

Střední kombinovaná aortální vada

P. Lupínek

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INSTITUT KLINICKÉ A EXPERIMENTÁLNÍ MEDICÍNY
KLINIKA KARDIOLOGIE



Kombinovaná aortální vada

MAVD – mixed aortic valve disease

Dosavadní přístup:
posouzení a indikace k intervenci podle dominující složky

ALE

Kombinovaná Ao vada má

- jiný typ a stupeň zatížení LK,
- jiný fenotyp
- jinou přirozenou historii a prognózu

Střední kombinovaná aortální vada

Moderate mixed aortic valve disease (MAVD)

Střední AoS

AVA mezi 1,0-1,5 cm²,
resp. mezi 0,6-0,9 cm²

plus

Střední AoR

Integrované posouzení

a

V max 3,0-3,9 m/s, střední gradient 30-39 mmHg

Combined aortic stenosis and regurgitation: double the trouble

Geraldine Ong,¹ Philippe Pibarot ²

Heart 2019;105:1515-1522

STRUCTURAL HEART
2020, VOL. 4, NO. 6, 468-474
<https://doi.org/10.1080/24748706.2020.1817643>

REVIEW ARTICLE

Mixed Aortic Valve Disease: A Diagnostic Challenge, a Prognostic Threat

Philippe Unger, MD, PhD ^a and Marie-Annick Clavel, DVM, PhD ^b

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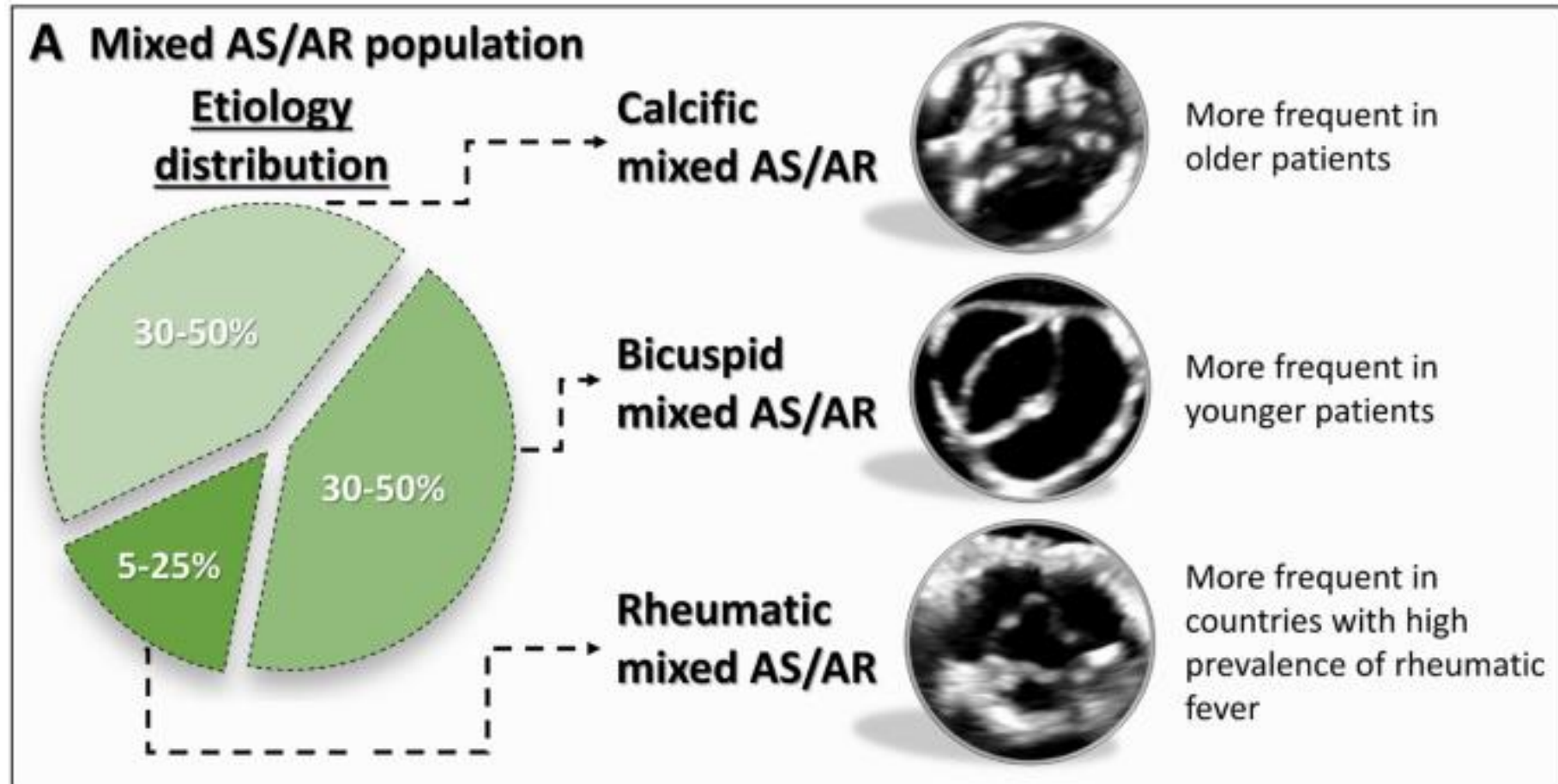
Mixed aortic stenosis and regurgitation: a clinical conundrum

Rashmi Nedadur,¹ David Belzile,² Ashley Farrell,³ Wendy Tsang ²

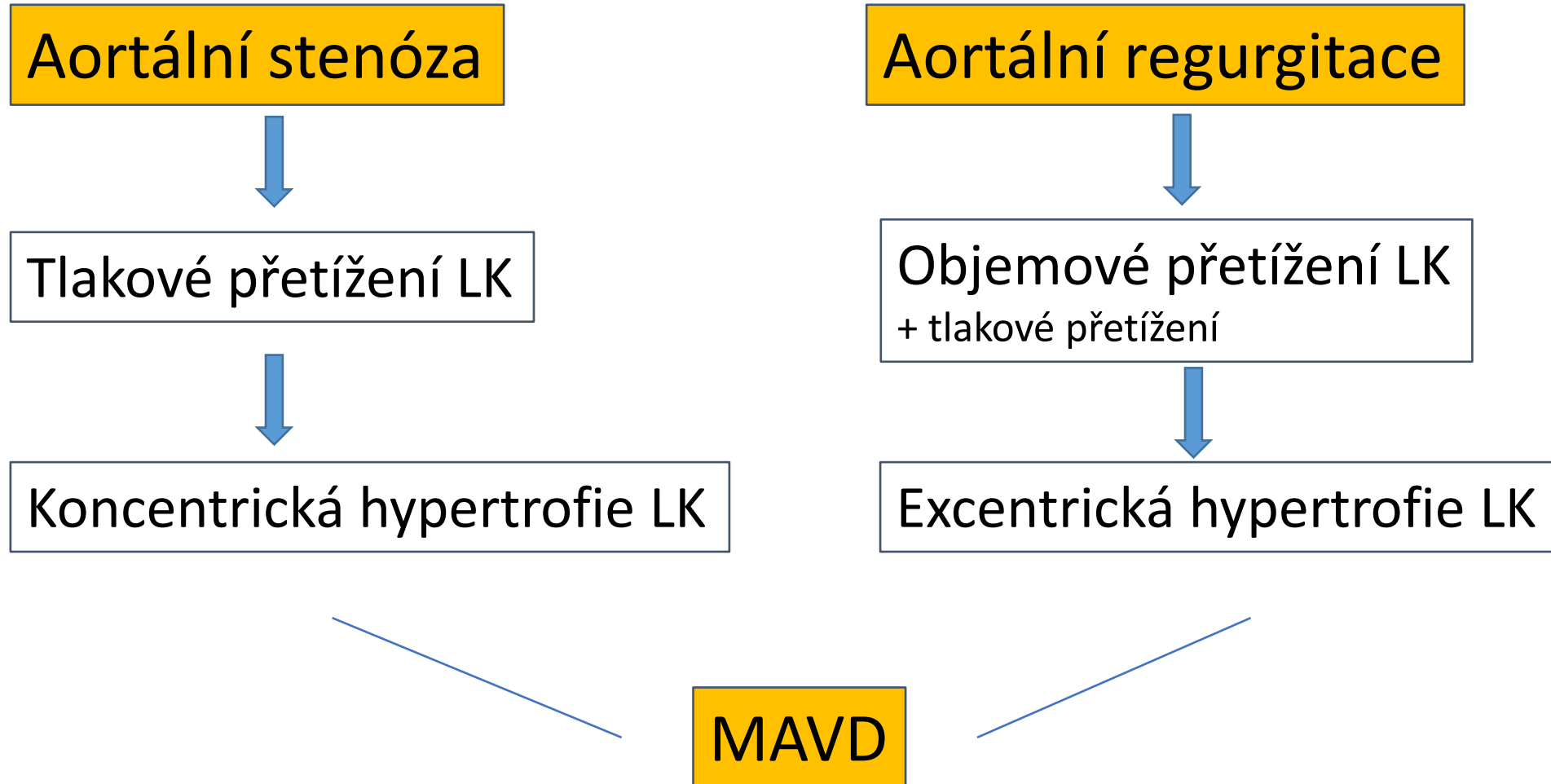
Heart 2022;0:1-12

[doi:10.1136/heartjnl-2021-320501](https://doi.org/10.1136/heartjnl-2021-320501)

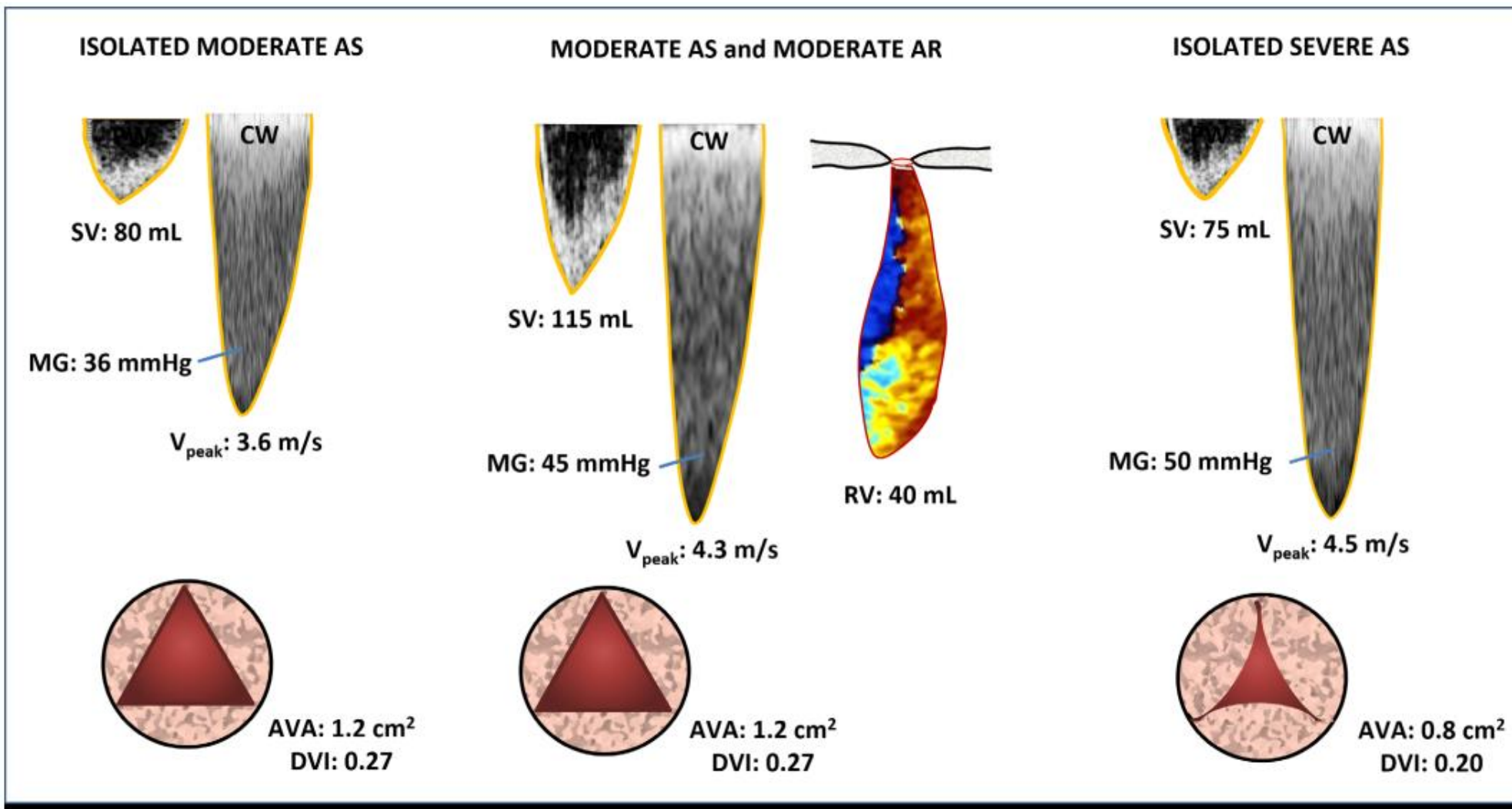
Etiologie MAVD

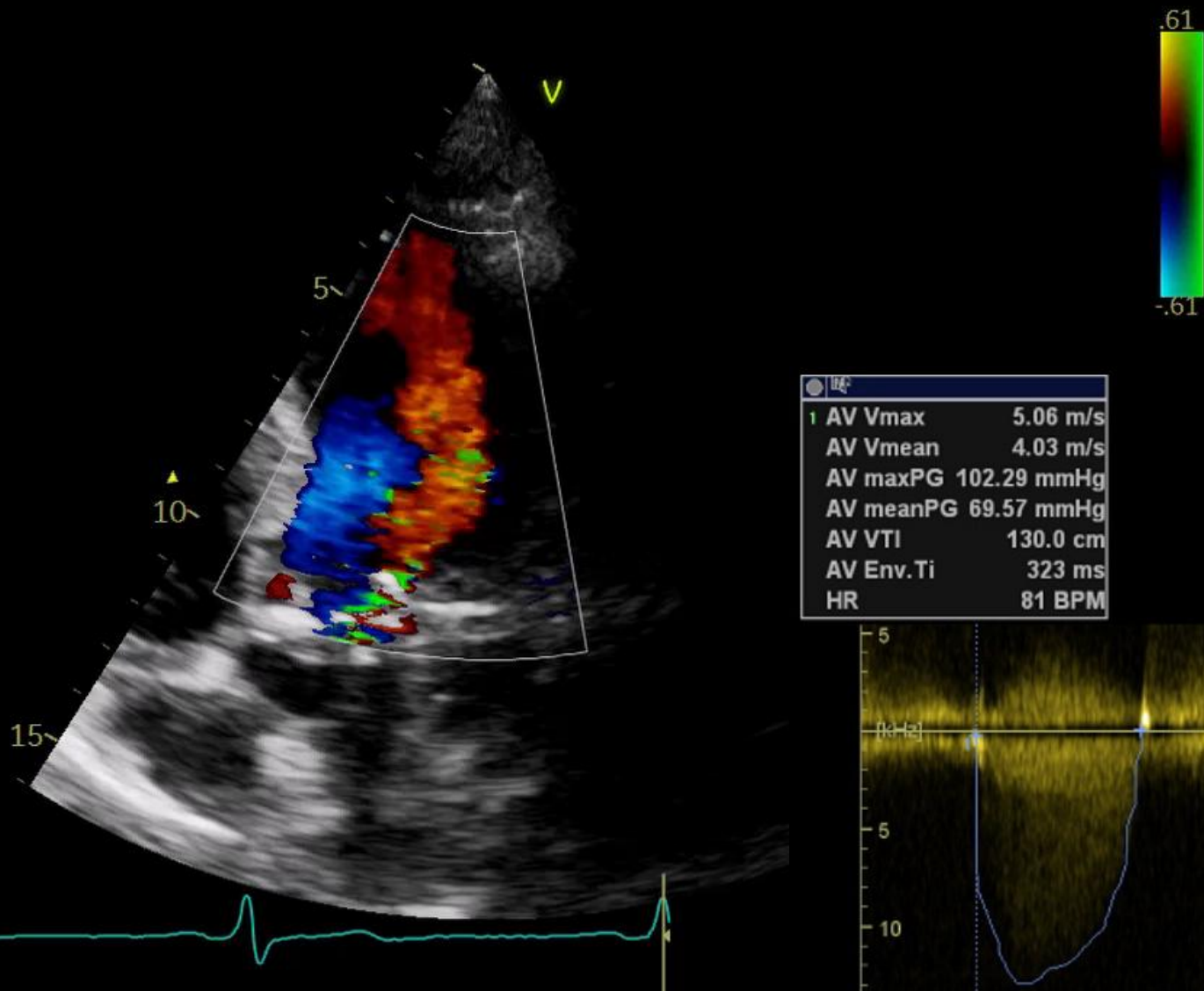


Patofyziologie

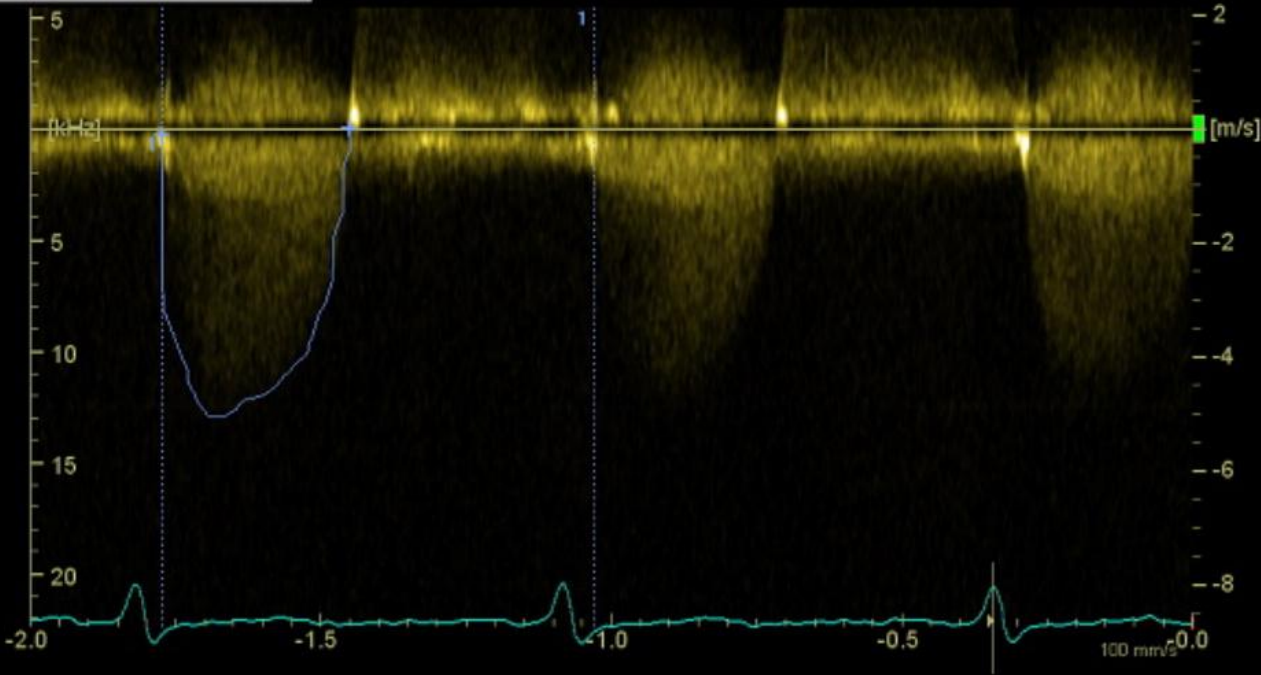
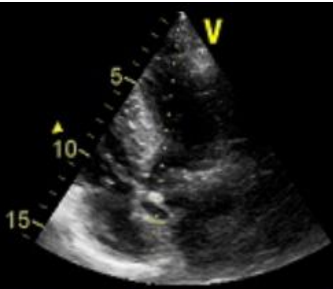


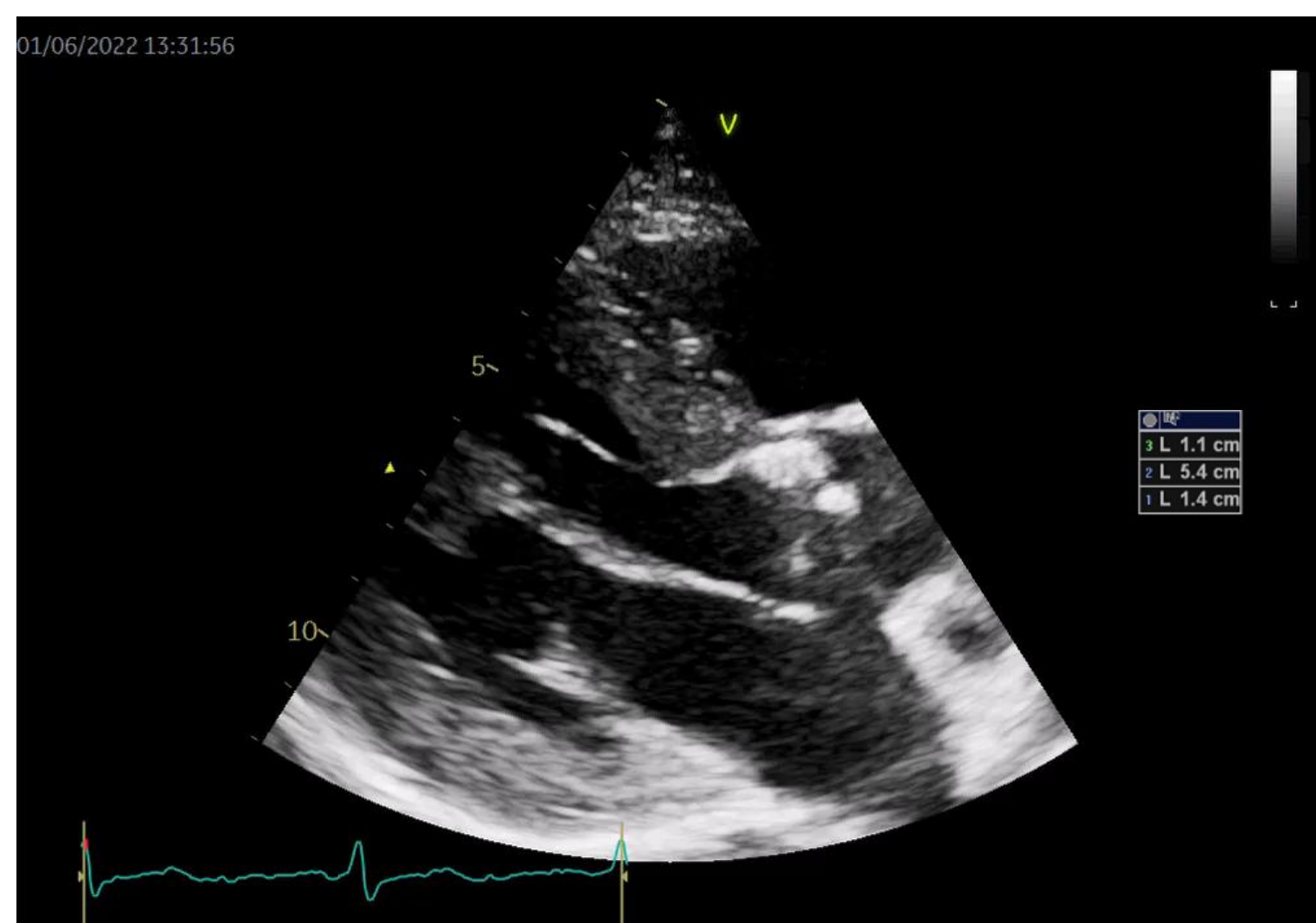
Zatížení levé komory



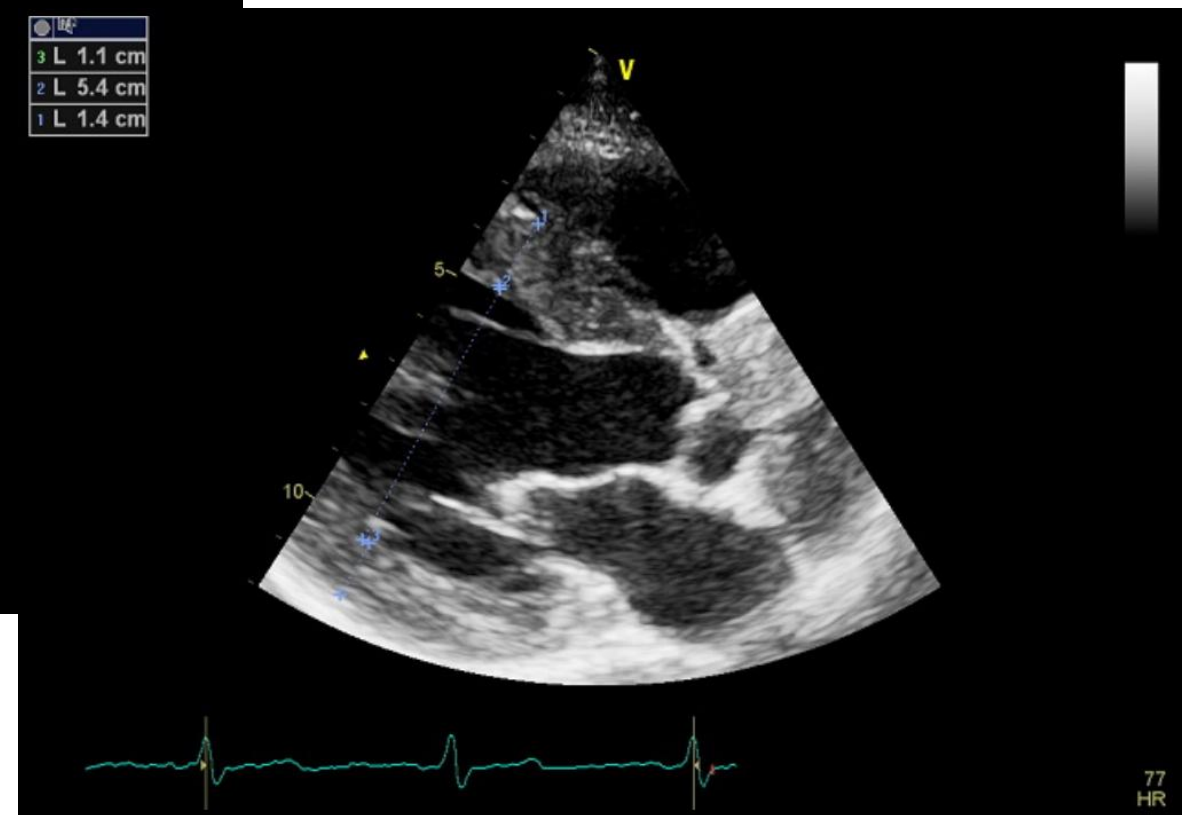


1	AV Vmax	5.06 m/s
	AV Vmean	4.03 m/s
	AV maxPG	102.29 mmHg
	AV meanPG	69.57 mmHg
	AV VTI	130.0 cm
	AV Env.Ti	323 ms
	HR	81 BPM





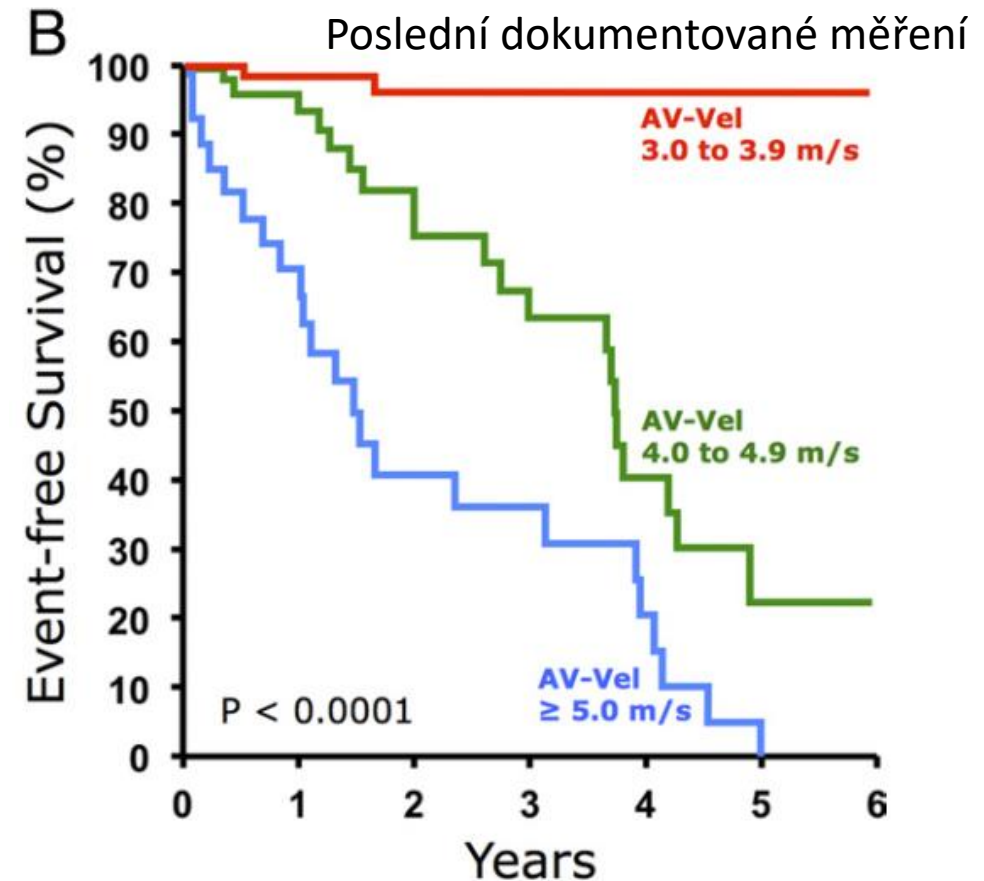
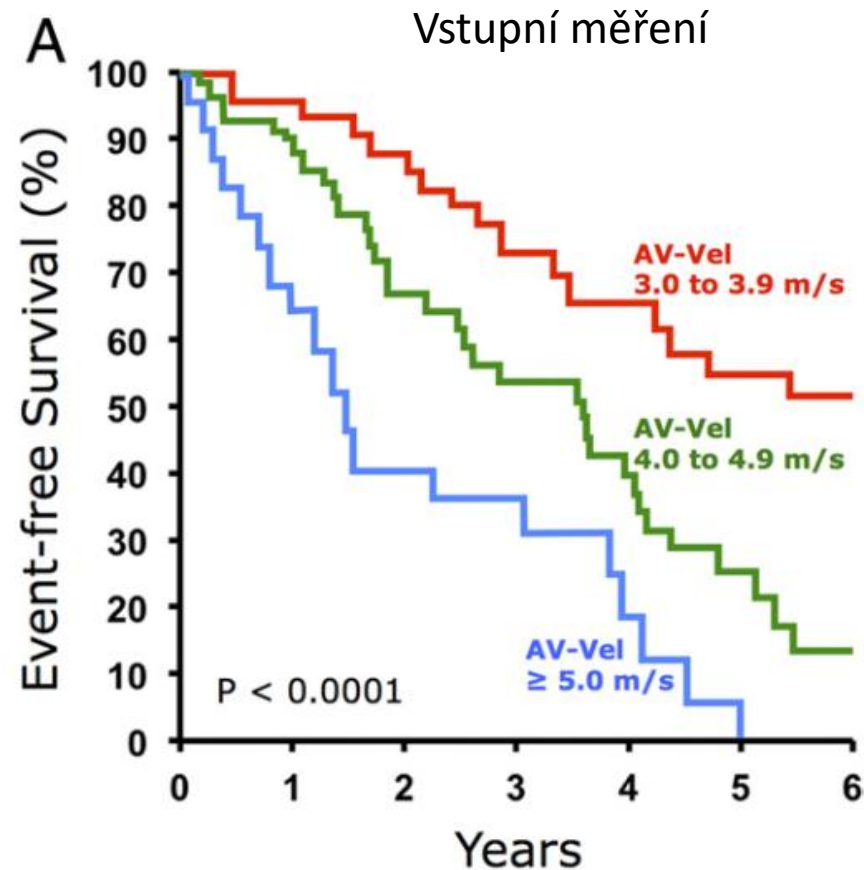
LK nedilatovaná
i přes významnou AoR



Ao gradient a prognóza

70 pacientů, střední AoS + aspoň střední AoR, asymptomaticí, EF ≥ 55 %

žádné úmrtí, 50 AVR



10 Combined and multiple-valve diseases

- When either stenosis or regurgitation is predominant, management follows the recommendations concerning the predominant VHD. When the severity of both stenosis and regurgitation is balanced, indications for interventions should be based on symptoms and objective consequences rather than on the indices of severity of stenosis or regurgitation.^{453–456} In this setting, Doppler pressure gradient reflects the global haemodynamic burden (stenosis and regurgitation) of the valve lesion.⁴⁵³

Kombinovaná aortální vada

Recommendations	Class ^a	Level ^b
Intervention is recommended in symptomatic patients with mixed moderate AV stenosis ^c and moderate regurgitation, and a mean gradient ≥ 40 mmHg or $V_{\max} \geq 4.0$ m/s ^{790–793}	I	B
Intervention is recommended in asymptomatic patients with mixed moderate AV stenosis ^c and moderate regurgitation with $V_{\max} \geq 4.0$ m/s and LVEF $< 50\%$ not attributable to other cardiac disease. ⁷⁹¹	I	C

Table 12). Patients presenting with mixed AV disease, but with gradients below thresholds for intervention, should undergo careful multimodality diagnostics including assessment of cardiac damage to inform individual treatment strategies. Global longitudinal strain and natriuretic peptides have shown incremental prognostic value beyond symptom status and single lesion severity in patients with preserved LVEF.^{762,794–796}

The severity of mixed AV disease is often underestimated and patients with balanced moderate AR and AS show adverse event rates comparable to patients with severe isolated AS.^{790,791}

Outcomes in Moderate Mixed Aortic Valve Disease

Is it Time for a Paradigm Shift?

Alexander C. Egbe, MD, MPH, Sushil A. Luis, MBBS, Ratnasari Padang, MBBS, PhD, Carole A. Warnes, MD

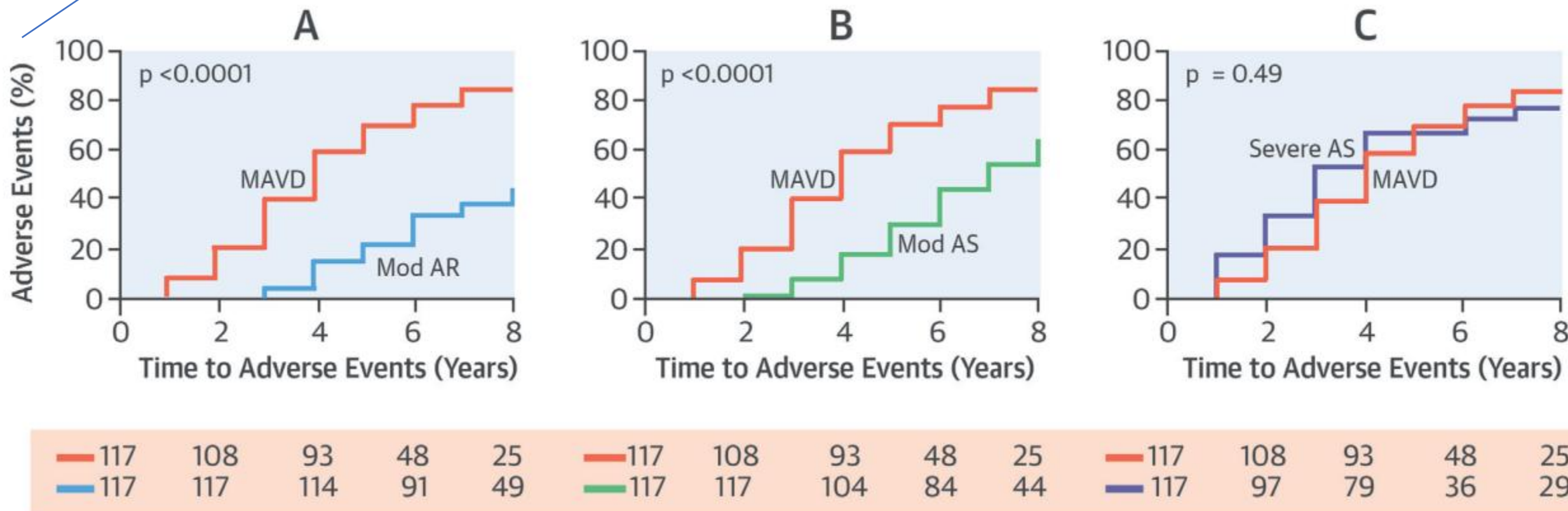
251 pacientů (63 ± 11 let) se **střední AoS + střední AoR**, asymptomatických, $EF \geq 50\%$ (38 % BAV)
F-UP $9,1 \pm 4,2$ years

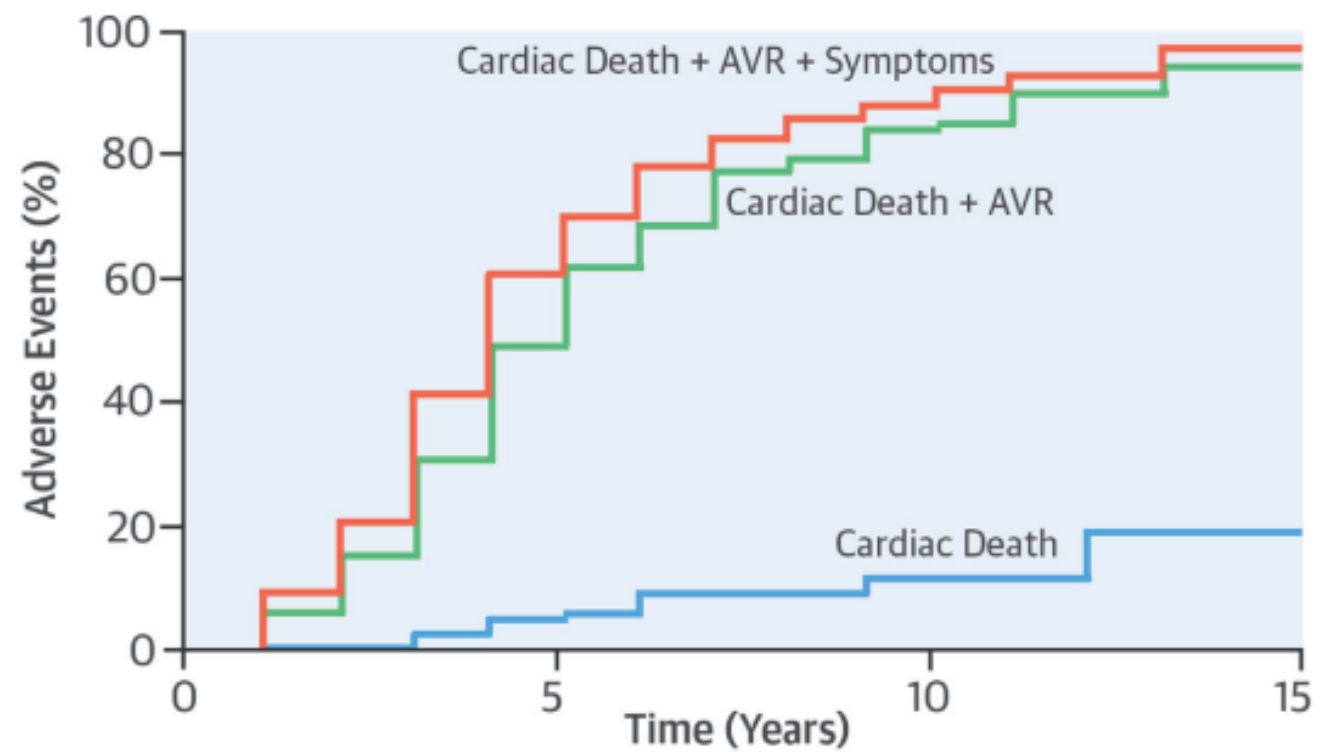
Vybráno 117 pacientů a k nim přiřazeny stejně početné kontrolní skupiny stejného věku a pohlaví se střední AoS, střední AoR a významnou AoS

CONCLUSIONS MAVD patients had outcomes comparable to those with severe AS, and preserved ejection fraction and should be monitored closely for symptoms. (J Am Coll Cardiol 2016;67:2321-9) © 2016 by the American College of Cardiology Foundation.

Prognóza MAVD vs izolovaná Ao vada

Úmrtí + vznik symptomů + AVR





251	117	53	26
251	138	71	31
251	218	159	94

Outcomes of moderate mixed aortic valve stenosis and regurgitation

Pilar Lopez Santi ¹, **Jérémy Bernard**², **Aileen Chua**¹, **Dorien Laenens**¹, **Andréanne Powers**², **Kathia Abdoun**², **Bart J.J. Velders**³, **Camille Sarrazyn**¹, **Paolo Springhetti**², **Jingnan Zhang**⁴, **Mohammed R. Amanullah**⁵, **See Hooi Ewe**⁵, **Kai-Hang Yiu**⁴, **Meindert Palmen**³, **Jesper Hjortnaes**³, **Philippe Pibarot**², **Marie-Annick Clavel**², **Jeroen J. Bax**^{1,6}, and **Nina Ajmone Marsan** ^{1*}

¹Department of Cardiology, [Leiden](#) University Medical Center, Albinusdreef 2, Leiden 2300RC, The Netherlands; ²Department of Cardiology, Institut universitaire de cardiologie et de pneumologie de Québec-Université Laval, 2725, Chemin Sainte-Foy, [Québec](#) G1V 4G5, Canada; ³Cardiothoracic Surgery, Leiden University Medical Center, Albinusdreef 2, Leiden 2300RC, The Netherlands; ⁴Cardiology Division, Department of Medicine, Queen Mary Hospital, The University of [Hong Kong](#), Pok Fu Lam Rd 102, Hong Kong 999077, China; ⁵Department of Cardiology, National Heart Centre [Singapore](#), 5 Hospital Drive, Singapore, 169609, Singapore; and ⁶Department of Cardiology, Turku Heart Center, University of Turku and Turku University Hospital, 20521 Turku, Finland

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1926 pacientů ze 4 center, 2003-2023

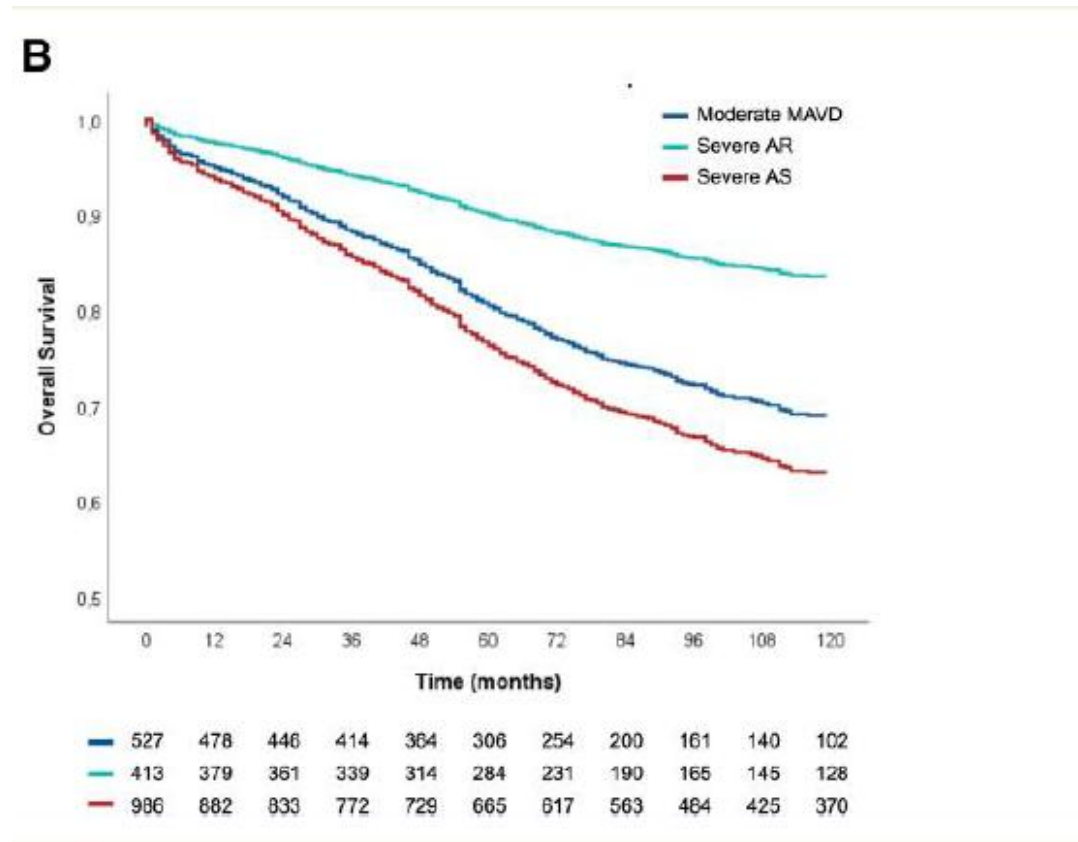
Střední MAVD n = 517

Významná AoR n=413

Významná AoS n=986 - *pouze konkordantní čtení*

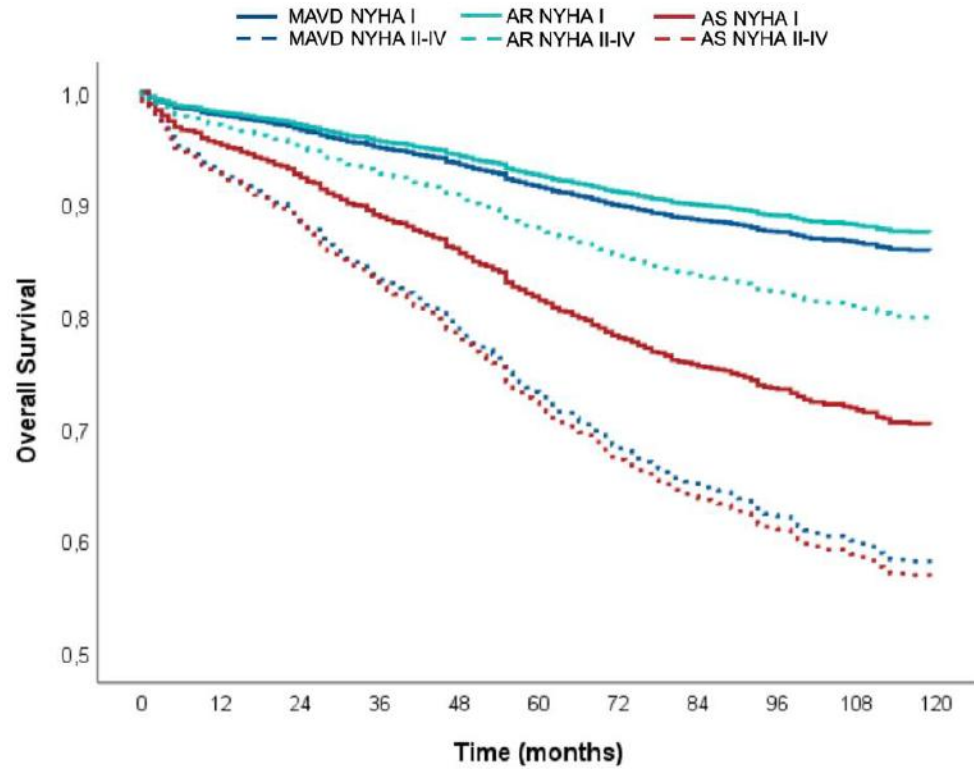
Doba sledování: medián 7,2 r. (IQR 3,4-11,3 r.)

Primární endpoint: celková mortalita

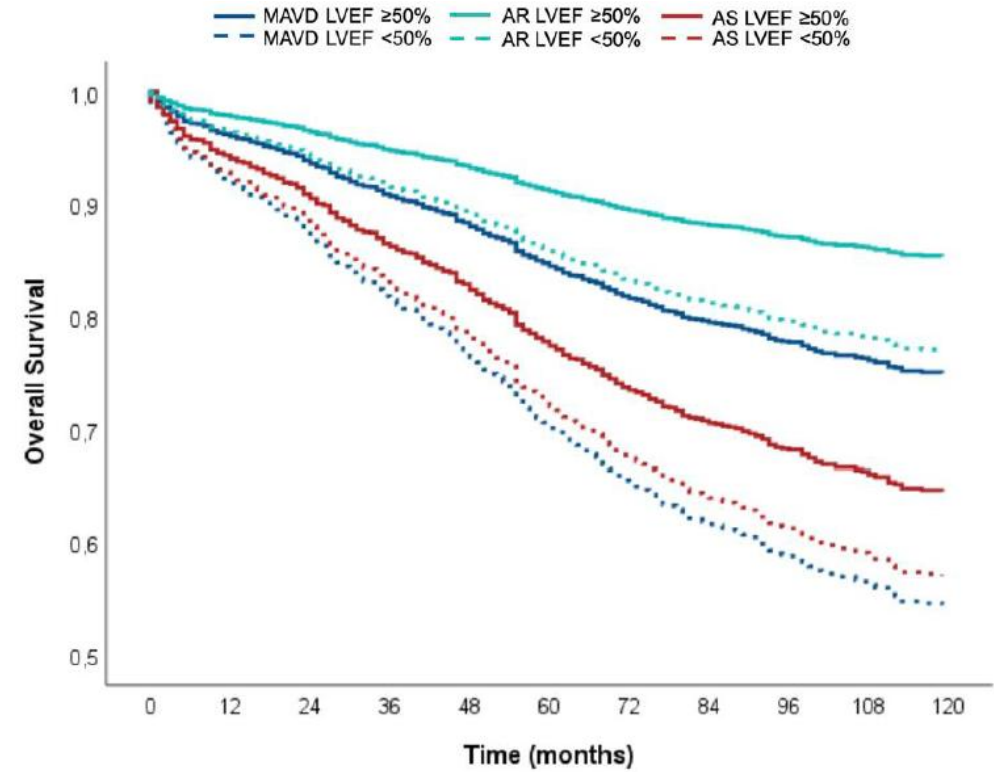


Santi et al. Eur Heart J 2026;47:157-1367

Symptomy

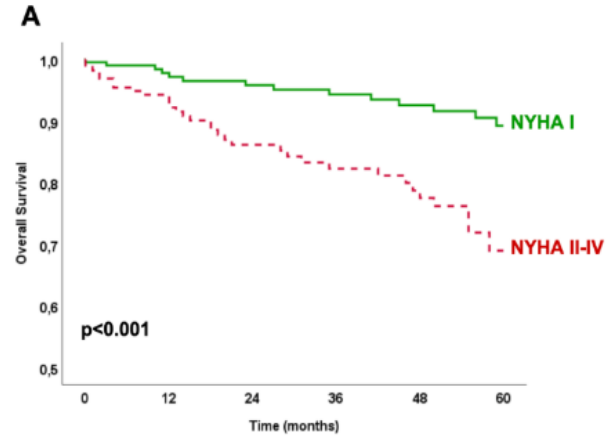


EF < 50 %

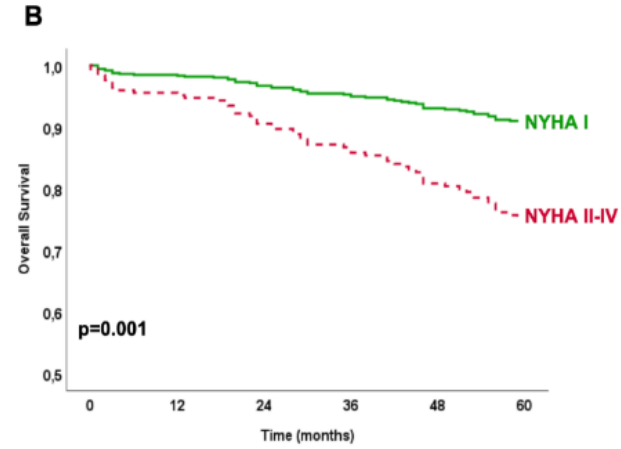


A) survival censored at AVR (medical surveillance)

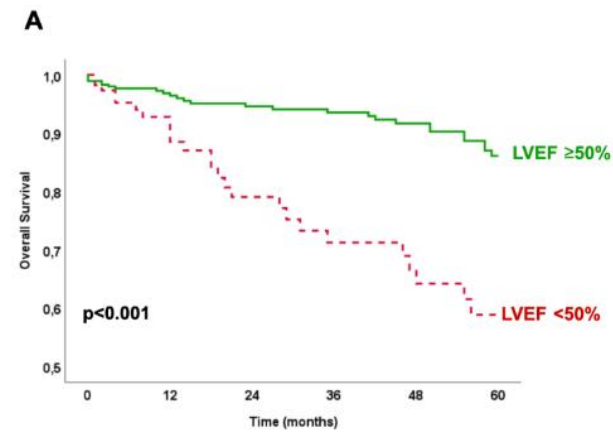
(B) post-AVR survival



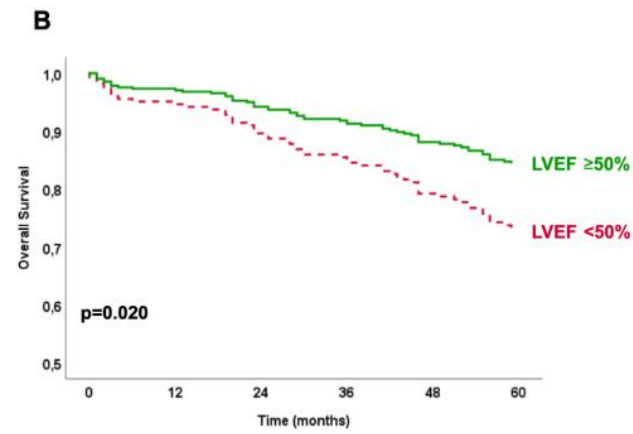
224	156	136	118	97	70
303	139	98	81	64	46



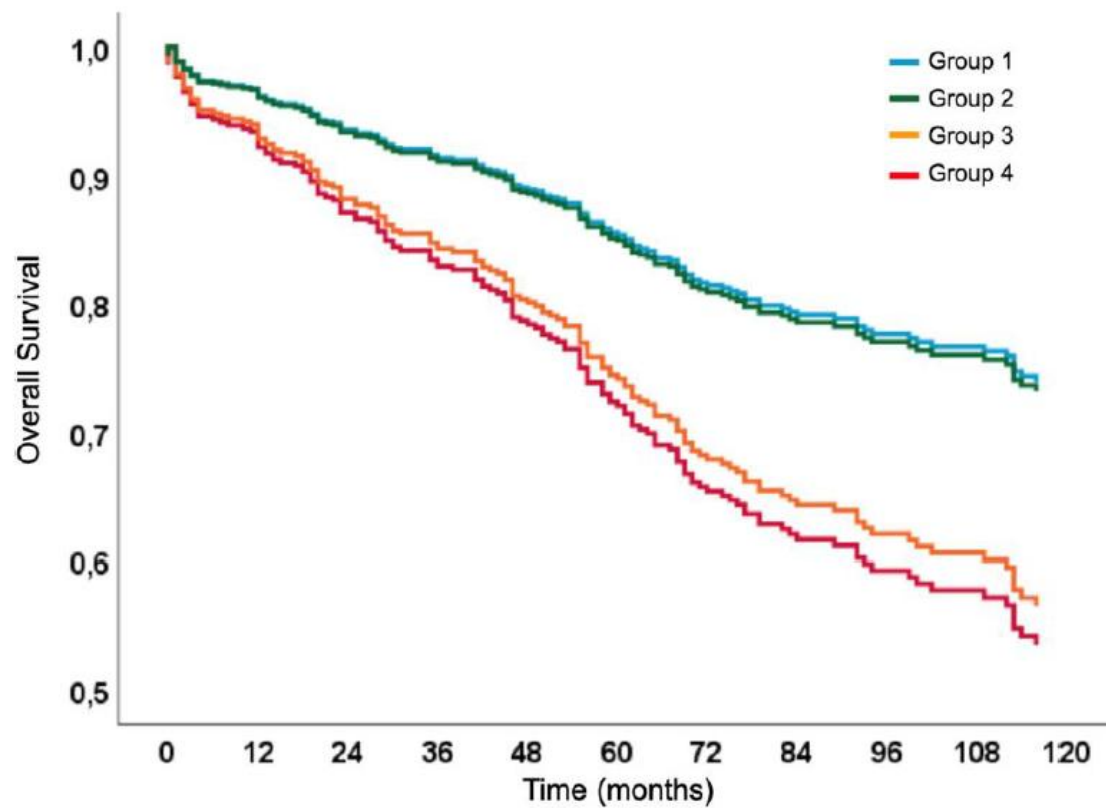
119	114	110	106	96	83
212	190	178	163	143	130



378	230	190	164	133	95
149	65	44	36	28	21



228	211	202	191	168	157
103	93	86	78	71	61



- 1: AVA 1,3-1,5 cm² + EROA 0,10-0,20 nebo VC 3,0-4,5 mm
 2: AVA 1,3-1,5 cm² + EROA 0,20-0,30 nebo VC 4,5-6,0 mm
 3: AVA 1,0-1,3 cm² + EROA 0,10-0,20 nebo VC 3,0-4,5 mm
 4: AVA 1,0-1,3 cm² + EROA 0,20-0,30 nebo VC 4,5-6,0 mm

133	121	115	109	103	82	74	54	43	40	29
29	27	26	25	22	21	19	15	14	13	7
283	257	238	215	177	151	115	91	70	59	50
82	73	67	65	62	52	46	40	34	28	16

Závěrem:

- „Střední MAVD“ představuje **samostatný fenotyp** co do hemodynamiky a remodelace LK a **není benigní** vadou → sledovat jako významnou vadu.
- Pacienti se „střední MAVD“ zejména v případě **symptomů** nebo **EF<50 %** mají podobné přežití jako kdyby měli izolovanou významnou AoS.
- Prognóza se zdá být ovlivněna především stenotickou složkou, pacienti s **AVA 1,0-1,3 cm²** mají horší přežití.
- Zásadní je integrované hodnocení kliniky, echokardiografie (obě složky vady, LK), případně doplňkových zobrazovacích metod.
- Po vyloučení jiné příčiny symptomů/dysfunkce LK vhodné zvážit AVR.

Mixed AS/AR

- Step 1 - AS and AR severity assessment

AS component

Echocardiography

Reliable parameters

Aortic valve area*

Dimensionless index

Parameters with limitations

Maximal velocity

Peak/mean gradients

Consider cardiac computed tomography

Calcium score

AS severity

None

Mild

Moderate

Severe

AR component

Echocardiography

Reliable parameters

Regurgitant fraction

Parameters with limitations

LV size

Pressure half-time

End-diastolic flow
reversal in the aorta

VC, EROA, RVol

Consider cardiac magnetic resonance

RVol

Regurgitant fraction

AR severity

None or
trivial

Mild

Moderate

Severe

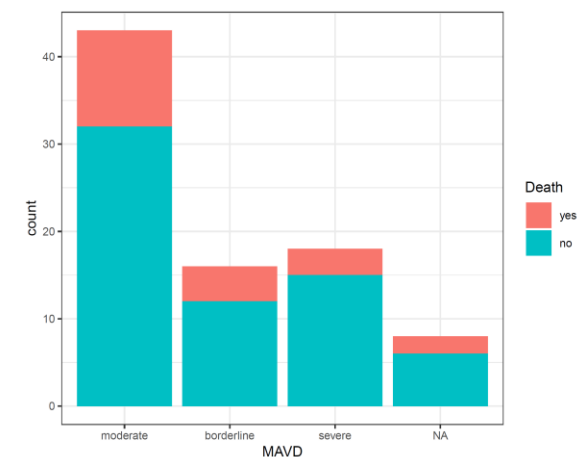
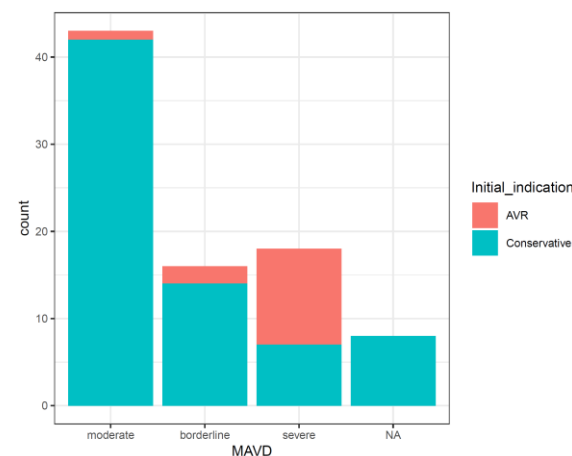
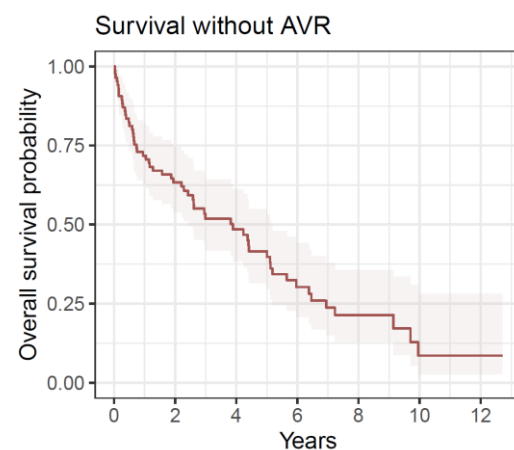
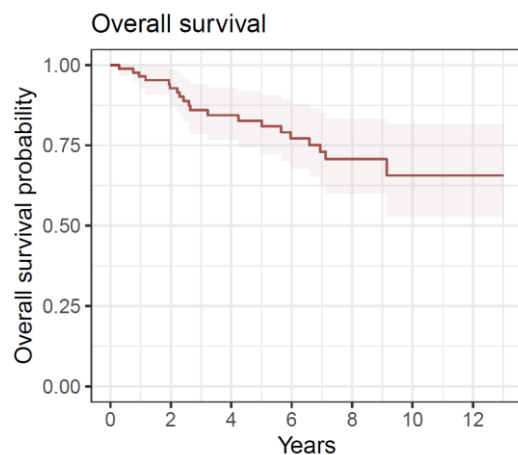
Methods

- Single center, retrospective study (2010-2021)
- Moderate AS: AVAc $>1.0 \text{ cm}^2$ and $\leq 1,5 \text{ cm}^2$ and
- Moderate AR by integrative assessment
- LVEF $\geq 50 \%$
- Patients with more than mild to moderate disease of other valve were excluded.

Results

N	85
Age (yrs)	66.4 ± 7.9, IQR 52.5-72.3
Males	58 (68 %)
Morphology	41 bi/uni/quadricuspid, 36 tricuspid, 8 ?
Symptomatic	35 (41 %)
Follow-up	5.9 ± 3.6 yrs

F-UP (yrs)	1 yr	2 yrs	5 yrs
Death	3.5 %	7.1 %	15.3 %
AVR	23.5 %	30.6 %	43.6 %
Alive free of AVR	71.8 %	63.5 %	47.1 %

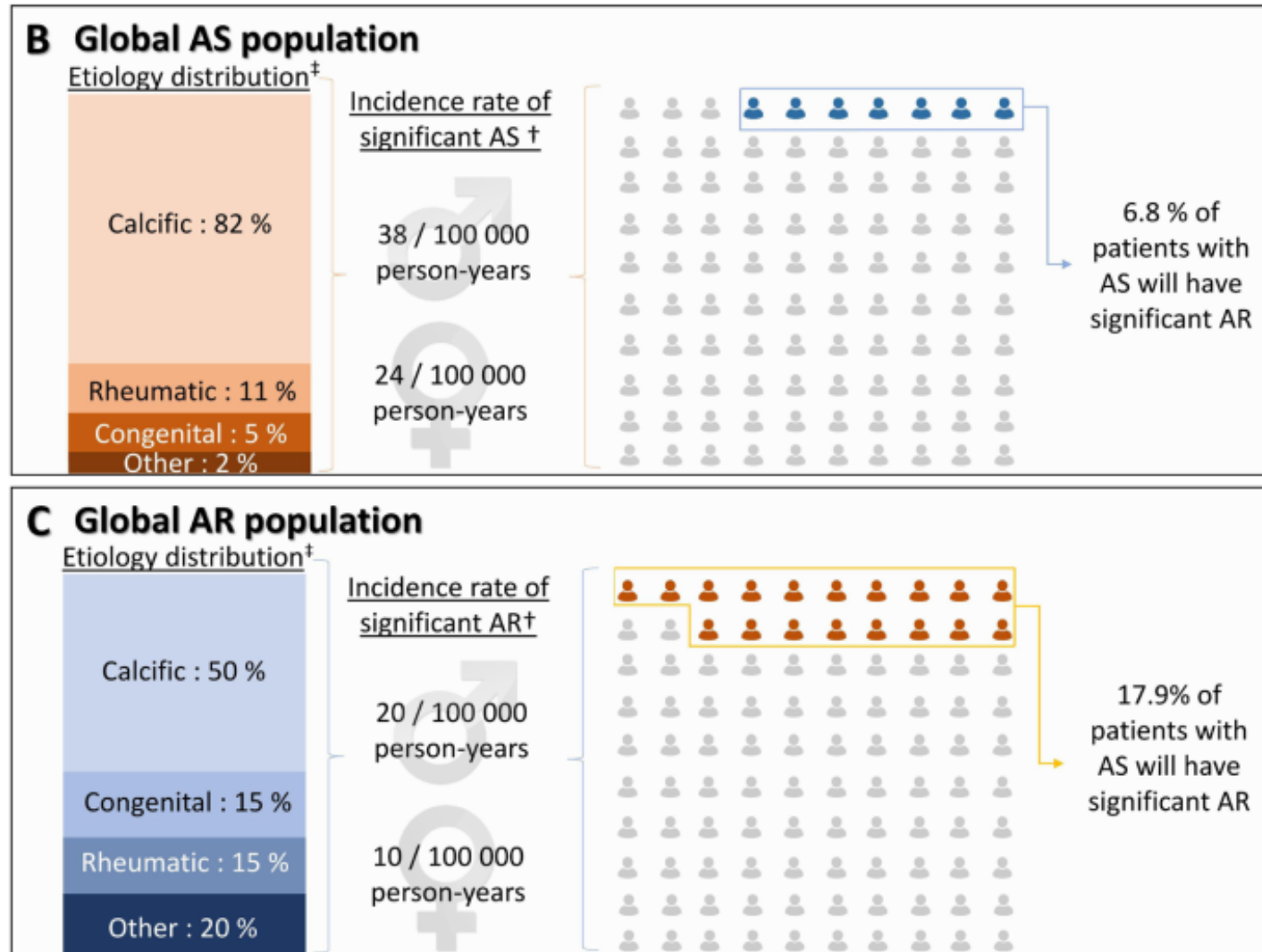


In 10/13 patients who died within 5 years, MAVD was classified as nonsevere, therefore they were treated conservatively and 8 of them died without AVR. Except one, all had peak velocity at aortic orifice $<4 \text{ m/s}$.

Mixed aortic valve disease (MAVD)

- Výskyt
- Patofyziologie a prognóza
- Posouzení hemodynamické a klinické závažnosti
- Optimální načasování intervence na aortální chlopni

Výskyt



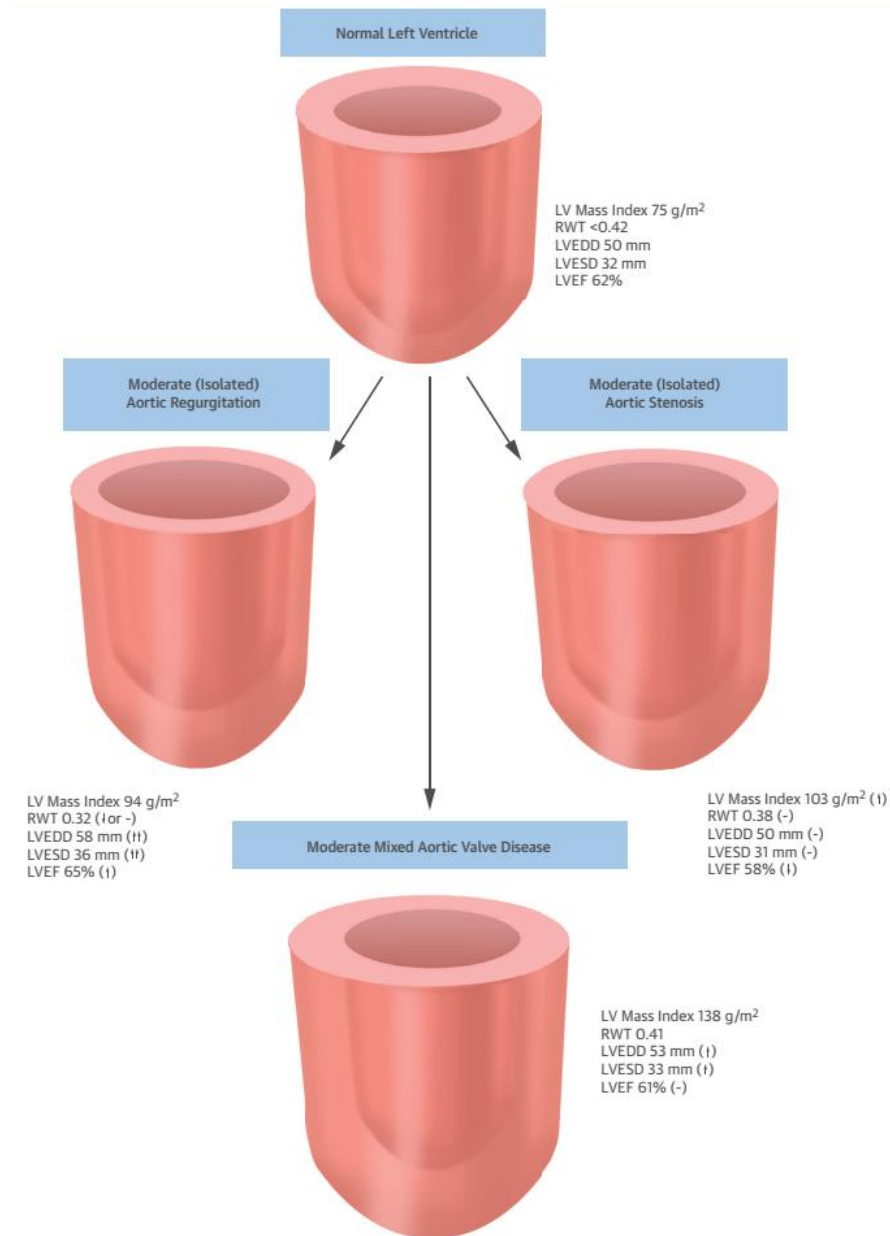
Heart 2017;0:1–8.

doi:10.1136/heartjnl-2016-310894

Heart 2022;0:1-12

doi:10.1136/heartjnl-2021-320501

FIGURE 1 LV Phenotypic Responses to Moderate AS, AR, and MAVD



Moderate mixed aortic valve disease (MAVD) leads to increased left ventricular diameters intermediate to that seen in isolated aortic regurgitation (AR) or aortic stenosis (AS) as well as increased relative wall thickness, resulting in larger indexed left ventricular mass than either lesion in isolation. LV = left ventricular; LVEDD = left ventricular end-diastolic diameter; LVEF = left ventricular ejection fraction; LVEDS = left ventricular end-systolic diameter; RWT = relative wall thickness.

EDITORIAL COMMENT

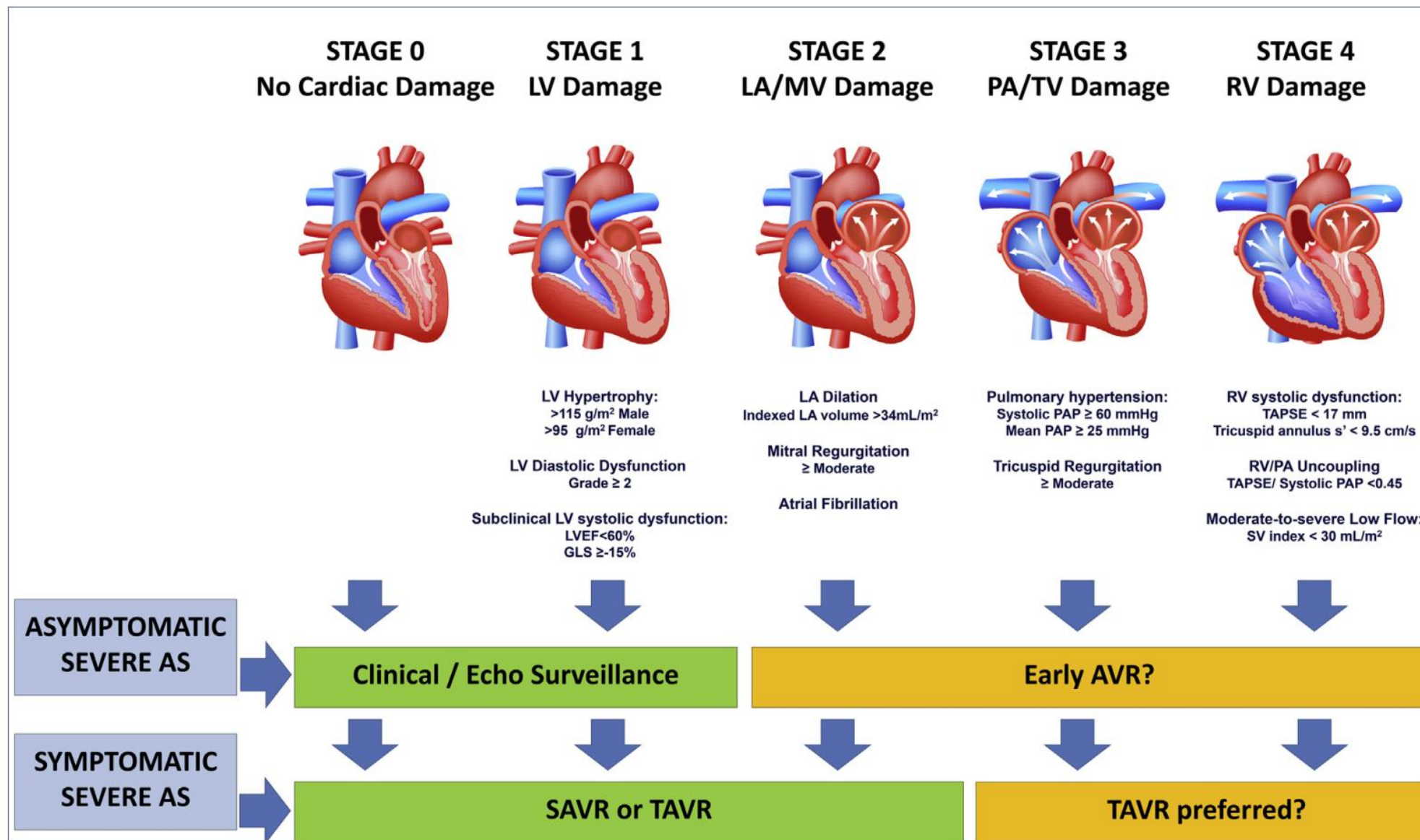
The Simple Arithmetic of Mixed Aortic Valve Disease

LVH + Volume Load = Trouble*

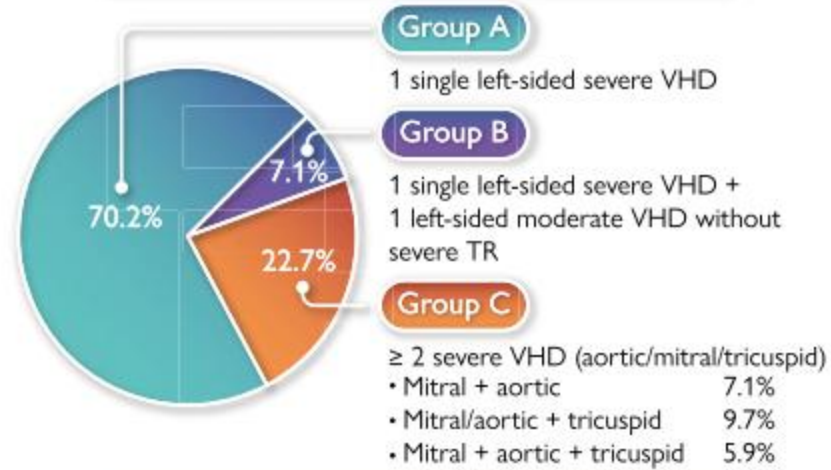
Matthew W. Parker, MD, Gerard P. Aurigemma, MD

JACC 2016;67:2330-3

FIGURE 1 Cardiac Damage Staging in Patients With AS and Implications for Therapeutic Management

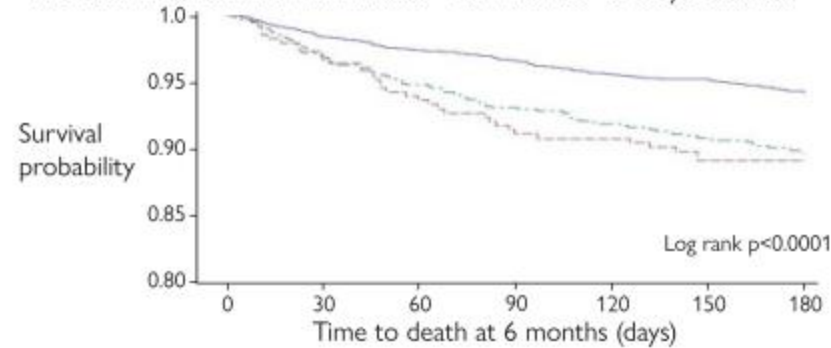


Prevalence of multiple VHD



Survival differences

Product-Limit Survival Estimates - with number of subjects at risk



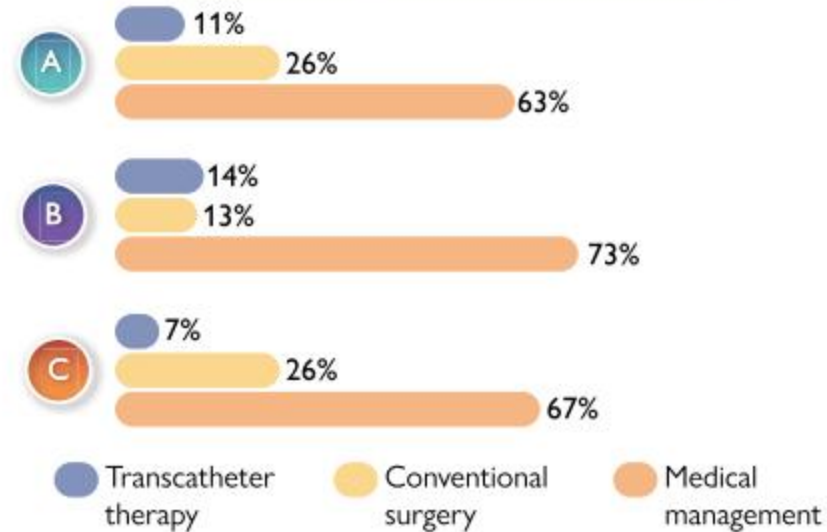
Valve disease groups — A — B — C

A	3571	3075	3001	2918	2811	2655	2224
B	363	317	302	290	280	259	202
C	1153	926	891	865	828	790	609

Baseline differences

	A n=3571	B n=363	C n=1153
Age (years)	71	79	73
Heart failure	18%	31%	35%
Left atrial volumes	↑	↑↑	↑↑
Pulmonary pressure	↑	↑↑	↑↑↑

Initial management differences



Klinická závažnost

Zastoupení emergentní TAVI je u MAVD významně vyšší než u izolované AoS



B. Heidari et al. / International Journal of Cardiology 299 (2020) 209–214

Současná echokardiografická kritéria pro významnost MAVD mohou její klinickou závažnost podhodnocovat.

Recommendations for Timing of Intervention for Mixed AS and AR
Referenced studies that support the recommendations are summarized in [Online Data Supplement 33](#).

COR	LOE	RECOMMENDATIONS
1	B-NR	1. In symptomatic patients with combined AS and AR and a peak transvalvular jet velocity of at least 4.0 m/s or a mean transvalvular gradient of at least 40 mm Hg, AVR is recommended (1,2).
1	C-EO	2. In asymptomatic patients with combined AS and AR who have a jet velocity of ≥ 4.0 m/s with an LVEF $< 50\%$, SAVR is recommended (1,2).

Posouzení hemodynamické závažnosti

1. Kvantifikace Ao stenózy
2. Kvantifikace Ao regurgitace
3. Posouzení významnosti kombinované vady

Kvantifikace kombinované Ao vady

Pokud je jedna vada dominantní nebo významná, určuje významnost MAVD.

Pokud jsou obě vady střední, je MAVD často významná, vodítkem může být V_{max} a gradienty.

Indikace k intervenci

- Hemodynamická významnost
- Symptomy
- BNP (?)
- (CMR: kvantifikace fibrózy?)