JAN BLÁHA

KLINIKA ANESTEZIOLOGIE, RESUSCITACE
A INTENZIVNÍ MEDICÍNY

1. LÉKAŘSKÁ FAKULTA
Univerzita Karlova

VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

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A TOHLE VÍTE?

10 years AKUTNE.CZ®
XII. KONFERENCE


COVID-19

Fardelmann & Alian *Anesthesiology Clin 38 (2020) 85–105*

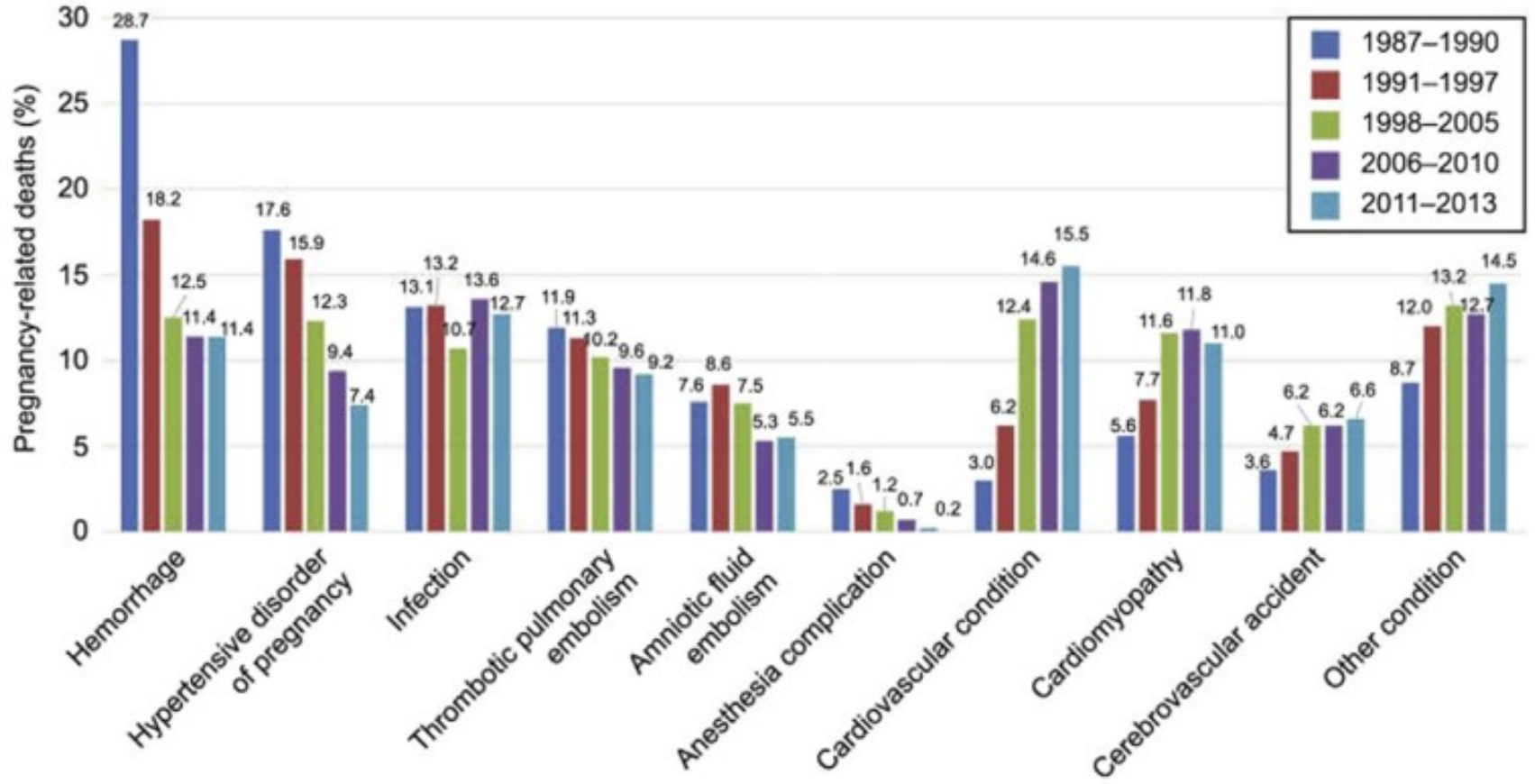


Fig. 1. Population-level, cause-specific proportionate pregnancy-related mortality (%) for 1987 to 1990 and 2011 to 2013. (*Adapted from* Creanga AA, Syverson C, Seed K, et al. Pregnancy-Related Mortality in the United States, 2011-2013. Obstet Gyneco 2017;130(2):366-373; with permission.)

COVID-19

D. Benhamou et al. / Anaesth Crit Care Pain Med 39 (2020) 351–353

Appendix 2: Thromboembolic risk in pregnant women with COVID disease (confirmed or suspected)

Caro

Changes in haemostasis appear to be present in patients infected with SARS-CoV2 (COVID-19). In this context, the CARO proposes the following assessment and management strategy (as of April 15, 2020)

THROMBOEMEBOLIC RISK FACTORS IN THE PRE-PARTUM PERIOD IN WOMEN WITH COVID-19 DISEASE	
Major risk factors	- History of personal thromboembolic disease - Asymptomatic high-risk thrombophilia - Symptomatic antiphospholipid syndrome - O_2 therapy > 4 L/min or HFNO* or mechanical ventilation
Minor risk factors	- Obesity (BMI > 30) or weight > 120 kg - Prolonged and complete immobilization - Others...

Low risk	No risk factor
Moderate risk	- 1 to 2 combined minor risk factors
High risk	At least one major risk factor or ≥ 3 minor risk factors

* HFNO: high flow nasal oxygen

Prophylaxis in the PRE-PARTUM period

- **Low risk**: No prophylaxis
- **Moderate risk**: LMWH at standard prophylactic dose (e.g. enoxaparin 4000 IU/24h SC).
- **High risk**: LMWH at intermediate dose (e.g. enoxaparin 4000 IU/12h SC or 6000 IU/12h SC if weight > 120 kg)*.
- Duration: until Covid-19 recovery
- Do not start prophylaxis if delivery is imminent (obstetrical advice)

* *intermediate dose LMWH: monitor anti-Xa activity 4 hours after the 3rd injection, then regularly if renal insufficiency, to avoid overdose (variable threshold value for each LMWH) exposing to a higher risk of bleeding*

⚠ **Take into account the dose of LMWH for the management of childbirth and neuraxial [illegible]**

Prophylaxis in the POST-PARTUM period

Reassess regularly, if recovery confirmed, treat as usual

If Covid-associated symptoms still present: Mode of delivery

Vaginal delivery

Low risk: Consider LMWH or anti-thrombotic elastic stockings
Moderate risk: Prophylactic dose of LMWH ± anti-thrombotic elastic stockings
High risk: Intermediate dose of LMWH ± anti-thrombotic elastic stockings
Duration: until Covid-19 recovery

Caesarean section

- ❑ Prophylactic dose of LMWH
- ❑ ± anti-thrombotic elastic stockings
- ❑ Duration adapted to the level of risk (see OR depicted in CNGOF 2015 *)

* Sénat MV et al. Eur J Obstet Gynecol Reprod Biol. 2016 Jul;202:1-8

Bláha. Anest. intenziv. Med., 24, 2013, č. 2, s. 91–101

DVT v anamnéze
+ vždy, když jsou LMWH aplikovány již antenatálně

→ **VYSOKÉ RIZIKO**
= LMWH + kompresní punčochy
Tromboprofylaxe nejméně 6 týdnů po porodu.

Akutní císařský řez v průběhu porodu
Asymptomatická trombofilie *(vrozená i získaná)*
BMI > 40 kg/m²
Prodloužená hospitalizace
Významné komorbidity
(onemocnění srdce a plic, zánětlivé stavy, SLE, nádory, nefrotický syndrom a další)
Abusus drog

→ **STŘEDNÍ RIZIKO**
= LMWH
Tromboprofylaxe nejméně 6 týdnů po porodu.
Pokud rizikové faktory v šestinedělí přetrvávají, nebo jsou přítomny > 3 rizikové faktory, je nutno zvážit prodloužení tromboprofylaxe.

Věk > 35 let
Obezita (BMI > 30kg/m²)
Parita < 3
Kouření
Elektivní císařský řez
Chirurgický výkon v šestinedělí
Větší varikózní žíly
[illegible] systémová infekce
Imobilita, transport na delší vzdálenost (> 4 h)
Preeklampsie
Operační vaginální porod
Protrahovaný porod (>24 h)
Peripartální krvácení > 1000 ml nebo podání krevní transfuze

→ **2 a více rizikové faktory**

→ **< 2 rizikové faktory**

→ **NÍZKÉ RIZIKO**
= Časná mobilizace a dostatečná hydratace

1. Pokud není přítomno krvácení nebo krvácivý stav, je farmakologická profylaxe TEN po císařském řezu zahájena 2 hodiny po porodu.
2. U pacientek s nízkým rizikem TEN je hlavní částí profylaxe časná mobilizace a dostatečná hydratace.
3. U pacientek se středním rizikem TEN je profylaktické podávání LMWH prodlouženo na 7 dní.
4. U pacientek s vysokým rizikem TEN jsou LMWH aplikovány po celé šestinedělí.

COVID-19: RECOMMENDATIONS FOR REGIONAL ANESTHESIA

Summary of Current Recommendations for Performing Regional Anesthesia for COVID-19 Positive Patients or Persons Under Investigation (PUI)

* Note that once community spread of COVID-19 is significant enough, these recommendations can apply to all patients

Planning and Preparation

Review COVID-19 status of patient

Oxygen delivery to awake patient: Surgical mask over oxygen mask

Patient to wear surgical mask at all times

Personal protective equipment (PPE) for healthcare workers:

- eye/face protection
- surgical mask
- gown
- double gloving
- shoe covers

Regional anesthesia is preferred whenever possible:

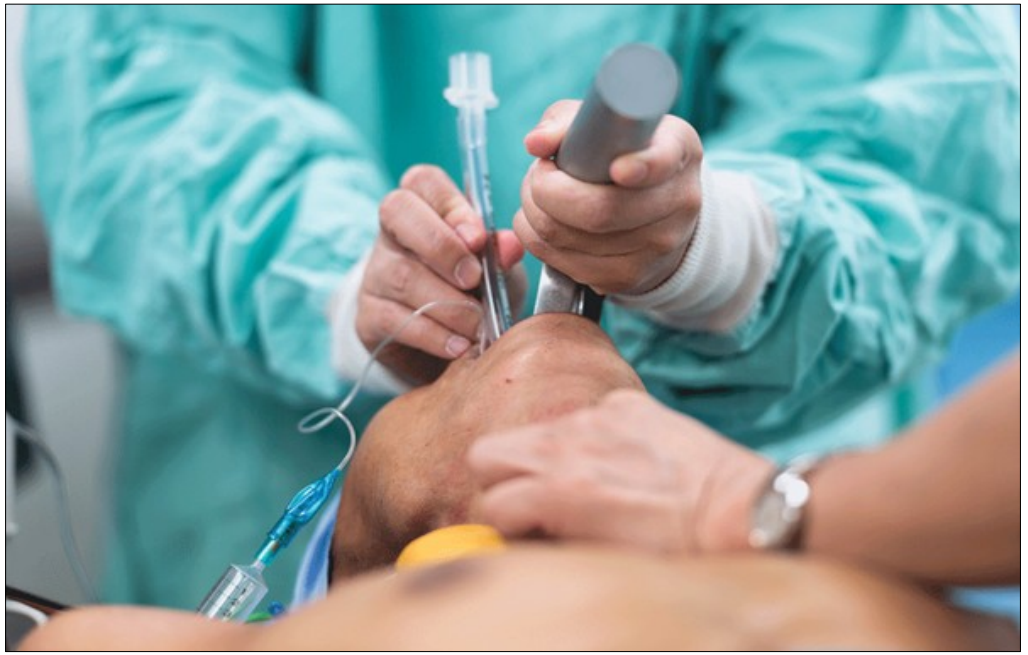
- Lowered risk of postoperative complications
- Reduced need for aerosol - producing general anesthesia (GA)
- Reduced risk of viral transmission to healthcare workers
- Preserves respiratory function if compromised by COVID-19 pneumonia

Unplanned conversion to GA is least desirable!

Neuraxial Anesthesia Precautions

- COVID-19 infection is not a contraindication to performing neuraxial anesthesia
- Experienced provider should perform procedures
- Minimize deep sedation to avoid airway intervention
- Consider risks of epidural blood patch in the setting of viral infection

krevní zátka ?



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

The NEW ENGLAND JOURNAL of MEDICINE

Barrier Enclosure during Endotracheal Intubation

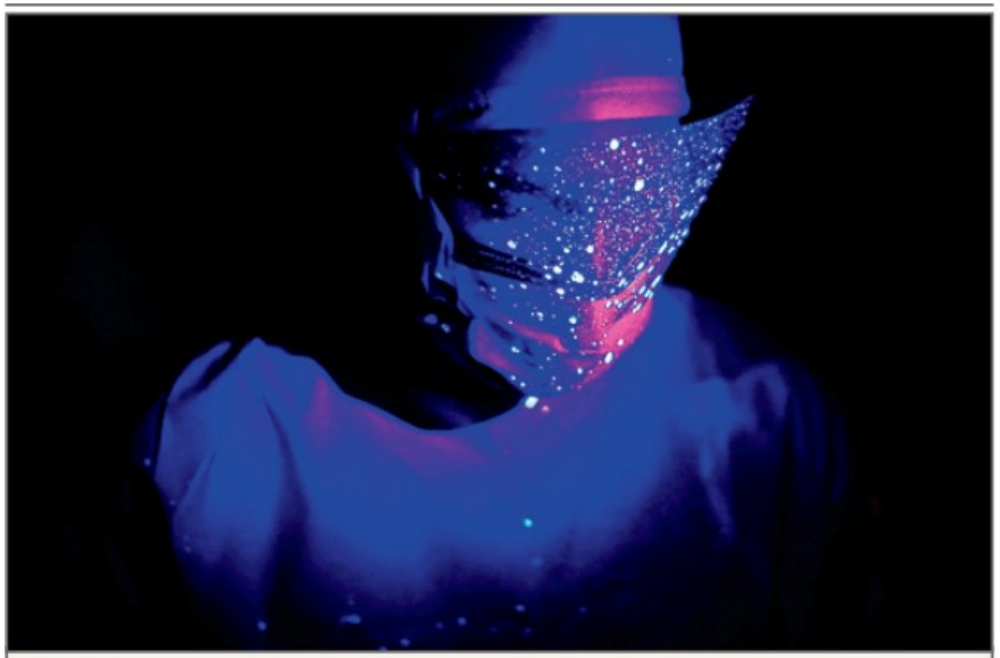


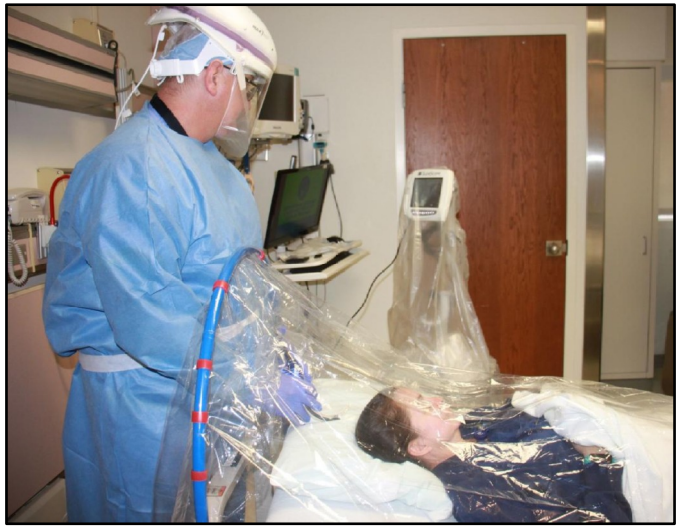
Figure 1. Fluorescent Dye Expelled from a Simulated Patient Cough That Ended Up on the Laryngoscopist.

A video showing the simulation is available at NEJM.org

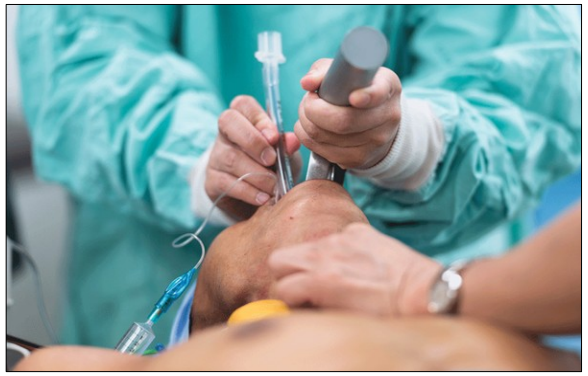
N ENGL J MED 382;20 NEJM.ORG MAY 14, 2020

Robert Canelli, M.D.
Boston Medical Center, Boston, MA


Xinhua Video




Já se bojím neočekávané obtížné intubace !



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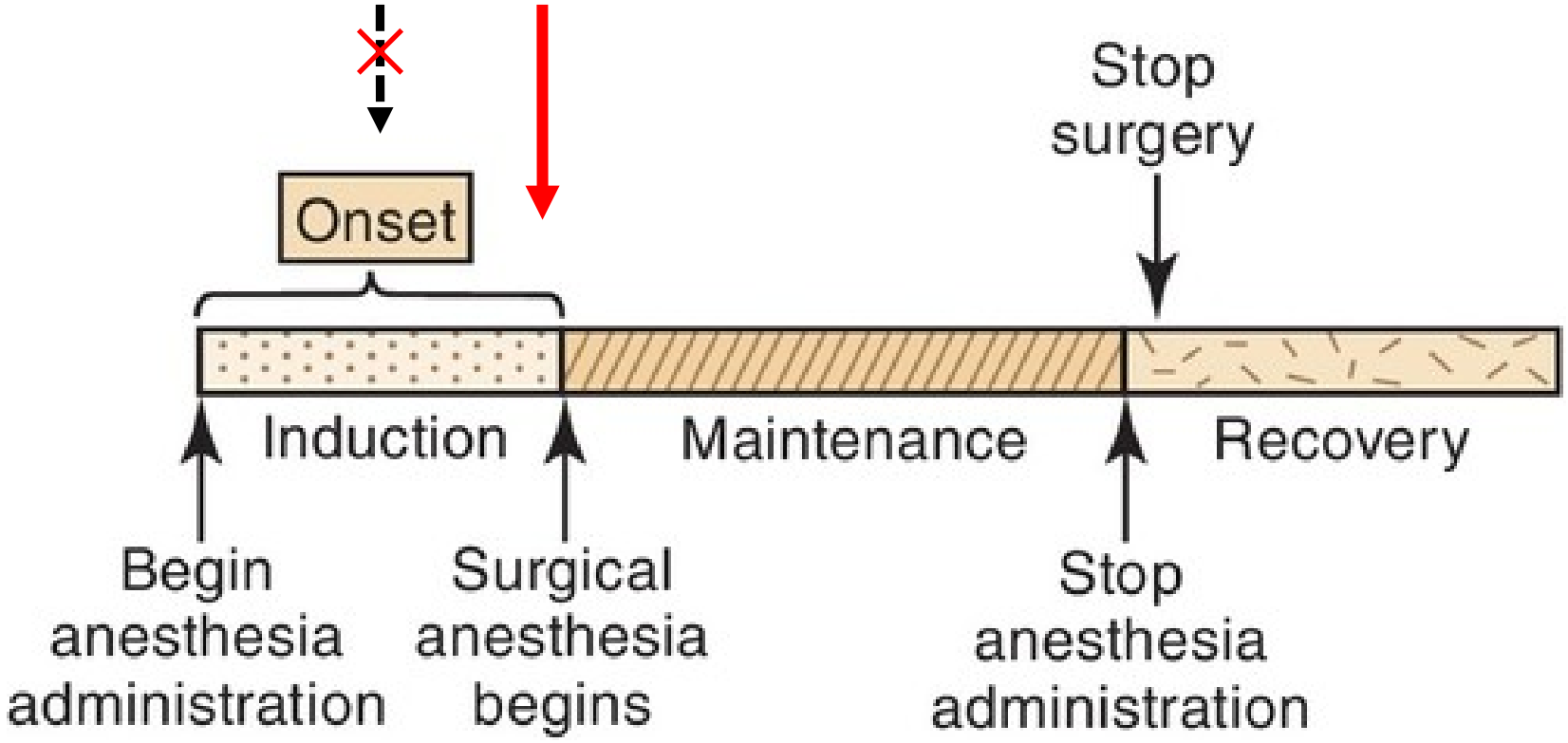
Stop
surgery
Onset
Induction
Maintenance
Recovery
Begin
anesthesia
administration
Surgical
anesthesia
begins
Stop
anesthesia
administration

International Journal of Obstetric Anesthesia (2019) xxx, xxx–xxx
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https://doi.org/10.1016/j.ijoa.2019.08.005

ORIGINAL ARTICLE

ELSEVIER
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Surgical conditions with rocuronium versus suxamethonium in cesarean section: a randomized trial

J. Bláha,[a,†] P. Nosková,[a,†] K. Hlinecká,[b] V. Krakovská,[c] V. Fundová,[a] T. Bartošová,[a] P. Michálek,[a] M. Stříteský[a]

Table 2 Times from induction of anesthesia to end of surgery; and induction characteristics.

	Rocuronium group		Suxamethonium group		*Difference in means*	*P-value*
	Mean	*Median*	*mean*	*median*		
Induction – delivery interval (s)	268.4 (72.9)	265 (223–330)	275.6 (63.4)	267 (239–400)	−7.2 (−39.5 to 19.3)	0.62
Induction – intubation interval (s)	105.8 (33.7)	108 (77–134)	67.6 (32.1)	63 (50–123)	38.2 (24.4 to 52.0)	<0.001
Incision – delivery interval (s)	146.6 (68.3)	130 (99–179)	196.2 (50.7)	201 (167–277)	−49.7 (−74.8 to −24.4)	0.0002
Intubation – incision interval (min)	15.8 (6.9)	15 (4–43)	11.7 (6.4)	10 (3–29)	4.1 (0.4 to 7.8)	0.061
Length of surgery (min)	39.3 (8.9)	39 (27–53)	39.4 (9.6)	39 (26–54)	0.1 (−4.0 to 3.8)	0.976
End of surgery to extubation (min)	5.2 (4.6)	4 (0–13)	8.8 (5.8)	8 (2–19)	−3.5 (−5.8 to 1.4)	0.002
SRSD (points)	3.73 (0.53)	4 (3–5)	2.77 (0.5)	3 (2–4)	1.0 (−0.01 to 0.20)	<0.001
Blood loss (mL)	533 (76)	500 (500–600)	538 (98)	500 (500–650)	−5 (−38 to 28)	0.859
Thiopental (mg/kg)	4.7 (0.16)	4.7 (4.5–5.1)	4.7 (0.21)	4.7 (4.5–5.3)		0.471
Muscle relaxant dose (mL/kg)	0.092 (0.01)	0.093 (0.090–0.106)	0.095 (0.00)	0.094 (0.09–0.106)		0.072
Muscle relaxant dose (mg/kg)	0.55 (0.05)	0.56 (0.54–0.65)	0.95 (0.04)	0.94 (0.9–0.11)		0.177

Data are presented as mean (SD) or median (range). Difference between the groups is expressed as median (95% confidence interval). SRSD: Surgical rating scale for delivery.

Doba nástupu účinku SCH je 50-60 sec !

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.

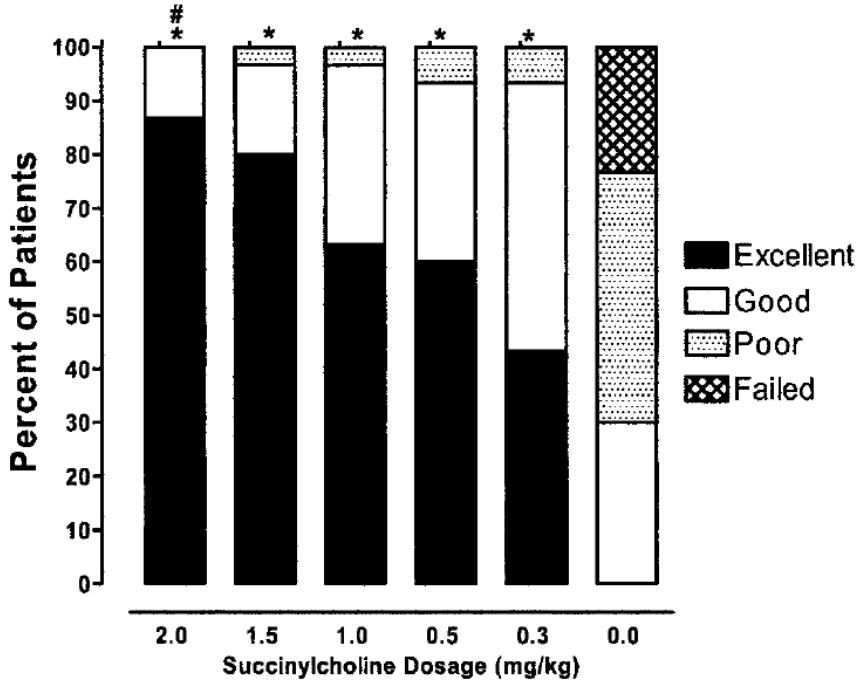
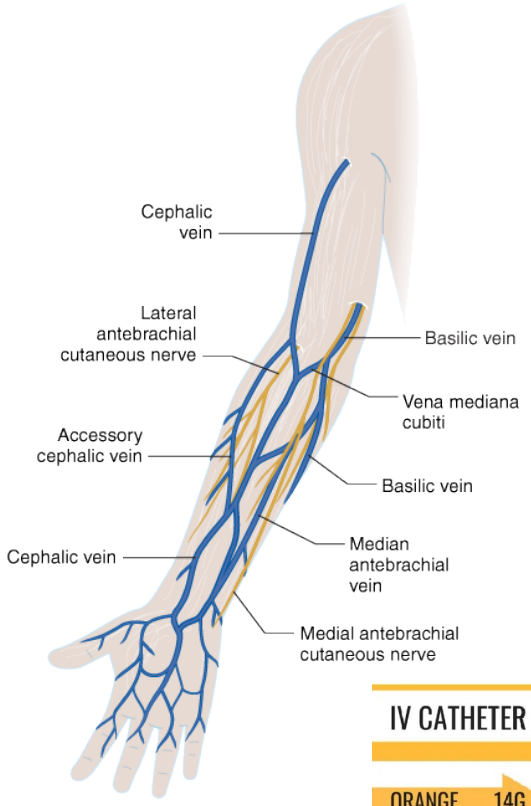
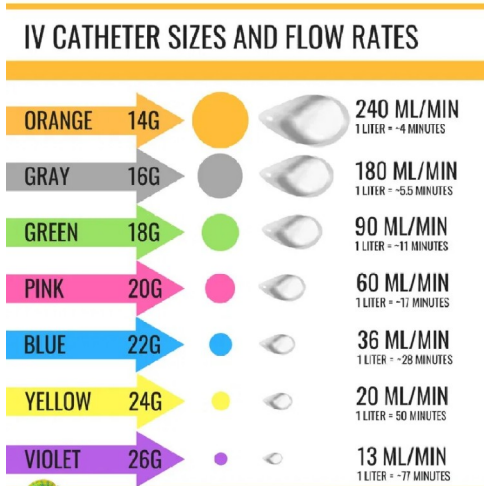


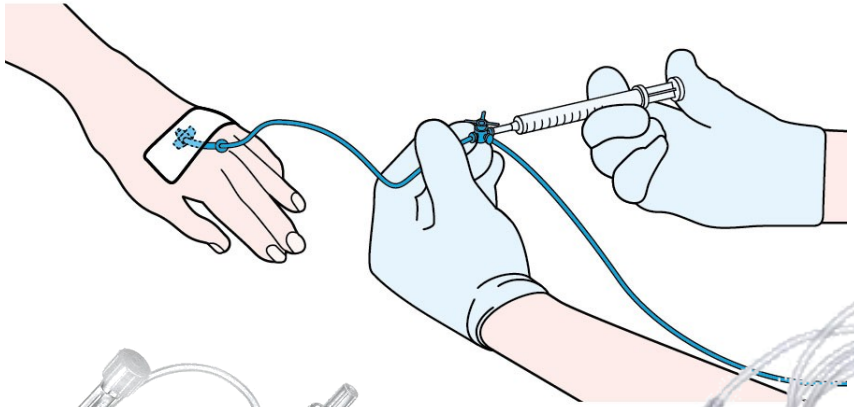
Figure 1. Intubating conditions with different doses of succinylcholine (n = 30 in. each group). The incidence of excellent intubating conditions was significantly more frequent (*$P < 0.001$) in patients receiving succinylcholine than in those of the control group and in the 2.0 mg/kg succinylcholine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

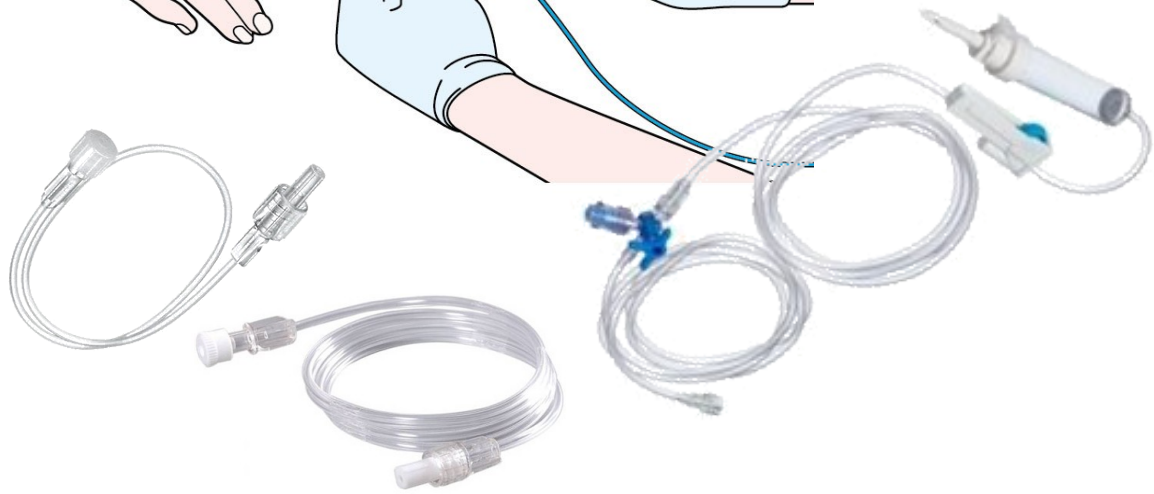
Naguib M et al. Anesth Analg 2006;102:151–5

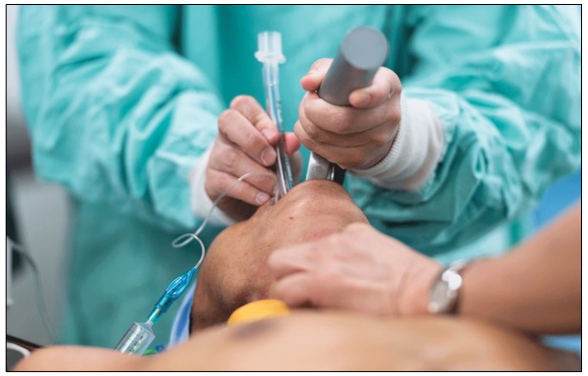
Doba nástupu účinku myorelaxancia záleží ale i na způsobu aplikace !!











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Onset

Induction

Mainten

Begin anesthesia administration

Surgical anesthesia begins

International Journal of Obstetric Anesthesia (2019) xxx, xxx–xxx
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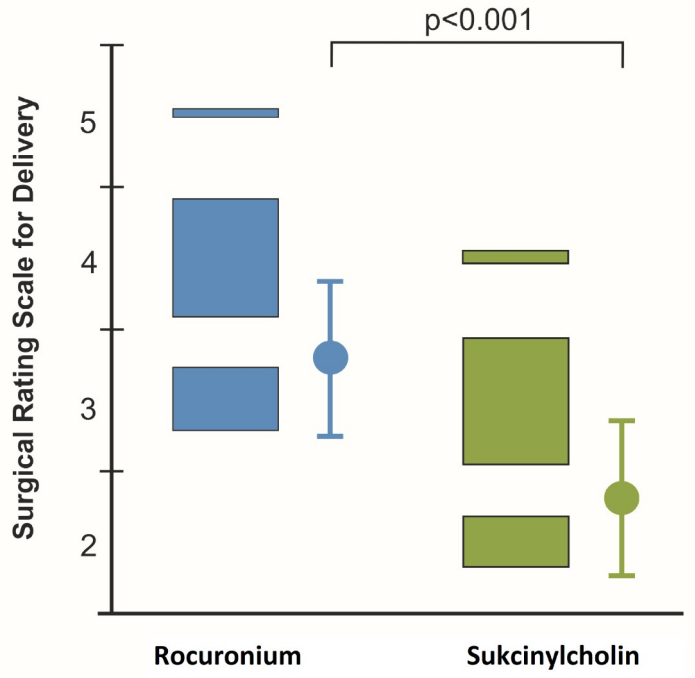

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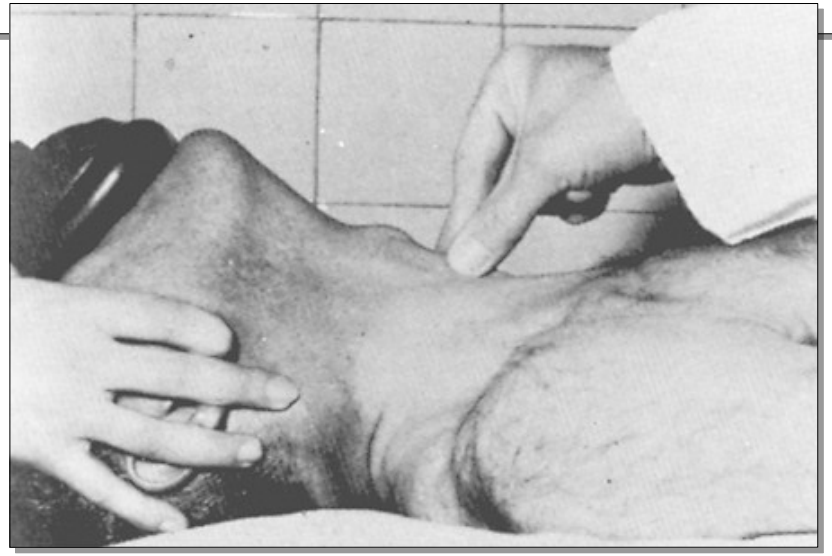
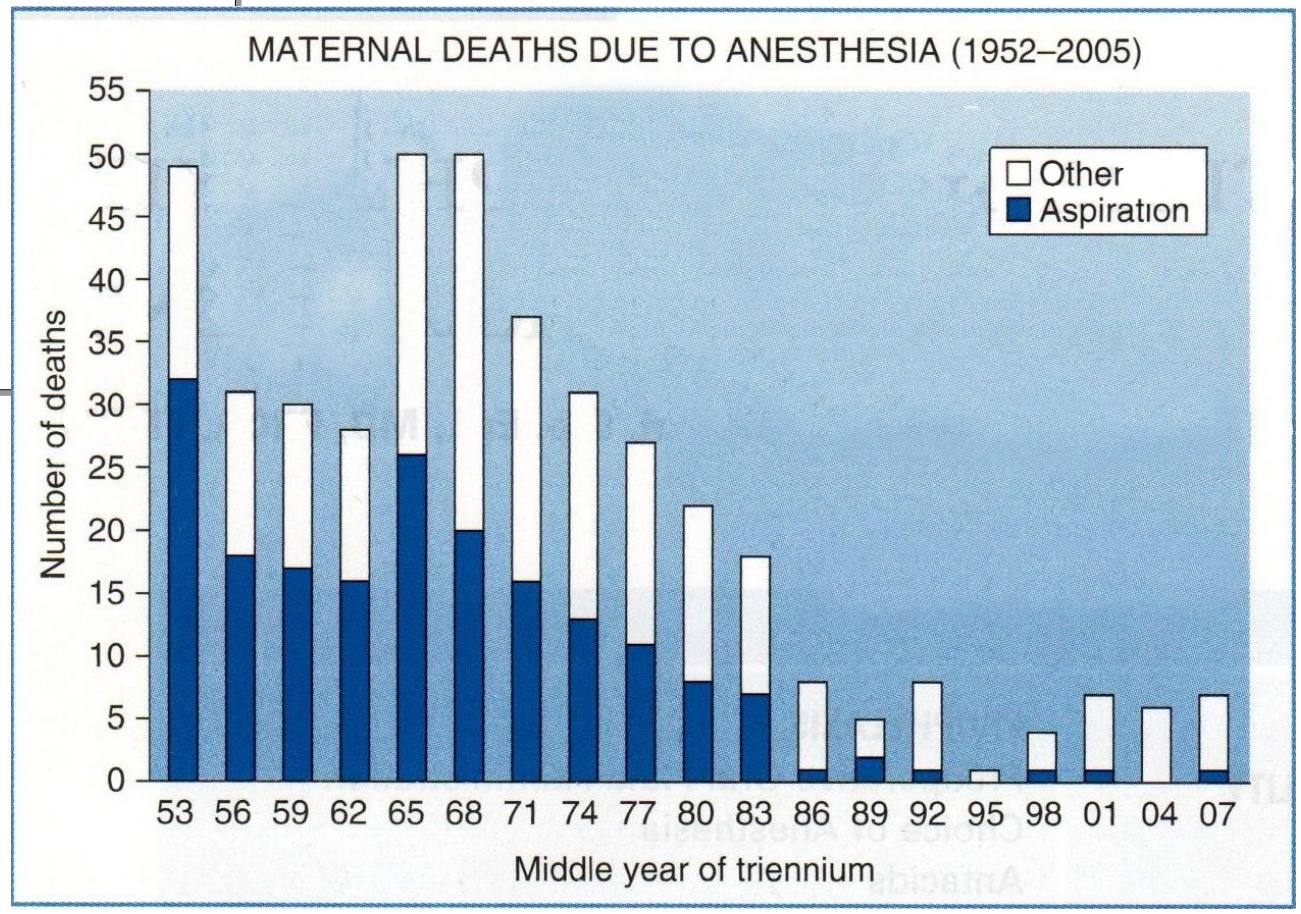




Sharp LM, Levy DM. Current Opinion in Anaesthesiology 2009, 22:357-361

Anaesthesia, 1993, Volume 48, pages 53–57

Forum

An evaluation of gastric emptying times in pregnancy and the puerperium

E. M. Whitehead,* BSc, FFARCS, Research Registrar, M. Smith,† MB, BS, FFARCS, Y. Dean, MB, BS, FRCA, Senior Registrars, G. O'Sullivan, MD, FFARCS, Consultant Anaesthetist, St Thomas' Hospital, Lambeth Palace Road, London SE1 7EH.

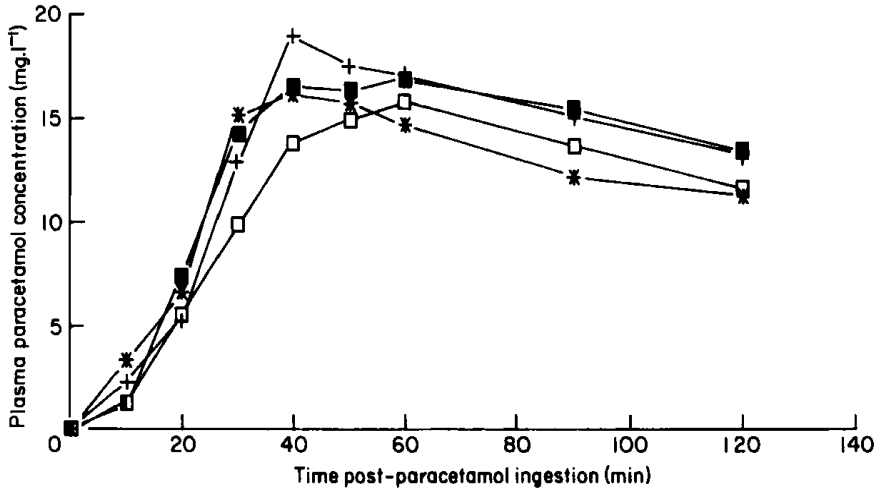


Fig. 1. Plasma paracetamol concentration vs time postparacetamol ingestion for the control (■), first (+), second (*) and third (□) trimester groups. Plasma paracetamol concentrations are expressed as median values.

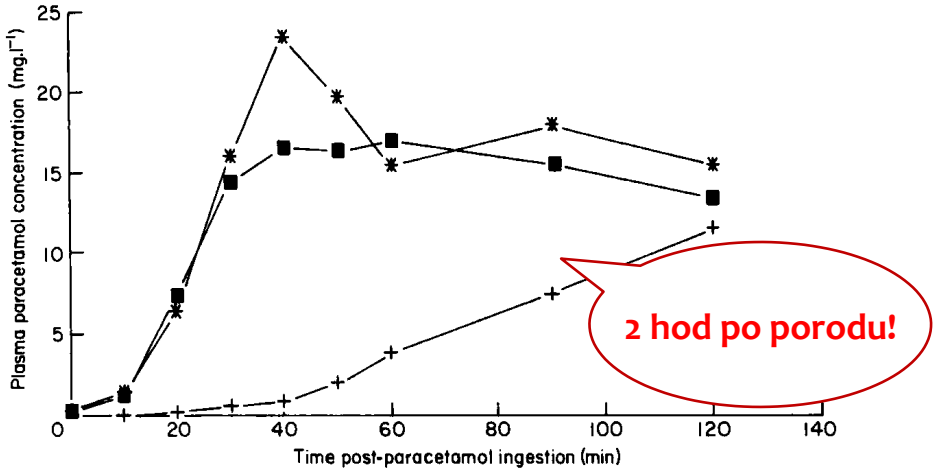


Fig. 3. Plasma paracetamol concentration vs time postparacetamol ingestion for the control group (■) and 12 mothers within 2 h postdelivery (+) and on the second postpartum day (*). Plasma paracetamol concentrations are expressed as median values.

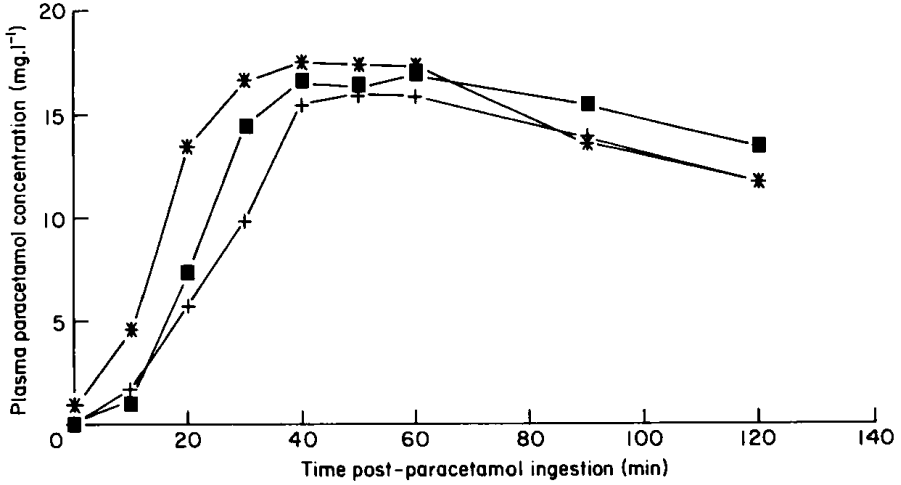
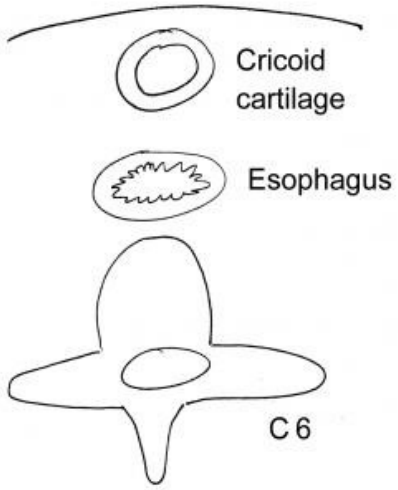
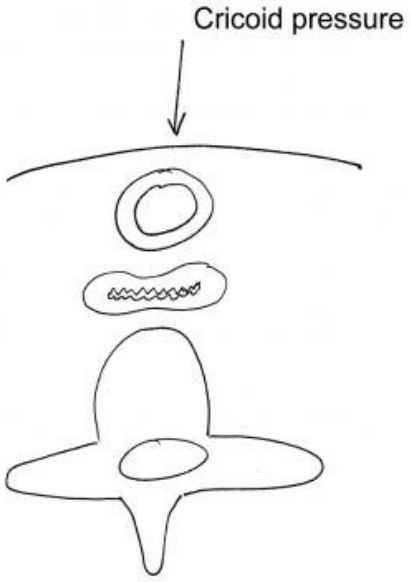


Fig. 2. Plasma paracetamol concentration vs time postparacetamol ingestion for the control group (■) and 30 females during the third trimester of pregnancy (+) and postdelivery between 18 and 48 h (*). Plasma paracetamol concentrations are expressed as median values.





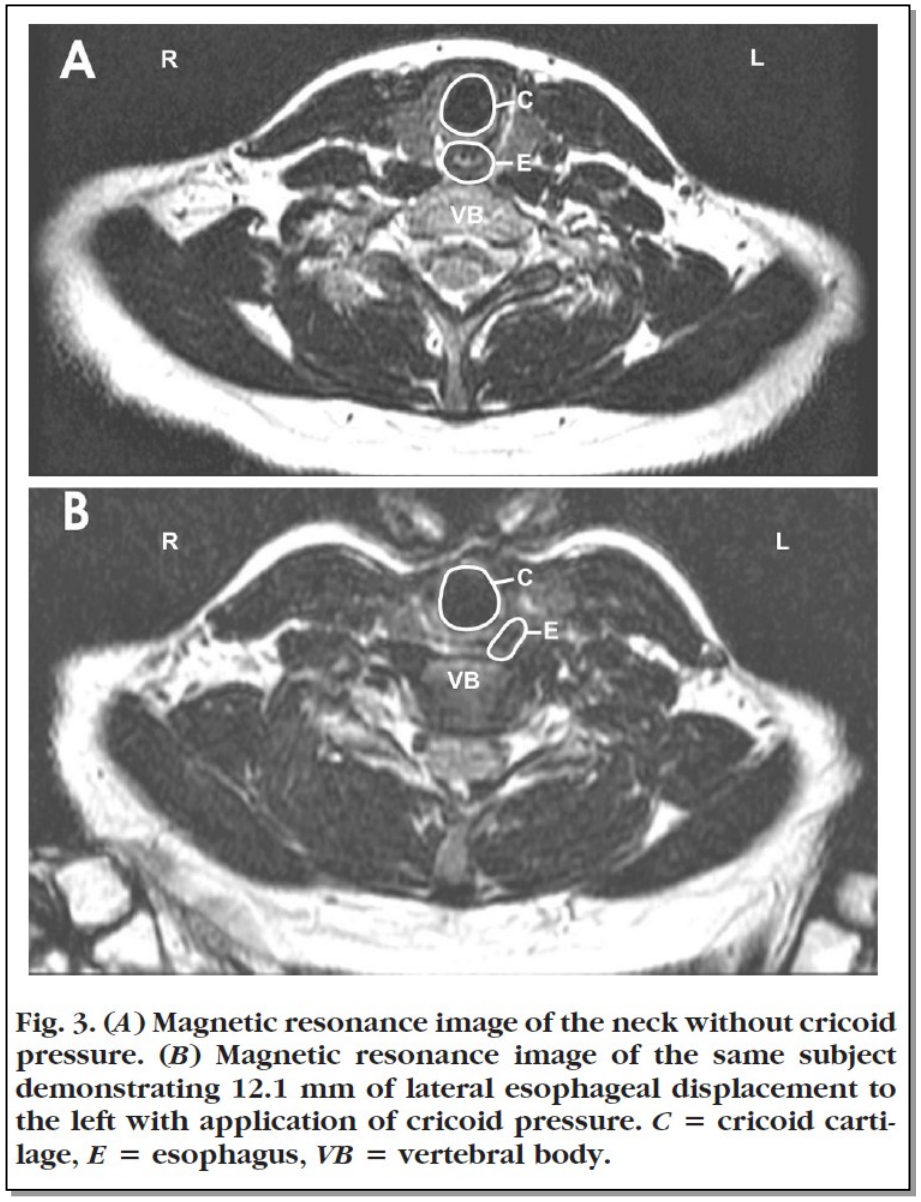
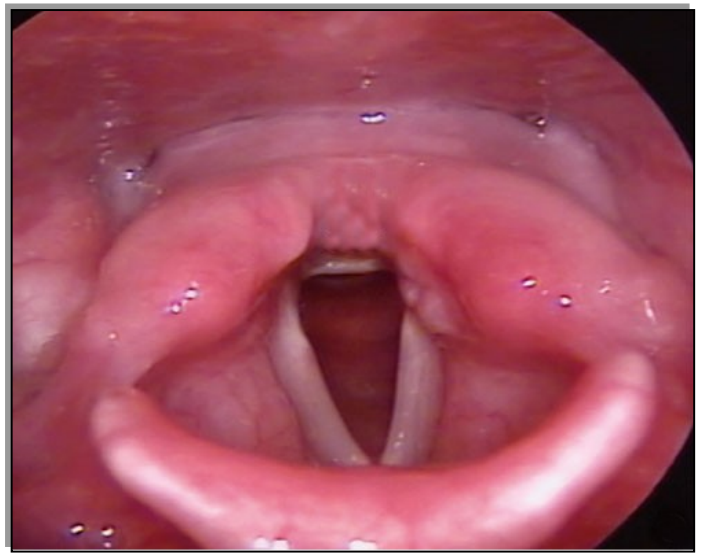
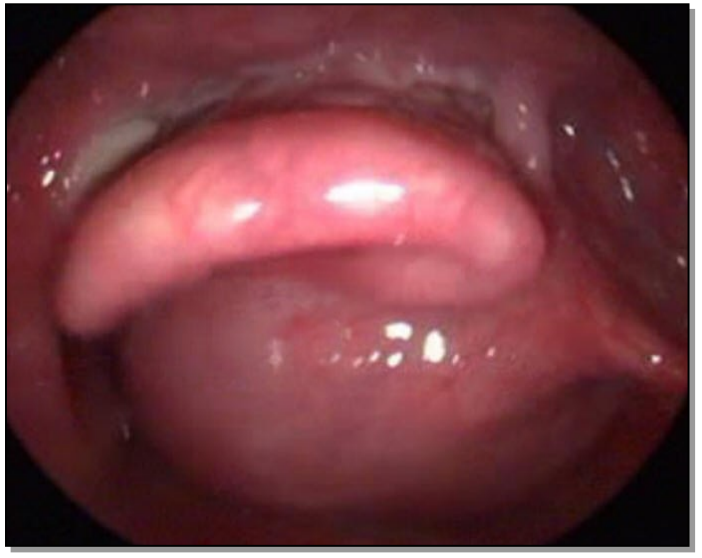


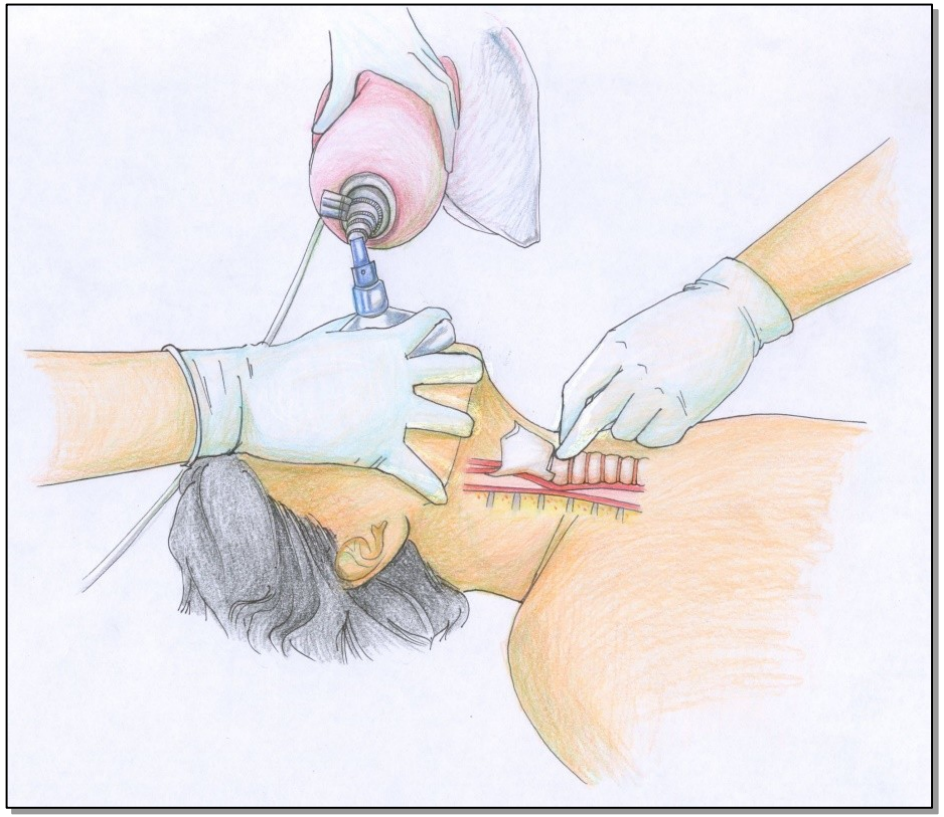
Fig. 3. (*A*) Magnetic resonance image of the neck without cricoid pressure. (*B*) Magnetic resonance image of the same subject demonstrating 12.1 mm of lateral esophageal displacement to the left with application of cricoid pressure. *C* = cricoid cartilage, *E* = esophagus, *VB* = vertebral body.





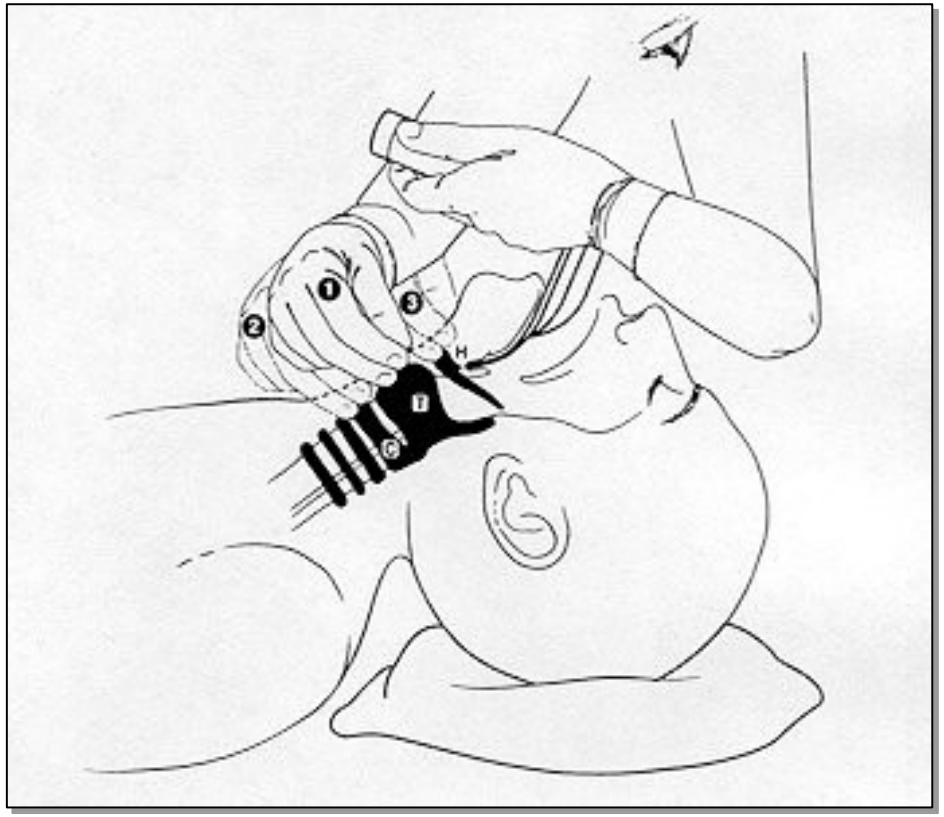
Smith KJ et al. Anesthesiology 2003; 99:60-4
Rice et al. Anesth Analg 2009;109:1546-52
Haslam et al. Anaesthesia 2005; 60: 41-47

Sellick's Maneuver



"BURP"

Backward, Upward, Rightward Pressure



V 90% případů získáme nejlepší "pohled" tlakem na **štítnou chrupavku**, **nikoli krikoidální!**

HYPOTENZE

Anaesthesia 2017 doi:10.1111/anae.14080

Guidelines

International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia

S. M. Kinsella,[1] B. Carvalho,[2] R. A. Dyer,[3] R. Fernando,[4] N. McDonnell,[5] F. J. Mercier,[6] A. Palanisamy,[7] A. T. H. Sia,[8] M. Van de Velde[9,10] and A. Vercueil[11]

Recommendations for best clinical practice

1 Hypotension following spinal or combined spinal-epidural anaesthesia at caesarean section causes both maternal and fetal/neonatal adverse effects.

2 Hypotension is frequent and, therefore, vasopressors should be used routinely and preferably prophylactically.

3 α-agonist drugs are the most appropriate agents to treat or prevent hypotension following spinal anaesthesia. Although those with a small amount of β-agonist activity may have the best profile (noradrenaline (norepinephrine), metaraminol), phenylephrine is currently recommended due to the amount of supporting data. Single-dilution techniques, and/or prefilled syringes should be considered.

4 Left lateral uterine displacement and intravenous (i.v.) colloid pre-loading or crystalloid coloading, should be used in addition to vasopressors.

Table 1 Comparison of commonly used vasopressors.

	Ephedrine	Phenylephrine	Metaraminol	Noradrenaline	Adrenaline
Receptor	β1, β2, weak α	α1	α1, weak β	α1, β	α1, β
Mechanism	Indirect, weak direct	Direct	Direct and indirect	Direct	Direct
Onset	Slow	Immediate	1–2 min	Immediate	Immediate
Duration	Prolonged	Intermediate	Prolonged	Short	Short

vasopresory nejlépe profylakticky

alfa-agonisté jsou nejlepší

prevence aorto-kavální komprese
a koloidní preload/ krystaloidní koload

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Techniques for preventing hypotension during spinal anaesthesia for caesarean section

Cochrane Systematic Review - Intervention | Version published: 01 July 2020 see what's new

https://doi.org/10.1002/14651858.CD002251.pub4

Cheryl Chooi | Julia J Cox | Richard S Lumb | Philippa Middleton | Mark Chemali | Richard S Emmett | Scott W Simmons | Allan M Cyna

Cochrane Database of Systematic Reviews 2020, Issue 7. Art. No.: CD002251.
DOI: 10.1002/14651858.CD002251.pub4.

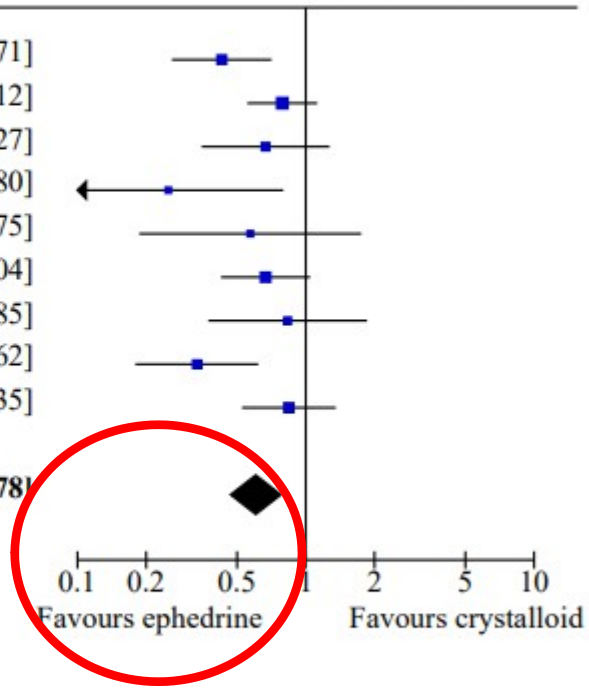
Analysis 13.1. Comparison 13: Ephedrine vs crystalloid, Outcome 1: Women with hypotension requiring intervention

Study or Subgroup	Ephedrine Events	Ephedrine Total	Crystalloid Events	Crystalloid Total	Weight	Risk Ratio M-H, Random, 95% CI
Carvalho 2000	18	80	21	40	13.8%	0.43 [0.26 , 0.71]
Chan 1997	15	23	19	23	19.1%	0.79 [0.55 , 1.12]
Damevski 2011	8	20	12	20	10.2%	0.67 [0.35 , 1.27]
El-Mekawy 2012	3	30	12	30	4.1%	0.25 [0.08 , 0.80]
Imam 2012	4	30	7	30	4.4%	0.57 [0.19 , 1.75]
Jabalameli 2011	18	50	27	50	15.5%	0.67 [0.43 , 1.04]
King 1998	5	10	6	10	7.5%	0.83 [0.37 , 1.85]
Kundra 2008	8	30	24	30	10.7%	0.33 [0.18 , 0.62]
Morgan 2000	35	83	12	24	14.7%	0.84 [0.53 , 1.35]
Total (95% CI)		**356**		**257**	**100.0%**	**0.60 [0.47 , 0.78]**
Total events:	114		140			

Heterogeneity: $Tau^2 = 0.06$; $Chi^2 = 13.26$, $df = 8$ ($P = 0.10$); $I^2 = 40\%$

Test for overall effect: $Z = 3.91$ ($P < 0.0001$)

Test for subgroup differences: Not applicable



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DOI: 10.1002/14651858.CD002251.pub4.

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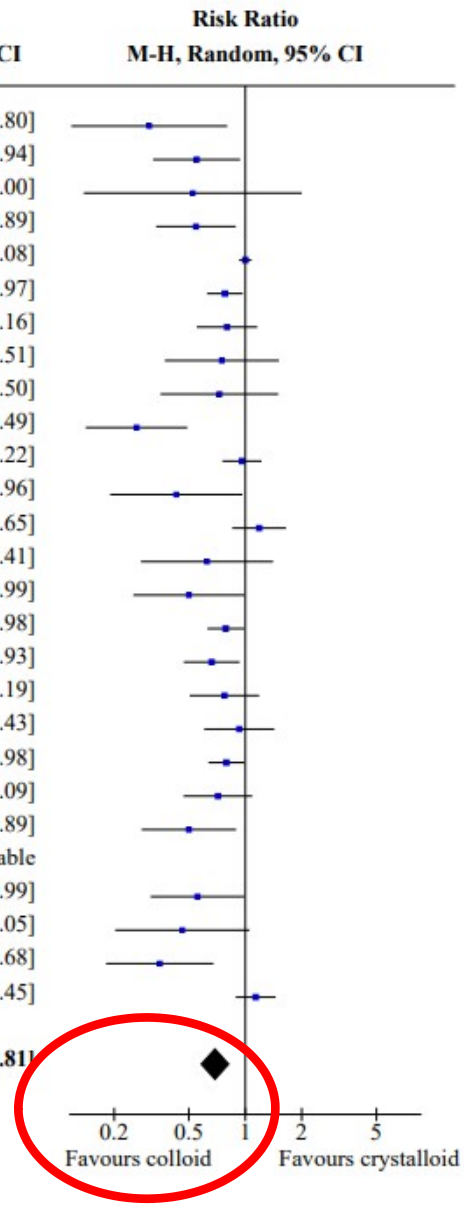
koloidy vs. krystaloidy

Analysis 7.1. Comparison 7: Colloid vs crystalloid, Outcome 1: Women with hypotension requiring intervention

Study or Subgroup	Colloid Events	Colloid Total	Crystalloid Events	Crystalloid Total	Weight	Risk Ratio M-H, Random, 95% CI
Alimian 2014	4	30	26	60	2.0%	0.31 [0.12 , 0.80]
Arora 2015 (1)	11	30	20	30	3.7%	0.55 [0.32 , 0.94]
Bottiger 2018	3	32	5	28	1.2%	0.53 [0.14 , 2.00]
Bouchnak 2012	12	30	22	30	3.9%	0.55 [0.33 , 0.89]
Cardoso 2004	25	25	25	25	5.9%	1.00 [0.93 , 1.08]
[illegible]	37	56	45	53	5.4%	0.78 [0.62 , 0.97]
Dahlgren 2007	17	28	19	25	4.6%	0.80 [0.55 , 1.16]
El-Mekawy 2013	9	30	12	30	2.9%	0.75 [0.37 , 1.51]
Embu 2011	8	25	11	25	2.8%	0.73 [0.35 , 1.50]
French 1999	10	80	38	80	3.3%	0.26 [0.14 , 0.49]
Gunaydin 2009	24	30	25	30	5.3%	0.96 [0.76 , 1.22]
Hasan 2012	6	30	14	30	2.5%	0.43 [0.19 , 0.96]
Jabalameli 2011	32	50	27	50	4.8%	1.19 [0.85 , 1.65]
Karinen 1995	5	13	8	13	2.5%	0.63 [0.28 , 1.41]
Lin 1999	8	30	16	30	3.0%	0.50 [0.25 , 0.99]
Madi-Jebara 2008	39	61	48	59	5.4%	0.79 [0.63 , 0.98]
Mercier 2014	30	82	47	85	4.8%	0.66 [0.47 , 0.93]
Ozkan 2004	24	75	31	75	4.3%	0.77 [0.51 , 1.19]
Perumal 2004	13	20	14	20	4.3%	0.93 [0.60 , 1.43]
Romdhani 2014	33	48	46	53	5.4%	0.79 [0.64 , 0.98]
Selvan 2004	20	40	14	20	4.3%	0.71 [0.47 , 1.09]
Siddik 2000	8	20	16	20	3.5%	0.50 [0.28 , 0.89]
Singh 2009	0	30	0	30		Not estimable
Ueyama 1999	10	24	9	12	3.5%	0.56 [0.31 , 0.99]
Unlugenc 2015	6	30	13	30	2.4%	0.46 [0.20 , 1.05]
Upadya 2016	7	25	20	25	3.1%	0.35 [0.18 , 0.68]
Yorozu 2002	27	32	26	35	5.3%	1.14 [0.89 , 1.45]
Total (95% CI)		**1006**		**1003**	**100.0%**	**0.69 [0.58 , 0.81]**
Total events:	428		597			

Heterogeneity: Tau² = 0.12; Chi² = 140.36, df = 25 (P < 0.00001); I² = 82%
Test for overall effect: Z = 4.37 (P < 0.0001)
Test for subgroup differences: Not applicable



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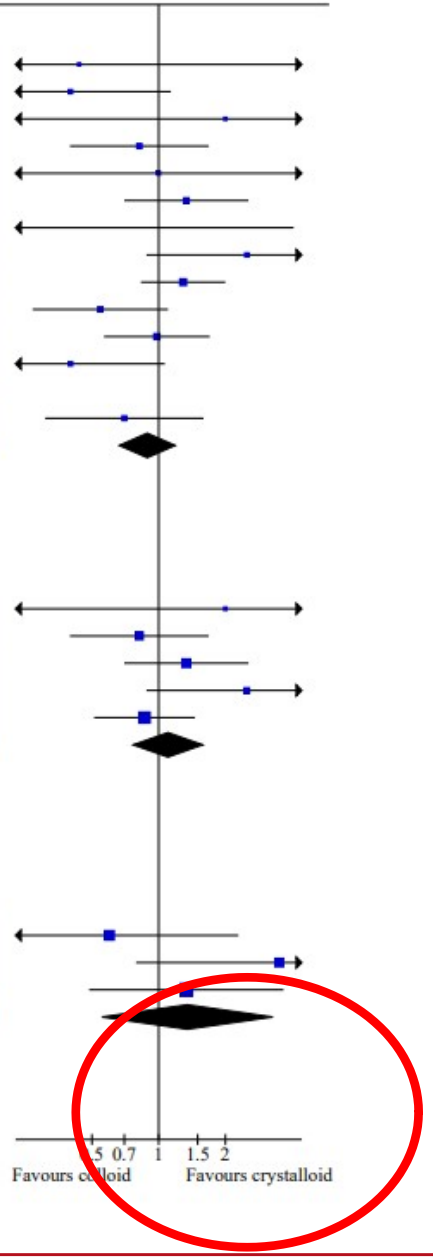
koloidy vs. krystaloidy u rodiček s nauzeou/zvracením

Analysis 7.4. Comparison 7: Colloid vs crystalloid, Outcome 4: Women with nausea and/or vomiting

Study or Subgroup	Colloid Events	Colloid Total	Crystalloid Events	Crystalloid Total	Weight	Risk Ratio M-H, Random, 95% CI
7.4.1 Nausea and/or vomiting						
Bottiger 2010	1	32	2	28	1.4%	0.44 [0.04 , 4.57]
Bouchnak 2012	4	30	10	30	6.1%	0.40 [0.14 , 1.14]
Cardoso 2004a	2	25	1	25	1.5%	2.00 [0.19 , 20.67]
El-Mekawy 2012	9	30	11	30	10.4%	0.82 [0.40 , 1.68]
Embu 2011	3	25	3	25	3.3%	1.00 [0.22 , 4.49]
Gunaydin 2009	12	30	12	40	12.0%	1.33 [0.70 , 2.54]
[illegible]	1	50	2	50	0.9%	0.20 [0.01 , 4.06]
[illegible]	[illegible]	30	4	30	6.1%	2.50 [0.88 , 7.10]
[illegible] Jojara 2008	28	61	21	59	17.6%	1.29 [0.83 , 2.00]
[illegible]	10	82	19	85	10.8%	0.55 [0.27 , 1.10]
Romdhani 2014	16	48	18	53	14.3%	0.98 [0.57 , 1.70]
[illegible]	4	20	10	20	6.7%	0.40 [0.15 , 1.07]
Singh 2009	0	30	0	30		Not estimable
Unlugenc 2015	7	30	10	30	8.7%	0.70 [0.31 , 1.59]
Subtotal (95% CI)		**523**		**535**	**100.0%**	**0.89 [0.66 , 1.19]**
Total events:	106		123			
Heterogeneity: Tau² = 0.07; Chi² = 16.92, df = 12 (P = 0.15); I² = 29%						
Test for overall effect: Z = 0.80 (P = 0.42)						
7.4.2 Nausea						
Cardoso 2004a	2	25	1	25	2.4%	2.00 [0.19 , 20.67]
El-Mekawy 2012	9	30	11	30	22.0%	0.82 [0.40 , 1.68]
Gunaydin 2009	12	30	12	40	26.7%	1.33 [0.70 , 2.54]
Lin 1999	10	30	4	30	11.2%	2.50 [0.88 , 7.10]
Ozkan 2004	19	75	22	75	37.7%	0.86 [0.51 , 1.46]
Subtotal (95% CI)		**190**		**200**	**100.0%**	**1.10 [0.77 , 1.58]**
Total events:	52		50			
Heterogeneity: Tau² = 0.02; Chi² = 4.45, df = 4 (P = 0.35); I² = 10%						
Test for overall effect: Z = 0.52 (P = 0.60)						
7.4.3 Vomiting						
Cardoso 2004a	0	25	0	25		Not estimable
El-Mekawy 2012	3	30	5	30	30.4%	0.60 [0.16 , 2.29]
Gunaydin 2009	7	30	2	30	26.2%	3.50 [0.79 , 15.49]
Ozkan 2004	8	75	6	75	43.4%	1.33 [0.49 , 3.66]
Subtotal (95% CI)		**160**		**160**	**100.0%**	**1.35 [0.55 , 3.27]**
Total events:	18		13			
Heterogeneity: Tau² = 0.21; Chi² = 3.00, df = 2 (P = 0.22); I² = 33%						
Test for overall effect: Z = 0.66 (P = 0.51)						



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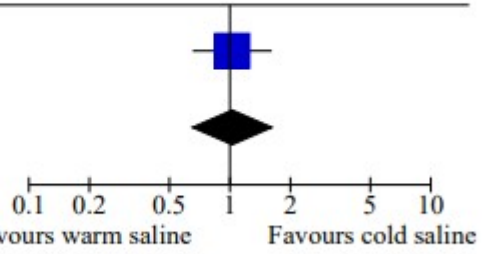
Analysis 5.1. Comparison 5: Crystalloid: warm vs cold, Outcome 1: Women with hypotension requiring intervention

krystaloidy
teplé vs. studené

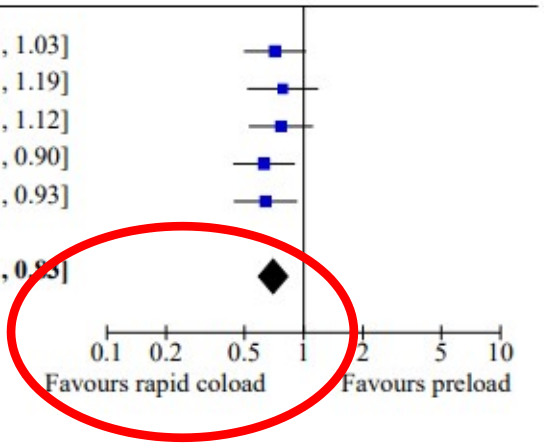
Study or Subgroup	Warm saline Events	Total	Cold saline Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Jorgensen 2000	23	57	22	56	100.0%	1.03 [0.65 , 1.62]
Total (95% CI)		**57**		**56**	**100.0%**	**1.03 [0.65 , 1.62]**
Total events:	23		22			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.12 (P = 0.91)						
Test for subgroup differences: Not applicable						



Analysis 4.1. Comparison 4: Crystalloid: rapid coload vs preload, Outcome 1: Women with hypotension requiring intervention

krystaloidy
koload vs. preload

Study or Subgroup	Rapid coload Events	Total	Preload Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Dyer 2004	15	25	21	25	21.5%	0.71 [0.50 , 1.03]
Farid 2016	18	37	23	37	16.4%	0.78 [0.52 , 1.19]
Jacob 2012	23	50	30	50	20.0%	0.77 [0.53 , 1.12]
Khan 2013	22	50	35	50	21.6%	0.63 [0.44 , 0.90]
Oh 2014	16	30	25	30	20.5%	0.64 [0.44 , 0.93]
Total (95% CI)		**192**		**192**	**100.0%**	**0.70 [0.59 , 0.83]**
Total events:	94		134			
Heterogeneity: Tau² = 0.00; Chi² = 1.08, df = 4 (P = 0.90); I² = 0%						
Test for overall effect: Z = 4.17 (P < 0.0001)						
Test for subgroup differences: Not applicable						



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DOI: 10.1002/14651858.CD002251.pub4.

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ondansetron

Analysis 31.3. Comparison 31: Ondansetron vs control, Outcome 3: Women with nausea or vomiting

Study or Subgroup	Ondansetron Events	Ondansetron Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
31.3.1 2 mg vs control						
Ortiz-Gomez 2014	5	32	2	10	6.4%	0.78 [0.18 , 3.43]
Wang 2014a	3	30	2	7	5.5%	0.35 [0.07 , 1.71]
Subtotal (95% CI)		**62**		**17**	**11.9%**	**0.54 [0.18 , 1.59]**
Total events:	8		4			
Heterogeneity: Tau² = 0.00; Chi² = 0.53, df = 1 (P = 0.47); I² = 0%						
Test for overall effect: Z = 1.12 (P = 0.26)						
31.3.2 4 mg vs control						
Ortiz-Gomez 2014	6	32	2	11	6.7%	1.03 [0.24 , 4.38]
Sahoo 2012	1	26	7	26	3.4%	0.14 [0.02 , 1.08]
Trabelsi 2015	9	40	25	40	35.8%	0.36 [0.19 , 0.67]
Wang 2014a	1	30	2	7	2.7%	0.12 [0.01 , 1.11]
Wang 2014b	2	33	11	32	6.8%	0.18 [0.04 , 0.73]
Subtotal (95% CI)		**161**		**116**	**55.5%**	**0.32 [0.17 , 0.60]**
Total events:	19		47			
Heterogeneity: Tau² = 0.09; Chi² = 4.75, df = 4 (P = 0.31); I² = 16%						
Test for overall effect: Z = 3.58 (P = 0.0003)						
31.3.3 6 mg vs control						
Wang 2014a	1	30	3	8	3.1%	0.09 [0.01 , 0.74]
Subtotal (95% CI)		**30**		**8**	**3.1%**	**0.09 [0.01 , 0.74]**
Total events:	1		3			
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.23 (P = 0.03)						
31.3.4 8 mg vs control						
Marciniak 2015	4	35	4	34	8.2%	0.97 [0.26 , 3.58]
Nivatpumin 2016	3	56	9	54	8.9%	0.32 [0.09 , 1.12]
Ortiz-Gomez 2014	2	32	3	11	5.1%	0.23 [0.04 , 1.20]
Wang 2014a	3	30	3	7	7.4%	0.23 [0.06 , 0.92]
Subtotal (95% CI)		**153**		**106**	**29.6%**	**0.38 [0.19 , 0.76]**
Total events:	12		19			
Heterogeneity: Tau² = 0.00; Chi² = 2.93, df = 3 (P = 0.40); I² = 0%						
Test for overall effect: Z = 2.76 (P = 0.006)						
Total (95% CI)		**406**		**247**	**100.0%**	**0.35 [0.24 , 0.51]**
Total events:	40		73			
Heterogeneity: Tau² = 0.00; Chi² = 10.42, df = 11 (P = 0.49); I² = 0%						
Test for overall effect: Z = 5.47 (P < 0.00001)						
Test for subgroup differences: Chi² = 2.33, df = 3 (P = 0.51), I² = 0%						

Risk Ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours ondansetron Favours control

nauzea/zvracení

Analysis 31.1. Comparison 31: Ondansetron vs control, Outcome 1: Women with hypotension requiring intervention

Study or Subgroup	Ondansetron Events	Ondansetron Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
31.1.1 2 mg vs control						
Ortiz-Gomez 2014	13	32	4	10	4.9%	1.02 [0.43 , 2.42]
Wang 2014a	14	30	4	7	6.2%	0.82 [0.39 , 1.72]
Subtotal (95% CI)		**62**		**17**	**11.1%**	**0.90 [0.51 , 1.58]**
Total events:	27		8			
Heterogeneity: Tau² = 0.00; Chi² = 0.14, df = 1 (P = 0.70); I² = 0%						
Test for overall effect: Z = 0.38 (P = 0.70)						
31.1.2 4 mg vs control						
Ortiz-Gomez 2014	7	32	4	11	3.7%	0.60 [0.22 , 1.67]
Sahoo 2012	2	26	11	26	2.1%	0.18 [0.04 , 0.74]
Trabelsi 2015	15	40	31	40	12.4%	0.48 [0.31 , 0.75]
Wang 2014a	9	30	4	7	5.1%	0.53 [0.23 , 1.22]
Wang 2014b	8	33	18	32	7.2%	0.43 [0.22 , 0.85]
Subtotal (95% CI)		**161**		**116**	**30.5%**	**0.46 [0.34 , 0.63]**
Total events:	41		68			
Heterogeneity: Tau² = 0.00; Chi² = 2.26, df = 4 (P = 0.69); I² = 0%						
Test for overall effect: Z = 4.84 (P < 0.00001)						
31.1.3 6 mg vs control						
Wang 2014a	9	30	5	8	5.9%	0.48 [0.22 , 1.03]
Subtotal (95% CI)		**30**		**8**	**5.9%**	**0.48 [0.22 , 1.03]**
Total events:	9		5			
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.88 (P = 0.06)						
31.1.4 8 mg vs control						
Marciniak 2015	14	35	15	34	9.3%	0.91 [0.52 , 1.58]
Nivatpumin 2016	32	56	37	54	17.2%	0.83 [0.62 , 1.11]
Ortiz-Gomez 2014	6	32	5	11	4.1%	0.41 [0.16 , 1.09]
Terkawi 2015	26	44	25	42	15.0%	0.99 [0.70 , 1.41]
Wang 2014a	12	30	5	8	6.9%	0.64 [0.32 , 1.28]
Subtotal (95% CI)		**197**		**149**	**52.5%**	**0.85 [0.70 , 1.03]**
Total events:	90		87			
Heterogeneity: Tau² = 0.00; Chi² = 3.61, df = 4 (P = 0.46); I² = 0%						
Test for overall effect: Z = 1.68 (P = 0.09)						
Total (95% CI)		**450**		**290**	**100.0%**	**0.67 [0.54 , 0.83]**
Total events:	167		168			
Heterogeneity: Tau² = 0.05; Chi² = 18.42, df = 12 (P = 0.10); I² = 35%						
Test for overall effect: Z = 3.68 (P = 0.0002)						
Test for subgroup differences: Chi² = 11.97, df = 3 (P = 0.008), I² = 74.9%						

Risk Ratio M-H, Random, 95% CI

0.05 0.2 1 5 20

Favours ondansetron Favours control

hypotenze

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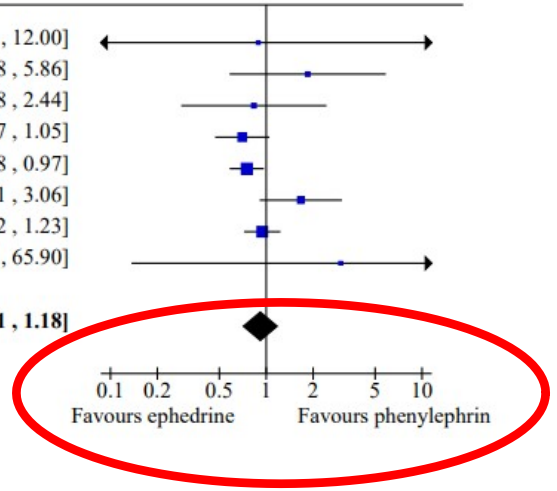
efedrin vs. phenylephrin

Analysis 16.1. Comparison 16: Ephedrine vs phenylephrine, Outcome 1: Women with hypotension requiring intervention

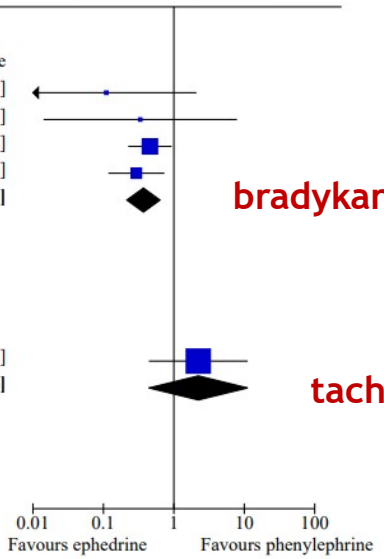
Study or Subgroup	Ephedrine Events	Ephedrine Total	Phenylephrine Events	Phenylephrine Total	Weight	Risk Ratio M-H, Random, 95% CI
Alahuhta 1992	1	9	1	8	0.9%	0.89 [0.07 , 12.00]
Bhardwaj 2013	6	26	4	32	4.2%	1.85 [0.58 , 5.86]
Gomaa 2003	5	30	6	30	4.8%	0.83 [0.28 , 2.44]
Hall 1994	12	19	9	10	20.1%	0.70 [0.47 , 1.05]
Magalhaes 2009	21	30	28	30	29.3%	0.75 [0.58 , 0.97]
Moslemi 2015	15	27	10	30	12.0%	1.67 [0.91 , 3.06]
Nazir 2012	33	50	35	50	28.1%	0.94 [0.72 , 1.23]
Ueyama 2002	1	10	0	10	0.6%	3.00 [0.14 , 65.90]
Total (95% CI)		**201**		**200**	**100.0%**	**0.92 [0.71 , 1.18]**
Total events:	94		93			

Heterogeneity: $Tau^2 = 0.04$; $Chi^2 = 11.19$, df = 7 (P = 0.13); $I^2 = 37\%$
Test for overall effect: Z = 0.69 (P = 0.49)
Test for subgroup differences: Not applicable



Analysis 16.3. Comparison 16: Ephedrine vs phenylephrine, Outcome 3: Cardiac dysrhythmia

Study or Subgroup	Ephedrine Events	Ephedrine Total	Phenylephrine Events	Phenylephrine Total	Weight	Risk Ratio M-H, Random, 95% CI
16.3.1 Bradycardia						
Bhardwaj 2013	0	26	0	32		Not estimable
Hall 1994	0	19	2	10	3.4%	0.11 [0.01 , 2.09]
Magalhaes 2009	0	30	1	30	3.0%	0.33 [0.01 , 7.87]
Moslemi 2015	7	27	17	30	58.5%	0.46 [0.22 , 0.93]
Nazir 2012	5	50	17	50	35.1%	0.29 [0.12 , 0.74]
Subtotal (95% CI)		**152**		**152**	**100.0%**	**0.37 [0.21 , 0.64]**
Total events:	12		37			
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.28$, df = 3 (P = 0.73); $I^2 = 0\%$						
Test for overall effect: Z = 3.59 (P = 0.0003)						
16.3.2 Tachycardia						
Moslemi 2015	4	27	2	30	100.0%	2.22 [0.44 , 11.18]
Subtotal (95% CI)		**27**		**30**	**100.0%**	**2.22 [0.44 , 11.18]**
Total events:	4		2			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.97 (P = 0.33)						
Test for subgroup differences: $Chi^2 = 4.25$, df = 1 (P = 0.04), $I^2 = 76.5\%$						



bradykardie

tachykardie

BJA

British Journal of Anaesthesia, 124 (3): e95–e107 (2020)

doi: 10.1016/j.bja.2019.09.045

REVIEW ARTICLE

Vasopressor drugs for the prevention and treatment of hypotension during neuraxial anaesthesia for Caesarean delivery: a Bayesian network meta-analysis of fetal and maternal outcomes

Preet M. Singh[1,*], Narinder P. Singh[2], Matthew Reschke[3], Warwick D. Ngan Kee[4],

Baltimore, MD, USA and [4]Department of Anesthesiology, Sidra Medicine, Doha, Qatar

Results: We included 52 RCTs with a total of 4126 patients.

Abstract

Background: The optimal choice of vasopressor drugs for managing hypotension during neuraxial anaesthesia for Caesarean delivery is unclear. Although phenylephrine was recently recommended as a consensus choice, direct comparison of phenylephrine with vasopressors used in other healthcare settings is largely lacking. Therefore, we assessed this indirectly by collating data from relevant studies in this comprehensive network meta-analysis. Here, we provide the possible rank orders for these vasopressor agents in relation to clinically important fetal and maternal outcomes.

Methods: RCTs were independently searched in MEDLINE, Web of Science, Embase, The Cochrane Central Register of Controlled Trials, and clinicaltrials.gov (updated January 31, 2019). The primary outcome assessed was umbilical arterial base excess. Secondary fetal outcomes were umbilical arterial pH and P_{CO_2}. Maternal outcomes were incidences of nausea, vomiting, and bradycardia.

Results: We included 52 RCTs with a total of 4126 patients. Our Bayesian network meta-analysis showed the likelihood that norepinephrine, metaraminol, and mephentermine had the lowest probability of adversely affecting the fetal acid-base status as assessed by their effect on umbilical arterial base excess (probability rank order: norepinephrine > mephentermine > metaraminol > phenylephrine > ephedrine). This rank order largely held true for umbilical arterial pH and P_{CO_2}. With the exception of maternal bradycardia, ephedrine had the highest probability of being the worst agent for all assessed outcomes. Because of the inherent imprecision when collating direct/indirect comparisons, the rank orders suggested are possibilities rather than absolute ranks.

Conclusion: Our analysis suggests the possibility that norepinephrine and metaraminol are less likely than phenylephrine to be associated with adverse fetal acid-base status during Caesarean delivery. Our results, therefore, lay the scientific foundation for focused trials to enable direct comparisons between these agents and phenylephrine.

Keywords: Caesarean section, fetal outcomes; maternal outcomes, hypotension; network meta-analysis, vasopressors; spinal anaesthesia

Editor's key points

- The results suggest that norepinephrine, metaraminol, and mephentermine have the smallest risk of adversely affecting fetal acid-base status, and ephedrine had the greatest risk.
- This grading of risk between vasopressors largely held true for umbilical arterial pH and P_{CO_2}. With the exception of maternal bradycardia, ephedrine had the highest probability of being the worst agent for all assessed outcomes.

norepinephrine > mephentermine > metaraminol > phenylephrine > ephedrine

BJA

British Journal of Anaesthesia, 124 (3): e95–e107 (2020)

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REVIEW ARTICLE

Vasopressor drugs for the prevention and treatment of hypotension during neuraxial anaesthesia for Caesarean delivery: a Bayesian network meta-analysis of fetal and maternal outcomes

Preet M. Singh[1,*], Narinder P. Singh[2], Matthew Reschke[3], Warwick D. Ngan Kee[4], Arvind Palanisamy[1] and David T. Monks[1]

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umbilikální pH

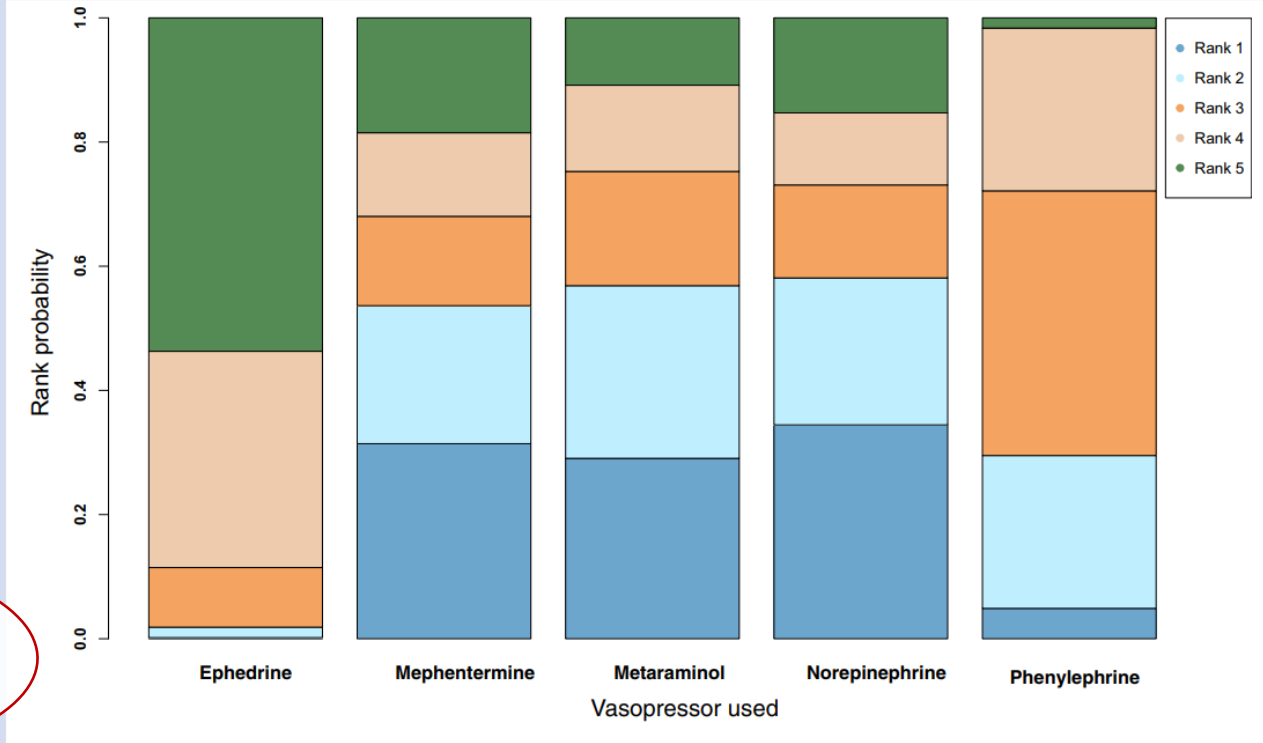


Fig 3. Umbilical artery base excess rankogram showing the rank probability for each of the treatment groups for umbilical artery base excess. Each treatment group has probability varying from 0 to 1 to fall within ranks 1 (best) to 5 (worst). The coloured segments in the bars represent the probability of the treatment falling under the given rank for the colour shown. The lower the rank, the better the treatment.

norepinephrine > mephentermine > metaraminol > phenylephrine > ephedrine

ULTRAZVUK

Curr Opin Anesthesiol 2018, 31:000–000 DOI:10.1097/ACO.0000000000000634

Recent developments in ultrasound imaging for neuraxial blockade

Ki Jinn Chin

Purpose of review
Recent research has shed further light on the place of ultrasound imaging in neuraxial blockade in routine clinical practice, its use in thoracic epidurals, and real-time ultrasound-guided techniques.

Recent findings
Compared with the conventional technique of surface landmark palpation, preprocedural ultrasound imaging minimizes technical difficulty associated with lumbar neuraxial blockade in patients with poor-quality surface landmarks. Novice practitioners are able to learn to employ the technique effectively. Safety benefits include a reduction in postprocedural back pain associated with fewer needle passes and a lower risk of procedure-associated bleeding. The advantage of ultrasound is minimal however in patients with easily discernible surface landmarks, especially if the practitioner is highly experienced. Recent trials show that preprocedural ultrasound scanning for thoracic epidural insertion reduces needle punctures and increases early analgesic efficacy compared with the palpation technique. Real-time ultrasound-guided techniques, while feasible, remain challenging and may not offer significant benefit over preprocedural imaging in lumbar neuraxial blockade. Their role in thoracic epidural insertion requires further investigation.

Summary
Ultrasound imaging of the spine is a valuable technique that, while not indicated for routine use, should be part of the skillset of any practitioner that regularly performs lumbar and thoracic neuraxial blockade.

možná...

KEY POINTS

- Preprocedural ultrasound imaging does not improve technical performance of lumbar neuraxial blockade in patients with easily discernible landmarks.
- Preprocedural ultrasound imaging reduces technical difficulty of neuraxial blockade in patients with difficult spinal anatomy, even for experienced practitioners.

Current Pain and Headache Reports (2020) 24: 59
https://doi.org/10.1007/s11916-020-00895-3

Ultrasound-Guided Neuraxial Anesthesia

Jinlei Li[1] · Ramya Krishna[1] · Yang Zhang[2] · David Lam[1] · Nalini Vadivelu[1]

Abstract
Purpose of Review There has been a recent surge of interest in clinical applications of ultrasound, which has revolutionized acute pain management. This review is to summarize the current status of ultrasound utilization in neuraxial anesthesia, the most common type of regional anesthesia.
Recent Findings Ultrasound-assisted and ultrasound-guided neuraxial anesthesia has improved clinical accuracy and patient safety through landmark identification including proper vertebral level and midline, as well as via measurements on neuraxial space. Direct needle or catheter visualization during the entire procedure has not yet been achieved consistently.
Summary The recent introduction of ultrasound into neural anesthesia has clinical performance benefits and patient safety implications, with documented improvement on overall efficacy with higher first attempt success rate as well as less needle pass. More controlled studies are needed for the overall impact of ultrasonography in neuraxial anesthesia in obstetric and non-obstetric patients.

URČITĚ !!!

ORIGINAL CLINICAL RESEARCH REPORT

Ultrasound-Assisted Versus Landmark-Guided Spinal Anesthesia in Patients With Abnormal Spinal Anatomy: A Randomized Controlled Trial

Sun-Kyung Park, MD, Jinyoung Bae, MD, Seokha Yoo, MD, Won Ho Kim, MD, PhD, Young-Jin Lim, MD, PhD, Jae-Hyon Bahk, MD, PhD, and Jin-Tae Kim, MD, PhD

čas identifikace prostoru 34 vs. 95 sec
čas provedení 118 vs. 38 sec

BACKGROUND: Spinal anesthesia using a surface landmark–guided technique can be challenging in patients with anatomical alterations of the lumbar spine; however, it is unclear whether using ultrasonography can decrease the technical difficulties in these populations. We assessed whether an ultrasound-assisted technique could reduce the number of needle passes required for block success compared with the landmark-guided technique in patients with abnormal spinal anatomy.
METHODS: Forty-four patients with abnormal spinal anatomy including documented lumbar scoliosis and previous spinal surgery were randomized to receive either surface landmark–guided or preprocedural ultrasound–assisted spinal anesthesia. All spinal procedures were performed by 1 of 3 experienced anesthesiologists. The primary outcome was the number of needle passes required for successful dural puncture. Secondary outcomes included the success rate on the first pass, total procedure time, periprocedural pain scores, and the incidences of radicular pain, paresthesia, and bloody tap during the neuraxial procedure. Intergroup difference in the primary outcome was assessed for significance using Mann-Whitney *U* test.
RESULTS: The median (interquartile range [IQR; range]) number of needle passes was significantly lower in the ultrasound group than in the landmark group (ultrasound 1.5 [1–3 {1–5}]; landmark 6 [2–9.3 {1–15}]; $P < .001$). First-pass success was achieved in 11 (50.0%) and 2 (9.1%) patients in the ultrasound and landmark groups, respectively ($P = .007$). The total procedure time, defined as the sum of the time for identifying landmarks and performing spinal anesthesia, did not differ significantly between the 2 groups (ultrasound 141 seconds [115–181 seconds {101–336 seconds}]; landmark 146 seconds [90–295 seconds {53–404 seconds}]; $P = .888$). The ultrasound group showed lower periprocedural pain scores compared with the landmark group (ultrasound 3.5 [1–5 {0–7}]; landmark 5.5 [3–8 {0–9}]; $P = .012$). The incidences of complications during the procedure showed no significant differences between the 2 groups.
CONCLUSIONS: For anesthesiologists with experience in neuraxial ultrasonography, the use of ultrasound significantly reduces the technical difficulties of spinal anesthesia in patients with abnormal spinal anatomy compared with the landmark-guided technique. Our results can lead to practical suggestions that encourage the use of neuraxial ultrasonography for spinal anesthesia in such patients. (Anesth Analg XXX;XXX:00–00)

(Anesth Analg XXX;XXX:00–00 DOI: 10.1213/ANE.0000000000004600)

Table 2. Efficacy Outcomes of Spinal Anesthesia and Periprocedural Pain/Discomfort Scores

	Landmark Group (n = 22)	Ultrasound Group (n = 22)	*P*	Relative Risk or Difference in Medians (95% CI)
Number of passes	6 (2–9.3 [1–15])	1.5 (1–3 [1–5])	<.001	4.5 (1–8)
Number of attempts	2 (1–4 [1–5])	1 (1–1 [1–2])	<.001	1 (0–2)
Successful dural puncture at the first pass	2 (9.1%)	11 (50.0%)	.007	5.5 (1.4–22.0)
Successful dural puncture within 2 passes	6 (27.3%)	15 (68.2%)	.007	2.5 (1.2–5.2)
Successful dural puncture at the first attempt	9 (40.9%)	20 (90.9%)	.001	2.2 (1.3–3.7)
Successful dural puncture within 2 attempts	12 (54.5%)	22 (100%)	.001	1.8 (1.2–2.7)
Identifying time (s)	34 (26–49 [18–76])	95 (83–126 [30–305])	<.001	−61 (−83 to −49)
Performing time (s)	118 (48–268 [25–362])	38 (30–50 [25–151])	<.001	81 (14–175)
Total procedure time (s)	146 (90–295 [53–404])	141 (115–181 [101–336])	.888	5 (−55 to 100)
Periprocedural pain score (NRS)	5.5 (3–8 [0–9])	3.5 (1–5 [0–7])	.012	2 (−0.5 to 5)
Periprocedural patient discomfort score (NRS)	4 (2–6.3 [0–9])	3 (1–5 [0–6])	.114	1 (−2 to 3.5)

Values are median (IQR [range]) or number (proportion). Identifying time, time taken for identifying the landmarks by palpation or ultrasound scan; performing time, time required for performing spinal anesthesia using the allocated method (time to completion of injection or declaration to use alternative methods, and alternative technique was used in 2 patients in the landmark group); total procedure time, the sum of the identifying time, and the performing time. *P* values are the results of the Mann-Whitney *U* test for continuous variables and χ^2 test or Fisher exact test for incidence variables between the groups.
Abbreviations: CI, confidence interval; NRS, numeric rating scale.

úspěšnost prvního pokusu 41 vs. 91 %
bolest během výkonu 5,5 vs. 3,5 NRS

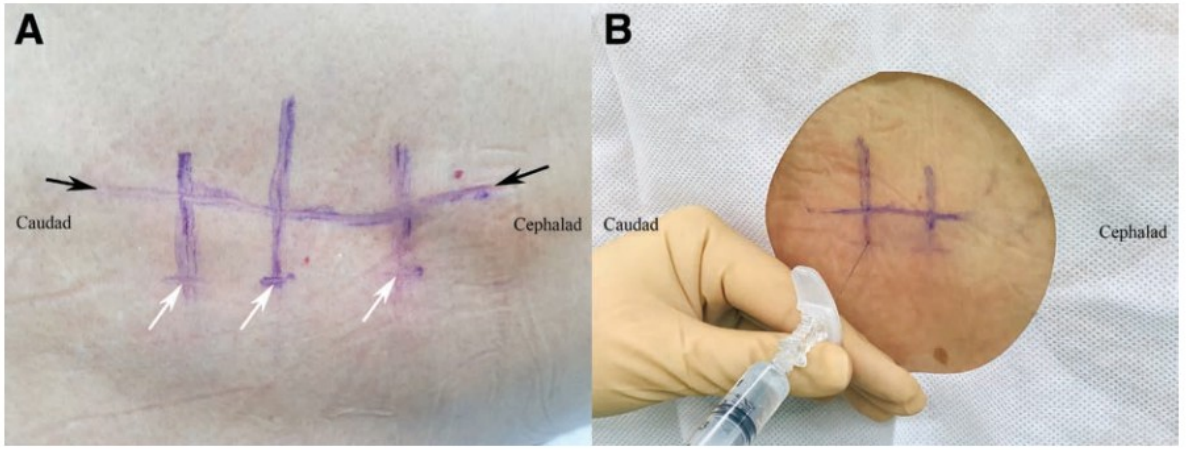


Figure 2. Preprocedural skin markings [illegible] needle insertion. A, The potential needle insertion points (white arrows) and spinal midline (black arrows) after the completion of the skin markings. B, Paramedian insertion of a spinal needle using preprocedural ultrasound skin markings.

Ultrasound-Assisted Technology Versus the Conventional Landmark Location Method in Spinal Anesthesia for Cesarean Delivery in Obese Parturients: A Randomized Controlled Trial

Mengzhu Li, MD, Xiu Ni, MD, Zhendong Xu, PhD, Fuyi Shen, MD, Yingcai Song, MD, Qian Li, MD, and Zhiqiang Liu, PhD

BACKGROUND: Spinal anesthesia, which is commonly used in cesarean deliveries, is often difficult to perform in obese parturients because of poorly palpable surface landmarks and positioning challenges. This study aimed to evaluate the benefits of ultrasound-assisted technology for performing spinal anesthesia in obese parturients.

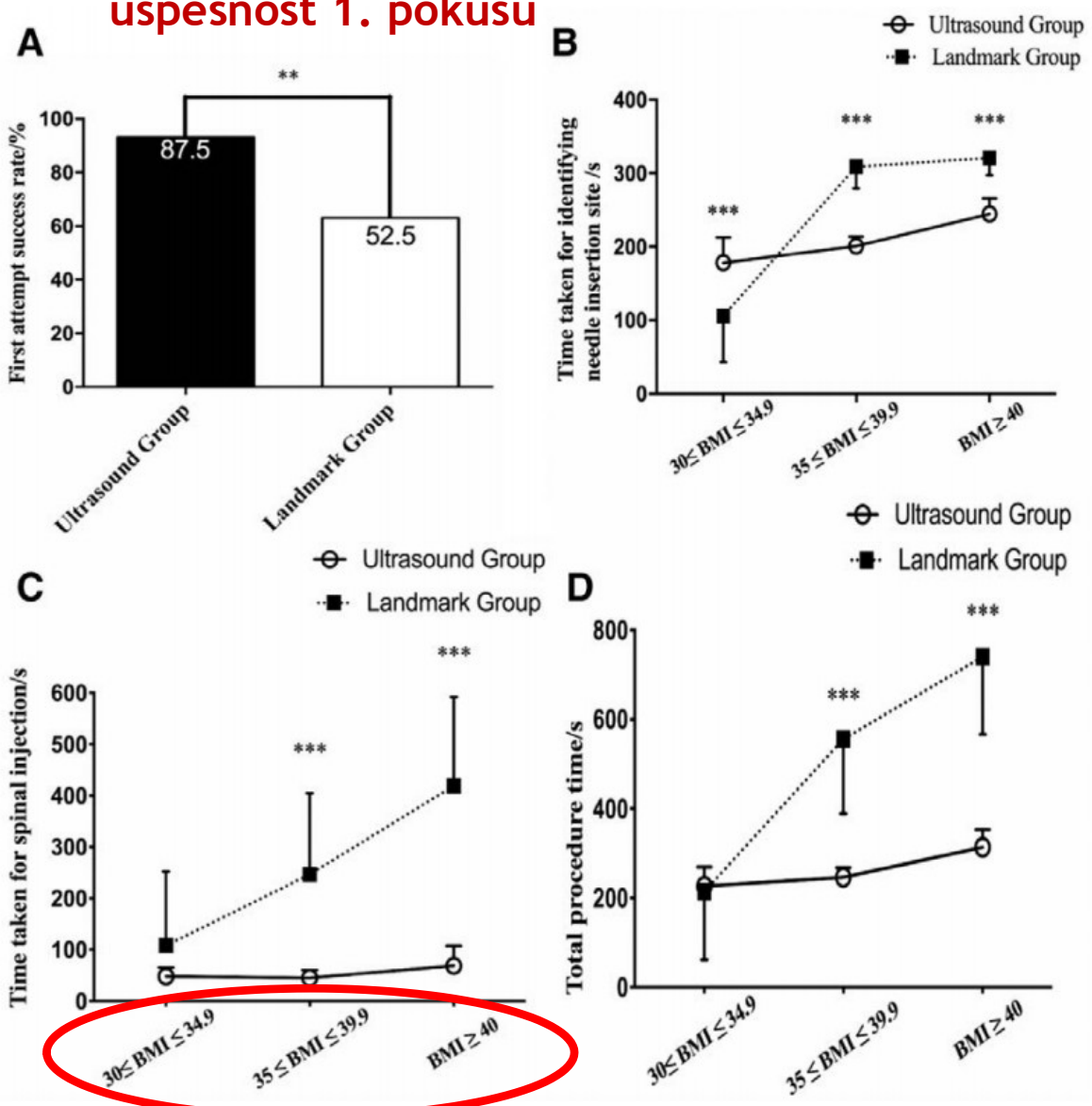
METHODS: Parturients with a body mass index (BMI) ≥30 kg/m² scheduled for elective cesarean delivery were randomized to undergo spinal anesthesia using the conventional landmark location technique (landmark group, n = 40) or prepuncture ultrasound examination (ultrasound group, n = 40). All participants underwent spinal anesthesia in the lateral position. The primary outcome was the first-attempt success rate. Secondary outcomes were the number of skin punctures and needle passes, procedure times, patient satisfaction, changes in the intended interspace, and incidence of complications.

RESULTS: The ultrasound group had a significantly higher first-attempt success rate (87.5% vs 52.5%; *P* = .001), fewer cases requiring >10 needle passes (1 vs 17; *P* < .001), and fewer skin punctures and needle passes (*P* < .001 for both). There was no statistically significant difference in the time taken to identify the needle insertion site between the 2 groups (202.5 vs 272.0 seconds; *P* = .580). Both the spinal injection time and total procedure time were significantly longer in the landmark group (*P* < .001). Patient satisfaction scores were significantly higher in the ultrasound group (*P* = .001). Among patients with BMI between 30 and 34.9 kg/m², there was no statistically significant difference in the first-attempt success rate (*P* = .407), number of cases with >10 needle passes (*P* = .231), spinal injection time (*P* = .081), or total procedure time (*P* = .729); however, more time was required to identify the needle insertion site in the ultrasound group (*P* < .001). For patients with BMI between 35 and 43 kg/m², the ultrasound group had a significantly higher first-attempt success rate (*P* ≤ .041), fewer cases with >10 needle passes (*P* ≤ .01), and shorter procedure times, including the time required to identify the needle insertion site (*P* < .001).

CONCLUSIONS: Prepuncture ultrasound examination can facilitate spinal anesthesia in the lateral position in obese parturients (35 kg/m² ≤ BMI ≤ 43 kg/m²) by improving the first-attempt success rate, reducing the number of needle passes and puncture attempts, shortening the total procedure time, and improving patient satisfaction. (Anesth Analg 2019;129:155–61)

úspěšnost 1. pokusu

čas identifikace prostoru



čas do aplikace anestetika

Ultrasound-Assisted Technology Versus the Conventional Landmark Location Method in Spinal Anesthesia for Cesarean Delivery in Obese Parturients: A Randomized Controlled Trial

Mengzhu Li, MD, Xiu Ni, MD, Zhendong Xu, PhD, Fuyi Shen, MD, Yingcai Song, MD, Qian Li, MD, and Zhiqiang Liu, PhD

Table 2. Comparisons of Procedure-Related Data Between Groups

	Ultrasound Group (n = 40)	Landmark Group (n = 40)	*P* Value
First-attempt success rate	35 (87.5)	21 (52.5)	.001[a]
No. skin punctures	1.2 ± 0.4	3.6 ± 3.3	<.001[b]
No. needle passes	2.1 ± 2.1	14.9 ± 16.8	<.001[b]
>10 needle passes	1 (2.5)	17 (42.5)	<.001[a]
Time taken to identify the needle insertion site (s)	202.5 (175.3–221.8)	272.0 (82–310.5)	.580[b]
Time taken for spinal injection (s), median (IQR)	41.5 (38–58)	120 (56–359.8)	<.001[b]
Total procedure time (s), median (IQR)	247 (225.3–272.8)	378 (195–699.3)	<.001[b]
New space attempted	0	16 (40)	<.001[a]
Satisfaction scores	…	…	.016[a]
Very satisfied	12	5	…
Satisfied	28	30	…
Dissatisfied	0	5	…

Data are given as mean ± SD, median (IQR), or n (%).

Abbreviations: IQR, interquartile range; SD, standard deviation.

[a]Fisher exact test.

[b]Student *t* test.

The Accuracy of a Handheld Ultrasound Device for Neuraxial Depth and Landmark Assessment: A Prospective Cohort Trial

Katherine M. Seligman, MD,* Carolyn F. Weiniger, MBChB,† and Brendan Carvalho MBBCh, FRCA‡

This study investigated the accuracy of a wireless handheld ultrasound with pattern recognition software that recognizes lumbar spine bony landmarks and measures depth to epidural space (Accuro, Rivanna Medical, Charlottesville, VA) (AU). AU measurements to epidural space were compared to Tuohy needle depth to epidural space (depth to loss of resistance at epidural placement). Data from 47 women requesting labor epidural analgesia were analyzed. The mean difference between depth to epidural space measured by AU versus needle depth was −0.61 cm (95% confidence interval, −0.79 to −0.44), with a standard deviation of 0.58 (95% confidence interval, 0.48–0.73). Using the AU-identified insertion point resulted in successful epidural placement at first attempt in 87% of patients, 78% without redirects. (Anesth Analg 2018;126:1995–8)

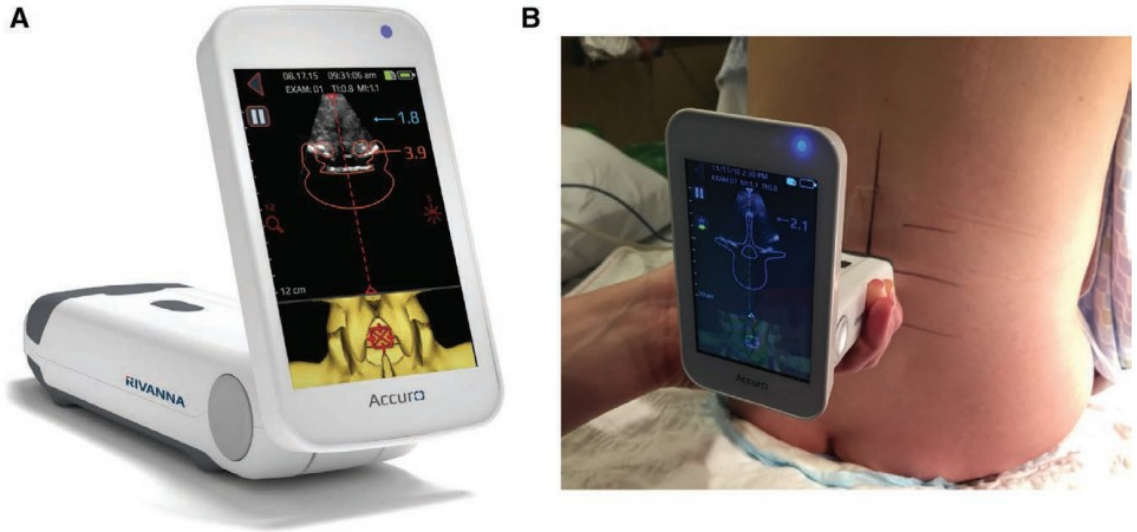


Figure 1. A, An image of the wireless handheld ultrasound (Accuro, Rivanna Medical, Charlottesville, VA) (AU) device investigated. The device has integrated software algorithm to depict bony landmarks and measure depth to spinous process and epidural space in real time. The image was downloaded from https://rivannamedical.com. Accessed February 24, 2017. B, A photograph to illustrate the ultrasound examination technique for the wireless handheld ultrasound (Accuro, Rivanna Medical, Charlottesville, VA) (AU) device. The ultrasound examination was conducted in the seated position. The probe was placed in the gluteal cleft and translocated cephalad. Marks that were placed on the patient's back indicate the horizontal and vertical midline. AU indicates Accuro.

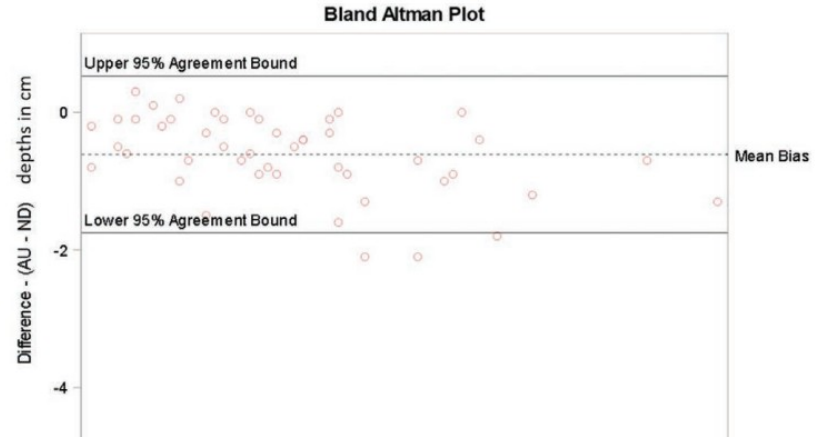
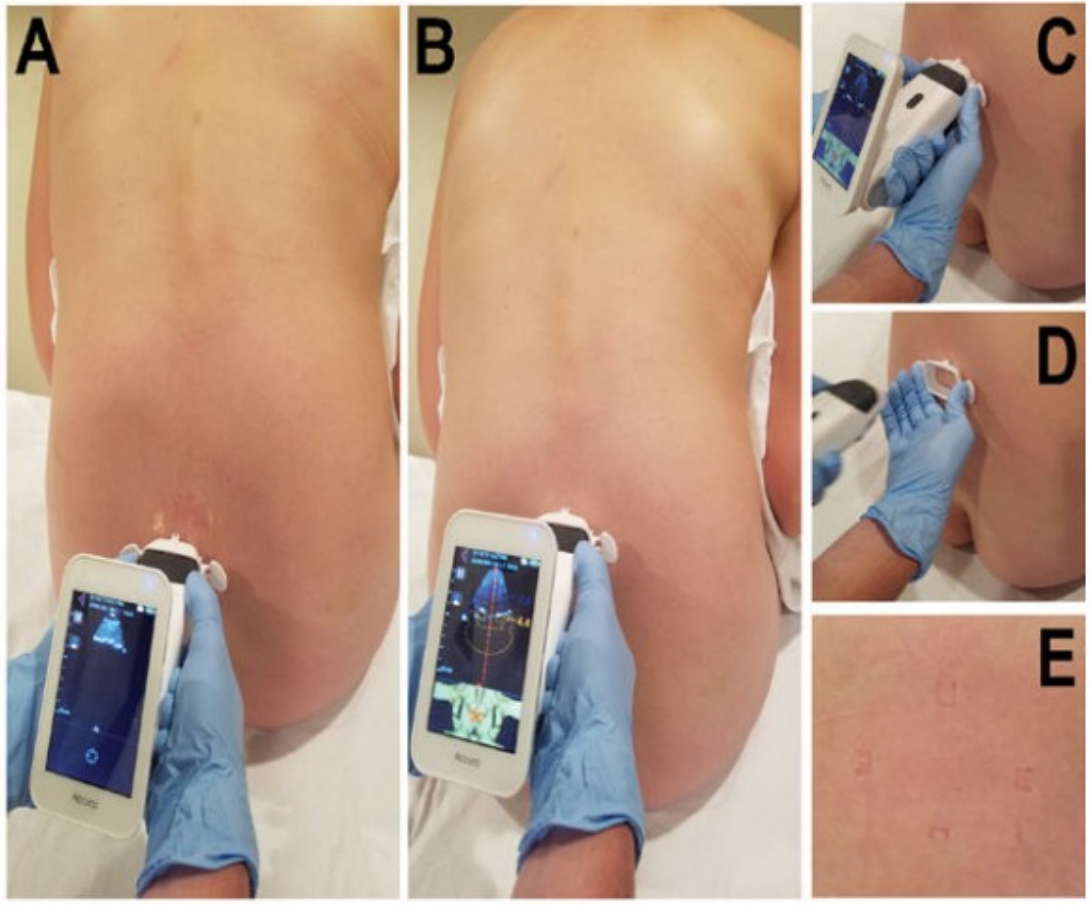


Figure 2. Bland-Altman plot of the agreement between epidural depths (cm) measured using the AU ultrasound (Accuro; Rivanna Medical, Charlottesville, VA) versus the ND at loss of resistance. The y-axis represents the difference between these measured depths and the x-axis represents the mean of the depths. Mean bias with 95% limits of agreement and respective confidence intervals are presented. AU indicates Accuro; ND, needle depth



Anesth Analg 2018;126:1995–8

Review Article

Conventional landmark palpation vs. preprocedural ultrasound for neuraxial analgesia and anaesthesia in obstetrics – a systematic review and meta-analysis with trial sequential analyses

B. Young,[1] **D. Onwochei**[2] and **N. Desai**[2,3]

1 Speciality Registrar, 2 Consultant, Department of Anaesthesia, Guy's and St Thomas' NHS Foundation Trust, 3 Honorary Senior Clinical Lecturer, King's College London, London, UK

Summary

The aim of this systematic review and meta-analysis was to examine the efficacy, time taken and the safety of neuraxial blockade performed for obstetric patients with the assistance of preprocedural ultrasound, in comparison with the landmark palpation method. The bibliographic databases Central, CINAHL, EMBASE, Global Health, MEDLINE, Scopus and Web of Science were searched from inception to 13 February 2020 for randomised controlled trials that included pregnant women having neuraxial procedures with preprocedural ultrasound as the intervention and conventional landmark palpation as the comparator. For continuous and dichotomous outcomes, respectively, we calculated the mean difference using the inverse-variance method and the risk ratio with the Mantel–Haenszel method. In all, 22 trials with 2462 patients were included. Confirmed by trial sequential analysis, preprocedural ultrasound increased the first-pass success rate by a risk ratio (95%CI) of 1.46 (1.16–1.82), p = 0.001 in 13 trials with 1253 patients. No evidence of a difference was found in the total time taken between preprocedural ultrasound and landmark palpation, with a mean difference (95%CI) of 50.1 (−13.7 to 113.94) s, p = 0.12 in eight trials with 709 patients. The quality of evidence was graded as low and very low, respectively, for these co-primary outcomes. Sub-group analysis underlined the increased benefit of preprocedural ultrasound for those in whom the neuraxial procedure was predicted to be difficult. Complications, including postpartum back pain and headache, were decreased with preprocedural ultrasound. The adoption of preprocedural ultrasound for neuraxial procedures in obstetrics is recommended and, in the opinion of the authors, should be considered as a standard of care, in view of its potential to increase efficacy and reduce complications without significant prolongation of the total time required.

Study or Subgroup	Ultrasound Events	Total	Landmark Events	Total	Weight	Risk Ratio M–H, Random, 95% CI
1.3.1 Easy						
Ansari et al, 2014	49	75	47	75	10.6%	1.04 [0.82, 1.33]
Arzola et al, 2015	36	60	34	68	9.8%	1.20 [0.88, 1.64]
Subtotal (95% CI)		**135**		**143**	**20.4%**	**1.10 [0.91, 1.33]**
Total events	85		81			
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.49$, df = 1 (P = 0.48); $I^2 = 0\%$						
Test for overall effect: Z = 0.96 (P = 0.34)						
1.3.2 Difficult						
Ekinci et al, 2017	8	32	7	32	4.2%	1.14 [0.47, 2.78]
Li et al, 2019	35	40	21	40	9.7%	1.67 [1.21, 2.29]
Wang et al, 2012	19	30	13	30	7.7%	1.46 [0.89, 2.39]
Subtotal (95% CI)		**102**		**102**	**21.6%**	**1.56 [1.21, 2.01]**
Total events	62		41			
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.76$, df = 2 (P = 0.68); $I^2 = 0\%$						
Test for overall effect: Z = 3.41 (P = 0.0006)						
1.3.3 Heterogenous						
Chin et al, 2018	67	105	42	110	10.2%	1.67 [1.27, 2.21]
Dhanger et al, 2018	37	50	9	50	6.3%	4.11 [2.22, 7.60]
Nassar et al, 2015	37	55	22	55	9.1%	1.68 [1.16, 2.44]
Perna et al, 2017	16	30	15	28	7.8%	1.00 [0.62, 1.61]
Tawfik et al, 2017	31	53	33	55	9.8%	0.97 [0.71, 1.33]
Turkstra et al, 2017	7	40	11	40	4.5%	0.64 [0.27, 1.47]
Subtotal (95% CI)		**333**		**338**	**47.7%**	**1.41 [0.96, 2.09]**
Total events	195		132			
Heterogeneity: $Tau^2 = 0.18$; $Chi^2 = 25.39$, df = 5 (P = 0.0001); $I^2 = 80\%$						
Test for overall effect: Z = 1.74 (P = 0.08)						
1.3.4 Unspecified						
Grau et al, 2001 B	30	40	8	40	6.0%	3.75 [1.97, 7.15]
Grau et al, 2004	7	10	4	10	4.4%	1.75 [0.74, 4.14]
Subtotal (95% CI)		**50**		**50**	**10.4%**	**2.70 [1.27, 5.76]**
Total events	37		12			
Heterogeneity: $Tau^2 = 0.15$; $Chi^2 = 2.02$, df = 1 (P = 0.16); $I^2 = 50\%$						
Test for overall effect: Z = 2.57 (P = 0.01)						
Total (95% CI)		**620**		**633**	**100.0%**	**1.46 [1.16, 1.82]**
Total events	379		266			
Heterogeneity: $Tau^2 = 0.11$; $Chi^2 = 43.26$, df = 12 (P < 0.0001); $I^2 = 72\%$						
Test for overall effect: Z = 3.29 (P = 0.0010)						
Test for subgroup differences: $Chi^2 = 8.73$, df = 3 (P = 0.03), $I^2 = 65.6\%$						

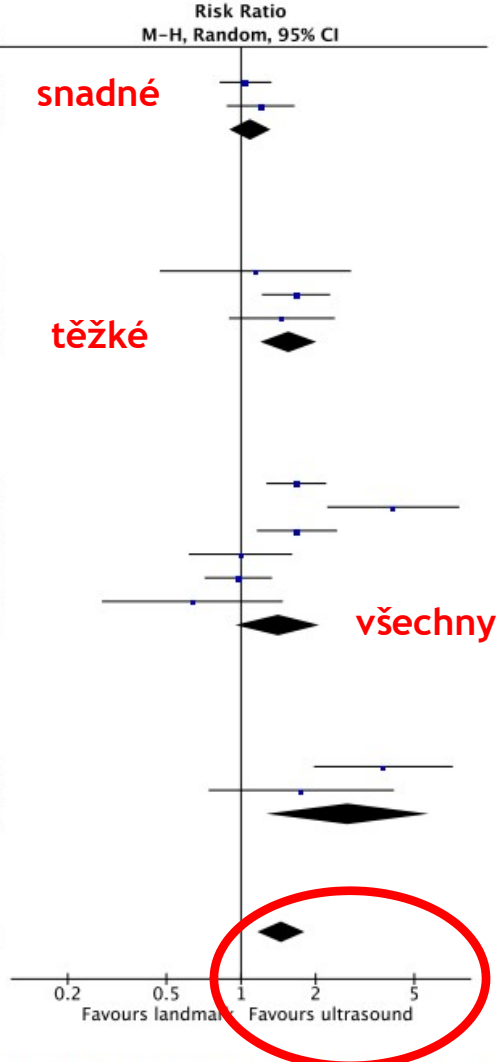
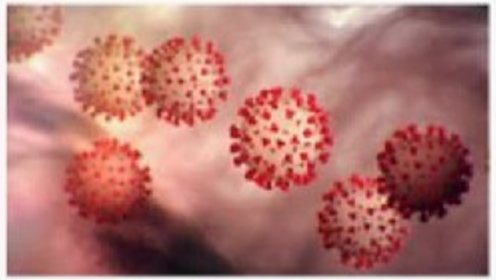
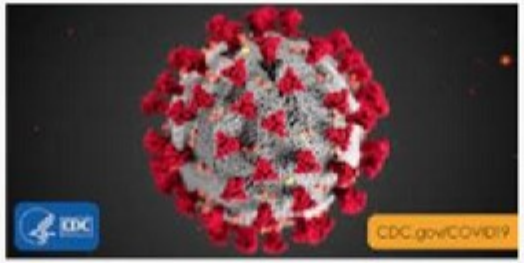


Figure 3 Forest plot of the first-pass success rate according to the predicted difficulty of the neuraxial procedure. M–H, Mantel–Haenszel.



Situation Summary | CDC
cdc.gov



What To Do if You Are Sick | CDC
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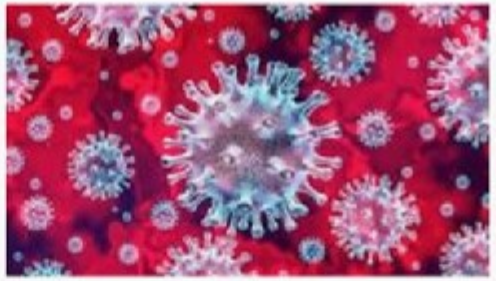

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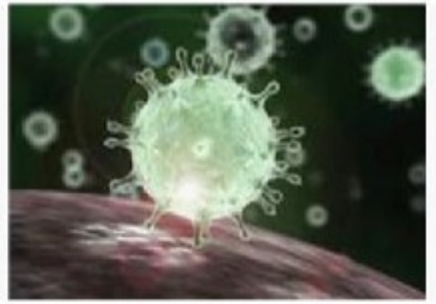

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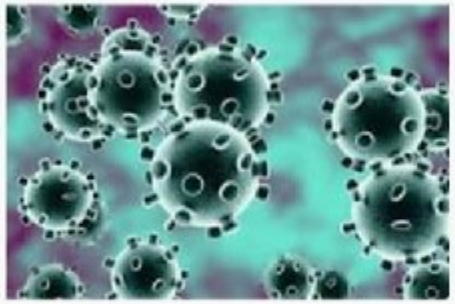

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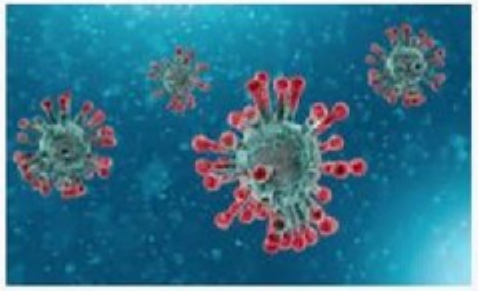

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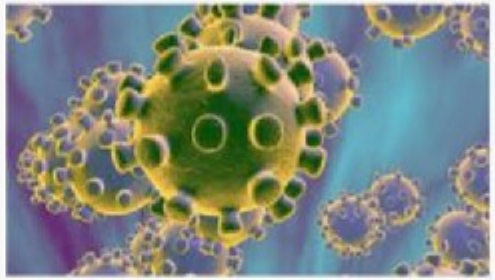

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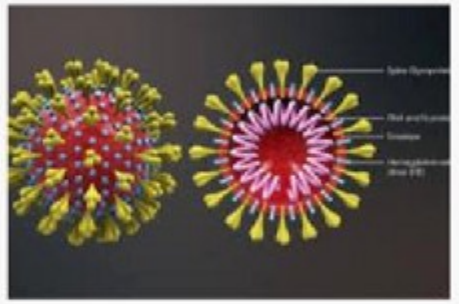

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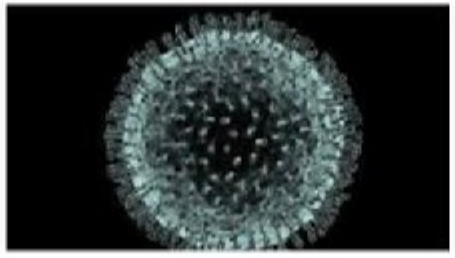

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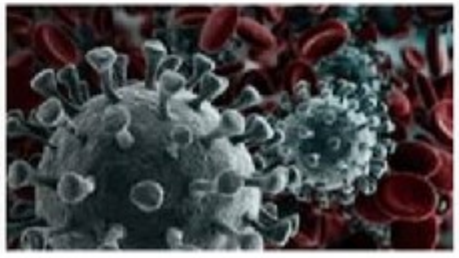

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jan.blaha@vfn.cz