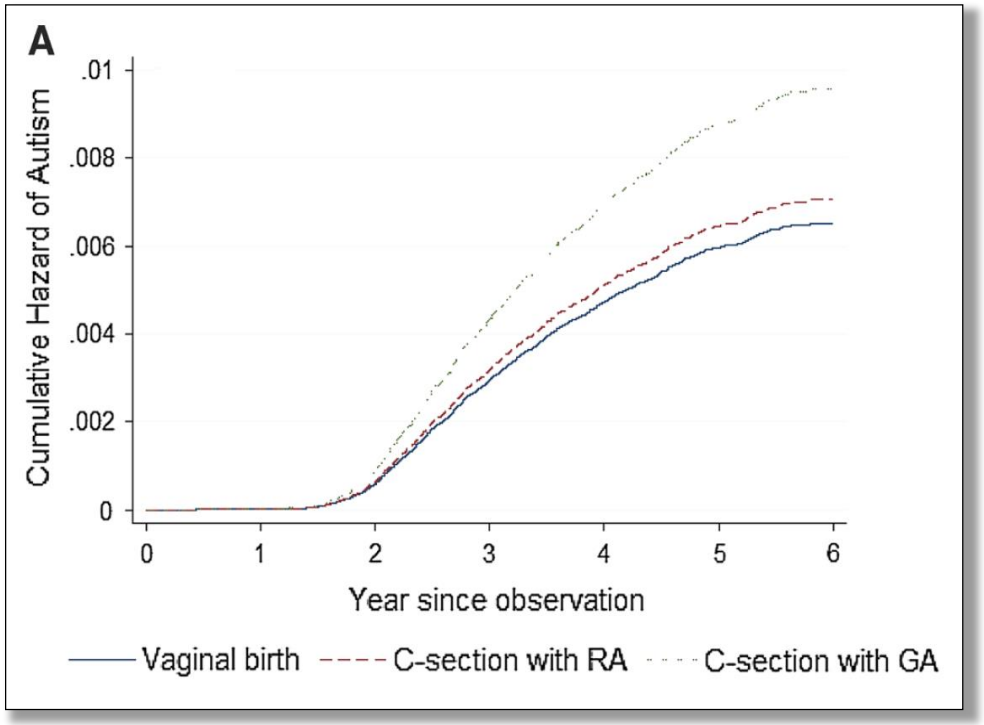

Adrenalin Léčiva 1 mg/ml
Clindamycin Kabi 150 mg/ml
Phenylephrine 50 micrograms/ml
Solution for injection in pre-filled syringe
IV Use
x10
500 micrograms
10 ml
POM
EPHEDRIN Biotika
Injekční roztok 10 amp. po 1 ml
Pro intramuskulární, subkutánní
a pomalou intravenózní aplikaci

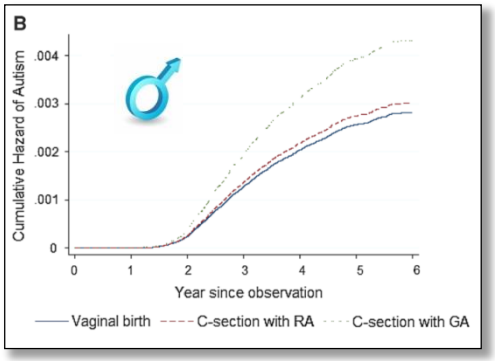
PROČ VLASTNĚ NE CELKOVOU ANESTEZII?

Risk of Autism Associated With General Anesthesia During Cesarean Delivery: A Population-Based Birth-Cohort Analysis

Li-Nien Chien · Hsiu-Chen Lin · Yu-Hsuan Joni Shao · Shu-Ti Chiou · Hung-Yi Chiou

Chien et al. J Autism Dev Disord. 2014 Sep 26.





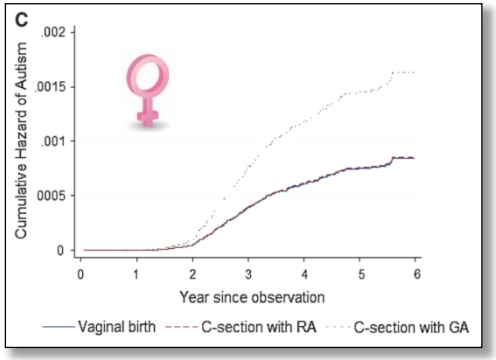
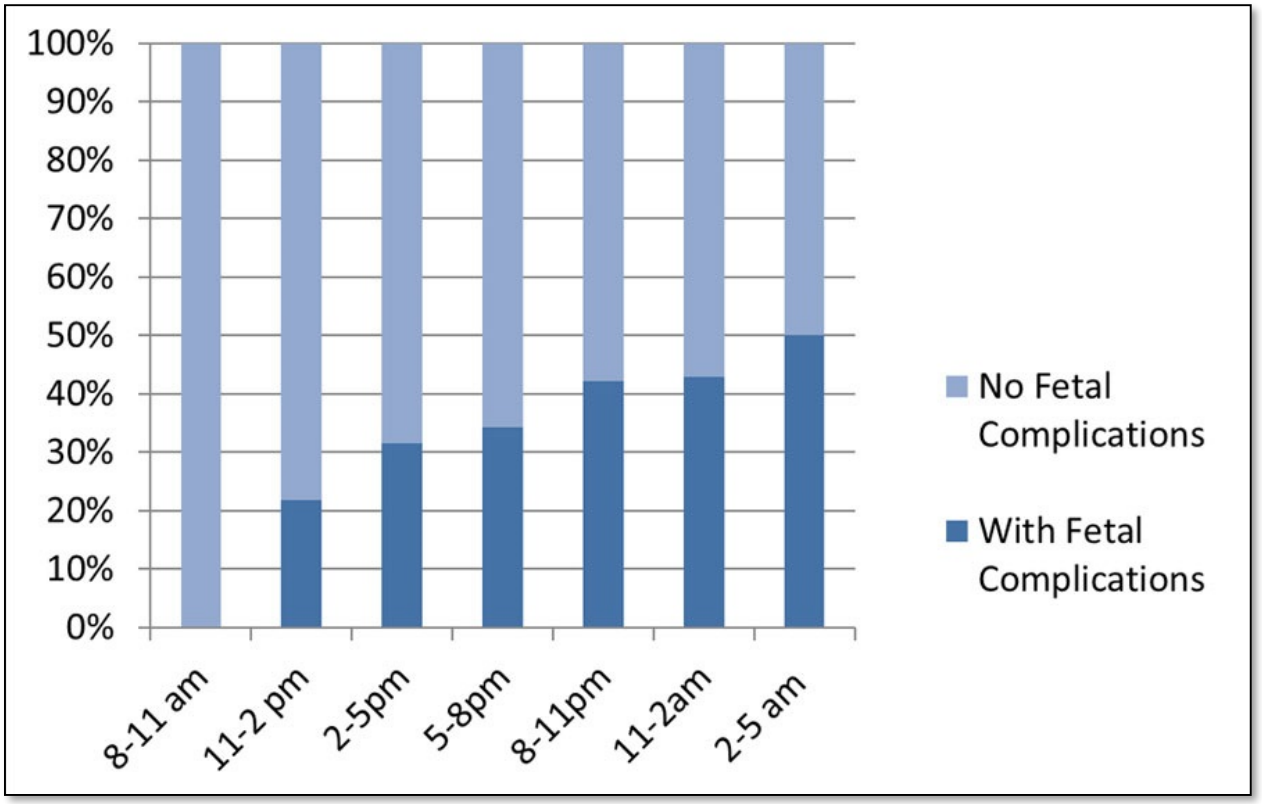


Fig. 2 Cumulative Kaplan–Meier curves of the incidence of autism in neonates delivered by C-section with GA, C-section with RA, and vaginally, after adjusting for all risk factors. *Panels* **a**, **b**, and **c** represent the overall data and data from the boy and girl cohorts, respectively

PROČ VLASTNĚ NE CELKOVOU ANESTEZII?



Daniel S et al. AMJI feb 2014, p. 32-36

PROČ VLASTNĚ NE CELKOVOU ANESTEZII?

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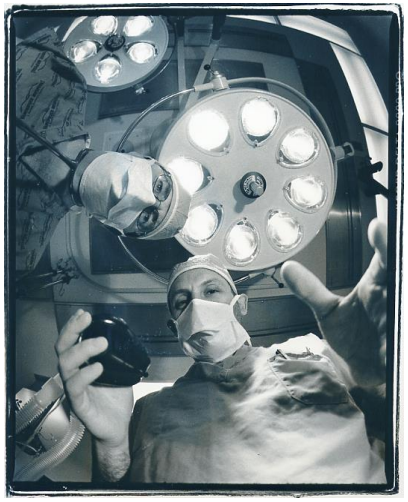
PRO REGIONÁLNÍ ANESTEZII:

- menší krevní ztráty
- není nutno vybavit plod do 5 min (!)

PRO CELKOVOU ANESTEZII:

- nižší výskyt nausey a zvracení

PROČ VLASTNĚ NE CELKOVOU ANESTEZII?



Doba do vybavení plodu:

stejný čas u celkové anestezie i po přidání do epidurálního katetru (7,7±3,0 min)

Lim et al. Ann Acad Med Singapore 2005; 34:606-10

Audit „Green code 444“ (Australie) – doba do vybavení plodu:

Celková anestezie 17±6 min
Přidání do epidurálního katetru 19±9 min
Spinální anestezie 26±9 min

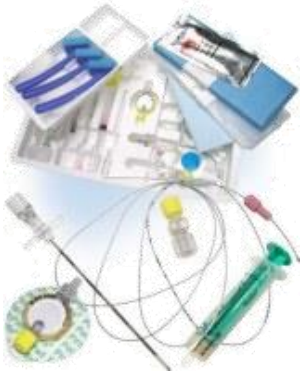
Popham et al. Anaesth Intensive Care. 2007;35:74-9

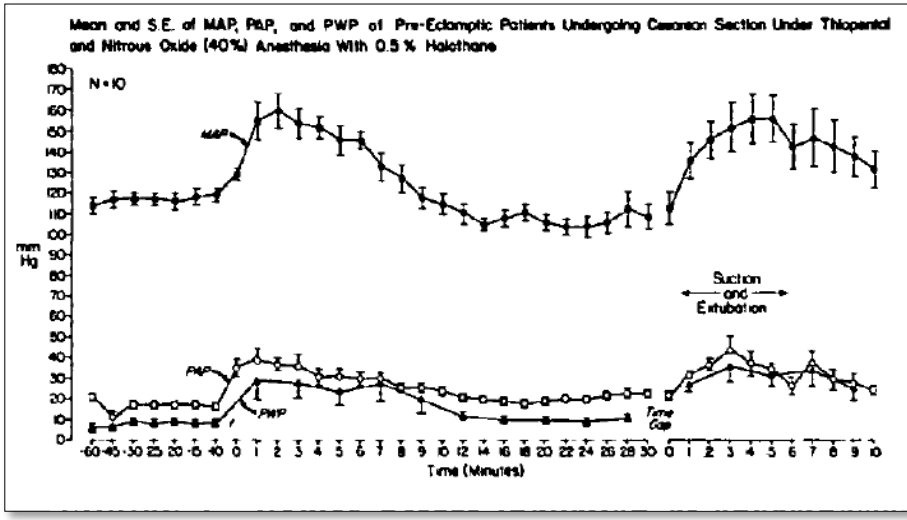
Doba do nástupu účinku při přidání do epidurálního katetru:

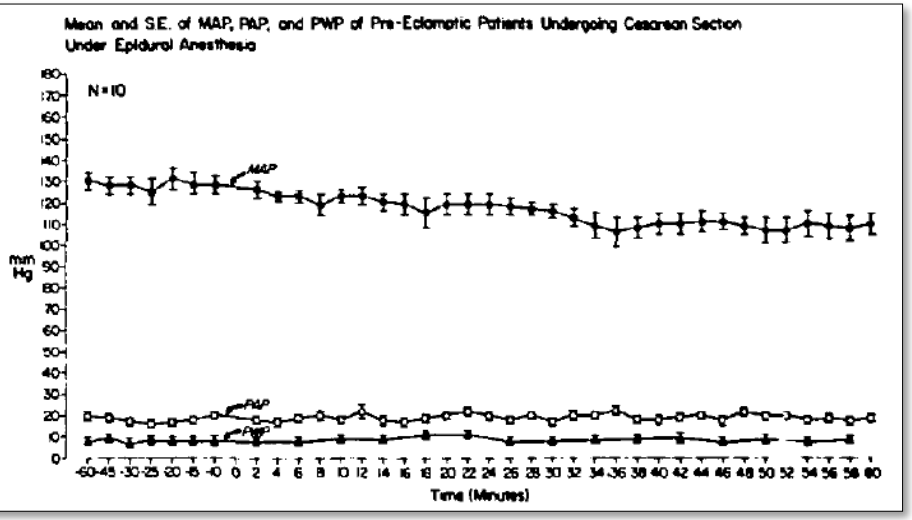
Lidocain 2% + adrenalin = 8 min (4-13 min)

Bjornestad et al: Acta Anaesthesiol Scand 2006;50:358-63

PROČ VLASTNĚ NE CELKOVOU ANESTEZII?







Hodgkinson et al. Can J Anesth 1980 27: 389-394.

THE ASPIRATION OF STOMACH CONTENTS INTO THE LUNGS DURING OBSTETRIC ANESTHESIA*

CURTIS L. MENDELSON, M.D., NEW YORK, N. Y.

(From the Department of Obstetrics and Gynecology, Cornell University Medical College and New York Hospital)

Am J Obstet Gynecol 1945;49:554–66.

Summary

Sixty-six cases of aspiration of stomach contents into the lungs during obstetric anesthesia are analyzed. The incidence of this complication is 0.15 per cent in 44,016 pregnancies at the New York Lying-In Hospital from 1932 to 1945.

Table 7 Reported incidence of aspiration in obstetric and general surgical populations

Study	No. of cases	Patient group characteristics	Incidence of aspiration [no. of cases]
This study	1870	Obstetric; peripartum; nonintubated	0.053% [1]
Kranz & Edwards [3]	37 282	Obstetric; vaginal delivery; nonintubated	0.013% [5]
Kranz & Edwards [3]	3076	Obstetric; Caesarean section; intubated	0.228% [7]
Olsson *et al*. [2]	2643	Obstetric; Caesarean section; intubated	0.15% [4]
Olsson *et al*. [2]	111 215	General surgery; nonintubated	0.018% [20]
Olsson *et al*. [2]	74 143	General surgery; intubated	0.085% [63]
Cohen *et al*. [5]	112 000	General surgery; intubated and nonintubated	0.064% [72]
Kallar [6]	529 150	Outpatients; intubated and nonintubated	0.017% [90]
Warner *et al*. [4]	13 427	General surgery; emergency	0.112% [15]
Warner *et al*. [4]	202 061	General surgery; elective	0.0257% [52]

Ezri et al. Anaesthesia 2000; 55:421-426

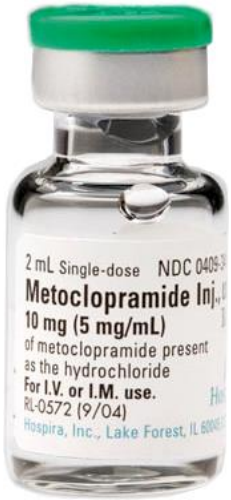


Table 1. Lower Esophageal Sphincter, Intragastric, and Barrier Pressures Obtained before and after Administration of 0.15 mg/kg Intravenous Metoclopramide

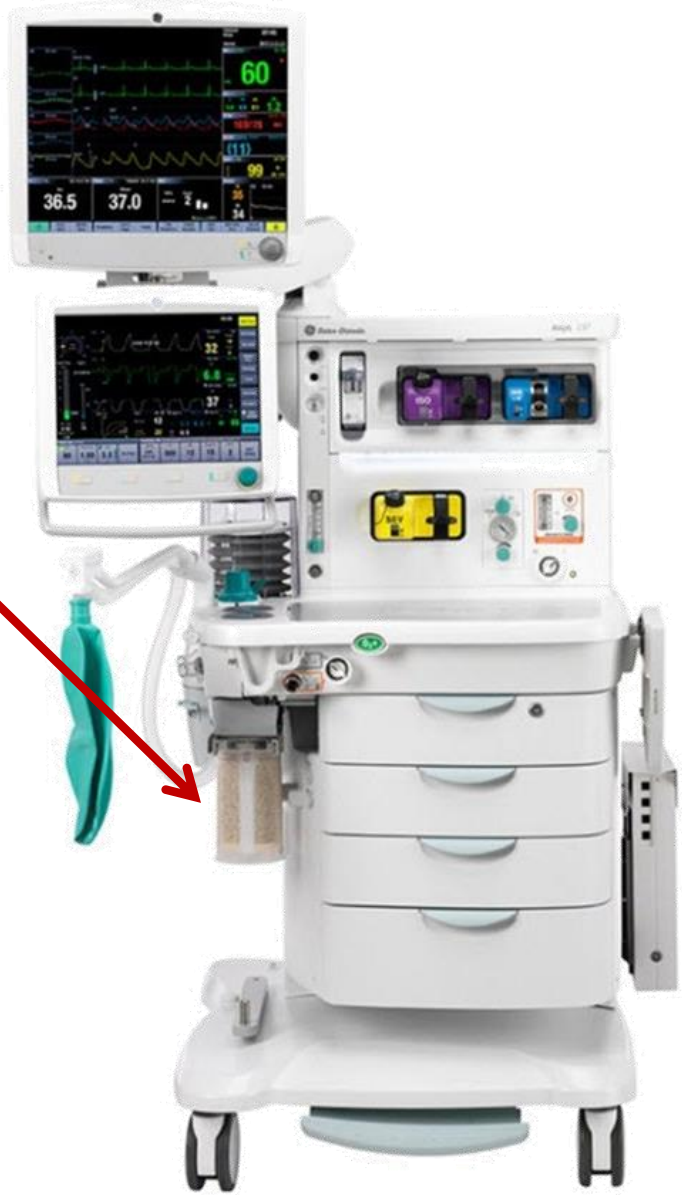
	Before Metoclopramide	After Metoclopramide	
	Baseline	Baseline	Cricoid Pressure Applied
Lower esophageal pressure	14.1 ± 2.9	19.6 ± 4.7†	5.0 ± 4.3*
Intragastric pressure	4.6 ± 1.4	5.7 ± 1.9	5.8 ± 2.3
Barrier pressure	9.6 ± 3.4	14.1 ± 5.5†	−0.2 ± 5.1*

Data are in mmHg ± SD.

* $P < 0.05$ *vs.* respective baseline value. † $P < 0.05$ *vs.* respective pre-metoclopramide value.

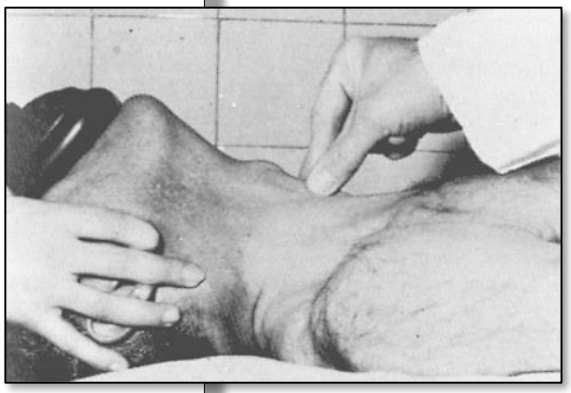
Salem et al. Anesthesiology 2008; 109:806–10

ZKONTROLOVAT ODSÁVAČKU !



The salient characteristics of RSI were delineated by Stept and Safar in 1970 [3].

- Preoxygenation
- Predetermined doses of thiopental and SCh
- Cricoid force
- Avoidance of ventilation by bag and mask
- Tracheal intubation



Sharp LM, Levy DM. Current Opinion in Anaesthesiology 2009, 22:357–361

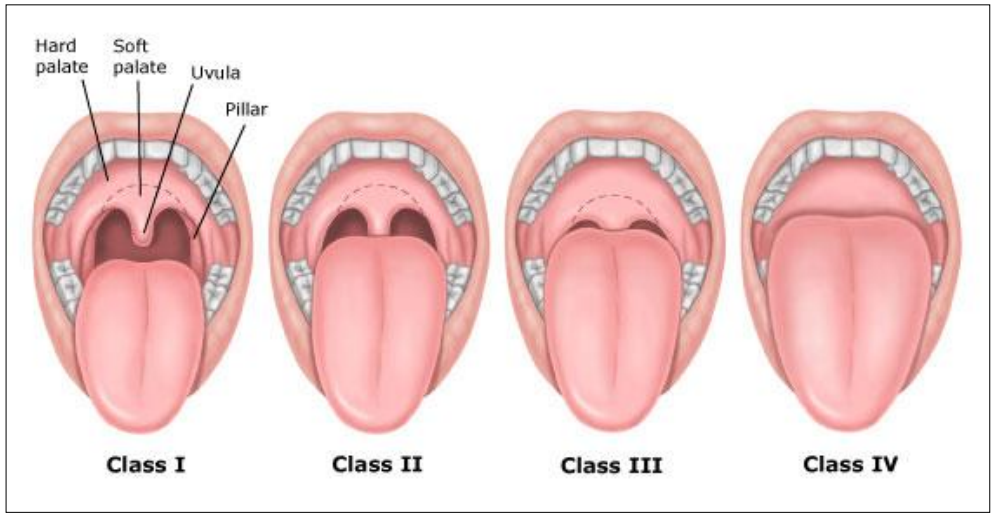
OBTÍŽNÁ INTUBACE V TĚHOTENSTVÍ



10x vyšší riziko obtížné intubace u těhotných !!!

Lyons. Anaesthesia **1985**; 40:759-62	**1:300**
Barnardo. Anaesthesia **2000**; 55:685-94	**1:249**
Rahman. Anaesthesia **2005**; 60:168-71	**1:238**
McDonnell. Int J Obst Anest **2009**; 17:292-7	**1:274**


OBTÍŽNÁ INTUBACE V TĚHOTENSTVÍ



10x

vyšší riziko obtížné intubace

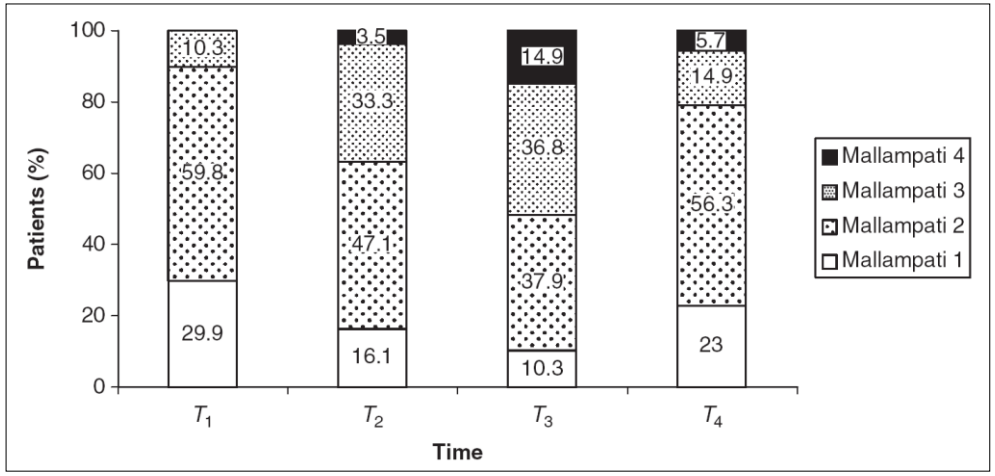


Fig 1 The Mallampati classes at different time points. T_1, 8 months of pregnancy; T_2, during labour; T_3, 20 min after delivery; T_4, 48 h after delivery. The percentages of patients with Mallampati class 3 or 4 changed significantly: T_1 *vs* T_2, P=0.0000; T_2 *vs* T_3, P=0.0005; T_3 *vs* T_4, P=0.0000; T_4 *vs* T_1, P=0.0062.

se v průběhu porodu ještě dále zvyšuje!

Boutonnet et al., Br J Anaesth 2010; 104:67–70

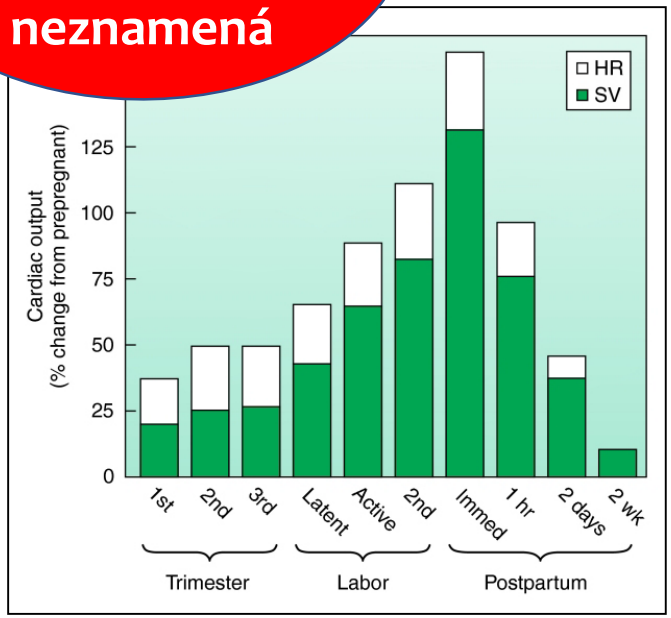
FYZIOLOGICKÉ ZMĚNY V TĚHOTENSTVÍ

- příprava na krevní ztrátu při porodu
- zajištění zvýšených nár… …atky + plodu

Krevní ztráta do 1000 ml většinou nic neznamená

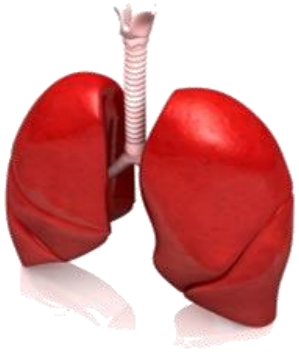
	Relativní změna proti netěhotnému stavu
Celkový objem krve (+1500 ml)	+40%
Plazmatický objem	+45%
Srdeční výdej	+50%
Tepový objem	+25%
Srdeční frekvence	+25%
LVEDV	zvýšený
Ejekční frakce	zvýšená
PCWP	beze změny
Centrální žilní tlak	beze změny
Systémová vaskulární rezistence	−20%

Conklin KA. Semin Anesth 1991; 10:221-34.



Chestnut's Obstetric Anesthesia: Principles and Practice, 4th Edition, 2009

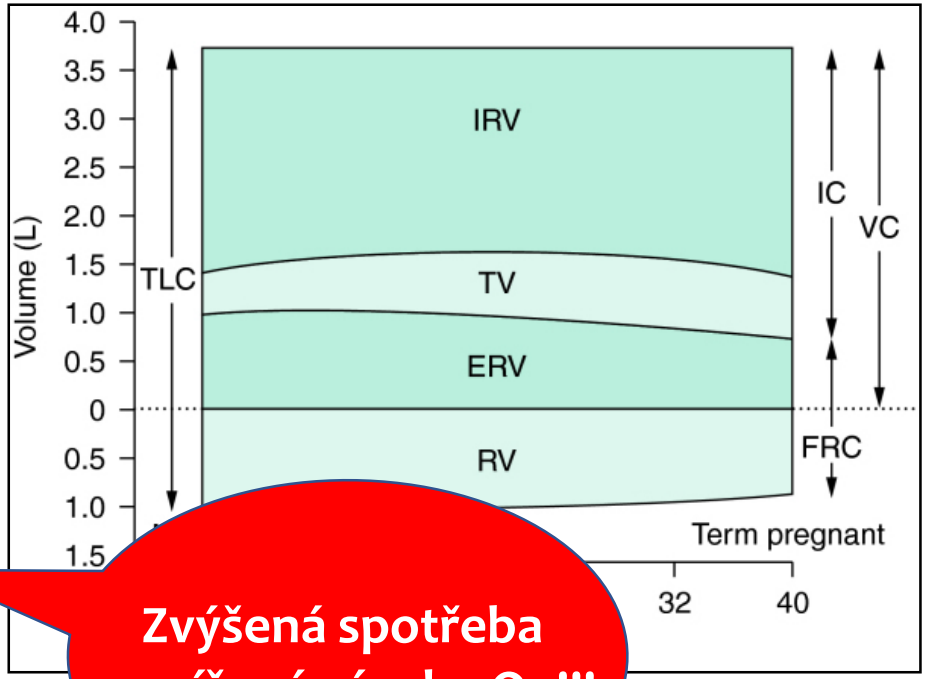
FYZIOLOGICKÉ ZMĚNY V TĚHOTENSTVÍ



- růst dělohy = zvýšená poloha bránice
- zvýšená senzitivita k CO_2 v respiračním centru (vliv progesteronu)
- **vyšší spotřeba kyslíku** (zvýšený metabolismus matky + plod)

Relativní změna

Spotřeba O_2	**+40%**
Dechová frekvence	mírně zvýšena
Minutová ventilace	+45%
Alveolární ventilace	+45%
Difúze přes alv.-kap. membránu	-15%
Dechový objem	+45%
Vitální kapacita	beze změny
Funkční reziduální kapacita	**-20%**
Poloha bránice	o 4 cm výše



Zvýšená spotřeba a snížená zásoba O_2 !!!

Conklin KA. Semin Anesth 1991; 10:221-34.

and Practice, 4th Edition, 2009

FYZIOLOGICKÉ ZMĚNY V TĚHOTENSTVÍ

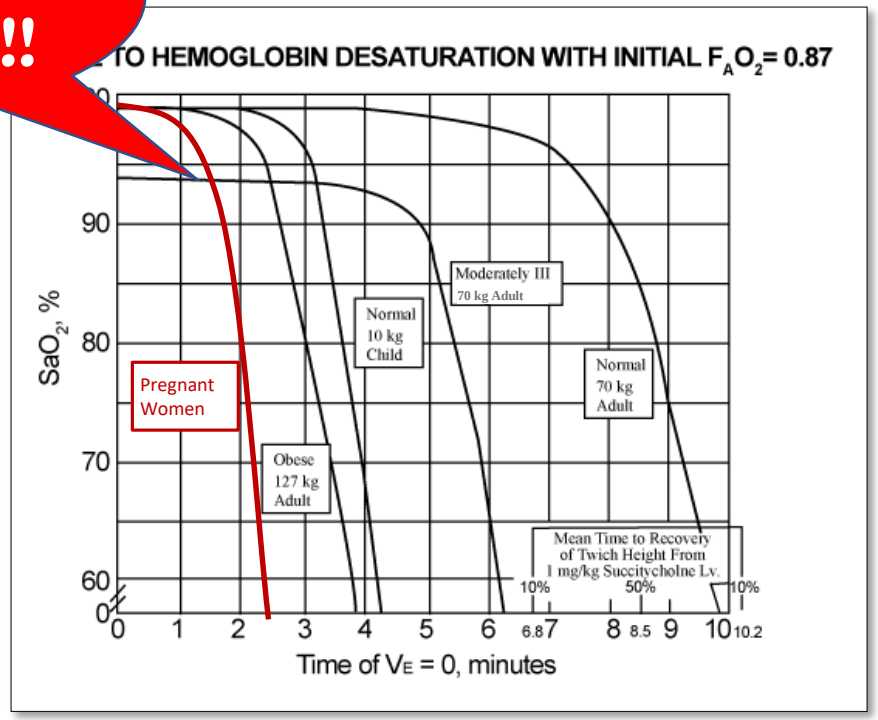
Nemáme čas váhat !!!

Table 1 Typical examples of duration o… in different patients

	FRC (mL)	O_2 consumption ($mL \cdot min^{-1}$)
No preoxygenation	2500	250
Normal preoxygenation	2500	250
Poor preoxygenation	2500	250
Obese	1250	350
Obese head-up	1500	350
Pregnant	1000	400
Elderly	2250	200

Examples only. Actual values may vary. FRC = functional residual capacity

Tanoubi I. Can J Anesth/J Can Anesth (2009) 56:449–466



Benumof JL et al. Anesthesiology 1997; 87:979-82

Díky zvýšenému metabolismu nastává u rodičky (i plodu !) desaturace krve a rozvoj kritické hypoxie nesrovnatelně rychleji než u netěhotných pacientek.

PREOXYGENACE !!!

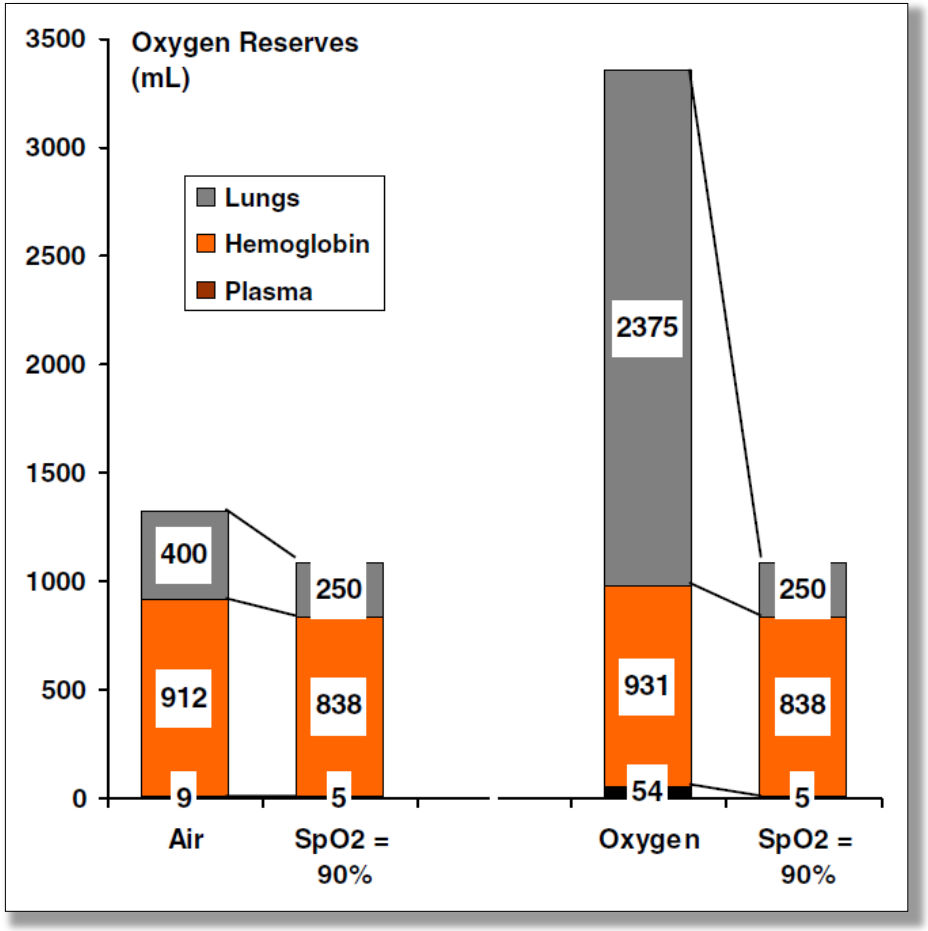
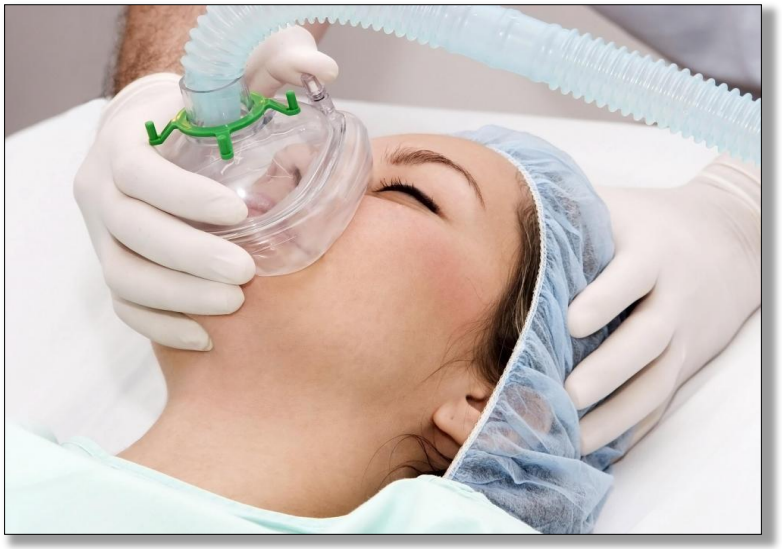


Fig. 1 Oxygen reserves in a normal healthy adult when breathing room air (left), after breathing 100% oxygen (right), at onset of apnea, and when reaching an oxygen saturation (SpO_2) of 90%. In this example, the oxygen available for consumption during the apneic period amounts to 228 mL when breathing air and 2267 mL when breathing oxygen. Calculations are based on a functional residual capacity of 2500 mL, hemoglobin concentration 140 $g \cdot L^{-1}$, $SpO_2 = 98\%$ on air, $SpO_2 = 100\%$ on oxygen, and blood volume 5 L. In this example, a subject with an oxygen consumption of 250 $mL \cdot min^{-1}$ could sustain a period of apnea of 228/250 = 0.9 min after breathing air and 2267/250 = 9 min after breathing oxygen

Tanoubi I. Can J Anesth/J Can Anesth (2009) 56:449–466

PREOXYGENACE !!!



A. lehká obličejová kyslíková maska

5-8 minut dýchání (100%) O_2 normálním objemem

B. plně těsnící obličejová kyslíková maska

3-8 vdechů v objemu vitální kapacity (100% O_2)

PREOXYGENACE !!!

British Journal of Anaesthesia **95** (5): 706–9 (2005)
doi:10.1093/bja/aei231 Advance Access publication September 2, 2005

BJA

Pre-oxygenation in the obese patient: effects of position on tolerance to apnoea

F. R. Altermatt*, H. R. Muñoz, A. E. Delfino and L. I. Cortínez

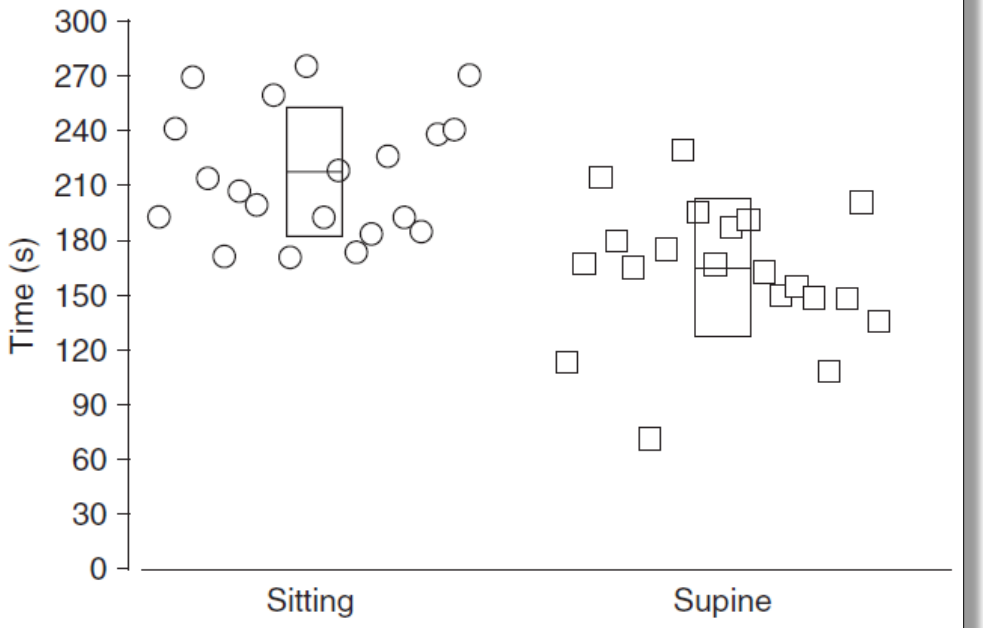


Fig 1 The individual times to peripheral desaturation to 90% in both groups.

POLOHA

ANTITRENDELENBURGOVA POLOHA

= zvýšení polohy trupu o 5-15 stupňů

- prevence vzduchové embolie
- prevence aspirace
- zvýšení FRC plic

PROČ VLASTNĚ NE CELKOVOU ANESTEZII?

- ~~těhotná p[illegible] 16. t[illegible] vždy „plný žaludek“~~
- akutní st[illegible] (S[illegible]ů je urgentních)
- nestanda[illegible]mínky pro řešení komplikací
- stres matky[illegible]logického i porodního týmu

Císařský řez = vždy riziko obtížné intubace !

PROČ MÁME VĚTŠINOU PROBLÉMY ?

1. Přecenění vlastních schopností.
2. Pozdě zavolaná pomoc.
3. Nedomyšlený postup bez řádného záložního plánu.

PAMATUJ, ŽE OXYGENACE JE DŮLEŽITĚJŠÍ NEŽ INTUBACE.

CELKOVÁ ANESTEZIE

The salient characteristics of RSI were delineated by Stept and Safar in 1970 [3].

- Preoxygenation
- Predetermined doses of thiopental and SCh
- Cricoid force
- Avoidance of ventilation by bag and mask
- Tracheal intubation

Sharp LM, Levy DM. Current Opinion in Anaesthesiology 2009, 22:357–361

CELKOVÁ ANESTEZIE

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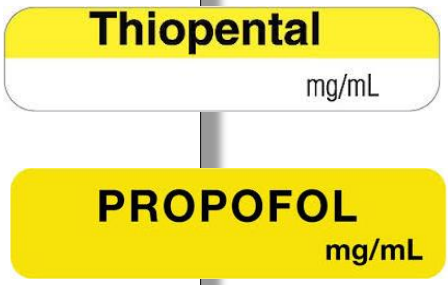

Sharp LM, Levy DM. Current Opinion in Anaesthesiology 2009, 22:357–361

CELKOVÁ ANESTEZIE

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Sharp LM, Levy DM. Current Opinion in Anaesthesiology 2009, 22:357–361

SVALOVÁ RELAXACE

SUKCINYLCHOLIN

- Nejrychlejší nástup účinku
- Výborné intubační podmínky
- Neprochází placentou
- Doporučená dávka 1-1,5 mg/kg

Table 3. Onset Times and Durations of Neuromuscular Block

Succinylcholine dose (mg/kg)	Onset time(s)	Duration of block (min)	*n*
0.3	72 ± 30	4.4 ± 1.4	13
0.5	68 ± 44	5.2 ± 1.8	27
1.0	53 ± 23	5.9 ± 1.9†	30
1.5	56 ± 31	7.2 ± 2*	30
2.0	52 ± 21	7.5 ± 1.7*	30

Values are means ± SD.
*$P < 0.01$ *versus* succinylcholine 0.3, 0.5, and 1.0 mg/kg groups; †$P < 0.05$ *versus* succinylcholine 0.3 mg/kg group.

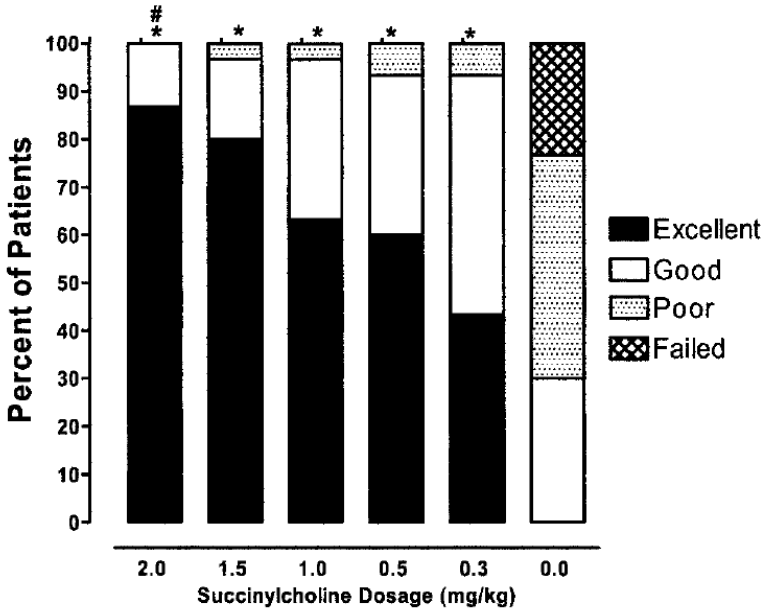

Figure 1. Intubating conditions with different doses of succinylcholine (n = 30 in. each group). The incidence of excellent intubating conditions was significantly more frequent (*$P < 0.001$) in patients receiving succinylcholine than in those of the control group and in the 2.0 mg/kg succinylcholine group (#$P < 0.05$) than in the 0.3 mg/kg succinylcholine group (Kruskal-Wallis test for multiple comparisons).

Naguib M et al. Anesth Analg 2006;102:151–5

0,6 mg/kg

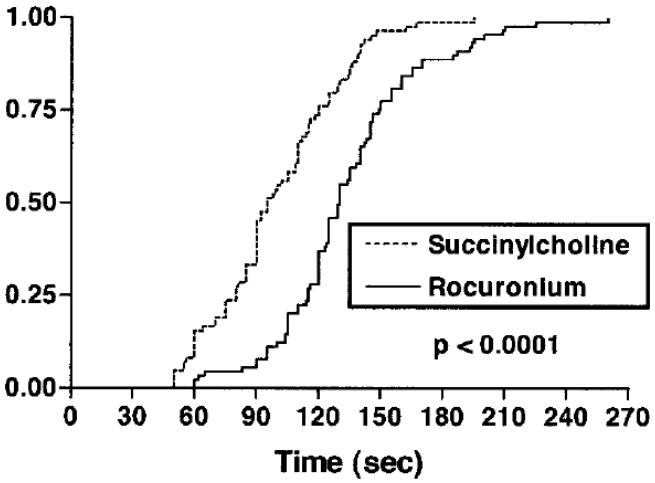

Figure 2. Kaplan-Meyer curve of the probability of the completion of the endotracheal intubation sequence including succinylcholine or rocuronium as the neuromuscular blocking drug. Time 0 denotes the beginning of the injection of the induction drug propofol. The endotracheal intubation sequence was defined to be completed upon the first appearance of end-tidal carbon dioxide after intubation. Curves differ significantly ($P < 0.0001$; logrank test).

Sluga M et al. Anesth Analg 2005;101:1356 –61

1 mg/kg

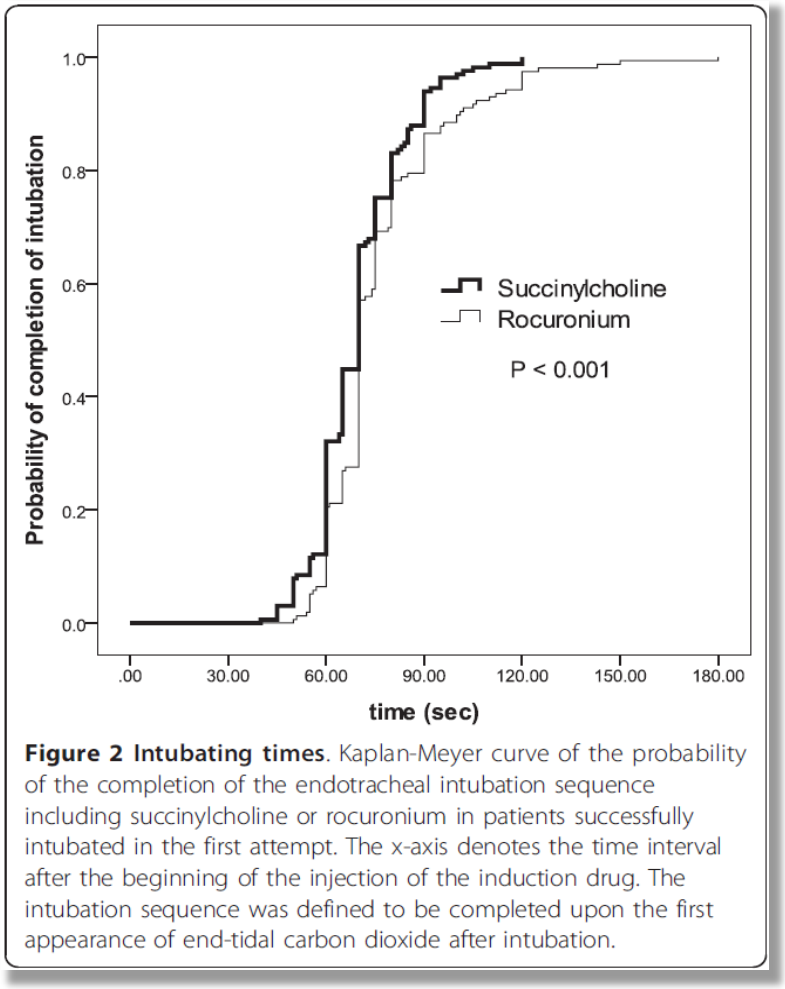

Figure 2 Intubating times. Kaplan-Meyer curve of the probability of the completion of the endotracheal intubation sequence including succinylcholine or rocuronium in patients successfully intubated in the first attempt. The x-axis denotes the time interval after the beginning of the injection of the induction drug. The intubation sequence was defined to be completed upon the first appearance of end-tidal carbon dioxide after intubation.

Stephan C Marsch, et al. Crit Care. 2011;15(4):R199-R199

The Response of Newborns to Succinylcholine and d-Tubocurarine

Leonard F. Walts, M.D., and John B. Dillon, M.D.†*

Anesthesiology. 1969 Jul;31(1):35-8.

Results

Mean age of the 60 adult patients was 41 years. The group given succinylcholine received an average of 68 mg (range 54–83) of drug. All patients had 100 per cent depression in twitch force. Recovery times to 10, 50 and 90 per cent of control values averaged 7.0, 8.5, and 10 minutes, respectively.

Acta Anaesthesiol Scand 2011; 55: 203–208
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ACTA ANAESTHESIOLOGICA SCANDINAVICA
doi: 10.1111/j.1399-6576.2010.02365.x

Desaturation following rapid sequence induction using succinylcholine vs. rocuronium in overweight patients

L. TANG[1], S. LI[1], S. HUANG[1], H. MA[1] and Z. WANG[2]
Departments of [1]Anesthesiology and [2]Pain Management, Shanghai First People's Hospital, Shanghai Jiaotong University, Shanghai, China

Background: Rapid sequence induction may be associated with hypoxemia. The purpose of this study was to investigate the possible difference in desaturation during rapid sequence induction in overweight patients using either succinylcholine or rocuronium.
Methods: Sixty patients with a body mass index (BMI) between 25 and 30 kg/m^2, American Society of Anesthesiologists class I or II, undergoing general anesthesia were randomly divided into a succinylcholine group and a rocuronium group. After a 3-min preoxygenation, patients received rapid sequence induction of general anesthesia with midazolum–fentanyl–propofol and succinylcholine (1.5 mg/kg) or rocuronium (0.9 mg/kg). Ventilation was not initiated until oxygen saturation declined to 92%. We measured the times when oxygen saturation reached 98%, 96%, 94% and 92%. Safe Apnea Time was defined as the time from administration of neuromuscular blocking drugs to oxygen saturation fell to 92%. The recovery period was defined as the time from initiation of ventilation until oxygen saturation was 97%. Arterial blood gases were taken at baseline, after preoxygenation and at 92% oxygen saturation.
Results: The mean Safe Apnea Time (95% CI) was 283 (257–309) s in succinylcholine vs. 329 (303–356) s in rocuronium ($P = 0.01$). The mean recovery period (95% CI) was 43 (39–48) s in succinylcholine vs. 36 (33–38) s in rocuronium ($P = 0.002$). Blood gas analysis showed no difference between the two groups.
Conclusions: Succinylcholine was associated with a significantly more rapid desaturation and longer recovery of oxygen saturation than rocuronium during rapid sequence induction in overweight patients.

Accepted for publication 29 October 2010

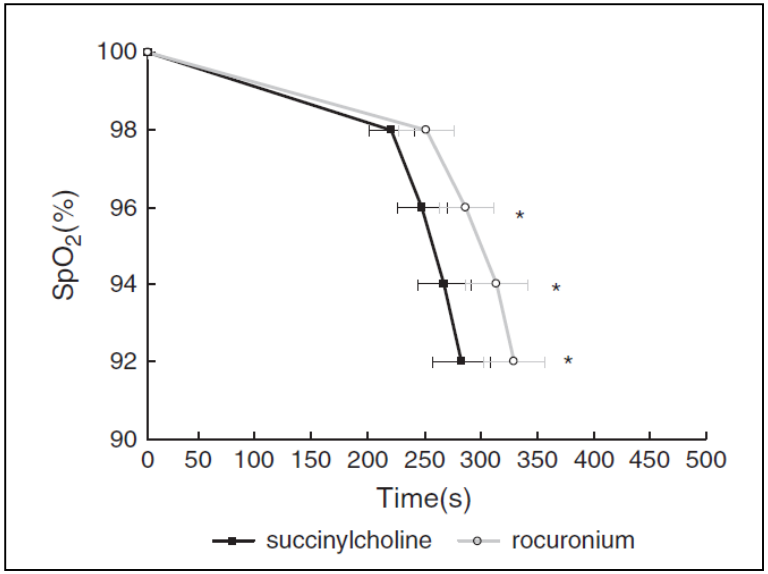


*Fig. 2. Changes in oxygen saturation (S_pO_2) with time during non-hypoxic apnea in the succinylcholine or the rocuronium group. Mean values (points) for both groups are shown. The vertical lines indicate 95% CI. The curves show smooth before S_pO_2 reach 98%, but afterward fall straightly to 92% S_pO_2. *P < 0.05 compared with succinylcholin.*

Anaesthesia
Journal of the Association of Anaesthetists of Great Britain and Ireland
Anaesthesia, 2010, 65, pages 358–361 doi:10.1111/j.1365-2044.20

ORIGINAL ARTICLE

Effect of suxamethonium vs rocuronium on onset of oxygen desaturation during apnoea following rapid sequence induction

S. K. Taha,[1] M. F. El-Khatib,[2] A. S. Baraka,[3] Y. A. Haidar,[4] F. W. Abdallah,[5] R. A. Zbeidy[4] and S. M. Siddik-Sayyid[1]

1 Associate Professor, 2 Professor, 3 Emeritus Professor, 4 Chief Resident, 5 Fellow, Department of Anesthesiology, American University of Beirut, Beirut, Lebanon

Summary
This study investigates the effect of suxamethonium vs rocuronium on the onset of haemoglobin desaturation during apnoea, following rapid sequence induction of anaesthesia. Sixty patients were randomly allocated to one of three groups. Anaesthesia was induced with lidocaine 1.5 mg.kg^{-1}, fentanyl 2 μg.kg^{-1} and propofol 2 mg.kg^{-1}, followed by either rocuronium 1 mg.kg^{-1} (Group R) or suxamethonium 1.5 mg.kg^{-1} (Group S). The third group received propofol 2 mg.kg^{-1} and suxamethonium 1.5 mg.kg^{-1} only (Group SO). The median (IQR [range]) time to reach S_pO_2 of 95% was significantly shorter in Group S (358 (311–373 [215–430]) s) than in Group R (378 (370–393 [366–420]) s; p = 0.003), and shorter in Group SO (242 (225–258 [189–370]) s) than in both Group R (p < 0.001) and Group S (p < 0.001). When suxamethonium is administered for rapid sequence induction of anaesthesia, a faster onset of oxygen desaturation is observed during the subsequent apnoea compared with rocuronium. However, time to desaturation is prolonged whenever lidocaine and fentanyl precede suxamethonium.

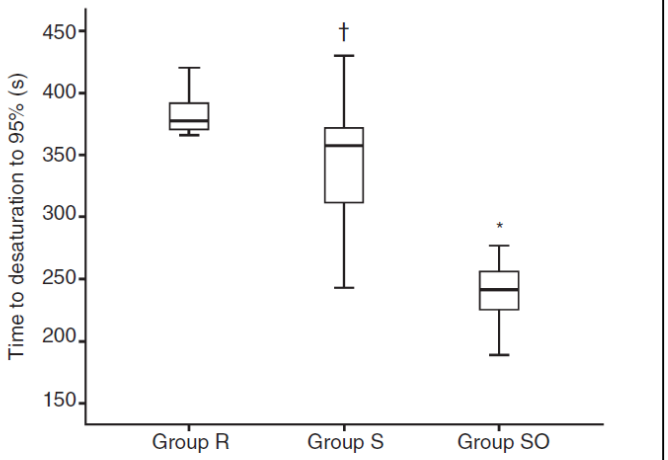
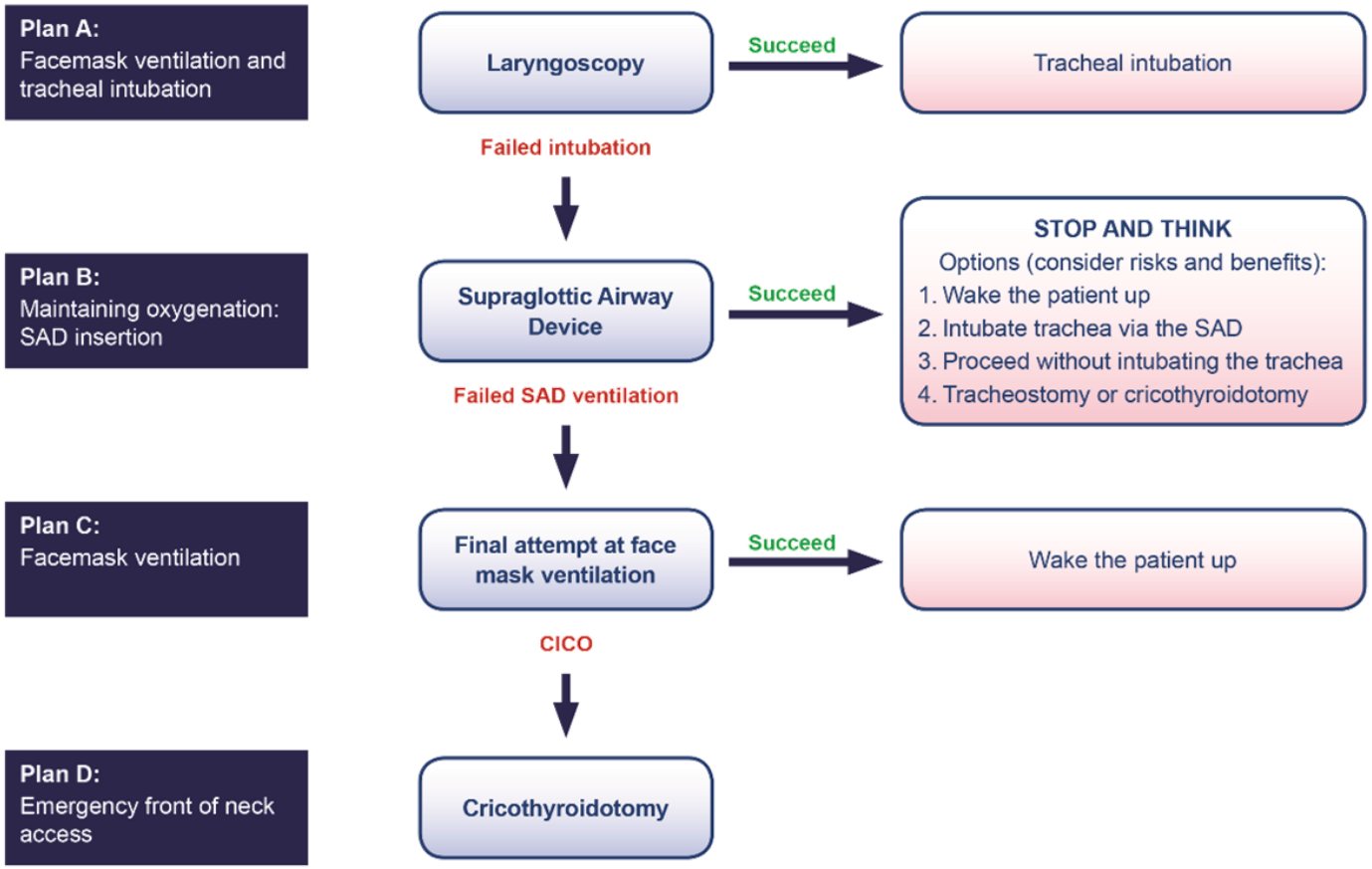
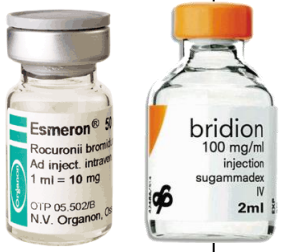


Figure 1 Time to reach S_pO_2 of 95% during apnoea following induction of anaesthesia with lidocaine/fentanyl/propofol/rocuronium (Group R), lidocaine/fentanyl/propofol/suxamethonium (Group S), or propofol/suxamethonium (Group SO).

DAS Difficult intubation guidelines – overview



This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.



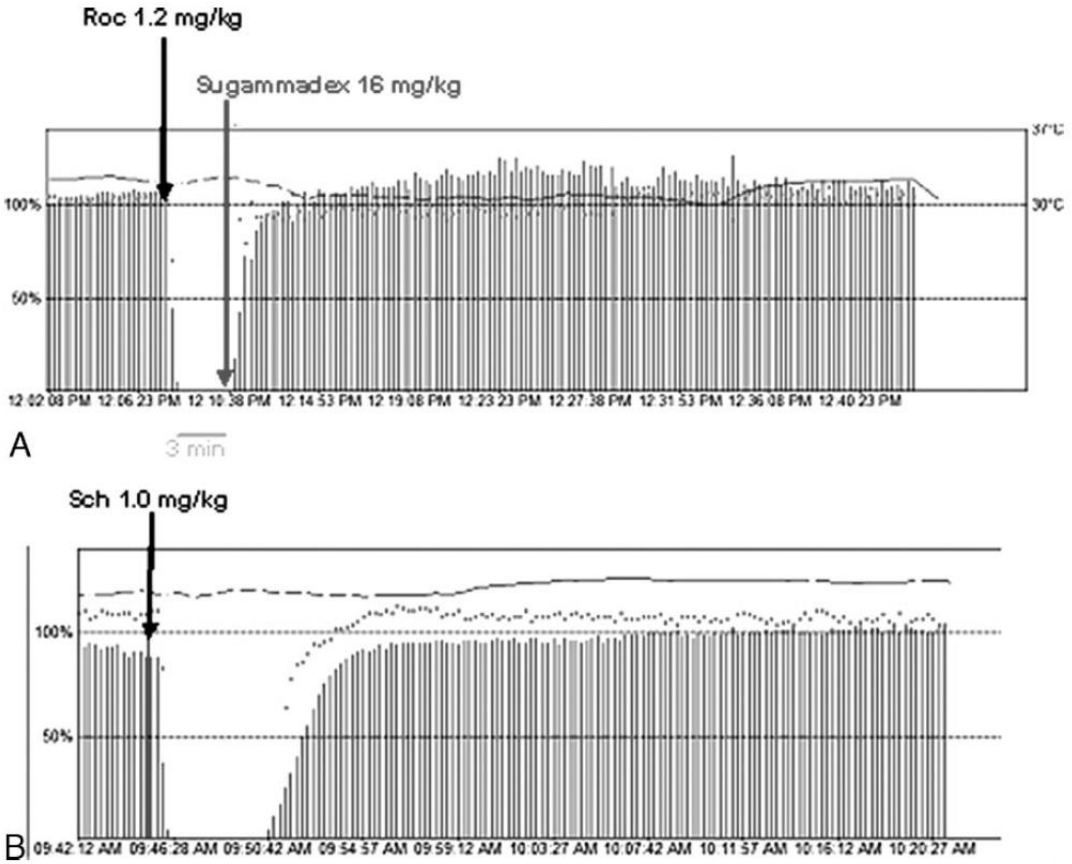


Figure 4. Panel A shows the recovery of the twitch height and train-of-four (TOF) ratio after administration of 1.2 mg/kg rocuronium followed 3 min later by 16 mg/kg sugammadex, both given IV. Recovery to a first twitch height (T1) of 90% and a TOF ratio of 0.94 occurred 110 s later. The onset-offset time with this sequence (i.e., the time from the end of the injection of rocuronium to a T1 recovery to 90%) was 4 min 47 s. Panel B shows the effects of administering 1.0 mg/kg succinylcholine (Sch) with spontaneous recovery to a T1 of 90% occurring after 9 min and 23 s.

Naguib M. Anesth Analg 2007;104:575–81

Rocuronium and sugammadex for rapid sequence induction of obstetric general anaesthesia

R. M. Williamson, S. Mallaiah and P. Barclay
Liverpool Women's Hospital, Liverpool, UK

Background: Many anaesthetists use rocuronium in place of suxamethonium for rapid sequence induction (RSI). This is less common in obstetric anaesthesia as the duration of action of an effective dose of rocuronium exceeds most obstetric procedures. Sugammadex offers the possibility of rapidly reversing profound rocuronium neuromuscular blockade at the end of surgery. We aimed to determine whether rocuronium 1.2 mg/kg used for RSI in the obstetric population would provide good intubating conditions at 60 s and would be effectively reversed by sugammadex at the end of surgery.
Methods: We present a prospective series of 18 patients who received rocuronium 1.2 mg/kg at induction of anaesthesia, monitored with a train-of-four ratio (TOF)-Watch SX®, and reversed using sugammadex 4 mg/kg.
Results: The mean (95% CI) onset time of rocuronium was 71 (56–86) s, and the mean (95% CI) time to recovery of the TOF to $\geq$ 90%, after the administration of sugammadex 4 mg/kg at the end of surgery, was 86 (69–104) s.
Conclusion: Rocuronium 1.2 mg/kg reversed by sugammadex appears to be effective in the obstetric population.

Accepted for publication 26 February 2011

The Prolonged Duration of Rocuronium in Chinese Patients

Linda M. Collins, MB, BCh, BAO, FFARCSI*, Joan C. Bevan, MD, FRCA†,
David R. Bevan, MB, MRCP, FRCA*, Giselle C. P. Villar, MD†, Raymond Kahwaji, MD, FRCPC†,
Michael F. Smith, MD, FRCPC†, and François Donati, PhD, MD, FRCPC‡

Departments of Anesthesia, *Vancouver General Hospital and †British Columbia's Children's Hospital, University of British Columbia, Vancouver, British Columbia, and ‡Université de Montréal, Montréal, Québec, Canada

We compared the potency and duration of action of rocuronium in Chinese and Caucasian patients during general anesthesia. Thirty-six women (18 Caucasian and 18 Chinese) and 36 children (18 Caucasian and 18 Chinese) were evaluated during the administration of propofol/fentanyl anesthesia. Patients in each age group were randomized into three subgroups to receive single doses of 0.06, 0.12, or 0.18 mg/kg rocuronium (adults) or 0.12, 0.18, or 0.24 mg/kg rocuronium (children). Neuromuscular blockade was assessed by electromyography of the adductor pollicis after train-of-four (TOF) stimulation of the ulnar nerve. Dose response curves were constructed when maximum neuromuscular depression of the first twitch of the train (T_1) was obtained. A second bolus dose of rocuronium was then administered to a total dose of 0.6 mg/kg. The times of spontaneous recovery to T_1 10%, 25%, and 90% of control and to TOF 0.25, 0.50, and 0.70 were recorded. For both adults and children, recovery occurred later in Chinese than in Caucasian patients ($P < 0.05$ for T_1 of 10%, 25%, 75%, and 90% and TOF to 0.7). The 50% effective dose was smaller in Chinese adults (125 ± 63 vs 159 ± 66 μg/kg) and Chinese children (171 ± 43 vs 191 ± 46 μg/kg) than in Caucasian adults and children, but the difference was not statistically significant. In adults, time to 25% T_1 recovery was 43 ± 13 min in Chinese patients and 33 ± 10 min in Caucasian patients ($P < 0.05$). The corresponding values were more rapid for children: 30 ± 10 and 24 ± 6 min ($P < 0.05$). We conclude that the recovery from rocuronium neuromuscular blockade was longer in Chinese compared with Caucasian patients and in adults compared with children.

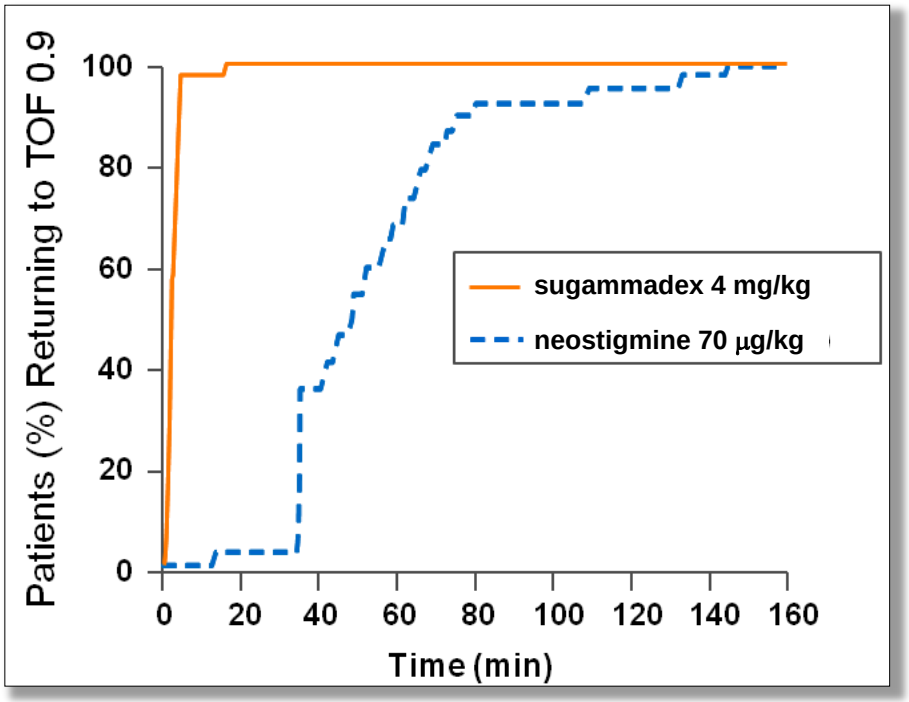
(Anesth Analg 2000;91:1526–30)

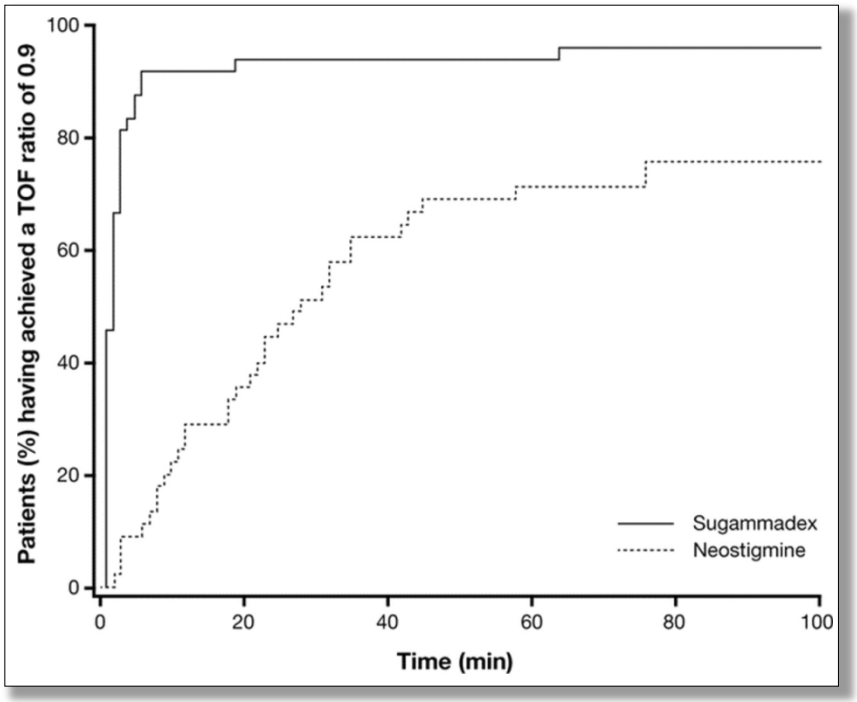
TABLE 9. *Side effects of succinylcholine.*

- Massive hyperkalemia in susceptible patients
- Cardiac arrhythmias
- Muscle fasciculations
- Myalgias
- Rhabdomyolysis
- Increased intracranial pressure
- Increased intragastric pressure
- Increased intraocular pressure
- Malignant hyperthermia
- Masseter muscle spasm or jaw rigidity
- Prolonged apnea (1–4 hours), if atypical plasma cholinesterase

From Bevan DR. Complications of muscle relaxants. *Semin Anesth.* 1995;14:63.

SVALOVÁ RELAXACE





Routine reversal - deep NMB
Time (min) from administration of sugammadex or neostigmine at deep NMB (1-2 PTCs) after rocuronium to recovery of the T_4/T_1 ratio to 0.9: **2.7** for sugammadex (4 mg/kg) and **49.0** for neostigmine (70 µg/kg).

Khuenl-Brady et al. Anesth Analg January 2010 110:64-73

Jones RK et al. *Anesthesiology*. 2008;109:816–824; Blobner M et al. *Eur J Anaesthesiol.* 2010;27:874–881

CELKOVÁ ANESTEZIE

The salient characteristics of RSI were delineated by Stept and Safar in 1970 [3].

- Preoxygenation
- Predetermined doses of thiopental and SCh
- Cricoid force
- Avoidance of ventilation by bag and mask
- Tracheal intubation

Sharp LM, Levy DM. Current Opinion in Anaesthesiology 2009, 22:357–361

Anaesthesia
Journal of the Association of Anaesthetists of Great Britain and Ireland

Correspondence

Anaesthesia, 2009, **64**, pages 781–792

Bag-mask ventilation in rapid sequence induction

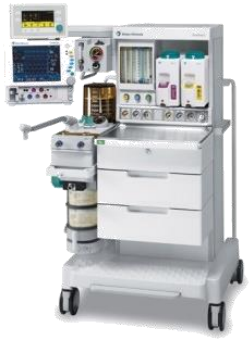
Gentle ventilation during rapid sequence induction is, as most things in anaesthetics, a balance of risks (aspiration) and benefits (preventing desaturation). Given the available evidence, routine exclusion of ventilation from a rapid sequence induction does not seem justified. Indeed it may have significant advantages in many patient sub-groups. Anecdotally, this technique is increasing in our region, something we plan to investigate more formally.

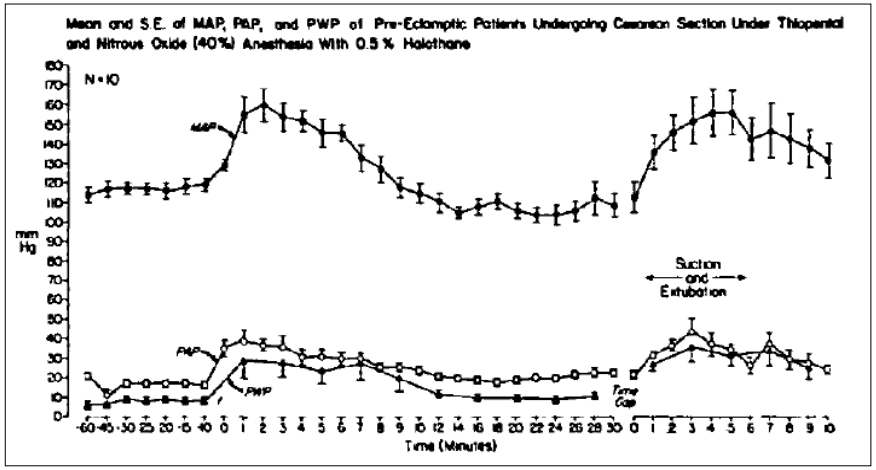
Areas for Discussion in 2006

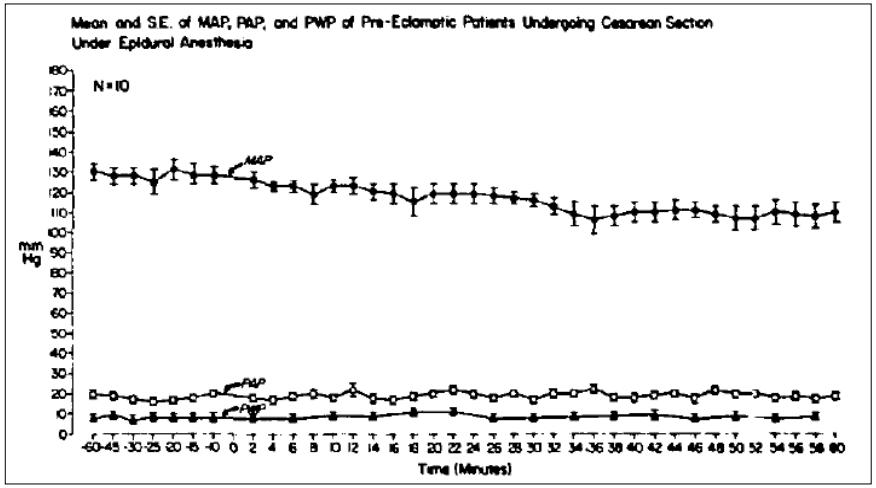
- **Gentle facemask ventilation (inspiratory pressure less than 20 cm water) is acceptable to some experienced practitioners during the period of waiting for the relaxant to work. Is this reasonable?**

http://www.das.uk.com/guidelines/rsi.html

NE OPIOIDY !!! (???)

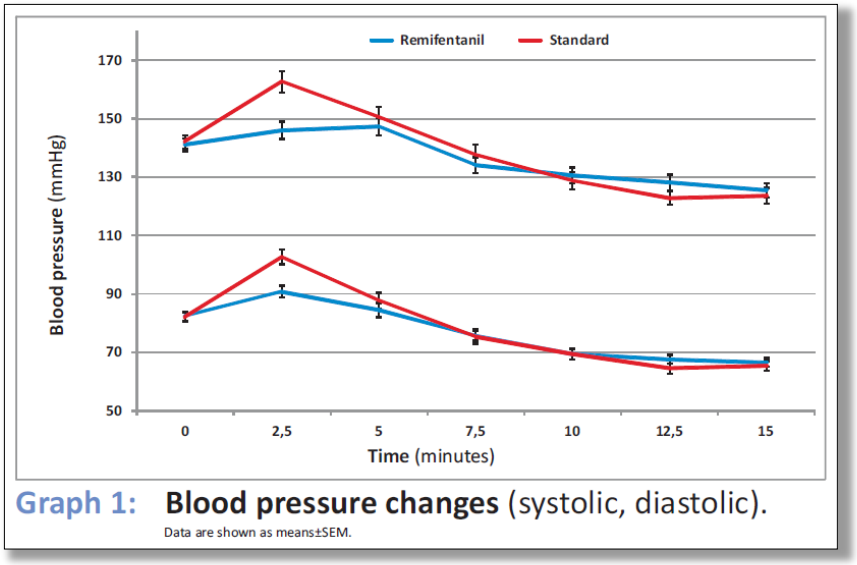




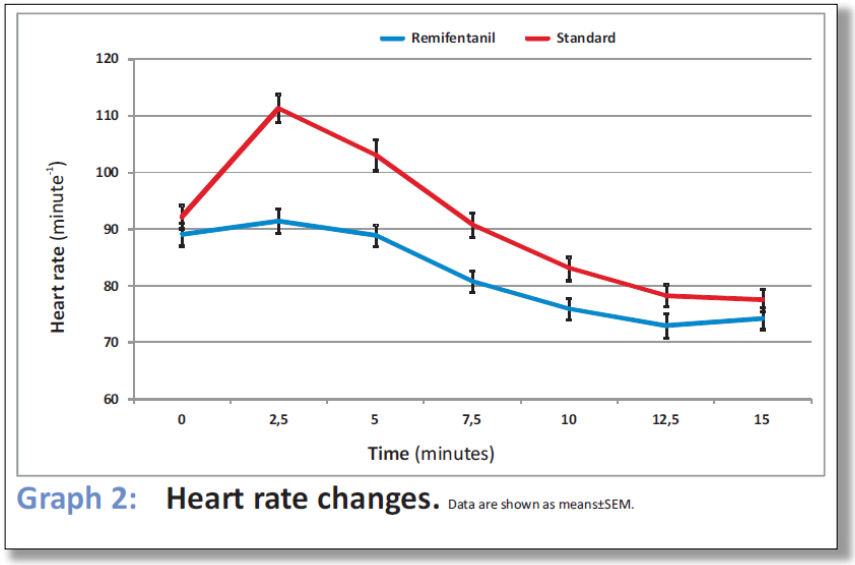


Hodgkinson et al. Can J Anesth 1980 27: 389-394.

Remifentanil 1 μg/kg před úvodem do celkové anestezie

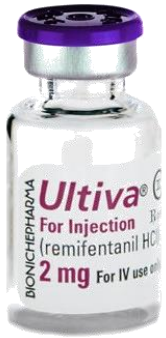


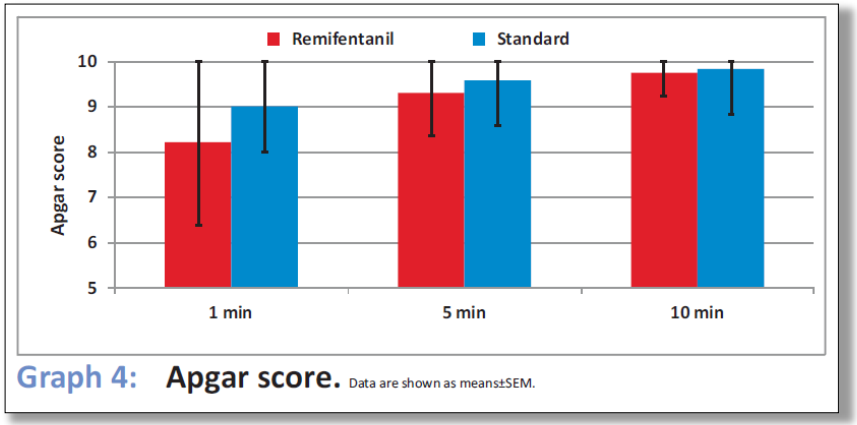
Graph 1: **Blood pressure changes** (systolic, diastolic).
Data are shown as means±SEM.



Graph 2: **Heart rate changes.** Data are shown as means±SEM.

Nosková, Bláha et al. BMC Anesthesiology 2015 (in press).





Graph 4: **Apgar score.** Data are shown as means±SEM.

CÍSAŘSKÝ ŘEZ - VOLBA ANESTEZIE

2011 OBAAMA-CZ

CELKOVÁ	47 %
REGIONÁLNÍ	53 %

Elektivní výkony:

CELKOVÁ	34 %
REGIONÁLNÍ	66 %

Stourac P, Blaha J et al. Anesth Analg. 2015 Jun;120(6):1303-8.

CÍSAŘSKÝ ŘEZ - VOLBA ANESTEZIE

2011 OBAAMA-CZ

CELKOVÁ	**47 %**
REGIONÁLNÍ	**53 %**

Stourac P, Blaha J et al. Anesth Analg. 2015 Jun;120(6):1303-8.

CELKOVÁ ANESTEZIE u SC:

Belgie	4%
USA	5%
Nizozemí	5%
Německo	<10%
UK	<15%
Izrael	15%
Španělsko	<30%
Itálie	<30%

Bucklin et al. Anesthesiology 2005, 103(3):645-653
Marcus et al. Der Anaesthesist 2011, 60(10):916-928
Betran et al. Paediatric and perinatal epidemiology 2007, 21(2):98-113
Wilkins et al. Anesthesia and analgesia 2009, 108(6):1869-1875
Tsai et al. British journal of anaesthesia 2011, 107(5):757-761
Van Houwe Pet al. Acta anaesthesiologica Belgica 2006, 57(1):29-37
Weiniger et al. International journal of obstetric anesthesia 2010, 19(4):410-416


ČSARIM
Česká společnost anesteziologie resuscitace a intenzivní medicíny
ÚVOD
O ČSARIM
AKTUALITY
AKCE
PŘEDNÁŠKY
ZDRAVOTNÍ POJIŠTĚNÍ
CENY
KE STAŽENÍ
SEKCE
» Sekce intenzivní medicíny
» Sekce regionální anestezie
» Sekce dětské anestezie & intenzivní medicíny
» Sekce pro ultrazvukové metody
» Sekce porodnické anestezie a analgezie
Sekce porodnické anestezie a analgezie
Výbor SPAA ČSARIM pro období 2014–2018
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Místopředseda: doc. MUDr. Petr Štourač, Ph.D. (Brno)
Členové výboru:
MUDr. Radka Klozová (Praha)
MUDr. Pavlína Nosková, Ph.D. (Praha)
MUDr. Dagmar Seidlová, Ph.D. (Brno)
Členové sekce:
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Zápis ze schůze výboru SPAA ČSARIM 13. 1. 2016


P. ŠTOURAČ
J. BLÁHA
XIX.
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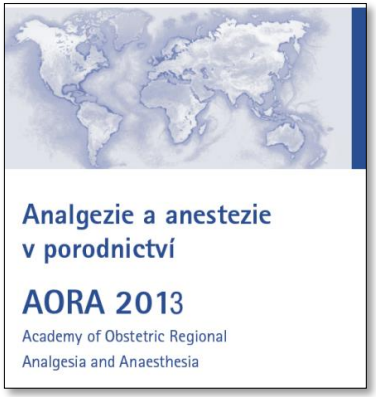
České společnosti
anesteziologie, resuscitace
a intenzivní medicíny


Analgezie a anestezie v porodnictví
AORA 2013
Academy of Obstetric Regional Analgesia and Anaesthesia


10. listopadu 2016
hotel Amarilis
Praha
Kontroverze porodnické anestezie a analgezie.
... není divné, že se naše postupy přes 40 let v podstatě nezměnily?
25. Hoderův den
pořádá
Klinika anesteziologie, resuscitace a intenzivní medicíny 1. LF UK a VFN v Praze,
Sekce porodnické anestezie a analgezie ČSARIM,


POSTGRADUÁLNÍ VZDĚLÁVÁNÍ
PŘEHLEDOVÝ ČLÁNEK
Současné postupy v porodnické anestezii – peroperační péče u císařského řezu
Bláha Jan[1,2], Nosková Pavlína[1,2], Klozová Radka[1,2], Seidlová Dagmar[1,4], Štourač Petr[1,3], Pařízek Antonín[2]
SOUHRN
ABSTRACT
Current Practice in obstetric anaesthesia I. – peri-operative care in Caesarean Section
KLÍČOVÁ SLOVA
KEYWORDS


POSTGRADUÁLNÍ VZDĚLÁVÁNÍ
Současné postupy v porodnické anestezii II. – celková anestezie u císařského řezu
Bláha Jan[1,2], Nosková Pavlína[1,2], Klozová Radka[1,2], Seidlová Dagmar[1,4], Štourač Petr[1,3], Pařízek Antonín[2]
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Current practice in obstetric anaesthesia. Part II General anaesthesia for Caesarean Section
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POSTGRADUÁLNÍ VZDĚLÁVÁNÍ
EXPERTNÍ SKUPINA PRO PORODNICKOU ANESTEZII A ANALGEZII
Současné postupy v porodnické anestezii III. – regionální anestezie u císařského řezu
SOUHRN
ABSTRACT
Bláha J., Nosková P., Klozová R., Seidlová D., Štourač P., Pařízek A.: Current Practice in Obstetric Anaesthesia. Part III. Regional anaesthesia for caesarean section


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Současné postupy v porodnické anestezii IV. – anesteziologické komplikace u císařského řezu
Štourač Petr[1,2], Bláha Jan[1,2], Nosková Pavlína[1,2], Klozová Radka[1,2], Seidlová Dagmar[1,2]


ANESTEZIOLOGIE
PŘEHLEDOVÝ ČLÁNEK
Současné postupy v porodnické anestezii V. – pooperační péče po císařském řezu
Bláha Jan[1,2], Klozová Radka[1,2], Nosková Pavlína[1,2], Seidlová Dagmar[1,4], Štourač Petr[1,3], Pařízek Antonín[2]

CÍSAŘSKÝ ŘEZ - VOLBA ANESTEZIE

2011 OBAAMA-CZ		2015 OBAAMA-INT	
CELKOVÁ	47 %	CELKOVÁ	37 %
REGIONÁLNÍ	53 %	REGIONÁLNÍ	63 %

Stourac P, Blaha J et al. Anesth Analg. 2015 Jun;120(6):1303-8.

KONTRAINDIKACE NEUROAXIÁLNÍ ANESTEZIE

ABSOLUTNÍ:

- hypotenze matky, nekorigovaná hypovolemie, masivní krvácení ???
- koagulopatie; aplikace LMWH v posledních 10 hodinách ???
- alergie na lokální anestetikum ???
- infekce v místě vpichu, neléčená bakteremie
- zvýšený ICP
- nesouhlas rodičky, porodníka či anesteziologa

REALATIVNÍ:

- neodkladný SC (x možnost SAB!)
- ~~onemocnění mozku a míchy (forenzní důvody)~~
- ~~deformity páteře, výhřez plotének; bolesti hlavy a zad v anamnéze~~

Chestnut DH, Obstetric Anesthesia

Management of the Parturient with a History of Local Anesthetic Allergy

Craig M. Palmer, MD, and Dimitri Voulgaropoulos, MD

Chandlerův protokol

Anesth Analg 1993;77:625-8

Table 1. Test Dosing Protocol

Step[a]	Route	Volume	Dilution
1	Prick		Undiluted
2[b]	Subcutaneous	0.1 mL	Undiluted
3	Subcutaneous	0.5 mL	Undiluted
4	Subcutaneous	1.0 mL	Undiluted
5	Subcutaneous	2.0 mL	Undiluted

Reproduced with permission from Chandler et al. J Allergy Clin Immunol 1987;79:883–6.

[a] Performed at 15-min intervals.

[b] Additional doses at dilutions of 1:100 and/or 1:10 can be added in patients with a particularly strong history.

KONTRAINDIKACE NEUROAXIÁLNÍ ANESTEZIE

ABSOLUTNÍ:

- hypotenze matky, nekorigovaná hypovolemie, masivní krvácení **???**
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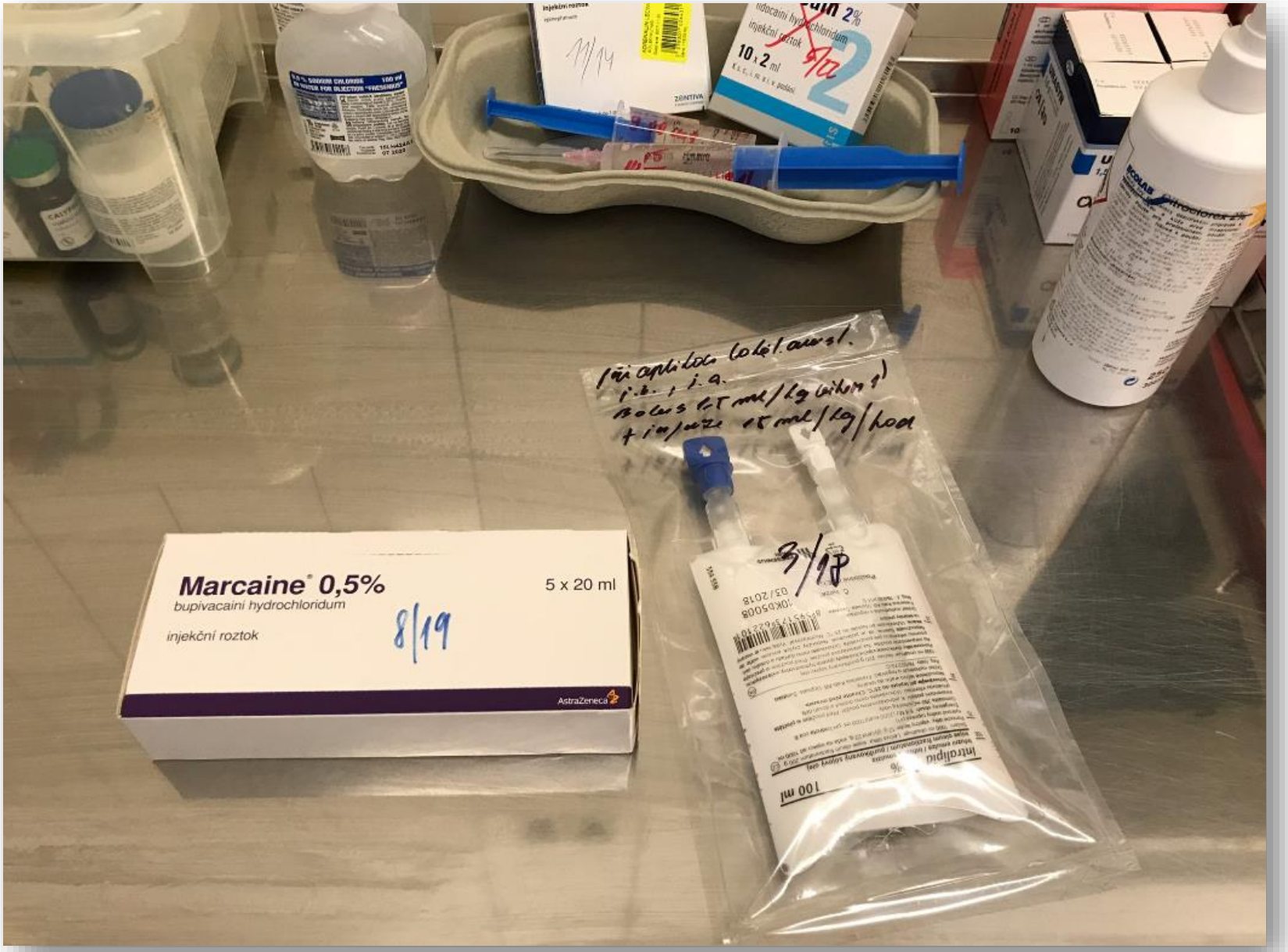
- ~~deformity páteře, výhřez plotének; bolesti hlavy a zad v anamnéze~~

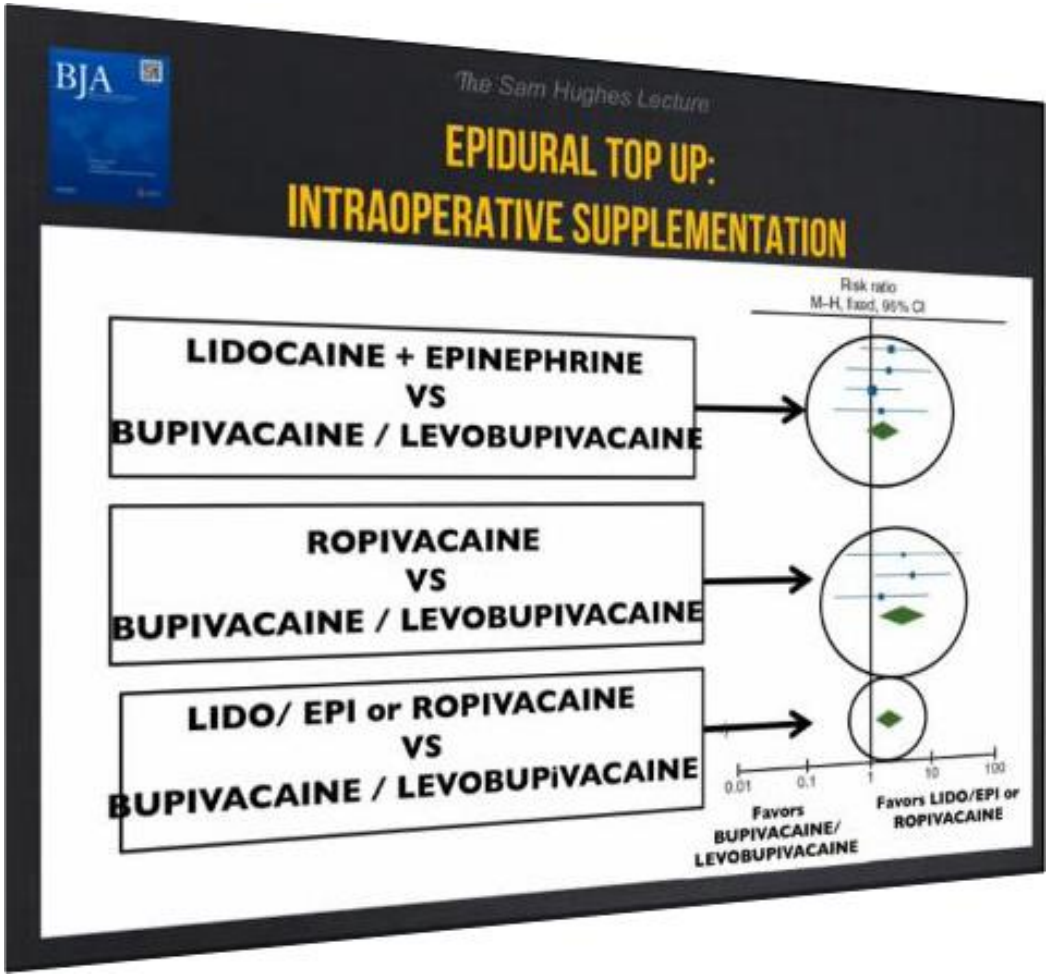
Chestnut DH, Obstetric Anesthesia

VOLBA ANESTEZIE

Čas do incize (min.)	**Volba dle času, který má anesteziolog k dispozici…**
elektivně	**EPID**, **SAB**, **CSE**
15-20	**EPID** s rychle nasedající epidurální směsí (2% lidocain), **SAB**, **CSE**
10-15	**SAB**, (**CSE**)
5-10	**SAB** (zkušený anesteziolog + dobré anatomické podmínky, jinak spíše CA)
0-5	**CELKOVÁ ANESTEZIE**
	Poznámka: je nutno vzít v úvahu i čas nutný k zpolohování rodičky, natažení směsi a punkci epidurálního/subarachnoidálního prostoru, nikoli pouze čas nasednutí účinku lokálního anestetika. Současně je nutno odhadnout čas svolání a umytí operačního týmu, desinfekci a zarouškování rodičky, …

epidurální směs: lidocain 2% 18 ml + sufentanyl 10 µg/2 ml + adrenalin 0,1 ml


Marcaine® 0,5%
bupivacaini hydrochloridum
injekční roztok
5 x 20 ml
8/19
AstraZeneca
10 x 2 ml
8/19



epidurální směs: lidocain 2% 18 ml + sufentanyl 10 µg/2 ml + adrenalin 0,1 ml

International Journal of Obstetric Anesthesia (2016) **25**, 45–52
0959-289X/$ - see front matter
http://dx.doi.org/10.1016/j.ijoa.2015.08.007

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ORIGINAL ARTICLE

The extension of epidural blockade for emergency caesarean section: a survey of Scandinavian practice

K. Wildgaard,[a] F. Hetmann,[b] M. Ismaiel[a,c]
[a]*Department of Anaesthesiology, Næstved Hospital, Næstved, Denmark*
[b]*Department of Nursing, Oslo and Akershus University College of Applied Sciences, Oslo, Norway*
[c]*Department of Anaesthesiology, Malmö Central Sykehus, Skånes Universitetssjukukhus, Malmö, Sweden*

Table 1 Location of epidural top-up in Denmark, Norway and Sweden

	Denmark (n=43)	Norway (n=43)	Sweden (n=59)	Total (n=145)	Trainee recommendation (n=138)
Full dose in labour ward	6 (14.0%)	5 (11.6%)	3 (5.1%)	14 (9.7%)	10 (6.9%)
Test dose in labour ward	9 (20.9%)	7 (16.3%)	18 (30.5%)	34 (23.4%)	26 (17.9%)
Transfer to theatre before giving local anaesthetic	22 (51.2%)	29 (67.4%)	36 (61.0%)	87 (60.0%)	95 (65.5%)
No top-up					
Alternative not described	0	0	1 (1.7%)	1 (0.7%)	0
Spinal anaesthesia	2 (4.7%)	1 (2.3%)	0	3 (2.1%)	3 (2.1%)
Unclear*	4 (9.3%)	1 (2.3%)	1 (1.7%)	6 (4.1%)	4 (2.8%)

Data are number (%). *Dependent on clinical presentation.

International Journal of Obstetric Anesthesia (2016) **25**, 45–52
0959-289X/$ - see front matter
http://dx.doi.org/10.1016/j.ijoa.2015.08.007

ORIGINAL ARTICLE

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The extension of epidural blockade for emergency caesarean section: a survey of Scandinavian practice

K. Wildgaard,[a] F. Hetmann,[b] M. Ismaiel[a,c]
[a]*Department of Anaesthesiology, Næstved Hospital, Næstved, Denmark*
[b]*Department of Nursing, Oslo and Akershus University College of Applied Sciences, Oslo, Norway*
[c]*Department of Anaesthesiology, Malmö Central Sykehus, Skånes Universitetssjukukhus, Malmö, Sweden*

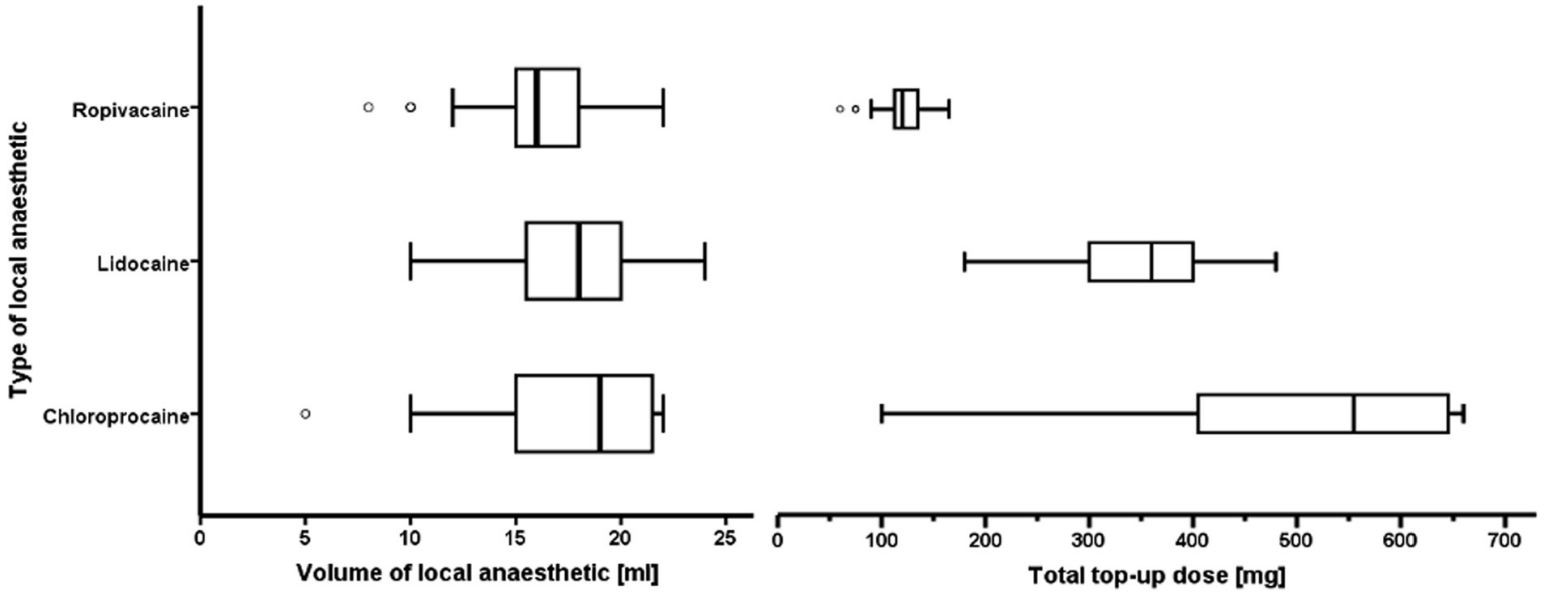


Fig. 3 Drug volumes and doses of the three most frequently used local anaesthetics in Scandinavia when initiating epidural top-up (n=126). Vertical bar: median; Box: interquartile range; Whiskers: range (excluding outliers); Circles represent outliers

Table 1 Location of epidural top-up in Denmark, Norway and Sweden

	Denmark (n=43)	Norway (n=43)	Sweden (n=59)	Total (n=145)	Trainee recommendation (n=138)
Full dose in labour ward	6 (14.0%)	5 (11.6%)	3 (5.1%)	14 (9.7%)	10 (6.9%)
Test dose in labour ward	9 (20.9%)	7 (16.3%)	18 (30.5%)	34 (23.4%)	26 (17.9%)
Transfer to theatre before giving local anaesthetic	22 (51.2%)	29 (67.4%)	36 (61.0%)	87 (60.0%)	95 (65.5%)
No top-up					
Alternative not described	0	0	1 (1.7%)	1 (0.7%)	0
Spinal anaesthesia	2 (4.7%)	1 (2.3%)	0	3 (2.1%)	3 (2.1%)
Unclear*	4 (9.3%)	1 (2.3%)	1 (1.7%)	6 (4.1%)	4 (2.8%)

Data are number (%). *Dependent on clinical presentation.

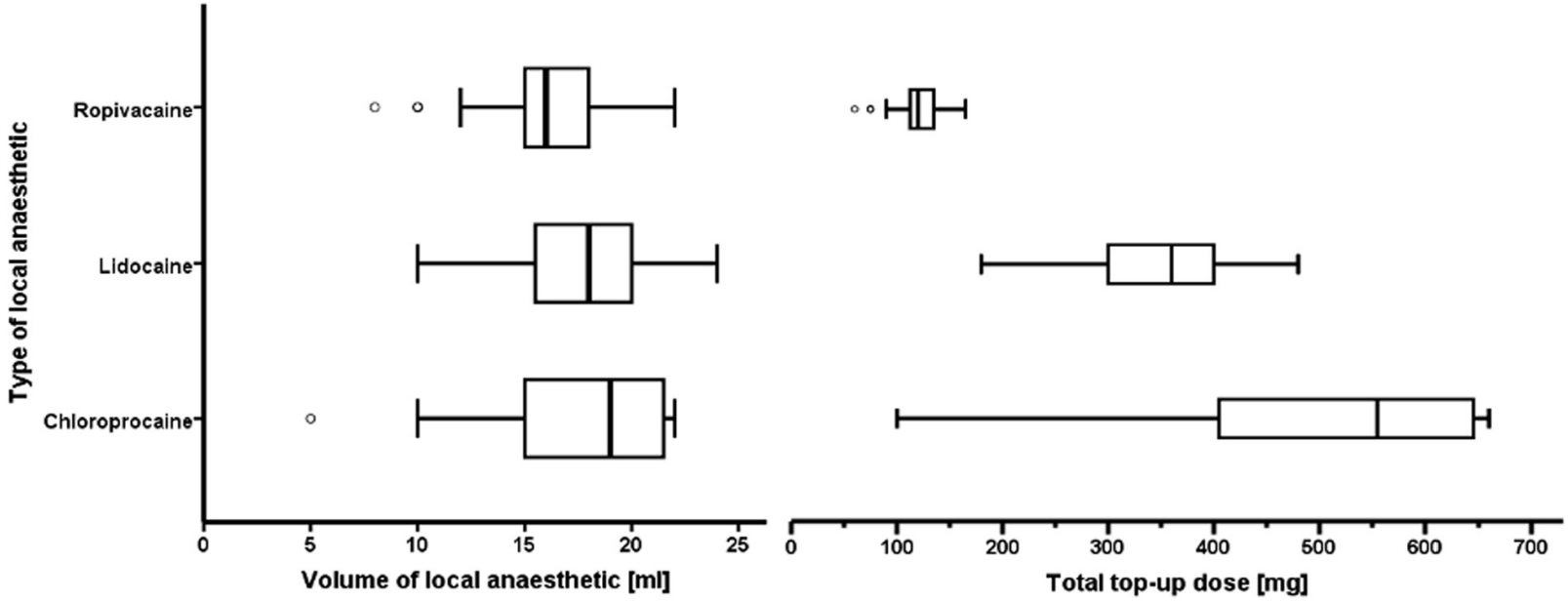
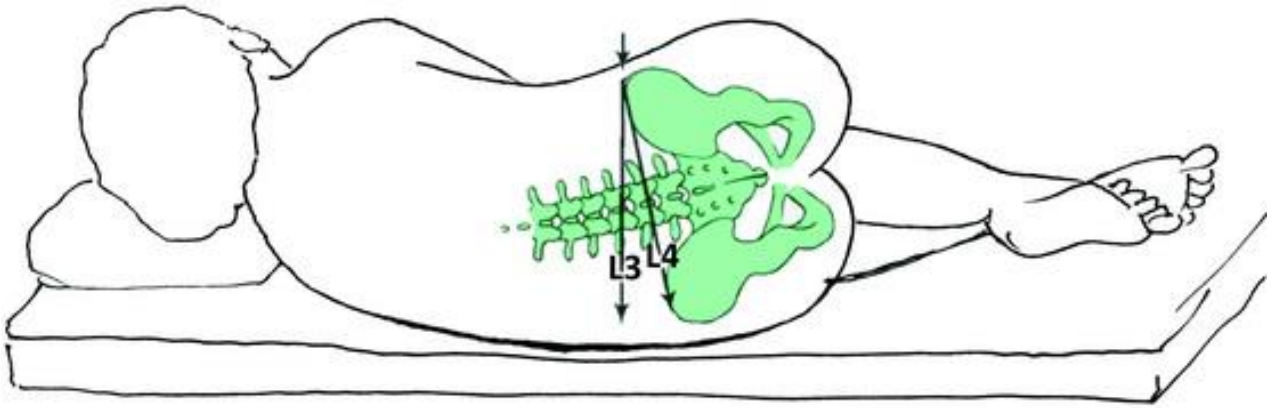


Fig. 3 Drug volumes and doses of the three most frequently used local anaesthetics in Scandinavia when initiating epidural top-up (n=126). Vertical bar: median; Box: interquartile range; Whiskers: range (excluding outliers); Circles represent outliers



Obr 1. Projekce spojnice obou iliakálních krist u ležící těhotné ženy.

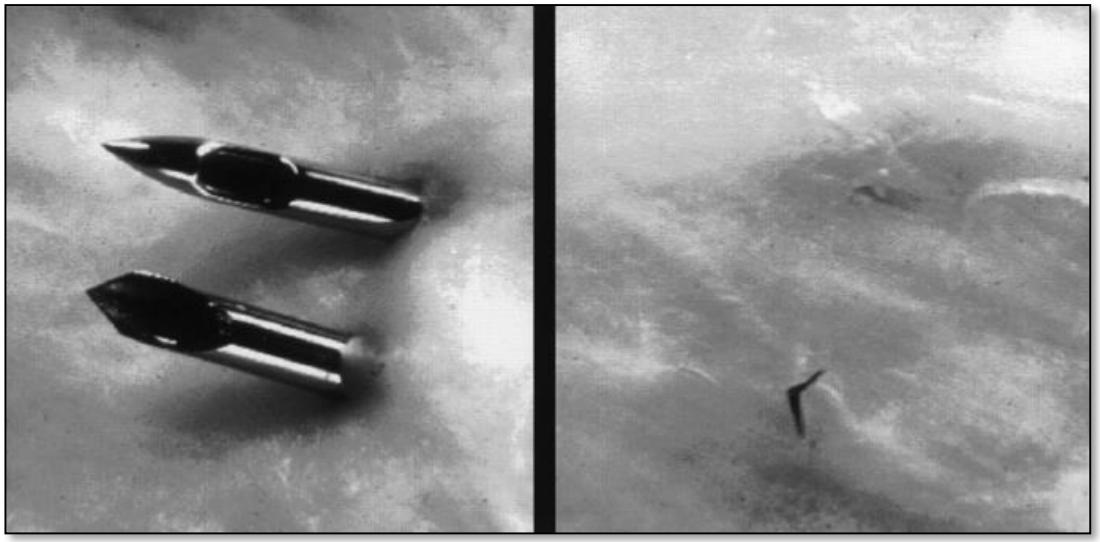
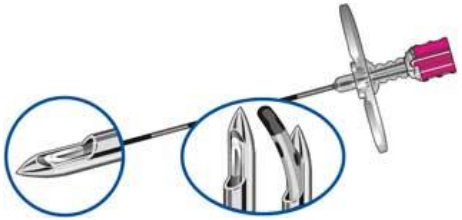


FIGURE 1. Dural puncture holes made by cutting and noncutting needles (Reproduced with permission from Strupp, et al. *Neurology*. 2001; 57:2310–2312).

HUBER POINT

Edward B. Tuohy
(1908–1959:USA)

Robert F. Husted
(1928–2008:USA)



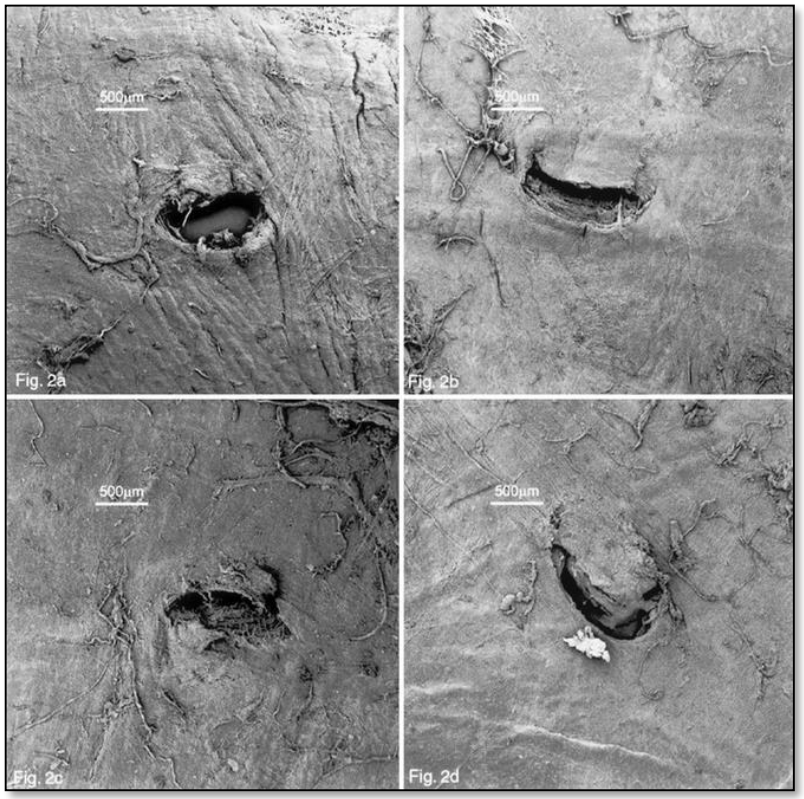


Fig. 2. Scanning electron microscopic images of (*a*) a 17-gauge Hustead epidural needle puncture (bevel parallel, 90° angle), (*b*) a 17-gauge Tuohy epidural needle puncture (bevel parallel, 90° angle), (*c*) an 18-gauge Special Sprotte® epidural needle puncture (90° angle), and (*d*) an 18-gauge Crawford epidural needle puncture (bevel parallel, 90° angle).

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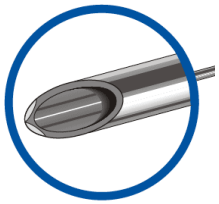

Table 2. Effect of Epidural Needle Design on CSF Leak (90° Punctures, Bevel Parallel), Cadaver n = 10

Epidural Needles	17-Gauge Hustead	17-Gauge Tuohy	18-Gauge Tuohy	20-Gauge Tuohy	18-Gauge Special Sprotte®	18-Gauge Crawford
17-Gauge Hustead	516 ± 319	0.3668	0.2922	0.0018*	0.2078	0.1326
17-Gauge Tuohy		405 ± 209	0.8312	0.0024*	0.6468	0.4312
18-Gauge Tuohy			420 ± 191	0.0003*	0.4324	0.2707
20-Gauge Tuohy				100 ± 112	0.0162	0.0001*
18-Gauge Special Sprotte®					360 ± 208	0.9698
18-Gauge Crawford						356 ± 121

Part 1 results are presented in the form of a *P* value matrix. Mean ± SD cerebrospinal fluid (CSF) leak rates are found on the diagonal for each needle in ml/15-min interval. The table may be read in the following way: Mean ± SD leak for the 17-g Hustead = 516 ± 319 (17-g Hustead [row] *vs.* 17-g Hustead [column]). Mean ± SD leak rate for the 17-g Tuohy (row) *vs.* 17-g Tuohy (column) = 405 ± 209. *P* value for differences in leak for the 17-g Hustead (row) *vs.* 17-g Tuohy (column) = 0.3668. *P* value required to reach statistical significance, corrected for multiple testing = 0.003.

* Statistically significant *P* values.

Pamela J. Angle et al. Anesthesiology. 2003;99(6):1376-1382

Original Article

Influence of needle diameter on spinal anaesthesia puncture failures for caesarean section: A prospective, randomised, experimental study

Fausto Fama' [b,1,*], Cecile Linard [b,1], Damien Bierlaire [a], Maria Gioffre'-Florio [b], Jacques Fusciardi [a], Marc Laffon [a]

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[b] University Hospital of Messina, Department of Human Pathology, Via Consolare Valeria, 1

27 G více selhání,
26 G více PDPH

Table 2
Spinal puncture failures and incidence of postdural puncture headache. The number of puncture failures was statistically significant in the 27 G group ($P = 0.006$ versus the 25 G group, $P < 0.001$ versus the 26 G group). No statistically significant difference was found between the 25 G and 26 G groups ($P = 0.606$). Only 2 general anaesthesia procedures were carried out after 25 G attempt failures.

Group	25 G	26 G	27 G
Number of patients: *n*	109	121	98
Failure: *n* (%)	2 (1.8)[a]	1 (0.9)[a]	12 (10.9)
Headache: *n* (%)	5 (4.6)	3 (2.5)	2 (2.0)
Blood patch: *n*	1	1	0

[a] $P < 0.05$, 27 G vs. 25G and 26 G.

PEROPERAČNÍ SUPLEMENTACE O_2

- rutinní oxygenoterapie (FiO_2 0,4-0,5) lehkou maskou v průběhu elektivního císařského řezu v RA je na většině pracovišť standardem

- dle současných dat je to nejen zbytečné a neefektivní, a dokonce s možnými negativními důsledky

Cogliano MS et al. Anaesthesia 2002, 57(1):66-9
Khaw KS et al. Br J Anaesth 2002, 88(1):18-23
Khaw KS et al. Curr Opin Anaesthesiol 2004, 17(4):309-13
Buhimschi IA et al. Am J Obstet Gynecol 2003, 189(1):181-8
Thorp JA et al. Am J Obstet Gynecol 1995, 172(2 Pt 1):465-74
Van de Velde M. Br J Anaesth 2009;102:1–2.

PEROPERAČNÍ SUPLEMENTACE O_2

Table 2 Maternal characteristics and arterial blood gas (ABG) data. Mean (SD), median (range). n.s. = not significant

	Air group (n=22)	Oxygen group (n=22)	P
Characteristics			
Age (yr)	31.5 (23–38)	32.1 (25–43)	n.s.
Height (cm)	154.7 (4.7)	155.9 (4.7)	n.s.
Weight (kg)	64.2 (6.6)	66.8 (7.7)	n.s.
ABG baseline			
pH	7.42 (0.02)	7.43 (0.02)	n.s.
P_{O_2} (kPa)	14.3 (2.1)	14.8 (9.9)	n.s.
P_{CO_2} (kPa)	4.1 (0.3)	4.0 (0.4)	n.s.
Base excess (mmol litre^{-1})	−2.4 (1.3)	−2.5 (1.4)	n.s.
ABG during surgery			
pH	7.43 (0.04)	7.44 (0.03)	n.s.
P_{O_2} (kPa)	14.3 (2.5)	31.8 (5.9)	<0.001
P_{CO_2} (kPa)	4.3 (2.3)	4.0 (2.4)	n.s.
Base excess (mmol litre^{-1})	−1.8 (1.4)	−2.0 (1.5	n.s.
ABG at birth			
pH	7.41 (0.04)	7.43 (0.03)	n.s.
P_{O_2} (kPa)	14.2 (1.9)	30.0 (6.3)	<0.001
P_{CO_2} (kPa)	4.4 (0.7)	4.1 (0.5)	n.s.
Base excess (mmol litre^{-1})	−2.1 (1.8)	−2.6 (1.9)	n.s.

Khaw KS et al. Br J Anaesth 2002; 88:18–23

PEROPERAČNÍ SUPLEMENTACE O_2

Table 3 Fetal characteristics, timed intervals, Apgar scores and umbilical cord blood gas data. Values are mean (SD), median (range) or number (%). I–D = interval from skin incision to delivery. U–D = interval from uterine incision to delivery. n.s. = not significant

	Air group (n=22)	Oxygen group (n=22)	P
Fetal characteristics			
Maturity (wk)	38.1 (37–40.3)	38.1 (37–39.4)	n.s.
Birth weight (kg)	3.08 (2.9–3.7)	3.14 (2.6–3.9)	n.s.
Timed intervals			
I–D (min)	7.2 (6.2–7.6)	7.5 (6.3–8.1)	n.s.
U–D (s)	68 (52–75)	69 (55–85)	n.s.
Duration of O_2 exposure (min)	52.7 (35–70)	53.2 (33–150)	n.s.
Apgar score			
1 min	9 (7–10)	9 (8–10)	n.s.
5 min	10 (9–10)	10 (9–10)	n.s.
<7 at 1 min	0 (0%)	0 (0%)	n.s.
<7 at 5 min	0 (0%)	0 (0%)	n.s.
Umbilical arterial blood gases			
pH	7.25 (0.09)	7.24 (0.09)	n.s.
P_{O_2} (kPa)	2.4 (0.6)	2.4 (0.8)	n.s.
P_{CO_2} (kPa)	7.2 (1.7)	7.5 (1.38)	n.s.
Base excess (mmol litre^{-1})	–4.6 (3.4)	–4.7 (3.8)	n.s.
Umbilical venous blood gases			
pH	7.29 (0.08)	7.30 (0.07)	n.s.
P_{O_2} (kPa)	4.0 (1.4)	4.8 (1.0)	<0.05
P_{CO_2} (kPa)	6.1 (0.9)	6.0 (0.8)	n.s.
Base excess (mmol litre^{-1})	–4.4 (3.7)	–4.2 (3.3)	n.s.

Table 4 Maternal and umbilical lipid peroxide concentrations. Values are mean (SD); units are µmol litre^{-1}. n.s. = not significant; N/A=not available

	Air group (n=22)	Oxygen group (n=22)	P
Maternal arterial (baseline)			
Isoprostane	118.8 (21.3)	127.4 (28.5)	n.s.
Malondialdehyde	0.89 (0.13)	0.93 (0.12)	n.s.
Organic hydroperoxides	0.13 (0.02)	0.14 (0.02)	n.s.
Maternal arterial (during surgery)			
Isoprostane	N/A	N/A	N/A
Malondialdehyde	0.89 (0.16)	1.26 (0.22)	<0.001
Organic hydroperoxides	0.14 (0.02)	0.14 (0.03)	n.s.
Maternal arterial (at birth)			
Isoprostane	121.8 (23.8)	200.6 (54.3)	<0.001
Malondialdehyde	0.89 (0.16)	1.12 (0.32)	<0.05
Organic hydroperoxides	0.14 (0.02)	0.14 (0.02)	n.s.
Umbilical venous			
Isoprostane	135.3 (66.7)	403.0 (100.4)	<0.001
Malondialdehyde	0.47 (0.13)	0.78 (0.16)	<0.05
Organic hydroperoxides	0.15 (0.05)	0.50 (0.17)	<0.001
Umbilical arterial			
Isoprostane	122.1 (73.4)	215.2 (92.7)	<0.001
Malondialdehyde	0.40 (0.06)	0.48 (0.10)	<0.001
Organic hydroperoxides	0.18 (0.09)	0.39 (0.10)	<0.001

Khaw KS et al. Br J Anaesth 2002; 88:18–23

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ANESTHESIA & ANALGESIA®

EDITORIAL

Epidural Fever in Obstetric Patients: It's a Hot Topic

Laura Goetzl, MD, MPH

MATERNAL PYREXIA ASSOCIATED WITH THE USE OF EPIDURAL ANALGESIA IN LABOUR

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Summary To establish the effect of pain relief on maternal temperature during labour forty patients who went into spontaneous labour with a single fetus, had a normal temperature (<37·5°C), and had no clinical evidence of infection were investigated prospectively. They were divided into two comparable groups—one receiving pethidine and the other epidural analgesia. Both groups had much the same temperatures at the beginning of labour and before any analgesic administration. The mean temperature in the pethidine group remained constant during labour, whereas in the epidural analgesia group it showed a significant rise after only 6 hours of labour. This rise was not related to any clinical evidence of infection. Patients receiving epidural analgesia during labour are at increased risk of developing pyrexia. This pyrexia may be the result of vascular and thermoregulatory modifications induced by epidural analgesia.

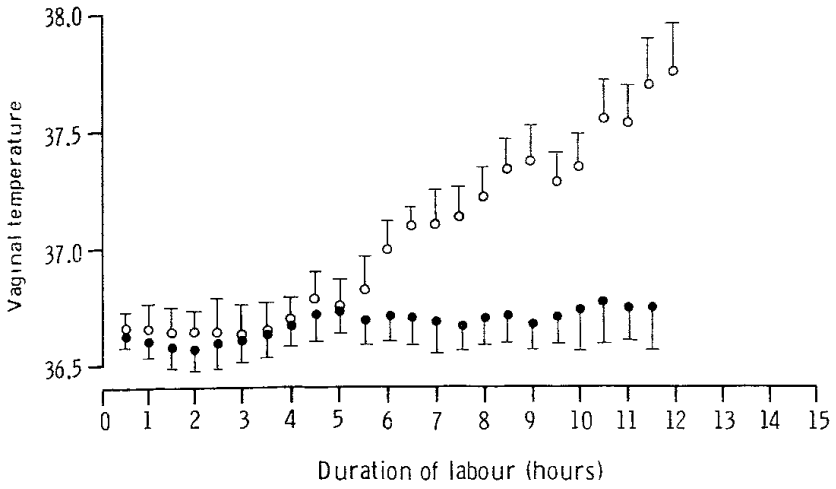

Fig 1—Mean vaginal temperature (°C) in the two groups of patients during labour.

●, Pethidine group; ○, epidural analgesia group; vertical bars, SEM.

Labor Epidural Analgesia and Maternal Fever

Scott Segal, MD, MHCM

Table 1. Incidence of Clinical Fever in Women with Labor Epidural Analgesia

Study	Design	Definition fever (°C)	Epidural group [% (*n*/*N*)]	Nonepidural group [% (*n*/*N*)]	*P* value
Lieberman[11]	Observational	>38	14.5 (152/1047)	1.0 (6/610)	<.001
Mayer[12]	Observational	≥37.8	20.4 (39/191)	2.1 (2/96)	<.001
Kaul[19]	Observational	>38	6.6 (61/922)	0 (0/255)	<.001
Dashe[20]	Observational[a]	≥38	4[illegible]	26.1 (18/69)	.01
Vinson[5]	Observational	≥37.5	26.8 (11/41)	8.3 (3/36)	.05
		>38	14.6 [illegible]	0 (0/36)	.03
Herbst[13]	Observational	≥38	6.4 (44/683)	1.1 (28/2426)	<.001
Ploeckinger[10]	Observational	>38	1.6 (17/1056)	0.2 (11/6261)	<.005
Yancey[9]	Before–after study[b]	≥37.5	26.2 (150/572)	8.2 (41/498)	<.01
		≥38	11.0 (63/572)	0.6 (3/498)	<.01
Ramin[16]	RCT[c]	≥38	22.7 (98/432)	4.8 (21/437)	<.001
Sharma[17]	RCT[c,d]	≥38	33.2 (75/226)	6.9 (16/233)	<.001
Sharma[18]	RCT[e]	>38	23.9 (58/243)	6.2 (16/259)	<.0001
Lucas[15]	RCT[f]	≥38	20.4 (76/372)	7.1 (26/366)	<.001

11 – 33% !

RCT = randomized controlled trial.

[a] All patients had ruptured membranes >6 hours and included fever up to 6 hours postpartum.

[b] Comparison of 2 time periods, before and after introduction of on-demand labor epidural analgesia. Epidural group reported as "after" period, in which 83% of women received epidural analgesia; nonepidural group reported as "before" period, in which 1% received epidural analgesia.

[c] Fever reported for protocol-compliant women only.

[d] Data from this investigation were analyzed again in more detail by Philip et al.[14]

[e] Nulliparas only.

[f] Patients with pregnancy-induced hypertension; percentages recalculated from *n*/*N* reported in the original publication.


MATERNAL PYREXIA ASSOCIATED WITH THE USE OF EPIDURAL ANALGESIA IN LABOUR
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Neonatal sepsis is mediated by maternal fever in labour epidural analgesia
Noninfectious Fever in the Near-Term Pregnant Rat Induces Fetal Brain Inflammation: A Model for the Consequences of Epidural-Associated Maternal Fever
Scott Segal, MD, MHCM,* Carlo Pancaro, MD,† Iwona Bonney, PhD,‡ and James E. Marchand, PhD‡
Labor Epidural Analgesia and Intrapartum Maternal Hyperthermia
Michael K. Yancey, MD, Jun Zhang, PhD, MD, Jenifer Schwarz, MD, Charles S. Dietrich III, MD, and Mark Klebanoff, MD, MPH
Fetal and maternal temperatures during labor and delivery: a prospective descriptive study
Tony Lavesson, Karin Källén & Per Olofsson
Labor epidural analgesia is independent risk factor for neonatal pyrexia
CHARALAMPOS AGAKIDIS, ELENI AGAKIDOU, SUMESH PHILIP THOMAS, PRASHANTH MURTHY, & DAVID JOHN LLOYD
The incidence of maternal fever during labor is less with intermittent than with continuous epidural analgesia: a randomized controlled trial
V. R. R. Mantha, M. C. Vallejo, V. Ramesh, A. L. Phelps, S. Ramanathan
Epidural Analgesia for Labor Pain and Its Relationship to Fever
James M. Alexander, MD
Regular intermittent bolus provides similar incidence of maternal fever compared with continuous infusion during epidural labor analgesia
ČESKO ?
SLOVENSKO ?
Fever during labour epidural analgesia
Jason Ju In Chan, Rajive Dabas, Reena Nianlin Han, Ban Leong Sng
Combined spinal and epidural anaesthesia and maternal intrapartum temperature during vaginal delivery: a randomized clinical trial
F. A. de Orange, R. Passini Jr, M. M. R. Amorim, T. Almeida and A. Barros

Question results

1. Víte co je „epidural fever“?					
1.	16	41,0%	16	51,6%	**Nevím.**
2.	11	28,2%	11	35,5%	**Ano, přibližně.**
3.	4	10,3%	4	12,9%	**Ano, vím přesně o co se jedná.**
	8	*20,5%*			*unanswered*
	39	100,0%	31	100,0%	

2. Existuje u nás „epidural fever“?					
1.	23	59,0%	23	60,5%	**Asi ne, aspoň jsme to nijak podstatně nezaznamenali.**
2.	12	30,8%	12	31,6%	**Asi ano, ale jedná se spíše o podružný problém.**
3.	2	5,1%	2	5,3%	**Ne. Jedná se pouze o špatnou interpretaci fyziologie.**
4.	1	2,6%	1	2,6%	**Ne. U českých rodiček / v českém porodnictví není.**
5.	0	0,0%	0	0,0%	**Ano, u nás to pozorujeme / řešíme.**
6.	0	0,0%	0	0,0%	**Nevím. U nás epidurální analgezii rodičkám nedáváme.**
	1	*2,6%*			*unanswered*
	39	100,0%	38	100,0%	

Arch Gynecol Obstet (2007) 276:71–72
DOI 10.1007/s00404-006-0222-3

ORIGINAL ARTICLE

The epidural “fever”: What does an obstetrician need to know?

Krzysztof M. Kuczkowski

Intrapartum Maternal Fever and Neonatal Outcome

Ellice Lieberman, MD, DrPH*; Janet Lang, PhD, ScD‡; Douglas K. Richardson, MD, MBA§; Fredric D. Frigoletto, MD‖; Linda J. Heffner, MD, PhD*; and Amy Cohen, BA*

ABSTRACT. *Objective.* Much of fever during term labor may not be infectious but rather a consequence of the use of epidural analgesia. Therefore, we investigated the association of elevated maternal intrapartum temperature with neonatal outcome when the infant does not develop an infection.

Methods. We studied 1218 nulliparous women with singleton, term pregnancies in a vertex presentation and spontaneous labor. Women were excluded if their temperature was >99.5°F at admission for delivery, if they were diabetic or had an active genital herpes infection or if their infant developed a neonatal infection, had a congenital infection, or had a major malformation. Maximum intrapartum temperature was categorized as: ≤100.4°F (afebrile), 100.5°F to 101°F, and >101°F.

Results. During labor, 123 women (10.1%) developed a fever >100.4°F; 62 (5.1%) women had a maximum temperature of 100.5°F to 101°F and 61 (5.0%) women had a maximum temperature >101°F. Of febrile women, 97.6% had received epidural analgesia for pain relief. Infants of women developing a fever >100.4°F were more likely to have a 1-minute Apgar score <7 (22.8% for >100.4°F vs 8.0% for afebrile) and to be hypotonic after delivery (4.8% for >100.4°F vs .5% for afebrile). Compared with infants of afebrile women, infants whose mothers' maximum temperature was >101°F were more likely to require bag and mask resuscitation (11.5% vs 3.0%) and to be given oxygen therapy in the nursery (8.2% vs 1.3%). We also found a higher rate of neonatal seizure with fever (3.3% vs .2%), but the number of infants with seizure was small ($n = 4$). All associations remained essentially the same after controlling for confounding in logistic regression analyses.

Conclusions. Intrapartum maternal fever, particularly if >101°F, was associated with a number of apparently transient adverse effects in the newborn. Larger studies are needed to investigate the association of intrapartum fever with neonatal seizures and to determine whether any lasting injury to the fetus may occur. *Pediatrics* 2000; 105:8–13; *fever, epidural analgesia, neonatal outcome, neonatal seizures, labor.*

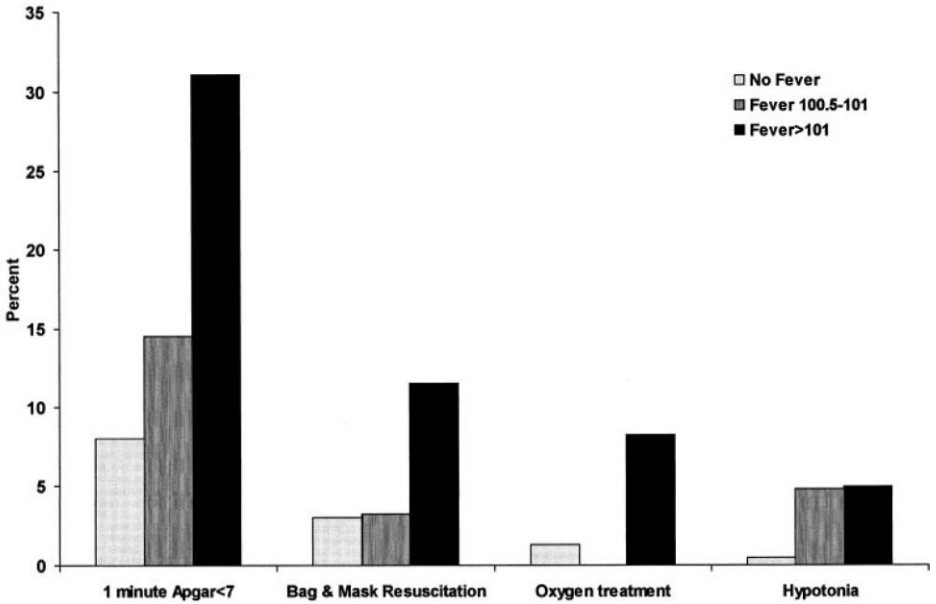

Fig 1. Neonatal outcomes according to maternal maximum intrapartum temperature.

Lieberman. Pediatrics 2000; 105:8 –13

AMERICAN JOURNAL OF PERINATOLOGY/VOLUME 14, NUMBER 2 *February 1997*

INCREASED INTRAPARTUM ANTIBIOTIC ADMINISTRATION ASSOCIATED WITH EPIDURAL ANALGESIA IN LABOR

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ABSTRACT

To determine whether women who receive continuous epidural analgesia for labor and delivery are more likely to receive antibiotic therapy compared to those parturients who do not use epidural analgesia, a chart review was performed for 300 women, 100 in each group using narcotics alone, epidural alone, or parenteral narcotics followed by epidural analgesia. While only 2% of women with narcotics alone developed an intrapartum temperature ≥ 37.8°C, 16% and 24% of women with epidural use alone or in addition to narcotics did so, respectively. Antibiotic administration was increased among women utilizing epidural analgesia, exclusively or following parenteral narcotics. No parturient with culture or pathological evidence of chorioamnionitis had maternal temperature elevation as an isolated finding. A probable causal relationship between maternal temperature elevation and epidural use in labor is supported. Rather than treating all women with temperature elevations and epidurals for presumed chorioamnionitis, it is reasonable to target treatment to those with fetal tachycardia, meconium stained fluid, or abnormal amniotic fluid studies.

Keywords: Epidural analgesia; maternal fever; antibiotics

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Labor Epidural Fever and Chorioamnionitis

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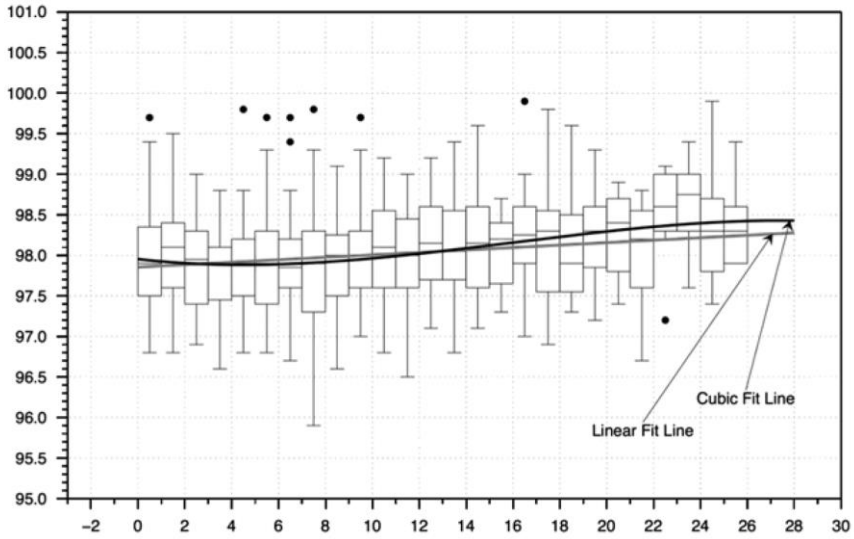


Figure 3. *Temperature course during labor. Boxplots of temperatures from 86 women scheduled for elective labor induction. This graph depicts the summary information of temperatures. Individual temperature slopes (not depicted) show mixed (positive and negative) trends. Linear and cubic fit lines are also displayed.*

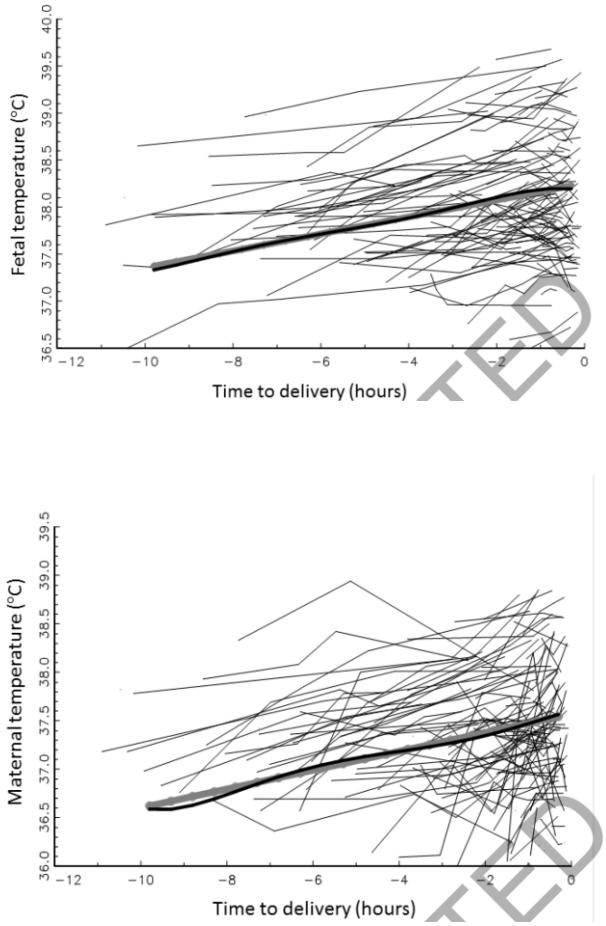
■ Summary and Clinical Implications

Maternal temperature varies during labor. On average, there is a small but clinically insignificant rise in temperature and this positive trend in maternal temperature is more frequently observed in women receiving epidural analgesia. The latter group of women requesting neuraxial pain relief are also more likely to have longer labor, more frequent pelvic examinations and chorioamnionitis, and an observed temperature trend, positive or negative, is not changed when epidural analgesia is started. The scientific evidence does not support a claim that epidural analgesia affects maternal fever, a classic symptom of chorioamnionitis that, if unrecognized or untreated, can pose a serious threat to the mother and baby.

Fetal and maternal temperatures during labor and delivery: a prospective descriptive study

Tony Lavesson, Karin Källén & Per Olofsson

The Journal of MaternalFetal & Neonatal Medicine, DOI: 10.1080/14767058.2017.1319928



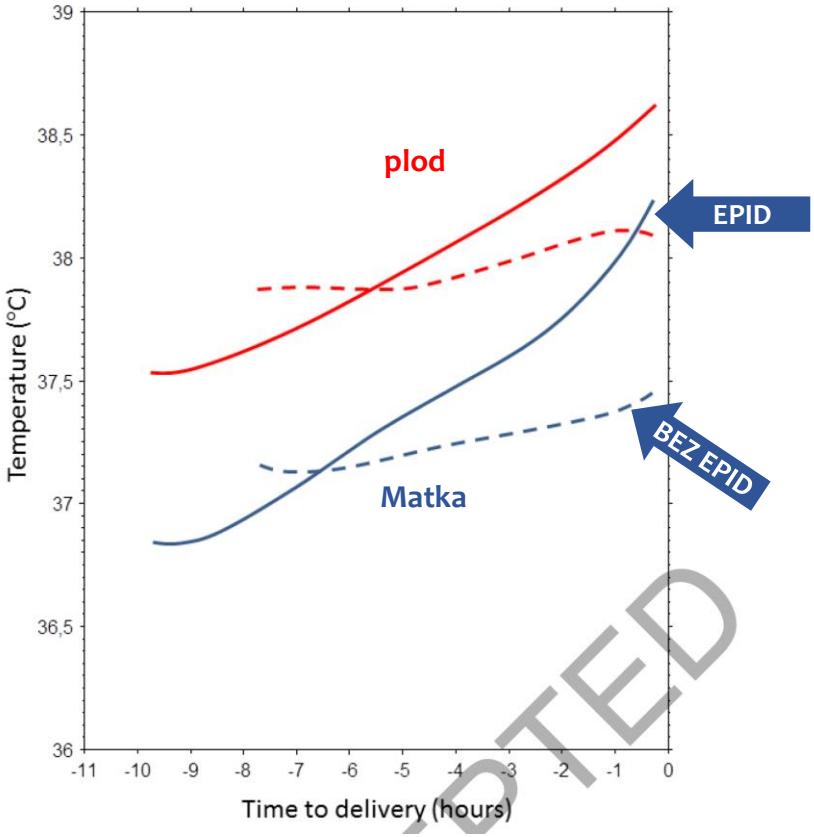


Figure 5.
Maternal axillary and fetal scalp temperatures relative to remaining time to delivery. Maternal temperatures are displayed in blue and fetal temperatures in red; solid lines denote women with epidural analgesia and interrupted lines denote women without epidural analgesia.

Epidural Analgesia and Intrapartum Fever: Placental Findings

JODI S. DASHE, MD, BEVERLY B. ROGERS, MD, DONALD D. MCINTIRE, PhD, AND KENNETH J. LEVENO, MD

Objective: To assess whether epidural analgesia is associated with fever, independent of maternal infection, by evaluating the relationship between epidural analgesia and inflammation of the placenta.

Methods: Placentas collected prospectively from women with singleton gestations, who delivered 6 hours or more after membrane rupture, were evaluated systematically for histologic inflammation by an investigator blinded to all clinical information. Maternal and neonatal markers of infection were assessed in the cohorts who did and did not receive epidural analgesia.

Results: One hundred forty-nine consecutive placentas were analyzed, and 80 (54%) of these women received epidural analgesia. On univariate analysis, significant differences between epidural and no epidural groups were found with respect to maternal fever 38C or greater (46% versus 26%, $P = .01$), placenta inflammation (61% versus 36%, $P = .002$), and length of labor (11.8 hours versus 9.6 hours, $P = .03$). The combination of maternal fever plus placental inflammation was significantly more common in the epidural group (35% versus 17% $P = .02$). However, maternal fever in the absence of supporting evidence of infection, in the form of placental inflammation, was not increased after epidural analgesia (11% versus 9%, $P = .61$).

Conclusion: Epidural analgesia is associated with intrapartum fever, but only in the presence of placental inflammation. This suggests that the fever reported with epidural analgesia is due to infection rather than the analgesia itself. (Obstet Gynecol 1999;93:341–4. © 1999 by The American College of Obstetricians and Gynecologists.)

Table 2. Markers of Potential Intrapartum Infection

Marker	Epidural (%) ($n = 80$)	No epidural (%) ($n = 69$)	P
Placental inflammation*	49 (61)	25 (36)	.002
Maternal fever†	37 (46)	18 (26)	.01
Fever with placental inflammation	28 (35)	12 (17)	.02
Fever without placental inflammation	9 (11)	6 (9)	.61

Data are presented as n (%).

* Placental inflammation = ≥grade 2 inflammation of the chorionic plate.[2]

† Maternal fever ≥38C in labor or within 6 h of delivery.

ORIGINAL ARTICLE

Intrapartum fever, epidural analgesia and histologic chorioamnionitis

WM Curtin[1,2], PJ Katzman[3], H Florescue[1], LA Metlay[3] and SH Ural[2]

OBJECTIVE: Our objective was to determine whether epidural analgesia and histologic chorioamnionitis were independent predictors of intrapartum fever.
STUDY DESIGN: This secondary analysis, retrospective cohort study included term parturients with placental examination during 2005. Logistic regression used fever (⩾38 °C) as the dependent variable. Significance was defined as $P \leqslant 0.05$.
RESULT: There were 488 (76%) of 641 term parturients with placental examination and epidural. Independent predictors of intrapartum fever were epidural odds ratio (OR) = 3.4, confidence interval (CI): 1.70, 6.81, histologic chorioamnionitis OR = 3.18, 95% CI: 2.04, 4.95, birthweight OR = 2.07, 95%CI: 1.38, 3.12, vaginal exams OR = 1.15, 95% CI:1.06, 1.24, duration ruptured membranes OR = 1.03, 95% CI: 1.01,1.05, parity ⩾ 1 OR = 0.44: 0.29, 0.66 and thick meconium OR = 0.35: 95%CI: 0.24, 0.85.
CONCLUSION: Epidural analgesia and histologic chorioamnionitis were independent predictors of intrapartum fever. Modification of labor management may reduce the incidence of intrapartum fever.

Journal of Perinatology advance online publication, 12 February 2015; doi:10.1038/jp.2014.235

Table 3. Multiple logistic regression for risk factors associated with intrapartum fever

Variable	*Odds ratio*	*95% CI*
Epidural	3.40	1.7,6.81
Histologic chorioamnionitis	3.18	2.04,4.95
Birthweight (kg)	2.07	1.38,2.12
Vaginal exams (No.)	1.15	1.06,1.24
ROM (h)	1.03	1.01,1.05
Parity ⩾ 1	0.44	0.29,0.66
Thick meconium	0.35	0.34,0.85

Abbreviations: CI, confidence interval; ROM, rupture of membranes. Model X2 $P < 0.001$, Nagelkerke $R2 = 0.354$, Goodness of fit $P = 0.237$.

Epidural Use and Clinical Chorioamnionitis among Women Who Delivered Vaginally

Adi Abramovici, MD[1] Jeff M. Szychowski, PhD[2] Joseph R. Biggio, MD[1] Yasser Sakawi, MD[3] William W. Andrews, PhD, MD[1] Alan T. N. Tita, PhD, MD[1]

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Am J Perinatol 2014;31:1009–1014.

Abstract

Objective Chorioamnionitis, an important cause of maternal and neonatal morbidity, is influenced by epidural use and the occurrence of epidural fever. We evaluated the association between chorioamnionitis, histologic placental findings, and intrapartum factors focusing on epidural use.

Materials and Methods We conducted a secondary analysis of a randomized controlled trial of different doses of oxytocin to prevent postpartum [illegible] women who delivered vaginally. The primary outc[illegible] chorioamnionitis leading to antibiotic therapy. Int[illegible] epidural use, parity, labor induction, gestational ag[illegible] index, cervical dilatation at admission, preeclamp[illegible] duration of labor.

Results Of the 1,798 women randomized, we excluded 13 m[illegible] 1,785 for analysis: 1,491 had an epidural and 294 did not. Of th[illegible] epidural, 8.0% had clinically diagnosed chorioamnionitis compared with onl[illegible].0% without epidural: unadjusted odds ratio (OR) = 8.3 (95% confidence interval [CI]: 2.63–26.40); $p < 0.0001$. After multivariable logistic regression, epidural use (adjusted OR: 5.80; 95% CI: 1.77–19.11), increasing parity (0.42; 0.32–0.55), and preeclampsia (0.31; 0.14–0.66) were significantly associated with chorioamnionitis.

Conclusion Epidural use is statistically associated with an increase in clinical diagnosis of chorioamnionitis. A cause and effect relationship cannot be confirmed from this study. Independently of labor duration and increasing parity, preeclampsia appeared protective.

Keywords
- epidural
- chorioamnionitis
- risk factors

EDA je spojena se vzestupem výskytu chorioamnionitidy

Epidural Use and Clinical Chorioamnionitis among Women Who Delivered Vaginally

Adi Abramovici, MD[1] Jeff M. Szychowski, PhD[2] Joseph R. Biggio, MD[1] Yasser Sakawi, MD[3]
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Am J Perinatol 2014;31:1009–1014.

Table 1 Patient characteristics by use of epidural

Characteristic	Nonepidural ($n = 294$)	Epidural ($n = 1,491$)	p Value
Parity, mean ± SD	1.7 ± 1.5	1.1 ± 1.2	< 0.0001
Pitocin for induction of labor, *n* (%)	53 (18%)	515 (35%)	< 0.0001
Race/ethnicity, *n* (%)			
Black	133 (45%)	920 (62%)	< 0.0001
Hispanic	119 (40%)	208 (14%)	
White/other	42 (14%)	363 (24%)	
Cervical dilatation at admission (cm), mean ± SD[a]	3.9 ± 1.9	2.9 ± 1.6	< 0.0001
Preeclampsia, *n* (%)	29 (10%)	186 (12%)	0.21
Preterm labor, *n* (%)	25 (9%)	156 (10%)	0.31
Gestational age at delivery (weeks), mean ± SD	39.1 ± 2.0	38.8 ± 2.1	0.046
Maternal years of age, mean ± SD	25.3 ± 5.9	23.8 ± 5.2	< 0.0001
BMI (kg/m^2), mean ± SD	31.9 ± 6.5	32.4 ± 7.2	0.27
Duration of labor (hours), mean ± SD[b]	4.8 ± 5.3	10.3 ± 11.3	< 0.0001
Postpartum fever (> 100.4°F), *n* (%)	3 (1%)	30 (2%)	0.25
$MgSO_4$ usage, *n* (%)	25 (9%)	160 (11%)	0.25

Abbreviations: BMI, body mass index; GA, gestational age; SD standard deviation.
[a]Forty-seven missing values.
[b]Three missing values.

Porodní nález při příjmu

Délka porodu

International Journal of Obstetric Anesthesia (2015) **24**, 313–322
0959-289X/$ - see front matter
http://dx.doi.org/10.1016/j.ijoa.2015.06.003

ORIGINAL ARTICLE

ELSEVIER
www.obstetanesthesia.com

Differences in maternal temperature during labour with remifentanil patient-controlled analgesia or epidural analgesia: a randomised controlled trial

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[a]*Department of Obstetrics, Leiden University Medical Center, Leiden, The Netherlands*
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[d]*Department of Anesthesiology, Leiden University Medical Center, Leiden, The Netherlands*

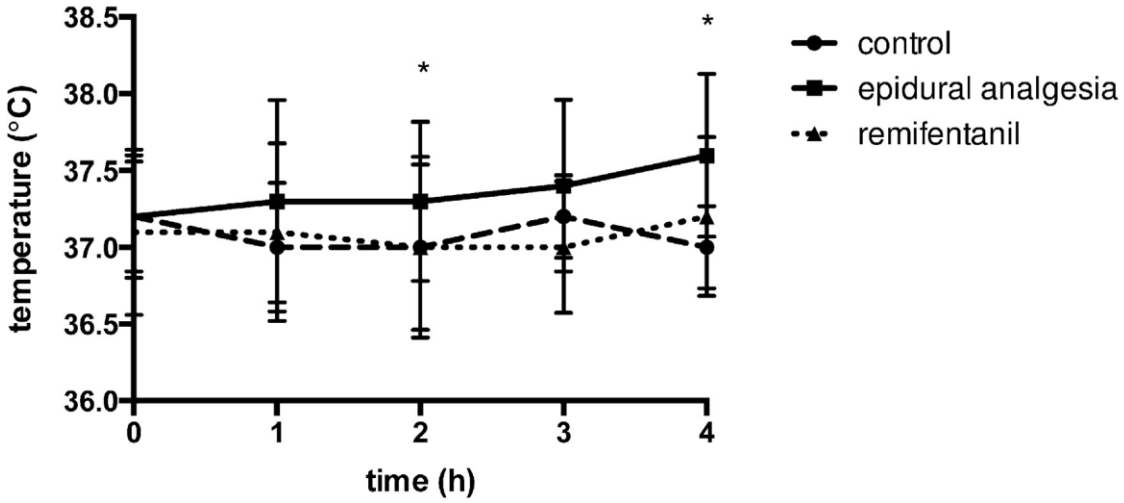

Fig. 2 Mean temperature as a function of time for remifentanil, epidural analgesia and control group. Vertical bars represent SD.
*$P < 0.05$

Prophylactic Acetaminophen Does Not Prevent Epidural Fever in Nulliparous Women: A Double-Blind Placebo-Controlled Trial

Laura Goetzl, MD, MPH
Jose Rivers, MD
Tracy Evans, RN
Deborah R. Citron, MD
Barbara E. Richardson, PhD
Ellice Lieberman, MD, DrPH
Maya S. Suresh, MD

paracetamol

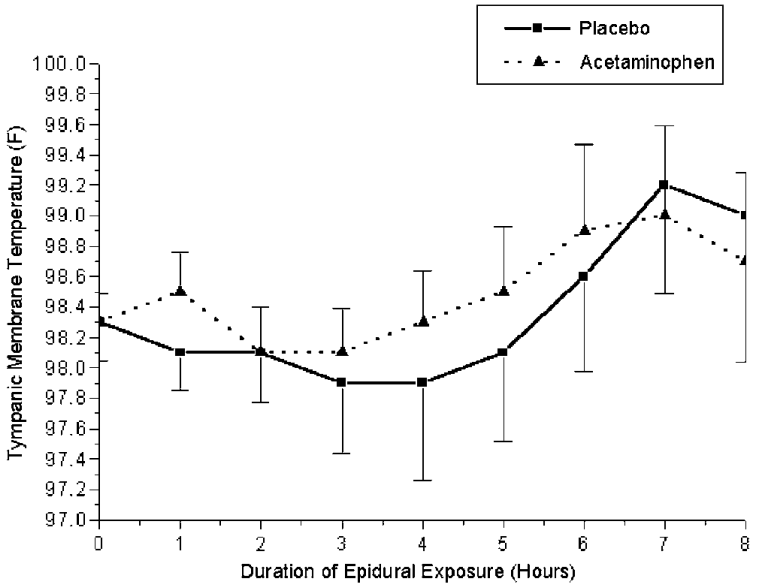

Figure 1. Maternal tympanic membrane temperature curve by treatment group.

Table 2 Pregnancy Outcomes by Treatment Group

Variable	Acetaminophen group ($n = 21$)	Placebo group ($n = 21$)	p-value
Fever >100.4°F	23.8%	23.8%	1.00
Low-grade fever >99.4°F	42.9%	42.9%	1.00
Maximum temperature (°F)	99.1±1.9	99.0±1.5	0.95
Duration of labor (hours)	16.2±1.5	16.6±2.1	0.88
Duration of ROM (hours)	8.4±0.9	9.0±1.2	0.73
Vaginal exams	6.4±0.5	5.7±0.5	0.30
Antibiotic treatment	30.0%	38.1%	0.42
IUPC use	52.4%	38.1%	0.54
Spontaneous vaginal birth	52.4%	61.9%	0.54
Birthweight (g)	3407±81.1	3208±77.3	0.08
5 min Apgar <7	4.8%	0%	1.00
Neonatal sepsis	33.3%	19.1%	0.48
Evaluations			
Placental inflammation	82.4%	62.5%	0.26

Means shown±SE. Student's t-tests, χ^2 used as appropriate ROM: rupture of membranes, IUPC: intrauterine pressure catheter.

Inflammation and Epidural-Related Maternal Fever: Proposed Mechanisms

Pervez Sultan, FRCA,* Anna L. David, PhD, FRCOG,† Roshan Fernando, MD, FRCA,* and Gareth L. Ackland, PhD, FRCA, FFICM‡

Intrapartum fever is associated with excessive maternal interventions as well as higher neonatal morbidity. Epidural-related maternal fever (ERMF) contributes to the development of intrapartum fever. The mechanism(s) for ERMF has remained elusive. Here, we consider how inflammatory mechanisms may be modulated by local anesthetic agents and their relevance to ERMF. We also critically reappraise the clinical data with regard to emerging concepts that explain how anesthetic drug–induced metabolic dysfunction, with or without activation of the inflammasome, might trigger the release of nonpathogenic, inflammatory molecules (danger-associated molecular patterns) likely to underlie ERMF. (Anesth Analg 2016;122:1546–53)

Trauma, Stress, and Inflammation from Epidural Catheter Insertion Alone

INFECTION VERSUS INFLAMMATION

Inflammation and Labor

A Direct Mechanistic Role for Local Anesthetic Agents

Inflammation and Epidural-Related Maternal Fever: Proposed Mechanisms

Pervez Sultan, FRCA,* Anna L. David, PhD, FRCOG,† Roshan Fernando, MD, FRCA,* and Gareth L. Ackland, PhD, FRCA, FFICM‡

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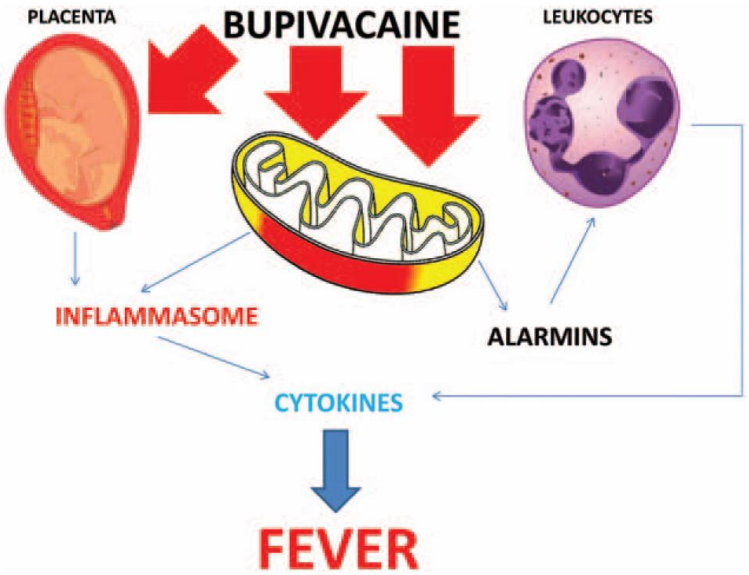

Figure 1. Proposed mechanism by which bupivacaine may cause epidural-related maternal fever. Bupivacaine causes cell injury by poisoning mitochondria. Injured cells release danger-to-self molecules known as alarmins, which provoke immune cells to generate fever-producing cytokines (pyrogens). Arrow pointing to uterus represents bupivacaine acting on the placenta/membrane. Arrows pointing to mitochondria indicate systemic bupivacaine absorbed from the epidural space. Increased levels of reactive oxygen species from injured mitochondria can also activate the inflammasome, which promotes the maturation of the inflammatory cytokines such as interleukin-1β and interleukin-18 and the induction of other fever-inducing cytokines.

Cochrane Central Register of Controlled Trials

Effect of epidural analgesia with 0.075% ropivacaine versus 0.1% ropivacaine on the maternal temperature during labor: a randomized controlled study

PubMed | Embase

Chinese medical journal, 2013, 126(22), 4301-4305 | added to CENTRAL: 31 January 2014 | 2014 Issue 1

Yue HL, Shao LJ, Li J, Wang YN, Wang L, Han RQ

Abstract

BACKGROUND: A wealth of evidence has indicated that labor epidural analgesia
overt clinical fever. Recently, evidence is emerging that the epidural analgesia-indu
analgesia and the variations in the epidural analgesia will affect the incidence of fever.
effects of epidural analgesia with 0.075% or 0.1% ropivacaine on the maternal temperature du

METHODS: Two hundred healthy term nulliparas were randomly assigned to receive epidural a with either 0.1% ropivacaine or 0.075% ropivacaine. Epidural analgesia was initiated with 10 ml increment of the randomized tion and 0.5 μg/ml sufentanyl after a negative test dose of 5 ml of 1.5% lidocaine, and maintained with 7 ml bolus doses of the above mentioned mixed analgesics every 30 minutes by the patient-controlled epidural analgesia. The measurements included the maternal oral temperature, visual analog scale pain scores, labor events and neonatal outcomes.

RESULTS: Epidural analgesia with 0.075% ropivacaine could significantly lower the mean maternal temperature at 4 hours after the initiation of analgesia and the oxytocin administration during labor compared with the one with 0.1% ropivacaine. Moreover, 0.075% ropivacaine treatment could provide satisfactory pain relief during labor and had no significant adverse effects on the labor events and neonatal outcomes.

CONCLUSION: Epidural analgesia with 0.075% ropivacaine may be a good choice for the epidural analgesia during labor.

PMID: 24238518

Nižší koncentrace ropivakainu snižuje výskyt epidurální horečky

International Journal of Obstetric Anesthesia (2008) **17**, 123–129

The incidence of maternal fever during labor is less with intermittent than with continuous epidural analgesia: a randomized controlled trial

V. R. R. Mantha,* M. C. Vallejo, V. Ramesh, A. L. Phelps, S. Ramanathan

Magee-Womens Hospital, University of Pittsburgh School of Medicine, Pittsburgh, A.J. Palumbo School of Business Administration, Duquesne University, Pittsburgh, PA, USA

Table 2 Incidence of fever during labor

	CLEA Fever (n)	ILEA Fever (n)	*P*
Time from epidural insertion			
Baseline	0 (46)	0 (46)	–
4 h	10 (44)	2 (42)	0.036
8 h	9 (26)	9 (20)	0.68
Delivery	13 (46)	10 (43)	0.77
Total	14 (46)	12 (43)	0.98
4 h post partum	3 (46)	1 (43)	0.49

Data are numerator (denominator).

International Journal of Obstetric Anesthesia (2008) **17**, 123–129

The incidence of maternal fever during labor is less with intermittent than with continuous epidural analgesia: a randomized controlled trial

V. R. R. Mantha,* M. C. Vallejo, V. Ramesh, A. L. Phelps, S. Ramanathan

Magee-Womens Hospital, University of Pittsburgh School of Medicine, Pittsburgh, A.J. Palumbo School of Business Administration, Duquesne University, Pittsburgh, PA, USA

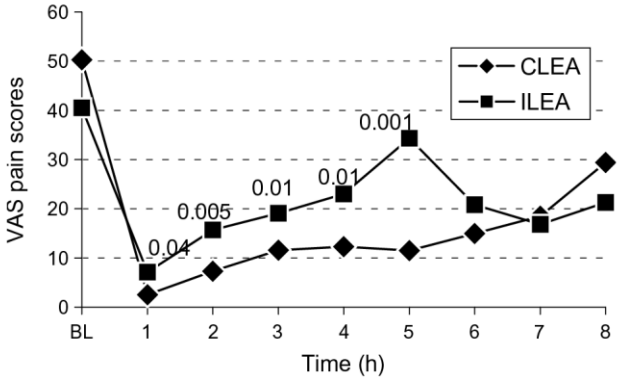

Figure 2 Mean VAS pain scores over time in CLEA and ILEA groups. BL = baseline values at epidural insertion. Statistically significant *P* values between CLEA and ILEA are given at the respective time points.

Table 5 Labor and epidural characteristics

	CLEA	n	ILEA	n	*P* value
Number of vaginal examinations	6.2 (2.3)	46	5.4 (2.0)	43	0.08
Use of internal monitors	17	46	17	43	0.98
Oxytocin augmentation	32	46	37	43	0.11
AROM	30	46	29	43	1.0
GBS positive	9	46	7	43	0.90
Chorioamnionitis	4	46	5	43	0.92
ROM to full dilatation (min)	370 ± 267	38	404 ± 261	39	0.57
Epidural insertion to full dilatation (min)	290 ± 158	39	300 ± 168	40	0.83
Epidural insertion to delivery (min)	426 ± 187	46	393 ± 199	43	0.42
Full cervical dilatation to delivery (min)	133 ± 91.8	39	80 ± 65	40	0.004
Normal vaginal delivery	26	46	37	43	0.005
Assisted vaginal delivery	6	46	1	43	0.24
Cesarean section	14	46	5	43	0.06
Epidural drugs and doses					
0.125% bupivacaine (mg)	88.6 ± 51	29	43.4 ± 22	25	<0.001
0.1% ropivacaine (mg)	86.2 ± 23	17	38.3 ± 21	20	<0.001
Fentanyl (μg)	264 ± 80	46	184.3 ± 63	43	<0.001
No of epidural boluses	1.3 ± 1.5	46	3.7 ± 2.3	43	<0.001

Data are mean ± standard deviation or number.
ROM: rupture of membranes; AROM: artificial rupture of membranes; GBS positive: group *B* streptococcal colonization of genital tract.

Regular intermittent bolus provides similar incidence of maternal fever compared with continuous infusion during epidural labor analgesia

Shan-Wu Feng, MS, MD, *Shi-Qin Xu,* MS, MD, *Li Ma,* MS, MD, *Cai-Jua*
Hong-Mei Yuan, MS, MD, *Fu-Zhou Wang,* MD, PhD, *Xiao-Feng Shen,*

Objectives: To compare the effects of regular intermittent bolus versus continuous infusion for epidural labor analgesia on maternal temperature and serum interleukin-6 (IL-6) level.

Methods: This randomized trial was performed in Nanjing Maternity and Child Health Care Hospital, Nanjing, Jiangsu Province, China between October 2012 and February 2014. Either regular intermittent bolus (RIB, n=66) or continuous infusion (CI, n=66) was used for epidural labor analgesia. A bolus dose (10 ml of 0.08% ropivacaine + 0.4 μg·ml^{-1} sufentanil) was manually administrated once an hour in the RIB group, whereas the same solution was continuously infused at a constant rate of 10 ml·h^{-1} in the CI group. Maternal tympanic temperature and serum IL-6 level were measured hourly from baseline to one hour post partum. The incidences of fever (≥38°C) were calculated.

Results: The incidence of maternal fever was similar between the 2 groups. There was a rising trend in mean temperature over time in both groups, but no statistical difference was detected between the groups at respective time points; maternal serum IL-6 showed similar changes.

Conclusion: Compared with continuous infusion, regular intermittent bolus presents with the same incidence of maternal fever for epidural labor analgesia. Interleukin-6 elevation could be involved in mean maternal temperature increase.

Saudi Med J 2014; Vol. 35 (10): 1237-1242

Table 3 - Incidence of maternal fever.

Time	RIB group	CI group	*P*-value
1 hour	0 (63)	0 (62)	-
2 hours	1 (63)	2 (62)	0.989
3 hours	0 (57)	2 (58)	0.496
4 hours	2 (47)	4 (50)	0.731
5 hours	4 (31)	5 (33)	1.000
Delivery	6 (63)	7 (62)	0.746
1 h post delivery	4 (63)	5 (62)	0.980
Total	6 (63)	8 (62)	0.549

Values are positive (total). RIB - regular intermittent bolus, CI - continuous infusion.

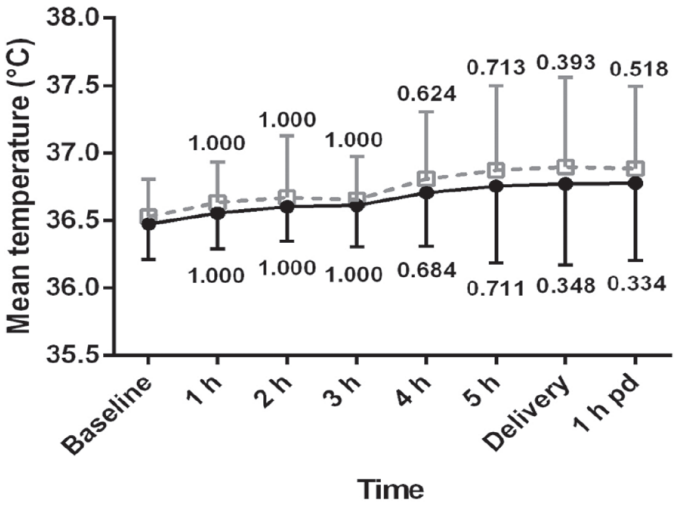

Figure 3 - Maternal mean temperatures in RIB (black solid line) or CI group (grey dotted line) over time. Error bars are mean and standard deviation. Compared with baseline, *p*-values are presented at corresponding time point. RIB - regular intermittent bolus, CI - continuous infusion, pd - post delivery.


KROMĚ MNE...
Everybody lies.
HOUSE MD