Co nám (ne)přinesl COVID-19 v oblasti porodnické anestezie

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Koronavirus počtem obětí překonal velké chřipkové epidemie i vlny veder

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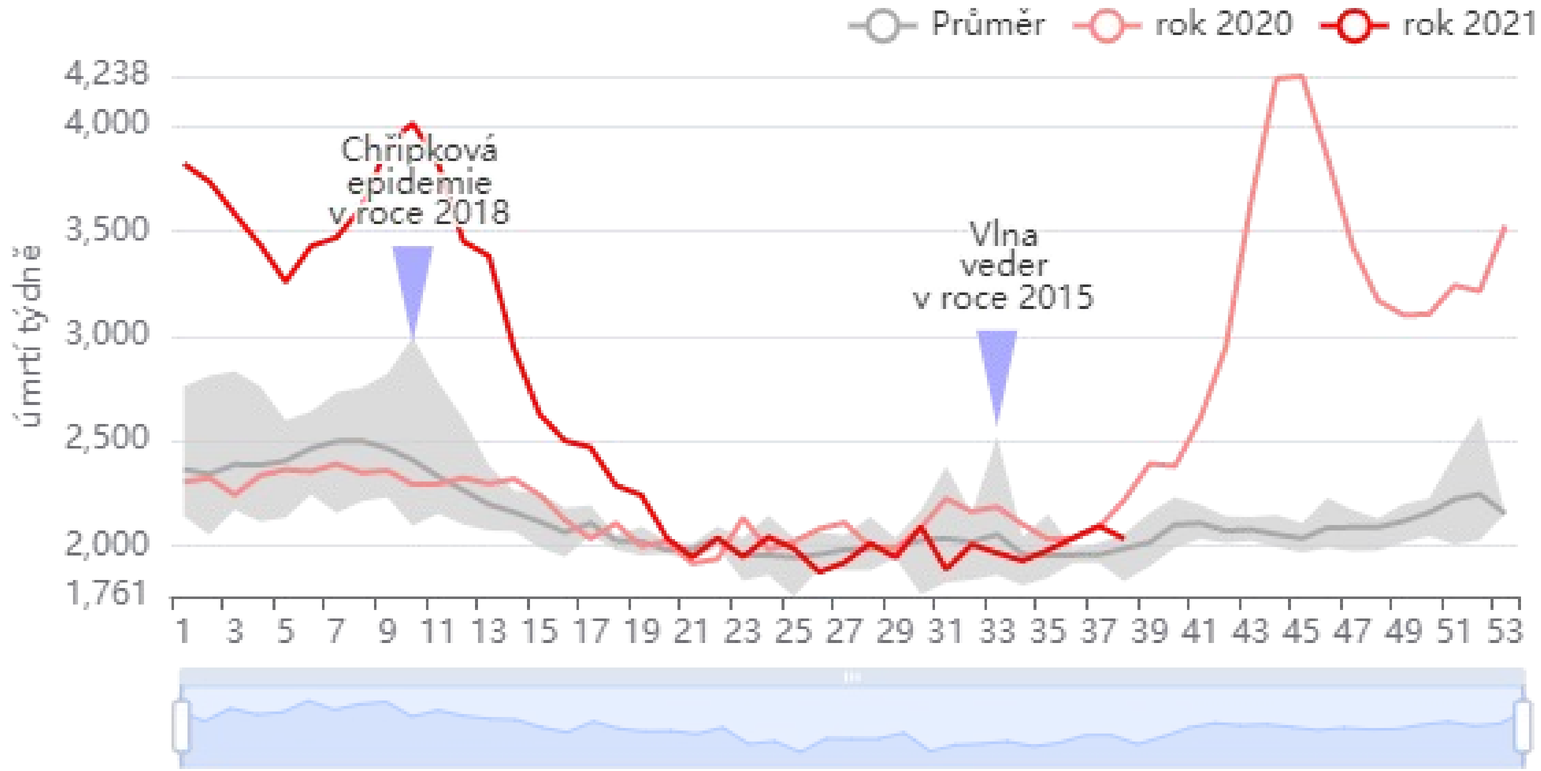
Do 47. týdne roku 2020 zemřelo o 11 651 lidí víc, než je průměr z let 2015-2019
Šedá plocha reprezentuje rozsah hodnot úmrtí v jednotlivých týdnech v letech 2015-2019



Zachrání ~~tři ze čtyř~~ pacientů s covidem. ‚Rozdíl je v tom, že máme zkušenosti,' říká přednosta z VFN

„My školíme sestru několik let, aby tohle zvládala bez jakýchkoliv obtíží."

Jan Bláha

Přednosta Kliniky anesteziologie, resuscitace a intenzivní medicíny (KARIM) 1. lékařské fakulty Univerzity Karlovy a Všeobecné fakultní nemocnice Jan Bláha. | Foto: Vladimír Kroc | Zdroj: Český rozhlas

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Jan Bláha je přednostou kliniky, na které se scházejí ti nejtěžší covidoví pacienti. Přesto se jeho týmu na Klinice anesteziologie, resuscitace a intenzivní medicíny (KARIM) 1. lékařské fakulty Univerzity Karlovy a Všeobecné fakultní nemocnice daří zachránit tři pacienty ze čtyř. „Roli v tom hraje hlavně to, že jsme na tento stav pacientů dlouhodobě zvyklí," říká Bláha.

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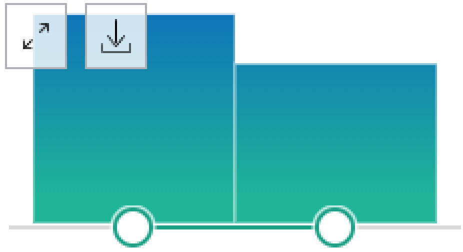

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Telehealth for High-Risk Pregnancies in the Setting of the COVID-19 Pandemic

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Abstract

As New York City became an international epicenter of the novel coronavirus disease 2019 (COVID-19) pandemic, telehealth was rapidly integrated into prenatal care at Columbia University Irving Medical Center, an academic hospital system in Manhattan. Goals of implementation were to consolidate in-person prenatal screening, surveillance, and examinations into fewer in-person visits while maintaining patient access to ongoing antenatal care and subspecialty consultations via telehealth virtual visits. The rationale for this change was to minimize patient travel and thus risk for COVID-19 exposure. Because a large portion of obstetric patients had underlying medical or fetal conditions placing them at increased risk for adverse outcomes, prenatal care telehealth regimens were tailored for increased surveillance and/or counseling. Based on the incorporation of telehealth into prenatal care for high-risk patients, specific recommendations are made for the following conditions, clinical scenarios, and services: (1) hypertensive disorders of pregnancy including preeclampsia, gestational hypertension, and chronic hypertension; (2) pregestational and gestational diabetes mellitus; (3) maternal cardiovascular disease; (4) maternal neurologic conditions; (5) history of preterm birth and poor obstetrical history including prior stillbirth; (6) fetal conditions such as intrauterine growth restriction, congenital anomalies, and multiple gestations including monochorionic placentation; (7) genetic counseling; (8) mental health services; (9) obstetric anesthesia consultations; and (10) postpartum care. While telehealth virtual visits do not fully replace in-person encounters during prenatal

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Pregnancy and COVID-19: what anesthesiologists should know

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Key messages

- COVID-19 may increase maternal hypoxia, premature labor, and fetal distress.
- For parturient without severe hypoxia, intrathecal anesthesia remains first choice
- Neonates of COVID-19 mother should be separated and avoid breastfeeding.
- Psychological support for both the parturient and the anesthetist is important.

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What obstetricians should know about obstetric anesthesia during the COVID-19 pandemic

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Box 1. Procedures and events considered to be potentially aerosol generating during anesthetic care in Labor and Delivery Units.

Nebulizer administration
O_2 administration (> 5 L)
Retching or vomiting
Bag-mask ventilation
Non-invasive ventilation (CPAP, BiPAP)
Endotracheal intubation
Endotracheal tube suctioning
Endotracheal extubation

Box 3. Specific anesthesia considerations for cesarean delivery in the patient with SARS-CoV-2 infection.

(1) Minimize the necessity for general anesthesia (preoperatively or intraoperatively)
(2) Spinal anesthesia is the preferred anesthetic if rapid onset is desired
(3) Combined-spinal epidural (or epidural if indwelling catheter) may be preferred if slow titration is desirable
(4) Minimize the odds of intraoperative nausea and vomiting
- phenylephrine infusion
- antiemetics (ondansetron, metoclopramide)
- avoidance of uterine exteriorization
(5) Multimodal opioid-sparing analgesia should be initiated as per ERAC protocols
- Acetaminophen 650 mg q6h
- Ibuprofen 600 mg q6h (unless specifically contraindicated)
- Oxycodone 5 mg for breakthrough pain (maximum daily dose 30 mg)

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The effect of COVID-19 on general anaesthesia rates for caesarean section

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Table 1
Event rates for primary and secondary outcomes comparing control and COVID-19 period

Measure	n	Control cohort (n=122)	COVID-19 cohort (n=18)	*P*-value
Mode of anaesthesia, n (%):	137			<0.01[§]
GA		48/119 (40.3%)	0/18 (0%)	
Epidural top-up		19/119 (16.0%)	2/18 (11.1%)	
Spinal		51/119 (42.9%)	16/18 (88.9%)	
Spinal to GA conversion		1/119 (0.8%)	0/19 (0%)	
RA utilisation, n (%):	137	70/119 (58.8%)	18/18 (100%)	<0.01[§]
Overall decision-to-delivery interval, median [IQR], min	135	25 [16–31]	27.5 [19.8–33.0]	0.42[†]
Overall theatre-to-delivery interval, median [IQR], min	134	18 [12–24]	20.0 [14.7–23.3]	0.47[†]
Neonatal resuscitation, n (%)	140	37 (30.3%)	4 (22.2%)	0.48[§]
Apgar score <7 at 5 min, n (%)	130	10 (8.8%)	1 (5.8%)	0.68[§]
Missing data, n		9	1	
Neonatal unit admission, n (%)	140	25 (20.4%)	6 (33.3%)	0.22[§]

GA: general anaesthesia. RA: regional anaesthesia.
[§]denotes tests performed using Pearson's exact statistic, and † denotes tests performed using Wilcoxon rank sum statistic.

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Perinatal and postpartum care during the COVID-19 pandemic: A nationwide cohort study

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Abstract

Methods: This study was an epidemiological cohort study analyzing comprehensive birth registry data among all 80 obstetric departments in Austria. Out of 469 771 records, 468 348 were considered eligible, whereof those with preterm delivery, birthweight <500 g, multiple fetuses, fetal malformations and chromosomal anomalies, intrauterine fetal death, maternal cancer, HIV infection, and/or inter-hospital transfers were excluded. Women who delivered between January and June 2020 were then classified as cases, whereas those who delivered between January and June 2015-2019 were classified as controls. Perinatal outcomes, postpartum hospitalization, and adverse events served as outcome measures.

Results: Of 33 198 cases and 188 225 controls, data analysis showed significantly increased rates of labor induction, instrumental delivery, obstetric anesthesia, NICU transfer, and 5-min Apgar score below 7 during the COVID-19 period. There was a significantly shorter length of postpartum hospitalization during the COVID-19 period compared with the non-COVID-19 period (3.1 ± 1.4 vs 3.5 ± 1.5 days; *P* < .001). Significantly more women opted for short-stay delivery during the COVID-19 period (3.7% vs 2.4%; *P* < .001). Those who delivered during the COVID-19 period were also more likely to experience postpartum adverse events (3.0% vs 2.6%; *P* < .001), which was confirmed in the logistic regression model (odds ratio, 2.137; 95% confidence interval, 1.805-2.530; *P* < .001).

Conclusions: Perinatal and postpartum care during the first wave of the COVID-19 pandemic differed significantly from that provided before. Increased rates of adverse events underline the need to ensure access to high-quality obstetric care to prevent collateral damage.

TABLE 1 Maternal characteristics and perinatal outcomes of 33 198 cases and 188 225 controls with delivery during or prior the first wave of the COVID-19 pandemic in Austria

	COVID-19 period		Non-COVID-19 period		
Variable	N	% Mean ± SD	N	% Mean ± SD	P
Gestational age at delivery[a]	33 198	39.3 ± 1.14	188 225	39.3 ± 1.15	.273
Induction of labor	7556	22.8	37 915	20.1	<.001
Short-stay delivery	991	3.7	4130	2.4	<.001
Postpartum hospitalization (days)	33 198	3.1 ± 1.4	188 225	3.5 ± 1.5	<.001
Mode of delivery[b]	33 018	100.0	188 126	100.0	.003
Vaginal	21 319	64.6	122 261	65.0	.139
Instrumental	2697	8.2	14 349	7.6	.001
Cesarean section	9002	27.3	51 516	27.4	.652
Anesthesia (any)	21 954	66.1	110 056	58.5	<.001
General	1670	5.0	11 060	5.9	<.001
Epidural	5675	17.1	29 349	15.6	<.001
Spinal	6766	20.4	38 202	20.3	.723
Episiotomy	3107	9.4	19 797	10.5	<.001
High-grade perineal tears	525	1.6	2961	1.6	.911
Uterine rupture	12	0	61	0	.729
Amniotic fluid embolism	7	0	18	0	.068
Pulmonary embolism	2	0	15	0	.709
Birthweight (g)[a]	33 198	3 425 ± 475	188 225	3412 ± 452	<.001
Apgar 5 min <7	262	0.8	1176	0.6	<.001
Umbilical cord arterial pH	33 198	7.34 ± 2.63	188 225	7.27 ± 0.08	<.001
Umbilical cord base excess	33 198	−4.47 ± 4.18	188 225	−4.57 ± 3.54	.001
NICU transfer	1395	4.2	7271	3.9	.003
Postpartum adverse event (any)[c]	984	3.0	4819	2.6	<.001
Retained placenta	836	2.5	4430	2.4	.069
Infection or sepsis	3	0	25	0	.526
Hysterectomy	14	0	67	0	.564
Blood transfusion	165	0.5	298	0.2	<.001
Surgical revision (any)	31	0.1	134	0.1	.172
Perineal surgical revision	4	0	10	0	.155
Abdominal surgical revision	27	0.1	126	0.1	.320

Note: Abbreviations: N, number; NICU, neonatal intensive care unit; [a]Cases and controls with delivery <37 + 0 wk and/or <500 g birthweight were excluded.

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The effect of COVID-19 on general anaesthesia rates for caesarean section. A cross-sectional analysis of six hospitals in the north-west of England

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Summary

At the onset of the global pandemic of COVID-19 (SARS-CoV-2), guidelines recommended using regional anaesthesia for caesarean section in preference to general anaesthesia. National figures from the UK suggest that 8.75% of over 170,000 caesarean sections are performed under general anaesthetic. We explored whether general anaesthesia rates for caesarean section changed during the peak of the pandemic across six maternity units in the north-west of England. We analysed anaesthetic information for 2480 caesarean sections across six maternity units from 1 April to 1 July 2020 (during the pandemic) and compared this information with data from 2555 caesarean sections performed at the same hospitals over a similar period in 2019. Primary outcome was change in general anaesthesia rate for caesarean section. Secondary outcomes included overall caesarean section rates, obstetric indications for caesarean section and regional to general anaesthesia conversion rates. A significant reduction (7.7 to 3.7%, $p < 0.0001$) in general anaesthetic rates, risk ratio (95%CI) 0.50 (0.39–0.93), was noted across hospitals during the pandemic. Regional to general anaesthesia conversion rates reduced (1.7 to 0.8%, $p = 0.012$), risk ratio (95%CI) 0.50 (0.29–0.86). Obstetric indications for caesarean sections did not change ($p = 0.17$) while the overall caesarean section rate increased (28.3 to 29.7%), risk ratio (95%CI) 1.02 (1.00–1.04), $p = 0.052$. Our analysis shows that general anaesthesia rates for caesarean section declined during the peak of the pandemic. Anaesthetic decision-making, recommendations from anaesthetic guidelines and presence of an on-site anaesthetic consultant in the delivery suite seem to be the key factors that influenced this decline.

Table 1 Effect of COVID-19 (C19) pandemic on general anaesthesia (GA) rates for caesarean section (CS). Values are number (proportion) or RR/OR/estimate (95%CI)

celková vs regionální anestezie

Hospital	Pre-C19 2019	Post-C19 2020	RR	OR
St Mary's	68/658 (10.3%)	24/671 (3.6%)	0.35 (0.22–0.54)	1.00 (reference)
WWL	15/269 (5.6%)	14/225 (6.2%)	1.12 (0.55–2.26)	0.81 (0.52–1.25)
Oldham	30/417 (7.2%)	17/405 (4.2%)	0.58 (0.33–1.04)	0.81 (0.56–1.16)
Preston	24/279 (8.6%)	22/279 (7.9%)	0.92 (0.53–1.60)	1.21 (0.83–1.75)
Burnley	24/406 (5.9%)	6/400 (1.5%)	0.25 (0.11–0.61)	0.51 (0.34–0.79) [b]
Liverpool	36/526 (6.8%)	12/500 (2.4%)	0.35 (0.19–0.67)	0.65 (0.45–0.93) [c]
Estimate	7.7% (6.7–8.8%)	3.7% (3.0–4.5%)	0.50 (0.39–0.63) [a]	0.47 (0.37–0.61) [d]

WWL, Wrightington, Wigan and Leigh Hospitals.
[a]Overall effect size of C19 as the risk ratio ($p < 0.0001$). Significant difference in GA rates in CS across hospitals compared with St Mary's as referenced with the largest denominator: [b]$p = 0.0021$; [c]$p = 0.019$; [d]Effect size of C19 as adjusted OR ($p < 0.0001$).

Table 3 Effect of COVID-19 (C19) pandemic on regional anaesthesia (RA) to general anaesthesia (GA) conversion rates from RA for caesarean section (CS). Values are number (proportion) and RR/OR/estimate (95%CI)

selhání celková anestezie

Hospital	Pre-C19 2019	Post-C19 2020	RR	OR
St Mary's	7/597 (1.2%)	1/648 (0.2%)	0.13 (0.02–1.07)	1.00 (Reference)
WWL	5/259 (1.9%)	5/216 (2.3%)	1.20 (0.35–4.1)	3.19 (1.25–8.13) [b]
Oldham	10/397 (2.5%)	4/392 (1.0%)	0.41 (0.13–1.28)	2.75 (1.15–6.59) [c]
Preston	4/259 (1.5%)	3/260 (1.2%)	0.75 (0.17–3.31)	2.09 (0.75–5.79)
Burnley	7/389 (1.8%)	2/396 (0.5%)	0.28 (0.06–1.34)	1.77 (0.68–4.62)
Liverpool	6/496 (1.2%)	4/492 (0.8%)	0.67 (0.19–2.37)	1.56 (0.61–3.96)
Estimate	1.7% (1.2–2.2%)	0.8% (0.5–1.2%)	0.50 (0.29–0.86) [a]	0.49 (0.28–0.86) [d]

WWL, Wrightington, Wigan and Leigh Hospitals.
[a]Overall effect size of C19 as the risk ratio ($p = 0.012$). Significant differences in conversion rates across hospitals compared with St Mary's as referenced with the largest denominator: [a]$p = 0.015$; [b]$p = 0.023$; [d]effect size of C19 as adjusted OR ($p = 0.012$).

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Obstetric Hemorrhage Risk Associated with Novel COVID-19 Diagnosis from a Single-Institution Cohort in the United States

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Abstract

Objective The study aimed to compare the quantitative blood loss (QBL) and hemorrhage-related outcomes of pregnant women with and without a coronavirus disease 2019 (COVID-19) diagnosis.

Study Design This retrospective cohort study of all live deliveries at Boston Medical Center between April 1, 2020 and July 22, 2020 compares the outcomes of pregnant women with a laboratory-confirmed COVID-19 positive diagnosis and pregnant women without COVID-19. The primary outcomes are QBL and obstetric hemorrhage. The secondary outcomes analyzed were a maternal composite outcome that consisted of obstetric hemorrhage, telemetry-level (intermediate care unit) or intensive care unit, transfusion, length of stay greater than 5 days, or intraamniotic infection, and individual components of the maternal composite outcome. Groups were compared using Student's *t*-test, Chi-squared tests, or Fisher's exact. Logistic regression was used to adjust for confounding variables.

Results Of 813 women who delivered a live infant between April 1 and July 22, 2020, 53 women were diagnosed with COVID-19 on admission to the hospital. Women with a COVID-19 diagnosis at their time of delivery were significantly more likely to identify as a race other than white ($p = 0.01$), to deliver preterm ($p = 0.05$), to be diagnosed with preeclampsia with severe features ($p < 0.01$), and to require general anesthesia ($p < 0.01$). Women diagnosed with COVID-19 did not have a significantly higher QBL ($p = 0.64$). COVID-19 positive pregnant patients had no increased adjusted odds of obstetric hemorrhage (adjusted odds ratio [aOR]: 0.41, 95% confidence interval [CI]: 0.17–1.04) and no increased adjusted odds of the maternal morbidity composite (aOR: 0.98, 95% CI: 0.50–1.93) when compared with those without a diagnosis of COVID-19.

Conclusion Pregnant women with COVID-19 diagnosis do not have increased risk for obstetric hemorrhage, increased QBL or risk of maternal morbidity compared with pregnant women without a COVID-19 diagnosis. Further research is needed to describe the impact of a COVID-19 diagnosis on maternal hematologic physiology and pregnancy outcomes.

Keywords
- quantitative blood loss
- obstetric hemorrhage
- SARS-CoV-2
- Pregnancy

Table 2 Maternal outcomes by COVID-19 status

	COVID positive deliveries ($n = 53$)	COVID negative deliveries ($n = 760$)	*p*-Value
Quantitative blood loss	551 ± 332.2	584.7 ± 509.3	0.64
Obstetric hemorrhage	6 (11.3)	140 (18.4)	
Maternal composite[a]	17 (32.1)	205 (27.0)	
Intraamniotic infection	2 (3.8)	46 (6.1)	
Any transfusion	0 (0)	14 (1.8)	0.32
Maternal LOS	4.4 ± 4.0	3.4 ± 1.8	<0.01
LOS > 5 d	12 (22.6)	74 (9.7)	
ICU or IMCU	6 (11.3)	5 (0.7)	

Abbreviations: aOR, BMI, body mass values; COVID, coronavirus disease; ICU, intensive care unit; IMCU, intermediate care unit; LOS, length of stay.

Anaesth Crit Care Pain Med 39 (2020) 351–353

Review article

Coagulation changes and thromboembolic risk in COVID-19 obstetric patients

Dan Benhamou [a,*], Hawa Keita [b,c], Anne Sophie Ducloy-Bouthors [d,e], The Obstetric Anaesthesia and Critical Care Club (Club Anesthésie Réanimation en Obstétrique [CARO]) Working Group, Dan Benhamou, Marie Pïerre Bonnet, Martine Bonnin, Anne Sophie Bouthors, Lionel Bouvet, Adeline Castel, Dominique Chassard, Pierre Yves Dewandre, Catherine Fisher, Benjamin Julliac, Hawa Keita, Frédéric J. Mercier, Estelle Morau, Thibault Rackelboom, Florence Vial, Anne Wernet

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frontiers in Physiology

MINI REVIEW
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Pathophysiological Processes Underlying the High Prevalence of Deep Vein Thrombosis in Critically Ill COVID-19 Patients

*Sebastian Voicu[1,2], Chahinez Ketfi[3], Alain Stépanian[4,5], Benjamin G. Chousterman[6,7,8], Nassim Mohamedi[3], Virginie Siguret[4,9], Alexandre Mebazaa[6,7,8], Bruno Mégarbane[1,2] and Philippe Bonnin[3,10]**

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Coronavirus disease 2019 (COVID-19) predisposes to deep vein thrombosis (DVT) and pulmonary embolism (PE) particularly in mechanically ventilated adults with severe pneumonia. The extremely high prevalence of DVT in the COVID-19 patients hospitalized in the intensive care unit (ICU) has been established between 25 and 84% based on studies including systematic duplex ultrasound of the lower limbs when prophylactic anticoagulation was systematically administrated. DVT prevalence has been shown to be markedly higher than in mechanically ventilated influenza patients (6–8%). Unusually high inflammatory and prothrombotic phenotype represents a striking feature of COVID-19 patients, as reflected by markedly elevated reactive protein C, fibrinogen, interleukin 6, von Willebrand factor, and factor VIII. Moreover, in critically ill patients, venous stasis has been associated with the prothrombotic phenotype attributed to COVID-19, which increases the risk of thrombosis. Venous stasis results among others from immobilization under muscular paralysis, mechanical ventilation with high positive end-expiratory pressure, and pulmonary microvascular network injuries or occlusions. Venous return to the heart is subsequently decreased with increase in central and peripheral venous pressures, marked proximal and distal veins dilation, and drops in venous blood flow velocities, leading to a spontaneous contrast "sludge pattern" in veins considered as prothrombotic. Together with endothelial lesions and hypercoagulability status, venous stasis completes the Virchow triad and considerably increases the prevalence of DVT and PE in critically ill COVID-19 patients, therefore raising questions regarding the optimal doses for thromboprophylaxis during ICU stay.

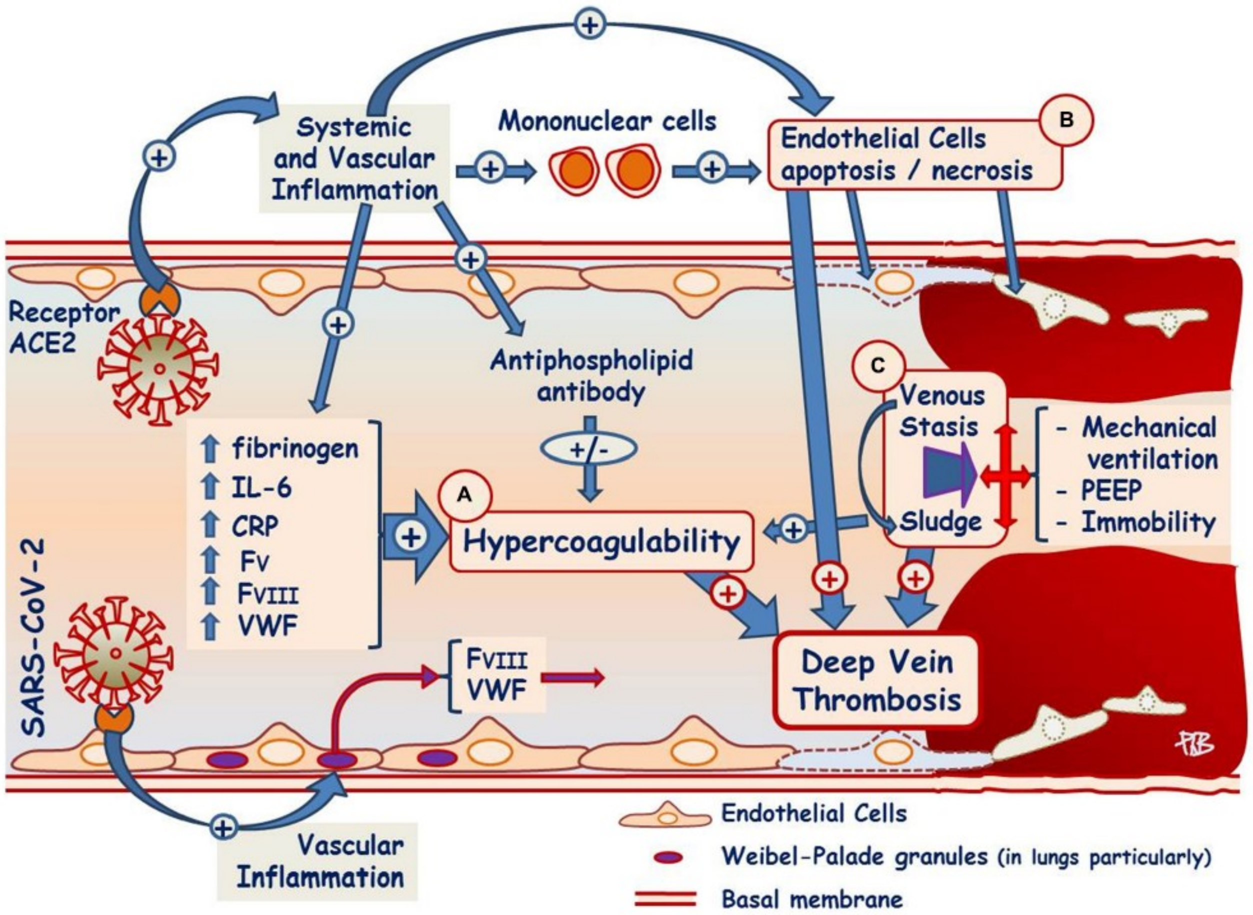


FIGURE 1 | Factors favoring deep vein thrombosis in COVID-19 patients. **(A)** SARS-CoV-2 invades the endothelial cell and produces systemic and vascular inflammation leading to increased fibrinogen, CRP, IL-6, and coagulation factor V, as well as antiphospholipid antibodies possibly through molecular mimicry. Mononuclear cell inflammation, apoptosis, and necrosis were documented in the lungs; in veins, their presence was not specifically studied. SARS-CoV-2 invades the endothelial cell and determines directly and/or through systemic inflammation the exocytosis of von Willebrand factor and factor VIII from Weibel–Palade granules. **(B)** SARS-CoV-2 involves endothelial cells injuries (apoptosis and necrosis). **(C)** Mechanical ventilation, high PEEP, and immobility decrease the blood velocities of the venous return. **(A–C)** Complete the Virchow triad and increase the risk of thrombosis. SARS-CoV-2, severe acute respiratory syndrome–coronavirus 2 virus; IL-6, interleukin-6; CRP, C-reactive-protein; FV, coagulation factor V; FVIII, coagulation factor VIII; VWF, von Willebrand factor; PEEP, positive end-expiratory pressure; ACE2, angiotensin-converting enzyme type 2.

COVID-19

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

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

Caro

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

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

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

* HFNO: high flow nasal oxygen

Prophylaxis in the PRE-PARTUM period

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

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

⚠ Take into account the dose of LMWH for the management of childbirth and neuraxial block

Prophylaxis in the POST-PARTUM period

Reassess regularly, if recovery confirmed, treat as usual

If Covid-associated symptoms still present: Mode of delivery

Vaginal delivery

Low risk: Consider LMWH or anti-thrombotic elastic stockings

Moderate risk: Prophylactic dose of LMWH ± anti-thrombotic elastic stockings

High risk: Intermediate dose of LMWH ± anti-thrombotic elastic stockings

Duration: until Covid-19 recovery

Caesarean section

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

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

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

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

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

Akutní císařský řez v průběhu porodu
Asymptomatická trombofilie *(vrozená i získaná)*
BMI > 40 kg/m^2
Prodloužená hospitalizace
Významné komorbidity *(onemocnění srdce a plic, zánětlivé stavy, SLE, nádory, nefrotický syndrom a další)*
Abusus drog

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

Věk > 35 let
Obezita (BMI > 30kg/m^2)
Parita < 3
Kouření
Elektivní císařský řez
Chirurgický výkon v šestinedělí
Větší varikózní žíly
Současná systémová infekce
Imobilita, transport na delší vzdálenost (> 4 h)
Preeklampsie
Operační vaginální porod
Protrahovaný porod (> 24 h)
Peripartální krvácení > 1000 ml nebo podání krevní transfuze

→ **2 a více rizikové faktory** → STŘEDNÍ RIZIKO

→ **< 2 rizikové faktory** → **NÍZKÉ RIZIKO**
= Časná mobilizace a dostatečná hydratace

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

AKUTN

Anticoagulation for COVID-19 Patients: A Bird's-Eye View

Clinical and Applied Thrombosis/Hemostasis
Volume 27: 1-9 2021
DOI: 10.1177/10760296211039288
SAGE

Firas Kreidieh, MD[1] and Sally Temraz, MD[1]

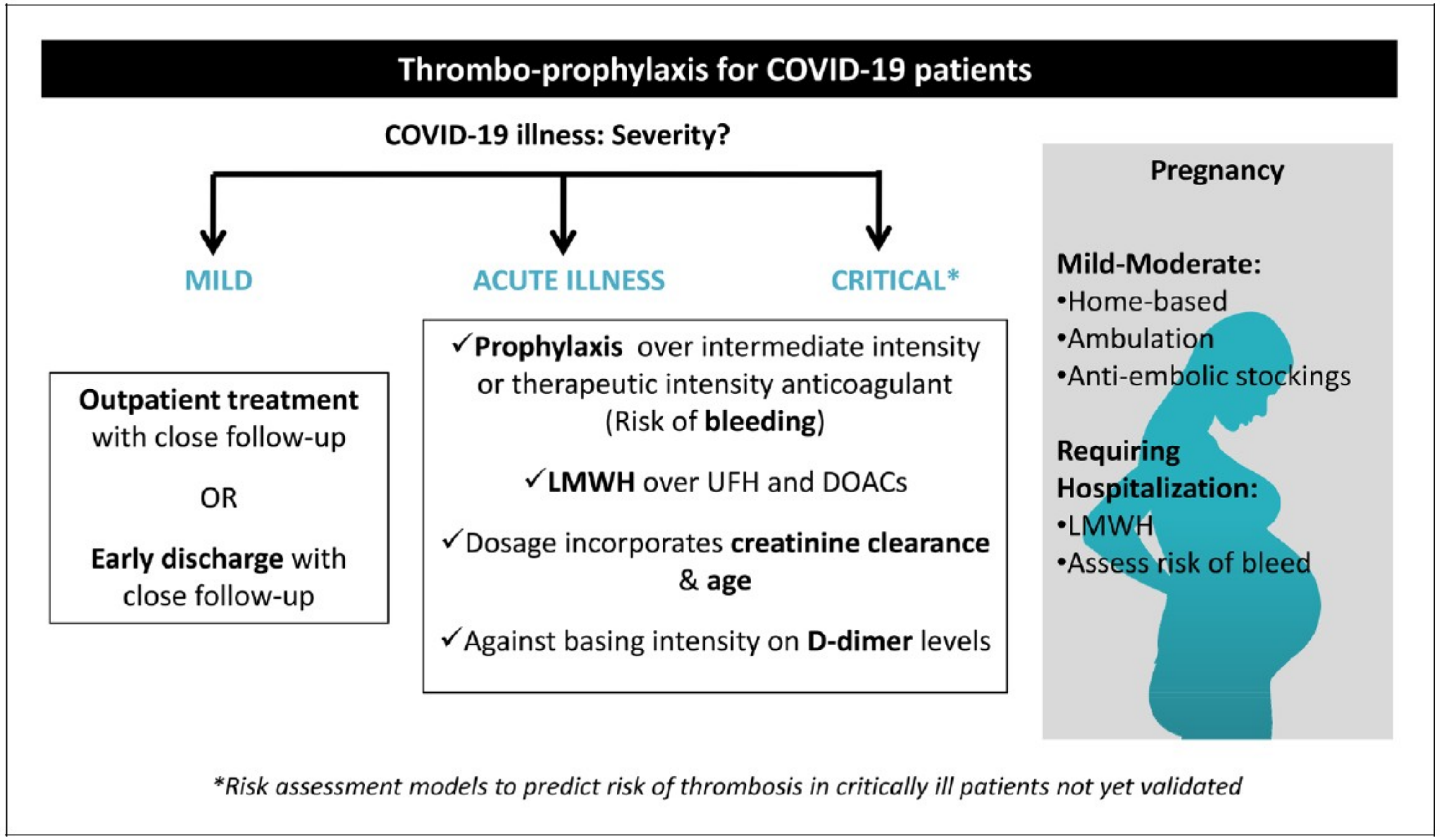
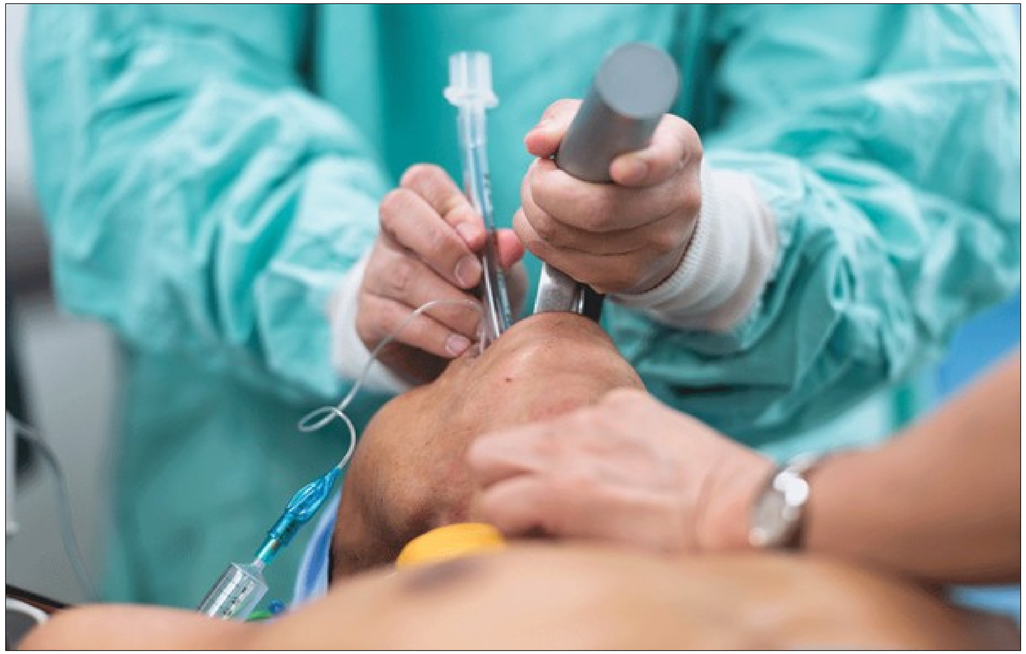


Figure 1. Thrombo-prophylaxis for coronavirus disease 2019 (COVID-19) patients.



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

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

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

The NEW ENGLAND JOURNAL of MEDICINE

Barrier Enclosure during Endotracheal Intubation

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

A video showing the simulation is available at NEJM.org

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

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


XinhuaVideo


Já se teda bojím
víc neočekávané
obtížné intubace !

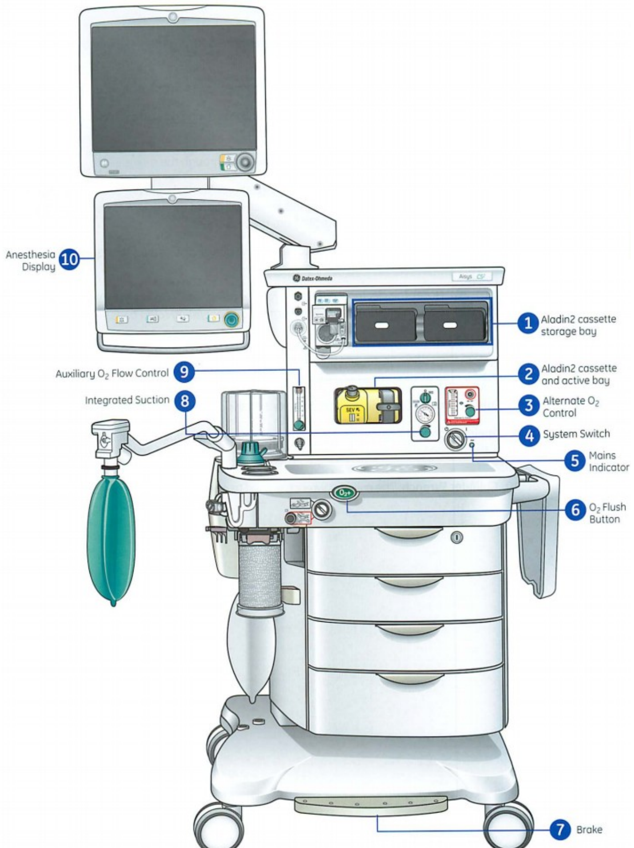


Figure 2.1 Aisys CS² Front View

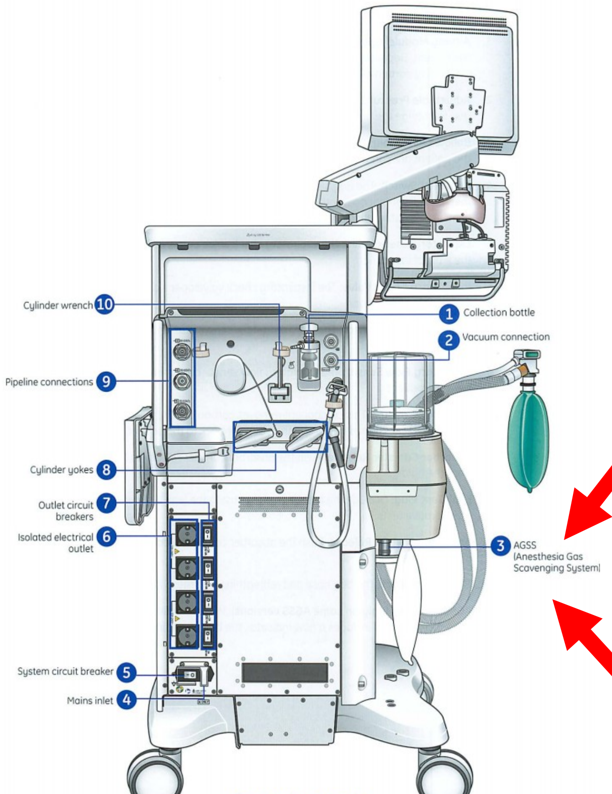


Figure 2.2 Aisys CS² Rear View

centrální odvod plynů

COVID-19: RECOMMENDATIONS FOR REGIONAL ANESTHESIA

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

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

Planning and Preparation

Review COVID-19 status of patient

Oxygen delivery to awake patient: Surgical mask over oxygen mask

Verbal consent if possible

Patient to wear surgical mask at all times

Personal protective equipment (PPE) for healthcare workers:
- eye/face protection
- surgical mask
- gown
- double gloving
- shoe covers

Regional anesthesia is preferred whenever possible:

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

Unplanned conversion to GA is least desirable!

Neuraxial Anesthesia Precautions

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

krevní zátka ?

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN

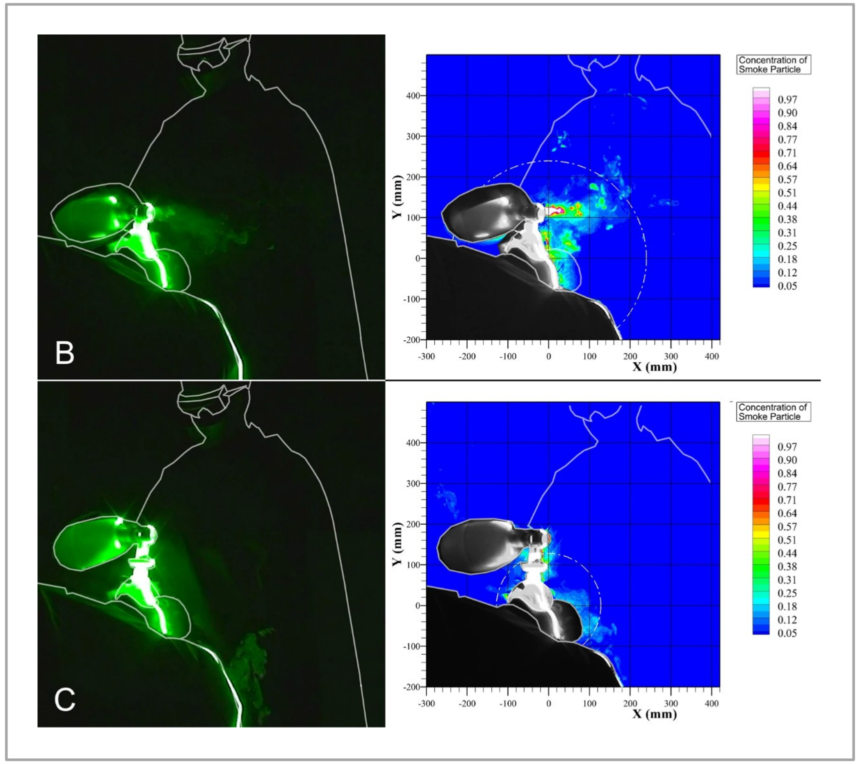
Exhaled air dispersion during bag-mask ventilation and sputum suctioning - Implications for infection control

Received: 26 July 2017
Accepted: 14 December 2017
Published online: 09 January 2018

Matthew T. V. Chan[1,4], Benny K. Chow[2], Thomas Lo[1], Fanny W. Ko[3], Susanna S. Ng[3], Tony Gin[1] & David S. Hui[2,3]

Mask ventilation and coughing during oro-tracheal suctioning produce aerosols that enhance nosocomial transmission of respiratory infections. We examined the extent of exhaled air dispersion from a human-patient-simulator during mask ventilation by different groups of healthcare workers and coughing bouts. The simulator was programmed to mimic varying severity of lung injury. Exhaled airflow was marked with tiny smoke particles, and highlighted by laser light-sheet. We determined the normalized exhaled air concentration in the leakage jet plume from the light scattered by smoke particles. Smoke concentration ≥20% was considered as significant exposure. Exhaled air leaked from mask-face interface in the transverse plane was most severe (267 ± 44 mm) with Ambu silicone resuscitator performed by nurses. Dispersion was however similar among anesthesiologists/intensivists, respiratory physicians and medical students using Ambu or Laerdal silicone resuscitator, $p = 0.974$. The largest dispersion was 860 ± 93 mm during normal coughing effort without tracheal intubation and decreased with worsening coughing efforts. Oro-tracheal suctioning reduced dispersion significantly, $p < 0.001$, and was more effective when applied continuously. Skills to ensure good fit during mask ventilation are important in preventing air leakage through the mask-face interface. Continuous oro-tracheal suctioning minimized exhaled air dispersion during coughing bouts when performing aerosol-generating procedures.

Figure 1



Bag-mask ventilation performed by an anaesthesiologist using (**A**) Laerdal silicone resuscitator (left panel) and the calculated normalized concentration of the smoke particle in the transverse plane of the expiration port (right panel); (**B**) Ambu silicone resuscitator and (**C**) Ambu silicone resuscitator with addition of a breathing filter, respectively.

Table 1 Dispersion distance of exhaled air during bag-mask ventilation.

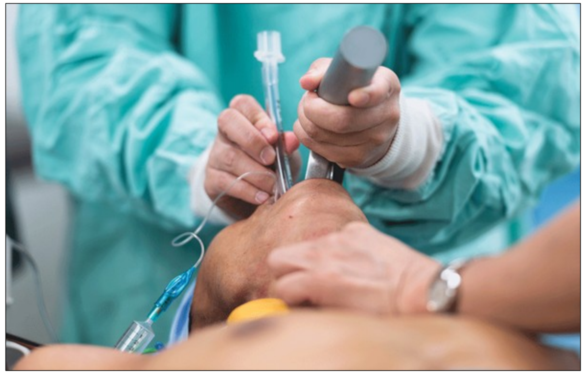
Zkušenost !!

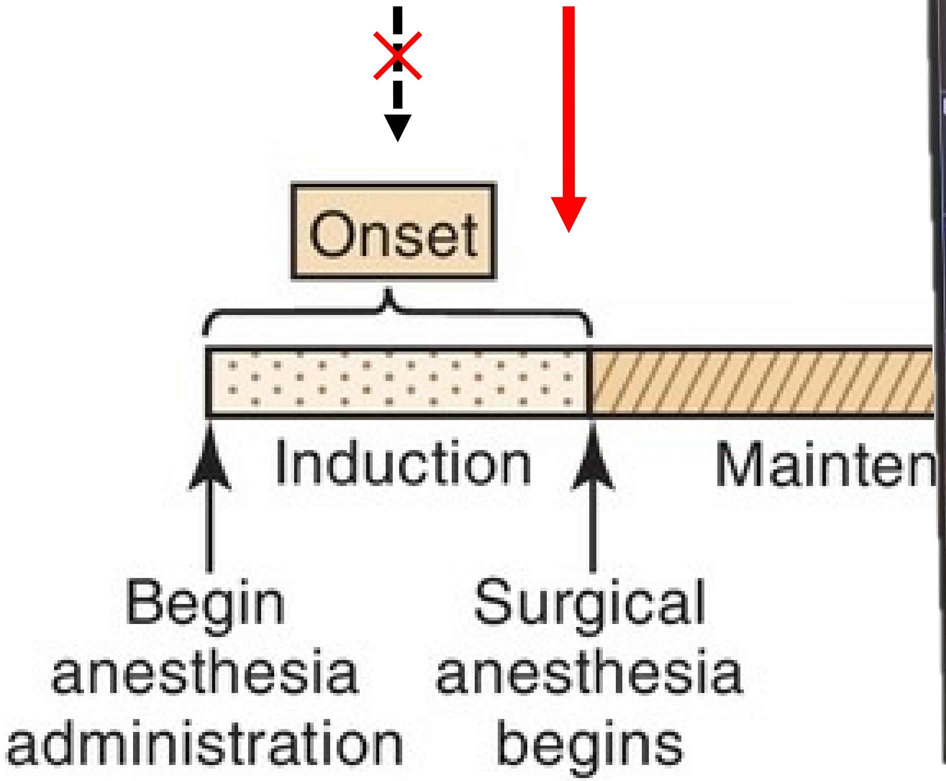
Group	No. of providers	Exhaled air dispersion distance (mm)*		
		Laerdal silicone resuscitator	Ambu silicone resuscitator	Ambu silicone resuscitator with addition of breathing filter
Anesthesiologists/Intensivists	5	161 ± 5	242 ± 20	128 ± 21
Respiratory physicians	5	187 ± 17	210 ± 48	148 ± 17
Nurses	5	230 ± 47	267 ± 44	241 ± 62
Medical students	5	175 ± 54	234 ± 51	129 ± 33

Values are mean ± standard deviations.

*Measured at 20% normalized concentration.

SCIENTIFIC REPORTS | (2018) 8:198 | DOI:10.1038/s41598-017-18614-1





Onset
Induction
Mainten
Begin anesthesia administration
Surgical anesthesia begins

Plná anestezie
plná analgezie
Hluboká NMB!
Entropie
RE 33
SE 33
SPI 14
NMT
TOF%
Count 0
HR /min
77
ST mm
0.3
SpO2 %
98
NIBP mmHg
95 / 52
(70)
Časovače
00:00:00

British Journal of Anaesthesia **105** (S1): i16–i23 (2010)
doi:10.1093/bja/aeq312

BJA

Dose adjustment of anaesthetics in the morbidly obese

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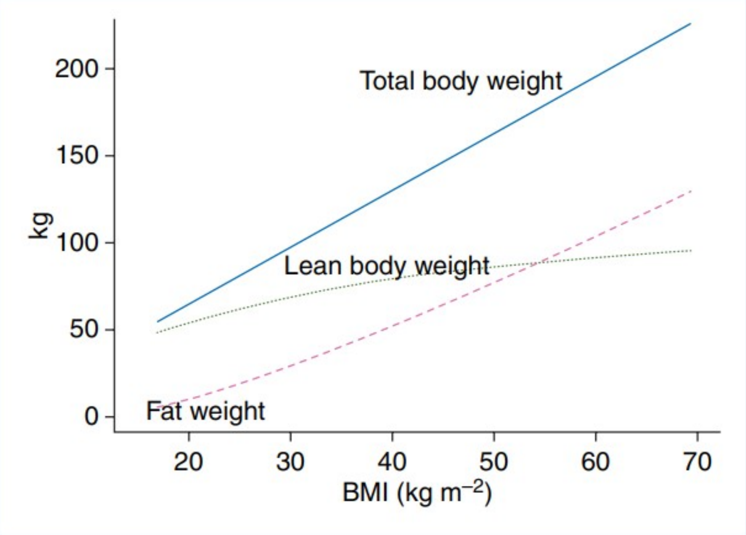

Fig 1 Relationship of TBW, fat weight, and LBW to BMI in a standard height male. LBW and fat weight were derived from the equations of Janmahasatian *et al.*[11]

Table 1 Weight-based dosing scalar recommendation for commonly used i.v. anaesthetics. CO, cardiac output; IBW, ideal body weight; LBW, lean body weight; TBW, total body weight

Drug	Dosing scalar	Comments
Thiopental	Induction: LBW Maintenance: TBW	Simulations showed a 60% decrease in peak plasma concentration in MO subjects compared with lean subjects after a 250 mg dose.[26] Induction dose adjusted to LBW results in same peak plasma concentration as dose adjusted to CO.[26] Volumes and clearances increase proportionally with TBW.[25]
Propofol	Induction: LBW Maintenance: TBW	MO subjects given an induction dose based on LBW required similar amounts of propofol and similar times to loss of consciousness compared with lean subjects given propofol based on TBW.[29] Volume of distribution and clearance at steady state increases with increasing TBW.[28]
Fentanyl	LBW	Clearance increases linearly with 'PK mass', an arbitrary scalar highly correlated to LBW.[46]
Remifentanil	LBW	An infusion based on LBW results in similar plasma concentrations as normal weight subjects were given an infusion based on TBW.[51]
Succinylcholine	TBW	Administration of 1 mg kg^{-1} based on TBW resulted in a more profound block and better intubating conditions compared with doses based on IBW or LBW.[67]
Vecuronium	IBW	Doses based on TBW result in a prolonged duration of action in obese *vs* non-obese subjects.[69 70]
Rocuronium	IBW	There is an increased duration of action when the drug is given based on TBW *vs* IBW.[71]
Atracurium, Cisatracurium	IBW	The duration of action is prolonged in obese subjects when given on the basis of TBW *vs* IBW.[73 74]

International Journal of Obstetric Anesthesia (2019) xxx, xxx–xxx
0959-289X/$ - see front matter
https://doi.org/10.1016/j.ijoa.2019.08.005

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

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

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

Nástup sukcinylcholinu je nejméně 50-60 sec!

SUKCINYLCHOLIN

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

Table 3. Onset Times and Durations of Neuromuscular Block

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

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

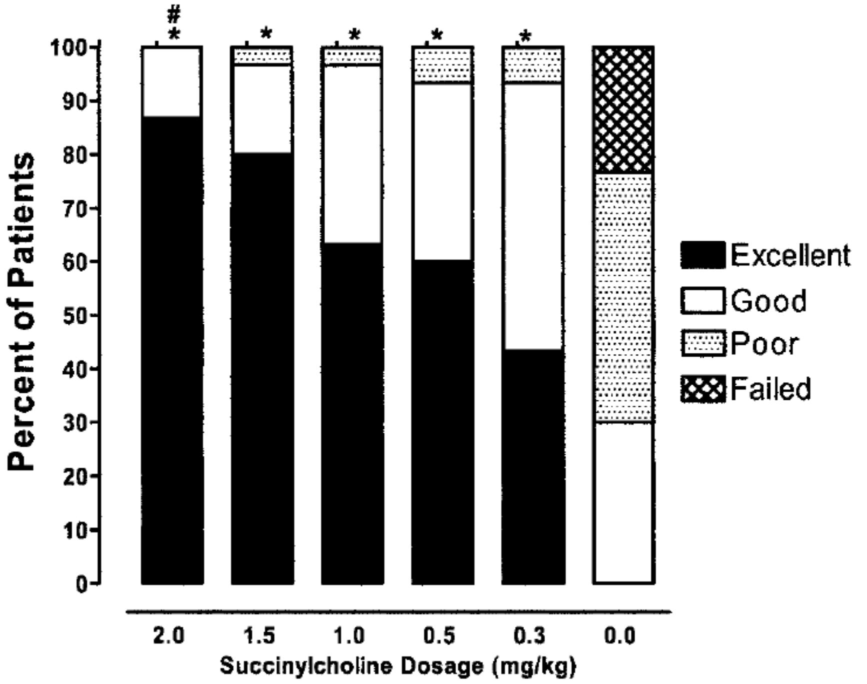
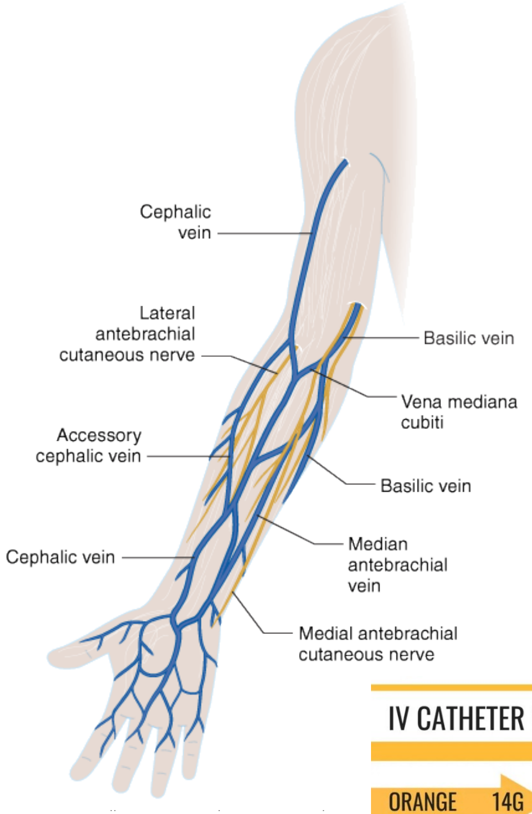
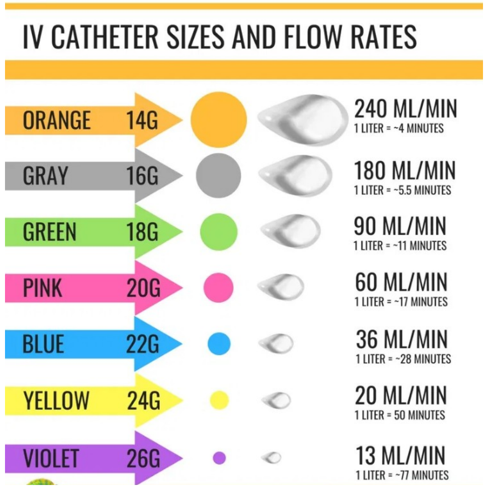


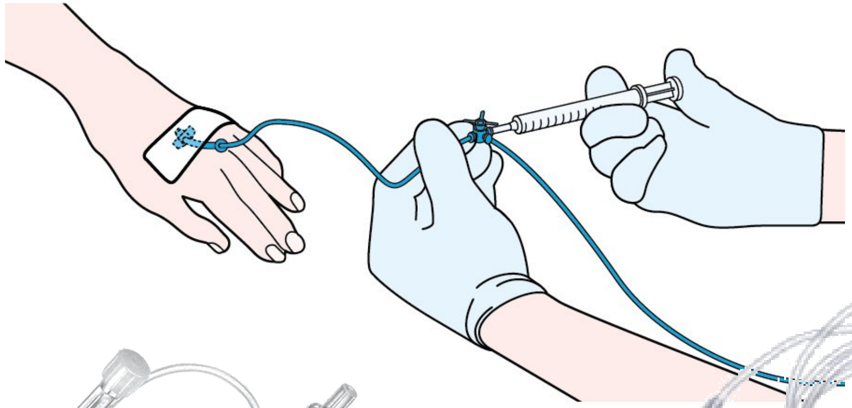
Figure 1. Intubating conditions with different doses of succinylcholine ($n = 30$ in. each group). The incidence of excellent intubating conditions was significantly more frequent (*$P < 0.001$) in patients receiving succinylcholine than in those of the control group and in the 2.0 mg/kg succinylcholine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

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



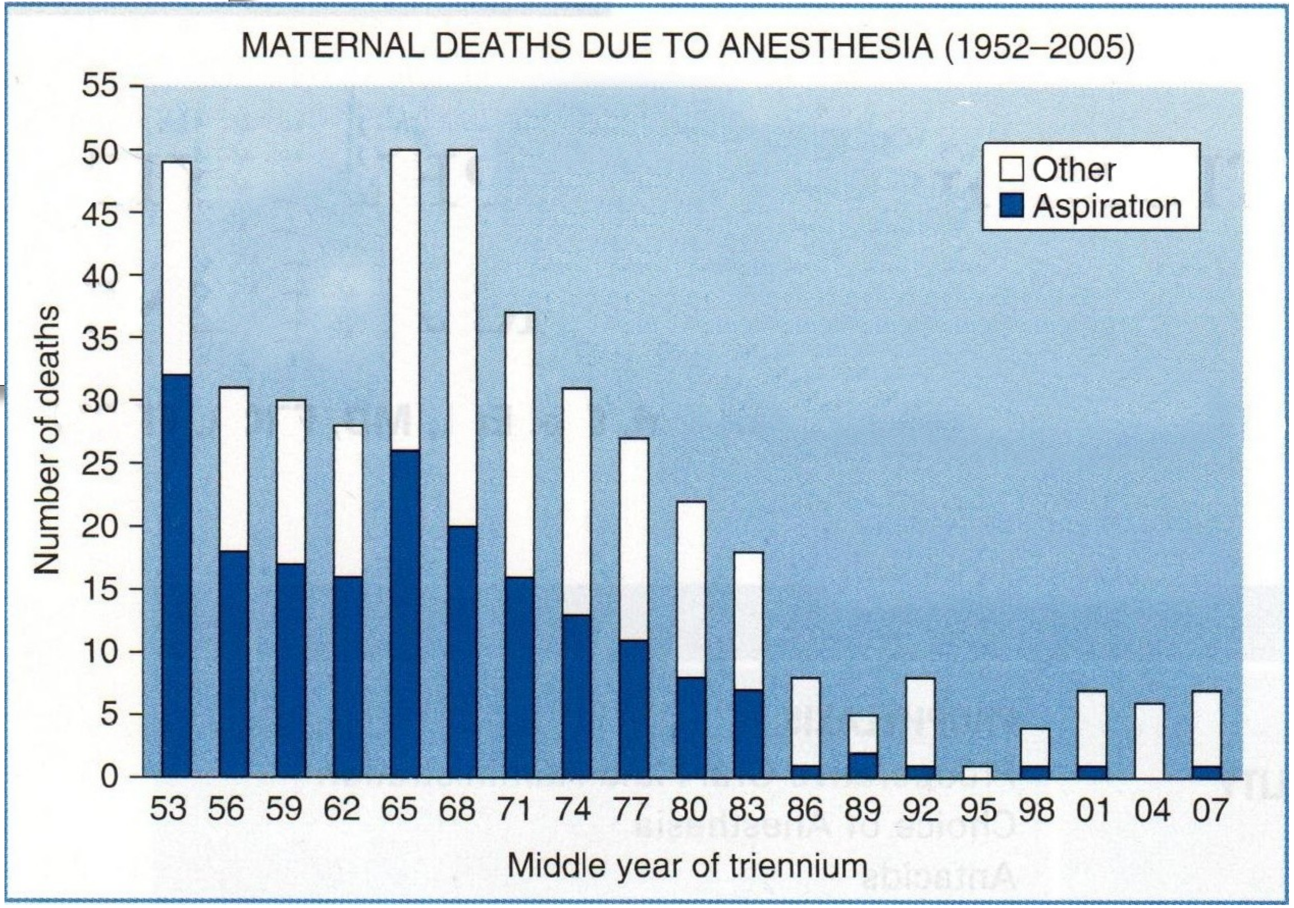
Doba nástupu účinku myorelaxancia závisí také na způsobu aplikace !!



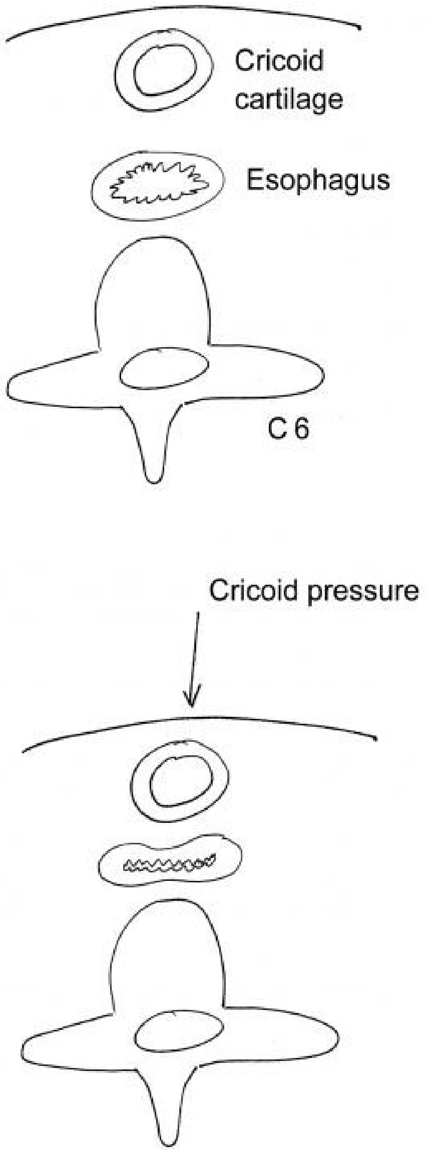


The salient characteristics of RSI were delineated by Stept and Safar in 1970 [3].

- 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



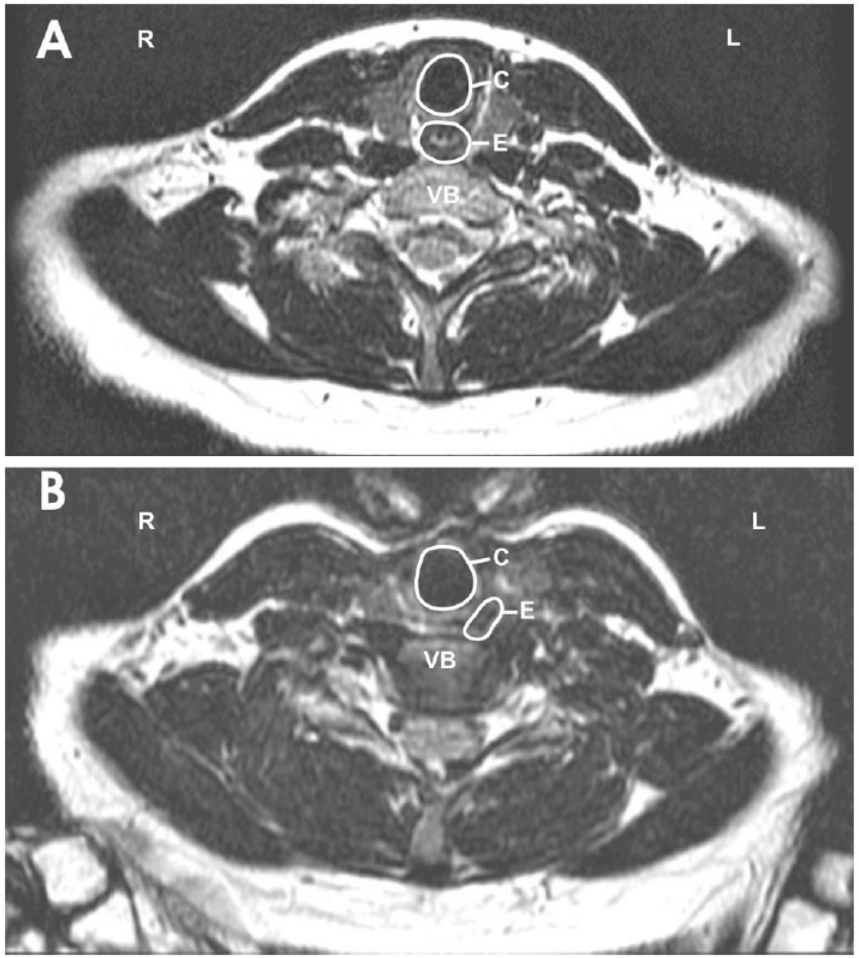
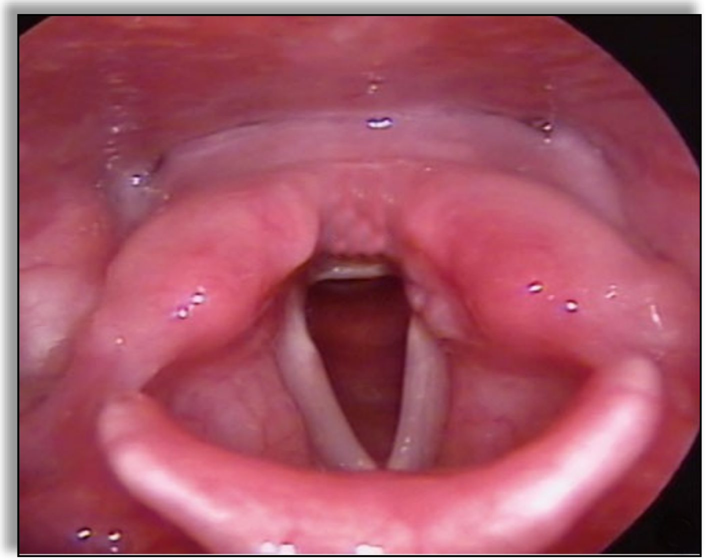
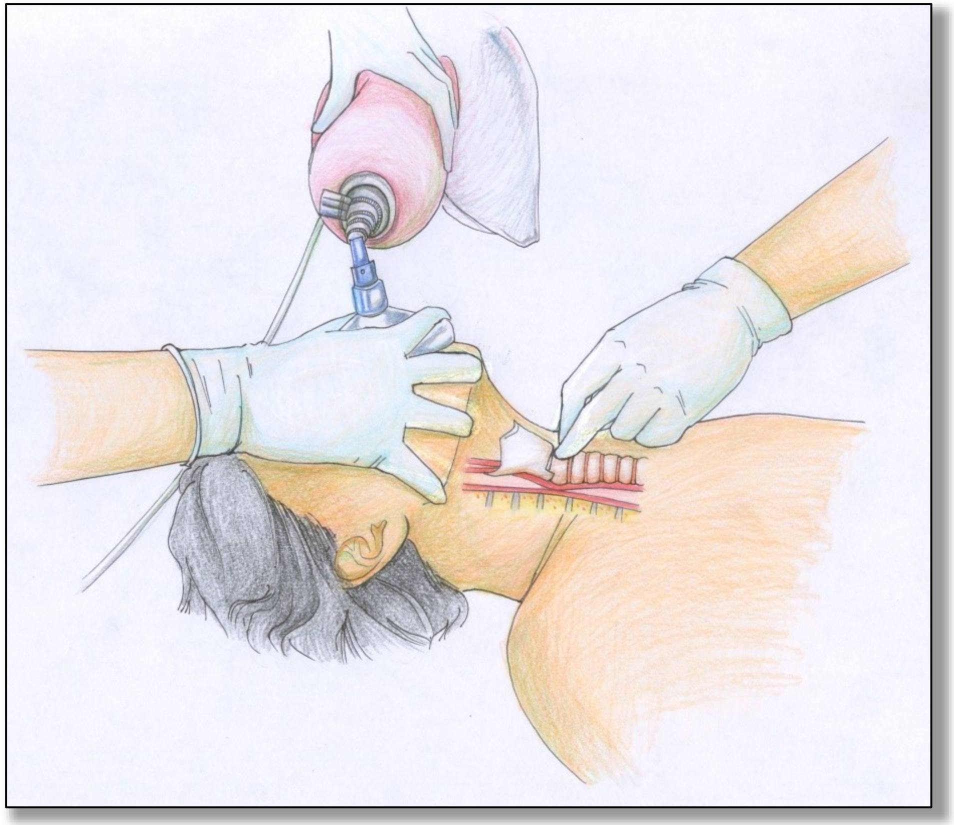


Fig. 3. (*A*) Magnetic resonance image of the neck without cricoid pressure. (*B*) Magnetic resonance image of the same subject demonstrating 12.1 mm of lateral esophageal displacement to the left with application of cricoid pressure. *C* = cricoid cartilage, *E* = esophagus, *VB* = vertebral body.



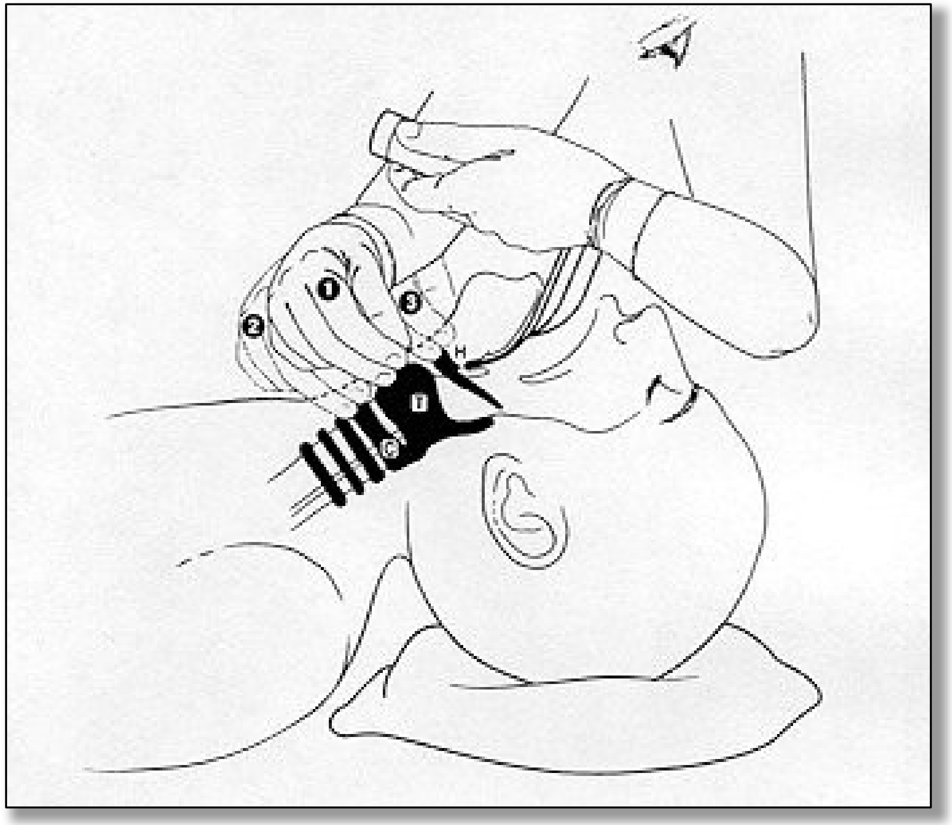
Smith KJ et al. Anesthesiology 2003; 99:60-4
Rice et al. Anesth Analg 2009;109:1546-52
Haslam et al. Anaesthesia 2005; 60: 41-47

Sellick's Maneuver



"BURP"

Backward, Upward, Rightward Pressure



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

jan.blaha@vfn.cz