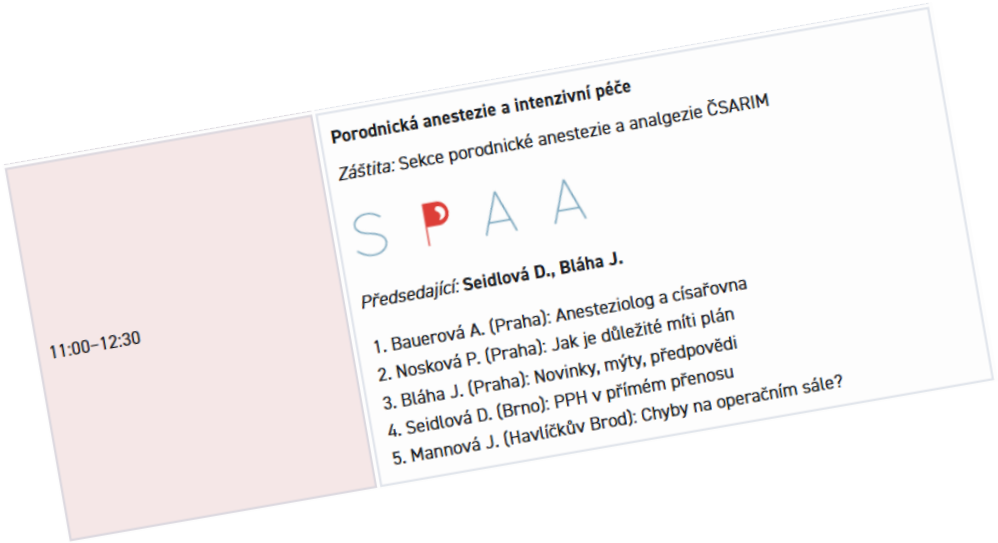
Novinky, mýty, předpovědi



11:00–12:30

Porodnická anestezie a intenzivní péče

Záštita: Sekce porodnické anestezie a analgezie ČSARIM

SPAA

Předsedající: **Seidlová D., Bláha J.**

1. Bauerová A. (Praha): Anesteziolog a císařovna
2. Nosková P. (Praha): Jak je důležité míti plán
3. Bláha J. (Praha): Novinky, mýty, předpovědi
4. Seidlová D. (Brno): PPH v přímém přenosu
5. Mannová J. (Havlíčkův Brod): Chyby na operačním sále?

JAN BLÁHA

KLINIKA ANESTEZIOLOGIE, RESUSCITACE A INTENZIVNÍ MEDICÍNY

1. LÉKAŘSKÁ FAKULTA
Univerzita Karlova

VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

jan.blaha@vfn.cz

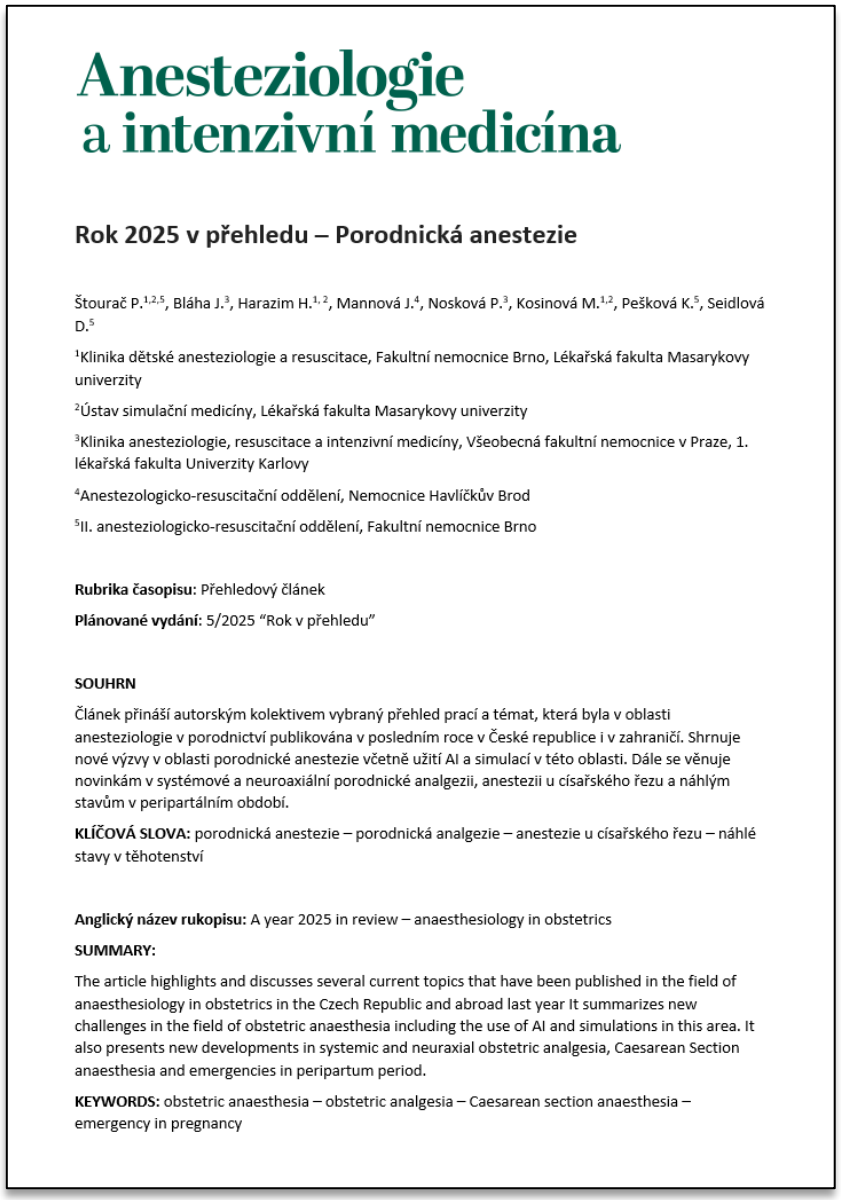
Česká anesteziologická cesta 2025

... mapujeme kudy jdeme

- ➔ Vyplňte krátký dotazník o tom, jak poskytujete vy anesteziologickou péči
- ➔ Pomozte nám zmapovat současnou anesteziologickou praxi
- ➔ Otiskněte svoji stopu na mapu české anesteziologie

Česká společnost anesteziologie, resuscitace a intenzivní medicíny

Nemám konflikt zájmů



Anesteziologie
a intenzivní medicína

Rok 2025 v přehledu – Porodnická anestezie

Štourač P.[1,2,5], Bláha J.[3], Harazim H.[1, 2], Mannová J.[4], Nosková P.[3], Kosinová M.[1,2], Pešková K.[5], Seidlová D.[5]

[1]Klinika dětské anesteziologie a resuscitace, Fakultní nemocnice Brno, Lékařská fakulta Masarykovy univerzity

[2]Ústav simulační medicíny, Lékařská fakulta Masarykovy univerzity

[3]Klinika anesteziologie, resuscitace a intenzivní medicíny, Všeobecná fakultní nemocnice v Praze, 1. lékařská fakulta Univerzity Karlovy

[4]Anestezologicko-resuscitační oddělení, Nemocnice Havlíčkův Brod

[5]II. anesteziologicko-resuscitační oddělení, Fakultní nemocnice Brno

Rubrika časopisu: Přehledový článek

Plánované vydání: 5/2025 "Rok v přehledu"

SOUHRN

Článek přináší autorským kolektivem vybraný přehled prací a témat, která byla v oblasti anesteziologie v porodnictví publikována v posledním roce v České republice i v zahraničí. Shrnuje nové výzvy v oblasti porodnické anestezie včetně užití AI a simulací v této oblasti. Dále se věnuje novinkám v systémové a neuroaxiální porodnické analgezii, anestezii u císařského řezu a náhlým stavům v peripartálním období.

KLÍČOVÁ SLOVA: porodnická anestezie – porodnická analgezie – anestezie u císařského řezu – náhlé stavy v těhotenství

Anglický název rukopisu: A year 2025 in review – anaesthesiology in obstetrics

SUMMARY:

The article highlights and discusses several current topics that have been published in the field of anaesthesiology in obstetrics in the Czech Republic and abroad last year It summarizes new challenges in the field of obstetric anaesthesia including the use of AI and simulations in this area. It also presents new developments in systemic and neuraxial obstetric analgesia, Caesarean Section anaesthesia and emergencies in peripartum period.

KEYWORDS: obstetric anaesthesia – obstetric analgesia – Caesarean section anaesthesia – emergency in pregnancy

- Nové výzvy v porodnické anestezii; AI; simulace v porodnické anestezii (*Štourač*)
- Systémová porodnická analgezie (*Harazim*)
- Neuroaxiální porodnická analgezie (*Nosková*)
- Celková anestezie u SC (*Harazim*)
- Neuroaxiální blokáda u SC (*Bláha*)
- Komplikace v perioperačním období (*Mannová*)
- Náhle stavy v těhotenství (*Seidlová, Pešková*)

Stále platí, že na porodnici vždy RSI…?

JAN BLÁHA

KLINIKA ANESTEZIOLOGIE, RESUSCITACE A INTENZIVNÍ MEDICÍNY

1. LÉKAŘSKÁ FAKULTA Univerzita Karlova

VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

jan.blaha@vfn.cz


FRESENIUS KABI
qCON
71
conox


INTUBACE
BOLEST
FRESENIUS KABI
SQI
100
EMG
27
BSR
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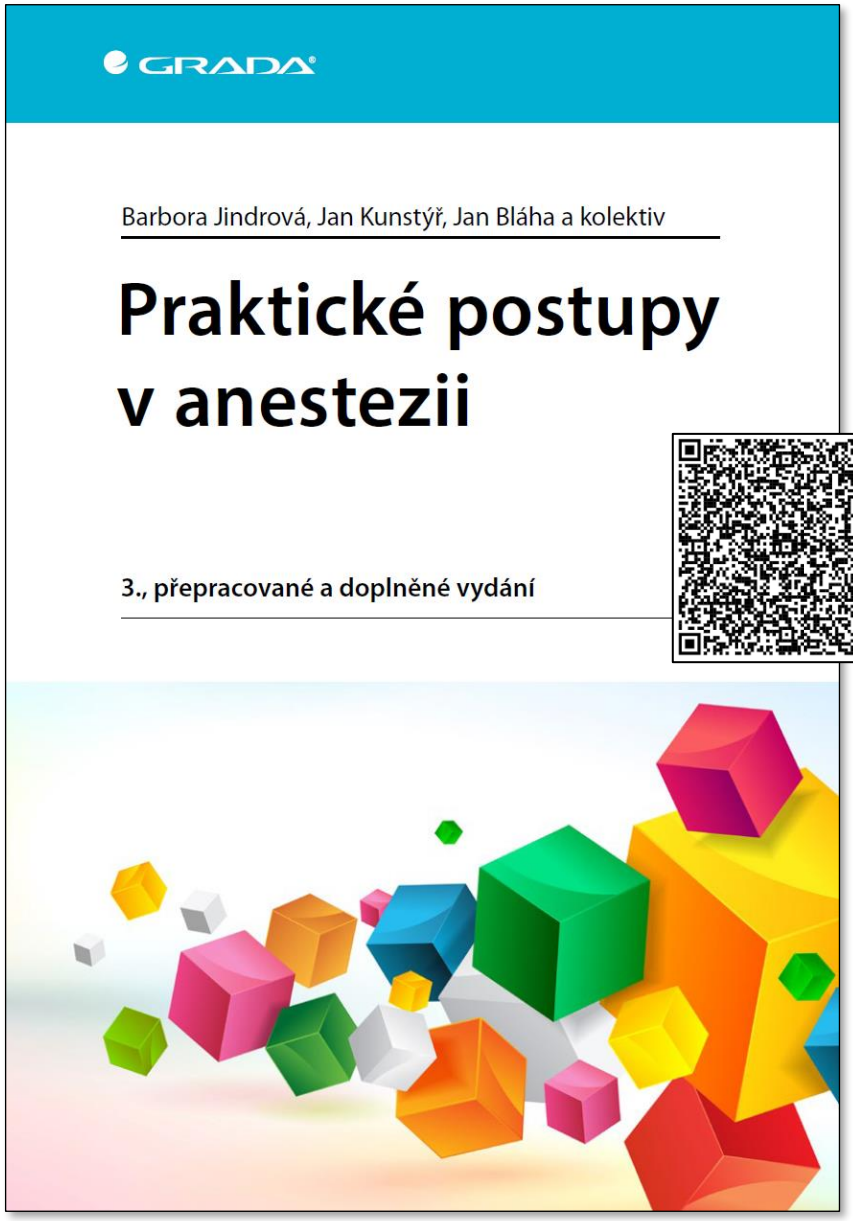
65
qCON
64
Impedance
Settings
VYBAVENÍ PLODU
VRÁCENÍ DĚLOHY
conox

CÍSAŘSKÝ ŘEZ … v celkové anestezii

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

Aktuální vyhodnocení rizika obtížnosti OTI, **CAVE:** piercing v oblasti úst!

Zkontrolovat okamžitou dostupnost vybavení pro alternativní zajištění DC, včetně funkční odsávačky.

U rodiček s těžší HT je vhodná redukce TK před úvodem do CA: pro rychlé snížení TK na OS lze použít především urapidil v dávce 10–20 mg à 5 min.

Preoxygenace/denitrogenace plic!

Úvod do CA: TP 5 mg/kg nebo propofol (2,5 mg/kg) + rokuronium 1 mg/kg (SCH 1,2–1,5 mg/kg).

Intubace za 50 sekund od podání relaxancia!

NE Sellickův manévr!

Zvaž:
- Při HT remifentanil 0,5–1 µg/kg.
- Při hypotenzi ketamin 0,5–1 mg/kg.
- Laryngoskop s flexitipem; ETK č. 7, event. se zavaděčem.
- Už po 1 nezdařilém pokusu o OTI jako první alternativu použít LM. Podstatná je oxygenace, nikoli intubace!

Anestezie do vybavení plodu: inhalace O_2 + vzduch + sevofluran 0,7% (zvaž N_2O jako analgetikum).

Relaxace: při OTI v SCH podat nedepolarizující svalové relaxans ihned po OTI (neprostupují placentou), např. atrakurium 15–25 mg.

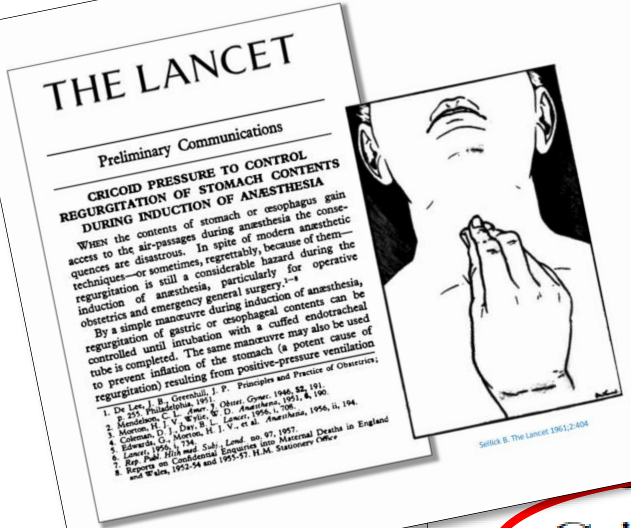
Anestezie po vybavení plodu: sufentanil bolus 30–50 µg, sevofluran zvýšit na 1,0 MAC nebo dle potřeby. A dále standardní postup pro CA.

KARIM
1.LF UK
VFN v Praze

Změna standardu CA u císařského řezu na KARIM VFN v Praze:

- *thiopental 5 mg/kg*
- *rokuronium 0,6/1 mg.kg^{-1} + sugammadex*

- zvaž *remifentanil 1 µg/kg*



THE LANCET

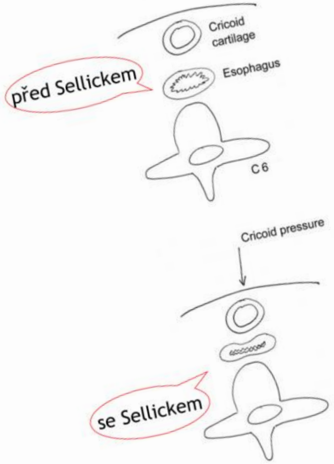
Preliminary Communications

CRICOID PRESSURE TO CONTROL REGURGITATION OF STOMACH CONTENTS DURING INDUCTION OF ANÆSTHESIA

When the contents of stomach or œsophagus gain access to the air-passages during anæsthesia the consequences are disastrous. In spite of modern anæsthetic techniques—or sometimes, regrettably, because of them—regurgitation is still a considerable hazard during the induction of anæsthesia, particularly for operative obstetrics and emergency general surgery.[1-8]

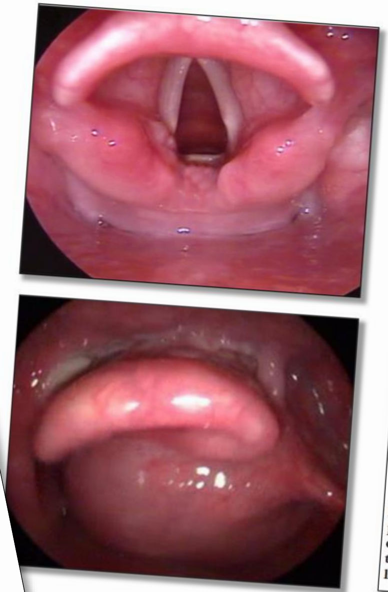
By a simple manœuvre during induction of anæsthesia, regurgitation of gastric or œsophageal contents can be controlled until intubation with a cuffed endotracheal tube is completed. The same manœuvre may also be used to prevent inflation of the stomach (a potent cause of regurgitation) resulting from positive-pressure ventilation

1. De Lee, J. B., Greenhill, J. P. Principles and Practice of Obstetrics; p. 255. Philadelphia, 1951.
2. Mendelson, C. L. Amer. J. Obstet. Gynec. 1946, 52, 191.
3. Morton, H. J. V., Wylie, W. D. Anæsthesia, 1951, 6, 190.
4. Coleman, D. J., Day, B. L. Lancet, 1956, i, 708.
5. Edwards, G., Morton, H. J. V., et al. Anæsthesia, 1956, ii, 194.
6. Lancet, 1956, i, 734.
7. Rep. Publ. Hlth med. Subj., Lond. no. 97, 1957.
8. Reports on Confidential Enquiries into Maternal Deaths in England and Wales, 1952-54 and 1955-57. H.M. Stationery Office



Sellick B. The Lancet 1961;2:404

Seminář KARIM 5.5.2025



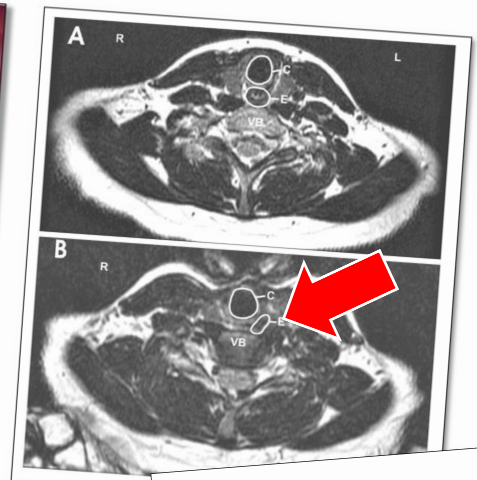


Fig. 3. (A) Magnetic re… pressure. (B) Magne… demonstrating 12.1 n… the left with applicati… lage, E = esophagus, …

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

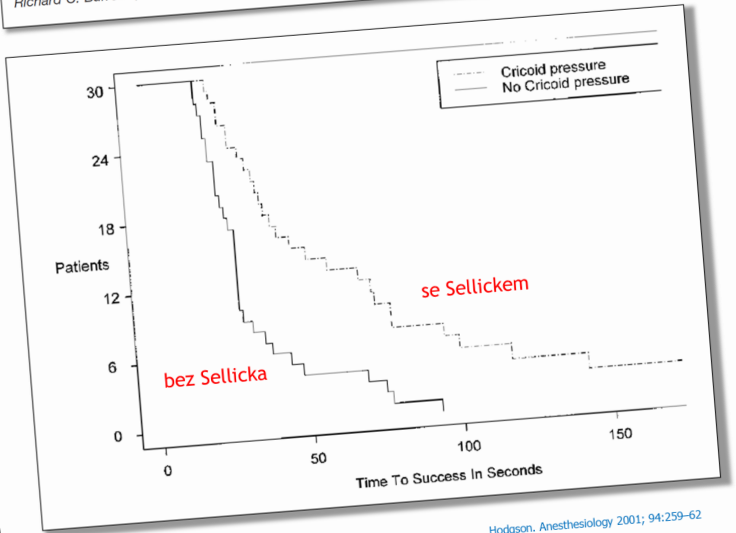
Seminář KARIM 5.5.2025

…ed by

…determined doses of thiopental …
– Cricoid force
– Avoidance of ventilation by bag and
– Tracheal intubation

Effect of Cricoid Pressure on the Success of Endotracheal Intubation with a Lightwand

R. Eric Hodgson, M.B., Ch.B.(Hons.), F.C.A.(S.A.)(Crit. Care),* P. Dean Gopalan, M.B., Ch.B., F.C.A.(S.A.),* Richard C. Burrows, M.B., Ch.B., F.C.A.(S.A.)(Crit. Care),† Khangelani Zuma, M.Sc.‡



Hodgson. Anesthesiology 2001; 94:259–62

Original Investigation

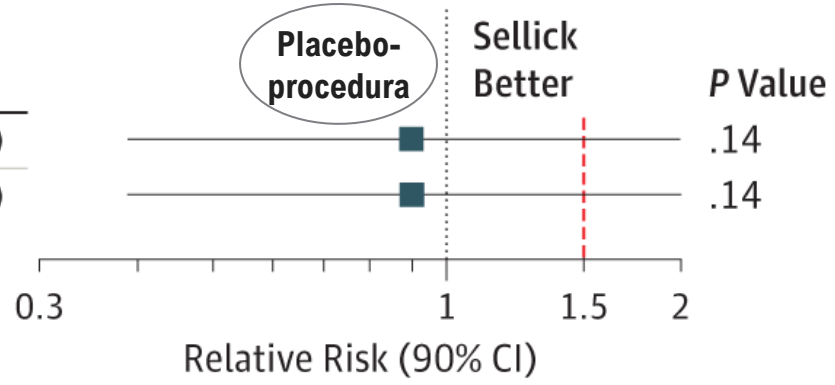
Effect of Cricoid Pressure Compared With a Sham Procedure in the Rapid Sequence Induction of Anesthesia The IRIS Randomized Clinical Trial

Aurélie Birenbaum, MD[1]; David Hajage, MD, PhD[2]; Sabine Roche, MD[1] ; et al

JAMA Surg
Published Online: January 2019
2019;154;(1):9-17. doi:10.1001/jamasurg.2018.3577

	No. of Events/Total No. (%)		Relative Risk (90% CI)
	Sellick	Sham	
Intention-to-treat analysis	10/1784 (0.6)	9/1736 (0.5)	0.90 (0.39-1.99)
Per-protocol analysis	10/1729 (0.6)	9/1730 (0.5)	0.90 (0.39-2.00)

placebo-procedura



Comparison of the Incidence of Pulmonary Aspiration Between the Sellick Group and the Sham Group

The points represent the estimates of relative risk (sham group/Sellick group), and the horizontal bars represent the associated 2-sided 90% CI. The upper limits are identical to those of the 1-sided 95% CI used in this study for establishing noninferiority. Clinical noninferiority of the sham procedure would be accepted if the upper limit of these intervals fell below the predefined noninferiority margin represented in red dotted line.

Intubační podmínky SX vs ROC …?

Anesth Analg 2016;122:1536–45)

Low-Dose or High-Dose Rocuronium Reversed with Neostigmine or Sugammadex for Cesarean Delivery Anesthesia: A Randomized Controlled Noninferiority Trial of Time to Tracheal Intubation and Extubation

Petr Stourac, MD, PhD,* Milan Adamus, MD, PhD,† Dagmar Seidlova, MD, PhD,‡ Tomas Pavlik, MSc, PhD,§ Petr Janku, MD, PhD,‖ Ivo Krikava, MD, PhD,¶ Zdenek Mrozek, MD, PhD,† Martin Prochazka, MD, PhD,# Jozef Klucka, MD,* Roman Stoudek, MD,* Ivana Bartikova, MD,¶ Martina Kosinova, MD,¶ Hana Harazim, MD,¶ Hana Robotkova, MD,‡ Karel Hejduk, MSc,§ Zuzana Hodicka, MD, PhD,‖ Martina Kirchnerova, MD,† Jana Francakova, MD,† Lenka Obare Pyszkova, MD,† Jarmila Hlozkova, MD,† and Pavel Sevcik, MD, PhD**

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

https://doi.org/10.1016/j.ijoa.2019.08.005

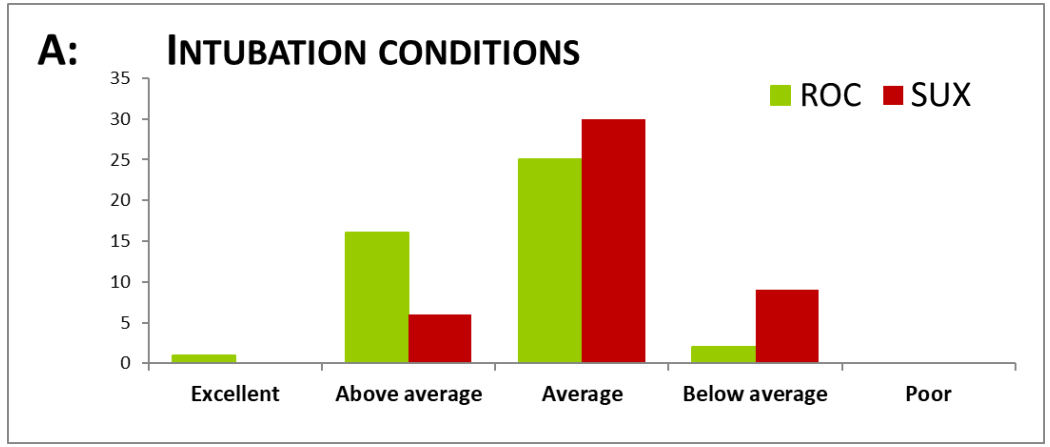
ORIGINAL ARTICLE

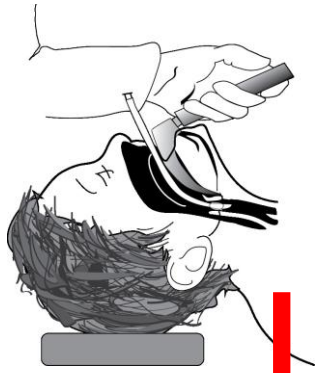
Surgical conditions with rocuronium versus suxamethonium in cesarean section: a randomized trial

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 3. Evaluation of Intubating Conditions

	ROC group (*n* = 120)		SUX group (*n* = 120)		
	n	%	*n*	%	*P*[a]
Resistance to laryngoscopy					0.019
None	105	88	89	74	
Mild (slight)	14	12	25	21	
Severe (active)	1	1	6	5	





U těhotné je 10x vyšší riziko obtížné intubace,
tak si musíme vytvořit **OPTIMÁLNÍ PODMÍNKY**,
a ne **NEDOSTATEČNÉ** !

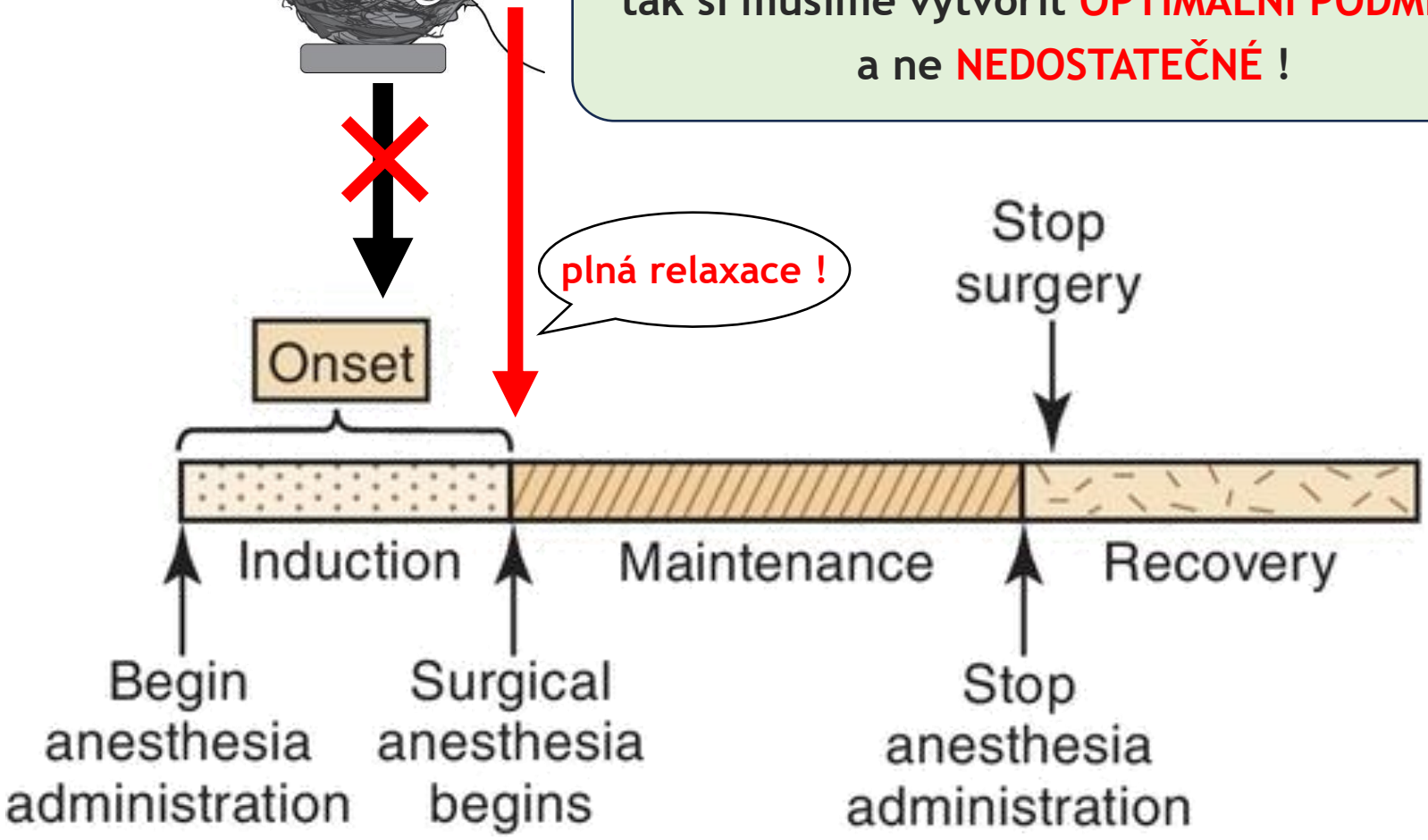


FIGURE 1: Photograph showing the improved airway position obtained by the use of a 'ramping' technique.

Authors received permission for use of photograph. *Anaesthesia and Intensive Care, Vol. 39, No. 4, July 2011*

Prodýchání maskou u sekce…

… A PROČ NE?

Facemask Ventilation during Induction of Anesthesia

How "Gentle" Is "Gentle" Enough?

Shiroh Isono, M.D., Ph.D., Matthias Eikermann, M.D., Ph.D., Takeo Odaka, M.D., Ph.D.

"'Gentle' facemask ventilation has been recommended—but what does that mean? … Bouvet **et al.** *give us new important information to answer that question."*

British Journal of Anaesthesia **115** (6): 815–18 (2015)
Advance Access publication 28 October 2015 · doi:10.1093/bja/aev296

Obstetric Anaesthetists' Association/Difficult Airway Society difficult and failed tracheal intubation guidelines – the way forward for the obstetric airway

M. C. Mushambi[1,*] and S. M. Kinsella[2]

Box 1 Summary of important points and changes in obstetric airway management

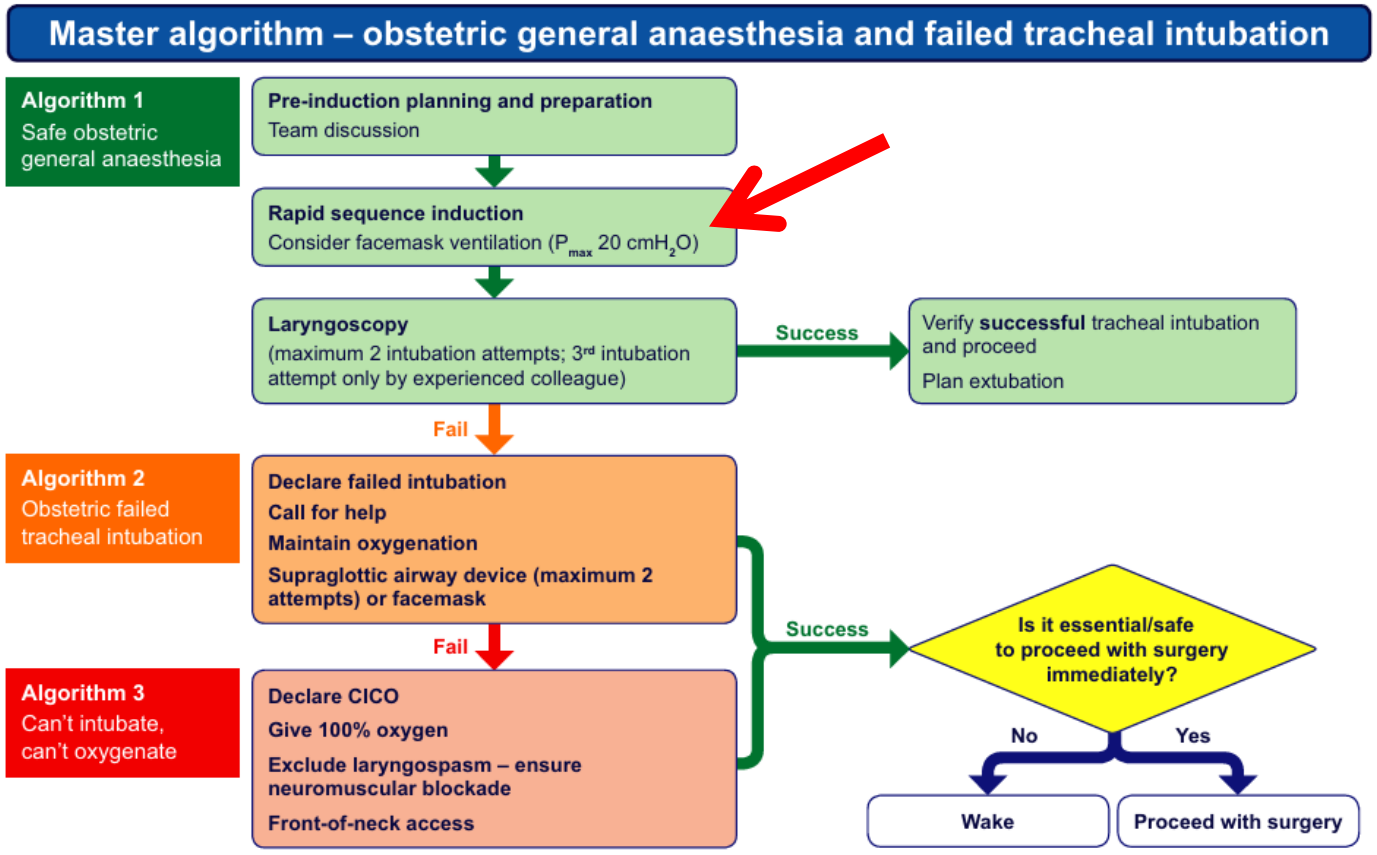
- Gentle mask ventilation with cricoid pressure after administering induction agents is recommended.
- Cricoid pressure should be reduced or released if there is a poor view at laryngoscopy.
- Supraglottic airway device or facemask ventilation are valid first options after failed tracheal intubation. A second-generation supraglottic airway device is recommended.

Anaesthesia 2015, 70, 1286–1306 doi:10.1111/anae.13260

Guidelines

Obstetric Anaesthetists' Association and Difficult Airway Society guidelines for the management of difficult and failed tracheal intubation in obstetrics*

M. C. Mushambi,[1] S. M. Kinsella,[2] M. Popat,[3] H. Swales,[4] K. K. Ramaswamy,[5] A. L. Winton[6] and A. C. Quinn[7,8]



Consider facemask ventilation: Mask ventilation before laryngoscopy has generally been avoided during rapid sequence induction for fear of gastric insufflation and increasing the risk of regurgitation [104], but this should not occur with correctly applied cricoid pressure and using low peak ventilatory pressures [105, 106]. Currently, gentle bag/facemask ventilation (maximal inflation pressure < 20 cmH_2O) is recommended after administration of induction drugs during rapid sequence induction as it can reduce oxygen desaturation [104], and may allow an estimation of the likelihood of successful bag–facemask ventilation should it be required during prolonged or failed intubation attempts.

Real-time Detection of Gastric Insufflation Related to Facemask Pressure–controlled Ventilation Using Ultrasonography of the Antrum and Epigastric Auscultation in Nonparalyzed Patients

A Prospective, Randomized, Double-blind Study

Lionel Bouvet, M.D., Marie-Laure Albert, M.D., Caroline Augris, M.D., Emmanuel Boselli, M.D., Ph.D., René Ecochard, M.D., Ph.D., Muriel Rabilloud, M.D., Ph.D., Dominique Chassard, M.D., Ph.D., Bernard Allaouchiche, M.D., Ph.D.

ABSTRACT

Background: The authors sought to determine the level of inspiratory pressure minimizing the risk of gastric insufflation while providing adequate pulmonary ventilation. The primary endpoint was the increase in incidence of gastric insufflation detected by ultrasonography of the antrum while inspiratory pressure for facemask pressure-controlled ventilation increased from 10 to 25 cm H_2O.

Methods: In this prospective, randomized, double-blind study, patients were allocated to one of the four groups (P10, P15, P20, and P25) defined by the inspiratory pressure applied during controlled-pressure ventilation: 10, 15, 20, and 25 cm H_2O. Anesthesia was induced using propofol and remifentanil; no neuromuscular-blocking agent was administered. Once loss of eyelash reflex occurred, facemask ventilation was started for a 2-min period while gastric insufflation was detected by auscultation and by real-time ultrasonography of the antrum. The cross-sectional antral area was measured using ultrasonography before and after facemask ventilation. Respiratory parameters were recorded.

Results: Sixty-seven patients were analyzed. The authors registered statistically significant increases in incidences of gastric insufflation with inspiratory pressure, from 0% (group P10) to 41% (group P25) according to auscultation, and from 19 to 59% according to ultrasonography. In groups P20 and P25, detection of gastric insufflation by ultrasonography was associated with a statistically significant increase in the antral area. Lung ventilation was insufficient for group P10.

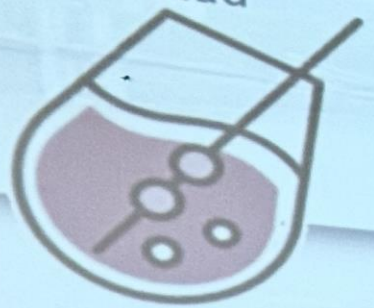
Conclusion: Inspiratory pressure of 15 cm H_2O allowed for reduced occurrence of gastric insufflation with proper lung ventilation during induction of anesthesia with remifentanil and propofol in nonparalyzed and nonobese patients. (ANESTHESIOLOGY 2014; 120:XX-XX)

Table 3. Probability (95% CI) of Absence of Gastric Insufflation and Probability of Acceptable Facemask Ventilation According to the Applied Peak Airway Pressure

Peak Airway Pressure (cm H_2O)	Probability of No Gastric Insufflation (%)		Probability of Hypoventilation (%)	Probability of Too High Tidal Volume (%)	Probability of Acceptable Ventilation (%)
	According to Auscultation	According to Real-time US			
10	100 (83–100)	81 (57–95)	75 (50–91)	7 (1–27)	19 (5–43)
15	88 (66–98)	65 (41–84)	12 (2–34)	24 (8–47)	65 (41–84)
20	59 (35–80)	47 (25–70)	6 (0–26)	59 (35–80)	35 (16–60)
25	59 (35–80)	41 (20–65)	0 (0–16)	100 (84–100)	0 (0–16)

US = ultrasonography.

@ruthi_landau

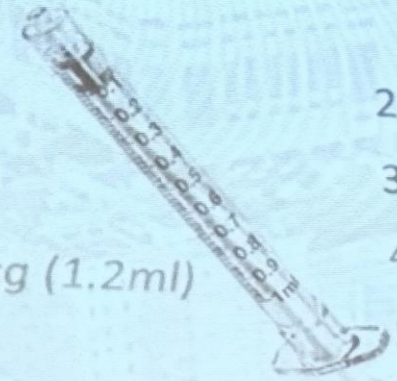


COLUMBIA UNIVERSITY
IRVING MEDICAL CENTER | Department of Anesthesiology

Cesarean anesthesia

Spinal cocktail

1. Hyperbaric bupivacaine 0.75% 12mg (1.6ml)
2. Fentanyl 15 mcg (0.3ml)
3. Morphine 150 mcg (0.3ml)
4. ± clonidine 30 mcg (0.3ml)
5. ± *PF dexmedetomidine 5 mcg (1.2ml)*



Epidural (intrapartum)

1. Lidocaine 2% epi 20ml + HCO_3. (or chloroprocaine 3% 20ml if emergent)
2. Fentanyl 100 mcg
3. Morphine 3 mg
4. ± clonidine 100 mcg
5. IV dexmedetomidine 10mcg

2024-12-06 12:

OBAAMA-COV

SPINAL ANAESTHESIA *(OBAAMA-COV data)*				
	Elective CS	**Emergent CS**	**Elective SVK**	**Emergent SVK**
	N=537	N=352	N=251	N=188
Position for spinal puncture				
Lying on the side	20,1 %	23,3 %	2,8 %	2,1 %
Sitting	76,4 %	72,2 %	90,4 %	91,5 %
Height of blockade application				
L1/L2	1,1 %	1,4 %	0,8 %	1,1 %
L2/L3	25,7 %	17,3 %	18,7 %	19,7 %
L3/L4	62,8 %	69,9 %	74,1 %	70,2 %
L4/L5	10,2 %	11,4 %	6,4 %	9,0 %
L5/S1	0,2 %	0,0 %	0,0 %	0,0 %
Needle				
G25	18,2 %	20,0 %	43,6 %	38,7 %
G26	48,9 %	45,1 %	27,8 %	23,7 %
G27	32,9 %	34,9 %	28,6 %	37,6 %
Introducer used	89,8 %	88,9 %	89,6 %	86,7 %
Needle tip				
Quincke/Lancet	25,6 %	33,7 %	47,2 %	53,4 %
Pencil point	48,6 %	53,0 %	38,7 %	36,2 %
Atraucan	24,2 %	12,1 %	14,0 %	10,3 %
Other	1,6 %	1,2 %	0,0 %	0,0 %
Spinal mixture				
Bupivacaine	88,3 %	84,4 %	94,8 %	91,0 %
- dose (ml) [1]	2,60 (2,40-2,80)	2,60 (2,50-2,80)	2,50 (2,20-2,60)	2,50 (2,20-2,70)
Levobupivacaine	10,8 %)	15,1 %)	4,4 %)	10,1 %)
- dose (ml) [1]	2,80 (2,50-3,00)	2,80 (2,60-3,00)	2,70 (2,50-2,95)	3,00 (2,50-3,00)
Morphine	24,4 %	24,4 %	0,0 %	0,0 %
Sufentanil	0,2 %	0,0 %	2,0 %	3,7 %
Other	0,0 %	0,0 %	0,0 %	0,0 %

Data are given in % or [1]median (IQR)

The effect of addition of ultra-low dose of naloxone to fentanyl–bupivacaine mixture on the incidence of pruritis after spinal anesthesia for cesarean delivery: Randomized clinical study

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Abstract

Background and Aims: The use of intrathecal opioids is associated with high risk of pruritis and this may be decreased by adding a low dose of naloxone. This study evaluated the effect of the addition of 20 μg of naloxone to fentanyl–bupivacaine mixture on the incidence of pruritis in pregnant females scheduled for cesarean section (CS).

Material and Methods: Eighty pregnant patients scheduled for CS under spinal anesthesia were randomized to receive either 10 mg of 0.5% hyperbaric bupivacaine (2 ml) plus 25 μg fentanyl (group F) or 10 mg of 0.5% hyperbaric bupivacaine (2 ml) plus 25 μg fentanyl and 20 μg naloxone (group FN). The incidence, onset, duration, site, and severity of pruritis were measured. Furthermore, the postoperative numerical rating scale (NRS) score, the total tramadol rescue analgesia, and the time for the first request of rescue analgesia were recorded.

Results: Compared to the F group, the FN group showed a significant decrease in the incidence of pruritis ($P = 0.022$), prolongation of the onset of pruritis ($P = 0.006$), shortening of the duration of pruritis ($P = 0.029$), and decrease in the severity of pruritis ($P = 0.039$). Furthermore, the postoperative pain score, the rescue analgesic consumption, and the time for the first request of rescue analgesia were comparable between the two groups ($P > 0.05$).

Conclusions: The addition of an ultra-low dose of naloxone (20 μg) to fentanyl–bupivacaine mixture in spinal anesthesia for pregnant females scheduled for CS significantly reduced the incidence of pruritis without having a significant effect on the postoperative analgesia.

Table 4: APGAR score at 1 min and 5 min in the study groups

	Group F (38 patients)	Group FN (39 patients
1-min APGAR score	8 (7–10)	8 (7–10)
5-min APGAR score	9 (8–10)	9 (8–10)

Group F (spinal anesthesia with fentanyl–bupivacaine), Group FN (spinal anesthesia with fentanyl–naloxone–bupivacaine). Data are presented as median and interquartile range

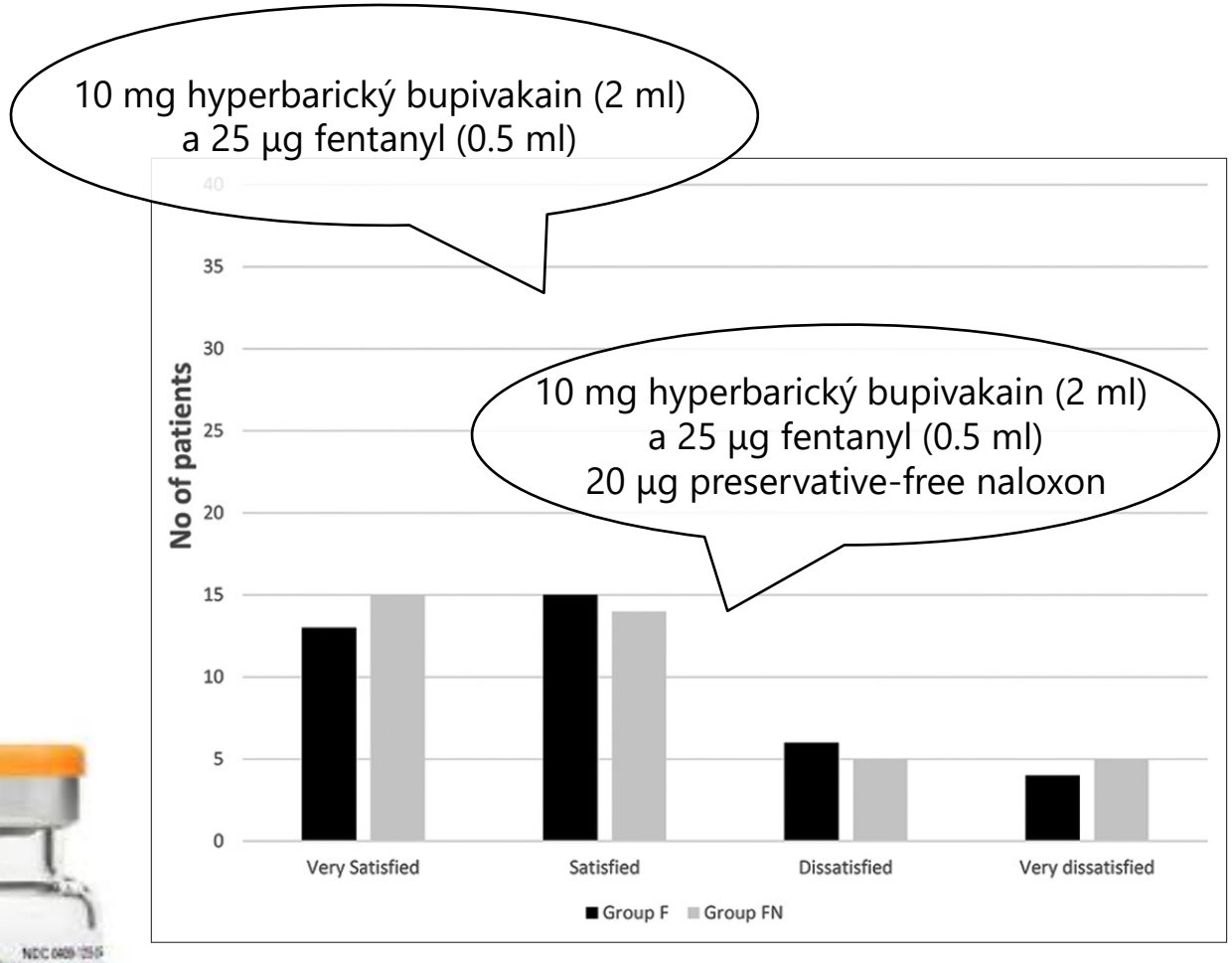

Figure 2: Maternal satisfaction in the studied groups. Group F (spinal anesthesia with fentanyl–bupivacaine: 38 patients), group FN (spinal anesthesia with fentanyl–naloxone–bupivacaine: 39 patients). Data are presented as the number of patients

The effect of adding dexmedetomidine or dexamethasone to bupivacaine–fentanyl mixture in spinal anesthesia for cesarean section

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Abstract

Background and Aims: Many strategies are available to prevent spinal-induced hypotension in cesarean section, especially the use of a low dose of spinal anesthesia combined with adjuvants. This study investigated the effect of adding either dexmedetomidine or dexamethasone to the intrathecal bupivacaine–fentanyl mixture on the postoperative analgesia duration, after elective cesarean section.

Material and Methods: This prospective, randomized, double-blind study was conducted on 90 full-term parturients undergoing elective cesarean section, who were randomly distributed into three groups. They all received spinal anesthesia with the bupivacaine–fentanyl mixture (2.5 ml), in addition to 0.5 ml normal saline (*control group*), 5 μg dexmedetomidine dissolved in 0.5 ml normal saline (*dexmedetomidine group*), or 2 mg dexamethasone (*dexamethasone group*). The time to the first request of morphine rescue analgesia was recorded, in addition to the total dose of morphine consumed in the first 24 h after surgery, the postoperative numerical rating score (NRS), and maternal and fetal outcomes.

Results: As compared to the control group and the dexamethasone group, the use of dexmedetomidine as an additive to the bupivacaine–fentanyl mixture significantly prolonged the time to the first request of rescue analgesia, decreased postoperative morphine consumption, and decreased the pain score 4 and 6 h after surgery. There was an insignificant difference between the control and dexamethasone groups.

Conclusion: The use of dexmedetomidine as an additive to bupivacaine–fentanyl mixture in spinal anesthesia for cesarean section prolonged the postoperative analgesia and decreased the postoperative opioid consumption in comparison to the addition of dexamethasone or normal saline.

dexmedetomidin

dexamethason

Table 3: Criteria of spinal anesthesia in the studied groups

	Group I (*n*=29 parturients)	Group II (*n*=30 parturients)	Group III (*n*=29 parturients)
Onset of sensory block (min)	4.52±1.38	4.47±1.55	4.38±1.37
Duration of sensory block (min)	306.03±44.21	451.83±68.74	326.72±41.47
Onset of motor block (min)	6.90±1.47	6.80±1.27	6.59±1.49
Duration of motor block (min)	133.45±36.57	142.67±34.93	136.55±33.52

Data are presented as mean±SD.
Group I (control group), group II (intrathecal dexmedetomidine), group III (intrathecal dexamethasone).

Table 4: Maternal complication and Apgar score in the three study groups

	Group I (*n*=29 parturients)	Group II (*n*=30 parturients)	Group III (*n*=29 parturients)	*P*
PONV scale	2 (0-3)	1.5 (0-3)	1 (0-3)	0.1133
Intraoperative shivering scale	2 (0-3)	1 (0-3)	1 (0-3)	0.627
Postoperative shivering scale	1 (0-3)	1 (0-3)	1 (0-3)	0.072
Perioperative sedation scale	1 (1-3)	1 (1-3)	2 (1-3)	0.904
Hypotension, *n* (%)	30.03%	36.67%	34.48%	0.899
Bradycardia, *n* (%)	20.69%	26.67%	30.03%	0.667
Pruritis, *n* (%)	30.03%	10%	24.14%	0.134
1 min Apgar score	9 (7-10)	9 (7-10)	9 (7-10)	0.921
5 min Apgar score	10 (8-10)	10 (8-10)	10 (8-10)	0.961

PONV=postoperative nausea and vomiting. Group I (control group), group II (intrathecal dexmedetomidine), group III (intrathecal dexamethasone). Data are presented as median and interquartile range or number (%). P value represents comparison among the three groups

Journal of Clinical Anesthesia 80 (2022) 110786

Maternal and neonatal outcomes with the addition of intrathecal midazolam as an adjuvant to spinal anesthesia in cesarean delivery: A systematic review and meta-analysis of randomized controlled trials

Čas do první analgezie

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[b] Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Room 501, No. 17, Xu-Zhou Road, Taipei, Taiwan
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A B S T R A C T

Study objective: To determine the efficacy and safety, in terms of maternal and neonatal outcomes, of adding intrathecal midazolam to spinal anesthesia for cesarean delivery in healthy pregnant women.

Design: A meta-analysis of randomized controlled trials was conducted. PubMed, Cochrane Library, Embase, and Web of Science were searched manually, and citation screening was completed on May 20, 2021.
Setting: Most of the included data were collected in the operating room and postoperative recovery area. *Patients:* A total of 1382 healthy parturients undergoing cesarean delivery with single-shot spinal anesthesia were recruited in 19 eligible randomized controlled trials.

Interventions: Single intrathecal midazolam adjuvant was compared to a control, with the local anesthetic dose in spinal anesthesia identical between the intervention and control groups.
Measurements: The primary outcomes were time to first analgesic use, maternal adverse effects, and neonatal Apgar scores at 1 and 5 min. The secondary outcomes were the onset and duration of the sensory and motor blocks.

Main results: Adjuvant intrathecal midazolam prolonged the time to the first analgesic (mean difference [MD]: 59.96 min, 95% confidence interval [CI]: [23.12, 96.79]) and decreased perioperative maternal nausea and/or vomiting (odds ratio [OR], 0.28; 95% CI: [0.17, 0.45]). However, more sedation events were observed with midazolam (OR, 3.93; 95% CI: [1.12, 13.78]). There was no significant difference in the neonatal Apgar scores at 1 or 5 min (MD: -0.29, 95% CI: [− 0.61, 0.03]; MD: -0.00, 95% CI: [− 0.11, 0.1], respectively). Intrathecal midazolam also shortened sensory and motor block onset by less than 1 min and prolonged sensory block duration but had no significant effect on motor block duration.

Conclusions: Current evidence indicates that intrathecal midazolam, as an adjuvant to spinal anesthesia, provides modest analgesic and significant antiemetic effects at the cost of more sedation events in cesarean delivery patients. The neonatal Apgar score was not affected by intrathecal midazolam administration. However, more objective, sensitive, and long-term measurements of neonatal safety and maternal neurological effects should be performed in the future.

S midazolamem lepší

Study or Subgroup	Midazolam Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
1.1.1 Midazolam = 2.5mg								
Akhtaruzzaman 2010	197	24.73	30	112.96	14.46	30	8.5%	84.04 [73.79, 94.29]
Amin 2020	224.2	18.6	30	185.5	17.45	30	8.5%	38.70 [29.57, 47.83]
Bhure 2012	270.54	36.22	30	146.83	26.6	30	8.4%	123.71 [107.63, 139.79]
Subtotal (95% CI)			**90**			**90**	**25.3%**	**81.75 [36.55, 126.96]**
Heterogeneity: $Tau^2 = 1557.35$; $Chi^2 = 95.07$, df = 2 ($P < 0.00001$); $I^2 = 98\%$								
Test for overall effect: Z = 3.54 (P = 0.0004)								
1.1.2 Midazolam = 2mg								
Alam 2020	165.1	15.6	30	130.3	5.4	30	8.5%	34.80 [28.89, 40.71]
Daramwar 2021	183.4	25.2	30	141.6	24.2	30	8.4%	41.80 [29.30, 54.30]
Karbasfrushan 2012	178.6	77.33	62	142.18	55.19	62	8.2%	36.42 [12.77, 60.07]
Kurdukar 2021	186.1	32.1	45	155.1	23.5	45	8.4%	31.00 [19.38, 42.62]
Prakash (2mg) 2006	366	60	20	228	30	10	8.0%	138.00 [105.79, 170.21]
Sen 2001	198.5	3.3	20	56.2	5.8	20	8.5%	142.30 [139.38, 145.22]
Zakeri (MgSO4) 2017	144.03	69.261	31	126.23	50.1	31	8.1%	17.80 [−12.29, 47.89]
Subtotal (95% CI)			**238**			**228**	**58.2%**	**63.07 [9.58, 116.56]**
Heterogeneity: $Tau^2 = 5109.99$; $Chi^2 = 1455.37$, df = 6 ($P < 0.00001$); $I^2 = 100\%$								
Test for overall effect: Z = 2.31 (P = 0.02)								
1.1.3 Midazolam < 2mg								
Abdollahpour 2015	117.8	16.54	25	117.28	48.69	25	8.3%	0.52 [−19.64, 20.68]
Prakash (1mg) 2006	258	42	20	228	30	10	8.2%	30.00 [3.84, 56.16]
Subtotal (95% CI)			**45**			**35**	**16.5%**	**14.03 [−14.76, 42.82]**
Heterogeneity: $Tau^2 = 292.55$; $Chi^2 = 3.06$, df = 1 ($P = 0.08$); $I^2 = 67\%$								
Test for overall effect: Z = 0.96 (P = 0.34)								
Total (95% CI)			**373**			**353**	**100.0%**	**59.96 [23.12, 96.79]**
Heterogeneity: $Tau^2 = 4144.36$; $Chi^2 = 1848.48$, df = 11 ($P < 0.00001$); $I^2 = 99\%$								
Test for overall effect: Z = 3.19 (P = 0.001)								
Test for subgroup differences: $Chi^2 = 7.10$, df = 2 (P = 0.03), $I^2 = 71.8\%$								

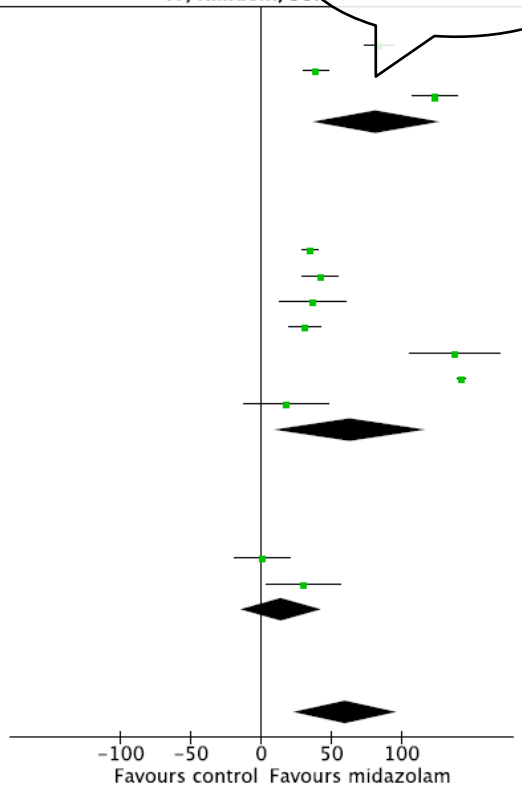

Fig. 2. Forest plot of the time to the first analgesic. CI, confidence interval; df, degree of freedom; IV, inverse variance; SD, standard deviation.

Zhang *et al. BMC Pharmacology and Toxicology* (2025) 26:96
https://doi.org/10.1186/s40360-025-00933-z

Adverse drug events observed with intrathecal magnesium sulfate as an adjuvant to bupivacaine for spinal anesthesia in patients undergoing elective cesarean section: a meta-analysis

Yuanhui Zhang[1†], Yan Huang[2†] and Jun Li[3*]

Abstract

Introduction Today, the number of cesarean section has drastically increased. Newer scientific reports have shown Magnesium sulfate (MgSO4) to have favorable outcomes for anesthesia. In this analysis, we aimed to systematically compare the adverse drug events observed with intrathecal MgSO4 as an adjuvant to bupivacaine for spinal anesthesia in patients undergoing elective cesarean section.

Methods MEDLINE, EMBASE, Web of Science, Google scholar, http://www.ClinicalTrials.gov, and the Cochrane database were searched for relevant publications comparing the adverse drug events observed with intrathecal MgSO4 as an adjuvant to bupivacaine for spinal anesthesia in patients undergoing elective cesarean section. The RevMan software version 5.4 was used to analyze data in this analysis. Risk ratios (RR) with 95% confidence intervals (CIs) were used to represent analysis for the dichotomous data whereas weighted mean difference (WMD) with 95% CI was used to represent results using continuous data. Heterogeneity was assessed by the Q statistic and the I2 statistic tests.

Results Eleven studies with a total number of 895 participants were included in this analysis whereby 466 patients were assigned to intrathecal MgSO4 and 429 participants were assigned to a control group. The main results of this analysis show that intrathecal MgSO4 as an adjuvant to bupivacaine was associated with a significantly lower risk of shivering (RR: 0.63, 95% CI: 0.48 – 0.83; P = 0.001). In addition, the risks for hypotension (RR: 1.11, 95% CI: 0.86 – 1.44; P = 0.40), nausea and vomiting (RR: 1.08, 95% CI: 0.76 – 1.54; P = 0.65), pruritus (RR: 0.77, 95% CI: 0.51 – 1.17; P = 0.22), and bradycardia (RR: 4.45, 95% CI: 0.97 – 20.36; P = 0.05) were not significantly increased. The sensory (WMD: 23.15,

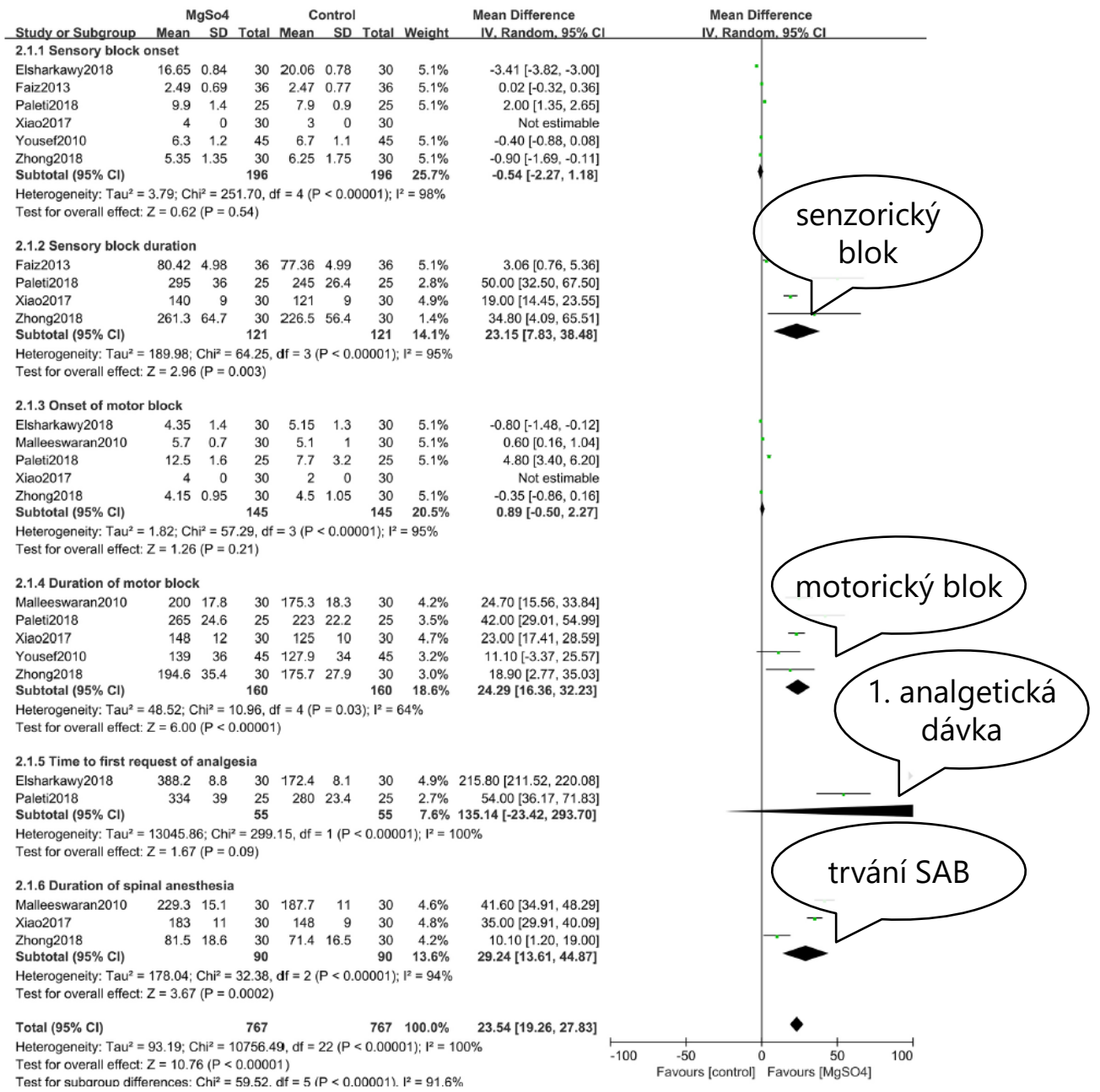

Fig. 4 Efficacy outcomes observed with intrathecal magnesium sulfate as an adjuvant to bupivacaine for spinal anesthesia in patients undergoing elective cesarean section

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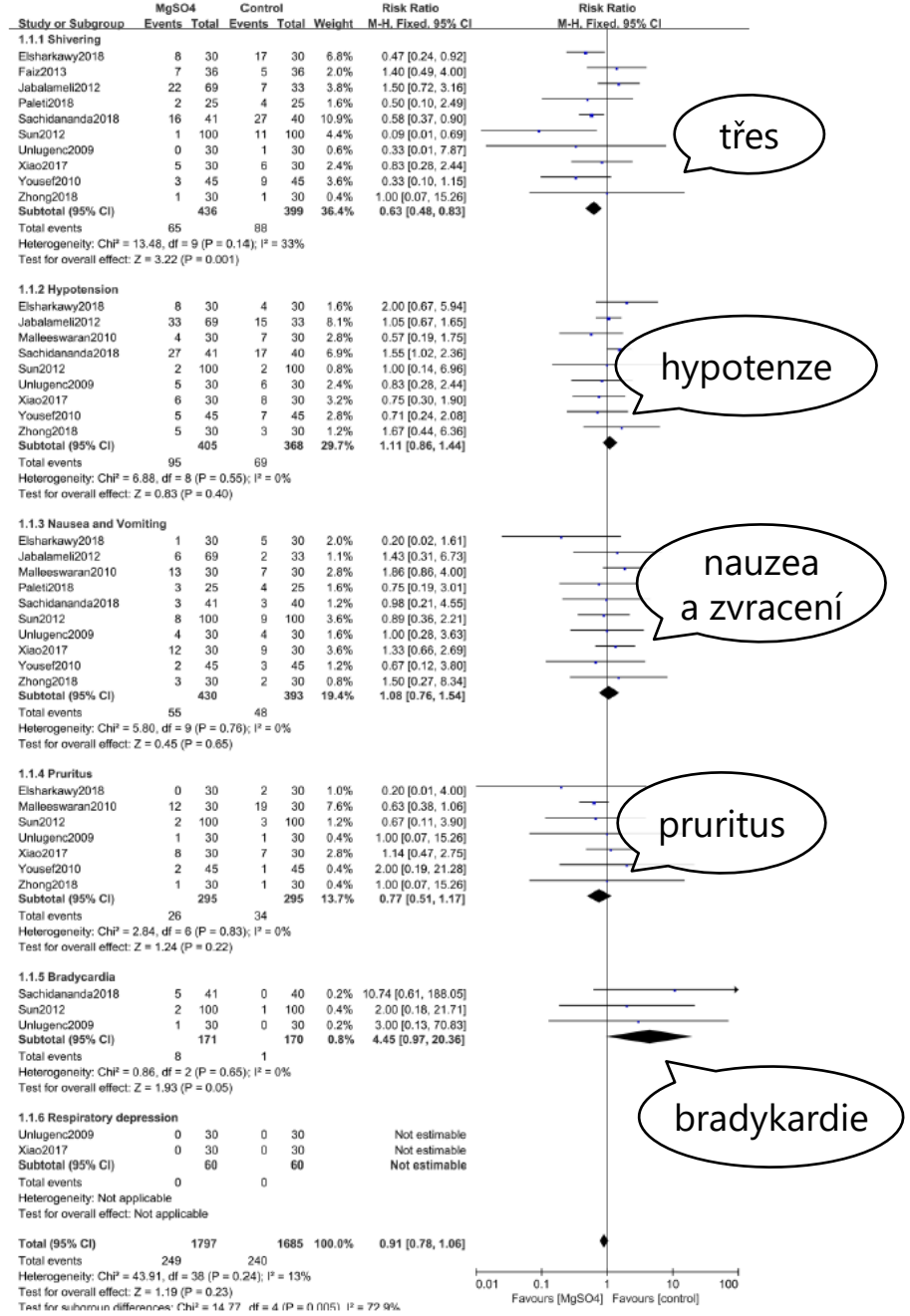

Fig. 3 Adverse drug events observed with intrathecal magnesium sulfate as an adjuvant to bupivacaine for spinal anesthesia in patients undergoing elective cesarean section

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Maternal and neonatal outcomes with the addition of intrathecal midazolam as an adjuvant to spinal anesthesia in cesarean delivery: A systematic review and meta-analysis of randomized controlled trials

Tsung-Yu Hung, MD [a], Yin-Shan Huang, MD [a,1], Ying-Chun Lin, MD, MS [a,b,c,*]

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Conclusions: Current evidence indicates that intrathecal midazolam, as an adjuvant to spinal anesthesia, provides modest analgesic and significant antiemetic effects at the cost of more sedation events in cesarean delivery patients. The neonatal Apgar score was not affected by intrathecal midazolam administration. However, more objective, sensitive, and long-term measurements of neonatal safety and maternal neurological effects should be performed in the future.

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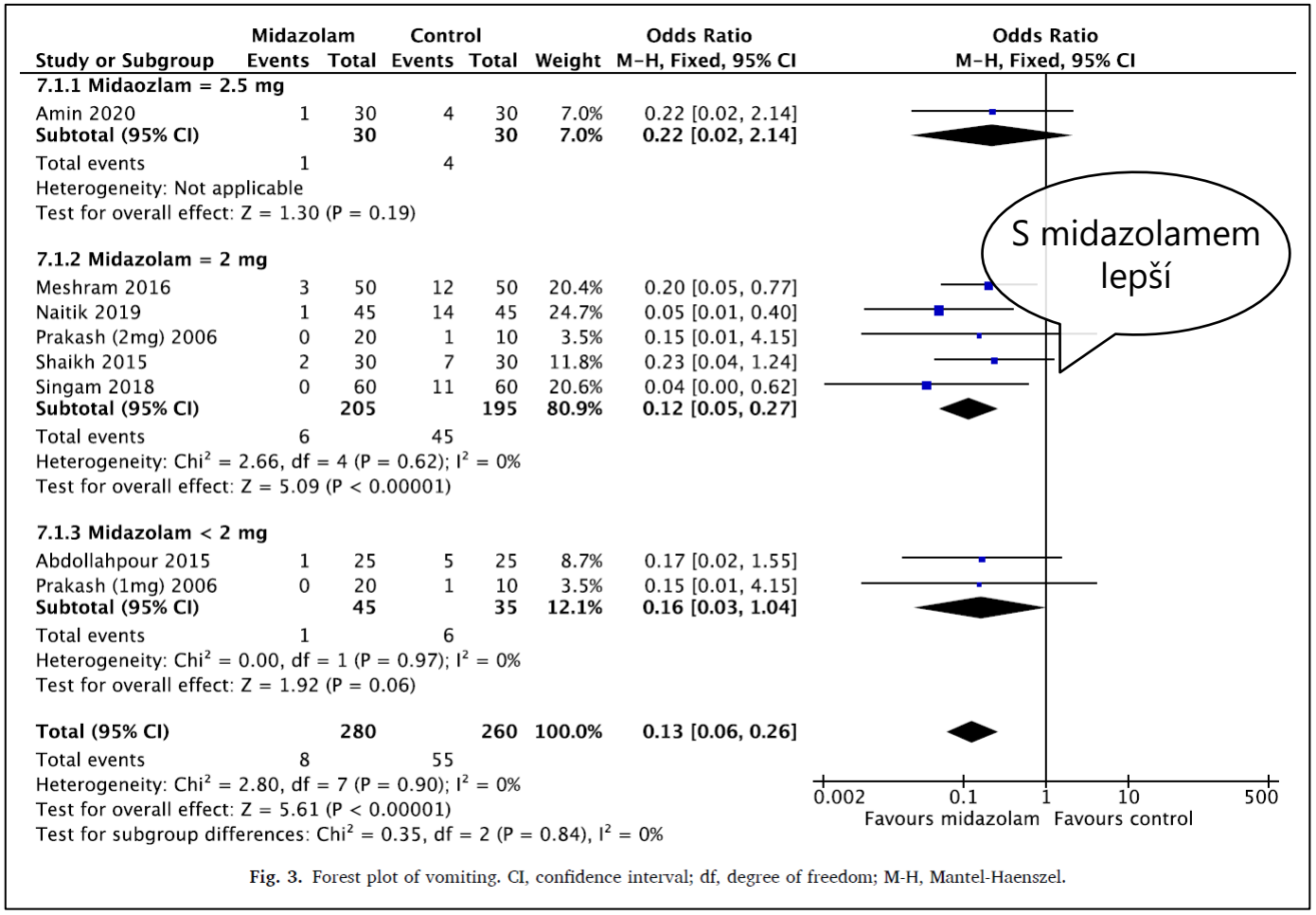

Fig. 3. Forest plot of vomiting. CI, confidence interval; df, degree of freedom; M-H, Mantel-Haenszel.

Journal of Clinical Anesthesia 80 (2022) 110786

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Apgar skóre

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Study or Subgroup	Midazolam Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
9.1.1 Midazolam = 2.5 mg								
Amin 2020	6.9	0.73	30	7.7	0.84	30	17.1%	−0.80 [−1.20, −0.40]
Subtotal (95% CI)			**30**			**30**	**17.1%**	**−0.80 [−1.20, −0.40]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 3.94 (P < 0.0001)								
9.1.2 Midazolam = 2 mg								
Alam 2020	7.64	0.48	30	7.43	0.46	30	20.7%	0.21 [−0.03, 0.45]
Shaikh 2015	7.57	0.82	30	8.47	0.51	30	18.3%	−0.90 [−1.25, −0.55]
Singam 2018	8.05	0.21	60	8.08	0.27	60	23.0%	−0.03 [−0.12, 0.06]
Zakeri (MgSO4) 2017	8.968	0.482	31	9.097	0.396	31	21.0%	−0.13 [−0.35, 0.09]
Subtotal (95% CI)			**151**			**151**	**82.9%**	**−0.18 [−0.49, 0.13]**
Heterogeneity: $Tau^2 = 0.09$; $Chi^2 = 28.49$, df = 3 (P < 0.00001); $I^2 = 89\%$								
Test for overall effect: Z = 1.15 (P = 0.25)								
Total (95% CI)			**181**			**181**	**100.0%**	**−0.29 [−0.61, 0.03]**
Heterogeneity: $Tau^2 = 0.11$; $Chi^2 = 41.36$, df = 4 (P < 0.00001); $I^2 = 90\%$								
Test for overall effect: Z = 1.80 (P = 0.07)								
Test for subgroup differences: $Chi^2 = 5.77$, df = 1 (P = 0.02), $I^2 = 82.7\%$								

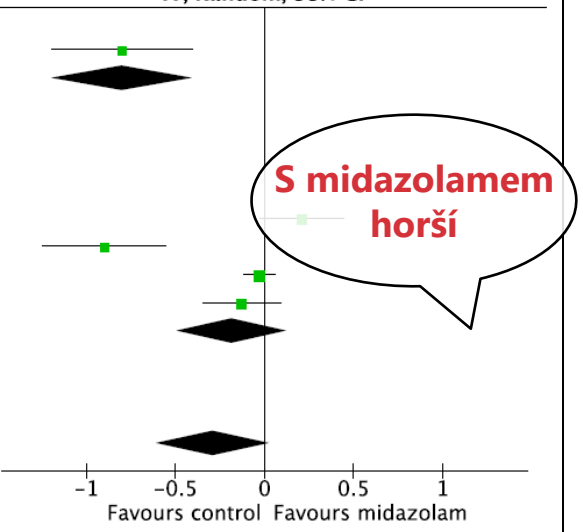

Fig. 4. Forest plot of Apgar scores at 1 min. CI, confidence interval; df, degree of freedom; IV, inverse variance; SD, standard deviation.

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Low-dose midazolam for anxiolysis for pregnant women undergoing cesarean delivery: a randomized trial

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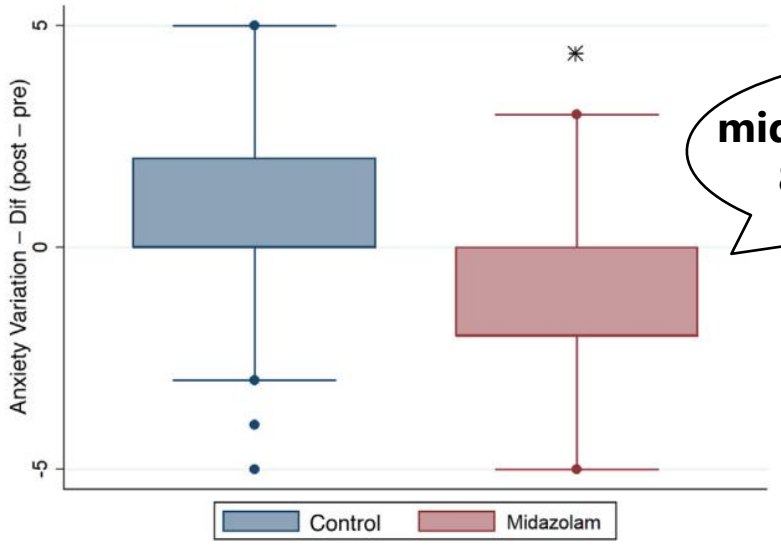
KEYWORDS
Anxiety;
Cesarean section;
Pregnant women;
Midazolam

Abstract
Introduction: Anxiety and fear are common among pregnant women undergoing cesarean delivery. In addition to psychologically unpleasant, they can elicit endocrine and metabolic changes. Administration of benzodiazepines in this patient group is uncommon and investigation focusing on the topic is rare. This study aimed to determine anxiolysis efficacy of low-dose midazolam administered preoperatively, right before cesarean delivery, and to evaluate whether its administration impacts neonatal vitality, maternal consciousness, and recall of the moment the baby was born.
Methods: Fifty pregnant women with indication for cesarean delivery were included in this randomized, double-blind, placebo-controlled clinical study and allocated into two groups of 25 participants each (Midazolam and Control group). Midazolam (0.0125 mg.kg^{-1}) or a placebo solution was administered immediately before spinal anesthesia and the anxiolytic effect was assessed using a visual analogue scale before and after administration. We registered the Apgar score at 1 and 5 minutes, the Ramsay scale and recall of the moment of birth, that was assessed 90 minutes after birth.
Results: Pregnant women from the Midazolam group presented a 1.3-point reduction in anxiety on the visual analogue scale, while the Control group showed virtually no change (p = 0.027). We observed no statistically significant changes in Apgar scores, level of maternal consciousness and recall of the moment of delivery.

Conclusions: Low-dose midazolam can provide anxiety management in pregnant women undergoing cesarean delivery with no significant undesirable effects.



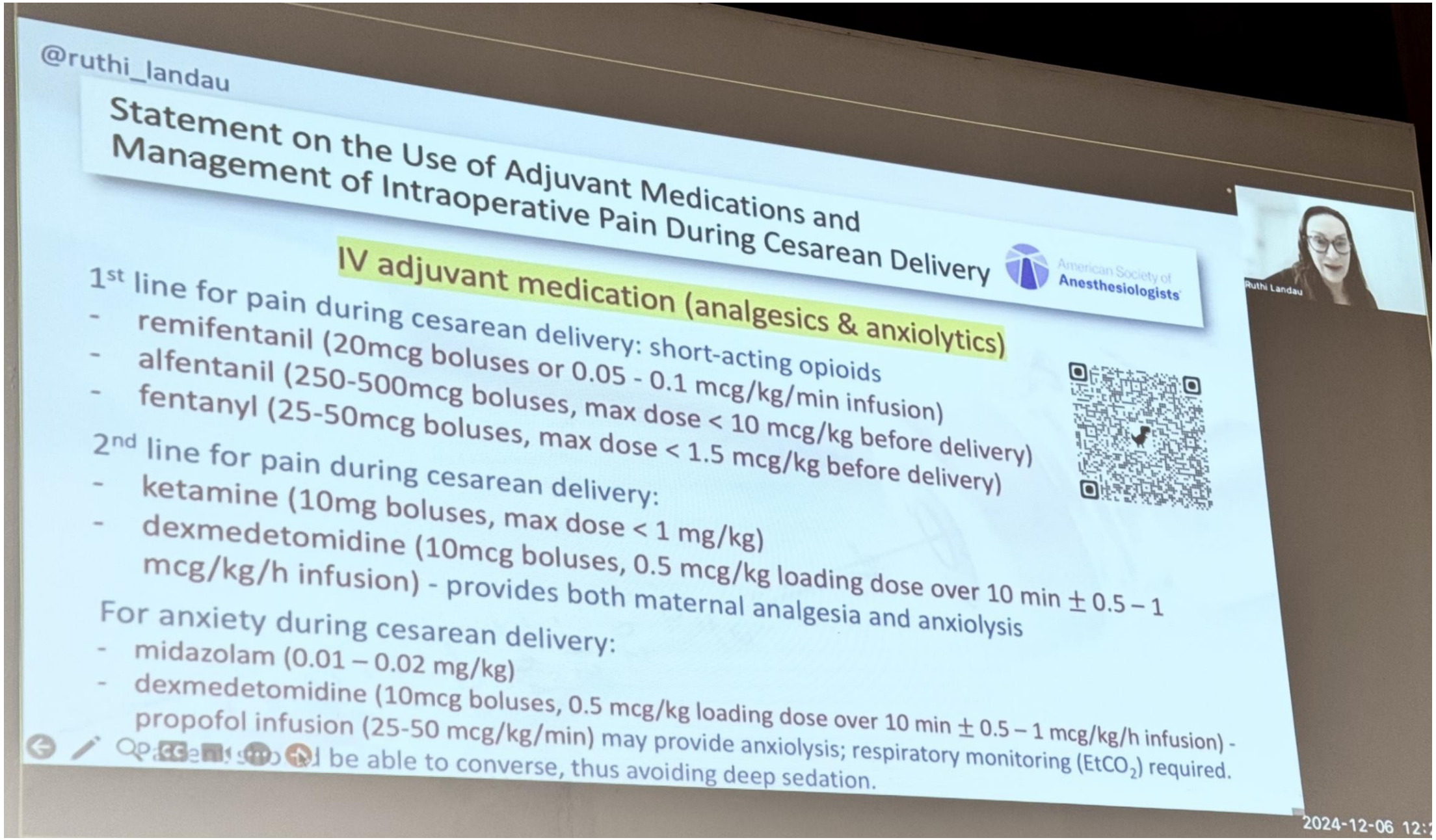
midazolam 0.0125 mg/kg
80 kg žena = 1 mg

Figure 2 Boxplot showing development of anxiety for Control group and Midazolam group, according to the Visual Analogic Scale (VAS). Dif, Difference; *p = 0.0274.

Table 4 Comparison between groups regarding the presentation of the newborn to the mother and recall of this moment after 90 minutes.

Parameter	Category	Midazolam group		Control group		p
		n	%	n	%	
Presentation to mother	No	6	24	1	4	0.098[a]
	Yes	19	76	24	96	
Recall after 90 minutes	No	1	5	0	0	Not calculated[b]
	Yes	18	95	24	100	

[a] Fisher exact test. [b] Due to low variability.


@ruthi_landau
Statement on the Use of Adjuvant Medications and Management of Intraoperative Pain During Cesarean Delivery
American Society of Anesthesiologists
IV adjuvant medication (analgesics & anxiolytics)
1st line for pain during cesarean delivery: short-acting opioids
- remifentanil (20mcg boluses or 0.05 - 0.1 mcg/kg/min infusion)
- alfentanil (250-500mcg boluses, max dose < 10 mcg/kg before delivery)
- fentanyl (25-50mcg boluses, max dose < 1.5 mcg/kg before delivery)
2nd line for pain during cesarean delivery:
- ketamine (10mg boluses, max dose < 1 mg/kg)
- dexmedetomidine (10mcg boluses, 0.5 mcg/kg loading dose over 10 min ± 0.5 – 1 mcg/kg/h infusion) - provides both maternal analgesia and anxiolysis
For anxiety during cesarean delivery:
- midazolam (0.01 – 0.02 mg/kg)
- dexmedetomidine (10mcg boluses, 0.5 mcg/kg loading dose over 10 min ± 0.5 – 1 mcg/kg/h infusion) -
propofol infusion (25-50 mcg/kg/min) may provide anxiolysis; respiratory monitoring ($EtCO_2$) required.
be able to converse, thus avoiding deep sedation.
Ruthi Landau
2024-12-06 12:

ANESTHESIOLOGY

Intraoperative Pain during Cesarean Delivery under Neuraxial Anesthesia: A Systematic Review and Meta-analysis

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ANESTHESIOLOGY 2025; 143:156–67

ABSTRACT

Background: Neuraxial anesthesia is the definitive standard technique for cesarean delivery; however, pain during cesarean delivery may be underreported. The primary aim of this systematic review and meta-analysis was to determine the incidence of patient-reported intraoperative pain during cesarean delivery under neuraxial anesthesia.

Methods: A literature search of databases (PubMed, MEDLINE, Embase, Web of Science, Scopus, Cochrane Database of Systematic Reviews, and Central Register of Controlled Trials) was conducted.

Results: A total of 34 articles were included (21 randomized studies and 13 nonrandomized studies). The incidence of intraoperative pain under neuraxial anesthesia was 17% (95% CI, 13 to 22%; 1,229 of 11,351 patients).

Patients who received spinal anesthesia had the lowest pooled incidence of pain of 14% (95% CI, 10.0 to 20.0%), and those who received epidural top-up had the highest pooled incidence of pain of 33% (95% CI, 17.0 to 54.0%). Risk of bias assessments showed high risk of bias in half of the included studies.

Conclusions: Patient-reported pain during cesarean delivery under neuraxial anesthesia is common, with spinal and combined spinal–epidural anesthesia reporting a lower incidence of pain than epidural anesthesia. Intraoperative pain can have significant psychologic impact for patients and medicolegal implications for providers.

(ANESTHESIOLOGY 2025; 143:156–67)

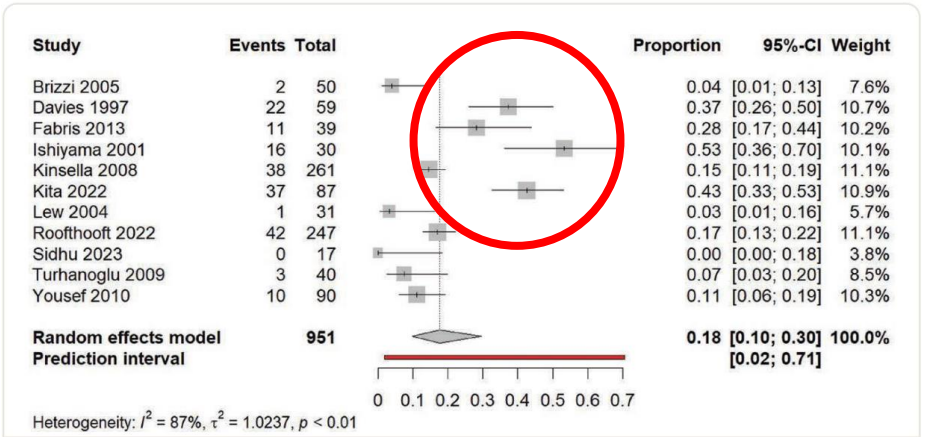


Fig. 5. Forest plot of incidence of pain during cesarean delivery under combined spinal epidural anesthesia.

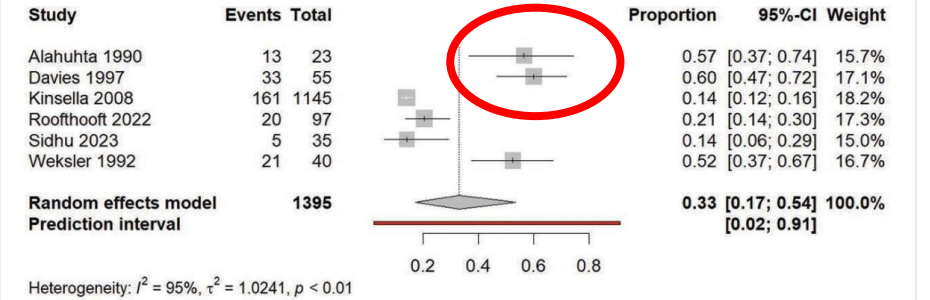
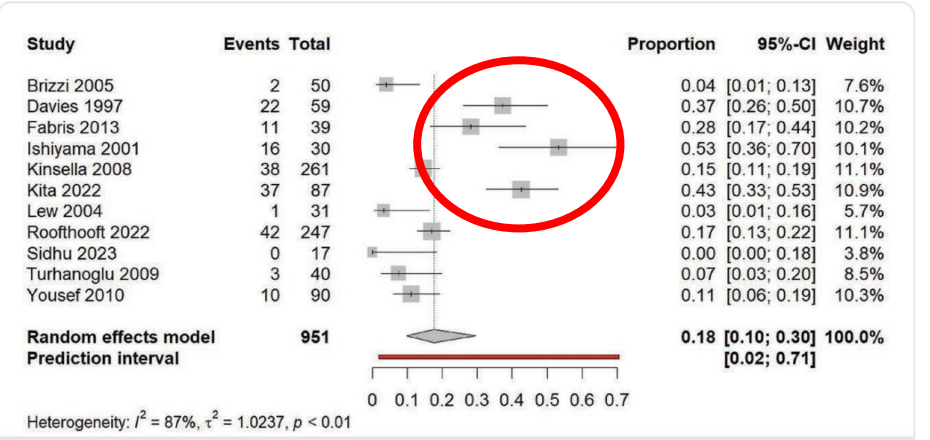


Fig. 4. Forest plot of incidence of pain during cesarean delivery under epidural anesthesia.

PERIOPERAČNÍ BOLEST U CÍSAŘSKÉHO ŘEZU

- *Neuroaxialní anestezie* *17 %*
- Spinální anestezie **14** %
- Epidurální top-up **33** %
- CSE **18** %



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BMC Anesthesiology

RESEARCH Open Access

Perinatal outcome of emergency cesarean section under neuraxial anesthesia versus general anesthesia: a seven-year retrospective analysis

Xueduo Shi[1†], Chenyang Xu[1†], Yazhou Wen[1†], Ming Jiang[1†], Huiling Yu[1], Xian Wang[1], Hongmei Yuan[1*] and Shanwu Feng[1*]

Abstract

Objective An emergency cesarean section (CS), which is extremely life-threatening to the mother or fetus, seems to be performed within an adequate time horizon to avoid negative fetal-maternal denouement. An effective and vigilant technique for anesthesia remains vital for emergency cesarean delivery. Therefore, this study aimed to validate the impact of various anesthesia tactics on maternal and neonatal outcomes.

Method This was a retrospective cohort study of parturient patients who were selected for emergency CS with the assistance of general or neuraxial anesthesia between January 2015 and July 2021 at our institution. The 5-min Apgar score was documented as the primary outcome. Secondary outcomes, including the 1 min Apgar score, decision-to-delivery interval (DDI), onset of anesthesia to incision interval (OAII), decision to incision interval (DII), duration of operation, length of hospitalization, height and weight of the newborn, use of vasopressors, blood loss, neonatal resuscitation rate, admission to neonatal intensive care unit (NICU), duration of NICU and complications, were also measured.

Results Of the 539 patients included in the analysis, 337 CSs were performed under general anesthesia (GA), 137 under epidural anesthesia (EA) and 65 under combined spinal-epidural anesthesia (CSEA). The Apgar scores at 1 min and 5 min in newborns receiving GA were lower than those receiving intraspinal anesthesia, and no difference was found between those receiving EA and those receiving CSEA. The DDI of parturients under GA, EA, and CSE were 7[6,7], 6[6,7], and 14[11.5,20.5], respectively. The DDI and DII of GA and EA were shorter than those of CSE, and the DDI and DII were similar between GA and EA. Compared to that in the GA group, the OAII in the intraspinal anesthesia group was significantly greater. GA administration correlated with more frequent resuscitative interventions, increased admission rates to NICU, and a greater incidence of neonatal respiratory distress syndrome (NRDS). Nevertheless,

Table 2 Outcomes of neonatus underwent emergency cesarean section under general or neuraxial anesthesia

Variables	GA group	EA group	CSE group	*P* value
Apgar score				
1 min	10[8,10][a,b]	10[10,10]	10[10,10]	$P<0.0001$
5 min	10[10,10][a,b]	10[10,10]	10[10,10]	$P<0.0001$
Apgar score < 7				
1 min	10.4%[a]	0.7%	1.5%	$P<0.0001$
5 min	2.7%	0	1.5%	0.111
Apgar score < 3				
1 min	3.0%	0	1.5%	0.108
5 min	0.9%	0	0	0.701
Birth height, cm	48.90 ± 3.09[a]	49.88 ± 1.21	49.32 ± 1.87	0.001
Birth weight, g	3062.72 ± 652.90[a]	3271.17 ± 397.70	3169.54 ± 515.82	0.002
Resuscitation, n	11.0%[a]	2.2%	7.7%	0.003
Admission to NICU, n	23.1%[a]	2.9%[b]	15.4%	$P<0.0001$
Duration of NICU,day	6[4, 13]	4.5[4, 6.5]	6[4.5, 8.5]	0.469
Complications, n				
NRDS	22(6.5%)[a]	1(0.7%)	2(3.1%)	0.01
NHIE	5(1.5%)	1(0.7%)	2(3.1%)	0.352
PDA	20(5.9%)	2(1.5%)	2(3.1%)	0.085
PFO	34(10.1%)[a]	3(2.2%)	2(3.1%)	0.003
Pneumonia	16(4.7%)	1(0.7%)	3(4.6%)	0.071
Child death, n	3(0.9%)	0	0	0.701

Data were expressed as mean ± standard deviation (Mean ± SD) or median [P25, P75] or number (percentage); *NRDS* Neonatal Respiratory Distress Syndrome, *NHIE* Neonatal Hypoxic Ischemic Encephalopathy, *PDA* Patent Ductus Arteriosus, *PFO* Patent Foramen Ovale

[a] $p<0.05$ in comparison with EA group; [b] $p<0.05$ in comparison with CSE group

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RESEARCH Open Access

Perinatal outcome of emergency cesarean section under neuraxial anesthesia versus general anesthesia: a seven-year retrospective analysis

Xueduo Shi[1†], Chenyang Xu[1†], Yazhou Wen[1†], Ming Jiang[1†], Huiling Yu[1], Xian Wang[1], Hongmei Yuan[1*] and Shanwu Feng[1*]

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Table 4 Intraoperative outcomes of parturients underwent emergency cesarean section under general or neuraxial anesthesia

Variables	GA group	EA group	CSE group	*P* value
DDI, min	7 [6,7][b]	6 [6,7][b]	14 [11.5,20.5]	$P<0.0001$
DDI ≤ 5, n(%)	19.3%	19.0%	0	
5 < DDI ≤ 10, n(%)	75.1%	75.9%	20.9%	
10 < DDI ≤ 15, n(%)	14.1%	2.2%	34.3%	
15 < DDI ≤ 20, n(%)	0.9%	42.9%	17.9%	
20 < DDI ≤ 30, n(%)	0.6%	0	22.4%	
DDI > 30, n(%)	0	0	1.5%	
DII, min	5[4,5][b]	5[4,5.5][b]	12[8, 17]	$P<0.0001$
OAII, min	1[1,2][a,b]	2[1,3][b]	5[3, 8]	$P<0.0001$
Blood loss, mL	400[380,565][b]	400[400,500][b]	390[350,500]	$P<0.0001$
Transfusion, n (%)	14(4.2%)[a]	0	0	0.01
Vasoactive drug, n (%)	12(3.6%)	5(3.6%)	6(9.2%)	0.108
Hospitalization, day	6[5,7][b]	6[6,7][b]	6[5,6.5]	0.001

Data were expressed as median [P25, P75] or number (percentage); *DDI* Decision to delivery interval, *DII* Decision to incision interval, *OAII* Onset of anesthesia to incision interval

[a] $p<0.05$ in comparison with EA group [b] $p<0.05$ in comparison with CSE group

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Pain during cesarean delivery: A patient-related prospective observational study assessing the incidence and risk factors for intraoperative pain and intravenous medication administration

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ABSTRACT

Introduction: The incidence of pain during cesarean delivery (PDCD) remains unclear. Most studies evaluated PDCD using interventions suggesting inadequate analgesia: neuraxial replacement, unplanned intravenous medication (IVM), or conversion to general anesthesia. Few assess self-reported pain. This study evaluates the incidence of and risk factors for self-reported PDCD and IVM administration.

Methods: Between May and September 2022, English-speaking women undergoing cesarean delivery under neuraxial anesthesia were approached within the first 48 h. Participants answered a 16-question survey about intraoperative anesthesia care. Clinical characteristics were extracted from electronic medical records. The primary outcome was PDCD. Secondary outcomes were analgesic IVM (opioids alone or in combination with ketamine, midazolam, or dexmedetomidine) and conversion to general anesthesia. Risk factors for PDCD and analgesic IVM were identified using multivariable logistic regression models.

Results: Pain was reported by 46/399 (11.5%; 95% CI: 8.6, 15.1) participants. Analgesic IVM was administered to 16 (34.8%) women with PDCD and 45 (12.6%) without. Conversion to general anesthesia occurred in 3 (6.5%) women with and 4 (1.1%) without PDCD. Risk factors associated with PDCD were substance use disorder and intrapartum epidural extension. Risk factors associated with analgesic IVM were PDCD, intrapartum epidural extension when ≥2 epidural top-ups were given for labor analgesia, and longer surgical duration.

Discussion: In our cohort of scheduled and unplanned cesarean deliveries, the incidence of PDCD was 11.5%. A significant proportion of women (15.1%) received analgesic IVM, of which some but not all reported pain, which requires further evaluation to identify triggers for IVM administration and strategies optimizing shared decision-making.

Bolest v 11 %

Table 3
Descriptive data about overall intravenous medication (IVM) administration in women with or without self-reported pain.

	No pain, n = 353	Pain, n = 46
Group A: Analgesics	45 (45.9%)	16 (55.1%)
Opioids only	25 (25.5%)	7 (24.1%)
Analgesic combination [a]	20 (20.4%)	9 (31.0%)
Group M: Midazolam only	17 (17.3%)	4 (13.8%)
Group D: Dexmedetomidine only	19 (19.4%)	4 (13.8%)
Group NAA: Non-analgesic adjuvants [b]	17 (17.3%)	5 (17.2%)

Dosing ranged as follows: fentanyl 25–185 mcg, morphine 1–5 mg, hydromorphone 0.8 mg (1 case), midazolam 0.5–6 mg, ketamine 10–110 mg, dexmedetomidine 10–40 mcg (no infusion in this cohort), nalbuphine 2.5–5 mg, diphenhydramine 25–50 mg, propofol 20 and 95 mg (2 cases).

[a] Analgesic combination: opioids (fentanyl, morphine, hydromorphone), ketamine, dexmedetomidine, midazolam, and combinations of these.

[b] Non-analgesic adjuvants: diphenhydramine, nalbuphine, propofol.

Table 4
Self-reporting of pain according to whether women did not receive intravenous midazolam (n = 351), received intravenous midazolam alone (n = 21) or in association with other intravenous medications (n = 31).

	No midazolam (n = 351)	Midazolam (n = 52)	*p*-value[a]
Self-reported pain at the start of the cesarean delivery			*< 0.001*
No	338 (96.3%)	40 (76.9%)	
Yes	13 (3.7%)	9 (17.3%)	
Not sure	**0 (0.0%)**	**3 (5.8%)**	
Self-reported pain during the cesarean delivery			*<0.001*
No	326 (92.9%)	39 (75.0%)	
Yes	21 (6.0%)	11 (21.2%)	
Not sure	**0 (0.0%)**	**2 (3.8%)**	
Did not answer	4 (1.1%)	0 (0.0%)	

[a] From Fisher exact test.

EDITORIAL · Volume 62, 104360, May 2025

Shedding more light on the management of intraoperative pain during cesarean delivery: a review of the American Society of Anesthesiologists statements

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Management of pain during cesarean delivery

The incidence of pain during cesarean delivery ranges between 2-36%.
If a patient reports pain and or distress, acknowledge their experience, apply shared decision-making and consider supplemental medication as follows:

Risk factors for pain during cesarean delivery

- **Patient-specific**
  - Opioid use disorder
  - Pain during a previous cesarean delivery
  - Fear of pain
  - Low maternal weight, increased height (lower BMI)
  - Spine surgery
- **Obstetric and surgical factors**
  - Urgent/emergent cesarean delivery
  - Repeat cesarean delivery
  - Lower gestational age and birth weight
  - Classical uterine incision
  - Exteriorization of the uterus
  - Adherent placenta
  - Duration of cesarean delivery
  - Tubal ligation
- **Anesthesia-specific**
  - Epidural > CSE/spinal
  - Spinal at L5 – S1, smaller needle gauge
  - < EDss of intrathecal hyperbaric bupivacaine (12 mg)
  - Absence of neuraxial opioids

Checking neuraxial block before start of surgery
- The OAA recommends test-to-light touch to a T5 dermatomal level
- Confirm motor and sensory block
- **Ask the surgeon to pause if the patient does not tolerate sensations**

Supplemental intravenous medication

For pain

1st line – opioids
- Remifentanil: 20 μg bolus or 0.05 – 0.1 μg/kg/min
- Fentanyl: 25-50 μg bolus, maximum cumulative dose < 1.5 μg/kg before delivery of the neonate
- Alfentanil* 250-500 μg, maximum cumulative dose < 10 μg/kg before delivery of the neonate

2nd line
- Ketamine: 10 mg bolus, maximum cumulative dose < 1mg/kg
- Dexmedetomidine: 10 μg bolus, 0.5 μg/kg loading dose over 10 min, and/or 0.5 – 1 μg/kg/h

For anxiety
- Midazolam: 0.01 - 0.02 mg/kg
- Dexmedetomidine: 10 μg bolus, 0.5 μg/kg loading dose over 10 min, and/or 0.5 – 1 μg/kg/h
- Propofol infusion: 25-50 mcg/kg/min

If intrapartum cesarean delivery:
Risk factors for failed conversion of labor epidural analgesia to cesarean anesthesia
- Epidural procedure without a dural puncture technique
- During labor epidural analgesia
  - Intrapartum pain
  - Increased pain scores within 2 hours of cesarean delivery
  - > 2 top-ups
- Chorioamnionitis/intraamniotic infection

Assessing the adequacy of labor epidural analgesia
Active management of labor epidural analgesia (every 3-4 hours)
- Communication with obstetricians regarding the progress of labor and fetal heart rate tracing
- Early replacement of poorly functioning epidural
- Consider performing another neuraxial technique before starting cesarean delivery

With an indwelling epidural catheter, consider epidural dosing with:
- Lidocaine 2% with epinephrine 1:200,000
- Chloroprocaine 3%
- Fentanyl: 50 – 100 μg
- Clonidine: 75 – 200 mcg μg
- Dexmedetomidine: 0.5 - 1 μg /kg

Supplemental inhalational medication
- Nitrous oxide
- Sevoflurane is **usually restricted to patients with a secured airway**
- **Sedation** is not a pain treatment or a substitute for general anesthesia

General anesthesia
- Should be avoided when possible and initiated when indicated

Neuraxial anesthesia and pain management for cesarean delivery

Ruth Landau, MD; Pervez Sultan, MBChB, FRCA, MD (Res)

Optimal neuraxial anesthesia for cesarean delivery requires a thorough understanding of patient, obstetrical, surgical, and anesthesia-related factors which can impact pain during and after cesarean delivery. While not all cesarean deliveries are the same from an obstetrical standpoint, not all anesthetics provide the same degree of anesthetic blockade and postcesarean analgesia; therefore, context is crucial to provide patients with a safe and pain-free experience. Communication between obstetrical and anesthesia teams is key to ensure that the anesthetic approach is tailored to the clinical scenario, particularly if emergency cesarean delivery is needed, and follows best practices for cesarean delivery anesthesia.

We propose several important considerations for the management of anesthesia and analgesia for cesarean delivery, focusing on patient-reported outcomes related to intraoperative and postoperative pain. Considerations include: (1) understanding the innervation of the uterus, peritoneum and abdominal wall, and the pain pathways involved with sensations and pain during and after cesarean delivery (eg, visceral sensations such as occurs with uterine manipulation may be very uncomfortable for some patients); (2) understanding the different neuraxial anesthetic and analgesic approaches (eg, epidural, spinal, combined spinal-epidural) with their specific advantages, limitations, and indications (eg, spinal anesthesia provides the most reliable neuraxial block, with the fastest onset but a limited duration, though it can be extended by the addition of adjuvants); (3) selecting the most appropriate anesthetic technique and neuraxial medications (eg, local anesthetics, opioids, adjuvants including alpha$_2$-adrenergic agonists) to prevent, mitigate, manage intraoperative discomfort, and optimize postoperative analgesia; (4) recognizing that intraoperative pain during cesarean delivery occurs in approximately 15% of cesarean deliveries and shivering in up to 50% of cesarean delivery (from a complex interplay of heat loss, disrupted thermoregulation, psychological stress, and surgical factors), necessitating multifaceted prevention approaches; (5) preoperatively identifying patient-specific risk factors for intraoperative pain (eg, opioid use disorder, chronic pain, previous traumatic childbirth experience, anxiety) to promote thorough counseling (eg, setting expectations, avoiding traumatizing circumstances, incorporating shared decision-making, offering general anesthesia if neuraxial block is inadequate) and tailored strategies; (6) optimizing interdisciplinary communication to identify inadequate labor epidural analgesia and allow replacement if intrapartum cesarean delivery becomes indicated, as well as adequate testing of neuraxial block by the anesthesia team and the obstetricians before proceeding with skin incision constitutes best practices; (7) recognizing the obstetric, surgical, and anesthesia-related factors associated with increased intraoperative and postoperative pain (eg, uterine exteriorization, intrapartum cesarean delivery, repeat cesarean delivery, use of an epidural anesthetic rather than a spinal or combined spinal-epidural anesthetic) should prompt specific approaches to enhance anesthesia and postoperative analgesia (eg, enhanced doses of neuraxial opioid, prolonged use of epidural analgesia with local anesthetic solutions or repeated doses of epidural morphine, abdominal wall blocks, particularly if neuraxial morphine could not be used); and (8) implementing stepwise opioid-sparing multimodal analgesia (eg, acetaminophen and nonsteroidal antiinflammatory drugs taken together) and personalized protocols for opioid prescriptions after cesarean delivery, since these have been shown to significantly reduce in-hospital opioid consumption and unnecessary opioid prescription without increasing postoperative pain.

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TABLE 1
Nerves responsible for pain during and after cesarean delivery

Incisional pain	Residual sensations
Ilioinguinal nerve	Burning, shooting, hypersensitive pain around the scar (neuropathic pain). Pain located around the scar, groin and upper thigh
Iliohypogastric nerve	
Genitofemoral nerve	
Lateral femoral cutaneous nerve	
Uterine manipulation	**Acute symptoms**
Sympathetic nerves from the inferior hypogastric plexus (T10–L1)	Deep visceral pain, nausea, and vomiting
Parasympathetic fibers from the pelvic splanchnic nerves (S2–S4)	
Shoulder tip pain	**Referred pain**
Phrenic nerve (C3–C5)	Due to irritation of the diaphragm

FIGURE 1
Innervation and pathways involved with sensations and pain during and after cesarean delivery

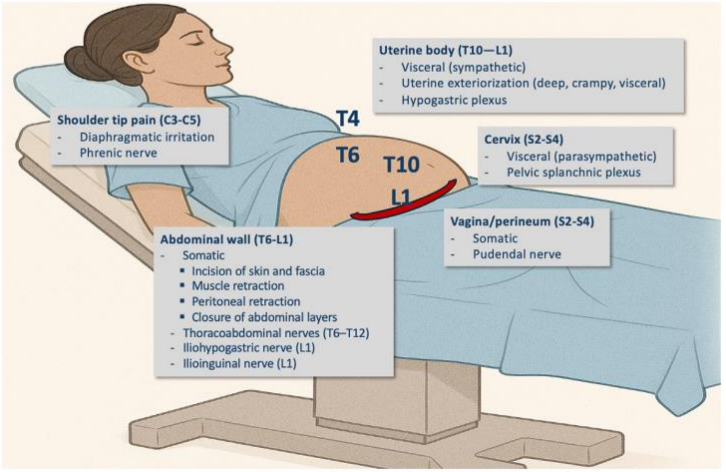

TABLE 5
Multimodal opioid-sparing analgesia strategy for cesarean delivery

Interventions	Scheduled cesarean delivery	Intrapartum cesarean delivery	Cesarean delivery under general anesthesia (if neuraxial anesthesia is contraindicated or not avoidable)
Intraoperative analgesia			
Neuraxial local anesthetics	X	X	N/A
Neuraxial fentanyl	X	X	N/A
Neuraxial morphine	X	X	N/A
IV opioid	(X)	(X)	X
IV dexmedetomidine	(X)	(X)	(X)
Acetaminophen (PO or IV) (pre- or intraoperatively)	X	X	X
NSAIDs (eg, IV ketorolac)	X	X	X
Postoperative analgesia including tailored approaches to enhanced analgesia			
Acetaminophen (scheduled)	X	X	X
NSAID (eg, ibuprofen; scheduled)	X	X	X
Oral opioid (eg, oxycodone; as needed)	X	X	X
IV opioid PCA	(X)	(X)	(X)
Abdominal wall block (eg, TAP or QLB)	(X)	(X)	X
Lidocaine patch	(X)	(X)	(X)

IV, intravenous; *N/A*, not applicable; *NSAID*, nonsteroidal antiinflammatory drug; *PCA*, patient-controlled analgesia; *PO*, per os; *QLB*, quadratus lumborum block; *TAP*, transversus abdominis plane block; *X*, administer in the absence of contraindications; *(X)*, consider administering if analgesia is inadequate.

Neuraxial anesthesia and pain management for cesarean delivery

Ruth Landau, MD; Pervez Sultan, MBChB, FRCA, MD (Res)

Optimal neuraxial anesthesia for cesarean delivery requires a thorough understanding of patient, obstetrical, surgical, and anesthesia-related factors which can impact pain during and after cesarean delivery. While not all cesarean deliveries are the same from an obstetrical standpoint, not all anesthetics provide the same degree of anesthetic blockade and postcesarean analgesia; therefore, context is crucial to provide patients with a safe and pain-free experience. Communication between obstetrical and anesthesia teams is key to ensure that the anesthetic approach is tailored to the clinical scenario, particularly if emergency cesarean delivery is needed, and follows best practices for cesarean delivery anesthesia.

We propose several important considerations for the management of anesthesia and analgesia for cesarean delivery, focusing on patient-reported outcomes related to intraoperative and postoperative pain. Considerations include: (1) understanding the innervation of the uterus, peritoneum and abdominal wall, and the pain pathways involved with sensations and pain during and after cesarean delivery (eg, visceral sensations such as occurs with uterine manipulation may be very uncomfortable for some patients); (2) understanding the different neuraxial anesthetic and analgesic approaches (eg, epidural, spinal, combined spinal-epidural) with their specific advantages, limitations, and indications (eg, spinal anesthesia provides the most reliable neuraxial block, with the fastest onset but a limited duration, though it can be extended by the addition of adjuvants); (3) selecting the most appropriate anesthetic technique and neuraxial medications (eg, local anesthetics, opioids, adjuvants including alpha$_2$-adrenergic agonists) to prevent, mitigate, manage intraoperative discomfort, and optimize postoperative analgesia; (4) recognizing that intraoperative pain during cesarean delivery occurs in approximately 15% of cesarean deliveries and shivering in up to 50% of cesarean delivery (from a complex interplay of heat loss, disrupted thermoregulation, psychological stress, and surgical factors), necessitating multifaceted prevention approaches; (5) preoperatively identifying patient-specific risk factors for intraoperative pain (eg, opioid use disorder, chronic pain, previous traumatic childbirth experience, anxiety) to promote thorough counseling (eg, setting expectations, avoiding traumatizing circumstances, incorporating shared decision-making, offering general anesthesia if neuraxial block is inadequate) and tailored strategies; (6) optimizing interdisciplinary communication to identify inadequate labor epidural analgesia and allow replacement if intrapartum cesarean delivery becomes indicated, as well as adequate testing of neuraxial block by the anesthesia team and the obstetricians before proceeding with skin incision constitutes best practices; (7) recognizing the obstetric, surgical, and anesthesia-related factors associated with increased intraoperative and postoperative pain (eg, uterine exteriorization, intrapartum cesarean delivery, repeat cesarean delivery, use of an epidural anesthetic rather than a spinal or combined spinal-epidural anesthetic) should prompt specific approaches to enhance anesthesia and postoperative analgesia (eg, enhanced doses of neuraxial opioid, prolonged use of epidural analgesia with local anesthetic solutions or repeated doses of epidural morphine, abdominal wall blocks, particularly if neuraxial morphine could not be used); and (8) implementing stepwise opioid-sparing multimodal analgesia (eg, acetaminophen and nonsteroidal antiinflammatory drugs taken together) and personalized protocols for opioid prescriptions after cesarean delivery, since these have been shown to significantly reduce in-hospital opioid consumption and unnecessary opioid prescription without increasing postoperative pain.

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FIGURE 4
Strategies to prevent and manage intraoperative pain (adapted from 39)

Identifying risk factors for intraoperative pain

- **Patient-specific**
  - Opioid use disorder
  - Pain during a previous cesarean delivery
  - Fear of pain
  - Low maternal weight, increased height (lower BMI)
  - Spine surgery
- **Obstetric and surgical factors**
  - Urgent/emergent cesarean delivery
  - Repeat cesarean delivery
  - Lower gestational age and birth weight
  - Classical uterine incision
  - Exteriorization of the uterus
  - Adherent placenta
  - Duration of cesarean delivery
  - Tubal ligation
- **Anesthesia-specific**
  - Epidural > CSE/spinal
  - Spinal at L5 – S1, smaller needle gauge
  - < ED_{95} of intrathecal hyperbaric bupivacaine (12 mg)
  - Absence of neuraxial opioids

If intrapartum cesarean delivery:
Risk factors for failed conversion of labor epidural analgesia to epidural anesthesia (top-up)

- Epidural procedure without a dural puncture technique
- During labor epidural analgesia
  - Intrapartum pain
  - Increased pain scores within 2 hours of cesarean delivery
  - > 2 top-ups
- Chorioamnionitis/intraamniotic infection

Testing neuraxial block before start of surgery

- Light touch for T5 dermatomal level
- Confirm motor and sensory block
- **Ask the surgeon to pause if the patient does not tolerate sensations**

Assessing the adequacy of labor epidural analgesia

Active management of labor epidural analgesia (every 3-4 hours):

- Communication with obstetricians regarding the progress of labor and fetal heart rate tracing
- Early replacement of poorly functioning epidural
- Consider performing another neuraxial technique before starting cesarean delivery

Supplemental intravenous medication

For pain
- 1st line – opioids
- 2nd line- ketamine, dexmedetomidine

For anxiety
- Midazolam, dexmedetomidine

Supplemental inhalational medication
- Nitrous oxide (not particularly effective)
- Sevoflurane is **usually restricted to patients with a secured airway**

Sedation
- Not a pain treatment or a substitute for general anesthesia

General anesthesia
- Should be avoided when possible and initiated when indicated

With intraoperative pain and an indwelling epidural catheter, consider dosing the epidural catheter with:

- Either lidocaine 2% with epinephrine 1:200,000 or chloroprocaine 3% (based on urgency)
- Fentanyl 50 – 100 μg (rapid onset)
- Clonidine: 75 – 200 μg or dexmedetomidine: 0.5 - 1 μg /kg

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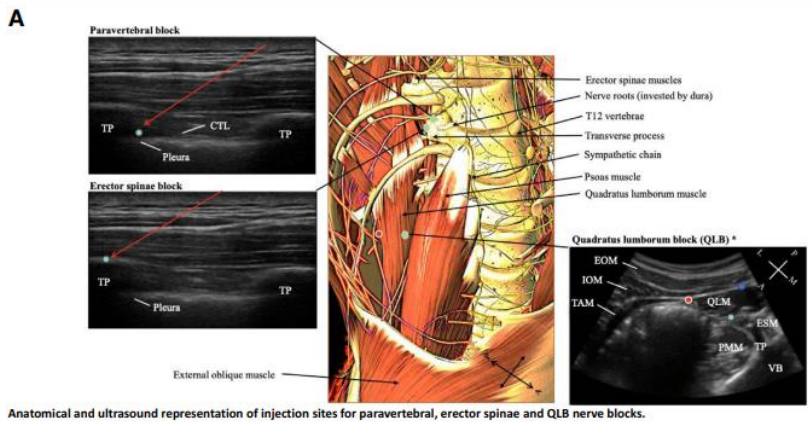
FIGURE 5
Approaches to ultrasound-guided abdominal wall nerve blocks 139 (reproduced with permission by John Wiley and Sons)

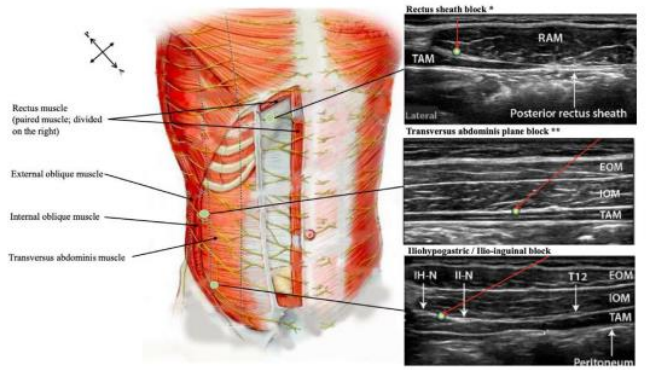


Anatomical and ultrasound representation of injection sites for paravertebral, erector spinae and QLB nerve blocks.

For erector spinae and paravertebral blocks, the green dots in the ultrasound images represent sites of optimal local anesthetic deposition; red lines depict possible needle path.

*QLB approaches: green dot represents site of local anesthetic deposition for anterior QLB; red dot for lateral QLB injection and blue dot for posterior QLB injection. The posterior QLB injection site is not visible on middle anatomical view shown.

CTL, costotransverse ligament; TP, transverse process; EOM, external oblique muscle;
IOM, internal oblique muscle; QLM, quadratus lumborum muscle; PMM, psoas major muscle; ESM, erector spinae muscle; VB, vertebral body. A, anterior; P, posterior; L, lateral; M, medial



Anatomical and ultrasound representations of injection sites for rectus sheath, transversus abdominis plane and iliohypogastric and ilio-inguinal nerve blocks.
Green dot represents site for optimal placement of local anesthetic; red arrows in
ultrasound images indicate possible needle path to desired target.

*paired muscle therefore bilateral injections required;
**denotes correct plane however posterior injection at the origin of the EOM and IOM muscles provides more complete coverage.

RAM, rectus abdominis muscle; TAM, transversus abdominis muscle; EOM, external oblique muscle; IOM, internal oblique muscle; IH-N, iliohypogastric nerve; II-N, ilio-inguinal nerve; P, posterior; A, anterior.

Anesth Pain Med. 2023 February; 13(1):e134316. https://doi.org/10.5812/aapm-134316.

Analgesic Effect of Preoperative Intravenous Administration of Paracetamol on Post-cesarean Pain: A Randomized Clinical Trial

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Abstract

Background: Pain control after every surgery, especially cesarean section, is very important, and physicians strive to discover pain control methods using the least amount of opioids. Paracetamol is a non-opioid analgesic with few complications.
Objectives: The present study aimed to investigate the analgesic effect of preoperative intravenous administration of paracetamol on post-cesarean pain.
Methods: This randomized, double-blind clinical trial was conducted on 240 pregnant women under spinal anesthesia who were candidates for elective cesarean section. The patients' weight, height, age, and body mass index (BMI) were recorded, and patients were randomly divided into 2 equal groups (n = 120). In the first group, 10 mg/kg paracetamol in 100 mL of normal saline (paracetamol group) and, in the second group, 100 mL normal saline (control group) were administered 15 minutes before surgery intravenously. Blood pressure, pulse rate, chills, and nausea were recorded during and 1 hour after surgery; in addition, the visual analogue scale (VAS) and the need for additional analgesics were recorded 1, 2, 4, 6, 12, and 24 hours after surgery.
Results: Mean pain scores were significantly lower in the paracetamol group (4.01 ± 2.22) than in the control group 6 hours (4.83 ± 2.35; P = 0.008) and 24 hours (2.26 ± 1.85 and 2.67 ± 1.80, respectably; P = 0.038) after surgery. Mean meperidine consumption was lower in the paracetamol group than in the control group, but it was not significant. No significant difference was found between the 2 groups in the frequency of chills and nausea (P > 0.05).
Conclusions: Within the limitations of the current study, preoperative intravenous administration of paracetamol significantly reduced post-cesarean pain within 24 hours.

Keywords: Cesarean Section, Pain, Paracetamol, Meperidine

Table 2. Frequency of Post-cesarean Chills and Nausea in Pregnant Women in the Paracetamol and Control Groups [a]

Variables and Index	Paracetamol	Control	P Value
Chills			0.315
Yes	12.6%	15.7%	
No	87.4%	84.3%	
Nausea			0.198
Yes	20%	15%	
No	80%	85%	

Figure 1. Mean pain scores over time in the paracetamol and control groups

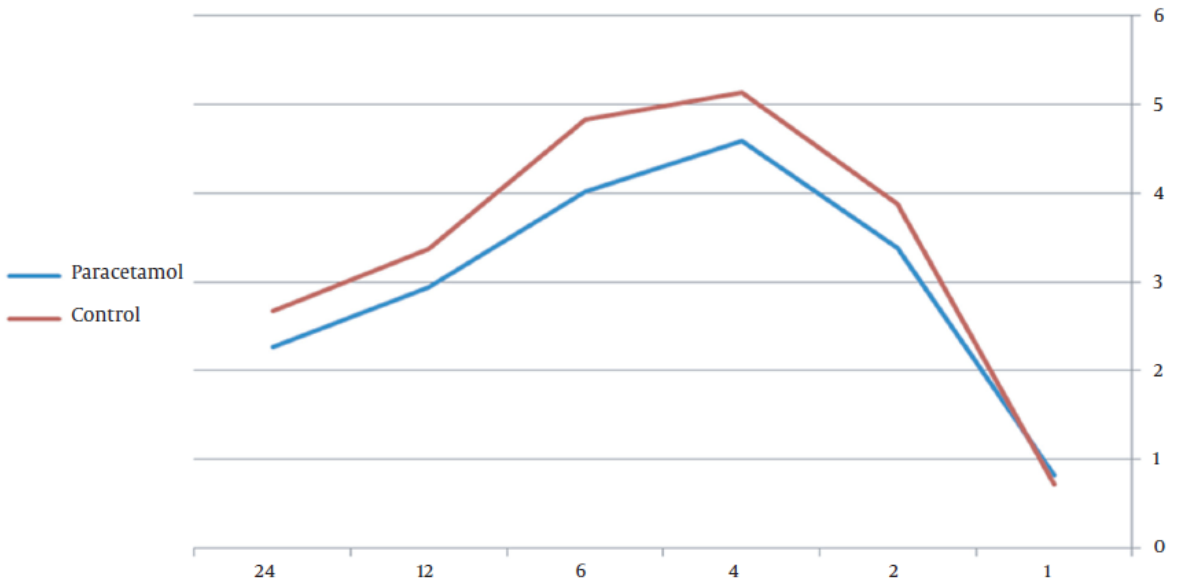

Table 3. Mean and SD of Pain Scores at Different Hours After Surgery in the Paracetamol and Control Groups

Group	1 Hour	2 Hours	4 Hours	6 Hours	12 Hours	24 Hours
Paracetamol	0.82 ± 1.83	3.38 ± 2.43	4.58 ± 2.58	4.01 ± 2.22	2.94 ± 1.78	2.26 ± 1.85
Control	0.72 ± 1.48	3.87 ± 2.45	5.13 ± 2.36	4.83 ± 2.35	3.37 ± 1.92	2.67 ± 1.80
P value	0.573	0.108	0.082	0.008	0.072	0.038

Table 4. Mean Consumption of Pethidine 24 Hours After Surgery in the Paracetamol and Control Groups

Groups	Pethidine (mg); Mean ± SD
Paracetamol	34.78 ± 12.47
Control	40.53 ± 58.12
P value	0.245

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A meta-analysis of randomized controlled trials: efficiency and safety of ondansetron in preventing post-anesthesia shivering during cesarean section

Guanghao Zheng[1] · Jieyu Zhang[1] · Jianpin Liu[1] · Chunxiang Chen[1] · Li Zhang[1] · Fei Cao[1]

TŘES

Abstract

Objective Although ondansetron was considered to prevent post-anesthesia shivering during cesarean section, its efficiency remained controversial. Our review was conducted to estimate the efficiency and safety of ondansetron in preventing post-anesthesia shivering during cesarean section.

Methods The literature were searched from their inception to October 2020 without restriction of language. All randomized controlled trials investigating the efficacy of ondansetron versus placebo in preventing shivering during cesarean section under neuraxial anesthesia were included. The meta-analysis was conducted using Stata software.

Results Eleven randomized controlled studies with a total of 748 individuals were finally included in our meta-analysis. Our results manifested that intravenous ondansetron compared with intravenous placebo significantly reduced the incidence of post-anesthesia shivering (PAS) (RR 0.53, 95% CI 0.14–0.68). Subgroup analysis according to doses of ondansetron indicated that the efficacy of 4 mg doses of ondansetron (RR 0.37, 95% CI 0.21–0.64) is equivalent to that of 8 mg doses of ondansetron (RR 0.61, 95% CI 0.47–0.81) in preventing PAS. In addition, the intravenous ondansetron led to a lower incidence of hypotension than intravenous placebo (OR 0.47, 95% CI 0.32–0.70). We could not demonstrate differences in the incidence of bradycardia between intravenous ondansetron and intravenous placebo.

Conclusion Our results found that intravenous ondansetron was effective in preventing shivering during cesarean section under neuraxial anesthesia, and had an advantage in reducing the incidence of hypotension compared with intravenous placebo.

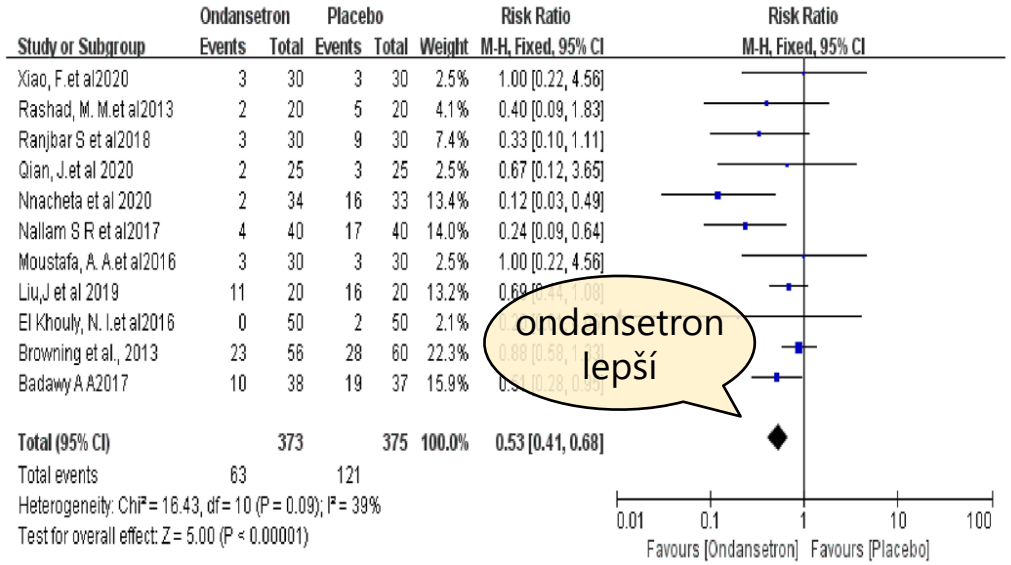

Fig. 2 Forest plot of intravenous ondansetron in relation to the risk of post-anesthesia shivering (PAS)

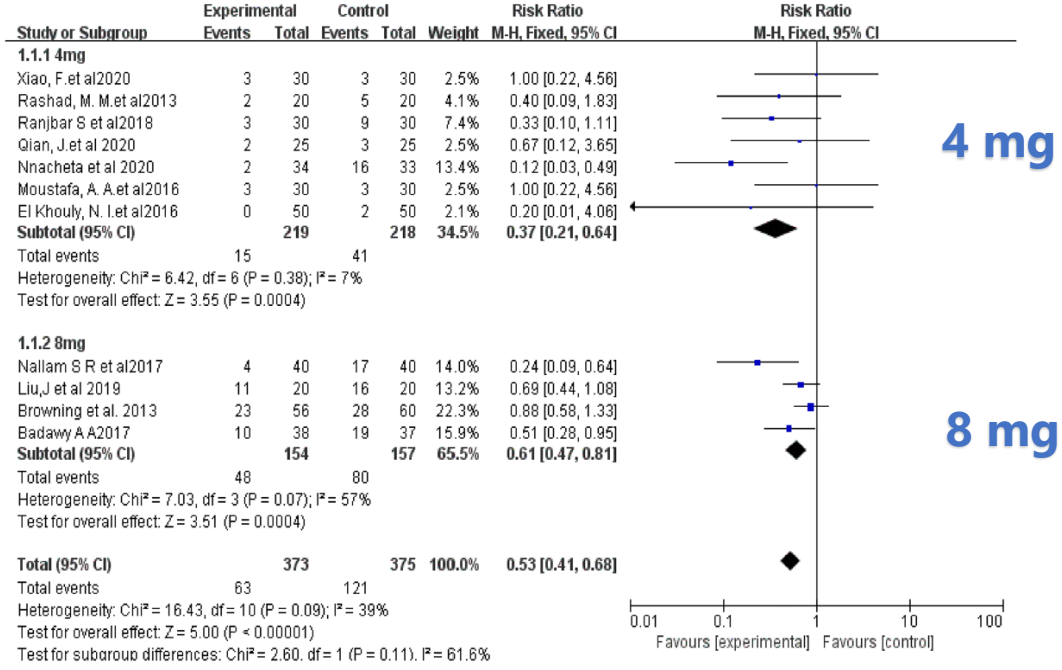

Fig. 3 Forest plot of subgroup analyses

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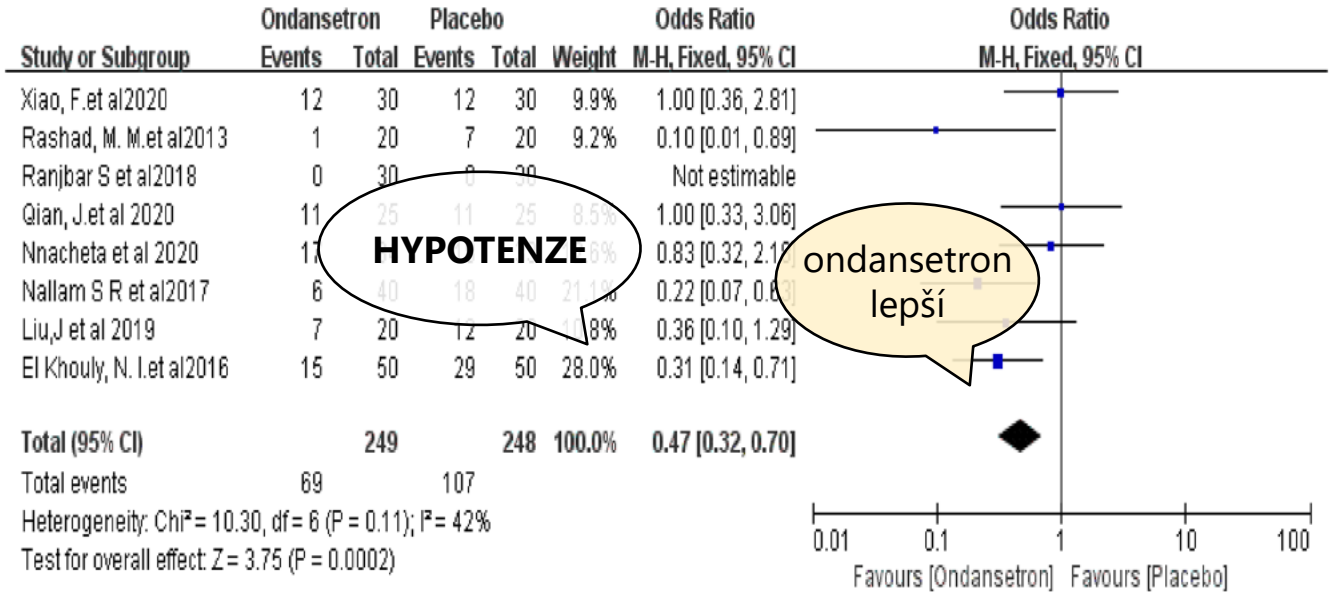

Fig. 4 Forest plot of intravenous ondansetron in relation to the risk of hypotension

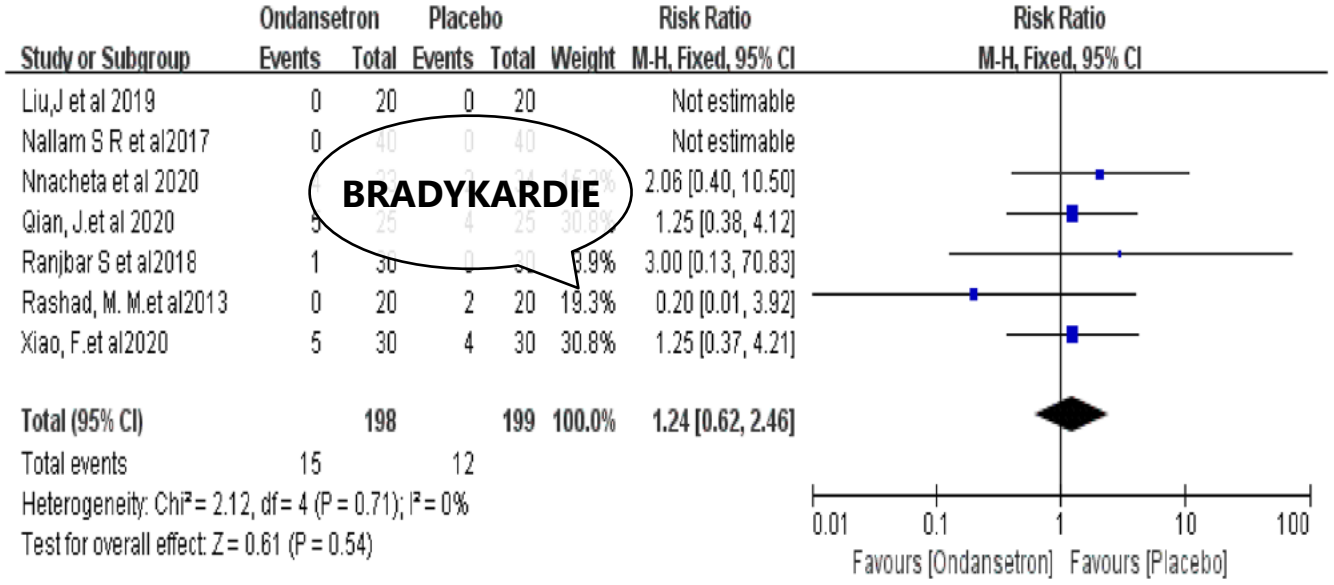

Fig. 5 Forest plot of intravenous ondansetron in relation to the risk of bradycardia

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Článek je uveřejněn v dvojjazyčné verzi. / The article is published in a bilingual version.

Spinální anestezie a hypotenze rodičky: základní patofyziologie a stanovisko mezioborové pracovní skupiny k jejímu řešení

Bláha J.[1], Heřman H.[2], Kacerovský M.[3], Koucký M.[4], Lukšová M.[4], Nosková P. [1], Nguyenová Q. G.[1], Pařízek A.[4], Seidlová D.[5], Straňák Z.[2], Štourač P. [6, 7]

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Hypotenze po aplikaci SAB se vyskytuje u 80% rodiček,

těžká hypotenze (SBP <80 mmHg) u 15-20%

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