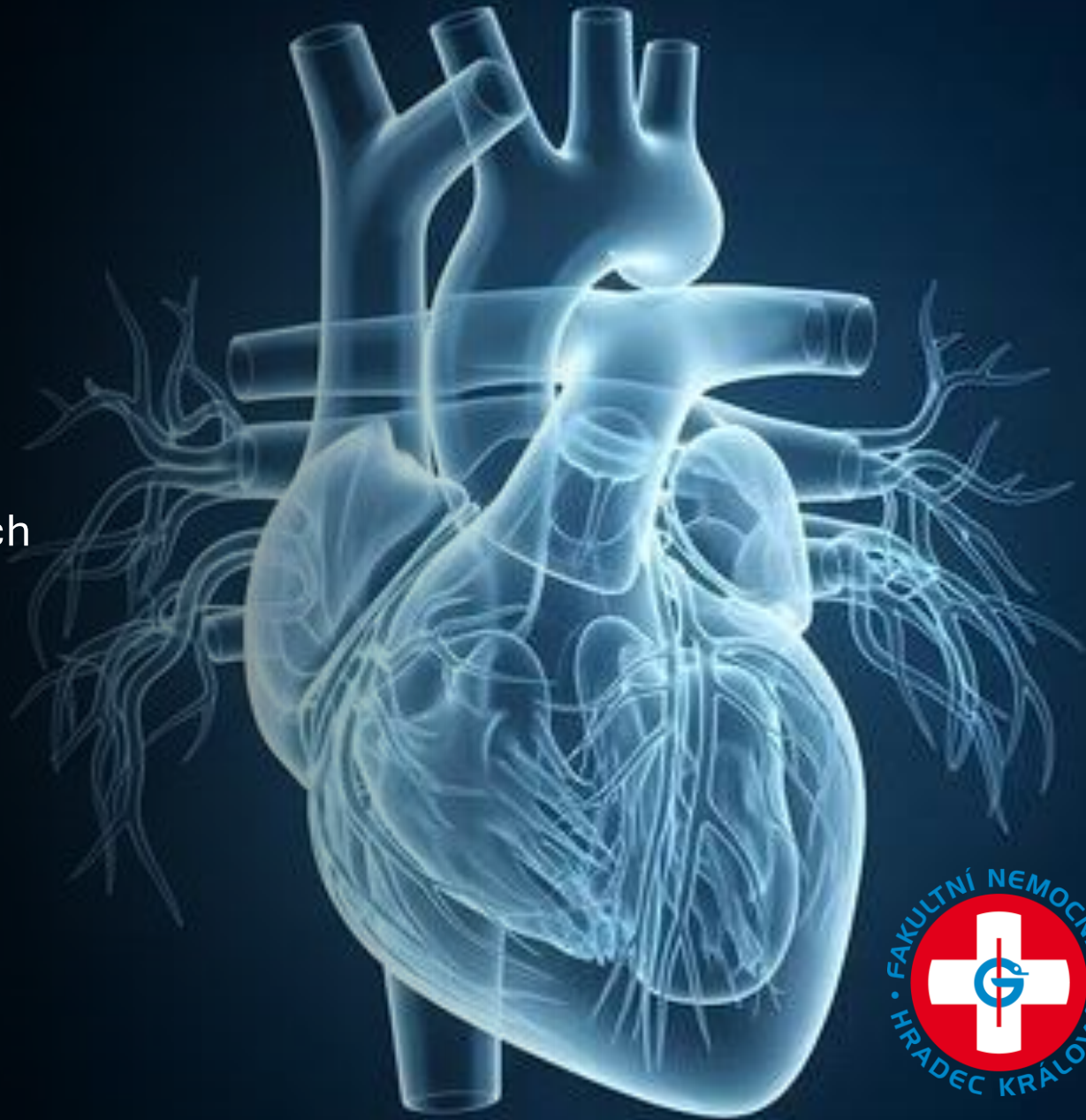


ERAS v kardiochirurgii

.....se zaměřím na periferní nervové duktály



Marian Mynář

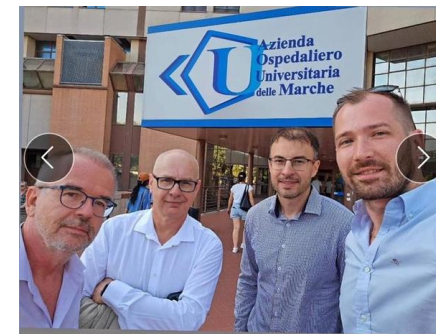


Proč já, proč ERAS

- 38 let, 13 let ve FNHK, kardio-anesteziolog
- 3 děti
- Závodní cyklistika, lyžování, stolní tenis, triatlon

-> Velký zájem o rehabilitaci :)

Proč ERAS, proč já



Fakultní nemocnice
Hradec Králové



Universitätsklinikum
Hamburg-Eppendorf



Azienda Ospedaliero
Universitaria delle
Marche





1. ERAS klinika (Centres of Excellence 2025)

Zkušnosti ze stáže - Hamburk

- Implementační program + audit
(ERAS Interactive Audit Systém – EIAS)
 - multidisciplinární protokol
 - všichni členové musí projít 10-měs. školením
 - vysoké procento plnění



Qualified Unit

Centres of Excellence

The evolution of the standardized Enhanced Recovery After Surgery concept in cardiac surgery – ERAS meets SDS

Article Feb 2025

Clinical Nutrition ESPEN

 Luisa Dolata ·  Catherina Gemander ·  Hermann Reichenspurner ·  Johannes Petersen

[View](#)

Strukturierte perioperative Patientenedukation: Enhanced recovery after Surgery zur Verbesserung des Patientenoutcome

Article Nov 2024

PADUA

 Luisa Dolata ·  Freya Brodersen ·  Inke Zastrow

Zusammenfassung: Im Universitätsklinikum Hamburg-Eppendorf (UKE) werden seit 2016 Patient_innen anhand von ERAS® Konzepten behandelt. Durch die interprofessionellen und evidenzbasierten Behandlungspfade können Prozesse optimiert und das Outcome der Patient_innen verbessert werden. Ein wichtiger Bestandteil ist die Beratung, Edukation und Informatio...

[View](#)

European Journal of Cardio-Thoracic Surgery 2026, 68(2), eza061
<https://doi.org/10.1093/ejcts/ezag061> Advance Access publication 31 January 2026

ORIGINAL ARTICLE

Cite this article as: Petersen J, Stock S, Brettschneider C, Dolata L, Dumps C, Löwe B et al. Interdisciplinary and Cross-Sectoral Perioperative Care Model in Cardiac Surgery: ERAS Implementation in the Setting of Minimally Invasive Heart Valve Surgery (INCREASE)—Results of a Randomized Controlled Trial. Eur J Cardiothorac Surg 2026; doi:10.1093/ejcts/ezag061.

Interdisciplinary and Cross-Sectoral Perioperative Care Model in Cardiac Surgery: ERAS Implementation in the Setting of Minimally Invasive Heart Valve Surgery (INCREASE)—Results of a Randomized Controlled Trial

Johannes Petersen¹*, Sina Stock³; Christian Brettschneider⁴; Luisa Dolata⁵; Christian Dumps⁶; Bernd Löwe⁷; Eric Nijman⁸; Ann-Kathrin Ozga⁹; Hermann Reichenspurner^{1,2}; Mona Elisabeth Schmid³; Leonie Schulte-Uentrop¹⁰; Eik Vettorazzi¹⁰; Antonia Zapf¹⁰; Inke Zastrow⁵; Susanne G.R. Klotz¹¹; Evaldas Girdauskas^{1,2,3}

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¹¹Department of Physiotherapy, University Medical Center Hamburg-Eppendorf, 20251 Hamburg, Germany

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Received: September 10, 2025; Revised: December 23, 2025; Accepted: January 6, 2026



ERAS^SSociety

About Guidelines Healthcare Professionals Patient Info News Members



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Bogotá, Colombia.

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- HCL - UCBL1, France.

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Valenciennes, France

CHRU de Bordeaux,
France



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Hamburg-Eppendorf,
Germany.

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Groningen, Netherlands.

Centres of Excellence

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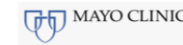


Royal Surrey NHS
Foundation Trust.

Yeovil District Hospital,
England.

Medica Uruguay.

Camoc Lamp, Carmelo



Carolinas Medical Center,
Charlotte, USA.

Brigham & Women's
Health, USA

Mayo Clinic Arizona, USA

•37

We need
Operational
Excellence!!

Now if only I
knew what it
really meant...



ERAS

2001 (ERAS® Study Group)

2005 vznikají první protokol
(kolorektální chirurgie)

2019 protokol pro KCH
pacienty

Special Communication

FREE

Guidelines for Perioperative Care in Cardiac Surgery Enhanced Recovery After Surgery Society Recommen- dations

Daniel T. Engelman, MD¹; Walid Ben Ali, MD²; Judson B. Williams, MD, MHS³; et al

» Author Affiliations | Article Information

RELATED ARTICLES FIGURES SUPPLEMENTAL CONTENT





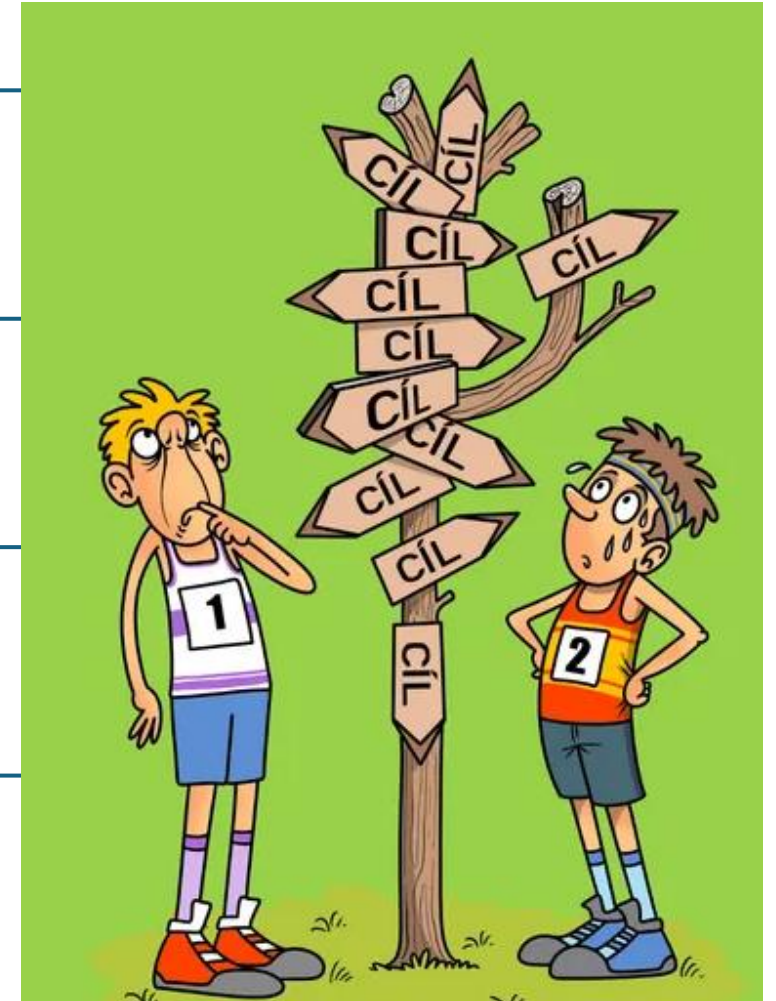
ERAS cíle

Zkrácení doby hospitalizace (30-50%)

Snížení počtu pooperačních komplikací (30%)

Časný návrat k běžnému životu

Snížení nákladů na zdravotní péči



A co říkají studie

- Doba hospitalizace - 1 den
- Sníže délky pobytu na ICU - 6h
- Snížení výskytu pooperační FLS

57 x 34 pacientů



Contents lists available at [ScienceDirect](#)
International Journal of Cardiology
journal homepage: www.elsevier.com/locate/ijcard



Enhanced recovery after minimally invasive heart valve surgery: Early and midterm outcomes[☆]

Paolo Berretta^{a,*,1}, Veronica De Angelis^a, Jacopo Alfonsi^a, Michele D. Pierri^a, Pietro Giorgio Malvindi^a, Hossein M. Zahedi^b, Christopher Munch^b, Marco Di Eusanio^a

^a Cardiac Surgery Unit, Lancisi Cardiovascular Center, Polytechnic University of Marche, Via Conca 71, 60126 Ancona, Italy
^b Cardiac Anaesthesia and Intensive Care Unit, Lancisi Cardiovascular Center, Via Conca 71, 60126 Ancona, Italy

Article
Effect of Enhanced Recovery After Surgery (ERAS) Implementation on Postoperative Atrial Fibrillation in Cardiac Surgery

Romain Niessen^{1,*}, Valentina Rancati², Mario Verdugo-Marchese³, Ziyad Gunga³, Anna Nowacka³, Valentine Melly³, Christophe Abellan¹, Karima Alouazen¹, Tamila Abdurashidova³, Caroline Botteau⁴, Matthias Kirsch^{3,5} and Zied Ltaief¹

¹ Department of Intensive Care Medicine, Lausanne University Hospital (CHUV), 1011 Lausanne, Switzerland
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^{*} Correspondence: romain.niessen@chuv.ch

ORIGINAL RESEARCH

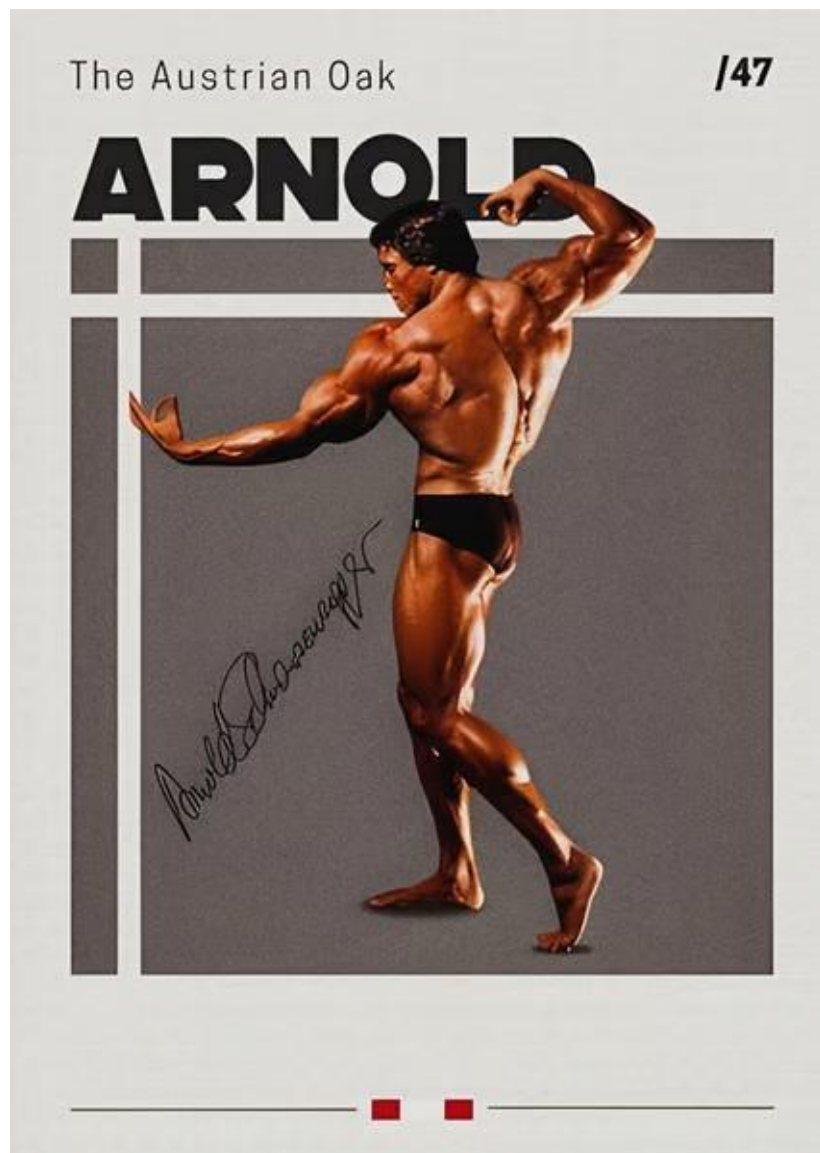
OUTCOMES AND QUALITY

Prehabilitation in Patients Undergoing Cardiac Procedures
A Systematic Review and Meta-Analysis

Carolin Steinmetz, PhD,¹ Phuc Thien Tran, PhD,^{1,2} Stephanie Heinemann, PhD,³ Daniel Arroyo-Ariza, MD,¹ Jane Jurayj, MD,³ Nicole B. Katz, MD,^{1,2} Johanneke Hartog, PhD,³ Thomas Schmidt, PhD,^{1,3} Bart Scheenstra, MD,³ Hermioni L. Amonoo, MD, MPH,^{1,2,3} Elizabeth N. Madva, MD,^{1,2} Jason Z. Qu, MD,³ Oluwaseun Akeju, MD,² Jeffery C. Huffman, MD,^{2,3} Ingo Kutschka, MD, MBA,^{1,2} Christoph Herrmann-Lingen, MD,^{1,2} Julie K. Silver, MD,³ Christine A.F. von Arnim, MD,^{1,2} Anna Lee, PhD,³ Christian Röver, PhD,³ Christopher M. Celano, MD,^{1,2} Monika Sadonova, MD,^{1,2,3,4,5} the Cardiac Prehabilitation Network

ABSTRACT
BACKGROUND Evidence supporting prehabilitation before cardiac procedures is growing, but the efficacy of different components remains unclear.
OBJECTIVES The primary aim was to assess the efficacy of prehabilitation on clinical outcomes based on recent randomized controlled trials (RCTs). The secondary aim was to identify effective intervention and which patient subgroups benefit most.
METHODS We searched Medline, Web of Science, PsycINFO, Embase, Scopus, and Cochrane Central Register of Controlled Trials Library for RCTs comparing prehabilitation with standard care in cardiac patients up to August 2024. Trials were screened by 2 reviewers and meta-analyses were performed using random-effects models.
RESULTS Forty-four RCTs including 3,925 patients were identified. Prehabilitation improved preprocedural functional capacity (6-minute walk distance) and recovery (in-hospital length of stay, intensive care unit stay, and occurrence of postprocedural pneumonia). Six trials (n = 600) showed improved 6-minute walk distance (mean difference [MD] 68.87 m; 95% CI: 12.76–124.98 m; P = 0.020). In 18 studies (n = 1,568), length of stay was shorter (MD -0.95 days; 95% CI: -1.77 to -0.13 days; P = 0.026) and meta-regression showed greater effect in studies including more women (P = 0.015). In 16 trials (n = 1,149), intensive care unit stay was reduced (MD -6.03 hours; 95% CI: -12.01 to -0.06 hours; P = 0.048). In 5 studies (n = 729), postprocedural pneumonia occurred less frequently (OR: 0.33; 95% CI: 0.15–0.72; P = 0.017). The analysis revealed substantial heterogeneity and risk of bias. Analysis of specific components showed no consistent effects.
CONCLUSIONS Prehabilitation before cardiac procedures may enhance preprocedural functional capacity and postprocedural recovery, particularly in women. Further multicenter studies are needed. (UACC Adv. 2026;5:102587) © 2026 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

A potrebujemo je?



ssova op.
spitaliazce



Měření síly stisku

- biomarker biologického věku a křehkosti (frailty)

Fountotos et al.
Handgrip Strength in Cardiac Surgery

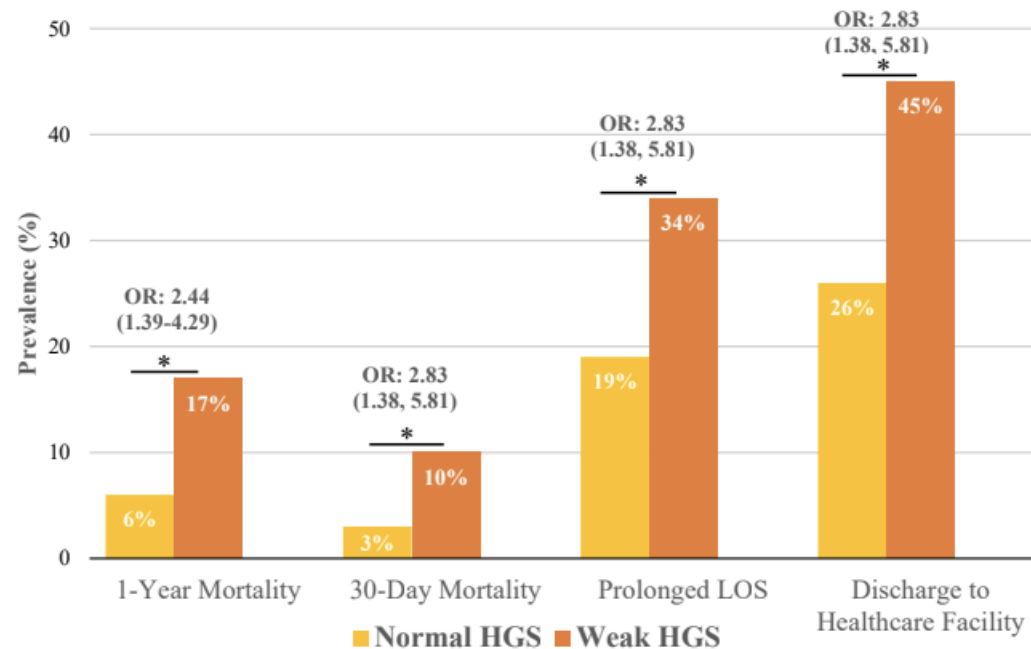


Figure 1. Postoperative outcomes according to handgrip strength (HGS) cutoff. Based on HGS cutoffs of 26 kg in men and 16 kg in women. * $P < 0.01$. **Bar height** represents incidence of outcomes. LOS, length of stay; OR, adjusted odds ratio (95% confidence interval).



Síla dolních končetin

- Test síly DKK – STS test (Sit-To-Stand)



Associations of Muscle Mass and Strength with All-Cause Mortality among US Older Adults

Normativní tabulka (počet vstanutí za 30 sekund)

Věková skupina	👩 ŽENY (průměrný počet)	👨 MUŽI (průměrný počet)
60 – 64 let	12 až 17	14 až 19
65 – 69 let	11 až 16	12 až 18
70 – 74 let	10 až 15	12 až 17
75 – 79 let	10 až 14	11 až 17
80 – 84 let	9 až 14	10 až 15
85 – 89 let	8 až 13	8 až 14
90 – 94 let	4 až 11	7 až 12

*U mladších ročníků (pod 60 let) by zdravý člověk měl bez problému zvládnout **více než 17 až 20 opakování.***

Proč je síla dolních končetin absolutně klíčová?



Jak se to projevilo?

Magnetická rezonance mozků ukázala rozdíly v:

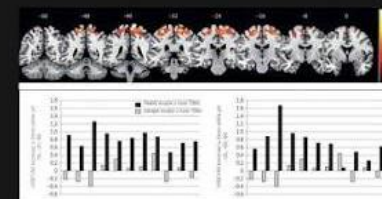
- objemu šedé hmoty
- aktivitě mozku
- funkci motorické kůry



V desetileté studii jednovaječných dvojčat měla sestra s vyšší silou dolních končetin lepší kognitivní výkon.

Stejné DNA, jiný výsledek.

Rozdíl? Svaly!



Každých **40 wattů navíc** ve svalové síle nohou znamenalo o **18 % nižší kognitivní stárnutí**.

A konkrétní čísla?

Mozek žen s lepší kondicí ukazoval hodnoty o 3,3 roku mladšího člověka.



- svaly na nohou jsou největší zásobárnou bílkovin v lidském těle

Observational Study > Gerontology. 2016;62(2):138-49. doi: 10.1159/000441029.
Epub 2015 Nov 10.

Kicking Back Cognitive Ageing: Leg Power Predicts Cognitive Ageing after Ten Years in Older Female Twins

Claire J Steves¹, Mitul M Mehta, Stephen H D Jackson, Tim D Spector

Affiliations + expand

PMID: 26551663 PMCID: PMC4789972 DOI: 10.1159/000441029

Výživa



Review > J Cardiothorac Vasc Anesth. 2018 Apr;32(2):762-770.

doi: 10.1053/j.jvca.2017.07.024. Epub 2017 Jul 24.

Phosphocreatine in Cardiac Surgery Patients: A Meta-Analysis of Randomized Controlled Trials

Fang Mingxing ¹, Giovanni Landoni ², Alberto Zangrillo ², Fabrizio Monaco ³, Vladimir V Lomivorotov ⁴, Cao Hui ¹, Maxim Novikov ⁵, Valery Nepomniashchikh ⁴, Evgeny Fominskiy ⁶

Affiliations + expand

PMID: 29409711 DOI: [10.1053/j.jvca.2017.07.024](https://doi.org/10.1053/j.jvca.2017.07.024)

> EF

↓ dávky vazopresorů,

↓ nižší výskyt arytmií

Creatine and Perioperative Brain Health (CREATE)

ClinicalTrials.gov ID ⓘ NCT07310043

Sponsor ⓘ Massachusetts General Hospital

Information provided by ⓘ Susana Vacas, MD, PhD, Massachusetts General Hospital (Responsible Party)

Last Update Posted ⓘ 2026-08-10

Delirium ↓



► Nutrients. 2024 Oct 28;16(21):3665. doi: [10.3390/nu16213665](https://doi.org/10.3390/nu16213665)

Effects of Creatine Supplementation and Resistance Training on Muscle Strength Gains in Adults <50 Years of Age: A Systematic Review and Meta-Analysis

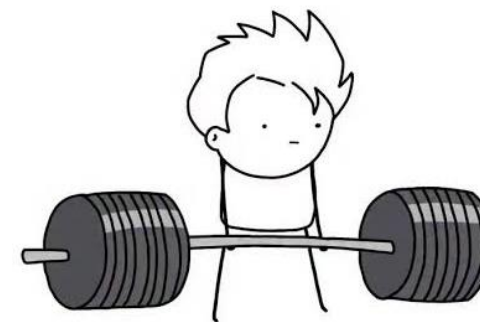
Ziyu Wang ^{1,†}, Bopeng Qiu ^{2,†}, Ruoling Li ¹, Yunzhi Han ³, Carl Petersen ⁴, Shuting Liu ², Yinkai Zhang ^{5,*}, Chang Liu ^{6,*}, Darren G Candow ⁷, Juan Del Coso ^{8,*}

Editor: Alaa El-Din A Bekhit

► Author information ► Article notes ► Copyright and License

PMCID: PMC11547435 PMID: [39519498](https://pubmed.ncbi.nlm.nih.gov/39519498/)

Tall Guy : 1 Month



ERAS - prehabilitace



A jak to celé udělat?

Article

Telemedicine/Telerehabilitation to Expand Enhanced Recovery After Surgery Interventions in Minimally Invasive Mitral Valve Surgery

Pietro Giorgio Malvindi ^{1,*}, Maria Gabriella Ceravolo ², Marianna Capecci ², Stefania Balestra ³, Emanuela Cini ³, Antonia Antonello ⁴, Lucia Pepa ⁵, Antonella Carbonetti ³, Maurizio Ricci ³, Paolo Berretta ¹, Francesca Mazzocca ¹, Marco Fioretti ¹, Umberto Volpe ⁶, Christopher Munch ⁷ and Marco Di Eusanio ¹

¹ Cardiac Surgery Unit, Azienda Ospedaliero Universitaria delle Marche, Polytechnic University of Marche, 60126 Ancona, Italy

² Neurorehabilitation Clinic, Department of Experimental and Clinical Medicine, Azienda Ospedaliero Universitaria delle Marche, Polytechnic University of Marche, 60126 Ancona, Italy

³ Rehabilitation Unit, Azienda Ospedaliero Universitaria delle Marche, 60126 Ancona, Italy; emanuela.cini@ospedaleiriuniti.marche.it (E.C.)

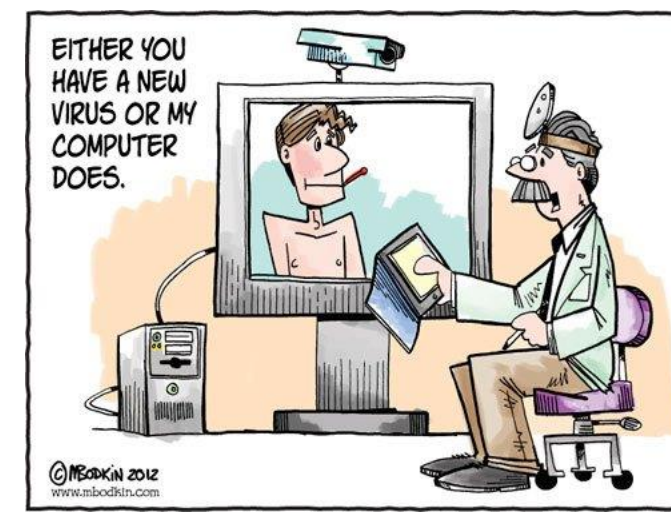
⁴ Department of Experimental and Clinical Medicine, Polytechnic University of Marche, 60126 Ancona, Italy; a.antonello@outlook.it

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* Correspondence: pg.malvindi@hotmail.com; Tel.: +39-0715965340



Mein Aufenthalt in der Klinik Tag 5

TAGESZIEL:

Ankleiden ☐ ja ☐ nein Gewicht (morgens): kg

Bewegung

Min. im Sitzen
(z. B. Sitzen am Stuhl, Sitzen in der Cafeteria, Sitzen auf einer Parkbank)

Min. im Stehen (inklusive Tätigkeiten im Stehen, z. B. Duschen, Zähneputzen, ...)

Min. Gehen innerhalb des Gebäudes

Min. Gehen außerhalb des Gebäudes

Min. Gesamtzeit außerhalb des Betts

Treppe ☐ ja ☐ nein Wenn ja, Anzahl Stufen:

Sonstige Übungen? Wenn ja, welche:

Anstrengungsempfinden

Atmung/Dyspnoe

50

Befinden

Schmerzen

Übelkeit

Erbrechen: ☐ ja ☐ nein

Trinken und Ernährung

Trinkmenge:

Proteindrinks:

Frühstück:

Mittag:

Abendbrot:

51



Analgezie

- Cíl: snížit dávky sufentanilu
- Jak: Multimodální anestezie, (OFA)
- PROČ?

- Dech.útlum
- Sval. Rigidita
- Nevolnost

- imunomodulační účinky: μ -receptory jsou i na povrchu imunitních bb.
- inhibice NK bb. (klíčová součást v boji proti virům)
 - potlačení fce T-Ly a makrofágů (omezení schopnosti fce fagocytózy)



Vyšší riziko NN

1. Periferní nervové blokády hrudní stěny

> [Reg Anesth Pain Med](#). 2026 Jun 25:rapm-2026-107773. doi: 10.1136/rapm-2026-107773.

Online ahead of print.

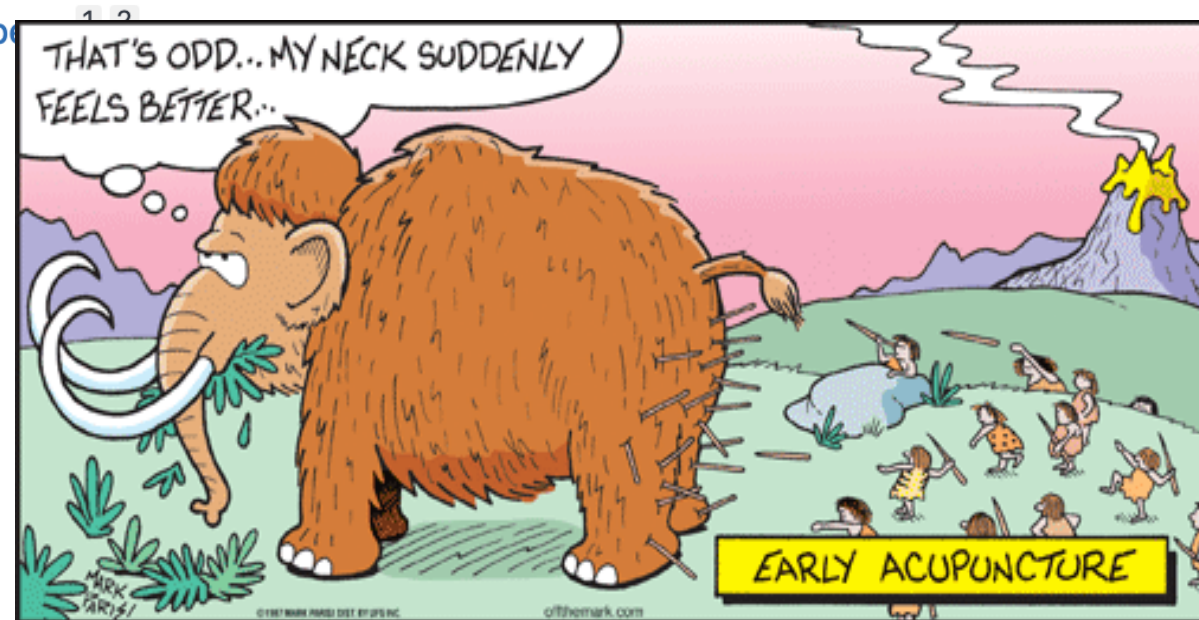
Analgesic efficacy of locoregional anesthesia techniques in cardiac surgery: a systematic review and network meta-analysis of randomized trials

Maxime Dejaegere¹, Jules Vandepitte¹, Jef Van den Eynde², Steve Coppes^{1,2},
Wouter Oosterlinck^{2,3}, Steffen Rex^{1,2}, Danny Feike Hoogma^{4,2}

Affiliations + expand

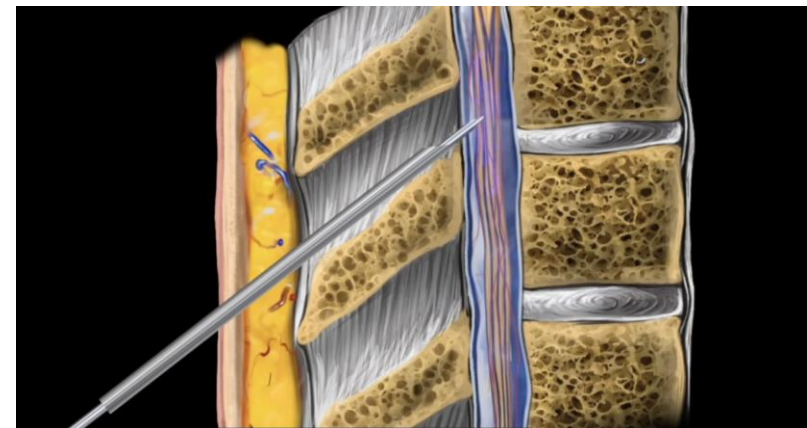
PMID: 42350062 DOI: [10.1136/rapm-2026-107773](https://doi.org/10.1136/rapm-2026-107773)

• **Která analgetická technika nabízí největší benefit?**



1. Spinální analgezie

- Největší benefit stran spotřeby opioidů
- Nejlepší výsledky v skórovacích systémech
- (Hydrofilní morfin)

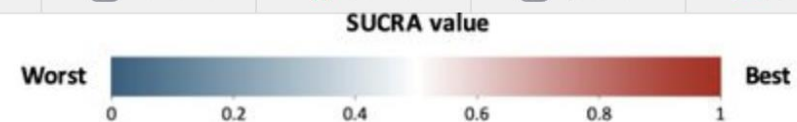


2. Hrudní epidurální analgezie

- Jediná metoda, která vedla k signifikantnímu snížení doby hospitalizace

3. ESPB

- Také signifikantně snižuje množství podaných opioidů, ale méně než ↑



	Control	IT	ESPB	PIPB	ICNB	LIA	TEA	SAPB	PVB	PSP	IP
24h opioid consumption	0.123	0.888	0.669	0.457	0.588	0.543	0.475	0.310	0.448	NA	NA
VAS 0h at rest	0.223	0.810	0.499	0.459	0.556	NA	0.391	NA	0.389	0.790	0.383
VAS 2h at rest	0.176	0.707	0.461	0.751	0.454	NA	NA	0.481	NA	0.471	NA
VAS 6h at rest	0.162	0.750	0.457	0.515	0.492	0.118	0.508	0.607	0.588	0.662	0.642
VAS 12h at rest	0.178	0.724	0.512	0.595	0.352	0.301	0.654	0.577	0.456	0.549	0.603
VAS 24h at rest	0.143	0.809	0.566	0.408	0.548	0.537	0.600	0.572	0.493	0.325	NA
Time to first rescue analgesia	0.248	0.668	0.636	0.648	0.517	0.152	NA	0.568	NA	0.564	NA
ICU length of stay	0.291	0.383	0.746	0.692	0.391	0.163	0.854	0.372	0.541	0.486	0.579
Hospital length of stay	0.296	0.408	0.208	0.555	0.606	0.411	0.846	0.564	0.586	NA	0.521

9816 pacientů

No major block –
related complications
were reported



DOPORUČENÍ PRO LÉČBU TOXICKÉ REAKCE PO PODÁNÍ LOKÁLNÍCH ANESTETIK

Pracovní skupina

Cvachovec Karel
Černý Vladimír
Doležal David
Herold Ivan
Horáček Michal
Kříkava Ivo
Ševčík Pavel



Local anesthetic	Plain		With epinephrine	
	Maximum dose	Maximum dose	Maximum dose	Maximum dose
Bupivacaine	2 mg·kg ⁻¹	175 mg	3 mg·kg ⁻¹	225 mg
Levobupivacaine	2 mg·kg ⁻¹	200 mg	3 mg·kg ⁻¹	225 mg
Lidocaine	5 mg·kg ⁻¹	350 mg	7 mg·kg ⁻¹	500 mg
Mepivacaine	5 mg·kg ⁻¹	350 mg	7 mg·kg ⁻¹	500 mg
Ropivacaine	3 mg·kg ⁻¹	200 mg	3 mg·kg ⁻¹	250 mg
Prilocaine	6 mg·kg ⁻¹	400 mg	8 mg·kg ⁻¹	600

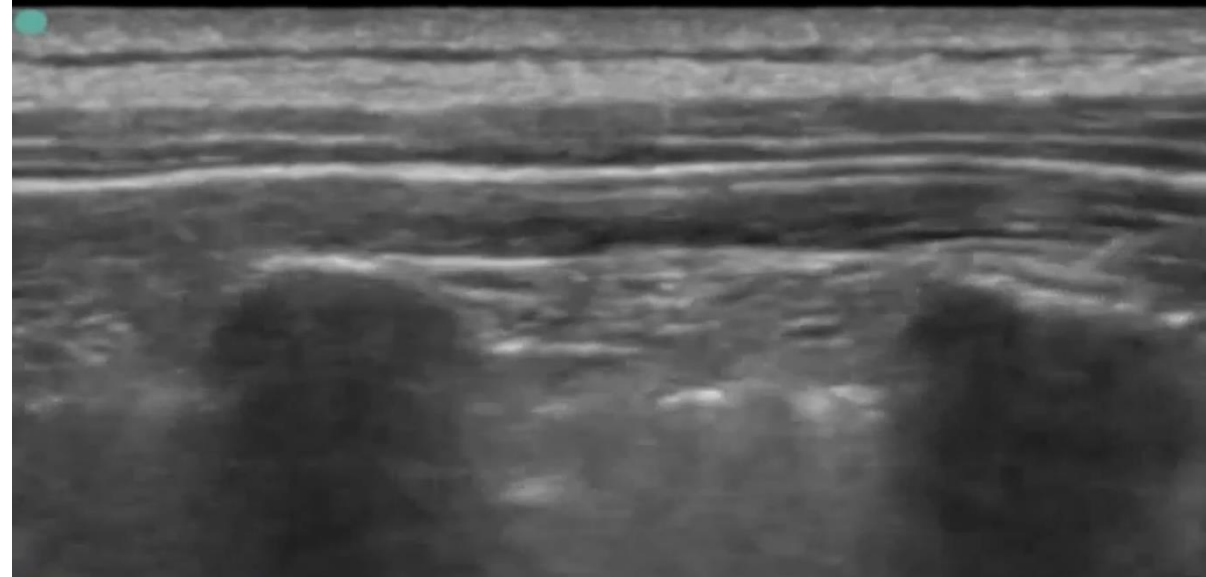
Paravertebrální blokáda



- Před / po
- Mimo místo op. rány
- Vysoce efektivní (má zkušenost)



- Rotace na bok
- Časově i technicky náročná metoda
- Víceetážový přístup
- Rizikovost (pleura, krvácení)



Erector spinae plane blok



- Před / po
- Mimo místo op. rány
- Jednoduché provedení



- Rotace na bok
- efektivita ?
(nepokrývá přední míšní větve)



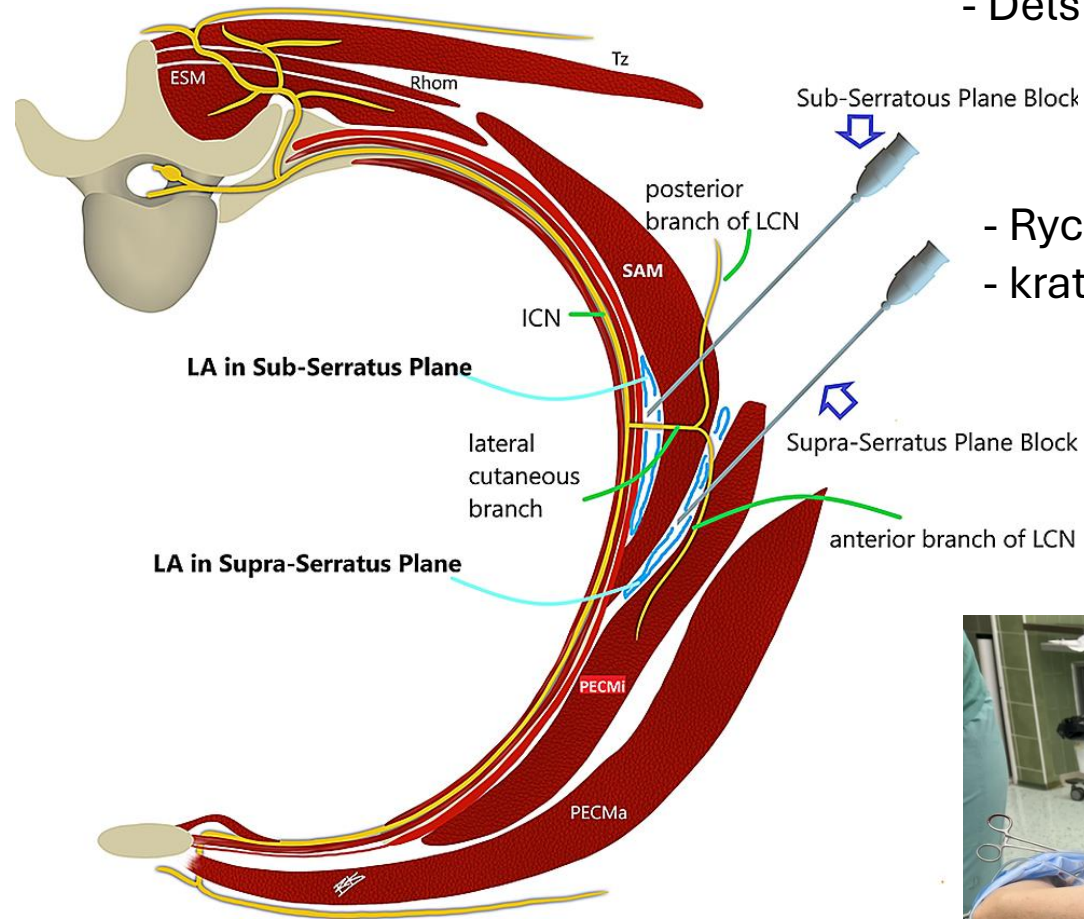
Serratus anterior plane blok



- Jednoduché provedení
- Supinní poloha
- bezpečný



- Čistě somatický blok
- Zasahuje do op. rány

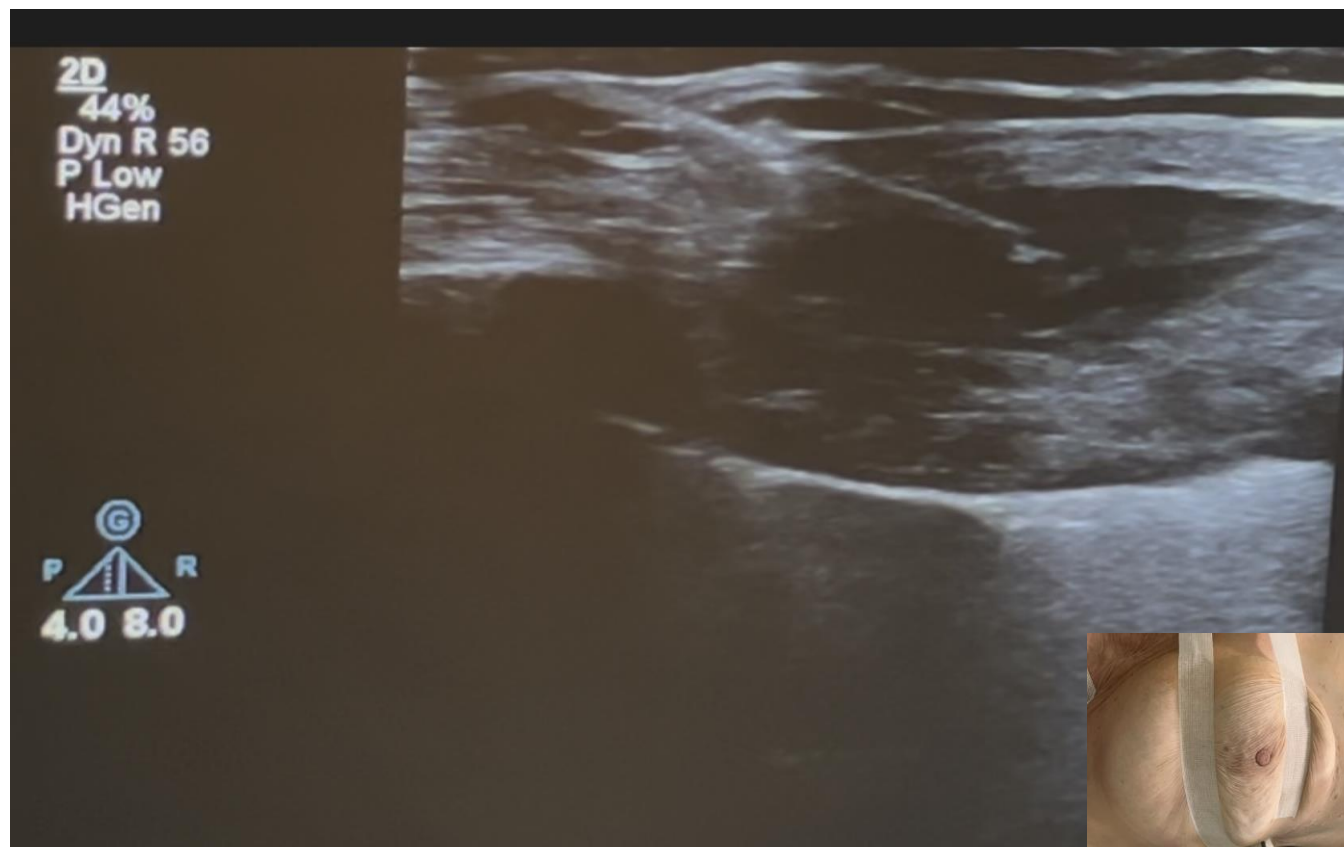
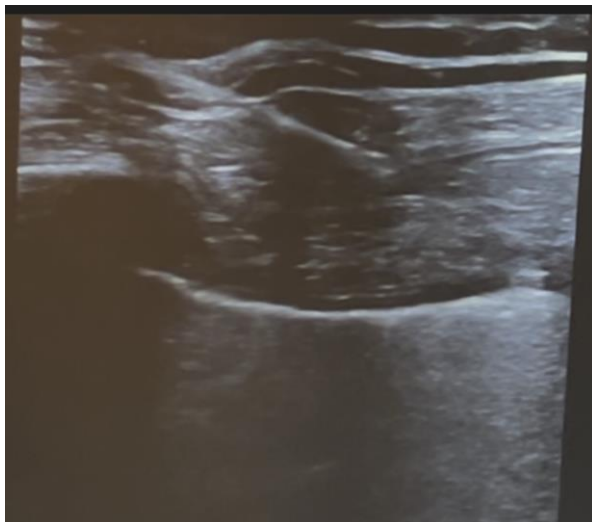
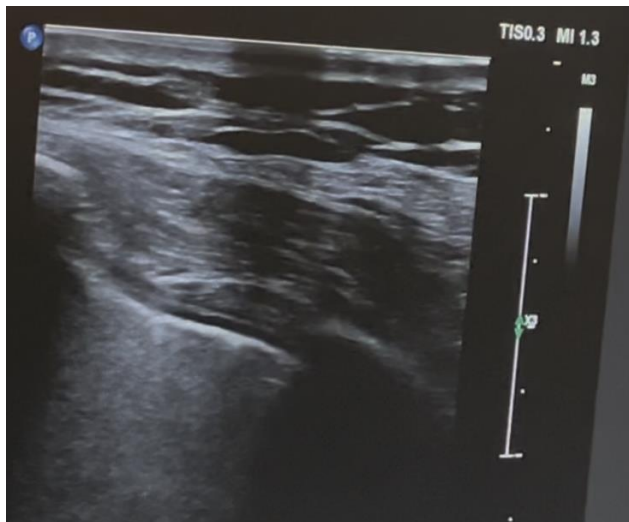


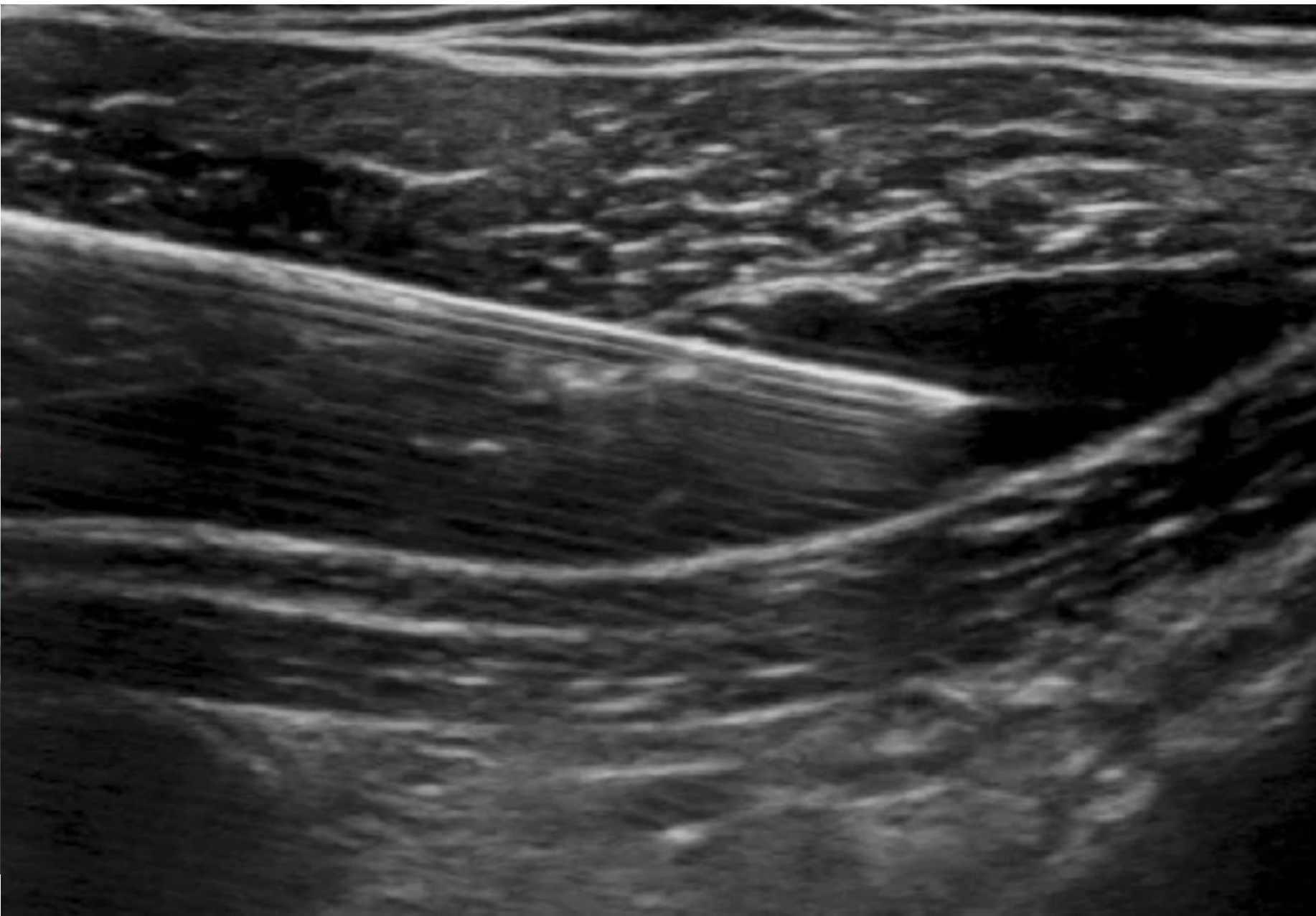
- Pomalejší nástup
- Delší trvání

- Rychlejší nástup
- kratší trvání





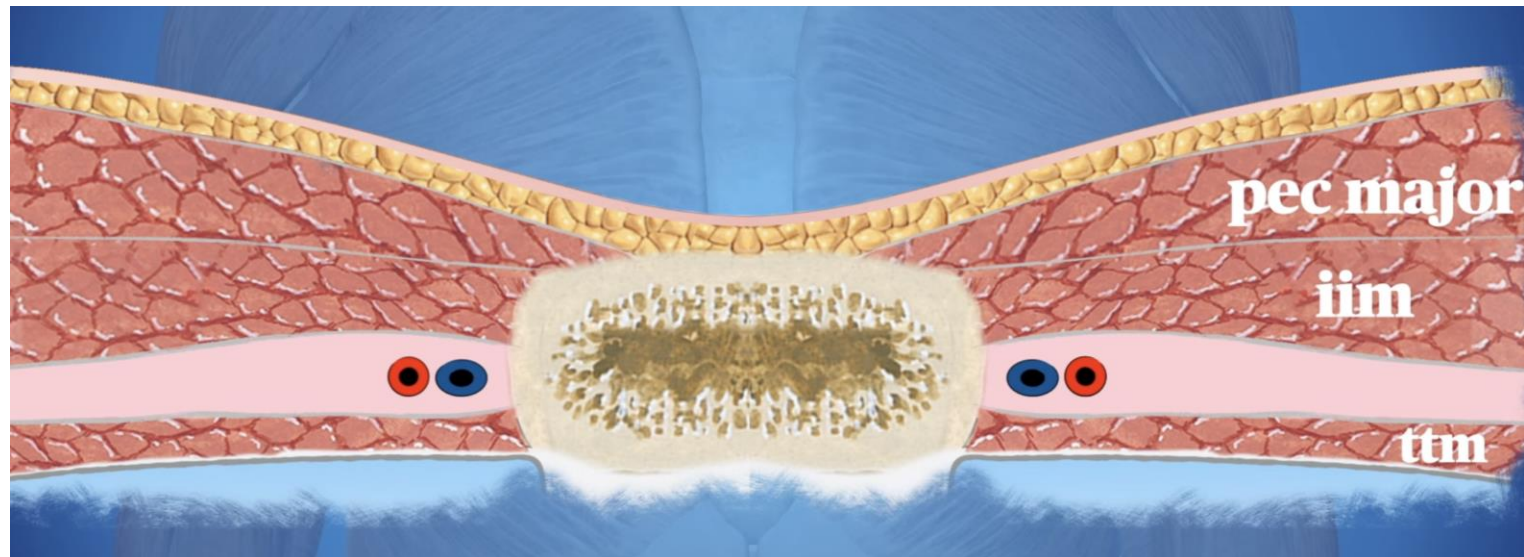




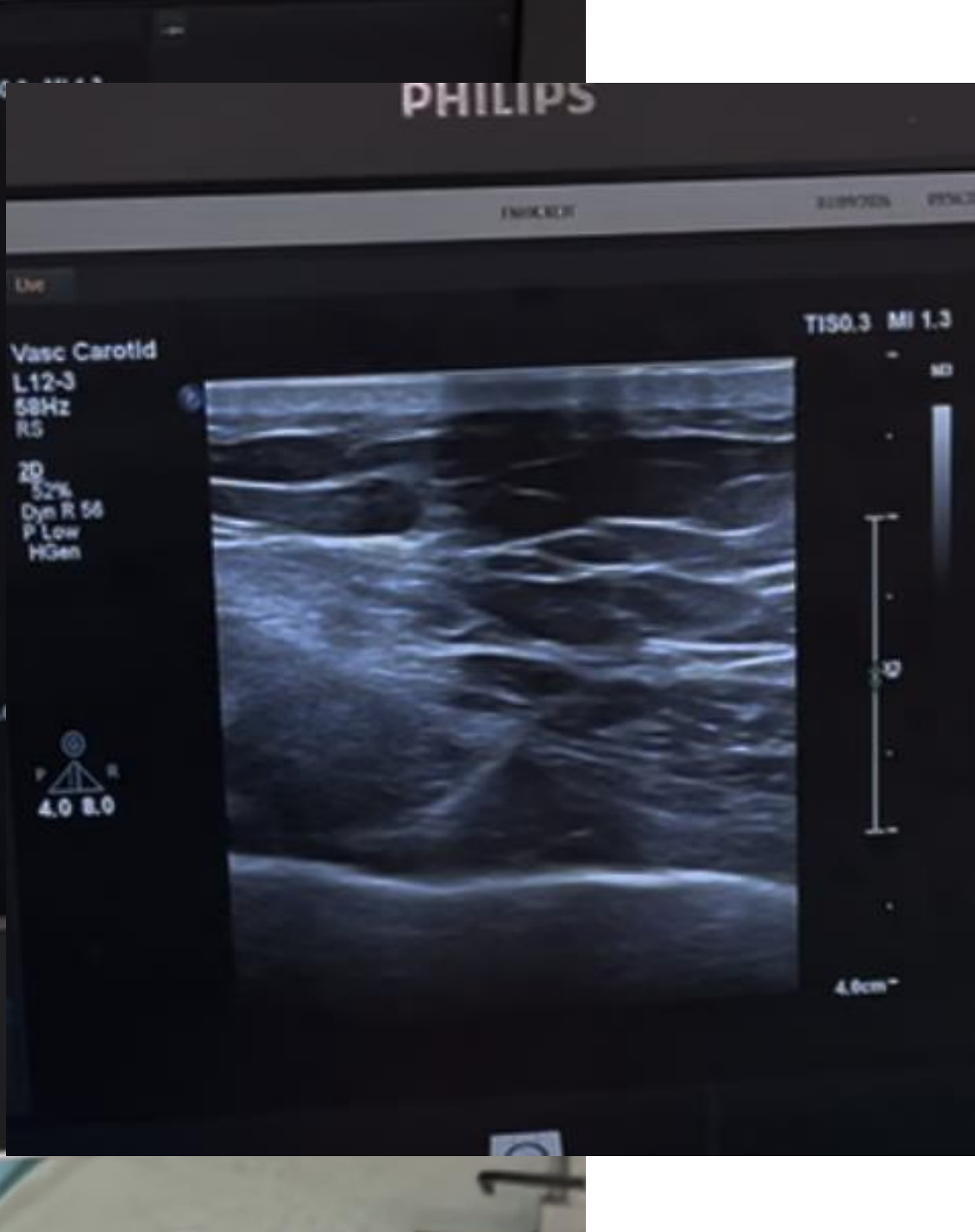
10-15ml 0,25% levobupivacain → PECS + 20ml 0,25 % levobupivacain Serratus

A co se sternotomií (ministernotomií)?

- Parasternální blok
 - A) povrchová varianta
 - mezi m.pect.maj. a mezižeburní svaly
 - B) hluboká varianta (transversus thoracic plane blok)
 - mezi mezižeburní svaly a m. transversus thoracis







Plán B

- Dexmedetomidin

- non-opioidní analgetikum, sedativum
- α_2 – selektivní agonista
- ↑ perioperační užití

Clinical Hemorheology and Microcirculation 89 (2025) 15–25
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IOS Press

Dexmedetomidine-isoﬂurane versus fentanyl-isoﬂurane anesthesia for colorectal surgery: Effect on perianastomotic microperfusion and oxygenation in pigs

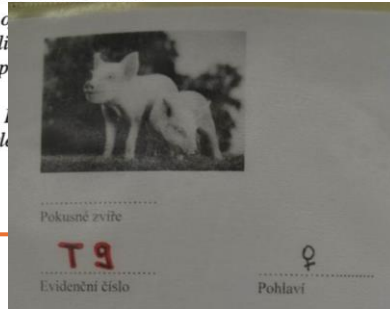
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^aDepartment of Anesthesiology and Intensive Care, Faculty of Medicine, Charles University, Hradec Kralove, Czech Republic

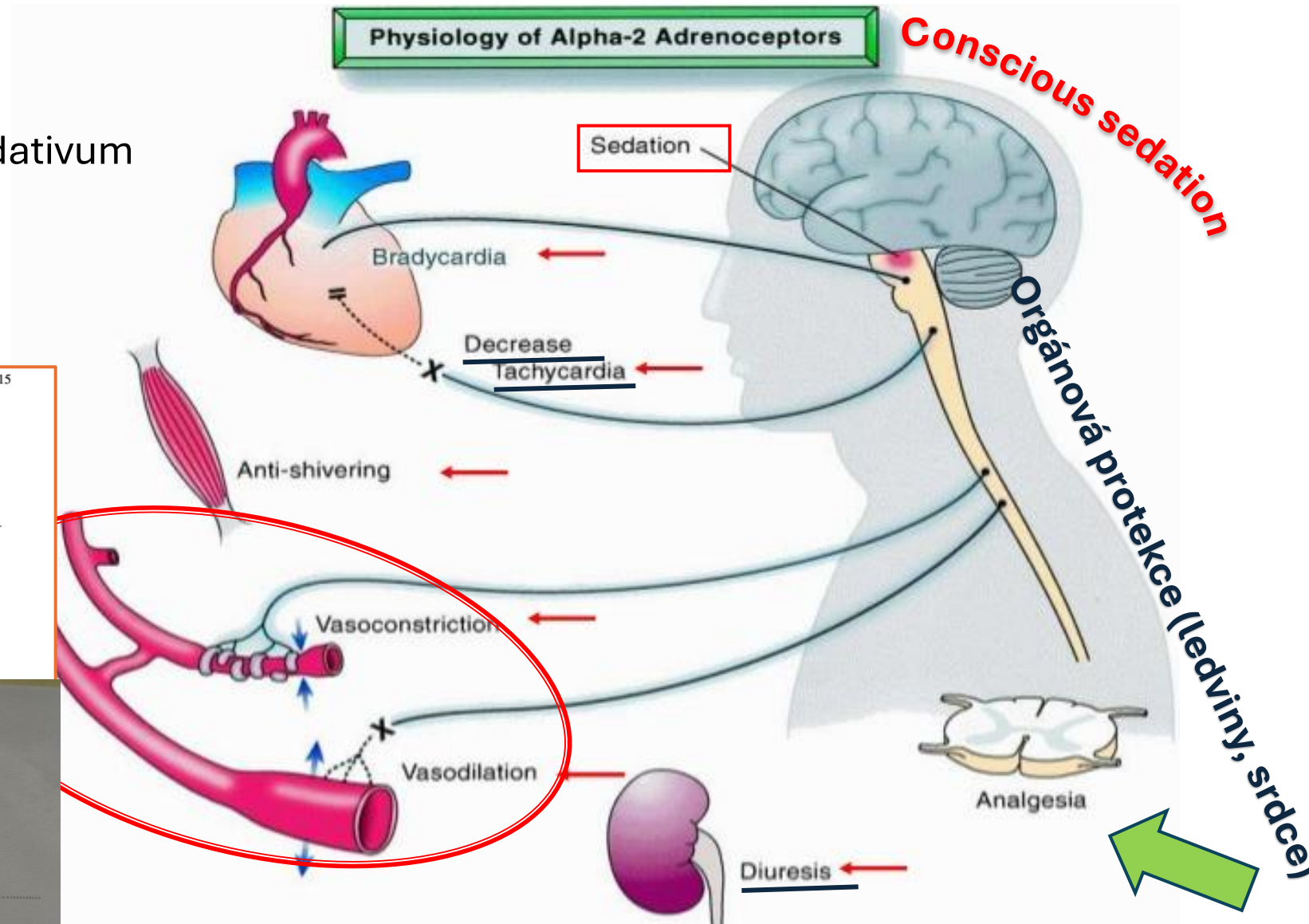
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Anesteziologický protokol

1. Paracetamol
2. Dexamethason
3. Dexmedetomidin (200ug / 50ml F1/1) –
4. Propofol – v redukované dávce a perfuz
5. Sufentanil („max.“ 100ug....kont., TCI) i
6. Rocuronium (TOF)
7. OTI (selektivní plicní ventilace u miniinv
8. Sevofluran (MAC 0,6)
9. CŽK, PMK, NGS, (TOE + ECC kanyla)
10. PNB (začátek x konec ?)
11. Extubace na sále (It has to be dry, it has



Pro koho ERAS?



„Jestliže existuje nějaké tajemství úspěchu, pak spočívá ve schopnosti postavit se na místo druhého a vidět všechno jak svými, tak i jeho očima.“

Děkuji za pozornost