# JAK NA TO…
# AKUTNÍ SEKCE


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Střet zájmů:

# AKUTNÍ nebo AKUTNÍ! ?

- bradykardie plodu
- prolaps pupečníku
- masivní krvácení
- eklampsie
- …

# Volba anestezie dle času, který má anesteziolog k dispozici !

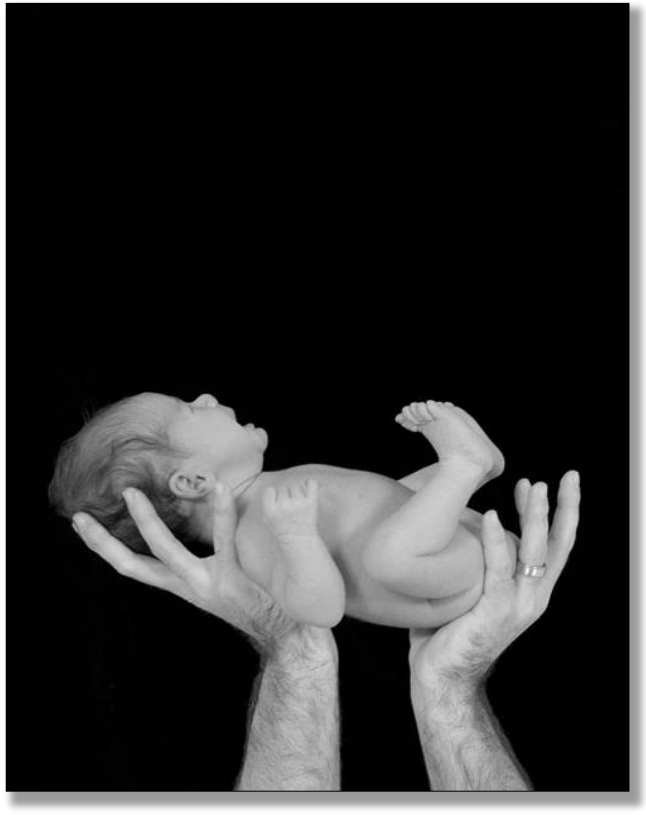
| Čas do incize (min.) | |
|---|---|
| elektivně | **EPID, SAB, CSE …** (CA) |
| 15-20 | **EPID** s rychle nasedající epidurální směsí (2% lidocain), **SAB**, **CSE**, (CA) |
| 10-15 | **SAB**, (**CSE**), (CA) |
| 5-10 | **SAB** (zkušený anesteziolog + dobré anatomické podmínky, jinak spíše CA) |
| 0-5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


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

vs.

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

# PROČ NECHCEME CELKOVOU ANESTEZII ?



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

Není signifikantní rozdíl mezi jednotlivými typy anestézie.

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

Authors' conclusions

Cochrane Library
Trusted evidence.
Informed decisions.
Better health.

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

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

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

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

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

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

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

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

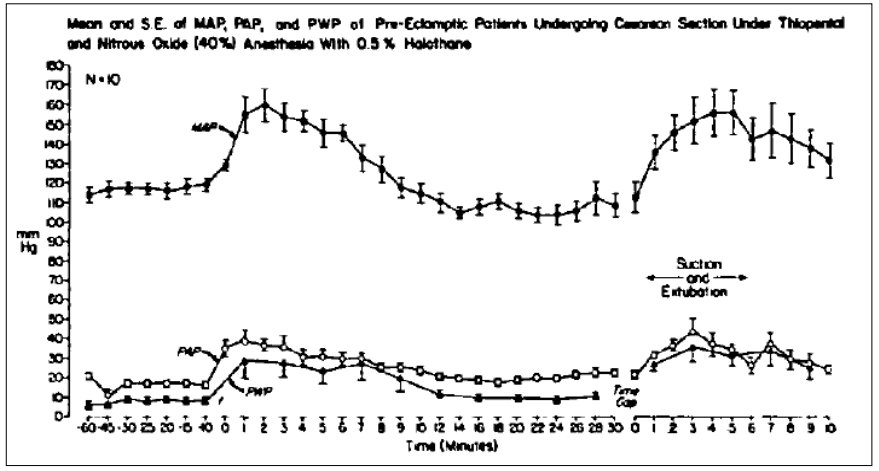
# = number of studies.

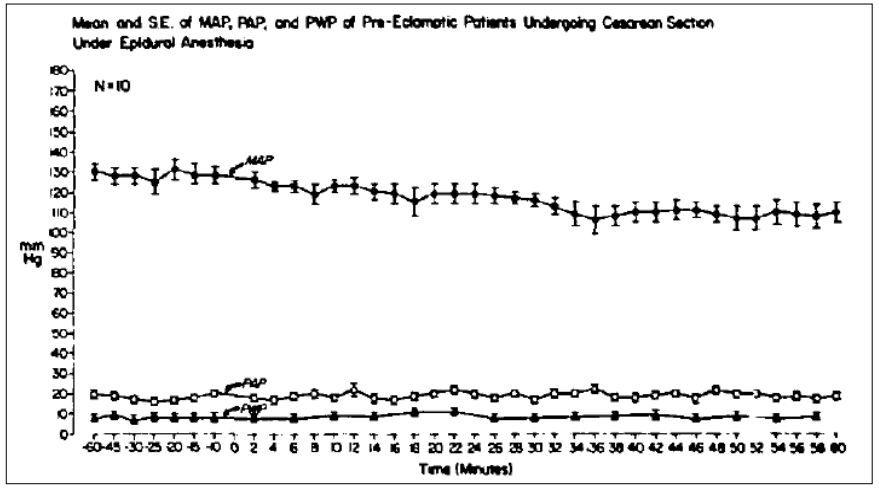
## Summary

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

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

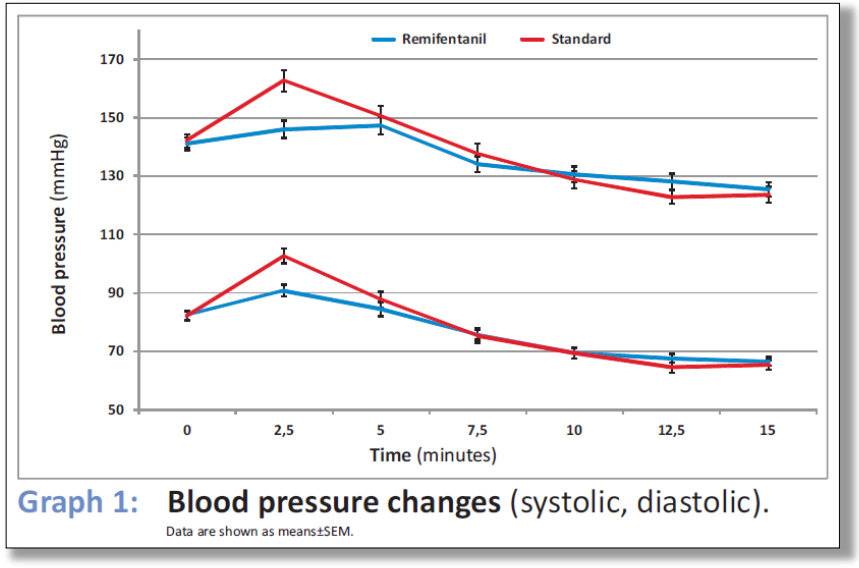
# PROČ NECHCEME CELKOVOU ANESTEZII ?



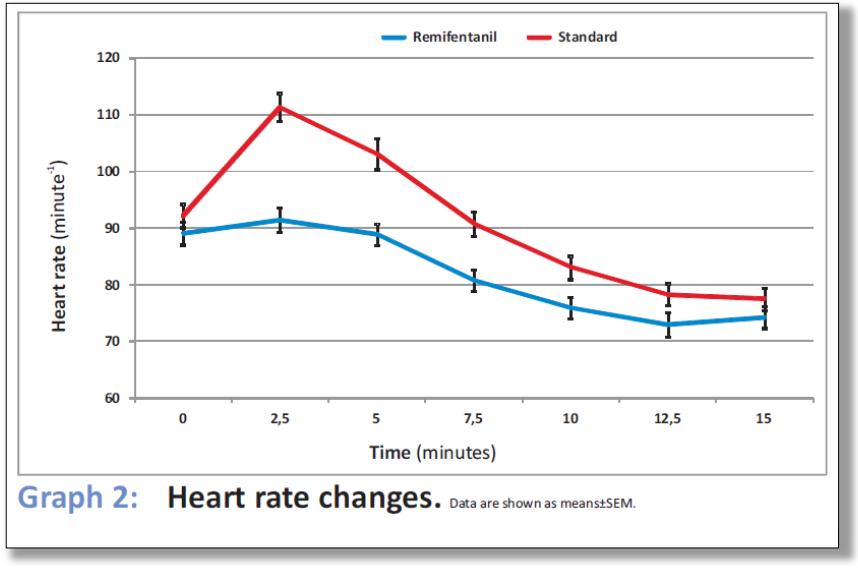

Hodgkinson et al. Can J Anesth 1980 27: 389-394.

# **Remifentanil** 1 μg/kg před úvodem do celkové anestezie

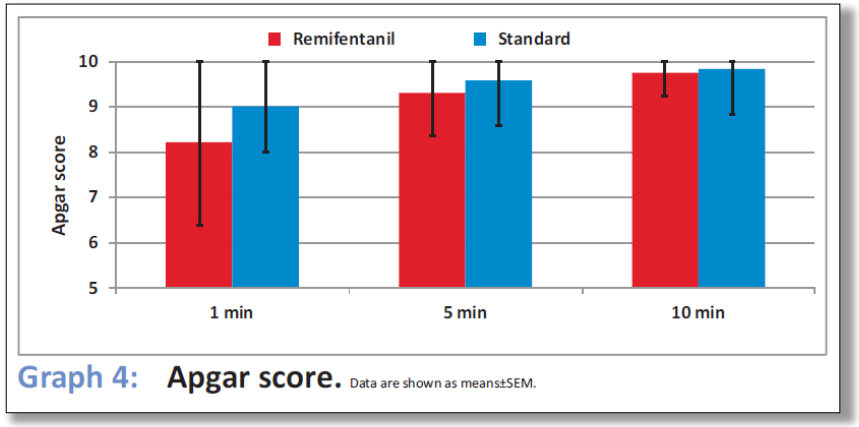



Graph 1: **Blood pressure changes** (systolic, diastolic).
Data are shown as means±SEM.

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


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



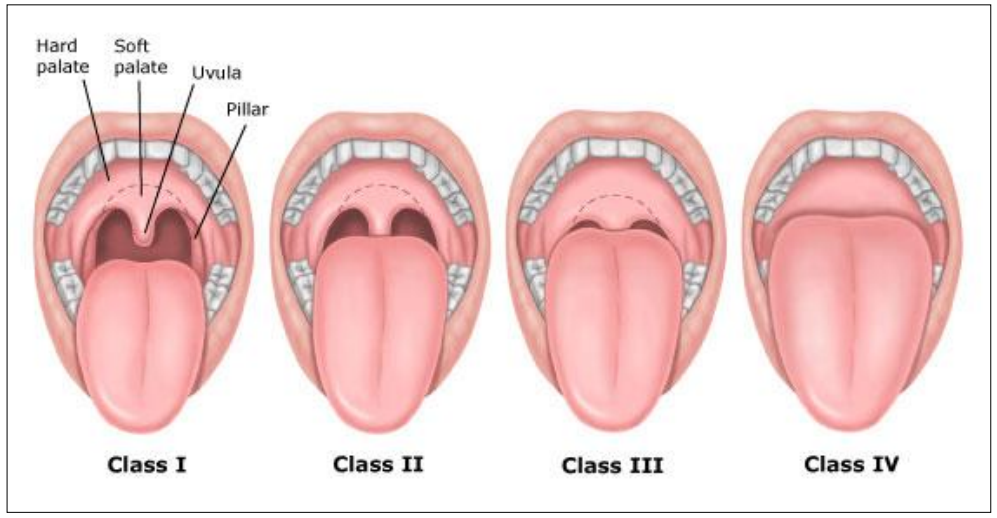

Graph 4: **Apgar score.** Data are shown as means±SEM.

# PROČ NECHCEME CELKOVOU ANESTEZII ?

= vždy riziko obtížné intubace !

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

# OBTÍŽNÁ INTUBACE V TĚHOTENSTVÍ



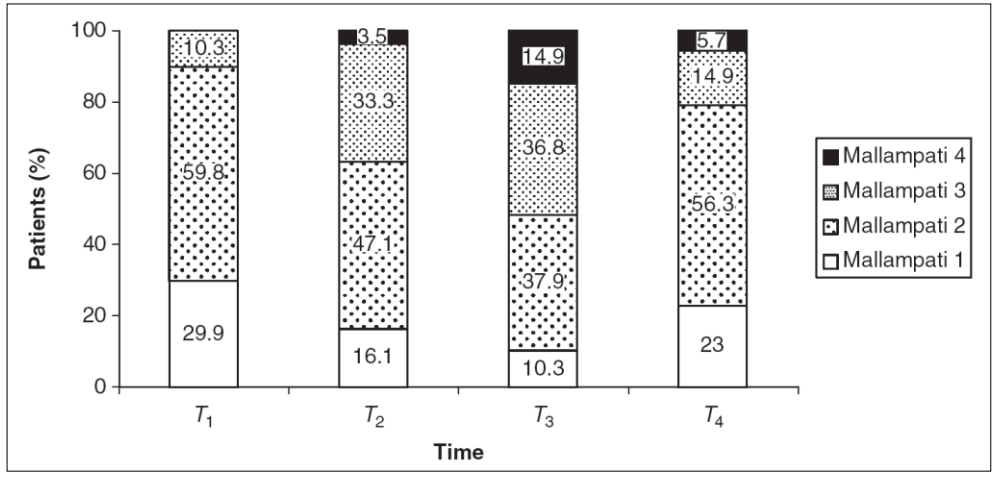




**Fig 1** The Mallampati classes at different time points. $T_1$, 8 months of pregnancy; $T_2$, during labour; $T_3$, 20 min after delivery; $T_4$, 48 h after delivery. The percentages of patients with Mallampati class 3 or 4 changed significantly: $T_1$ *vs* $T_2$, $P$=0.0000; $T_2$ *vs* $T_3$, $P$=0.0005;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

**10x**

**vyšší riziko obtížné intubace**

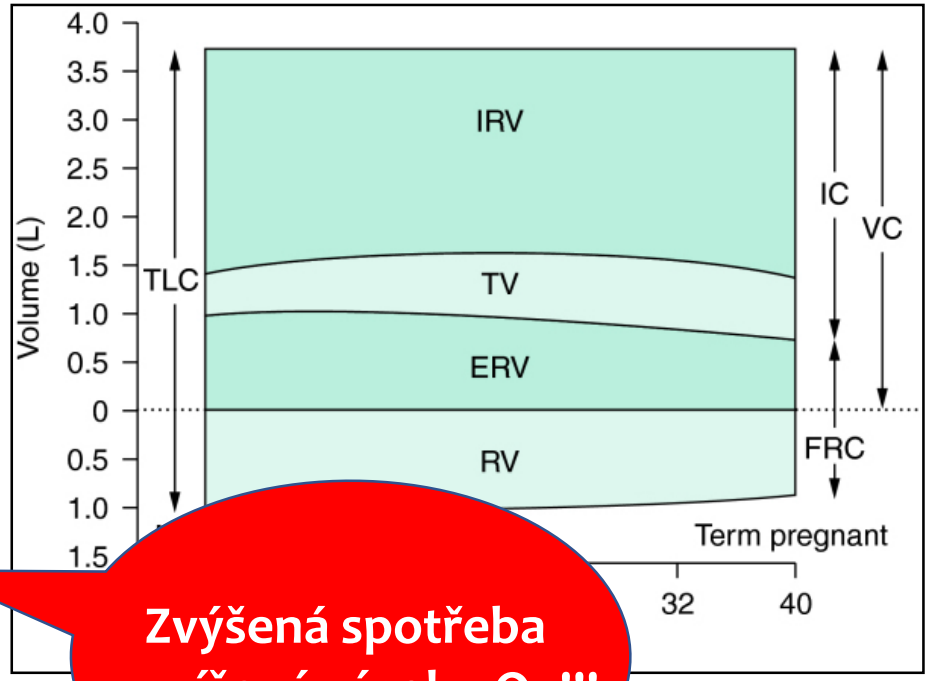
**se v průběhu porodu ještě dále zvyšuje!**

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

# FYZIOLOGICKÉ ZMĚNY V TĚHOTENSTVÍ

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

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




**Zvýšená spotřeba a snížená zásoba $O_2$ !!!**

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

and Practice, 4th Edition, 2009

# PREOXYGENACE !!!

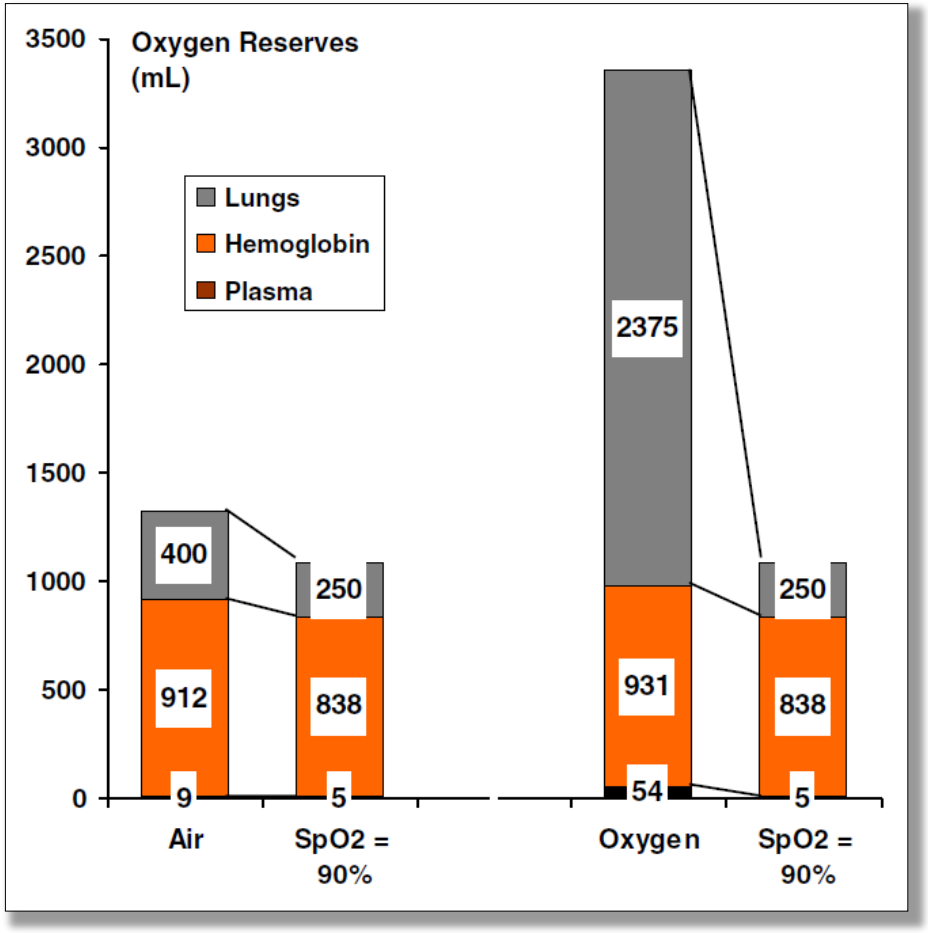
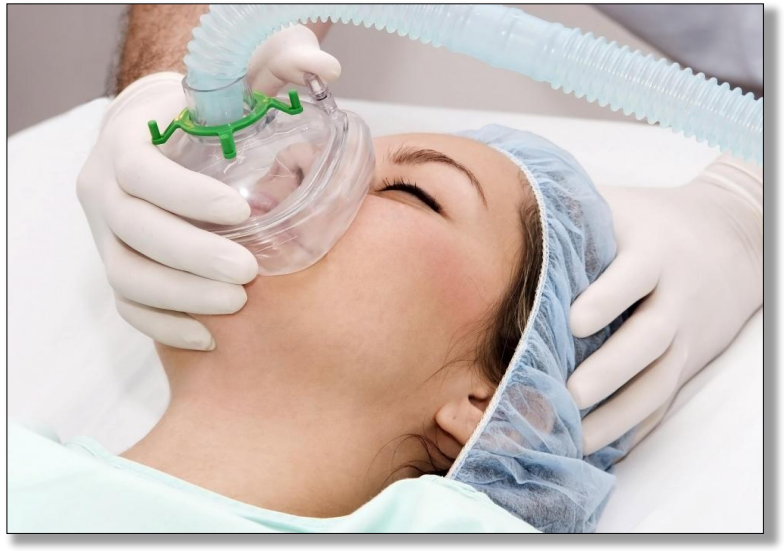



**Fig. 1** Oxygen reserves in a normal healthy adult when breathing room air (left), after breathing 100% oxygen (right), at onset of apnea, and when reaching an oxygen saturation ($SpO_2$) of 90%. In this example, the oxygen available for consumption during the apneic period amounts to 228 mL when breathing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

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

# PREOXYGENACE !!!



**A. lehká obličejová kyslíková maska**
5-8 minut dýchání 100% $O_2$
normálním objemem

**B. plně těsnící obličejová kyslíková maska**
3-8 vdechů 100% $O_2$
v objemu vitální kapacity

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

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

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

Am J Obstet Gynecol 1945;49:554–66.

## Summary

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

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

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

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

# ANESTEZIE A MATEŘSKÁ MORTALITA

70./80. léta — celková anestézie má **17x** vyšší mortalitu než regionální

90. léta — již "pouze" **6x** vyšší mortalita CA proti RA

21. století — **není rozdíl** mezi celkovou a regionální anestezií

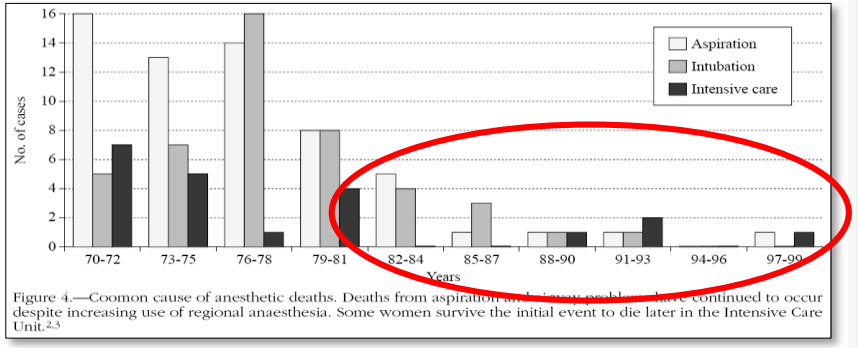
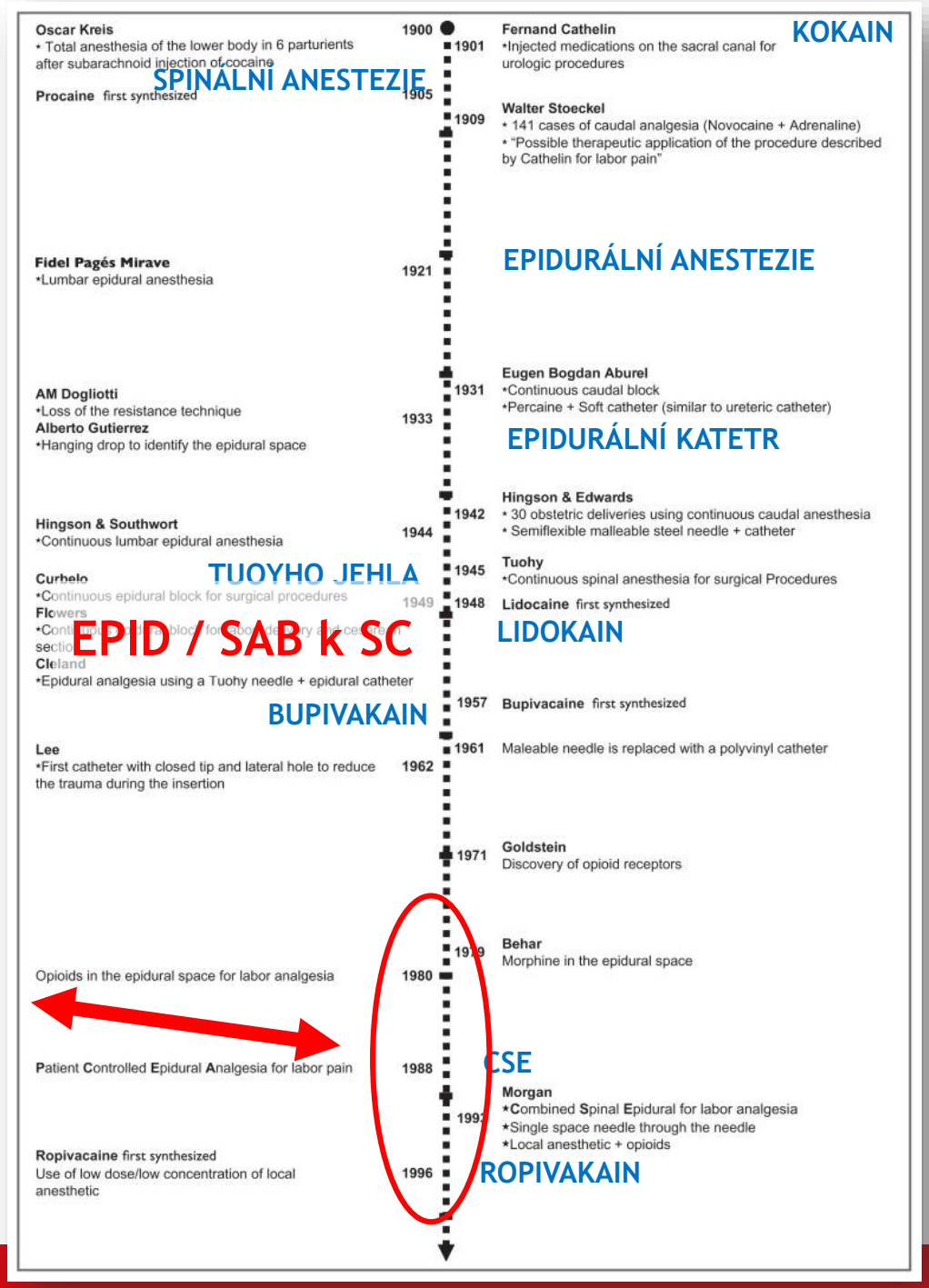



Figure 4.—Coomon cause of anesthetic deaths. Deaths from aspiration and airway problems have continued to occur despite increasing use of regional anaesthesia. Some women survive the initial event to die later in the Intensive Care Unit.[2,5]

Silva Mt al. Local Reg Anesth. 2010; 3: 143–153
Hawkins JL, Anesthesiology 1997;86:277-84
Hawkins JL, Clin Obstet Gyn 2003; 46: 679-87
Cochrane Database of Systematic Reviews 2012



# Oral sodium citrate increases nausea amongst elective Cesarean delivery patients

*[Le citrate de sodium oral augmente les nausées pendant la césarienne réglée]*

Klaus Kjaer MD, Michele Comerford MD, Linda Kondilis BA, Lauren DiMaria BA, Sharon Abramovitz MD, Michael Kiselev MD, Jon Samuels MD, Farida Gadalla MD, Barbara L. Leighton MD

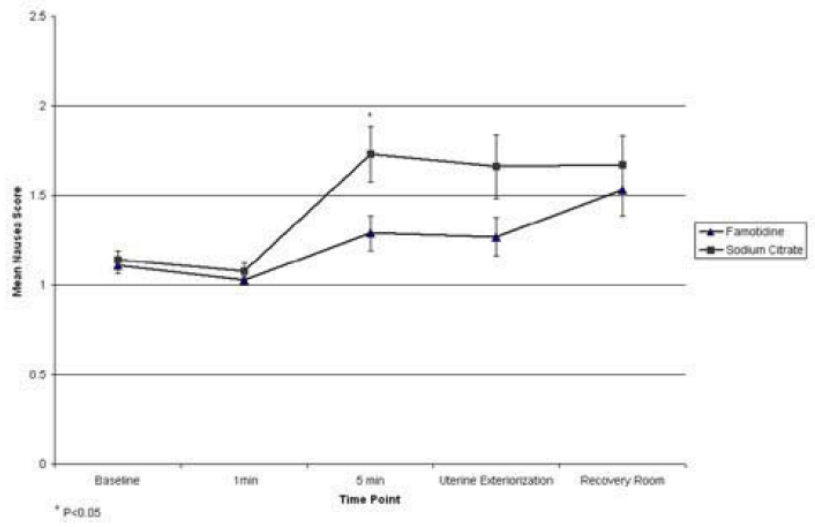



FIGURE 1 Average degree of nausea over time.

TABLE II Occurrence of nausea and hypotension

| | *Sodium citrate* | *Control* | *P-value* |
|---|---|---|---|
| 1 min after spinal | | | |
| Nausea | 4/60 (7%) | 2/63 (3%) | 0.43 |
| Hypotension | 4/59 (7%) | 4/61 (7%) | 1 |
| 5 min after spinal | | | |
| Nausea | 22/60 (37%) | 9/63 (14%) | 0.006 |
| Hypotension | 13/60 (22%) | 11/63 (17%) | 0.65 |
| Uterine exteriorization | | | |
| Nausea | 14/53 (26%) | 7/52 (13%) | 0.14 |
| Hypotension | 1/53 (2%) | 2/53 (4%) | 1 |
| Recovery room | | | |
| Nausea | 17/58 (29%) | 15/62 (24%) | 0.54 |
| Hypotension | 5/60 (8%) | 9/63 (14%) | 0.39 |

Nausea = 2–5 on a scale of 1–5, with 1 being no nausea and 5 being vomiting. Hypotension = systolic blood pressure ≤ 100. Compared with Pearson Chi-square test.

Kjaer K et al. Can J Anaesth. 2006 Aug;53(8):776-80.

# Interventions at caesarean section for reducing the risk of aspiration pneumonitis

S. Paranjothy,[a] J.D. Griffiths,[b] H.K. Broughton,[a] G.M.L. Gyte,[c] H.C. Brown,[d] J. Thomas[c]

[a] *Department of Primary Care and Public Health, Clinical Epidemiology Interdisciplinary Research Group, School of Medicine, Cardiff University, Cardiff, UK*

[b] *Department of Anaesthesia, Royal Women's Hospital, Parkville, Australia*

[c] *Cochrane Pregnancy and Childbirth Group, School of Reproductive and Developmental Medicine, Division of Perinatal and Reproductive Medicine, University of Liverpool, Liverpool Women's NHS Foundation Trust, Liverpool, UK*

[d] *Maternity Services Department, Royal Sussex County Hospital, Brighton, UK*

Int J Obstet Anesth. 2011 Apr;20(2):142-8

**ABSTRACT**

**Background:** Various interventions are used as prophylaxis for aspiration pneumonitis in obstetric anaesthesia. This review, based on a Cochrane systematic review currently being updated, examines whether interventions given before caesarean section reduce the risk of aspiration pneumonitis.

**Methods:** Twenty-two studies, involving 2658 women providing data in a usable format for meta-analysis were identified.

**Results:** Compared to no treatment or placebo, there was a significant reduction in the risk of intra-gastric pH <2.5 with antacids (risk ratio (RR) 0.17, 95% confidence interval (CI) 0.09–0.32), H2 antagonists (RR 0.09, 95% CI 0.05–0.18) and proton-pump antagonists (RR 0.26, 95% CI 0.14–0.46). H2 antagonists were associated with a reduced risk of intra-gastric pH <2.5 when compared with proton-pump antagonists (RR 0.39, 95% CI 0.16–0.97), but compared with antacids the findings were unclear. Combined use of antacids plus H2 antagonists was associated with a significant reduction in the risk of intra-gastric pH <2.5 when compared with placebo (RR 0.02, 95% CI 0.00–0.15) or compared with antacids alone (RR 0.12, 95% CI 0.02–0.92).

**Conclusion:** The quality of evidence was weak and may not reflect a reduction in the risk of aspiration pneumonitis since none of the studies assessed substantive clinical outcomes or potential adverse effects. Further work is required to validate the suitability of surrogate markers of pH and gastric volume for clinical outcomes in the context of aspiration pneumonitis.

# RIZIKO ASPIRACE

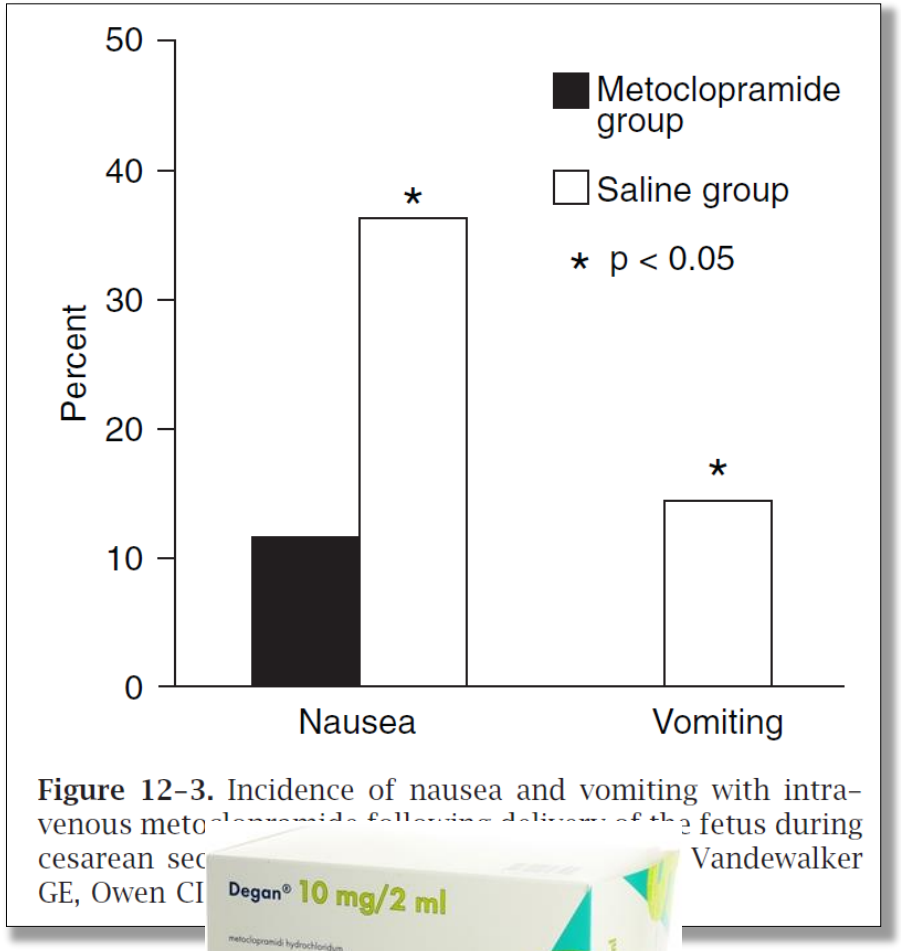



**Figure 12–3.** Incidence of nausea and vomiting with intravenous meto fetus during cesarean sec Vandewalker GE, Owen CI

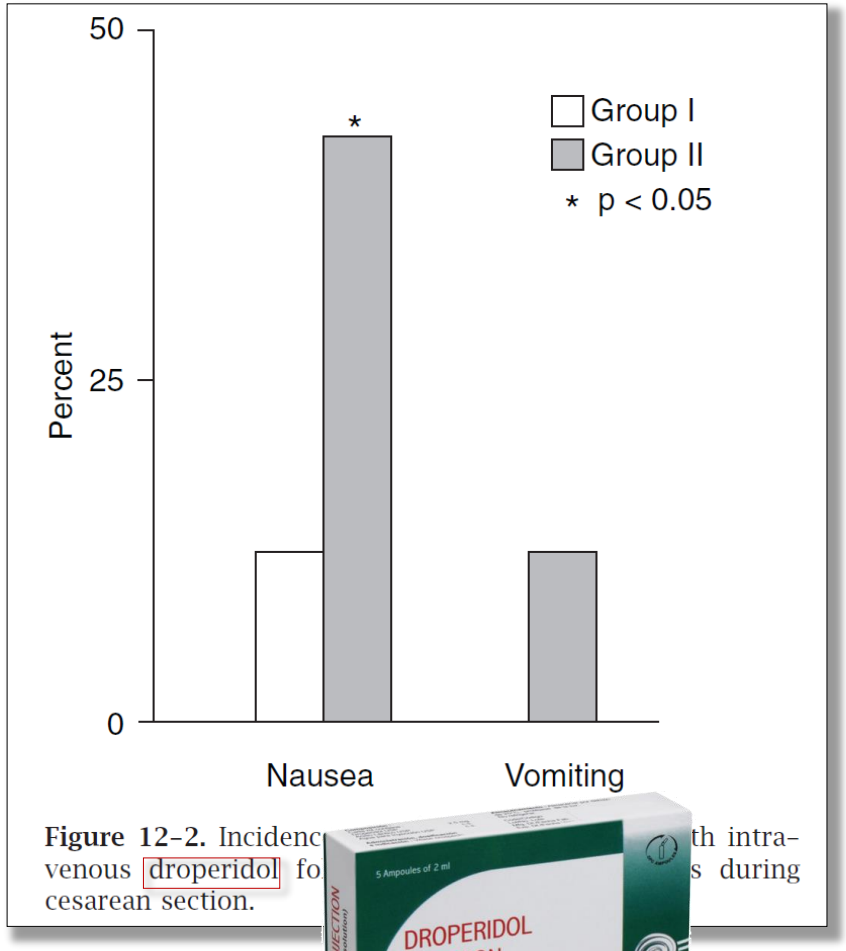
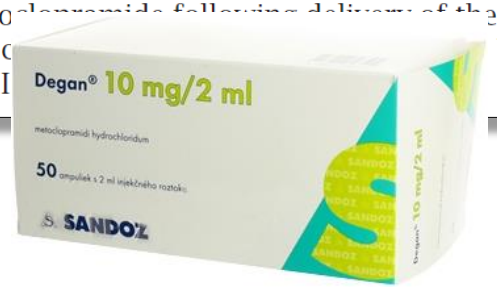
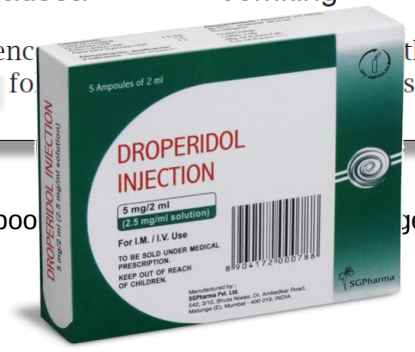



**Figure 12–2.** Incidenc th intravenous droperidol fo s during cesarean section.




Sanjay Datta, ed. Obstetric Anesthesia Handboo ger, 2006


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

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

Data are in mmHg ± SD.

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

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

TABLE 9. *Side effects of succinylcholine.*

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

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

# THE LANCET

## Preliminary Communications

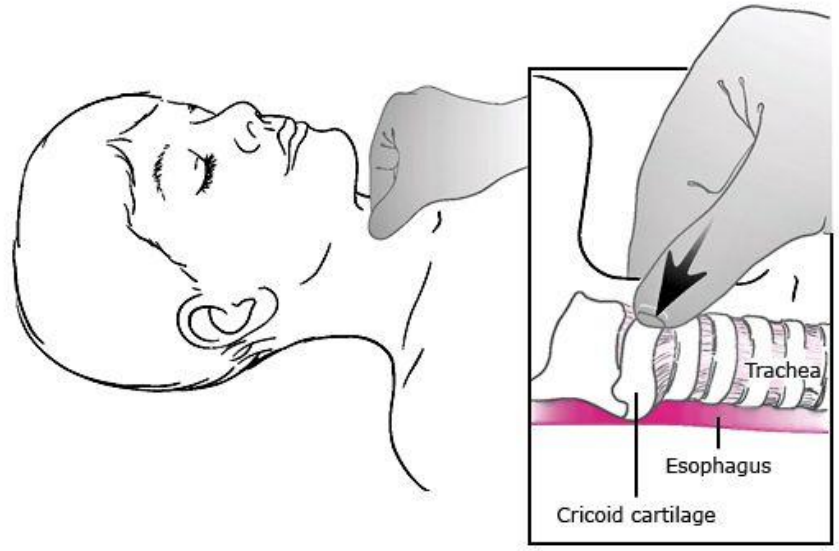
### CRICOID PRESSURE TO CONTROL REGURGITATION OF STOMACH CONTENTS DURING INDUCTION OF ANÆSTHESIA

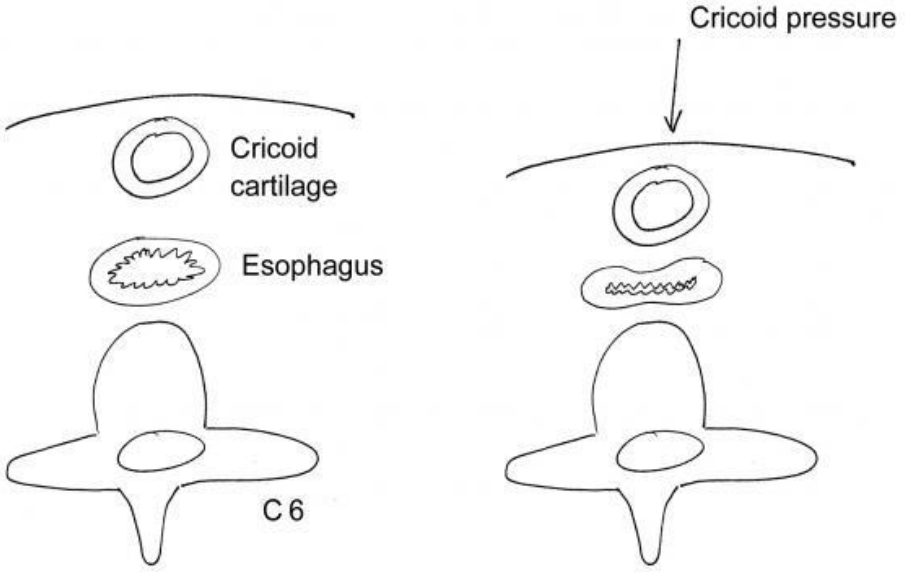
WHEN the contents of stomach or œsophagus gain access to the air-passages during anæsthesia the consequences are disastrous. In spite of modern anæsthetic techniques—or sometimes, regrettably, because of them—regurgitation is still a considerable hazard during the induction of anæsthesia, particularly 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



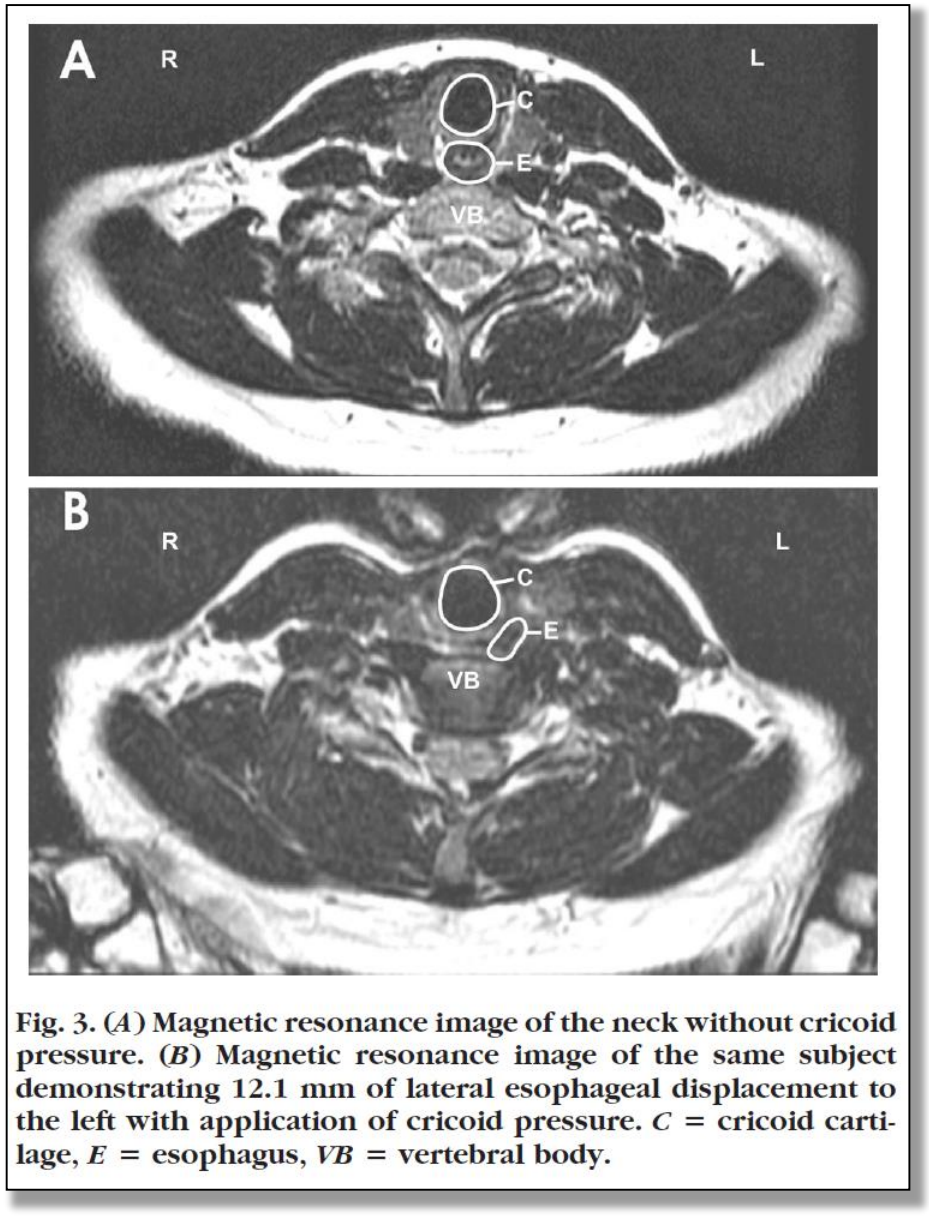
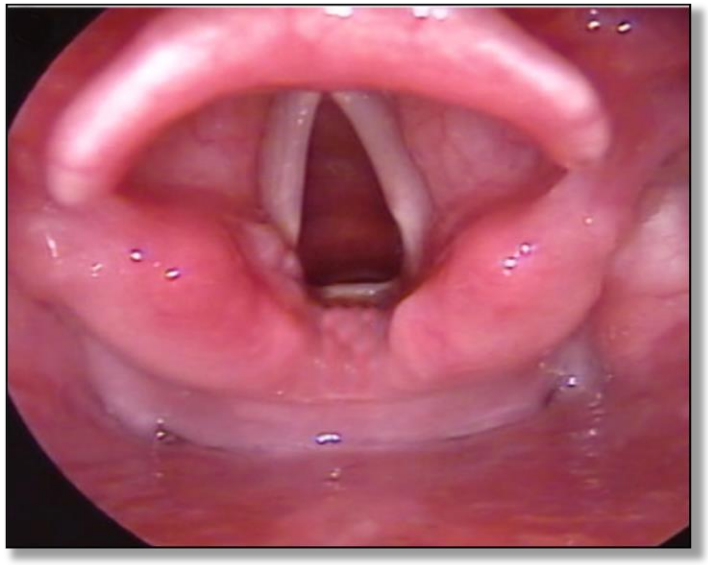




**Fig. 3. (*A*) Magnetic resonance image of the neck without cricoid pressure. (*B*) Magnetic resonance image of the same subject demonstrating 12.1 mm of lateral esophageal displacement to the left with application of cricoid pressure. *C* = cricoid cartilage, *E* = esophagus, *VB* = vertebral body.**

Smith KJ et al. Anesthesiology 2003; 99:60-4

Rice et al. Anesth Analg 2009;109:1546-52



…tlak 30 N na krikoidní chrupavku může zcela ‘zrušit’ vizualizaci glotis

Haslam et al. *Anaesthesia* 2005; 60: 41-47

# *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.‡*

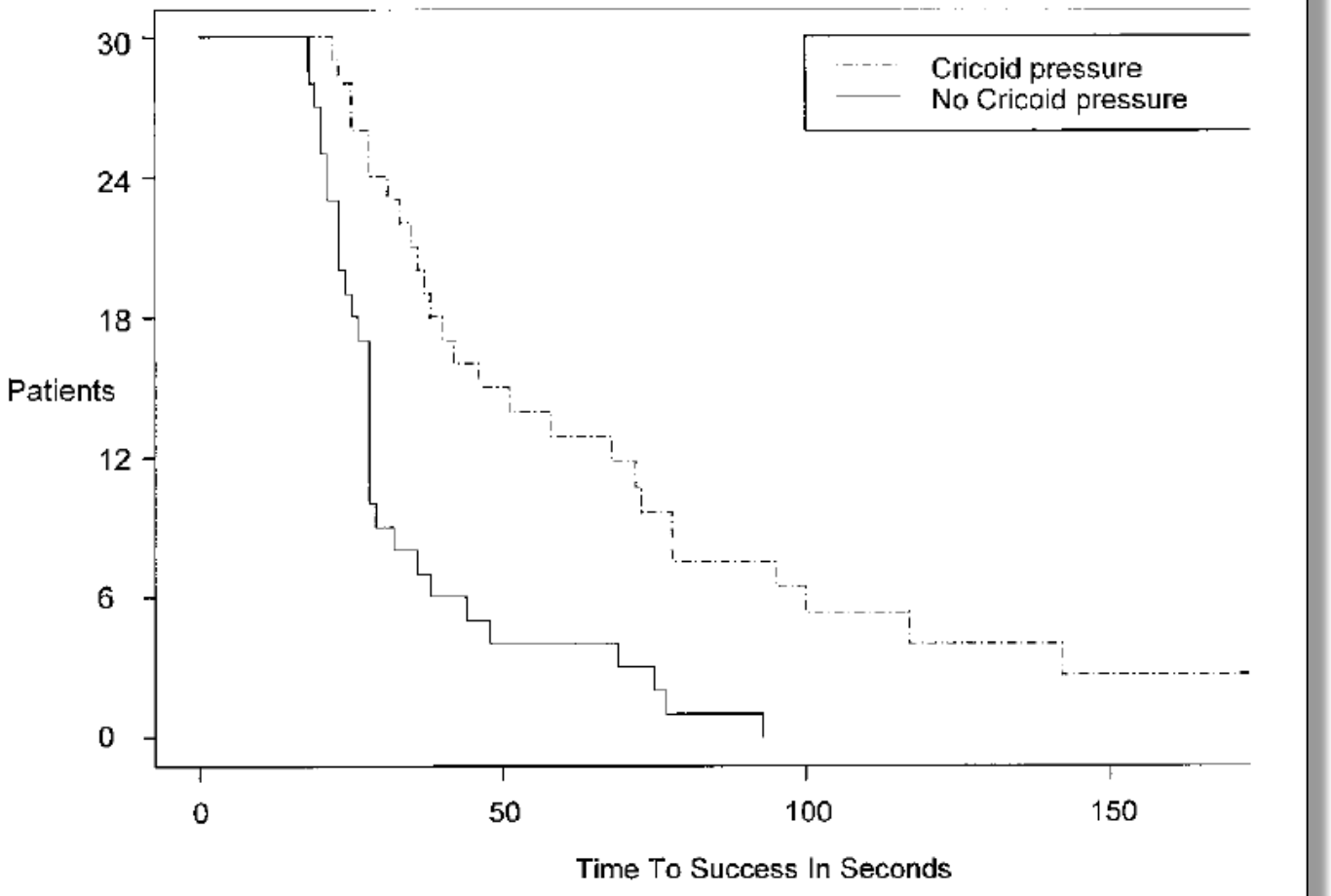
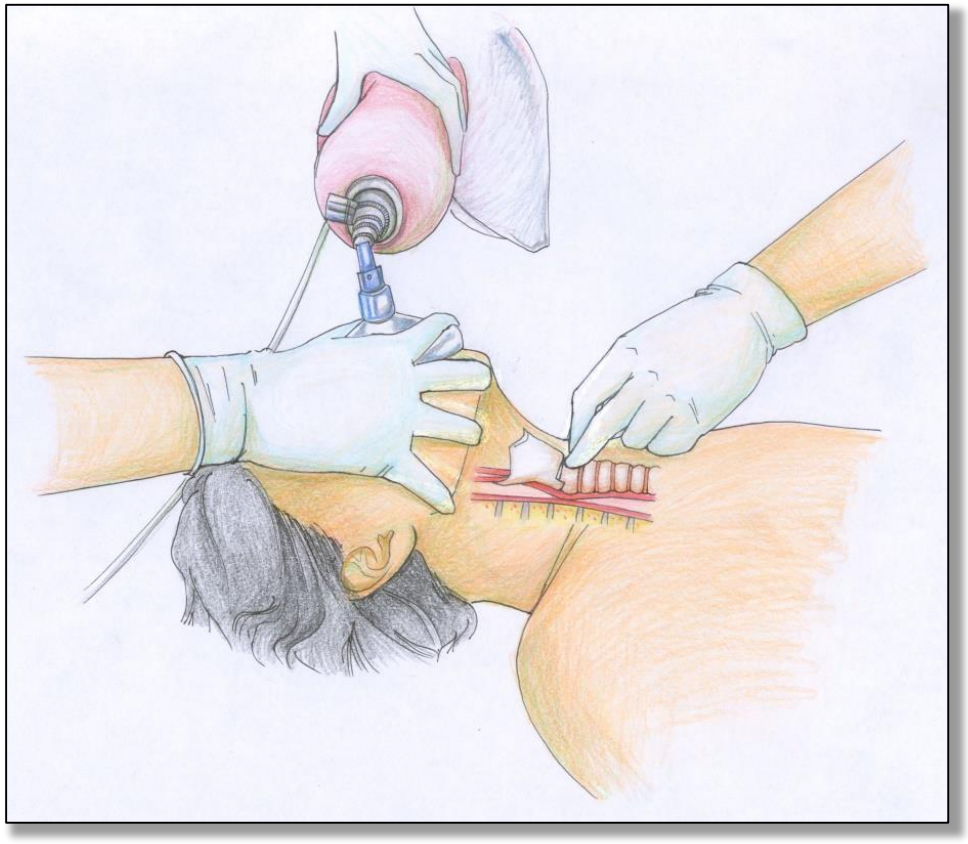



**Fig. 1. Kaplan-Meier plot of time to successful intubation for the sixty patients. Thirty patients were intubated with cricoid pressure, with values for four patients requiring multiple attempts censored. Thirty patients were intubated without cricoid pressure. Time to successful intubation was significantly prolonged in the cricoid pressure group ($P = 0.0001$, log-rank test).**

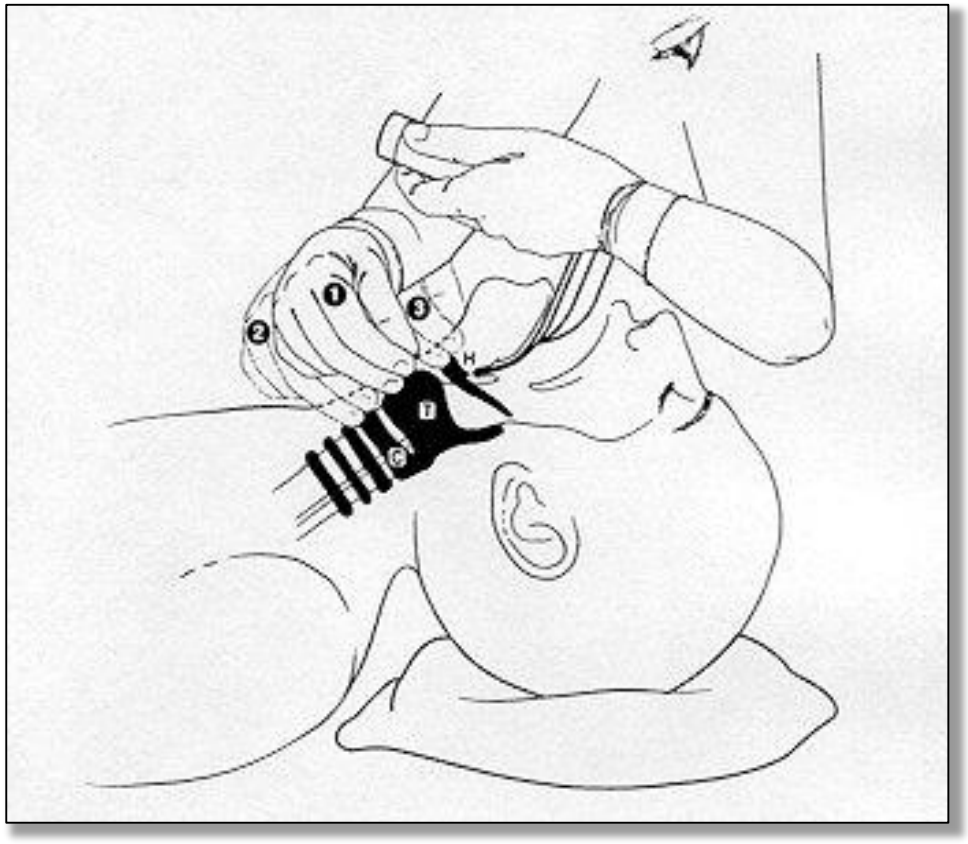
Hodgson. Anesthesiology 2001; 94:259–62

# Sellick's Maneuver



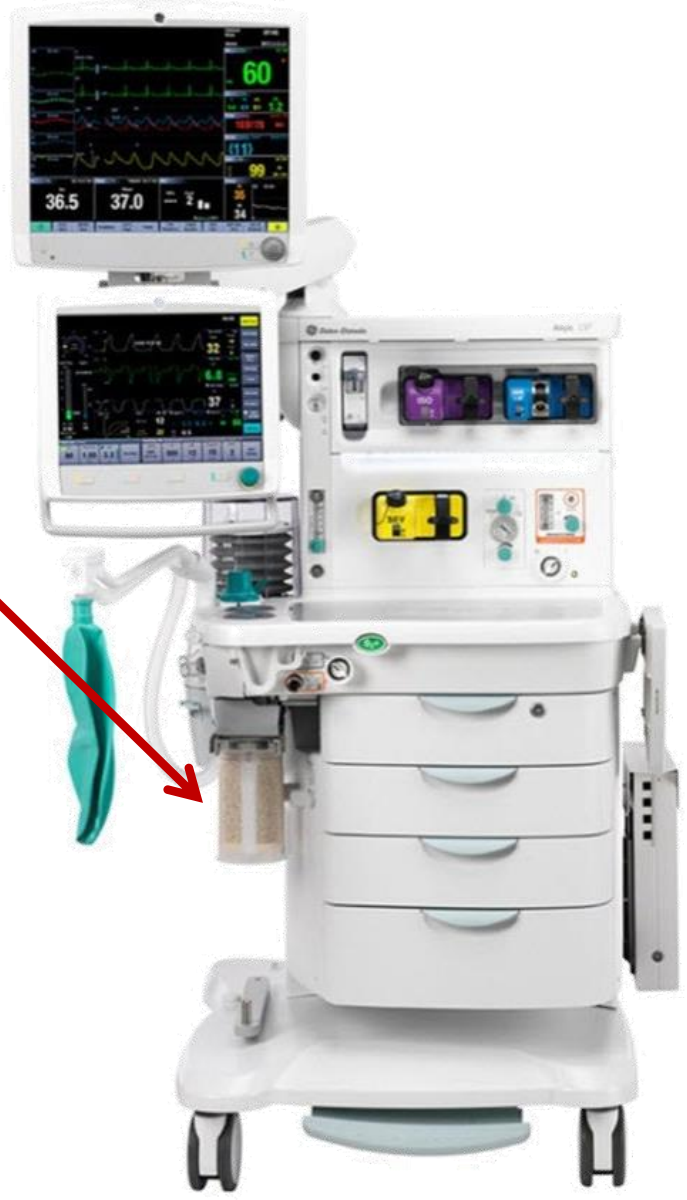
# "BURP"

Backward, Upward, Rightward Pressure

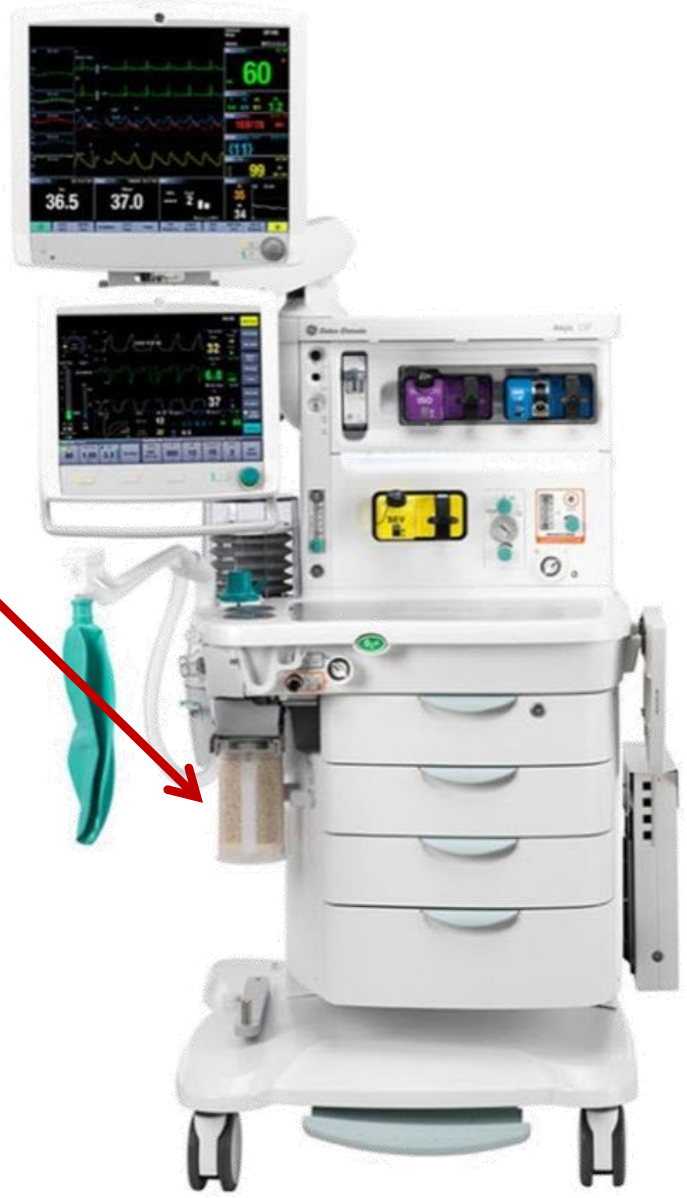


V 90% případů získáme nejlepší "pohled" tlakem na **štítnou chrupavku**, **nikoli krikoidální!**

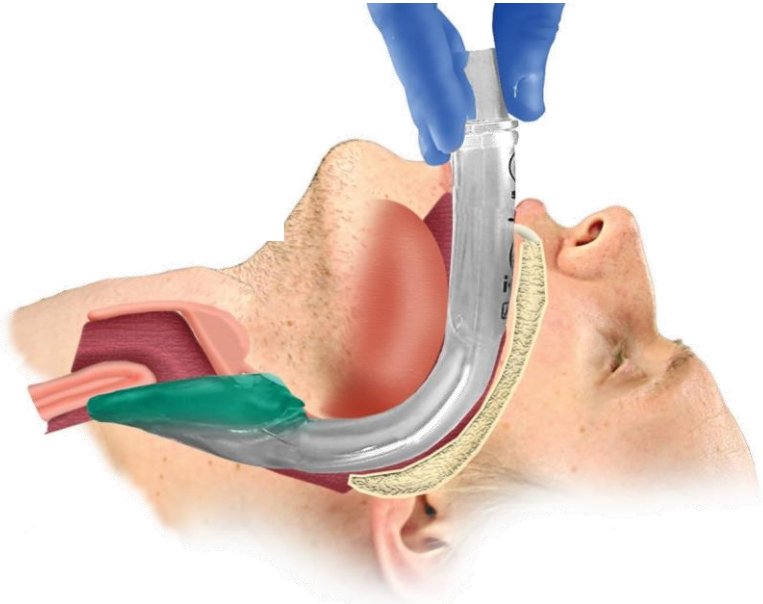
**ZKONTROLOVAT ODSÁVAČKU !**

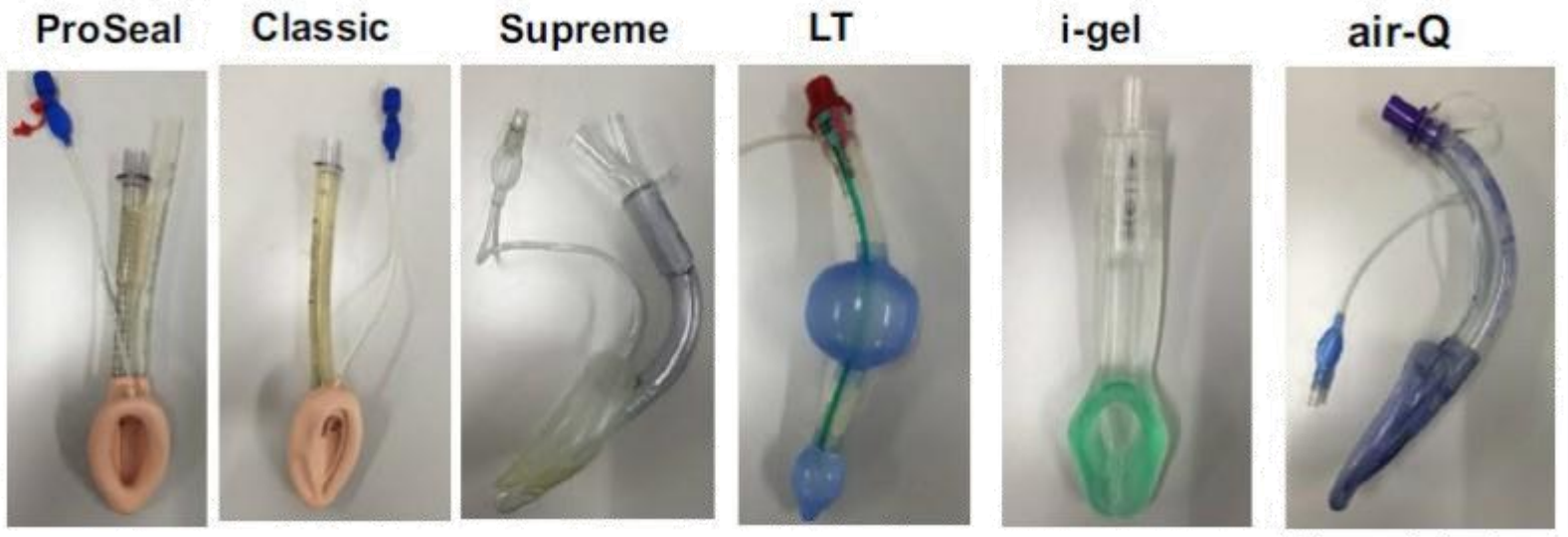


**ZKONTROLOVAT ODSÁVAČKU !**

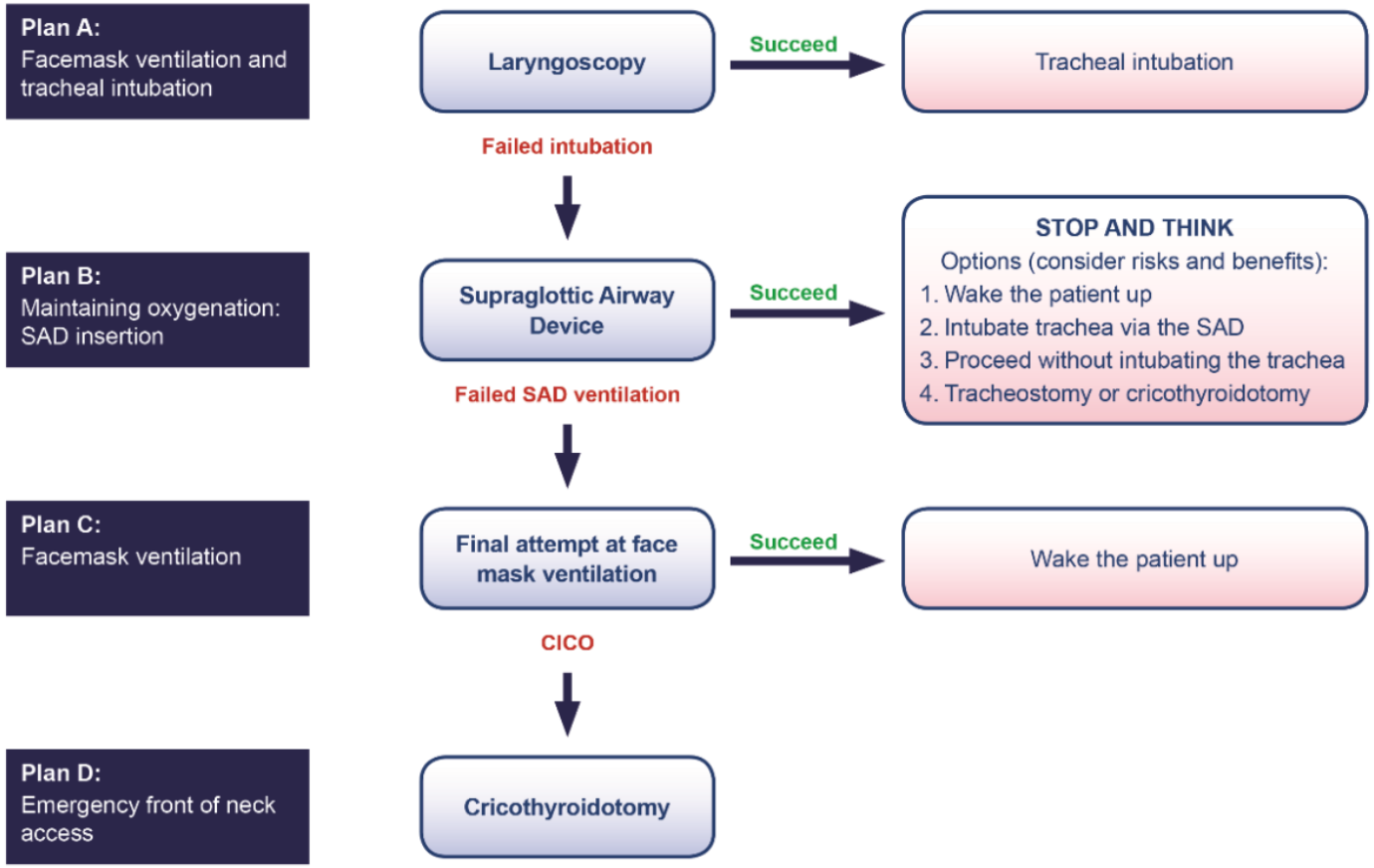


**PAMATUJ, ŽE OXYGENACE JE DŮLEŽITĚJŠÍ NEŽ INTUBACE.**




ProSeal
Classic
Supreme
LT
i-gel
air-Q

# DAS Difficult intubation guidelines – overview

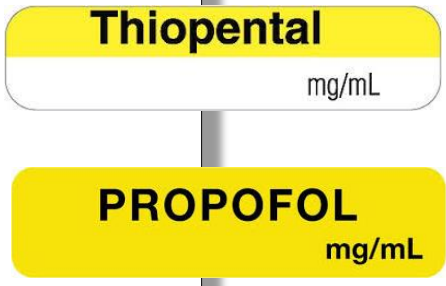



This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

# CELKOVÁ ANESTEZIE

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

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




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

# CELKOVÁ ANESTEZIE

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

# *The Response of Newborns to Succinylcholine and d-Tubocurarine*

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

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

## Results

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

# SVALOVÁ RELAXACE

## SUKCINYLCHOLIN


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

**Table 3.** Onset Times and Durations of Neuromuscular Block

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

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

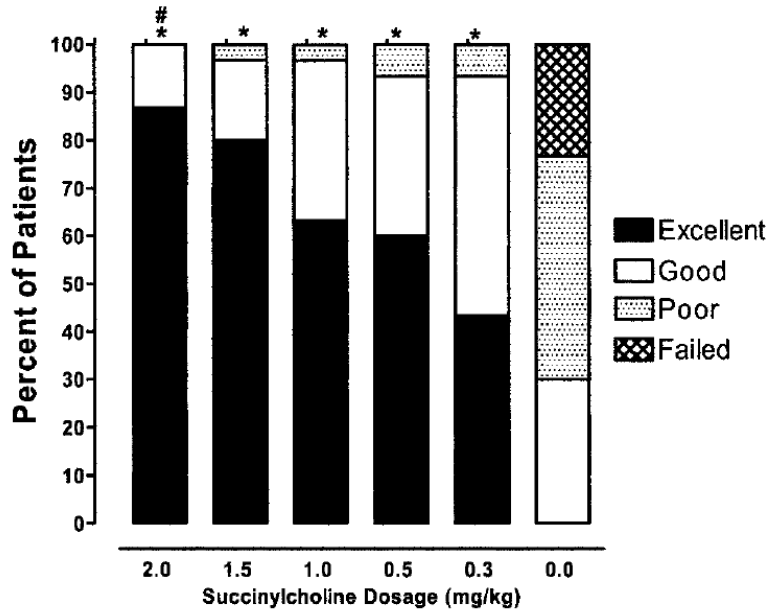
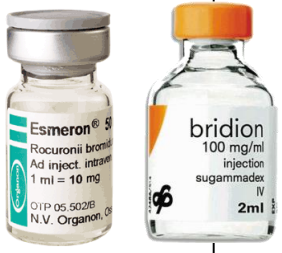



**Figure 1.** Intubating conditions with different doses of succinylcholine ($n = 30$ in. each group). The incidence of excellent intubating conditions was significantly more frequent (*$P < 0.001$) in patients receiving succinylcholine than in those of the control group and in the 2.0 mg/kg succinylcholine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

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





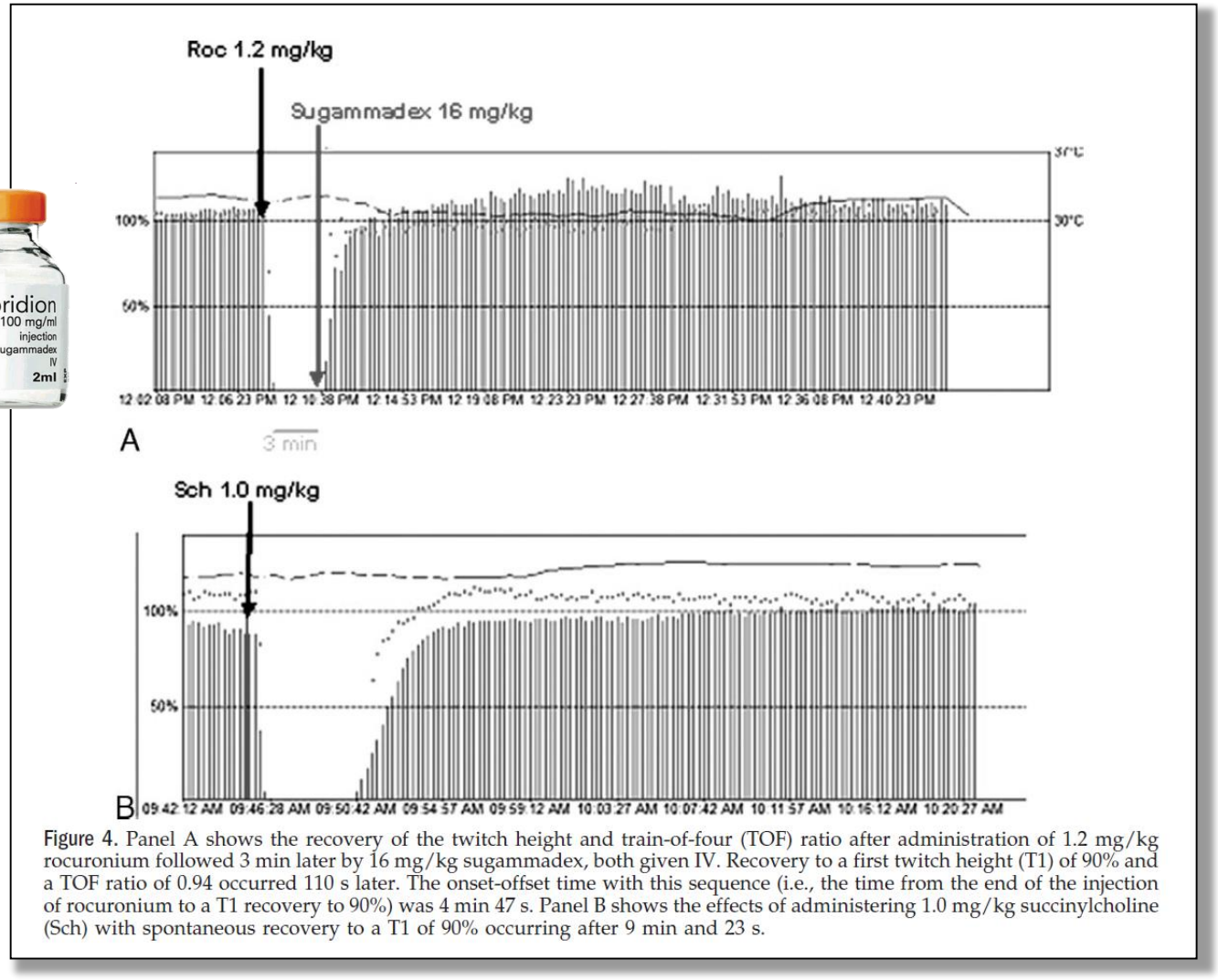



**Figure 4.** Panel A shows the recovery of the twitch height and train-of-four (TOF) ratio after administration of 1.2 mg/kg rocuronium followed 3 min later by 16 mg/kg sugammadex, both given IV. Recovery to a first twitch height (T1) of 90% and a TOF ratio of 0.94 occurred 110 s later. The onset-offset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

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

# 0,6 mg/kg

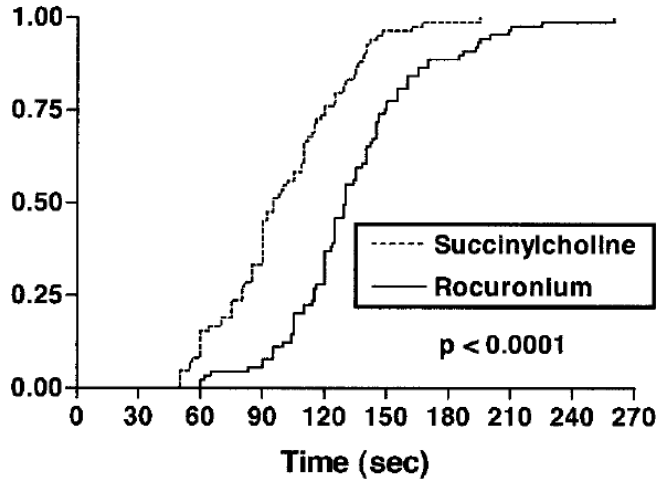



**Figure 2.** Kaplan-Meyer curve of the probability of the completion of the endotracheal intubation sequence including succinylcholine or rocuronium as the neuromuscular blocking drug. Time 0 denotes the beginning of the injection of the induction drug propofol. The endotracheal intubation sequence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


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

# 1 mg/kg

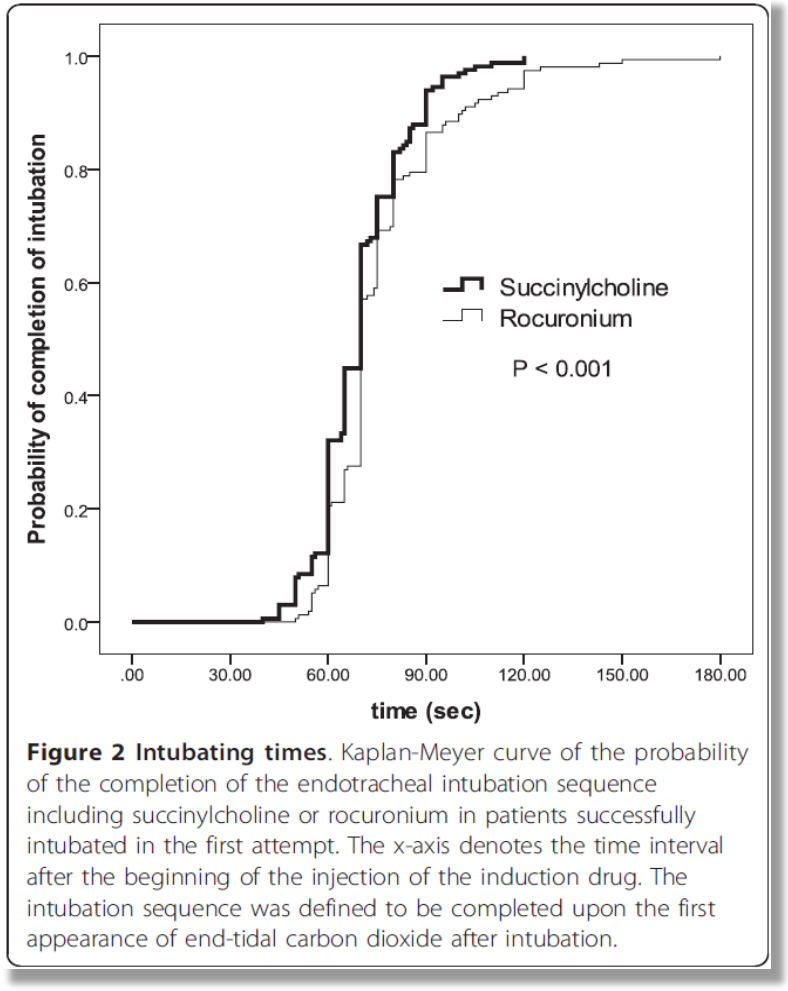



**Figure 2 Intubating times**. Kaplan-Meyer curve of the probability of the completion of the endotracheal intubation sequence including succinylcholine or rocuronium in patients successfully intubated in the first attempt. The x-axis denotes the time interval after the beginning of the injection of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

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

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

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

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

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

*Accepted for publication 29 October 2010*



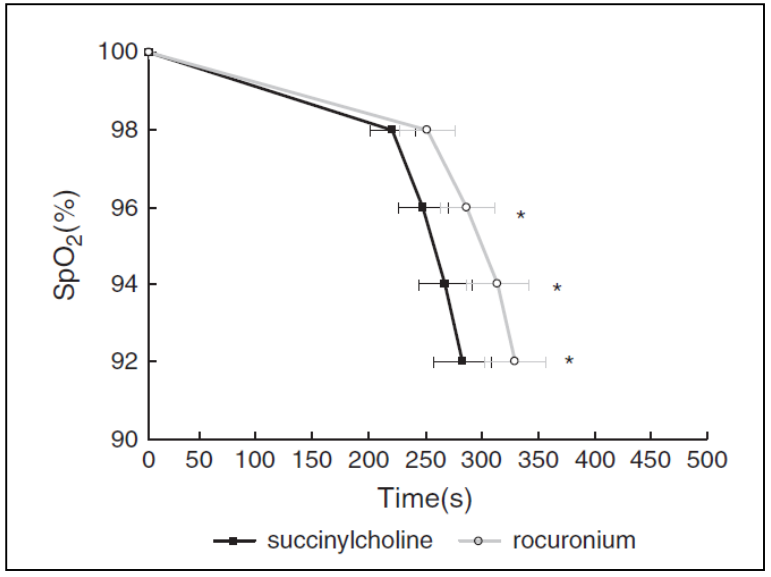



*Fig. 2. Changes in oxygen saturation ($S_pO_2$) with time during non-hypoxic apnea in the succinylcholine or the rocuronium group. Mean values (points) for both groups are shown. The vertical lines indicate 95% CI. The curves show smooth before $S_pO_2$ reach 98%, but afterward fall straightly to 92%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



Anaesthesia
Journal of the Association of Anaesthetists of Great Britain and Ireland
Anaesthesia, 2010, 65, pages 358–361 doi:10.1111/j.1365-2044.2

ORIGINAL ARTICLE

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

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

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

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

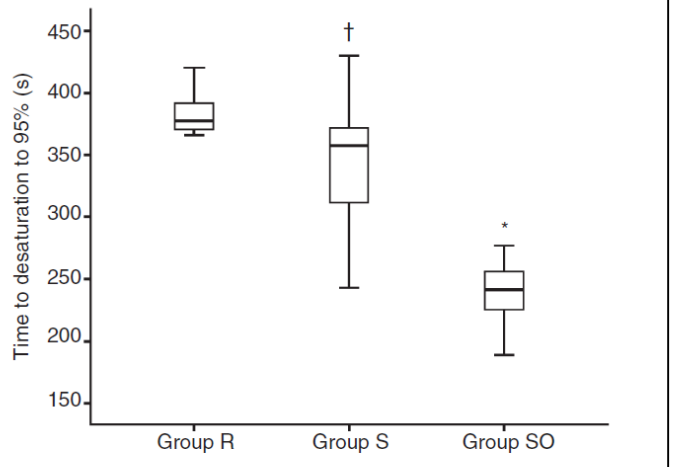


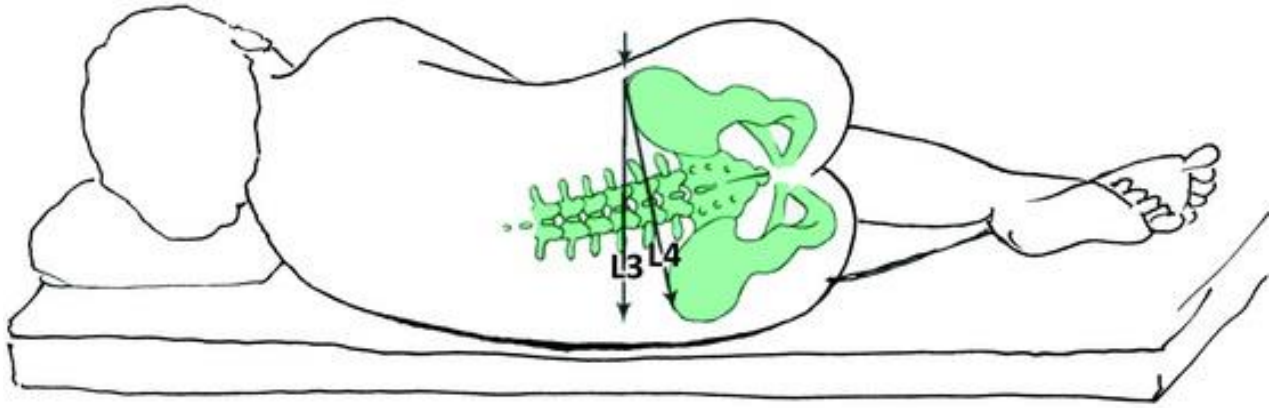

**Figure 1** Time to reach $S_pO_2$ of 95% during apnoea following induction of anaesthesia with lidocaine/fentanyl/propofol/rocuronium (Group R), lidocaine/fentanyl/propofol/suxamethonium (Group S), or propofol/suxamethonium (Group SO).

# Rocuronium and sugammadex for rapid sequence induction of obstetric general anaesthesia

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

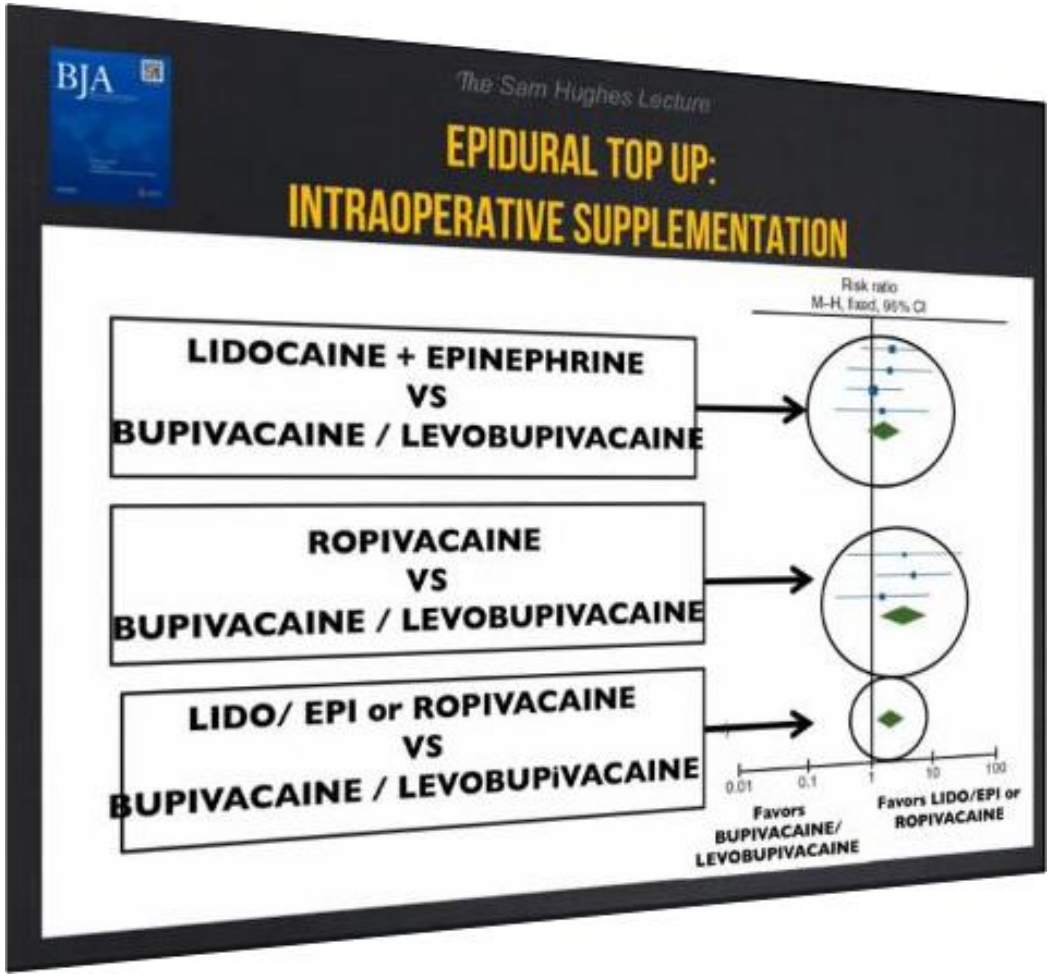
**Background:** Many anaesthetists use rocuronium in place of suxamethonium for rapid sequence induction (RSI). This is less common in obstetric anaesthesia as the duration of action of an effective dose of rocuronium exceeds most obstetric procedures. Sugammadex offers the possibility of rapidly reversing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

*Accepted for publication 26 February 2011*

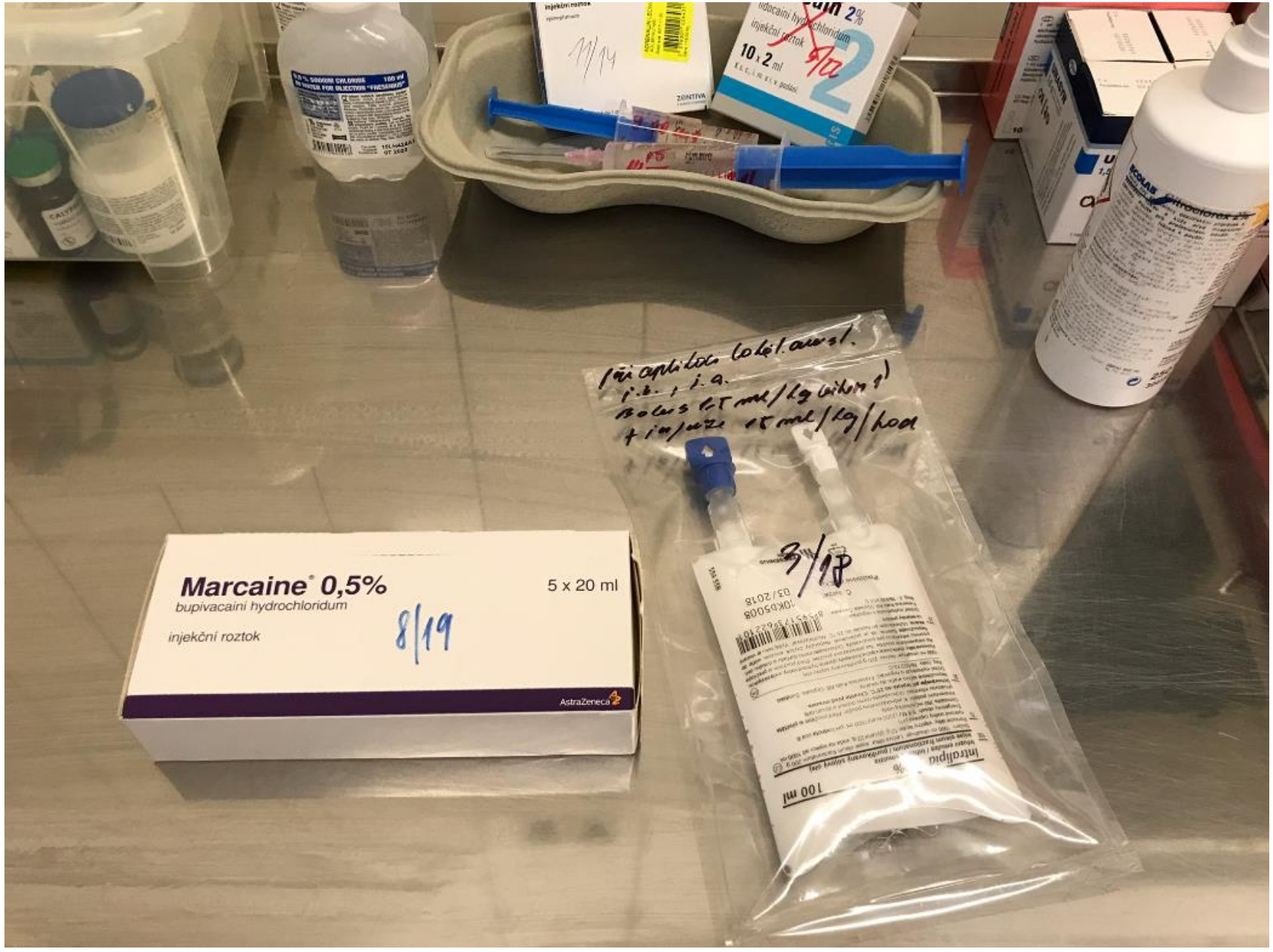



**Obr 1.** Projekce spojnice obou iliakálních krist u ležící těhotné ženy.


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




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


Marcaine® 0,5%
bupivacaini hydrochloridum
injekční roztok
5 x 20 ml
8/19
AstraZeneca
3/18
100 ml

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

ORIGINAL ARTICLE

ELSEVIER
www.obstetanesthesia.com

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

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



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

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

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

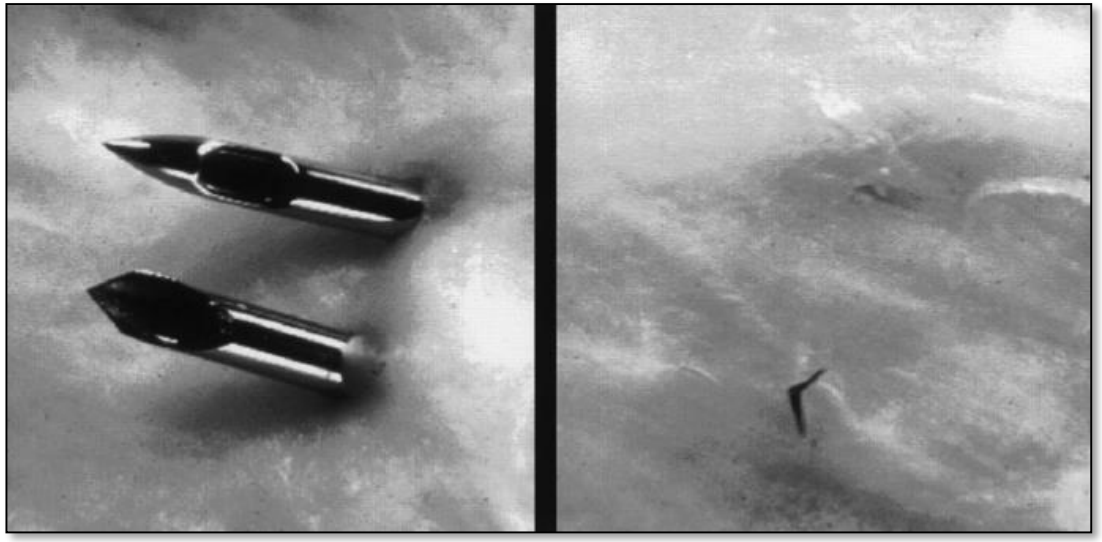
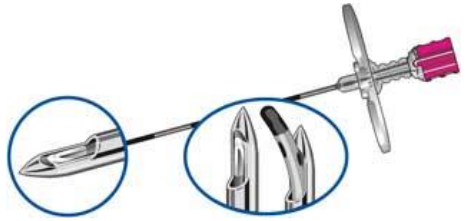


**FIGURE 1.** Dural puncture holes made by cutting and noncutting needles (Reproduced with permission from Strupp, et al. *Neurology*. 2001; 57:2310–2312).

HUBER POINT

Edward B. Tuohy
(1908–1959: USA)

Robert F. Husted
(1928–2008: USA)



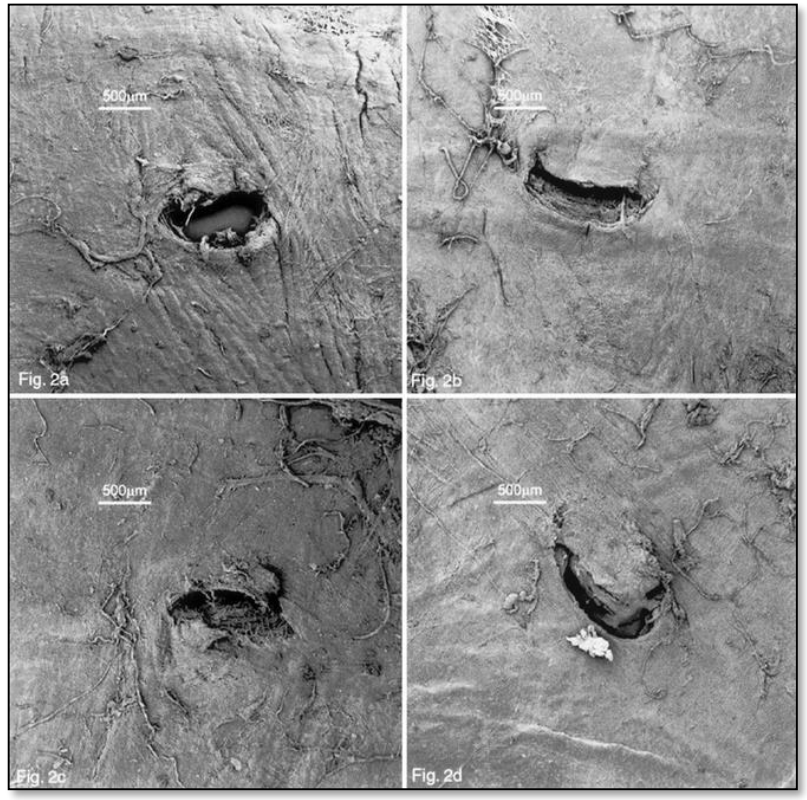



Fig. 2. Scanning electron microscopic images of (*a* ) a 17-gauge Hustead epidural needle puncture (bevel parallel, 90° angle), (*b* ) a 17-gauge Tuohy epidural needle puncture (bevel parallel, 90° angle), (*c* ) an 18-gauge Special Sprotte® epidural needle puncture (90° angle), and (*d* ) an 18-gauge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

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

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

| Epidural Needles | 17-Gauge Hustead | 17-Gauge Tuohy | 18-Gauge Tuohy | 20-Gauge Tuohy | 18-Gauge Special Sprotte® | 18-Gauge Crawford |
|---|---|---|---|---|---|---|
| 17-Gauge Hustead | 516 ± 319 | 0.3668 | 0.2922 | 0.0018* | 0.2078 | 0.1326 |
| 17-Gauge Tuohy | | 405 ± 209 | 0.3812 | 0.0024* | 0.6468 | 0.4312 |
| 18-Gauge Tuohy | | | 420 ± 191 | 0.0003* | 0.4324 | 0.2707 |
| 20-Gauge Tuohy | | | | 100 ± 112 | 0.0162 | 0.0001* |
| 18-Gauge Special Sprotte® | | | | | 360 ± 208 | 0.9698 |
| 18-Gauge Crawford | | | | | | 356 ± 121 |

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

* Statistically significant *P* values.

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

Anaesth Crit Care Pain Med 34 (2015) 277–280

Original Article

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

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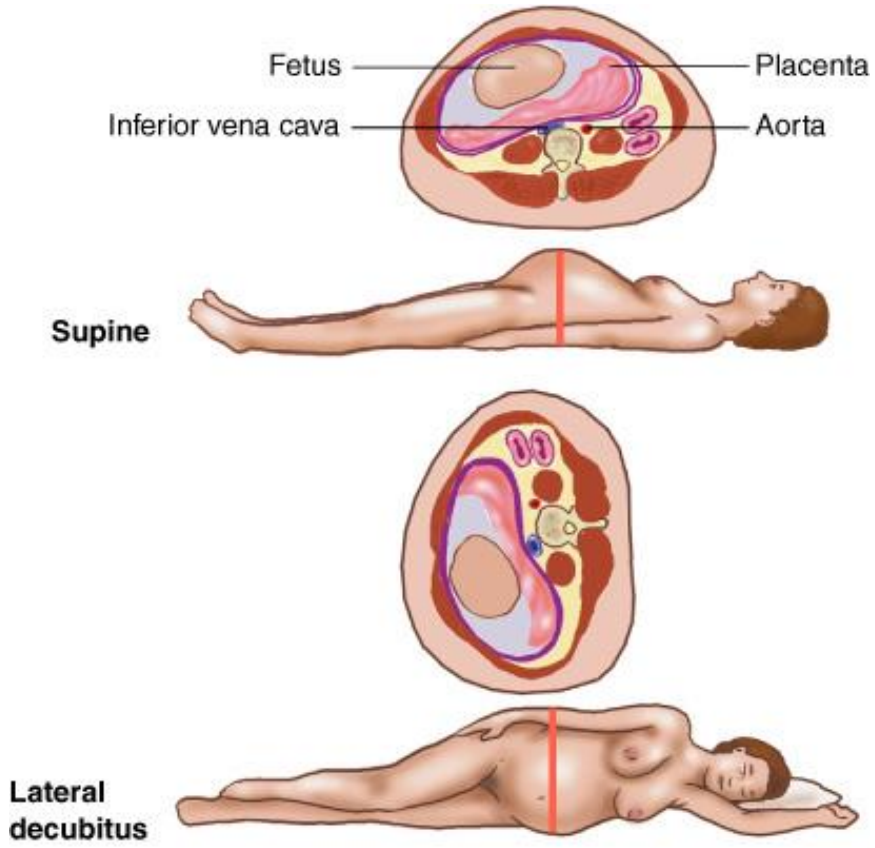
27 G více selhání,
26 G více PDPH

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

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

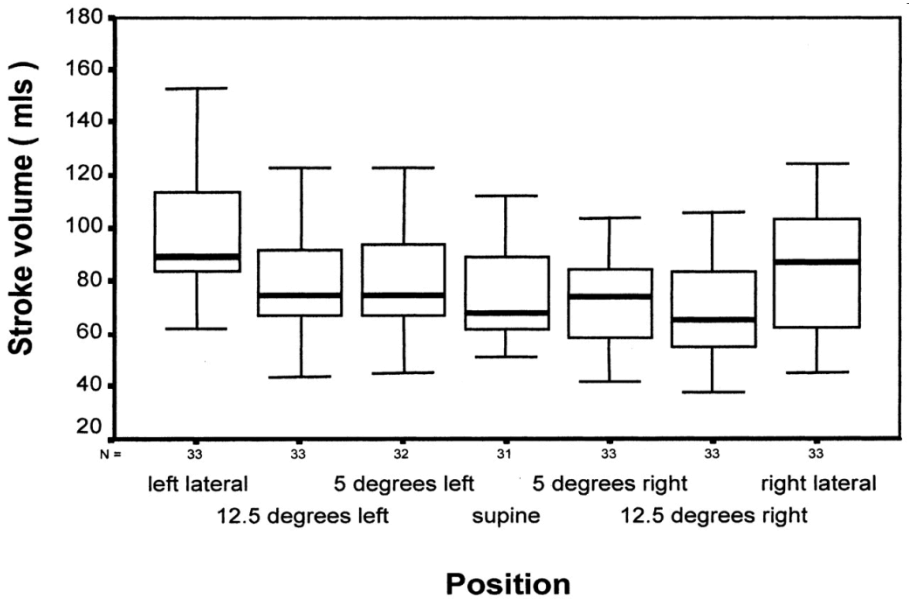
[a] $P < 0.05$, 27 G vs. 25G and 26 G.



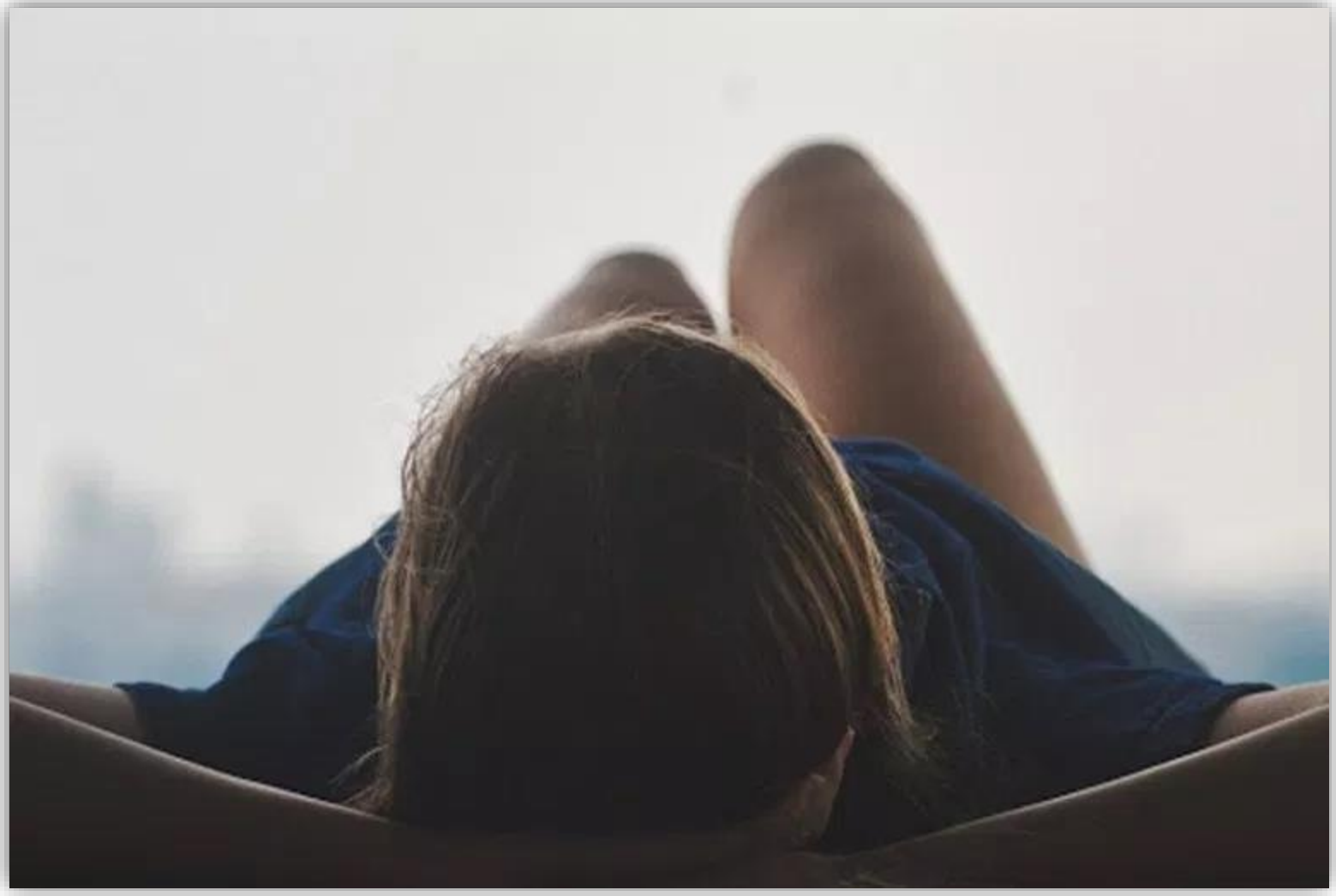

## SEMILATERÁLNÍ POLOHA

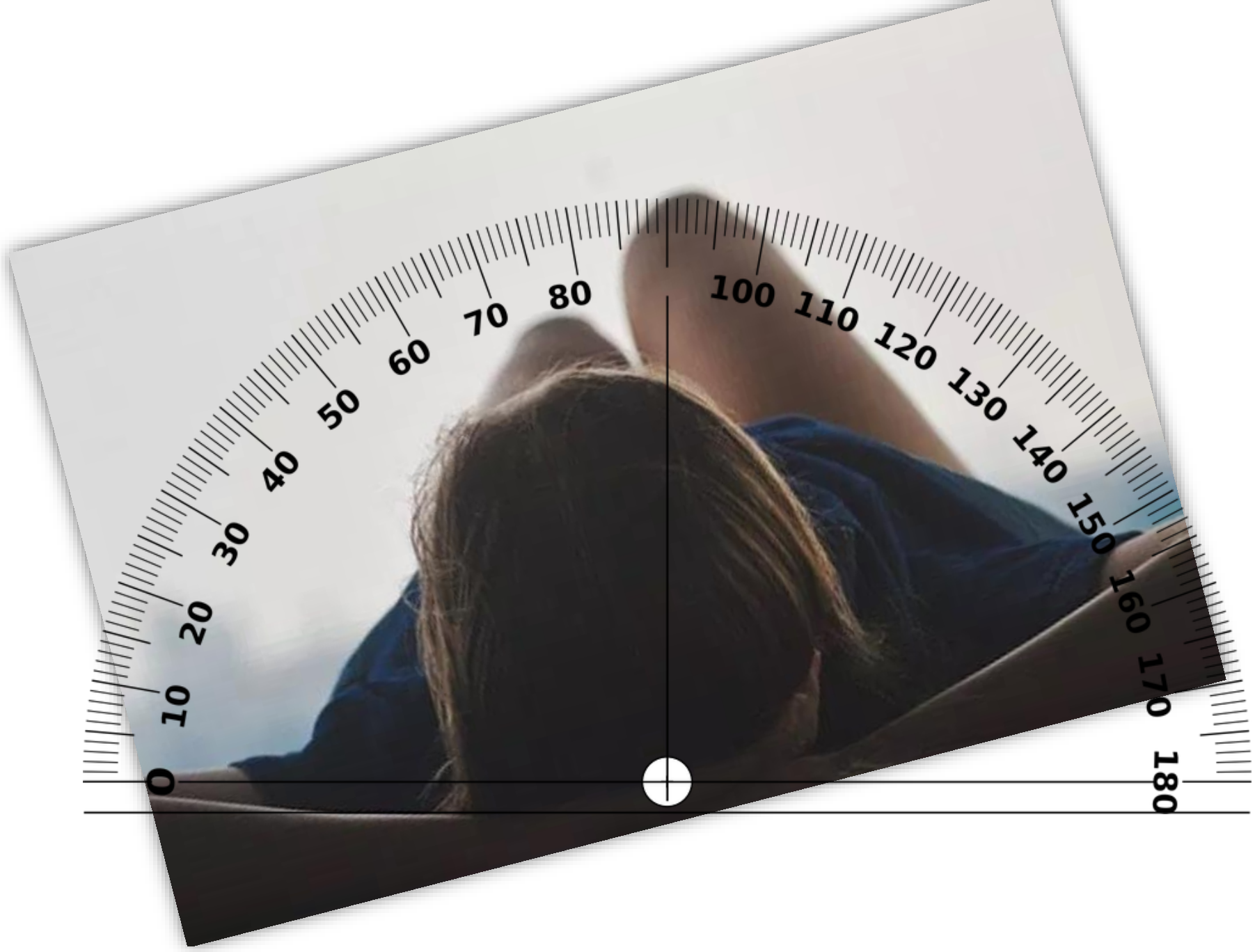
naklonění trupu o 5-15 stupňů

= prevence aortokavální komprese




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

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0959-289X/$ - see front matter 
http://dx.doi.org/10.1016/j.ijoa.2012.12.005

ELSEVIER
www.obstetanesthesia.com

ORIGINAL ARTICLE

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

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

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

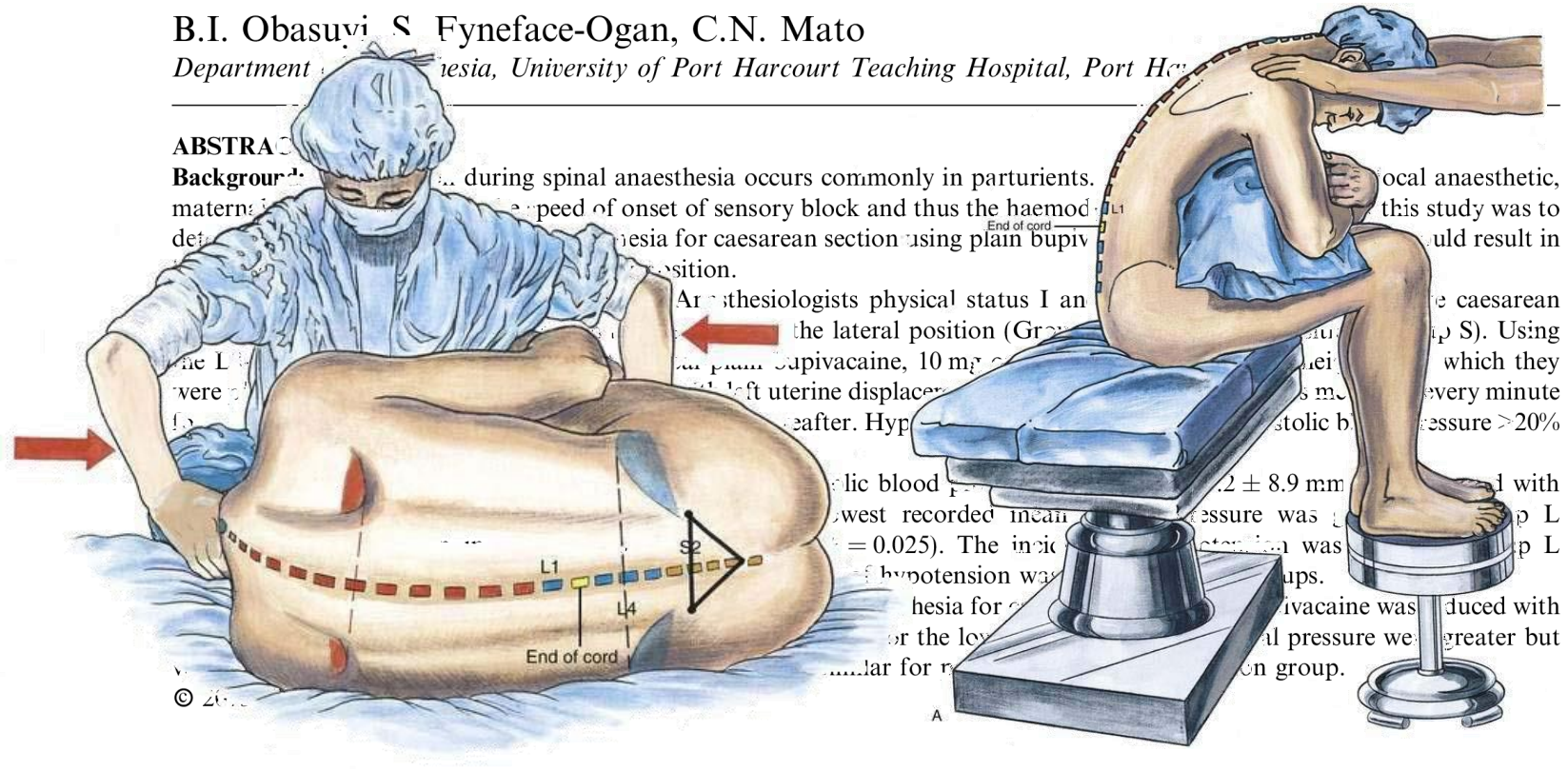



**Table 3 Haemodynamic data, ephedrine use and intraoperative blood loss**

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

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

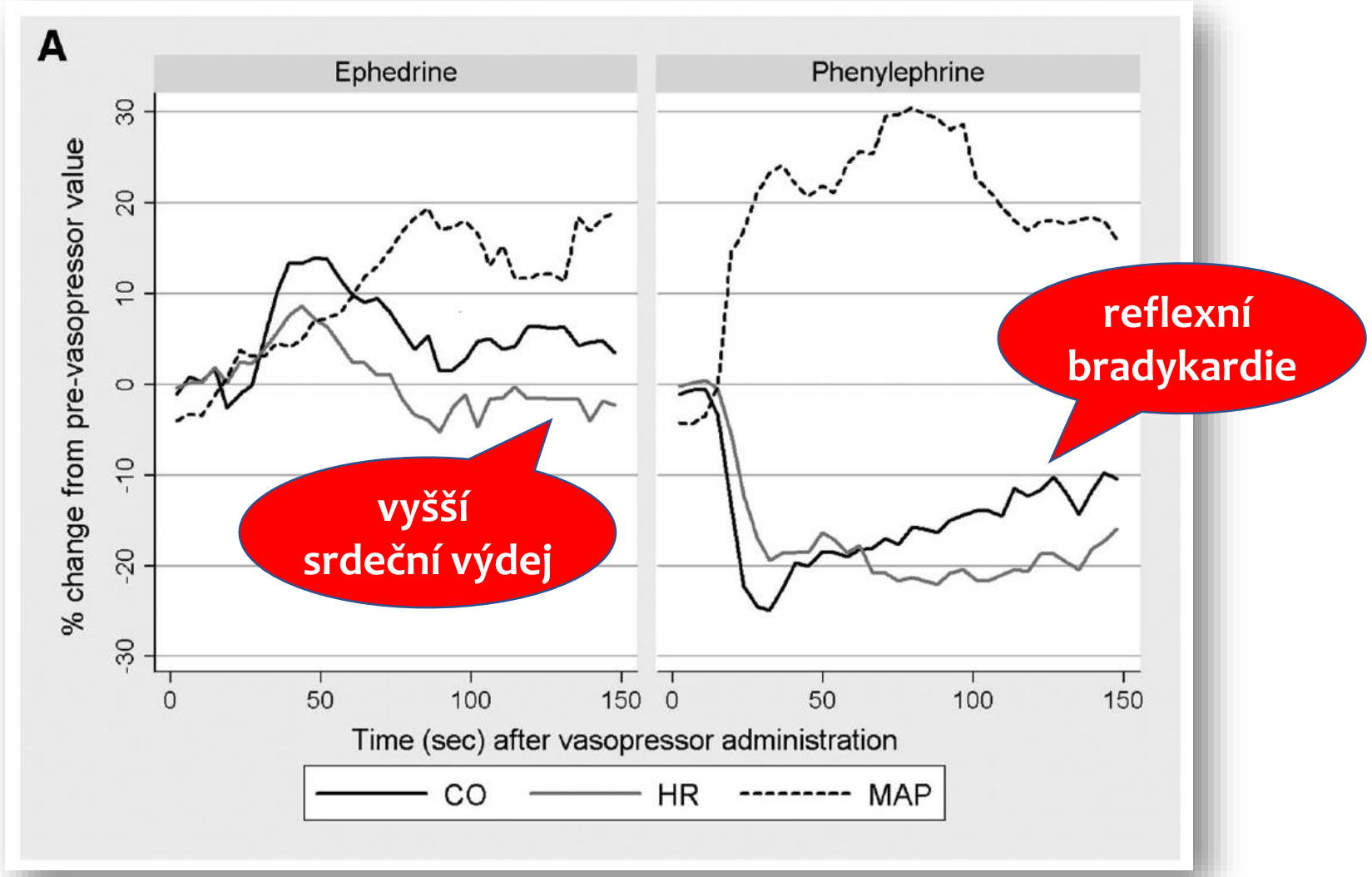
**Table 5 Incidence of complications**

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

Data are number (%).

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

# HYPOTENZE NA PORODNÍM SÁLE




Dyer RA et al. Anesthesiology. 2009 Oct;111(4):753-65

# HYPOTENZE NA PORODNÍM SÁLE



**NE ! (zatím)**

1. Odhadnout své možnosti !
2. Mít záložní plán (a nebát se ho použít)
3. Prevence hypotenze u neuroaxiální anestezie
4. Preoxygenace u celkové anestezie
5. Oxygenace je cílem…