LIMITACE SAVR

Komentář kardiochirurga

Štěpán ČERNÝ
Nemocnice Na Homolce
Praha

Limitace SAVR

A Decade of Randomized Clinical Trials….

Journal of *Clinical Medicine*

MDPI

Article

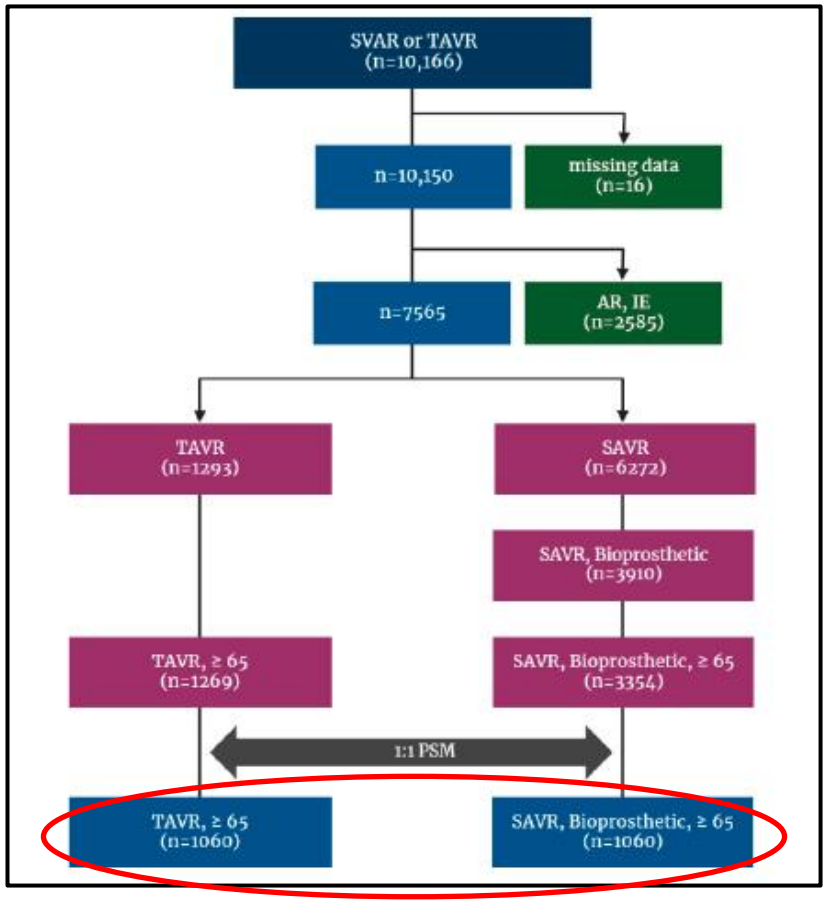
Real-World Comparison of Transcatheter Versus Surgical Aortic Valve Replacement in the Era of Current-Generation Devices

Young Kyoung Sa [1], Byung-Hee Hwang [2], Woo-Baek Chung [2], Kwan Yong Lee [2], Jungkuk Lee [3], Dongwoo Kang [3], Young-Guk Ko [4], Cheol Woong Yu [5], Juhan Kim [6], Seung-Hyuk Choi [7], Jang-Whan Bae [8], In-Ho Chae [9], Yun-Seok Choi [2], Chul Soo Park [1], Ki Dong Yoo [10], Doo Soo Jeon [11], Hyo-Soo Kim [12], Wook-Sung Chung [2] and Kiyuk Chang [2,*]

Kyoung Sa Y et al: Clin Med 2023;12:571

Limitace SAVR

A Decade of Randomized Clinical Trials....



Kyoung Sa Y et al: Clin Med 2023;12:571

Limitace SAVR

A Decade of Randomized Clinical Trials....

	TAVR $n = 1060$	SAVR $n = 1060$	SMD	p-Value
Age (mean ± SD)	79.1 ± 4.8	78.9 ± 4.6		0.279
(median, IQR) *	79, 6	79, 6	0.047	0.203
Age categories			−0.019	1.000
65~79	538 (50.8)	568 (53.4)		
≥80	522 (49.2)	502 (47.4)		
Female	557 (52.5)	557 (52.5)	0	1.000
Hypertension	989 (93.3)	990 (93.4)	0.001	0.931
Diabetes	727 (68.6)	742 (70.0)	0.014	0.480

Kyoung Sa Y et al: Clin Med 2023;12:571

Limitace SAVR

Limitace SAVR z pohledu intervenčního kardiologa….

- Riziko a invazivita operačního výkonu
- CMP, FIS, krvácení
- PPM – patient prosthesis mismatch

Limitace SAVR

Limitace SAVR z pohledu intervenčního kardiologa….

- **Riziko a invazivita operačního výkonu**
- **CMP, FIS, krvácení**
- PPM – patient prosthesis mismatch

Limitace SAVR

Trend and early outcomes in isolated surgical aortic valve replacement in the United Kingdom

Jeremy Chan[1], Arnaldo Dimagli[1], Daniel P. Fudulu[1], Shubhra Sinha[1], Pradeep Narayan[1,2], Tim Dong[1] and Gianni D. Angelini[1]*

[1]Bristol Heart Institute, University of Bristol, Bristol, United Kingdom, [2]NH Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata, India

Chan J et al: Front Cardiovasc Med 2023;9:1077279

Limitace SAVR

Nemocniční/30 denní mortalita

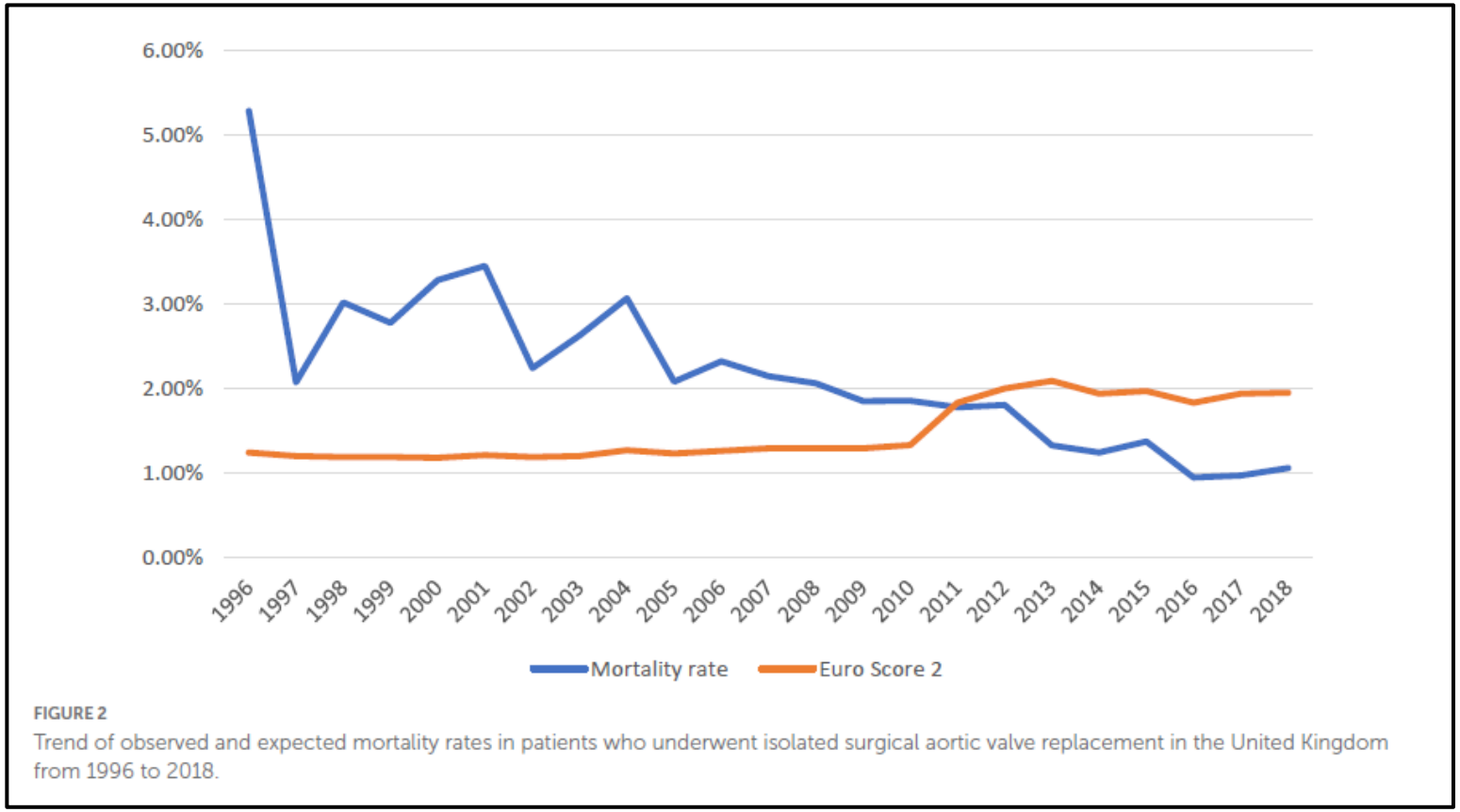
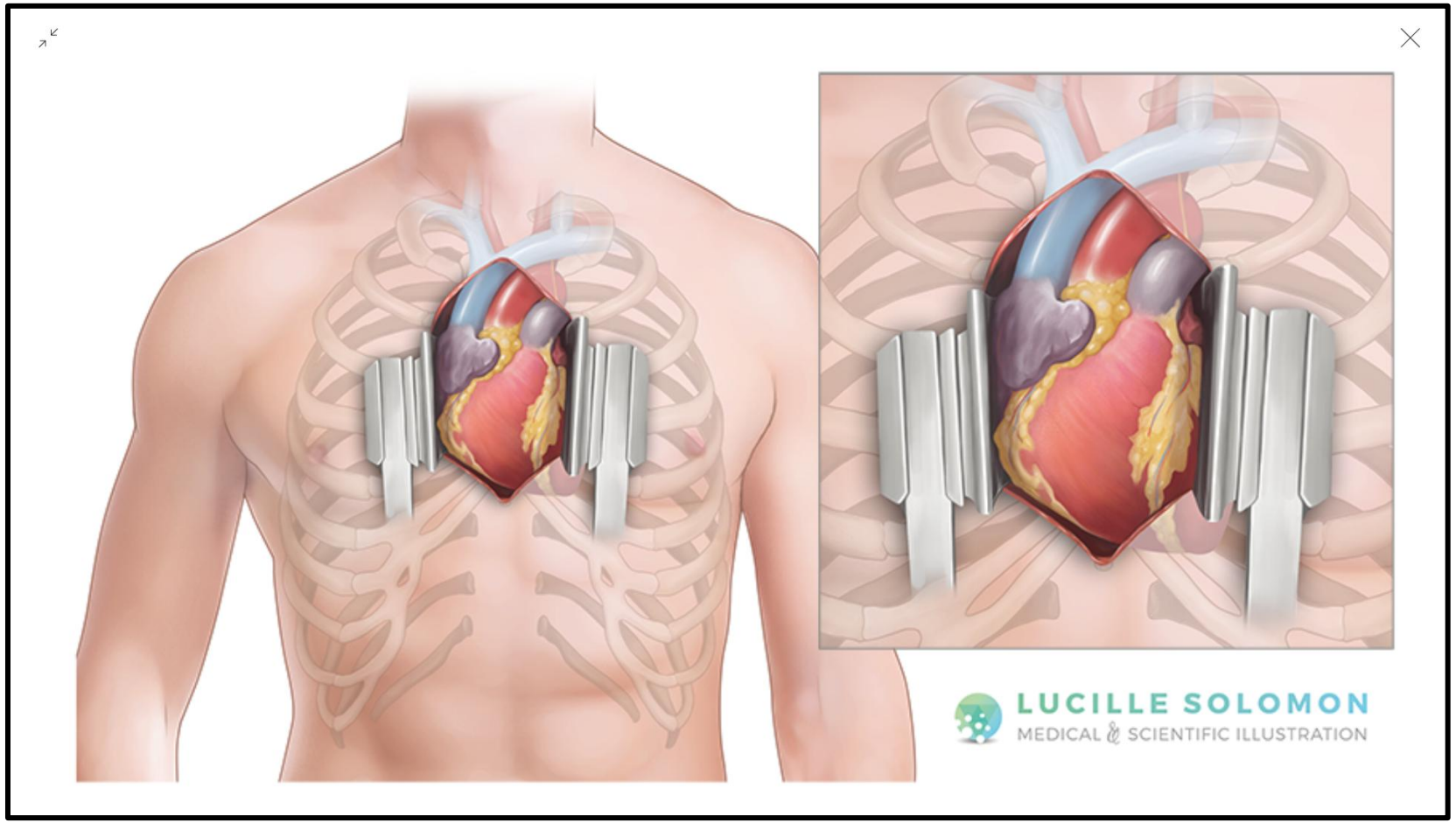


FIGURE 2
Trend of observed and expected mortality rates in patients who underwent isolated surgical aortic valve replacement in the United Kingdom from 1996 to 2018.

Chan J et al: Front Cardiovasc Med 2023;9:1077279

Limitace SAVR

SAVR = STERNOTOMIE



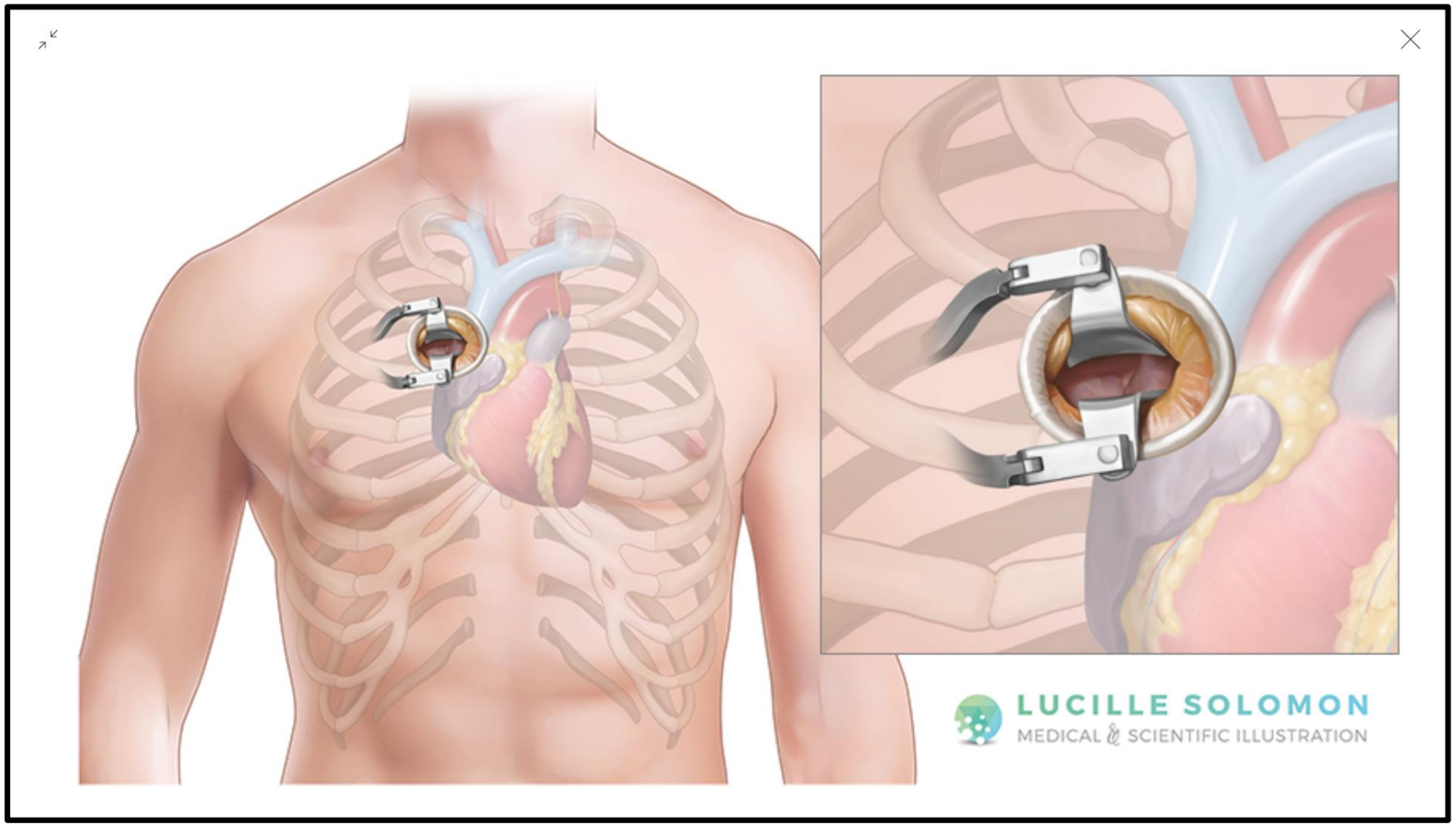
Limitace SAVR

SAVR = STERNOTOMIE

STŘEDNÍ STERNOTOMIE – DEHISCENCE 2-5%

Limitace SAVR

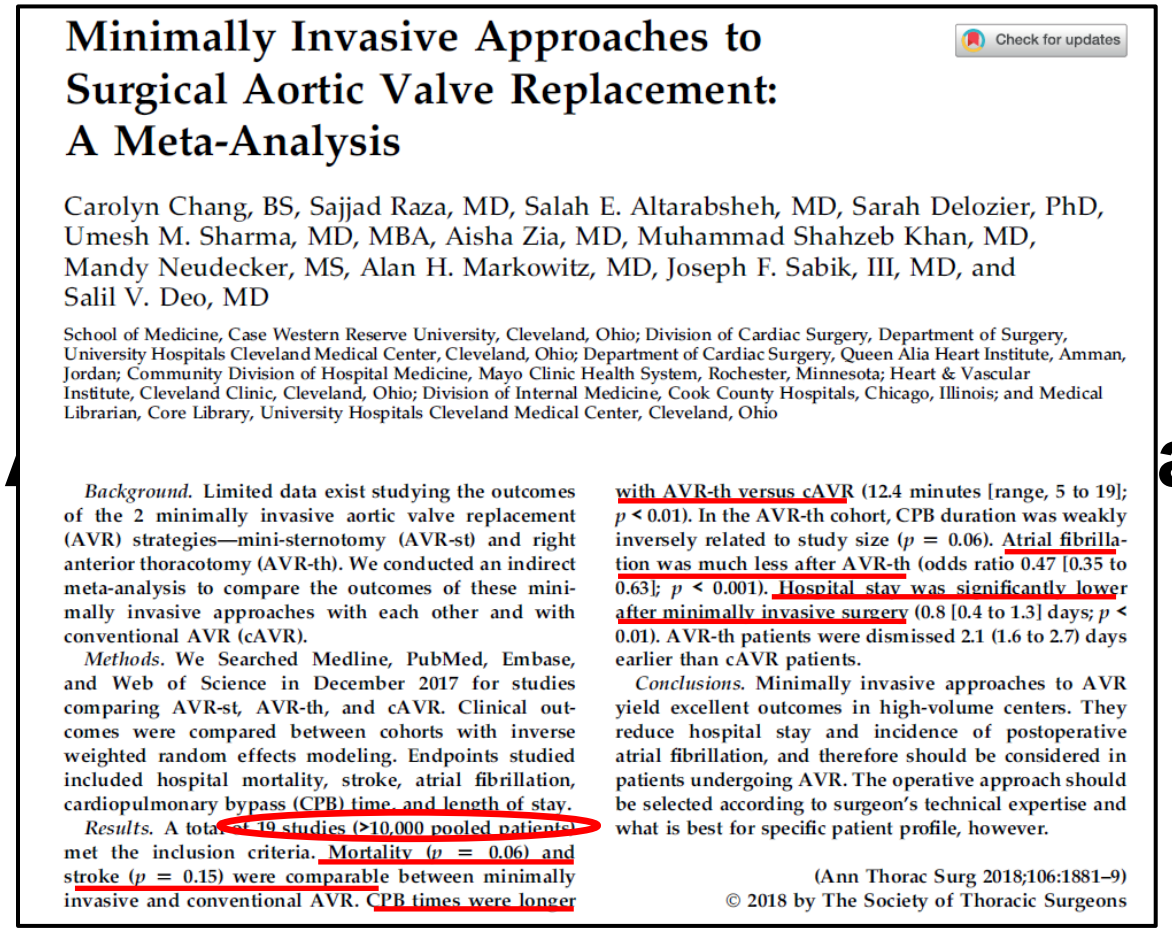
Budoucnost SAVR = minivazivita = RAT atd



Limitace SAVR

Budoucnost SAVR = minivazivita = RAT atd

mini A at???



Minimally Invasive Approaches to Surgical Aortic Valve Replacement: A Meta-Analysis

Check for updates

Carolyn Chang, BS, Sajjad Raza, MD, Salah E. Altarabsheh, MD, Sarah Delozier, PhD, Umesh M. Sharma, MD, MBA, Aisha Zia, MD, Muhammad Shahzeb Khan, MD, Mandy Neudecker, MS, Alan H. Markowitz, MD, Joseph F. Sabik, III, MD, and Salil V. Deo, MD

School of Medicine, Case Western Reserve University, Cleveland, Ohio; Division of Cardiac Surgery, Department of Surgery, University Hospitals Cleveland Medical Center, Cleveland, Ohio; Department of Cardiac Surgery, Queen Alia Heart Institute, Amman, Jordan; Community Division of Hospital Medicine, Mayo Clinic Health System, Rochester, Minnesota; Heart & Vascular Institute, Cleveland Clinic, Cleveland, Ohio; Division of Internal Medicine, Cook County Hospitals, Chicago, Illinois; and Medical Librarian, Core Library, University Hospitals Cleveland Medical Center, Cleveland, Ohio

Background. Limited data exist studying the outcomes of the 2 minimally invasive aortic valve replacement (AVR) strategies—mini-sternotomy (AVR-st) and right anterior thoracotomy (AVR-th). We conducted an indirect meta-analysis to compare the outcomes of these minimally invasive approaches with each other and with conventional AVR (cAVR).

Methods. We Searched Medline, PubMed, Embase, and Web of Science in December 2017 for studies comparing AVR-st, AVR-th, and cAVR. Clinical outcomes were compared between cohorts with inverse weighted random effects modeling. Endpoints studied included hospital mortality, stroke, atrial fibrillation, cardiopulmonary bypass (CPB) time, and length of stay.

Results. A total of 19 studies (>10,000 pooled patients) met the inclusion criteria. Mortality ($p = 0.06$) and stroke ($p = 0.15$) were comparable between minimally invasive and conventional AVR. CPB times were longer with AVR-th versus cAVR (12.4 minutes [range, 5 to 19]; $p < 0.01$). In the AVR-th cohort, CPB duration was weakly inversely related to study size ($p = 0.06$). Atrial fibrillation was much less after AVR-th (odds ratio 0.47 [0.35 to 0.63]; $p < 0.001$). Hospital stay was significantly lower after minimally invasive surgery (0.8 [0.4 to 1.3] days; $p < 0.01$). AVR-th patients were dismissed 2.1 (1.6 to 2.7) days earlier than cAVR patients.

Conclusions. Minimally invasive approaches to AVR yield excellent outcomes in high-volume centers. They reduce hospital stay and incidence of postoperative atrial fibrillation, and therefore should be considered in patients undergoing AVR. The operative approach should be selected according to surgeon's technical expertise and what is best for specific patient profile, however.

(Ann Thorac Surg 2018;106:1881–9)
© 2018 by The Society of Thoracic Surgeons

Chang C et al: Ann Thorac Surg 2018;106:1881-9

Limitace SAVR

Budoucnost SAVR = minivazivita = RAT atd

- „Learning curve“
- Delší CPB a svorku
- Kratší pobyt na OS
- Kratší doba UPV a pobytu na JIP
- Méně FiS
- Žádné rané komplikace
- Kratší doba hospitalizace

Limitace SAVR

Budoucnost SAVR = minivazivita = RAT atd

Robotic Aortic Valve Replacement: First 50 Cases

Lawrence M. Wei, MD, Chris C. Cook, MD, J. W. Awori Hayanga, MD, MPH, J. Scott Rankin, MD, Christopher E. Mascio, MD, and Vinay Badhwar, MD

Department of Cardiovascular and Thoracic Surgery, West Virginia University, Morgantown, West Virginia

ABSTRACT

BACKGROUND Existing management challenges in selecting transcatheter vs surgical aortic valve replacement (SAVR) include bicuspid stenosis, low clinical risk, horizontal valve position, aortic insufficiency (AI), and need for concomitant procedures or mechanical valves. To address these gaps, we present our early experience with fully robotic-assisted aortic valve replacement (RAVR).

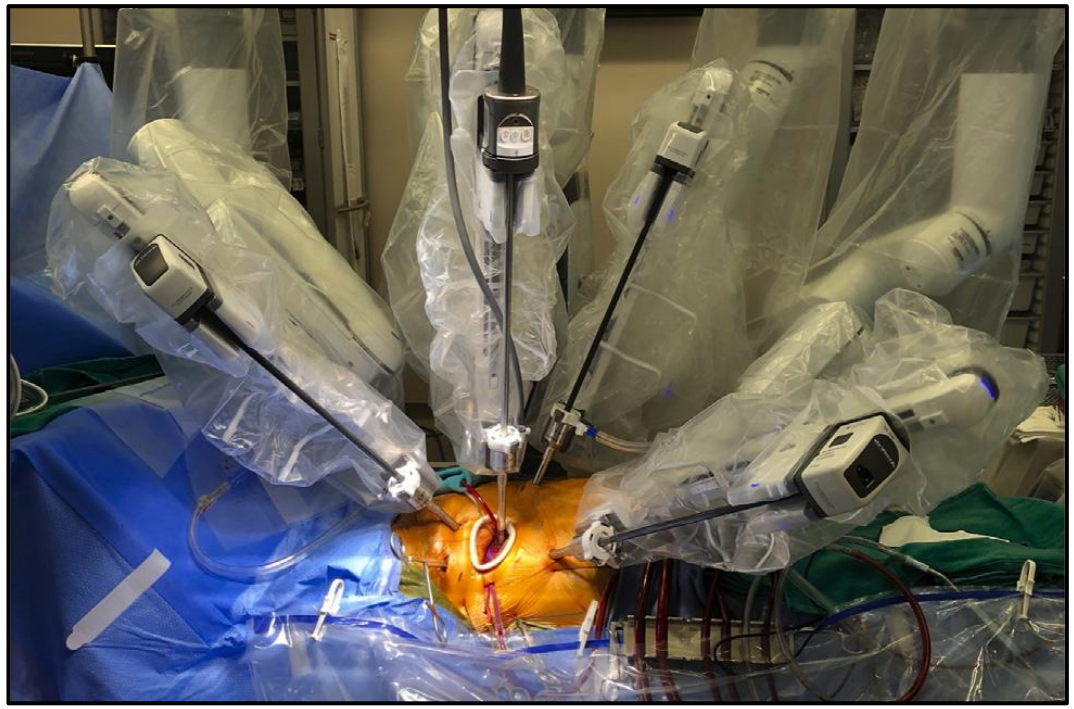
METHODS Between January 2020 and February 2021, 50 consecutive RAVR operations were performed using a 3- to 4-cm lateral mini-thoracotomy 3-port technique with transthoracic aortic clamping, similar to our robotic mitral platform. Conventional SAVR prostheses were implanted with interrupted braided sutures in all cases.

RESULTS The 50 patients were a median age of 67.5 years, body mass index was 29 kg/m^2, calcified bicuspid disease was present in 28 (56%), and severe AI in 8 (16%). Ejection fraction was 0.55 ± 0.08 (mean ± SD), and The Society of Thoracic Surgeons predicted risk of mortality was 1.54% ± 0.7%. Mechanical prostheses were used in 16 of 50 (32%), and 7 required concomitant procedures, including Cox maze in 3, aortic root enlargement in 2, and left atrial appendage clipping, mitral repair, and left atrial myxoma excision in 1 each. Median times (minutes) were 166 for cardiopulmonary bypass, 117 for cross-clamp, 4 for valvectomy, 20 for annular sutures, and 31 for aortotomy closure. All times plateaued after the initial 5 cases. Extubation occurred in 42 of 50 patients (84%) in the operating room, and within 4 hours in the remaining 8 (16%). There was no 30-day operative mortality or stroke. All had 30-day echocardiography demonstrating no valvular or perivalvular abnormalities.

CONCLUSIONS RAVR appears to have procedural safety and short-term outcomes to rival alternatives. Incremental experience may facilitate the safe performance of concomitant procedures as deemed necessary.

(Ann Thorac Surg 2021;■:■-■)

© 2021 by The Society of Thoracic Surgeons



Wei L et al: Ann Thorac Surg 2022;114:720-726

Limitace SAVR

MITRÁLNÍ CHLOPEŇ –
30 denní kosmetický efekt

Zachování integrity hrudního koše

Návrat k plné fyzické aktivitě obvykle během 2 týdnů

Limitace SAVR

VIDEO: S laskavým svolením prof. Badhwar, West Virginia University

ROBOTICKÁ AVR

- MUŽ 76 LET
- Symptomatická aortální stenóza, stopová až mírná aortální regurgitace
- Stále velmi aktivní (farmář)
- Lateralní přístup: Kamera a pracovní port ve 4 MZŽ

Limitace SAVR

Robotic AVR Early Results

- 225 cases January 2020 – May 2022
- 97% OR extubation
- Incremental increase in co-morbid risk
- Additional concomitant procedures – Aortic root enlargement with patch, MV repair, MV replacement for MS, full Cox Maze, TV repair
- Institutional Multidisciplinary Heart Team now views RAVR as preferred option for low to intermediate risk

DATA: Courtesy of prof. Badhwar, West Virginia University

Limitace SAVR

Limitace SAVR z pohledu intervenčního kardiologa….

- Riziko a invazivita operačního výkonu
- CMP, FIS, krvácení
- PPM – patient prosthesis mismatch

Limitace SAVR

Limitace SAVR z pohledu intervenčního kardiologa….

- Riziko a invazivita operačního výkonu
- CMP, FIS, krvácení
- **PPM – patient prosthesis mismatch**

Limitace SAVR

PPM – velikost SAVR chlopní

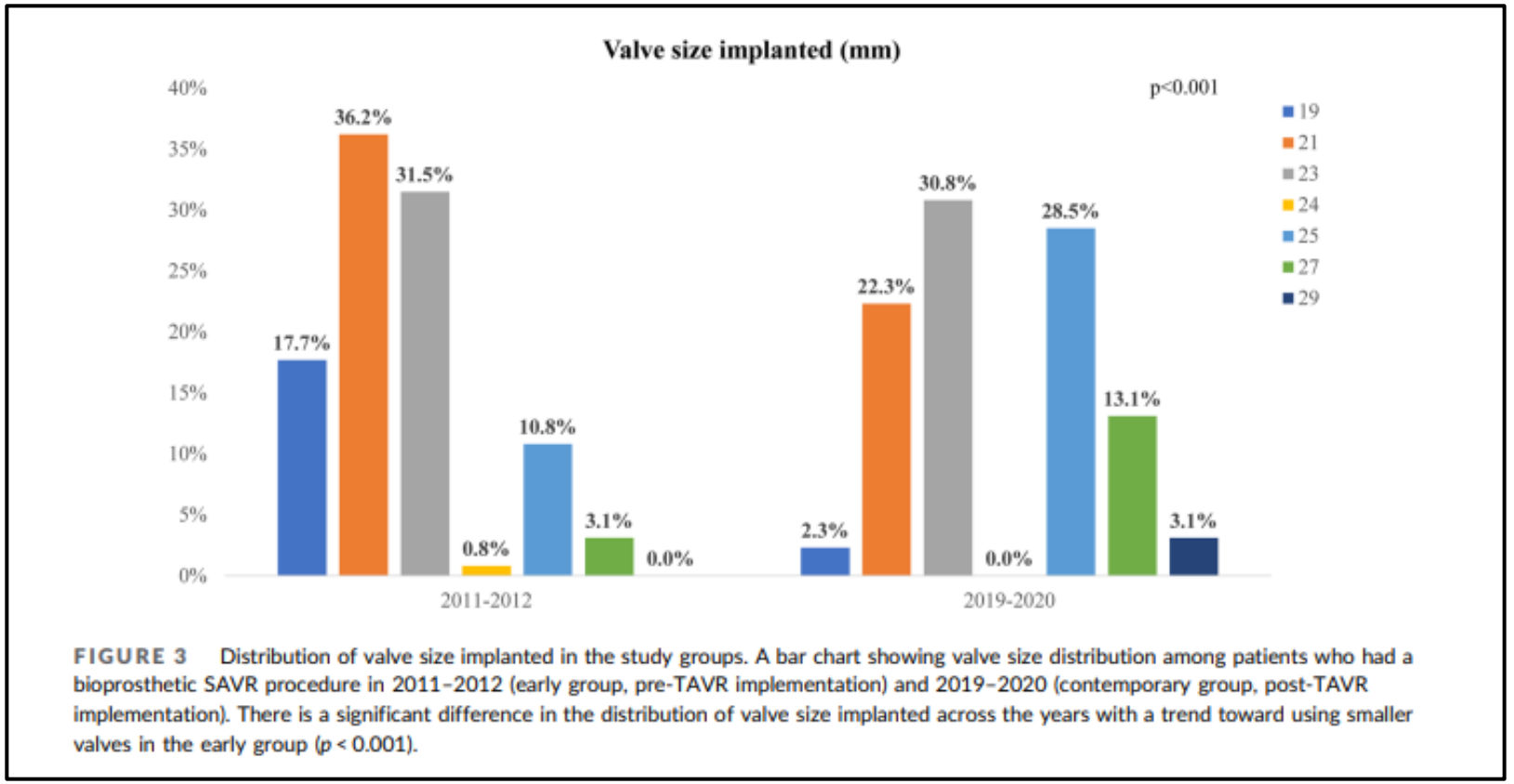
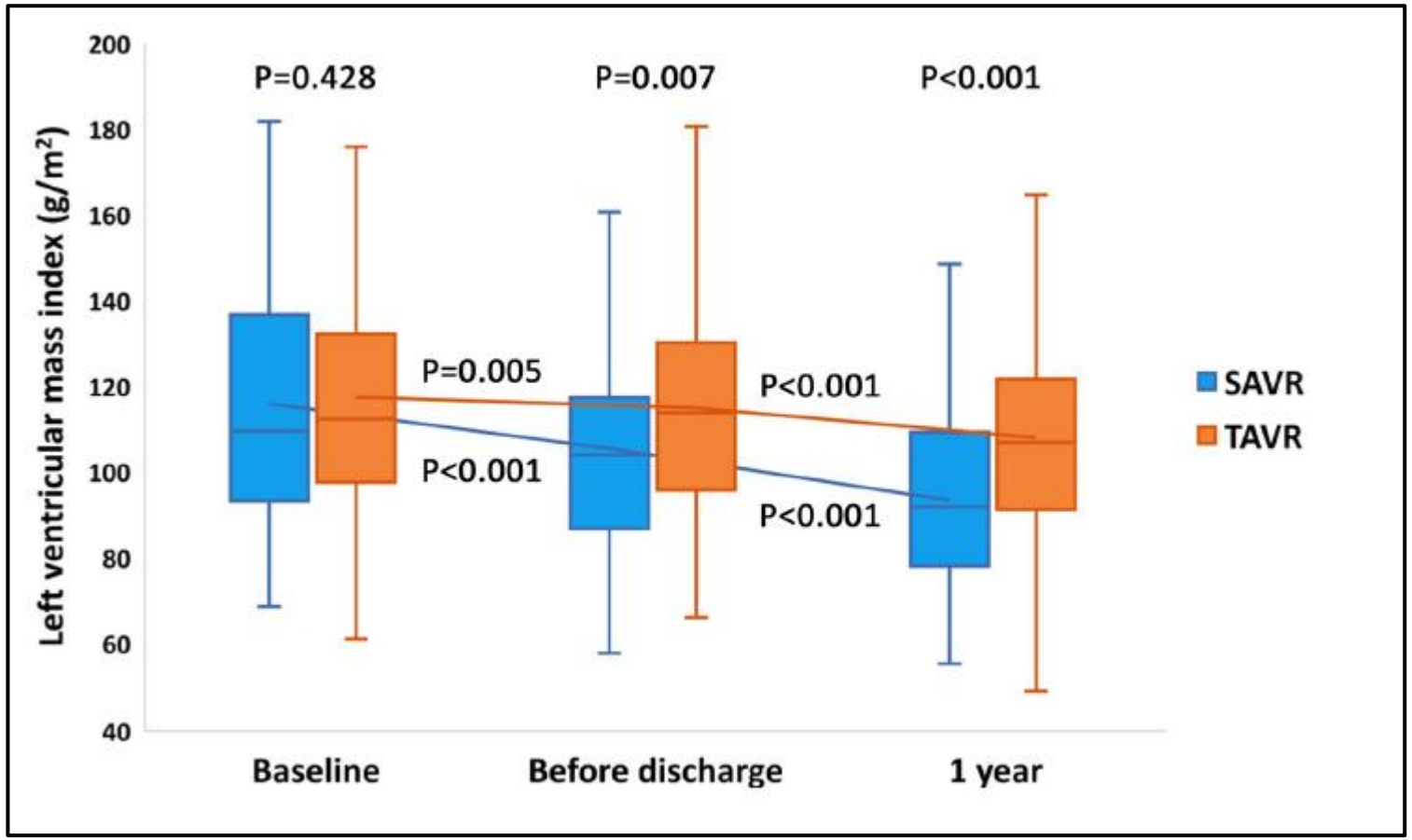


FIGURE 3 Distribution of valve size implanted in the study groups. A bar chart showing valve size distribution among patients who had a bioprosthetic SAVR procedure in 2011–2012 (early group, pre-TAVR implementation) and 2019–2020 (contemporary group, post-TAVR implementation). There is a significant difference in the distribution of valve size implanted across the years with a trend toward using smaller valves in the early group ($p < 0.001$).

Chahine J et al: Health Sci Rep 2022;5:e660

Limitace SAVR

PPM – regrese LVMI



Nishigawa K et al: Gen Thorac Cardiovasc Surg 2023;71:167-174

Limitace SAVR

Co zde nezaznělo….

- Low risk = low age
- Kombinované procedury – FiS, CABG, BAV, AA ….

Limitace SAVR

Co zde nezaznělo….

- **Low risk = low age**
- Kombinované procedury – FiS, CABG, BAV, AA ….

Limitace SAVR

TAVR/SAVR – Očekávané dožití běžné populace

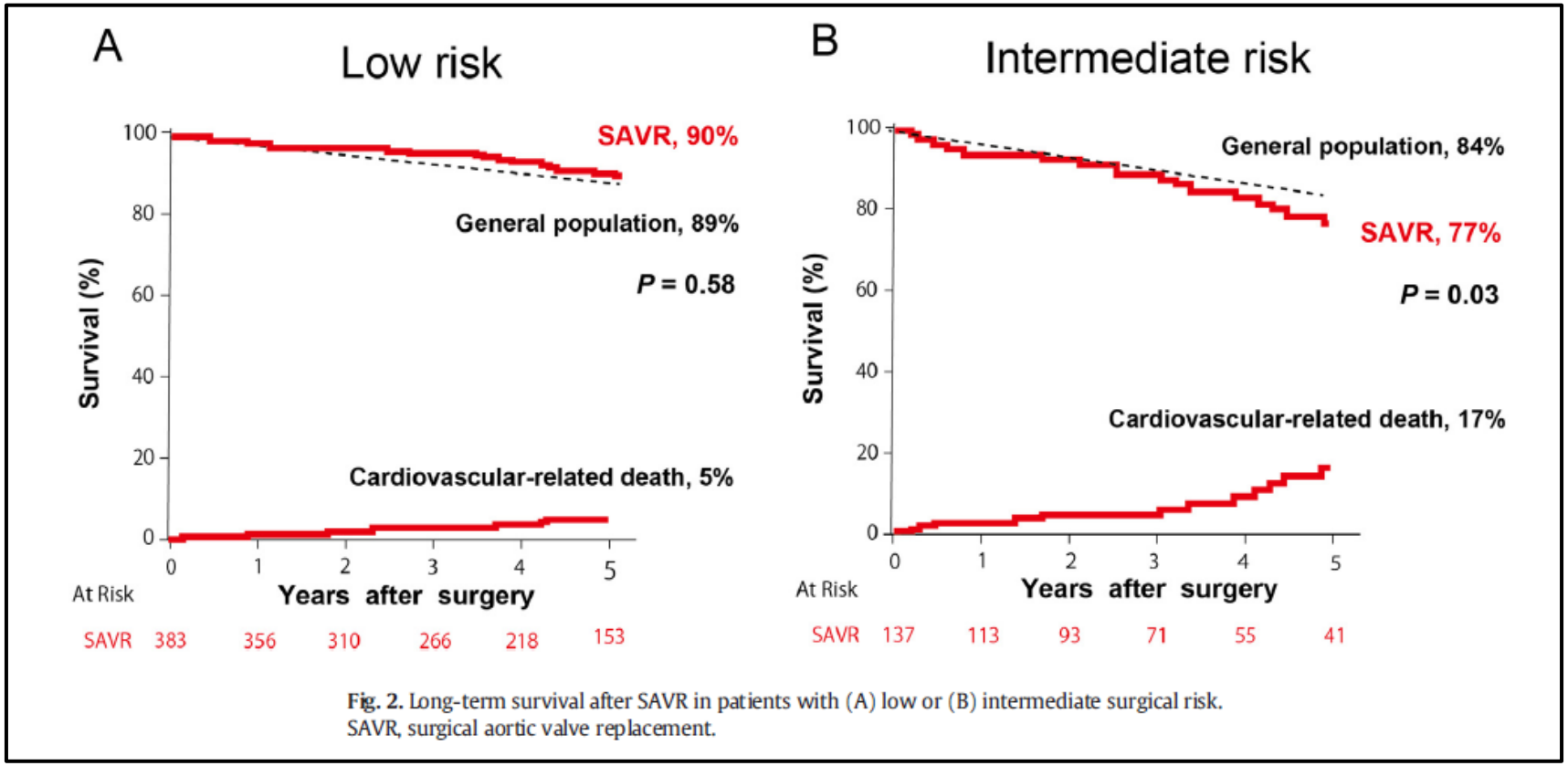


Fig. 2. Long-term survival after SAVR in patients with (A) low or (B) intermediate surgical risk. SAVR, surgical aortic valve replacement.

Maeda S et al: Journal of Cardiology 2023;81:68-75

Limitace SAVR

TAVR/SAVR – Očekávané dožití běžné populace

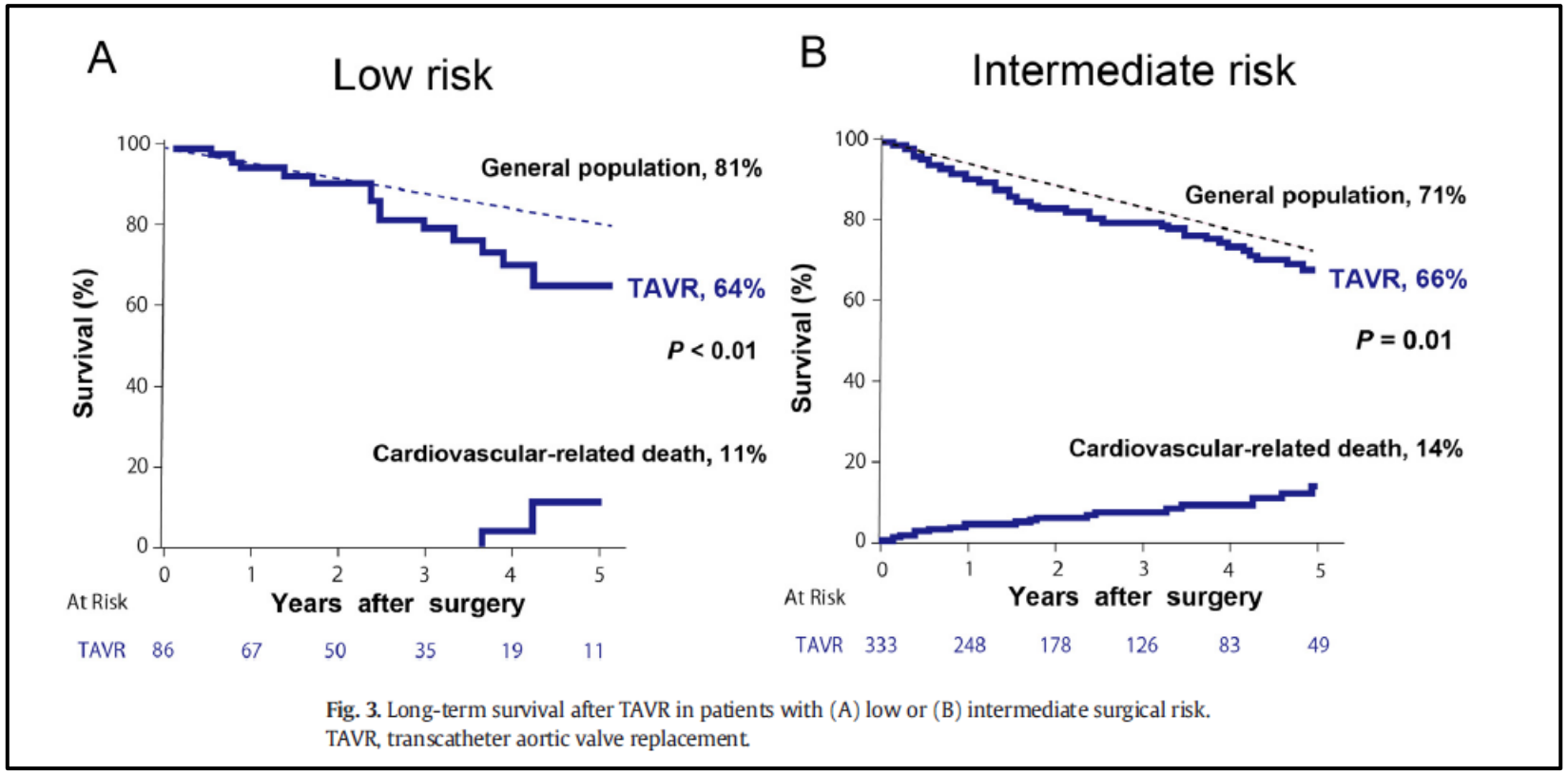


Fig. 3. Long-term survival after TAVR in patients with (A) low or (B) intermediate surgical risk. TAVR, transcatheter aortic valve replacement.

Maeda S et al: Journal of Cardiology 2023;81:68-75

Limitace SAVR

Zastoupení biologických chlopní u SAVR

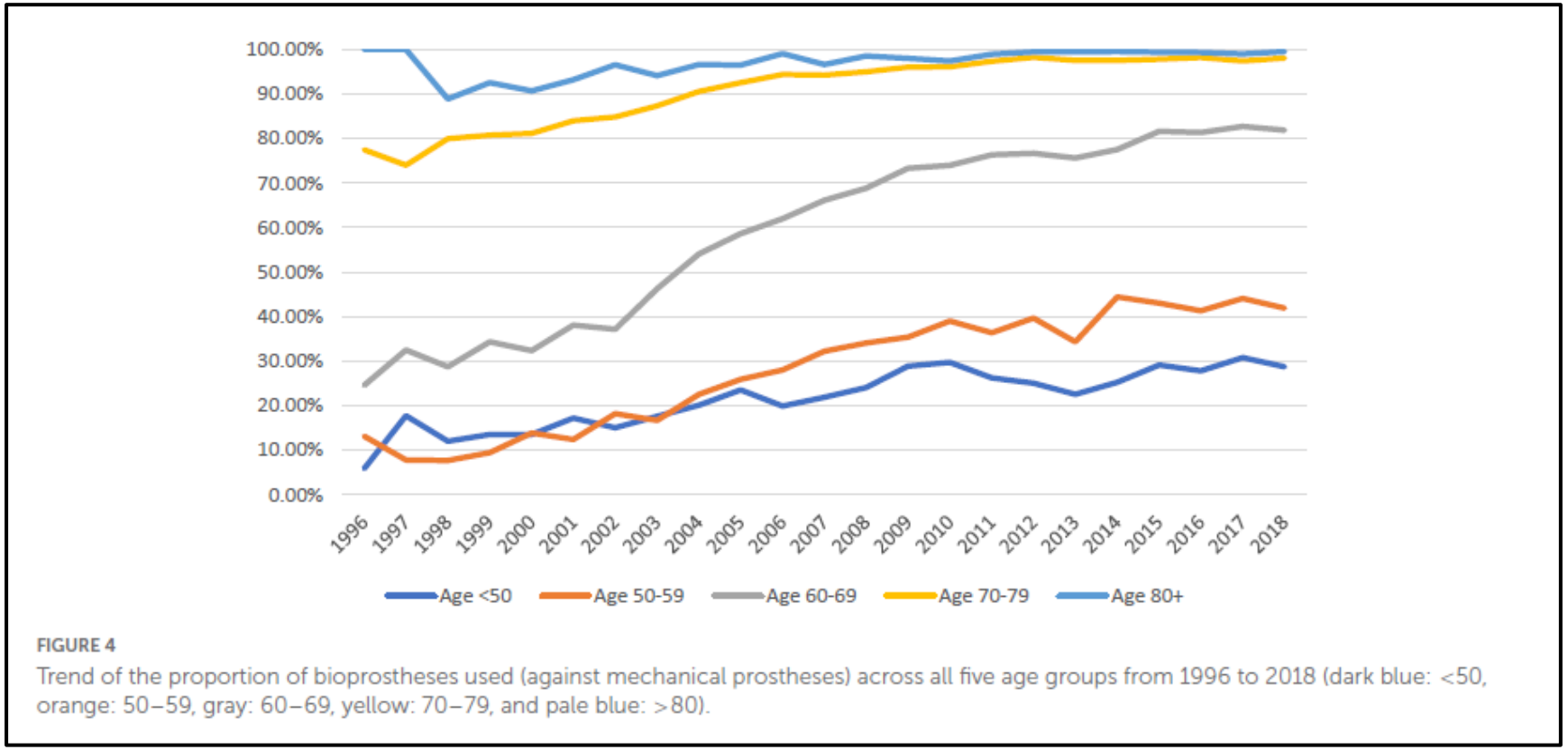


FIGURE 4
Trend of the proportion of bioprostheses used (against mechanical prostheses) across all five age groups from 1996 to 2018 (dark blue: <50, orange: 50–59, gray: 60–69, yellow: 70–79, and pale blue: >80).

Chan J et al: Front Cardiovasc Med 2023;9:1077279

Limitace SAVR

A co mechanické chlopně???

Recent Studies of Mortality in Mechanical vs Bioprosthetic Aortic Valves

Author Year Country	Study methodology	No. of patients	Patient ages	Mortality outcomes
Badhwar[3] 2012 United States	Prospective, single practice, propensity-matching	172	bioprosthetic 58.6 ± 8.8; mechanical 52.7 ± 9.8	Mechanical valves begin to confer mortality benefit over bioprosthetic valves as early as 7.5 years postoperatively.
Weber[4] 2012 Switzerland	Retrospective, propensity-matched study	206	<60 years	Biologic aortic valve replacement significantly reduced survival (90.3% vs 98%; $P = .038$) during a mean follow-up period of 2.75 years.
Chiang[5] 2014 United States	Retrospective, propensity-matched cohorts from a New York state database	4253	50–69	No significant difference in survival over median follow-up of 10.8 years. Actuarial 15-year survival was 62.1% with mechanical valve vs 60.6% with bioprosthetic valve.
Glaser[6] 2016 Sweden	Retrospective, propensity-matched pairs from nationwide population registry	2198	50–69	Patients who received mechanical valves had better long-term survival after AVR than those with bioprostheses.
Zhao[7] 2016 Australia	Meta-analysis of 12 studies	8661	<70	No significant difference found in overall long-term mortality, but better long-term survival for mechanical valves in patients <65 years old.
Goldstone[8] 2017 United States	Retrospective using California state data sets, inverse-probability-weighted cohorts	9942	45–64	Biologic prosthesis was associated with significantly higher 15-year mortality than mechanical prosthesis among patients 45 to 54 years of age, but not among patients 55 to 64 years of age.
Diaz[9] 2019 Spain	Meta-analysis of 5 studies	4686	50–70	Mechanical valves are associated with a long-term survival benefit for patients between 50 and 70 years, compared to biological valves.
Iribarne[10] 2019 United States	Multicenter, retrospective propensity model with inverse probability weighting	1449	50–65	There was no difference in adjusted long-term survival according to prosthesis type. Tissue valves were associated with a higher risk of reoperation.
Kytö[11] 2020 Finland	Retrospective, propensity-matched from nationwide registry	1152	50–70	Ten-year all-cause mortality was 18.6% with mechanical and 27.6% with biological valve (HR 0.72; $P = .028$). Results do not support the routine use of biological valve prostheses in this age group.

Gerdisch MW et al: Progress Cardiovasc Dis 2022;72:31-40

Limitace SAVR

ON-X chlopeň

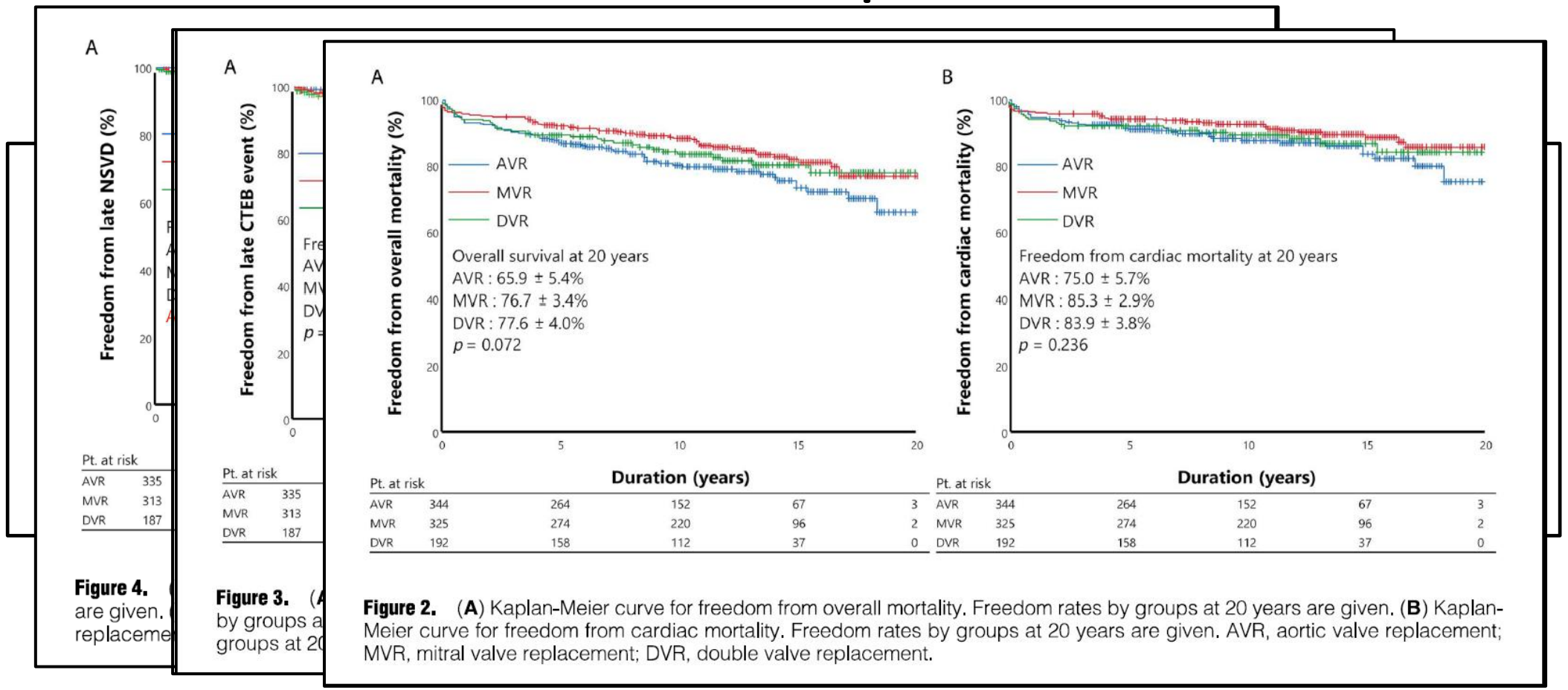


Figure 2. (**A**) Kaplan-Meier curve for freedom from overall mortality. Freedom rates by groups at 20 years are given. (**B**) Kaplan-Meier curve for freedom from cardiac mortality. Freedom rates by groups at 20 years are given. AVR, aortic valve replacement; MVR, mitral valve replacement; DVR, double valve replacement.

Kim JS et al: Circulation Journal 2021;85:1042-1049

Limitace SAVR

Co zde nezaznělo….

- Low risk = low age
- Kombinované procedury – FiS, CABG, BAV, AA ….

Limitace SAVR

Co zde nezaznělo….

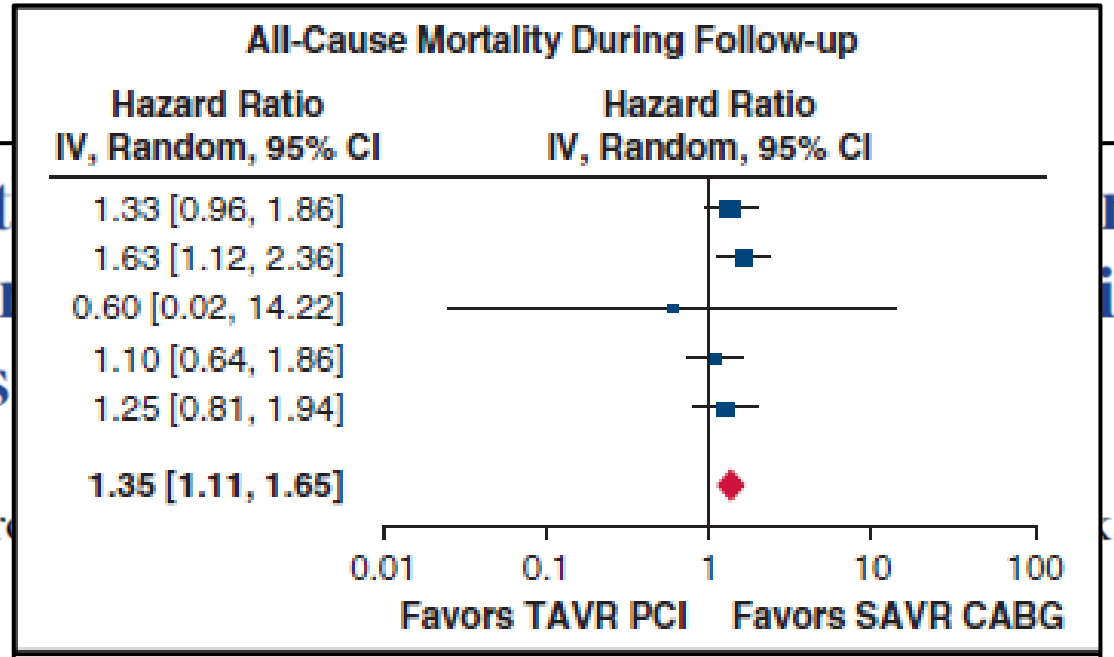
- Low risk = low age
- **Kombinované procedury – FiS, CABG, BAV, AA ….**

Limitace SAVR

AS + ICHS

Complete transcat… stenosis with coron… and meta-analysis

Yosuke Sakurai, MD,[a] Yujir… …kagi, MD, PhD,[d] and Toshiki Kuno, MD, PhD[e]



TAVR + PCI was associated with greater all-cause mortality during follow-up than SAVR + CABG.

Sakurai Y et al: J Thorac Cardiovasc Surg 2022:S0022-5223(22)0893

Limitace SAVR

AS + FiS

Patients with At… with Surgical Ab…

…m SAVR Alone

William L. Patrick · Zehang…
Akhil Rao · Fabliha Khurshan …
Amit Iyengar · John J. Kelly · J…
Joseph E. Bavaria · Nimesh D. …

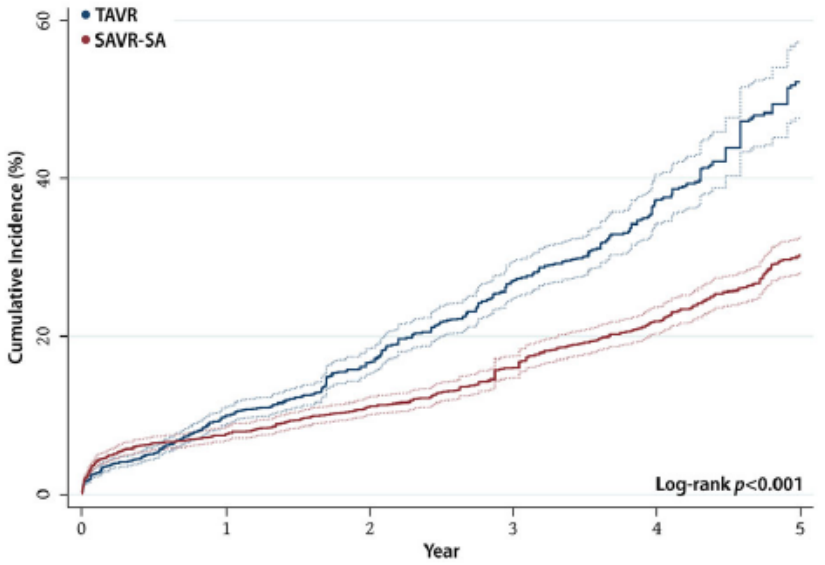


Fig. 3 Cumulative all-cause mortality following aortic valve replacement stratified by procedure. All-cause mortality was significantly lower for patients who underwent SAVR-SA compared to those who underwent TAVR alone (30.3% vs. 52.3% at 5 years; adjusted HR 0.65, 95% CI 0.53–0.79; $p < 0.01$)

Patrick WL et al: Cardiol Ther 2022;11:283-296

Limitace SAVR

ZÁVĚRY

- **SAVR má stále nezastupitelné místo v léčbě nemocných s AS**
- **Vlastní chirurgická technika se stále vyvíjí a zavedení mininvazivity do chirurgie aortální chlopně přinese redukci některých pooperačních komplikací (rané infekce, FiS, doba UPV, doba hospitalizace…)**
- **Při dalším posunu hranice pro TAVR do nižšího věku bude opět potřeba intenzivně diskutovat adekvátnost volby biologické náhrady**
- **Kombinované výkony (CABG, FiS) především ve skupině nízkého rizika stále patří do rukou kardiochirurga**
- **Ale především….**

Aortální patologie – máme společný cíl!!!

Děkuji za pozornost!!!