

TIVA v kardiochirurgii PRO & CON



MUDr. Daniel Hujo



2. LÉKAŘSKÁ
FAKULTA
Univerzita Karlova

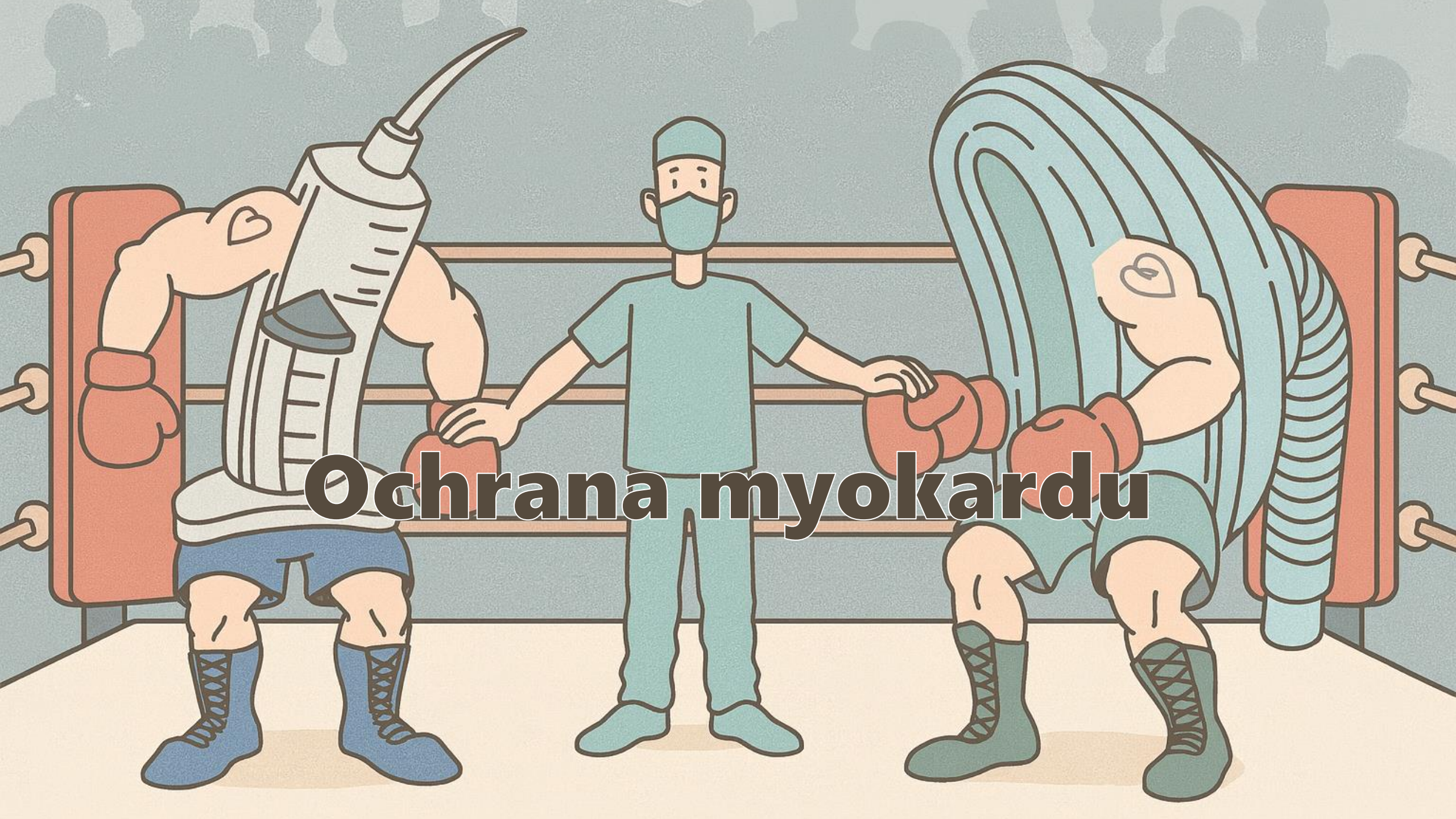


MUDr. Tereza Bartošová





Jaký způsob vedení anestezie obvykle volíte pro kardiochirurgický výkon?



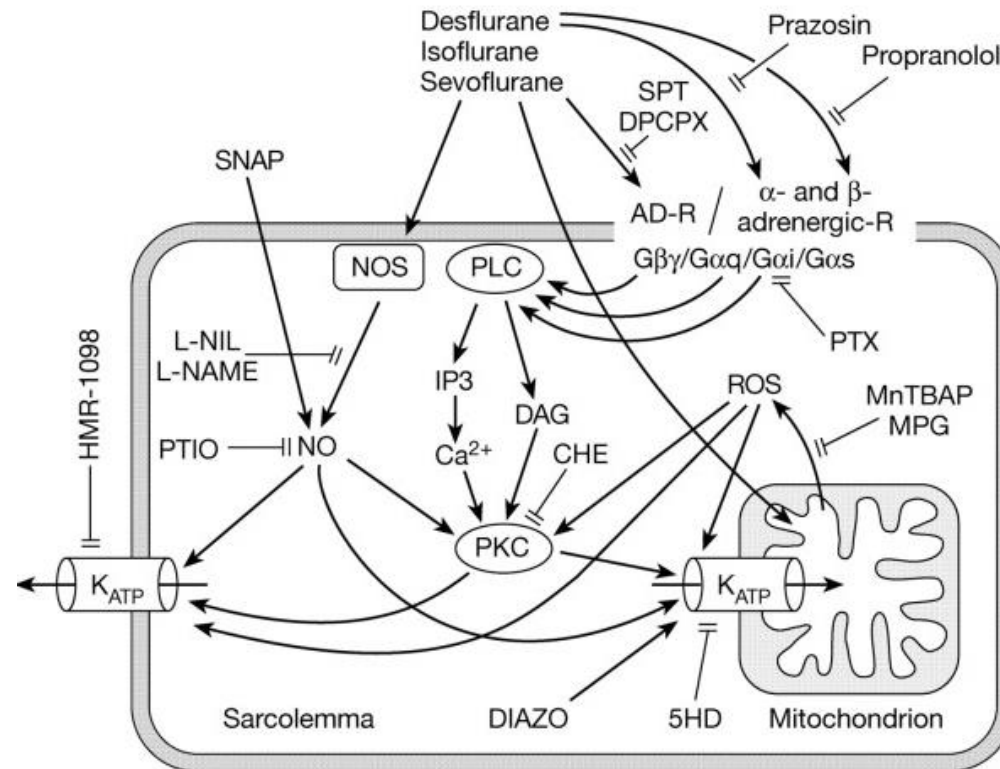
Ochrana myokardu

Kardioprotekce

- Ischemický preconditioning (IPC)
- Anestetický preconditioning (APC)
- Vzdálený ischemický preconditioning (RIPC)

- Snížení ischemicko-reperfuzního poškození (myokard, ledviny, mozek)

Anestetický preconditioning



- Zaugg M, Lucchinetti E, Uecker M, Pasch T, Schaub MC. Anaesthetics and cardiac preconditioning. Part I. Signalling and cytoprotective mechanisms. Br J Anaesth. 2003 Oct;91(4):551-65. doi: 10.1093/bja/aeg205. PMID: 14504159.

Inhalační anestezie je lepší

ANESTHESIOLOGY

Volatile Anesthetics versus Propofol for Cardiac Surgery with Cardiopulmonary Bypass

Meta-analysis of Randomized Trials

Alice Bonanni, M.D., Alessio Signori, M.D., Ph.D.,
Cristiano Alicino, M.D., Ph.D., Irene Mannucci, M.D.,
Maria Antonietta Grasso, M.D., Luigi Martinelli, M.D.,
Giacomo Deferrari, M.D., Ph.D.

Anesthesiology 2020; 132:1429–46

- 42 studií, 8000+ pacientů
- 1-yr mortality (5.5 vs. 6.8%; odds ratio, 0.76 [95% CI, 0.60 to 0.96]; $P = 0.023$)
- myocardial infarction (odds ratio, 0.60 [95% CI, 0.39 to 0.92]; $P = 0.023$)
- cardiac troponin release (standardized mean difference, -0.39 [95% CI, -0.59 to -0.18], $P = 0.0002$)
- need for inotropic medications (odds ratio, 0.40 [95% CI, 0.24 to 0.67]; $P = 0.0004$)
- extubation time (standardized mean difference, -0.35 [95% CI, -0.68 to -0.02]; $P = 0.038$)
- higher cardiac index/output (standardized mean difference, 0.70 [95% CI, 0.37 to 1.04]; $P < 0.0001$)



Journal of Cardiothoracic and Vascular
Anesthesia

Volume 21, Issue 4, August 2007, Pages 502-511



Original article

Desflurane and Sevoflurane in Cardiac Surgery: A Meta-Analysis of Randomized Clinical Trials

Giovanni Landoni MD *  , Giuseppe G.L. Biondi-Zoccai MD †, Alberto Zangrillo MD *, Elena Bignami MD *, Stefania D'Avolio MD *, Chiara Marchetti MD *, Maria Grazia Calabrò MD *, Oliviero Fochi MD *, Fabio Guarracino MD ‡, Luigi Tritapepe MD §, Stefan De Hert MD ||, Giorgio Torri MD ¶

THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Volatile Anesthetics versus Total Intravenous Anesthesia for Cardiac Surgery

G. Landoni, V.V. Lomivorotov, C. Nigro Neto, F. Monaco, V.V. Pasyuga, N. Bradic, R. Lembo, G. Gazivoda, V.V. Likhvantsev, C. Lei, A. Lozovskiy, N. Di Tomasso, N.A.R. Bukamal, F.S. Silva, A.E. Bautin, J. Ma, M. Crivellari, A.M.G.A. Farag, N.S. Uvaliev, C. Carollo, M. Pieri, J. Kunstýř, C.Y. Wang, A. Belletti, L.A. Hajjar, E.V. Grigoryev, F.E. Agrò, H. Riha, M.R. El-Tahan, A.M. Scandroglio, A.M. Elnakera, M. Baiocchi, P. Navalesi, V.A. Shmyrev, L. Severi, M.A. Hegazy, G. Crescenzi, D.N. Ponomarev, L. Brazzi, R. Arnoni, D.G. Tarasov, M. Jovic, M.G. Calabrò, T. Bove, R. Bellomo, and A. Zangrillo, for the MYRIAD Study Group*

Propofol je nutné ZLO!



Journal of Cardiothoracic and Vascular
Anesthesia

Volume 37, Issue 11, November 2023, Pages 2176-2180



Editorial

Mechanisms of Action of the Detrimental Effects of Propofol on Survival

Yuki Kotani MD *^{†‡1}, Alessandro Pruna MD *¹, Giovanni Landoni MD *^{†1}  

ONLINE LABORATORY INVESTIGATIONS

Cardioprotection by Humoral Factors Released After Remote Ischemic Preconditioning Depends on Anesthetic Regimen

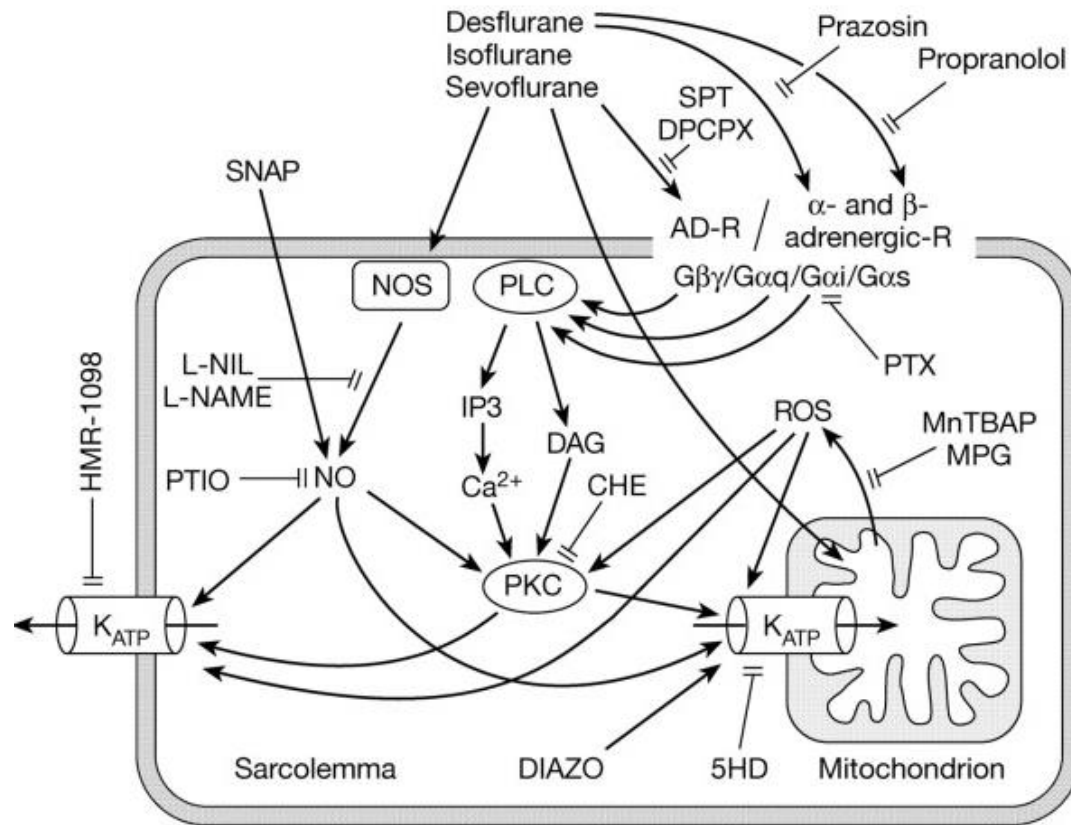
Bunte, Sebastian MD¹; Behmenburg, Friederike MD¹; Eckelskemper, Franziska MD¹; Mohr, Felix¹; Stroethoff, Martin MD¹; Raupach, Annika PhD¹; Heinen, André MD, PhD²; Hollmann, Markus W. MD, PhD, DEAA³; Huhn, Ragnar MD, PhD¹

[Author Information](#) 

Critical Care Medicine 47(3);p e250-e255, March 2019. | DOI: 10.1097/CCM.0000000000003629

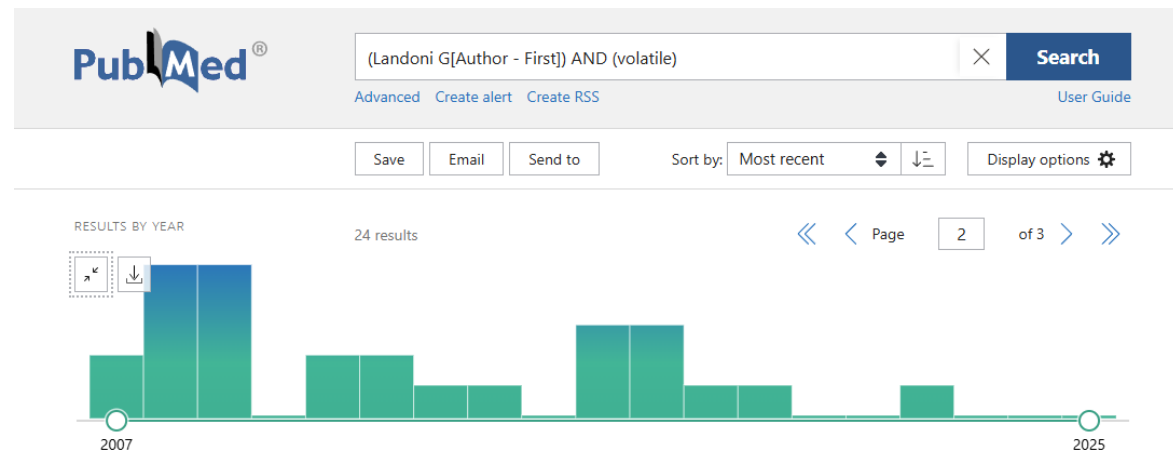
- Propofol inhibuje neurální a humorální signální dráhy a tím inhibuje orgánově protektivní působení volatilních anestetik (APC, RIPC)

K_{ATP} kanály zní sexy



Zaugg M, Lucchinetti E, Uecker M, Pasch T, Schaub MC. Anaesthetics and cardiac preconditioning. Part I. Signalling and cytoprotective mechanisms. Br J Anaesth. 2003 Oct;91(4):551-65. doi: 10.1093/bja/aeg205. PMID: 14504159.

Ale ani jejich zastáncům studie nevyšly...



British Journal of Anaesthesia **111** (6): 886–96 (2013)
Advance Access publication 12 July 2013 · doi:10.1093/bja/aet231

BJA

Anaesthetic drugs and survival: a Bayesian network meta-analysis of randomized trials in cardiac surgery

G. Landoni^{1*}, T. Greco¹, G. Biondi-Zoccai², C. Nigro Neto^{3,4}, D. Febres¹, M. Pintaudi¹, L. Pasin¹, L. Cabrini¹, G. Finco⁵ and A. Zangrillo¹

¹ Anesthesia and Intensive Care Department, San Raffaele Scientific Institute, Milan, Italy

² Department of Medico-Surgical Sciences and Biotechnologies, Sapienza University of Rome, Latina, Italy

³ Anaesthesia and Intensive Care Department, Federal University of São Paulo, São Paulo, Brazil

⁴ Dante Pazzanese Institute of Cardiology, São Paulo, Brazil

⁵ Department of Medical Sciences "M. Aresu", University of Cagliari, Italy

* Corresponding author. E-mail: landoni.giovanni@hsr.it

Ale ani jejich zastáncům studie nevyšly...

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Volatile Anesthetics versus Total Intravenous Anesthesia for Cardiac Surgery

G. Landoni, V.V. Lomivorotov, C. Nigro Neto, F. Monaco, V.V. Pasyuga, N. Bradic, R. Lembo, G. Gazivoda, V.V. Likhvantsev, C. Lei, A. Lozovskiy, N. Di Tomasso, N.A.R. Bukamal, F.S. Silva, A.E. Bautin, J. Ma, M. Crivellari, A.M.G.A. Farag, N.S. Uvaliev, C. Carollo, M. Pieri, J. Kunstýř, C.Y. Wang, A. Belletti, L.A. Hajjar, E.V. Grigoryev, F.E. Agrò, H. Riha, M.R. El-Tahan, A.M. Scandroglio, A.M. Elnakera, M. Baiocchi, P. Navalesi, V.A. Shmyrev, L. Severi, M.A. Hegazy, G. Crescenzi, D.N. Ponomarev, L. Brazzi, R. Arnoni, D.G. Tarasov, M. Jovic, M.G. Calabrò, T. Bove, R. Bellomo, and A. Zangrillo, for the MYRIAD Study Group*

N Engl J Med 2019;380:1214-25.
DOI: 10.1056/NEJMoa1816476
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A ty co vyšly...

ANESTHESIOLOGY

Vol
ve
Cal
Cal

Sevoflurane Versus Total Intravenous Anesthesia for Isolated Coronary Artery Bypass Surgery With Cardiopulmonary Bypass: A Randomized Trial



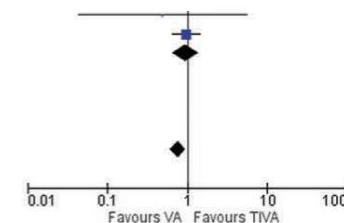
Met: Valery V. Likhvantsev, MD,* Giovanni Landoni, MD,† Dmitry I. Levikov, PhD,‡ Oleg A. Grebenchikov, PhD,* Yuri V. Skripkin, MD,* and Rostislav A. Cherpakov, MD§

Alice Bonanni, M.D., Alessio Signori, M.D., Ph.D.,
Cristiano Alicino, M.D., Ph.D., Irene Mannucci, M.D.,
Maria Antonietta Grasso, M.D., Luigi Martinelli, M.D.,
Giacomo Deferrari, M.D., Ph.D.

Anesthesiology 2020; 132:1429–46

- IA snižují roční mortalitu (5.5 vs.

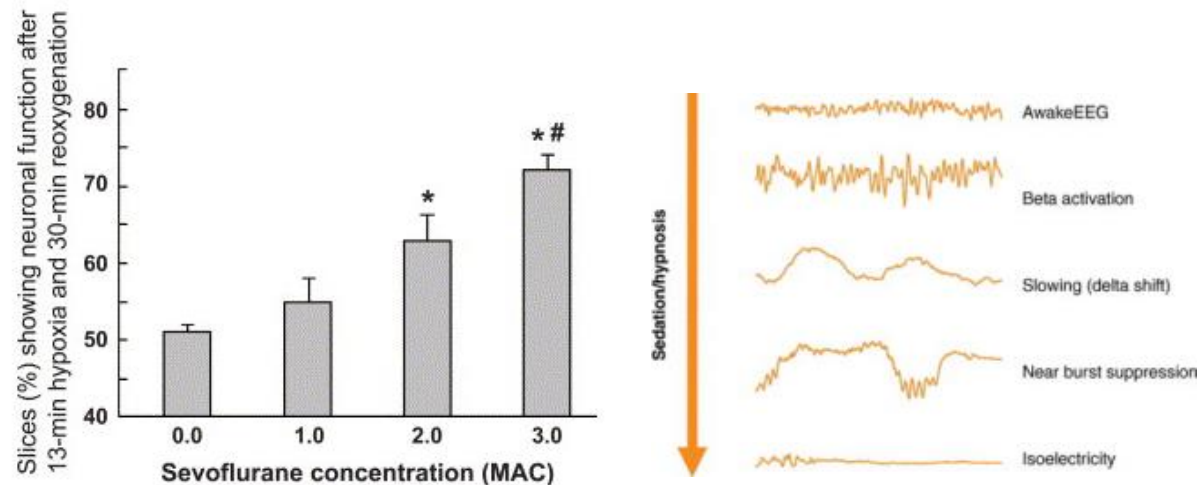
Bignami et al.	1	50	2	50	1.0%	0.49 [0.04, 5.58]	2012
Landoni et al. (†)	52	1709	54	1721	37.6%	0.97 [0.66, 1.43]	2019
Subtotal (95% CI)		1759		1771	38.6%	0.95 [0.65, 1.40]	
Total events	53		56				
Heterogeneity: Tau ² = 0.00; Chi ² = 0.29, df = 1 (P = 0.59); I ² = 0%							
Test for overall effect: Z = 0.25 (P = 0.80)							
Total (95% CI)		2606		2490	100.0%	0.76 [0.60, 0.96]	
Total events	143		168				
Heterogeneity: Tau ² = 0.00; Chi ² = 4.63, df = 5 (P = 0.46); I ² = 0%							
Test for overall effect: Z = 2.27 (P = 0.02)							
Test for subgroup differences: Chi ² = 2.20, df = 1 (P = 0.14), I ² = 54.6%							



Efekt je závislý na dávce – jsme ochotni obětovat elektrickou aktivitu mozku?

3.1. Sevoflurane-induced preconditioning in vitro is dose-dependent

In $51 \pm 1\%$ of control slices (0.0 MAC) neuronal function recovered following 13-min hypoxia and 30-min reoxygenation. Sevoflurane significantly and dose-dependently increased the degree of neuronal function as $55 \pm 3\%$, $63 \pm 3\%$, and $72 \pm 2\%$ of slices exhibited recovery of neuronal function after preconditioning with 1.0, 2.0 and 3.0 MAC sevoflurane, respectively (Fig. 1).



- Supraanestetické dávky sevofluranu mají lepší výsledky
- Bez monitorace hloubky anestezie, nebo BIS <40

Dose dependent – jsme ochotní obětovat elektrickou aktivitu mozku?

- Při monitoraci hloubky anestezie s cílem BIS 40-60 se benefit nepodařilo prokázat

Sevoflurane-Remifentanil Versus Propofol-Remifentanil Anesthesia at a Similar Bispectral Level for Off-Pump Coronary Artery Surgery: No Evidence of Reduced Myocardial Ischemia

Jean Dominique Law-Koune, MD,* Catherine Raynaud, MD,* Ngai Liu, MD,* Claude Dubois, MD,† Mauro Romano, MD,† and Marc Fischler, MD*

Objective: Sevoflurane could decrease myocardial ischemic injury in patients undergoing off-pump coronary artery bypass surgery. This study was designed to compare postoperative troponin I (cTnI) concentrations after sevoflurane-remifentanil versus propofol-remifentanil anesthesia.

Design: Prospective, randomized single-blind clinical study.

Setting: University hospital.

Participants: Eighteen patients.

Interventions: General anesthesia was conducted with sevoflurane-remifentanil (n = 9) or propofol-remifentanil (n = 9). Administration of sevoflurane and propofol was adjusted to maintain the bispectral index (BIS) between 40 and 60.

Measurements and Main Results: Groups were comparable regarding the patients' characteristics. The objective of BIS was maintained in both groups except during the period of coronary artery grafts ($p < 0.001$) when the BIS number in the propofol group fell below 40 and was significantly lower than in the sevoflurane group. Intraoperative hemodynamic

variables were similar between groups. No patient required cardiopulmonary bypass. Need for inotropic and vasoactive support during the first graft was not necessary in the propofol group and occurred in 4 patients in the sevoflurane group (not significant). During the second graft, 2 patients in the propofol group and 3 in the sevoflurane group needed hemodynamic support. Postoperative hemodynamic variables were comparable between groups. Areas under the curve of postoperative increases in cTnI were 27.0 ± 38.6 and 17.4 ± 14.6 ng/mL/hour in the sevoflurane and propofol groups, respectively (not significant).

Conclusion: This study does not support cardioprotective effects of sevoflurane. The particularly short total cumulative duration of ischemia and the relatively low administered end-tidal sevoflurane concentrations may explain this result.

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KEY WORDS: off-pump coronary bypass surgery, ischemia, volatile, sevoflurane, intravenous, propofol, monitoring, bispectral index

British Journal of Anaesthesia 105 (2): 122-30 (2010)
Advance Access publication 23 June 2010 · doi:10.1093/bja/aeq111

BJA

CARDIOVASCULAR

Influence of propofol–opioid vs isoflurane–opioid anaesthesia on postoperative troponin release in patients undergoing coronary artery bypass grafting†

S. Flier*, J. Post, A. N. Concepcion, T. H. Kappen, C. J. Kalkman and W. F. Buhre

Division of Perioperative Care and Emergency Medicine, Department of Anaesthesiology, University Medical Center Utrecht, Mailstop Q 04.2.313, PO Box 85500, 3508 GA Utrecht, The Netherlands

* Corresponding author. E-mail: s.flier@umcutrecht.nl



Jak velký význam podle vás má myokardiální preconditioning volatilními anestetiky v reálné klinické praxi?

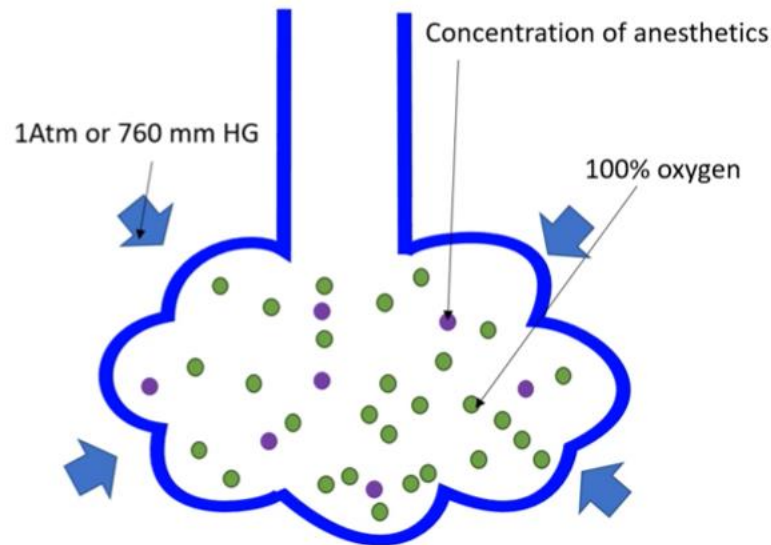


Řiditelnost anestezie

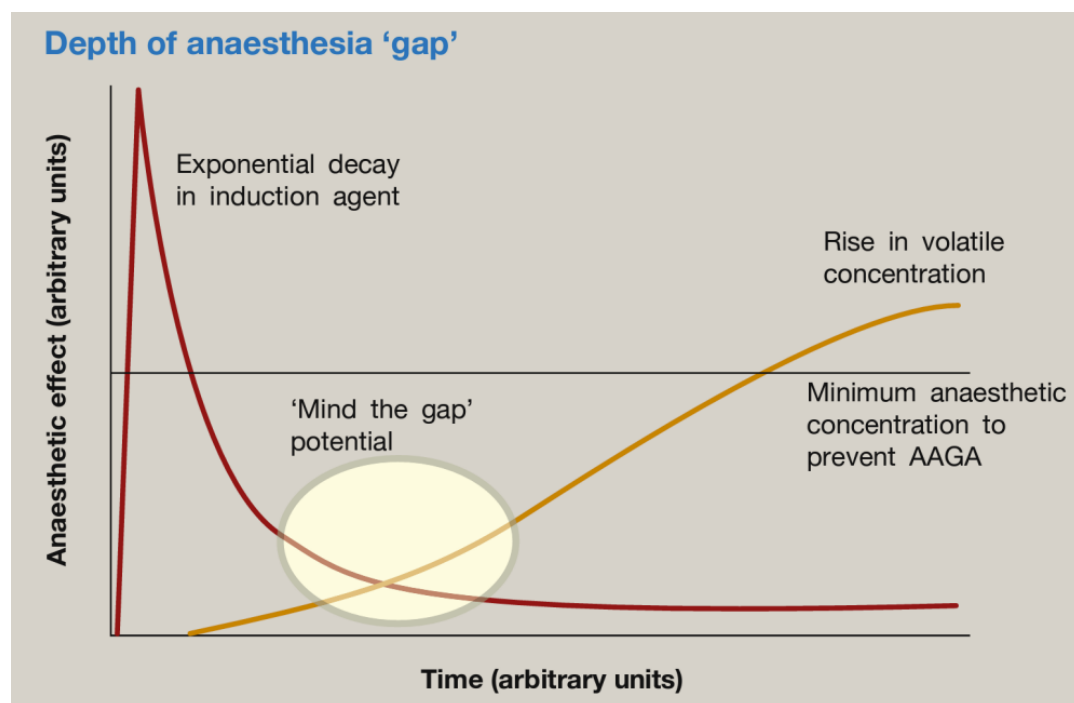
MAC není kontrola, MAC je přání...

Definition of MAC

MAC is defined as the minimum alveolar concentration of an inhaled anesthetic at 1 atmosphere pressure in 100% oxygen equilibrium, at which 50% of patients do not exhibit purposeful movement in response to a standardized noxious stimulus, such as a surgical skin incision.



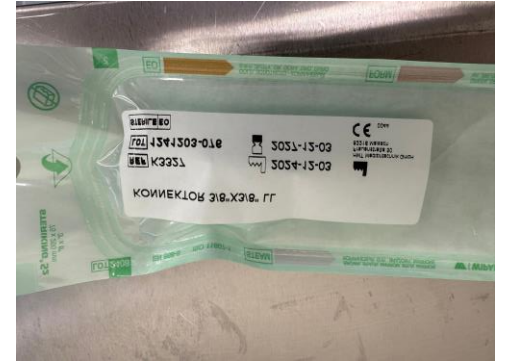
„Mind ALL the gaps“



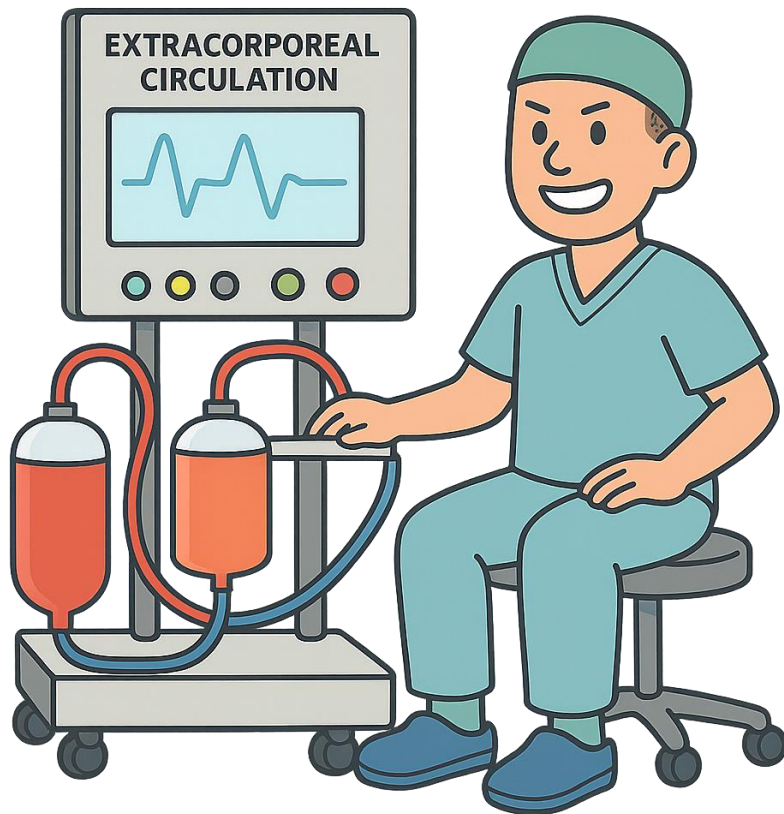
- 1. Úvod do anestezie**
 - Intravenózní úvod, pak přepnutí na plyn
→ *první rizikové období – propad mezi efekty*
- 2. Začátek mimotělního oběhu (IA off → IV on)**
 - Po přechodu na MO vypínáme plyn
 - Dochází k pozvolné atenuaci účinku IA
→ *druhá mezera – nástup propofolu nemusí být okamžitý*
- 3. Po ukončení MO (IV off → IA on)**
 - Znovu zapínáme plyn, ale jeho nástup je opožděný
→ *třetí přechod, opět potenciální „gap“*
- 4. Překlad na JIP (IA off → IV on)**
 - Odpojení od dýchacího okruhu, návrat k propofolu
→ *čtvrté rizikové období*

Použití IA na mimotělním oběhu – víme, co vlastně děláme?

- Víme, jaký oxygenátor používáme?
 - Polypropylen × polymethylpenten
 - U některých (např. Eurosets) není použití IA vůbec v návodu
- Prochází IA skutečně oxygenátorem?
 - Propustnost se liší podle materiálu a teploty
 - Inspirace ≠ koncentrace v krvi
- Měříme koncentraci IA za oxygenátorem?



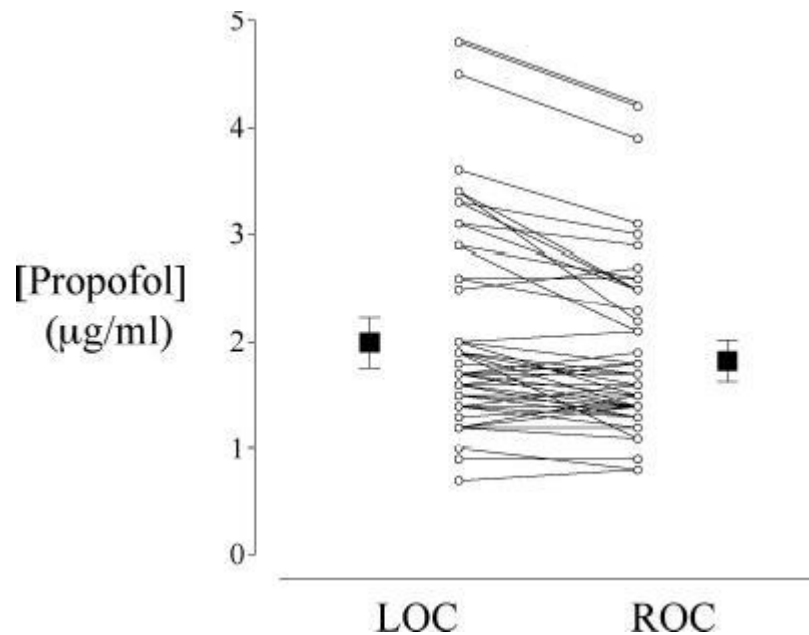
Není ET control na pumpu..



... jen perfuzionista

TIVU lze dělat pacientovi na míru

- Koncentrace, na které pacient ztratí vědomí (C_e) se $\pm$ rovná koncentraci, při které se probudí (rozdíl max 0,25 $\mu\text{g/ml}$, CI 95%)



Liu SH, Tian M. Factors affecting recovery from anaesthesia with propofol-remifentanyl target-controlled infusion in laparoscopic surgery. J Int Med Res. 2017 Jun;45(3):1007-1014. doi: 10.1177/0300060517705539. Epub 2017 May 23. PMID: 28534702; PMCID: PMC5536417.

Nic není dokonalé

- MAC – 1965 – Eger et al.
- EtAC – elementární součást každého anesteziologického přístroje
- BIS – silně doporučen pro monitoraci při TIVA



British Journal of Anaesthesia
Volume 130, Issue 2, February 2023, Pages e317-e329



The NEW ENGLAND
JOURNAL of MEDICINE

CURRENT ISSUE ▾ SPECIALTIES ▾ TOPICS ▾

Monitoring

Depth of anaesthesia and mortality after cardiac or noncardiac surgery: a systematic review and meta-analysis of randomised controlled trials

Thomas Payne^{1,2}  , Hannah Braithwaite², Tim McCulloch², Michael Paleologos², Charlotte Johnstone², Jordan Wehrman¹, Jennifer Taylor¹, John Loadsman^{1,2}, Andy Y. Wang^{2,3}, Robert D. Sanders^{1,2,4,5}  

ORIGINAL ARTICLE

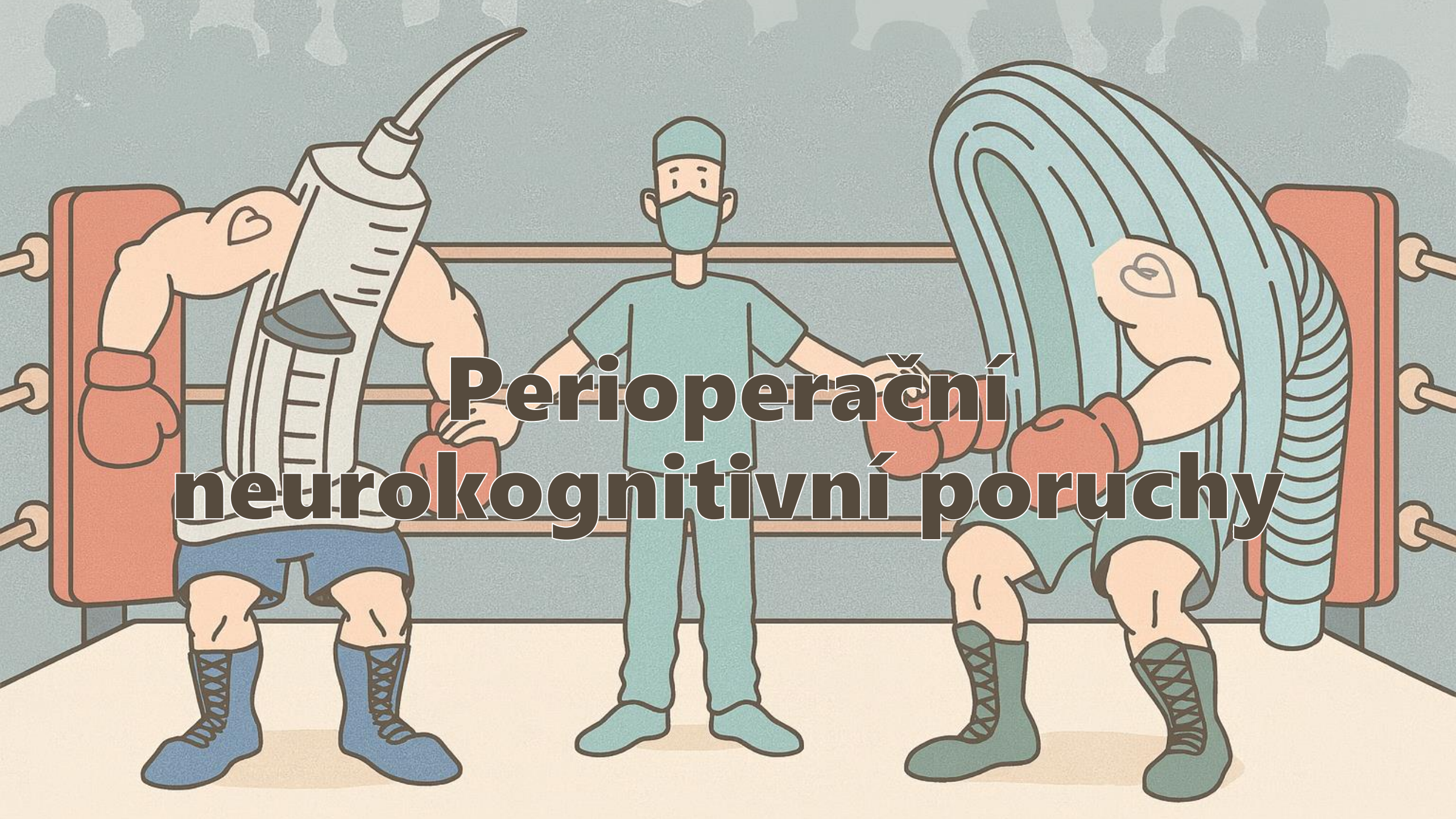


Anesthesia Awareness and the Bispectral Index

Authors: Michael S. Avidan, M.B., B.Ch., Lini Zhang, M.D., Beth A. Burnside, B.A., Kevin J. Finkel, M.D., Adam C. Searleman, B.S., Jacqueline A. Selvidge, B.S., Leif Saager, M.D.,  ⁺⁵, and Alex S. Evers, M.D. [Author Info & Affiliations](#)

Published March 13, 2008 | N Engl J Med 2008;358:1097-1108 | DOI: 10.1056/NEJMoa0707361 | **VOL. 358 NO. 11**

Copyright © 2008

A cartoon illustration of a boxing ring. In the center stands a surgeon wearing green scrubs, a surgical cap, and a face mask. To the left, a boxer in blue shorts and blue boxing boots is in a defensive stance, holding a large medical syringe as if it were a boxing glove. To the right, another boxer in green shorts and green boxing boots is in a similar stance, holding a large blue medical tube. The background shows the ropes of the boxing ring and a blurred crowd of spectators.

Perioperační neurokognitivní poruchy

POCD – inhalační anestezie



ORIGINAL ARTICLE | Open Access | CC BY-NC-ND

Cognitive function and delirium following sevoflurane or propofol anesthesia for valve replacement surgery: A multicenter randomized controlled trial

Guang-You Duan, Zhen-Xin Duan, Hong Chen, Feng Chen, Fang Chen, Zhi-Yong Du, Li-Yong Chen, Kai-Zhi Lu, Zhi-Yi Zuo, Hong Li

First published: 10 November 2022 | <https://doi.org/10.1002/kjm2.12618> | Citations: 11

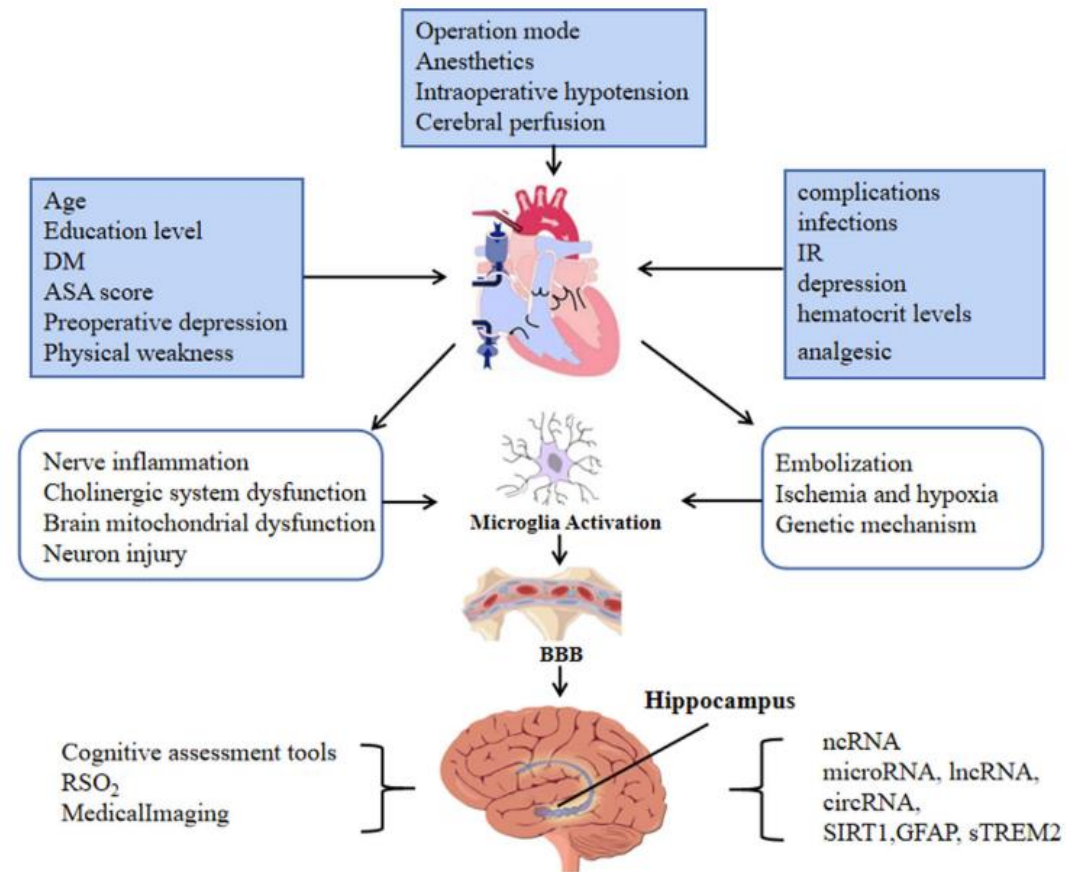
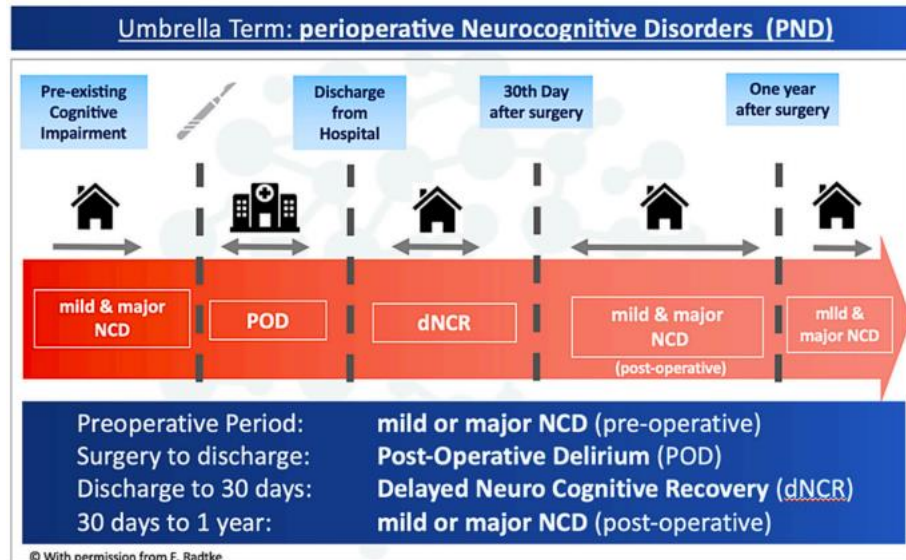
- Lepší neuroprotektce u inhalačních anestetik koreluje s výsledkem meta-analýz
- Kratší pobyt na ICU
- Kratší hospitalizace

BMJ Open Comparison of the cerebroprotective effect of inhalation anaesthesia and total intravenous anaesthesia in patients undergoing cardiac surgery with cardiopulmonary bypass: a systematic review and meta-analysis

Feng Chen,¹ Guangyou Duan,¹ Zhuoxi Wu,¹ Zhiyi Zuo,² Hong Li¹

Kéž by to bylo tak jednoduché

- Nekonzistentní výsledky metaanalýz
- 24h vs delší sledování
- Způsob monitorace



Propofol snižuje neuroinflamaci

Zhao et al. *Journal of Cardiothoracic Surgery* (2025) 20:54
<https://doi.org/10.1186/s13019-024-03327-0>

Journal of Cardiothoracic
Surgery

Original Article

Comparison of effects of propofol versus sevoflurane for patients undergoing cardiopulmonary bypass cardiac surgery

Shaoqun Tang¹, Wei Huang², Kun Zhang³, Wei Chen⁴, Tao Xie⁵

ABSTRACT

Objective: To compare the effects of propofol versus sevoflurane on the outcomes of patients undergoing cardiac surgery with cardiopulmonary bypass (CPB).

Methods: A total of 110 patients undergoing cardiac surgery with CPB in our hospital from January 2015 to June 2017 were randomly divided into 2 groups (n=55): Group A, in which anesthesia was maintained with sevoflurane, and Group B, in which anesthesia was maintained with propofol. The MMSE score before and after operation, perioperative laboratory index, incidence of postoperative cognitive dysfunction (POCD) and incidence of adverse events between the two groups were compared.

Results: The MMSE score was significantly higher in Group B than in Group A after anesthesia ($p < 0.05$). Serum levels of the brain injury markers neuron-specific enolase, S100B and matrix metalloproteinase 9 were significantly lower in Group B than in Group A ($p < 0.05$). POCD incidence at 12 hour and 24 hour after operation was significantly lower in Group B than in Group A ($p < 0.05$). There were no significant differences in the incidence of low cardiac output and thoracotomy bleeding between two groups.

Conclusion: Compared with sevoflurane, the use of propofol during cardiac surgery with CPB can efficiently improve postoperative cognitive function without increasing the risk of adverse reactions.

KEYWORDS: Propofol, Sevoflurane, Cardiopulmonary bypass, Cardiac surgery.

doi: <https://doi.org/10.12669/pjms.35.4.1279>

How to cite this:

Tang S, Huang W, Zhang K, Chen W, Xie T. Comparison of effects of propofol versus sevoflurane for patients undergoing cardiopulmonary bypass cardiac surgery. *Pak J Med Sci.* 2019;35(4):1072-1075. doi: <https://doi.org/10.12669/pjms.35.4.1279>

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RESEARCH

Open Access



Sevoflurane versus propofol on immediate postoperative cognitive dysfunction in patients undergoing cardiac surgery under cardiopulmonary bypass: a comparative analysis

Na Zhao¹, Rui Qin¹, Bin Liu¹ and Dongmei Zhang^{1*}

Abstract

Objective This study aims to compare the effects of sevoflurane (SEV) and propofol (PRO) on postoperative cognitive dysfunction (POCD) in patients undergoing cardiac surgery (CS) under cardiopulmonary bypass (CPB), with a focus on evaluating the efficacy of these anesthetic agents in preventing POCD.

Methods A total of 113 patients undergoing CS with CPB were grouped into two: PRO group (n=58) and SEV group (n=55). Baseline data, anesthesia effects (CPB duration, anesthesia time, respiratory recovery time, and anesthesia recovery time), Montreal Cognitive Assessment (MoCA) scores, POCD incidence, neurological function markers (NSE, S-100β, MMP9), and serum inflammatory markers (IL-6, IL-8, TNF-α) were analyzed. The study was conducted between March 2018 and May 2021.

Results The PRO group showed significantly shorter anesthesia time ($P < 0.05$), respiratory recovery time ($P < 0.05$), and anesthesia recovery time ($P < 0.05$) compared to the SEV group. The postoperative MoCA score in the PRO group reduced markedly compared with the baseline, but still higher than that in the SEV group ($P < 0.05$). The incidence of POCD was significantly lower in the PRO group (5.17% vs. 27.27%, $P = 0.001$). The levels of NSE, S-100β, MMP9, IL-6, IL-8, and TNF-α were significantly elevated compared to baseline values, but still lower than those in the SEV group ($P < 0.05$ for all comparisons).

Conclusion PRO is more effective than SEV in preventing POCD in patients undergoing CS with CPB. It provides superior anesthetic effects and offers better protection against neuronal damage and serum inflammation compared to SEV.

Clinical trial number Not applicable.

Keywords Cardiac surgery, Cardiopulmonary bypass, Sevoflurane, Propofol, Cognitive dysfunction, Postoperative cognitive complications, Neuropsychological tests

PND a hloubka anestezie

- v kardioanestezii neměříme, jestli je EEG izoelektrické, ale jak dlouho
- Izelektrické EEG >100 min = ↑ výskyt deliria

Soehle et al. *BMC Anesthesiology* (2015) 15:61
DOI 10.1186/s12871-015-0051-7



RESEARCH ARTICLE

Open Access

Intraoperative burst suppression is associated with postoperative delirium following cardiac surgery: a prospective, observational study

Martin Soehle^{1††}, Alexander Dittmann^{2†}, Richard K Ellerkmann¹, Georg Baumgarten¹, Christian Putensen¹ and Ulf Guenther¹

EJA

Eur J Anaesthesiol 2024; **41**:81–108

OPEN

GUIDELINES

Update of the European Society of Anaesthesiology and Intensive Care Medicine evidence-based and consensus-based guideline on postoperative delirium in adult patients

Recommendation 5.1	Quality of the evidence	Strength of recommendation
We suggest Index-based EEG-monitoring depth of anaesthesia guidance to decrease the risk of POD.	Low	Weak

TIVA = monitorare EEG?



TIVA = monitorace EEG!



No jen houšť!



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Pro and Con

Total Intravenous Anesthesia Is Preferred Over Volatile Agents in Cardiac Surgery

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Po dnešní debatě mám jasno, že...