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Aortální stenóza s nízkým gradientem

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Klasifikace aortální stenózy

SEPT. 24, 1955

AORTIC STENOSIS

BRITISH
MEDICAL JOURNAL 759

AORTIC STENOSIS: A CLINICAL STUDY

BY

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Cardiac Catheterization

These findings have been made the subject of a separate communication (Gorlin *et al.*, 1955). There was evidence to show that aortic stenosis prevented the increase in stroke work which normally occurs on exercise before the symptoms were incapacitating, and that the "pulmonary capillary pressure," although normal at rest except for those patients in frank congestive failure, rose abnormally on exercise. This gave a good indication of the poor ventricular reserve.

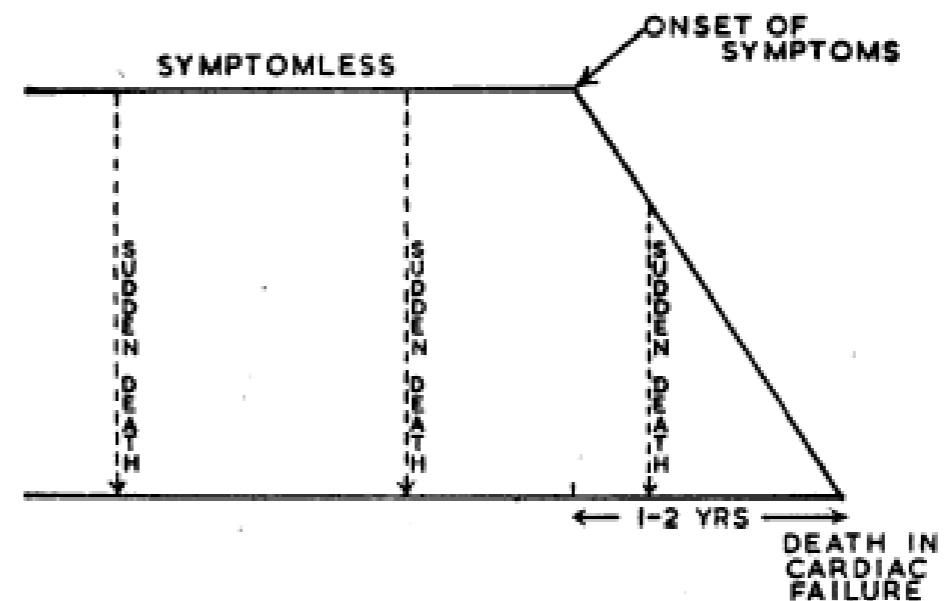
In combination with post-mortem studies of the aortic valves in an artificial perfusion system (McMillan *et al.*, 1952) it appeared that the critical valve area in isolated aortic stenosis was of the order of 0.5 square cm.; with co-existing aortic incompetence it is variably larger. This reduction is generally due to commissural fusion, but may arise from increased valve-cusp rigidity alone (Smith and Matthews, 1955).

We believe, however, that cardiac catheterization has no important part to play in the routine assessment of a patient with aortic stenosis.

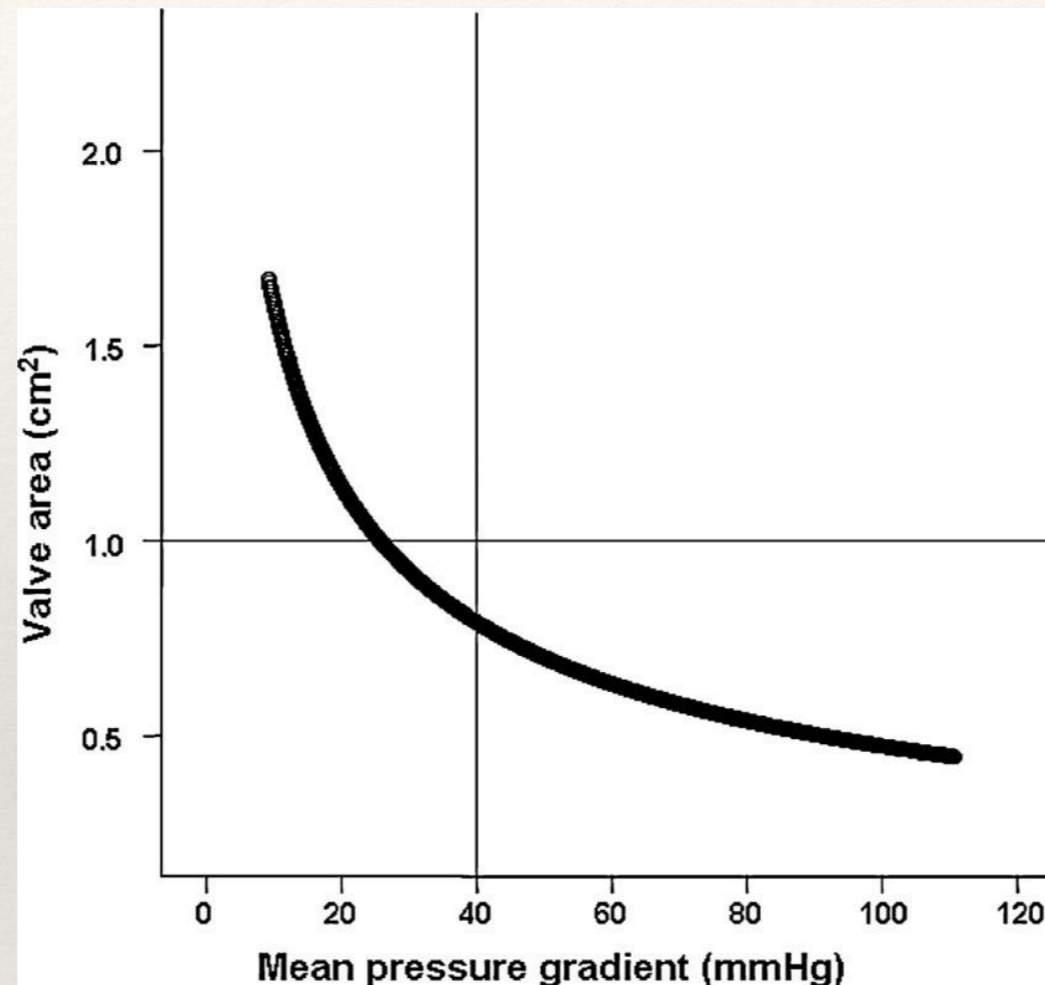
Material and Methods

The diagnosis of aortic stenosis was made from the characteristic harsh systolic murmur, maximal either in the aortic area or in the suprasternal notch. This murmur was usually loud, but, as is emphasized later, in cardiac failure its intensity was sometimes reduced. Those with evidence of mitral valvular disease were excluded. Only four of the patients have died; severe aortic stenosis was found in the three who came to post-mortem examination.

AORTIC STENOSIS



Vypočtený vztah mezi „anatomickou“ plochou ústí (AVA) a středním gradientem podle Gorlina vzorce



❖ „Efektivní“ AVA (doppler) < „anatomická“ AVA (Gorlin)

Jander, N. Eur Heart J Suppl 2008 10:E11-15E; doi:10.1093/eurheartj/sun016

Klasifikace aortální stenózy

❖ Riziko AS

- ❖ BAV
- ❖ Ao skleróza
- ❖ RCHS

❖ Progresivní AS

- ❖ V max 2-3,9 m/s
- ❖ Stř. grad 16 - 40 mmHg
- ❖ AVA >1

❖ Těžká AS

❖ S vysokým gradientem

- ❖ velmi těžká Vmax >5 m/s

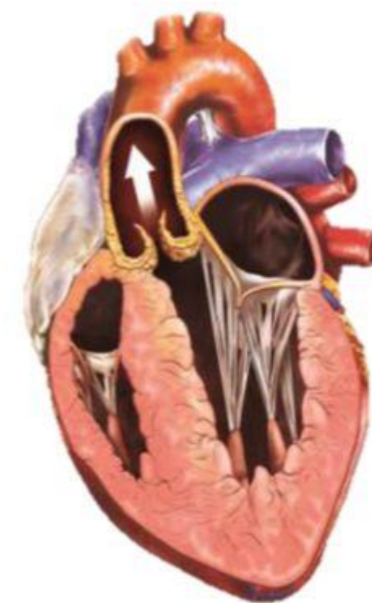
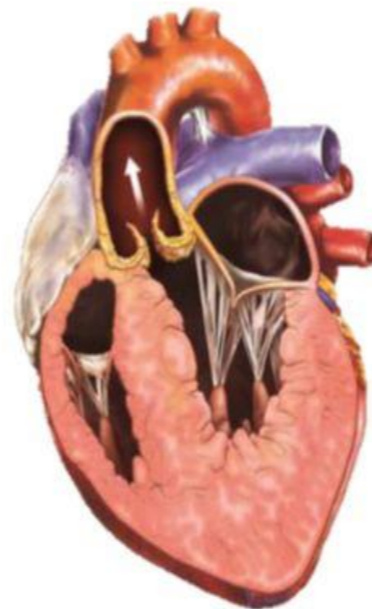
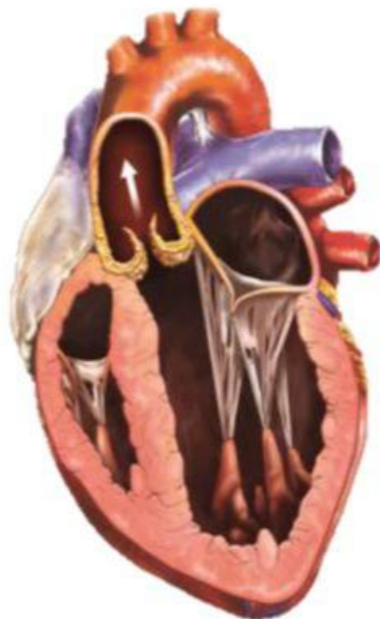
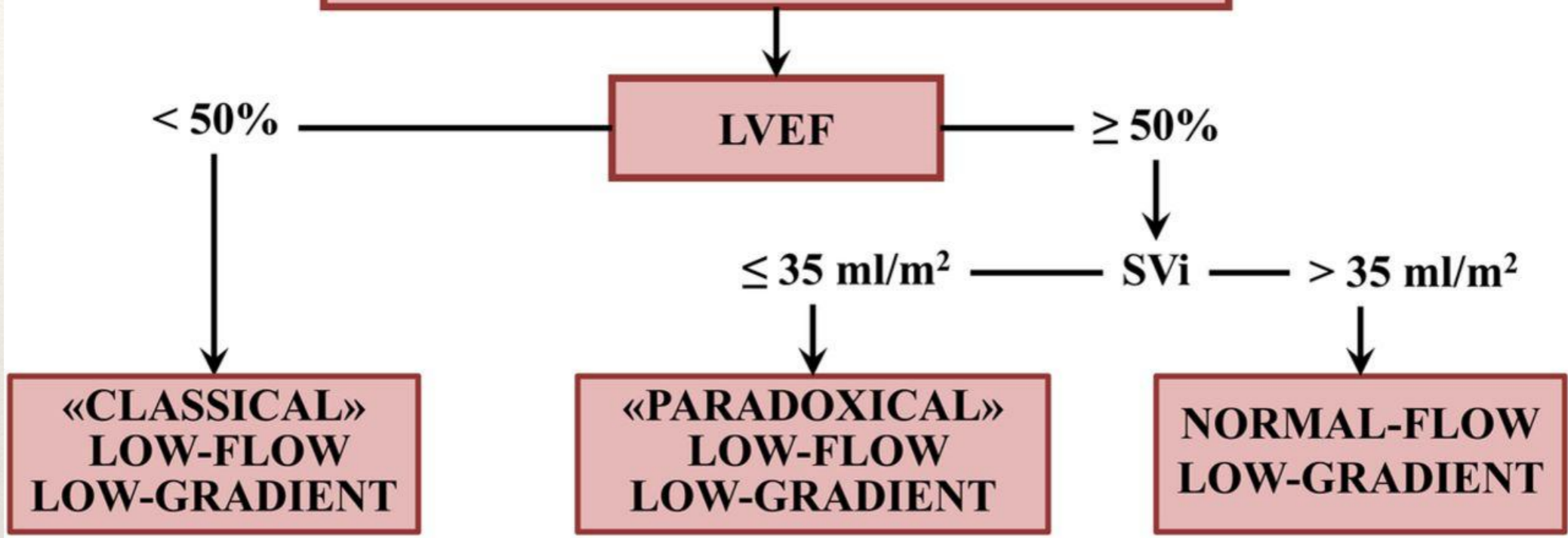
❖ S nízkým gradientem = „low flow“

- ❖ (stř. grad <40 + AVA <1)

❖ Nízká EF

- ❖ Vysoká EF, ale nízký SV při malé komoře = „paradoxní low flow“

LOW GRADIENT AS
AVA \leq 1.0cm² and MG<40mmHg

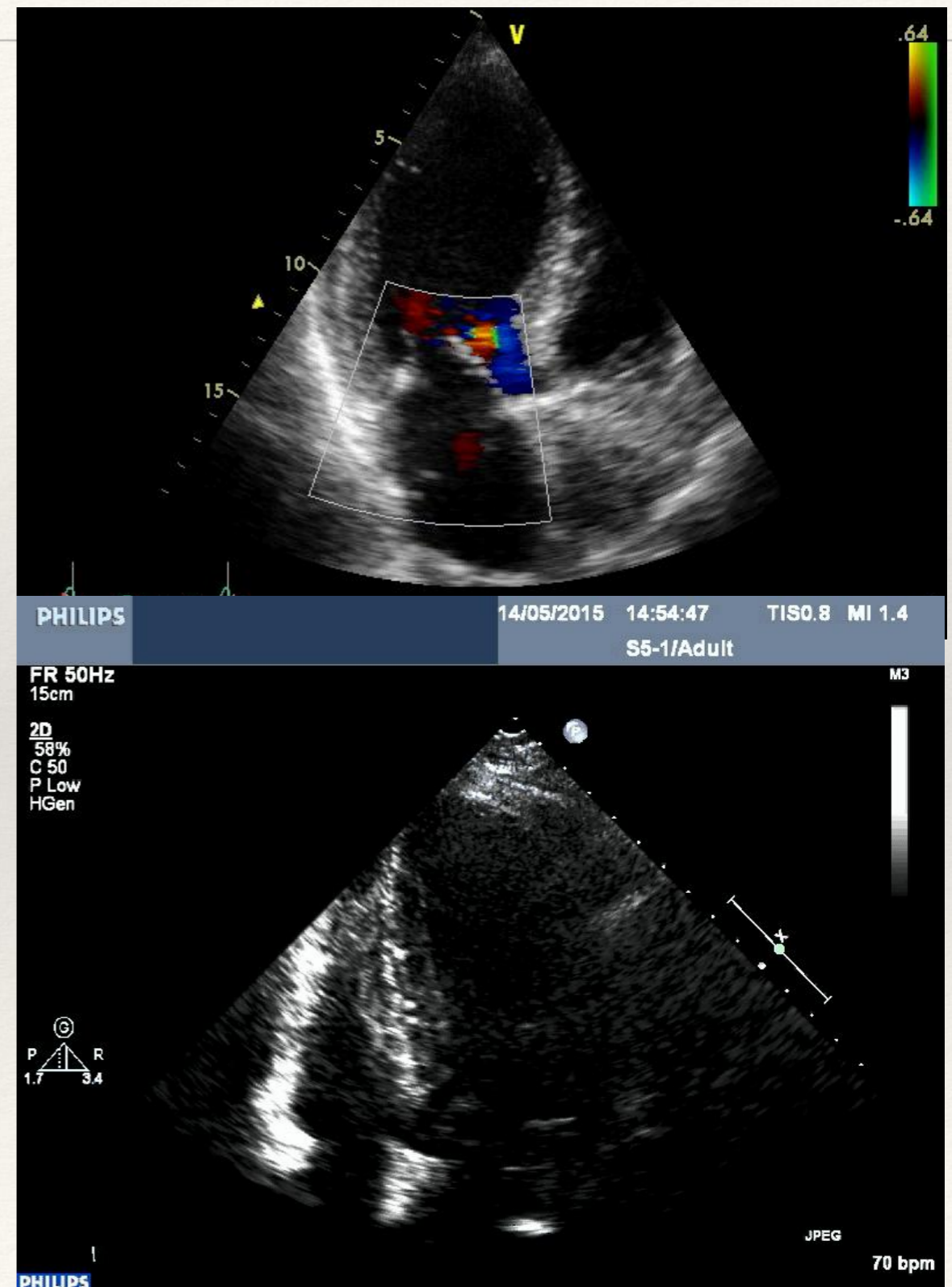


Typy aortální stenózy




Typy AS	střední gradient (mm Hg)	EF (%)	LV index tep. objemu (ml/m ²)	Hodnocení kontraktilní rezervy	Kalciové skóre
Normální průtok vysoký gradient	≥40	≥50	>35	-	+
Normální flow a gradient, nízká EF	≥40	<50	>35	-	+
Klasická low flow, low gradient	<40	<50	≤35	+	+
Paradoxní low flow, low gradient	<40	≥50	≤35	+/-	+
Pseudostenóza	<40	< 50	≤35	-	-

AS s nízkým gradientem a nízkou EF

- ❖ posouzení funkční rezervy
- ❖ pseudostenóza?
- ❖ bez funkční rezervy ?

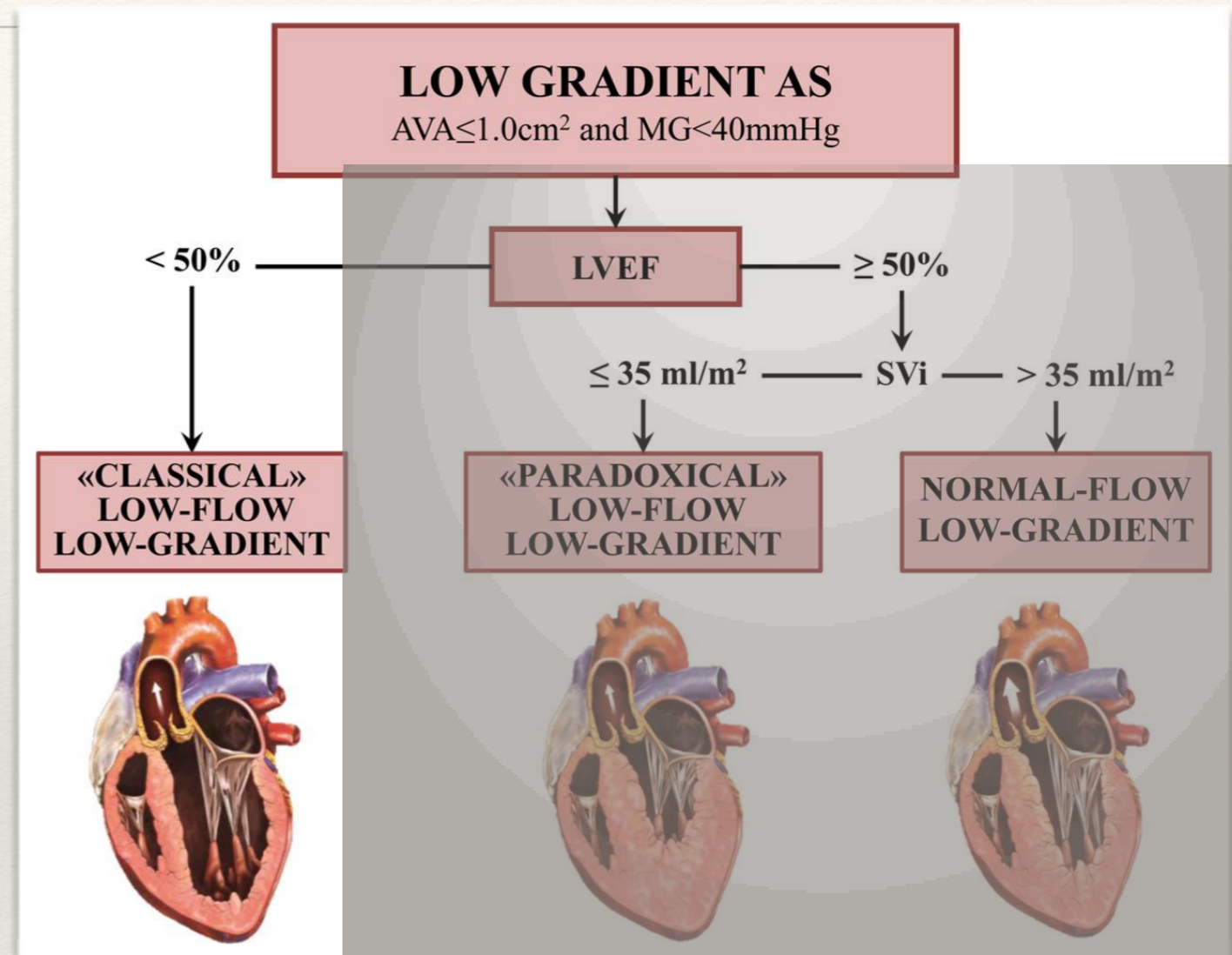


AS s nízkým gradientem a nízkou EF low flow low gradient

- ❖ Střední gradient <30 mmHg, EF $<50\%$
- ❖ Dobutamin 5 - 20 ug/kg/min.
- ❖ gradient,  EF  AVA 
- ❖ = těžká AS, indikace k urychlené korekci vady

AS s „paradoxním low flow, low gradient“ EF>50% &AVA <1 cm²

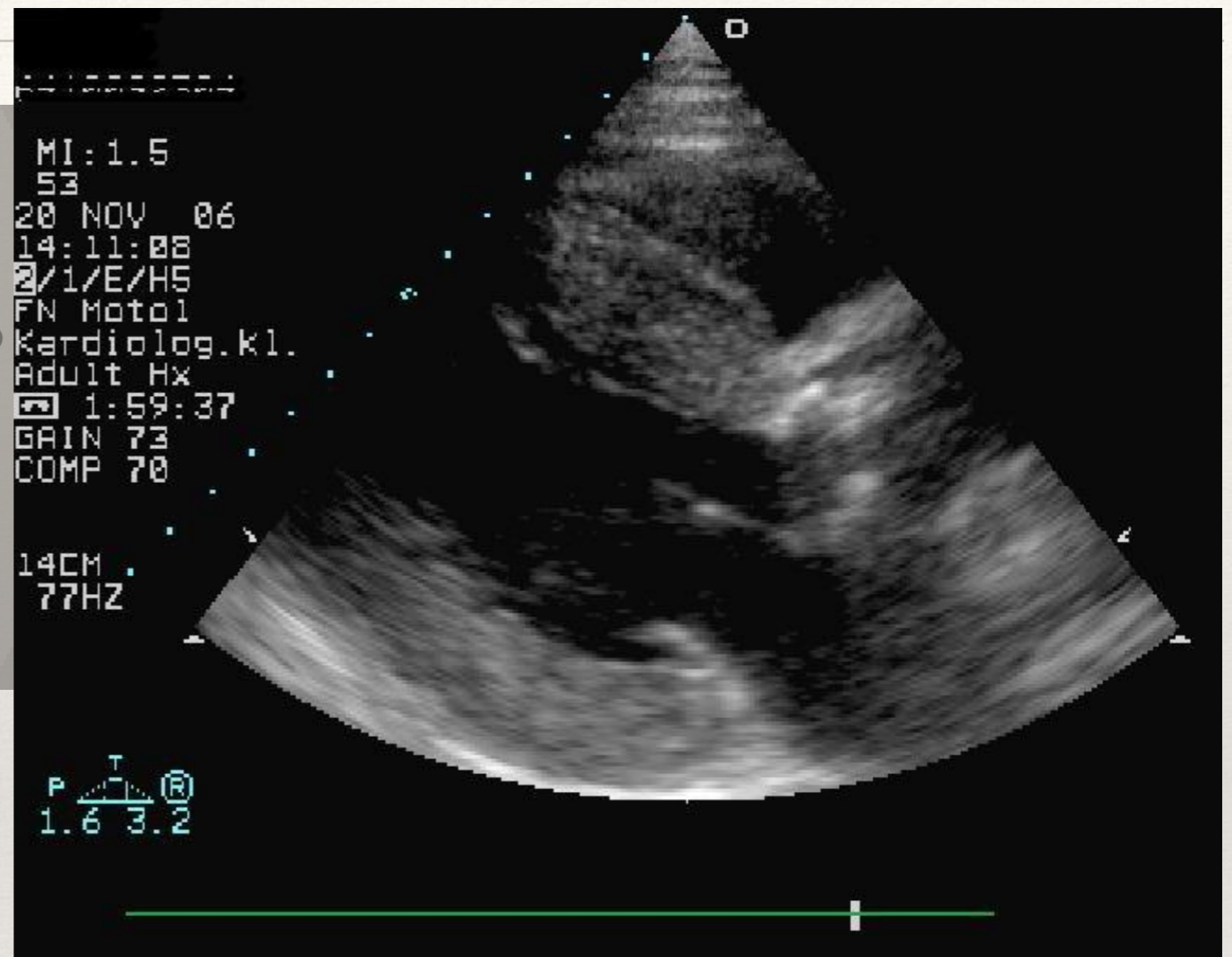
- ❖ inkonzistence kriterií, těžká vada od AVA 0,8?
- ❖ podhodnocení asymetrického LVOT?
- ❖ podhodnocení gradientu?
- ❖ jde ve skutečnosti o střední vadu?



- ❖ V max 3-3,9 m/s
- ❖ Δgradient 20-39 mmHg
- ❖ SV < 35 ml/m²

AS s „paradoxním low flow, low gradient“ EF>50% &AVA <1 cm²

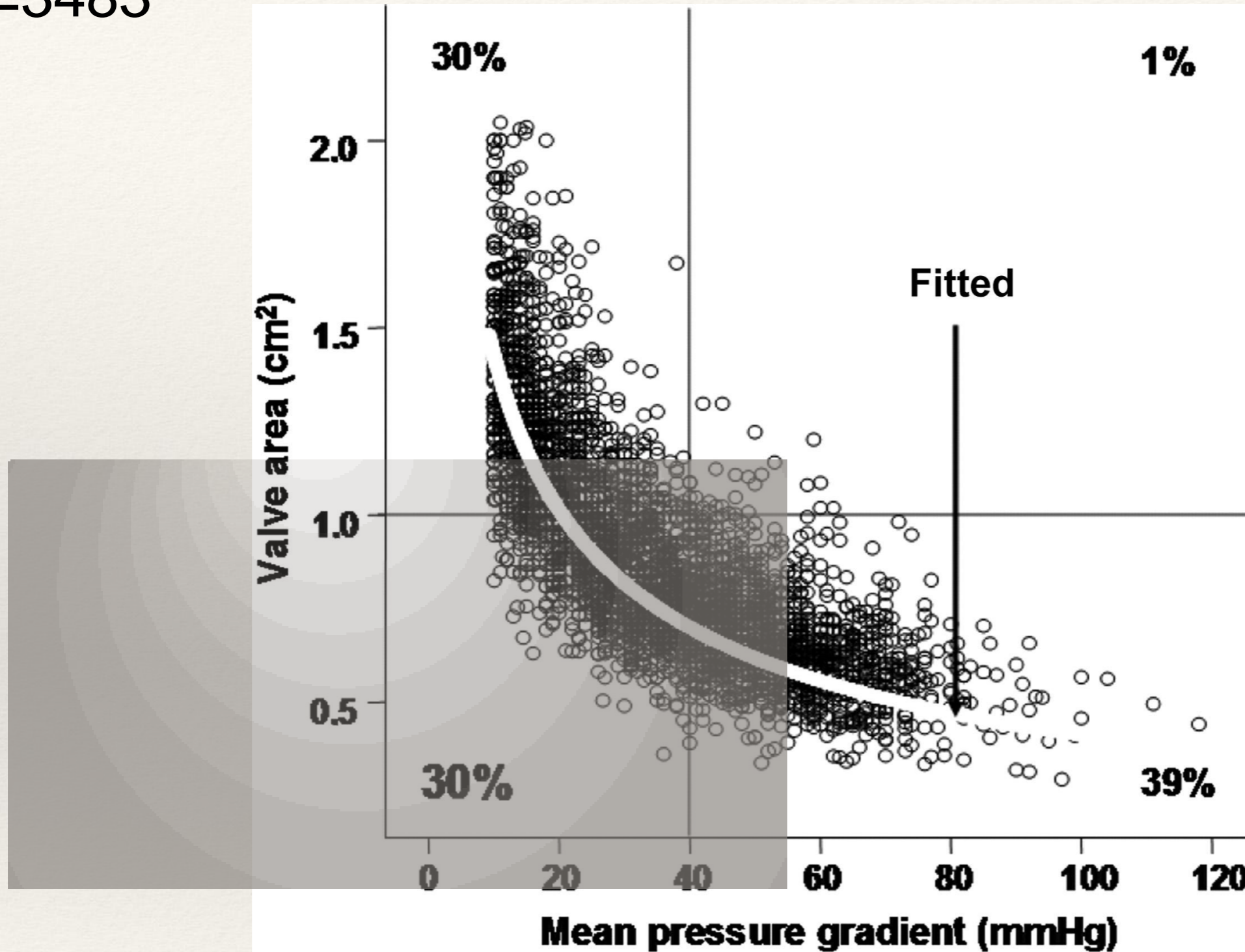
- ❖ *inkonzistence kriterií, těžká vada od AVA 0,8?*
- ❖ *podhodnocení při asymetrickém LVOT?*
- ❖ *podhodnocení gradientu?*
- ❖ *jde ve skutečnosti o střední vadu?*



- ❖ *V max 3-3,9 m/s*
- ❖ *Δgradient 20-39 mmHg*
- ❖ *SV <35 ml/m²*

Valve area and mean pressure gradient (dPm) with relationship to criteria for severe aortic stenosis

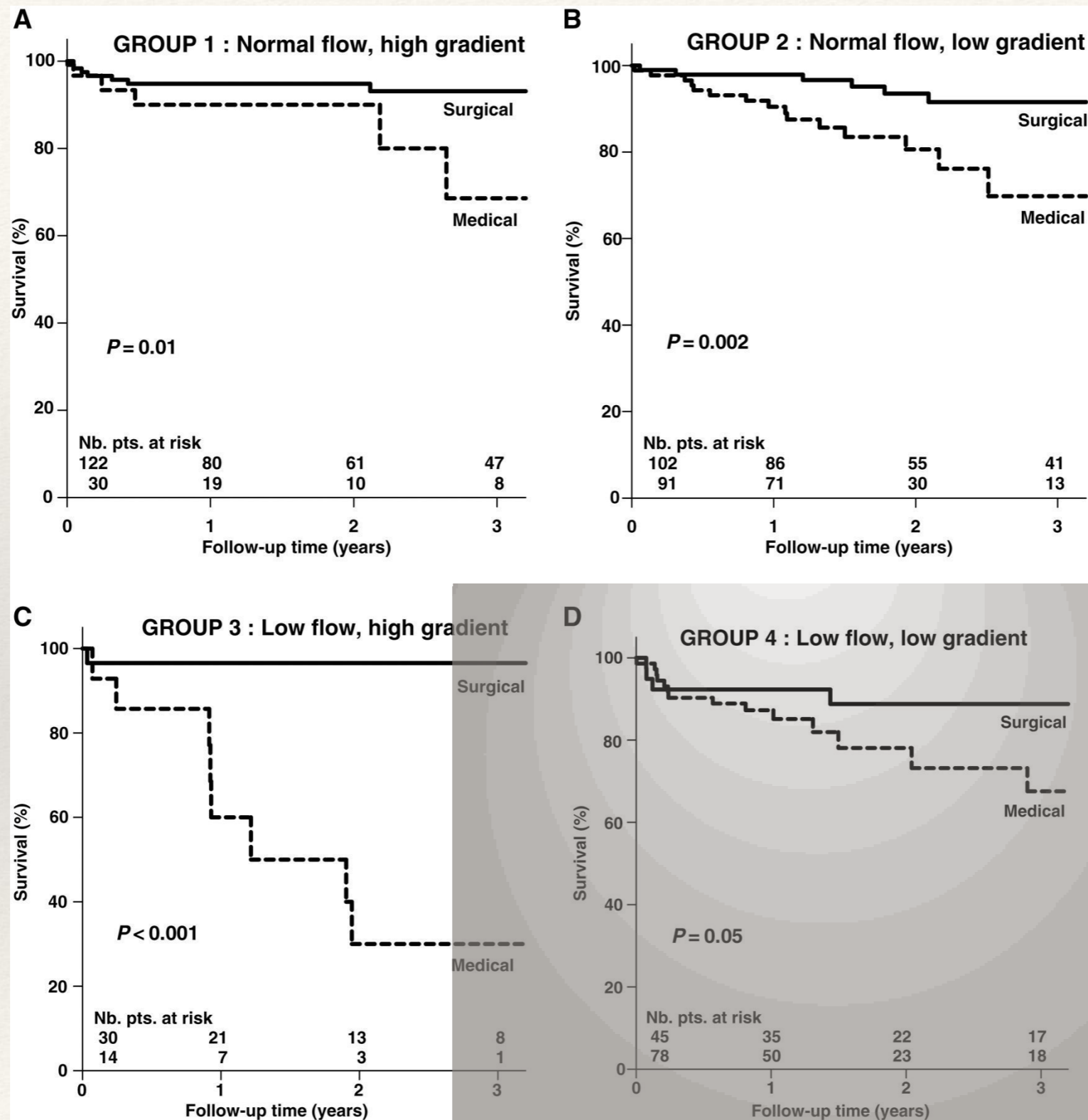
N=3483



Jander, N. Eur Heart J Suppl 2008 10:E11-15E; doi:10.1093/eurheartj/sun016

Přežití v „hemodynamických“ skupinách pacientů s AS

AVA < 0,6 cm²/m² : chirurgická vs konzervativní léčba



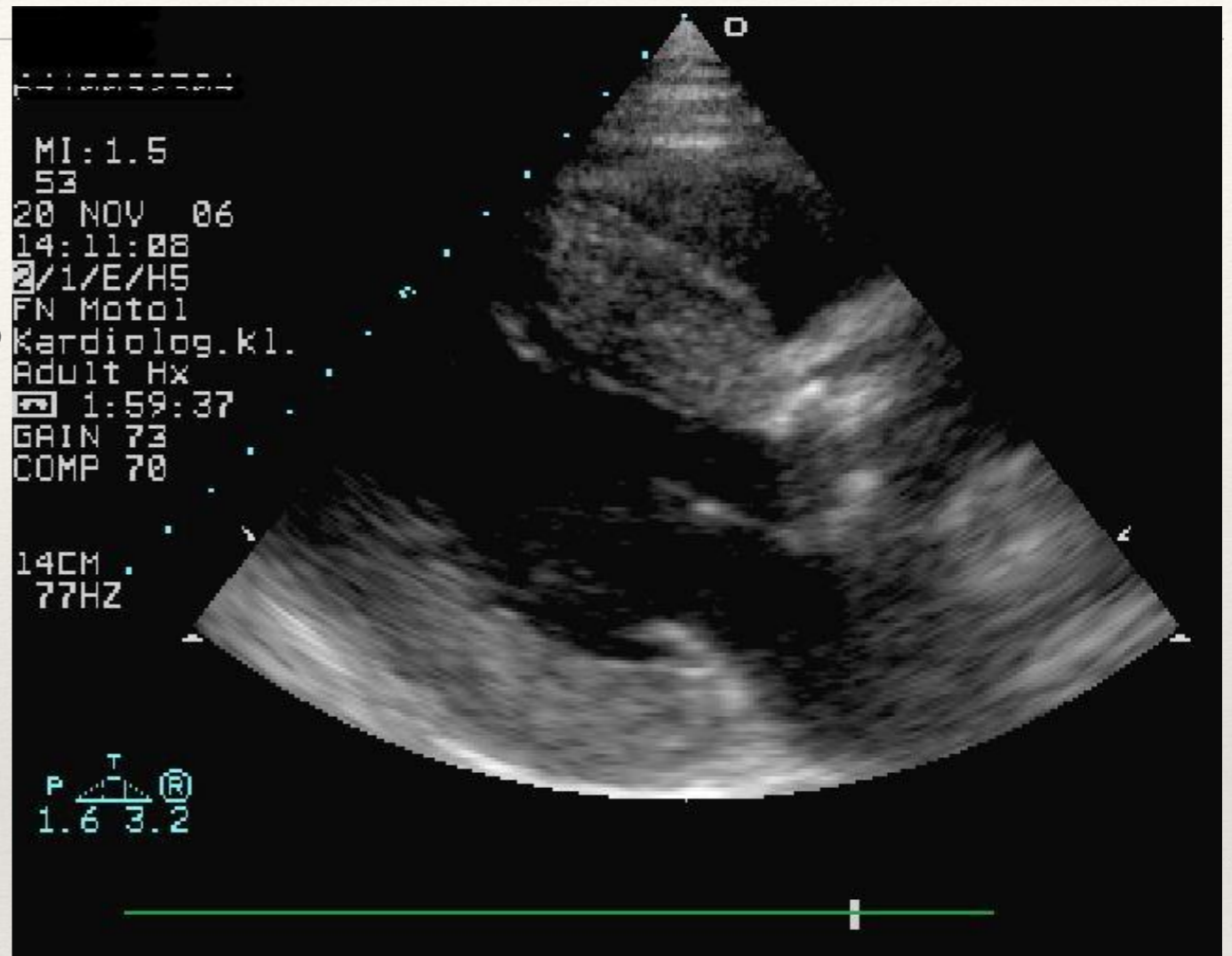
Stejný gradient \Leftrightarrow různá AVA

- ❖ n=9488 58% muži
- ❖ Vmax 3.9±0.8 m/s, MG 37±16 mm Hg, AVA 1.09±0.34 cm².
- ❖ Rozdělení do 3 skupin podle LVOT.
- ❖ AVA se významně nelišila
- ❖ Osoby s malým LVOT častěji starší ženy (91%), s častějším paradoxním low-flow
- ❖ Hranice AVA 0.8 cm² snížila inkonzistenci závažné AS ze 48% na 26% u osob s malým LVOT
- ❖ Hranice AVA 1,0 cm² se jeví konzistentní pro velký LVOT.

AVA=1 LVOT	střední gradient	Vmax	VLVOT/ Vmax
23+	42	4,1	0,22
20-22	35	3,8	0,29
17-19	29	3,5	0,36

AS s „paradoxním low flow, low gradient“ EF>50% &AVA <1 cm²

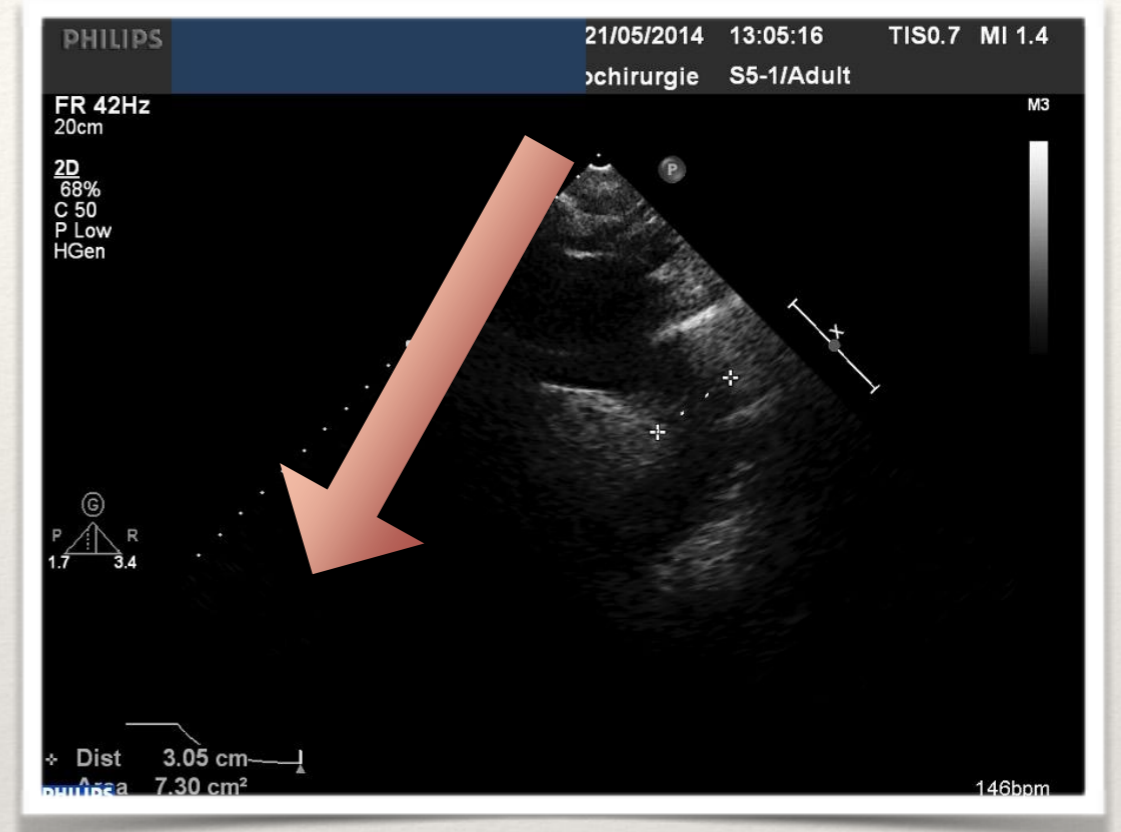
- ❖ inkonzistence kriterií, těžká vada od AVA 0,8?
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- ❖ Δgradient 20-39 mmHg
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Nonapikální projekce

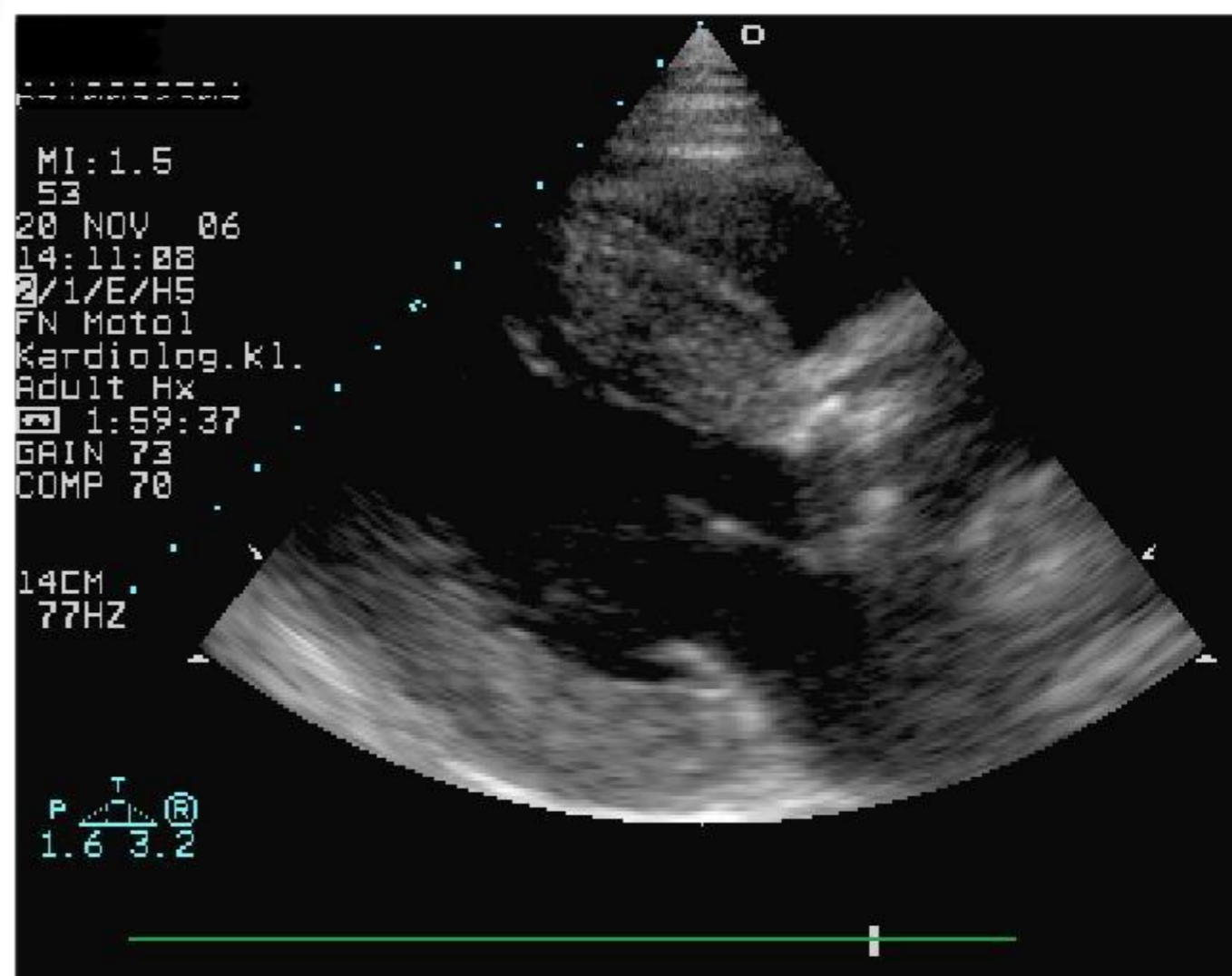
- ❖ Doppler Imaging in Aortic Stenosis: The Importance of the Nonapical Imaging Windows to Determine Severity in a Contemporary Cohort.
- ❖ n=100
- ❖ Vmax nejčastěji z pravého parasternálního okna - 50%
- ❖ apex 39%
- ❖ při ostrém úhlu aorty častěji Vmax nonapikálně
- ❖ Při vynechání nonapikální projekce 8% pt
- ❖ chybně klasifikováno místo high-gradient severe AS jako low-gradient severe AS
- ❖ Re:
- ❖ Vmax byla mimo apikální projekce u 61% pacientů
- ❖ vynechání nonapikálních projekcí vedlo k podhodnocení závažnosti vady u 23%



- ❖ *Thaden J Am Soc Echocardiogr. 2015;28:780-5.*

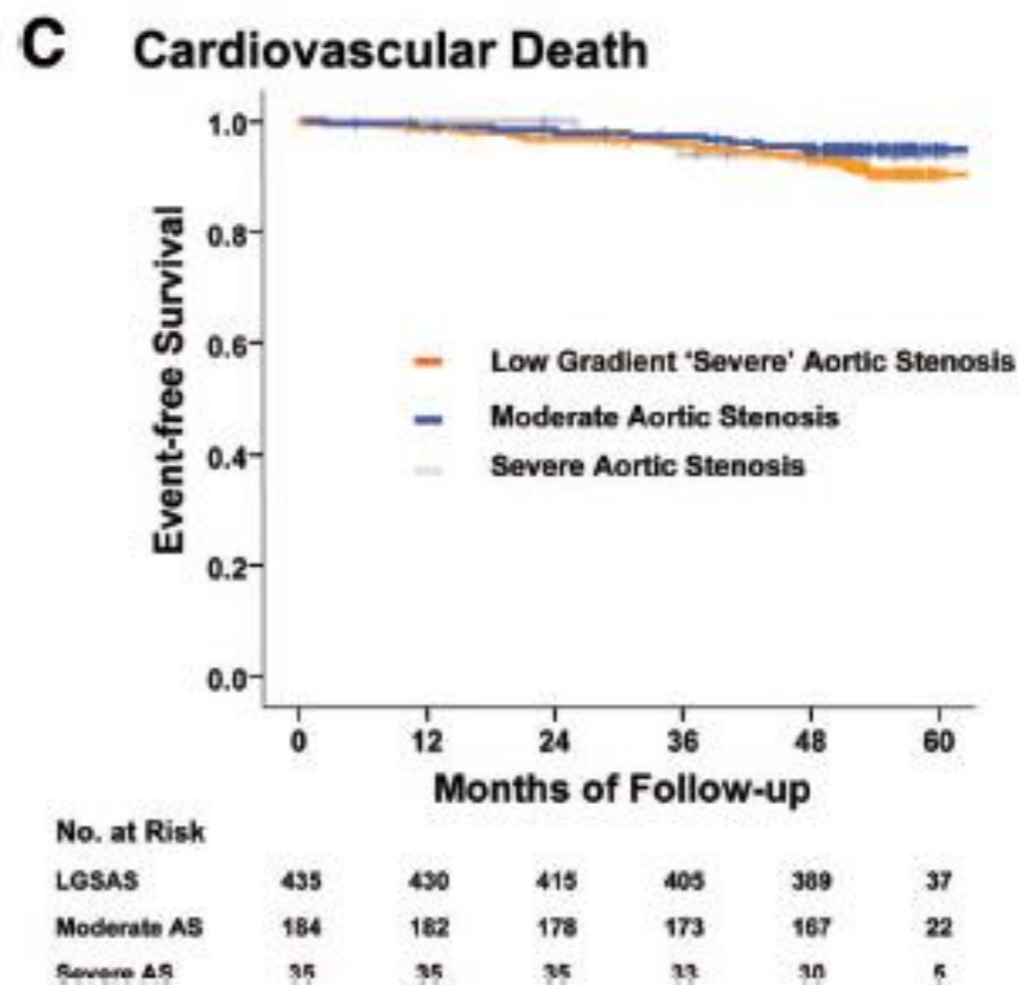
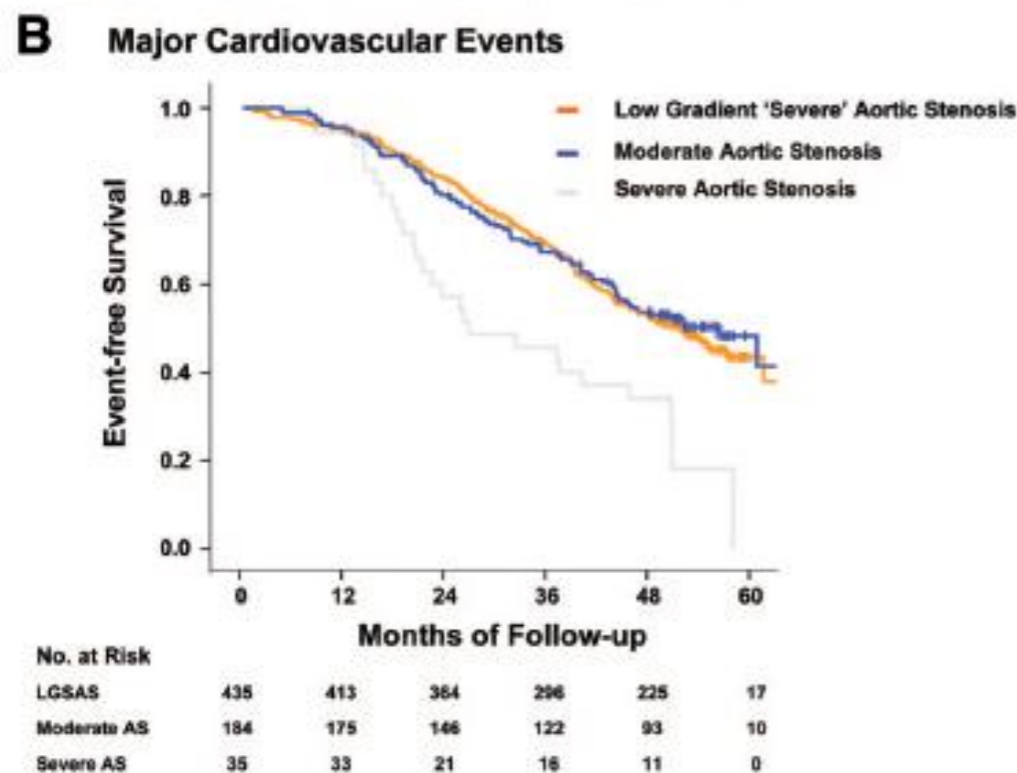
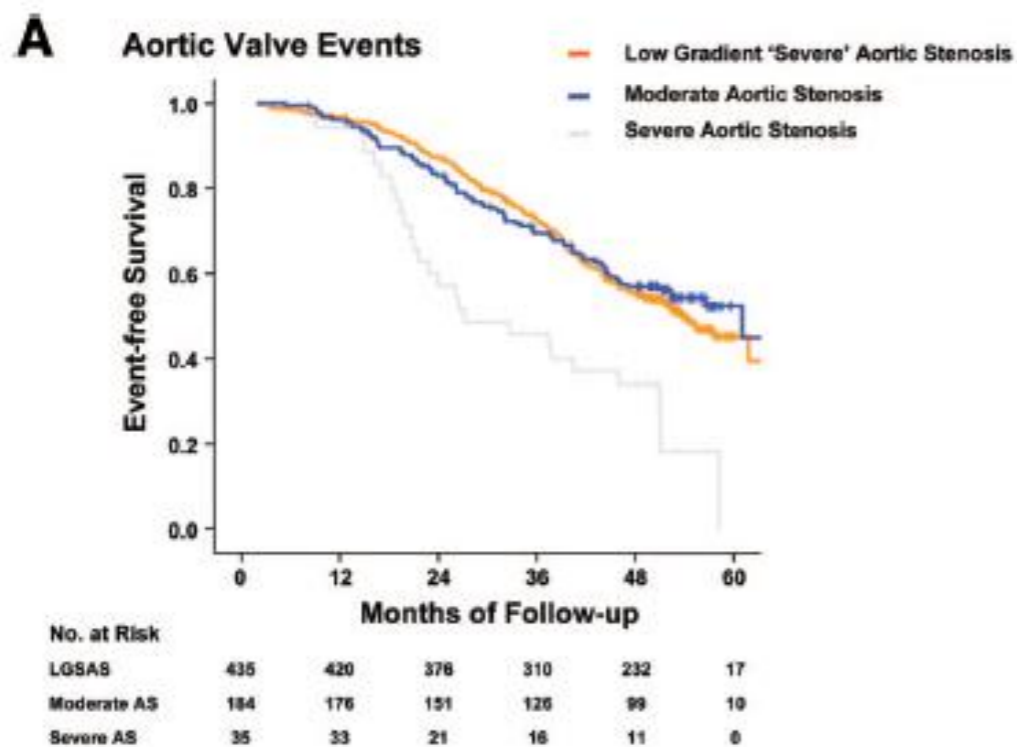
AS s „paradoxním low flow, low gradient“ EF>50% &AVA <1 cm²

- ❖ *inkonzistence kriterií, těžká vada od AVA 0,8?*
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- ❖ *jde ve skutečnosti o střední vadu ?*



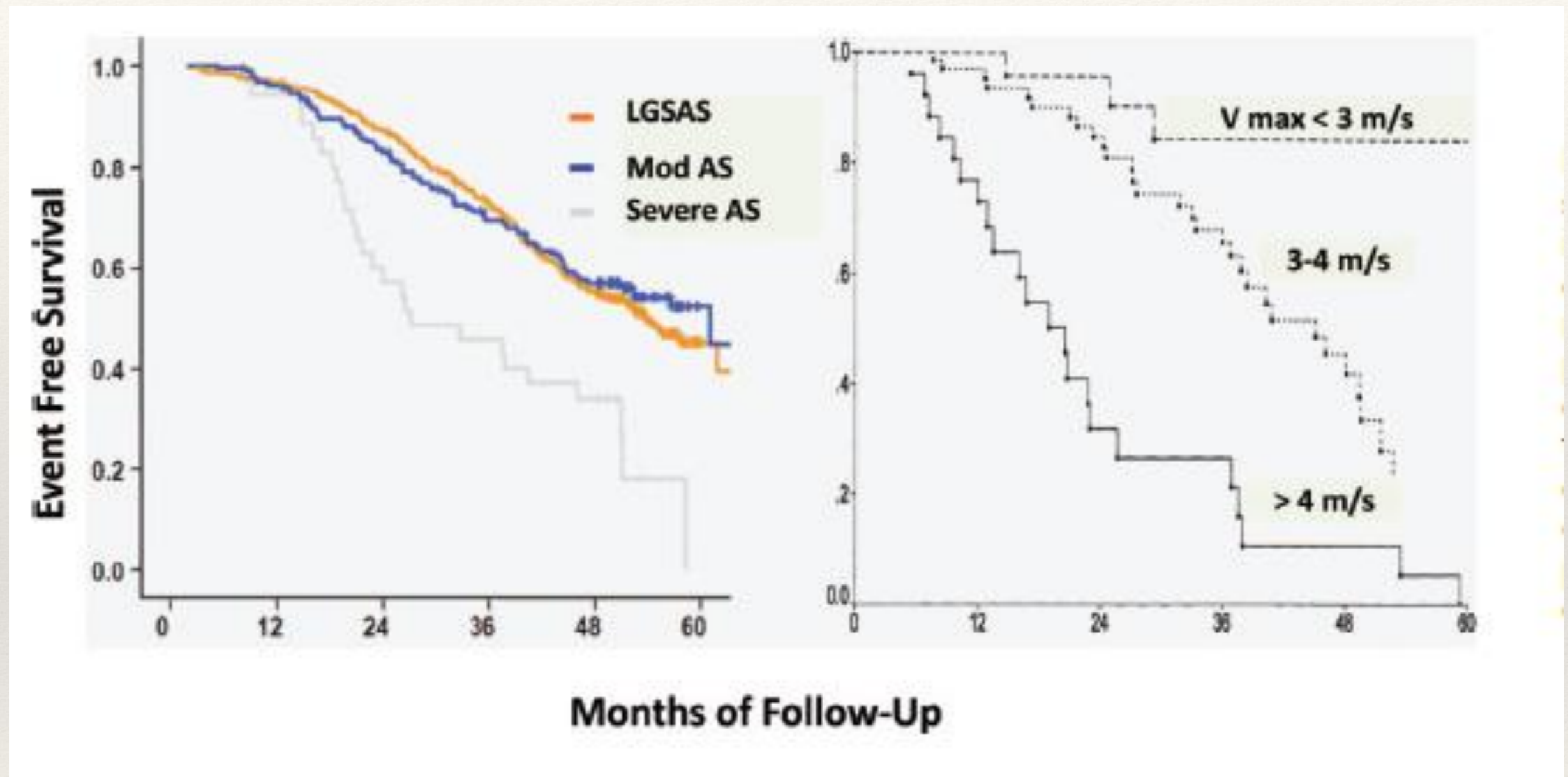
- ❖ *V max 3-3,9 m/s*
- ❖ *Δgradient 20-39 mmHg*
- ❖ *SV <35 ml/m²*

Prognóza asymptomatických pacientů s LF LG těžkou AS vs. střední AS dle gradientu ve studii SEAS



❖ Jander N. *Circulation*. 2011;123:887-895.

Přežití bez KV příhod, srdečního selhání a náhrady chlopně asymptomatická AS



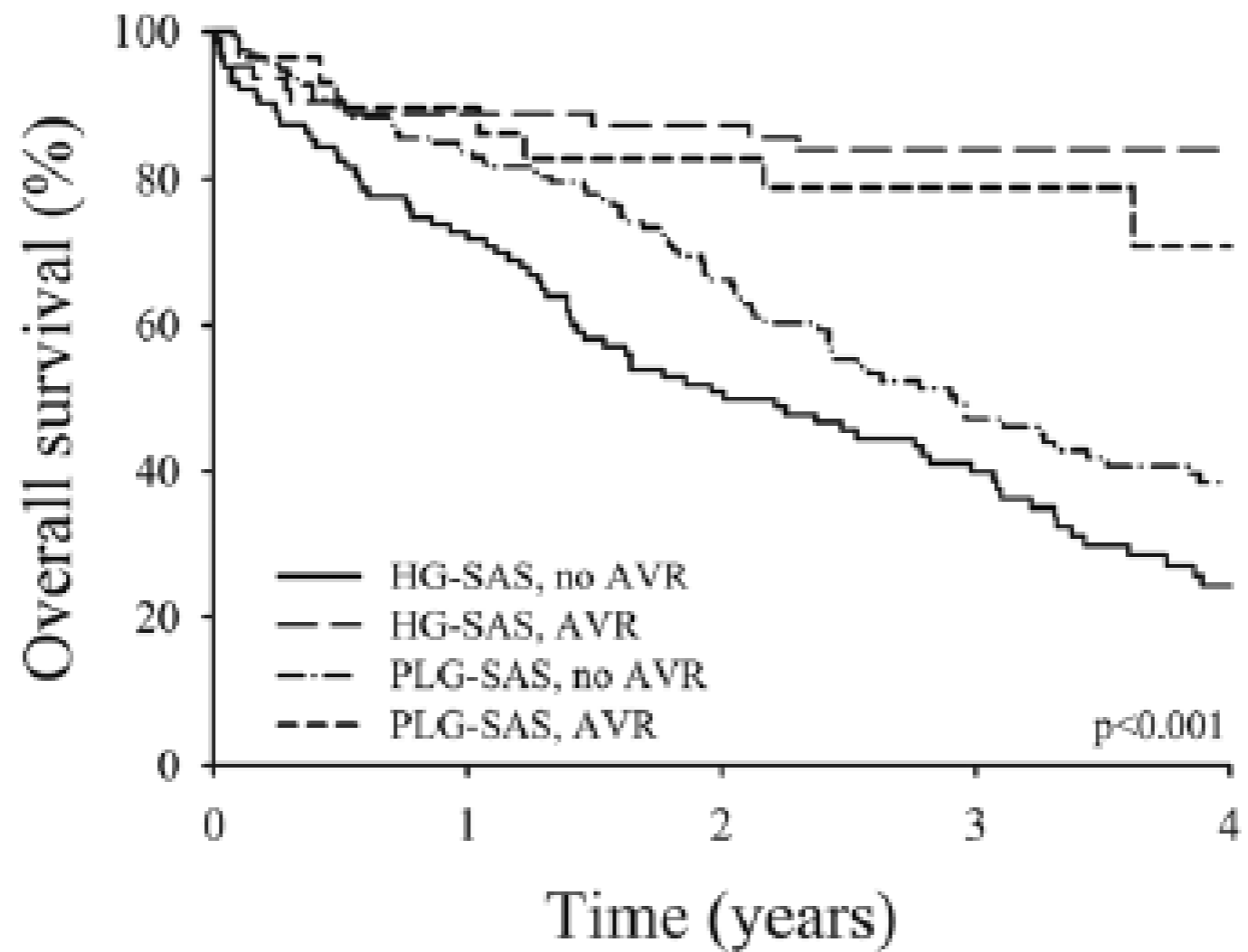
SEAS, Jander

Otto 1997

William A. Zoghbi Circulation. 2011;123:838-840



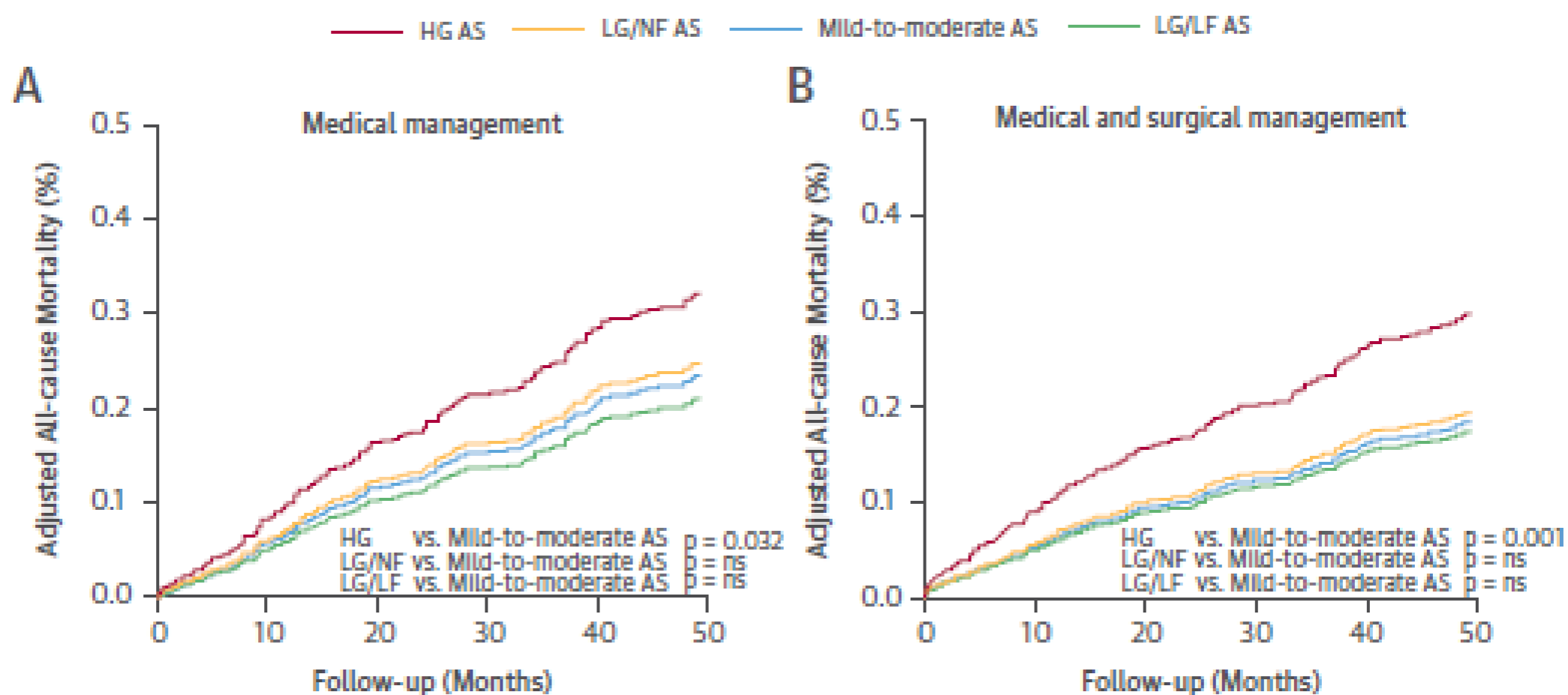
Přežití náhrada chlopně vs. konzervativně HG vs paradoxní low gradient



HG-SAS, no AVR	103	76	51	34	17
HG-SAS, AVR	63	57	56	43	33
PLG-SAS, no AVR	154	127	80	46	34
PLG-SAS, AVR	29	26	23	16	9

Prognóza HG vs. LG vs. střední AS

FIGURE 2 Adjusted Mortality Curves for the 4 Groups of AS Patients



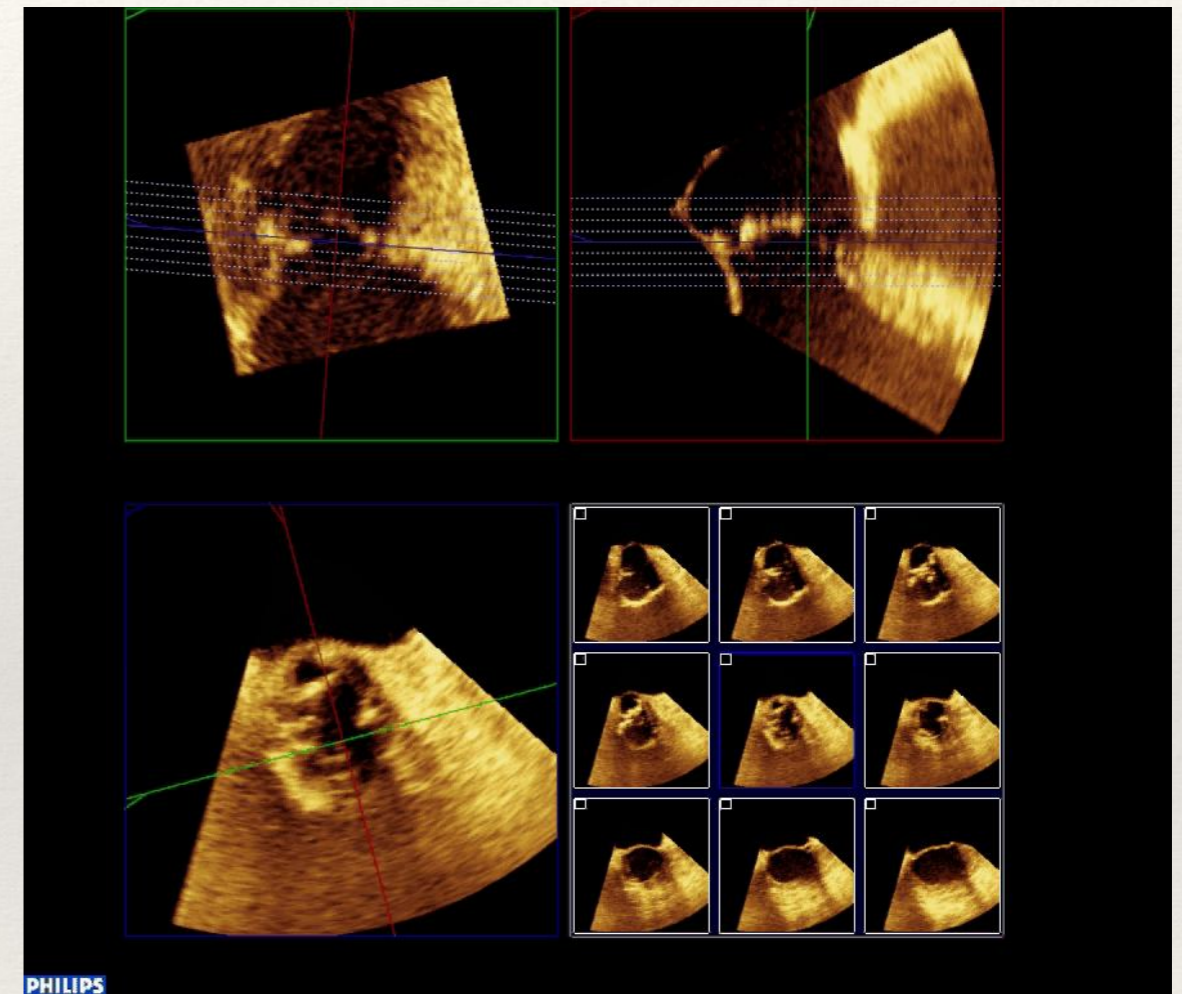
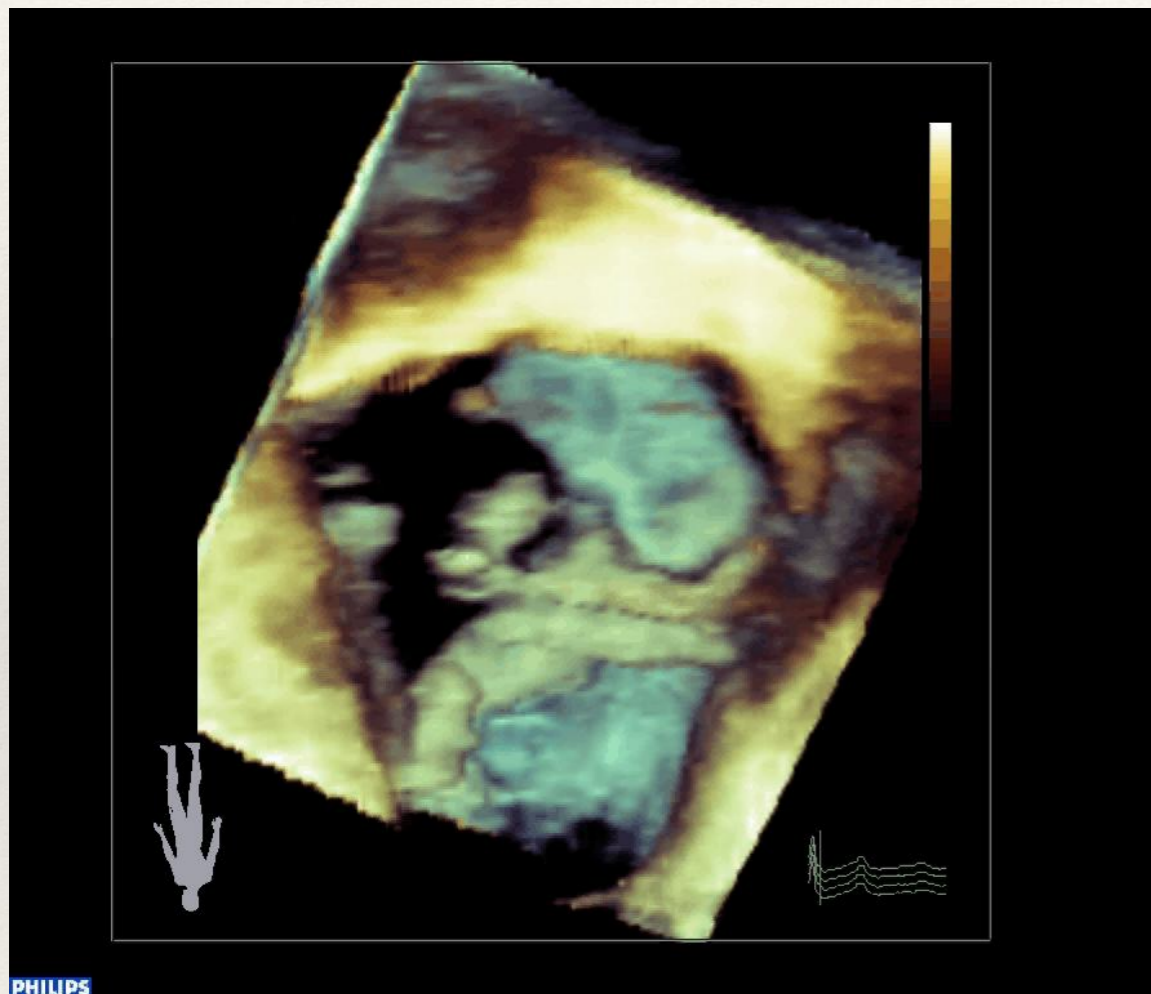
Adjusted for age, sex, body surface area, comorbidity, symptoms, coronary artery disease, atrial fibrillation, and ejection fraction. **(A)** Medical management. **(B)** Medical and surgical management. Abbreviations as in Figure 1.

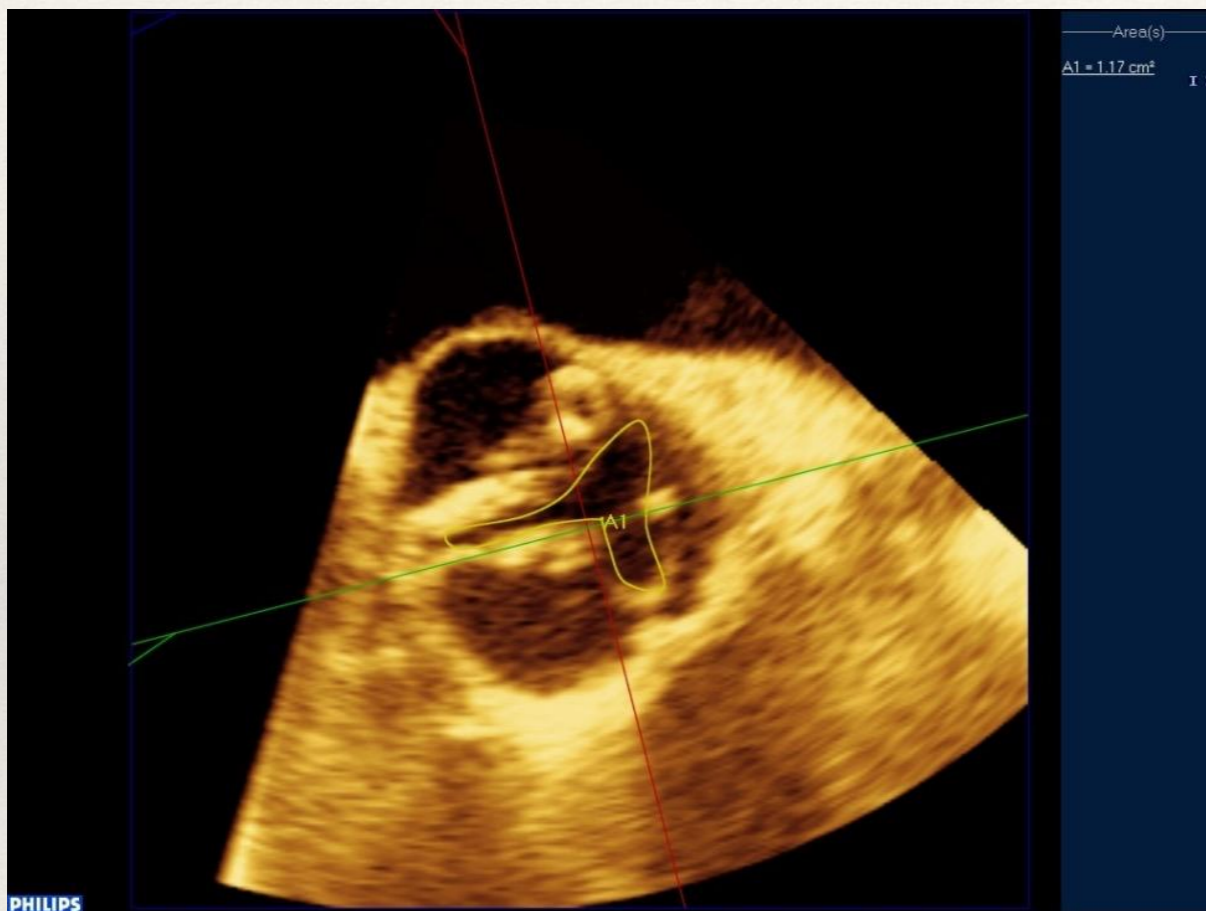
Prognóza HG vs. LG vs. střední AS

TABLE 1 Baseline Demographic and Clinical Characteristics of the 4 Groups of Patients With Aortic Stenosis

	All Patients (N = 809)	Group				p Value
		Moderate AS (n = 420)	LG/LF AS (n = 57)	LG/NF AS (n = 85)	HG AS (n = 247)	
Demographics, baseline, data and symptoms						
Age, yrs	77.4 (69.3-83.5)	76.9 (67.4-83.2)	78.5 (73.5-86.3)*	79.3 (73.9-83.9)*	76.9 (67.9-83.1)	0.009
Male	428 (53.0)	249 (59.3)	24* (42.1)	33* (38.8)	122 (49.4)	0.001
Body surface area, m ²	1.90 ± 0.23	1.94 ± 0.22	1.86 ± 0.21*	1.78 ± 0.23†	1.88 ± 0.24	<0.001
Systolic blood pressure, mm Hg	140.0 (125.0-150.0)	140.0 (125.0-150.0)	140.0 (120.0-156.0)	140.0 (130.0-150.0)	138.0 (120.0-150.0)	0.65
NYHA functional class III-IV symptoms	128 (15.8)	59 (14.0)	9 (15.8)	6 (7.1)	54* (21.9)	0.005
NYHA functional class						
I	360 (44.5)	196 (46.7)	25 (43.9)	42 (49.4)	97 (39.3)	0.07
II	321 (39.7)	165 (39.3)	23 (40.4)	37 (43.5)	96 (38.9)	
III	99 (12.2)	46 (11.0)	8 (14.0)	6 (7.1)	39 (15.8)	
IV	29 (3.6)	13 (3.1)	1 (1.8)	0 (0)	15 (6.1)	
Medical history and risk factors						
Hypertension	583 (72.1)	316 (75.2)	40 (70.2)	65 (76.5)	162* (65.6)	0.043
Smoking	225 (27.8)	126 (30.0)	14 (24.6)	19 (22.4)	66 (26.7)	0.44
Dyslipidemia	343 (42.4)	186 (44.3)	16 (28.1)	36 (42.4)	105 (42.5)	0.14
Diabetes mellitus	243 (30.0)	138 (32.9)	20 (35.1)	21 (24.7)	64 (25.9)	0.11
Coronary artery disease	265 (32.8)	126 (30.0)	22 (38.6)	28 (32.9)	89 (36.0)	0.31
History of atrial fibrillation	266 (32.9)	146 (34.8)	22 (38.6)	27 (31.8)	71 (28.7)	0.36
Charlson comorbidity index	2.0 (1.0-3.0)	2.0 (1.0-4.0)	2.0 (1.0-4.0)	2.0 (1.0-3.0)	1.0† (1.0-2.0)	<0.001

3D planimetrie

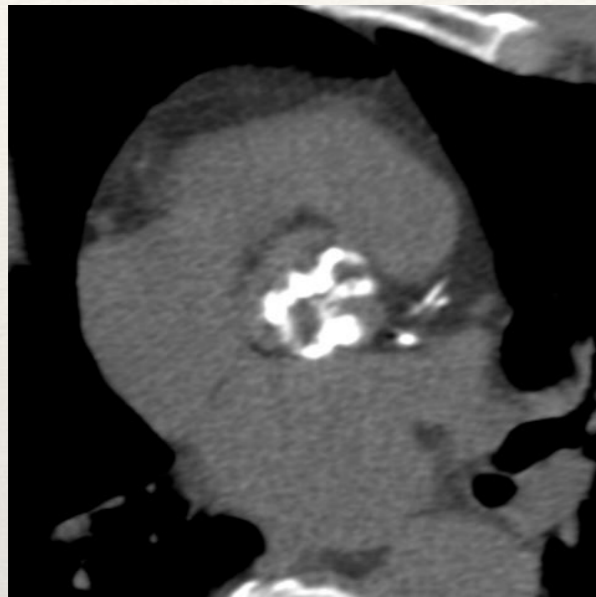




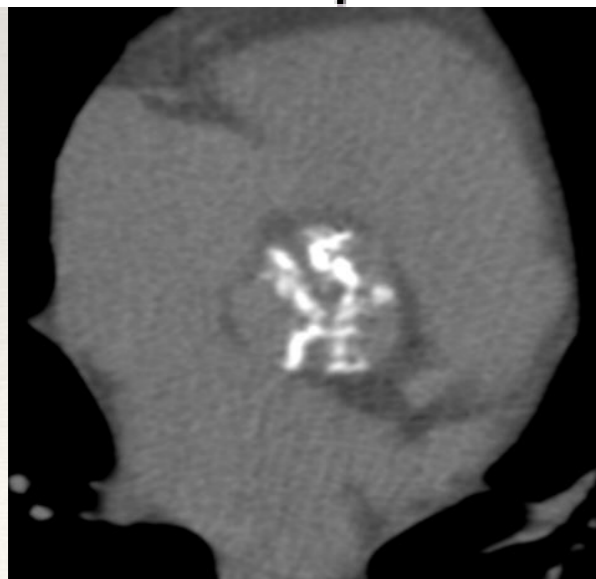
❖ AVA planimetricky 1,2 cm²



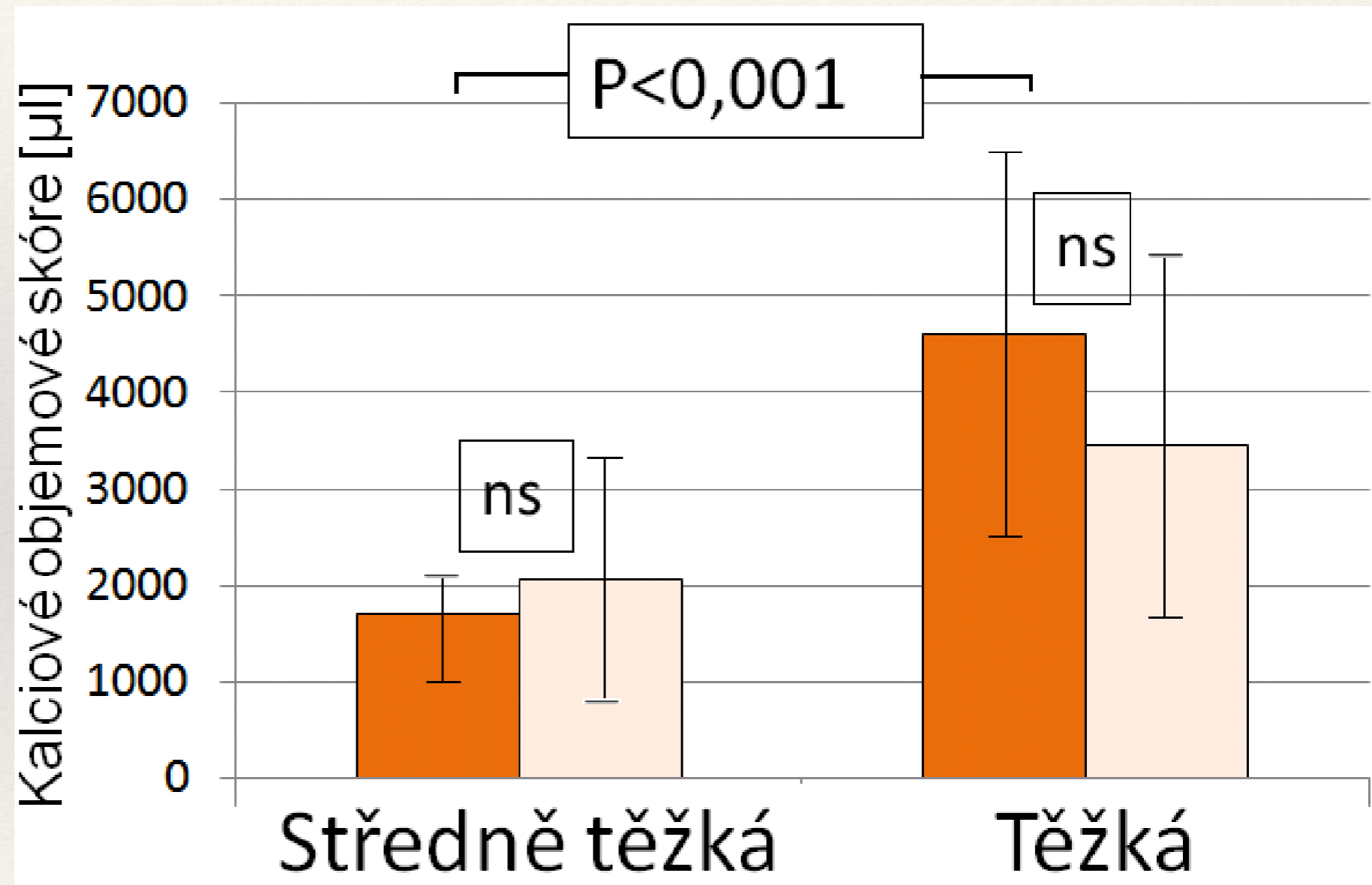
Kalcifikace → rigidita cípů → stenóza



■ Bikuspidální



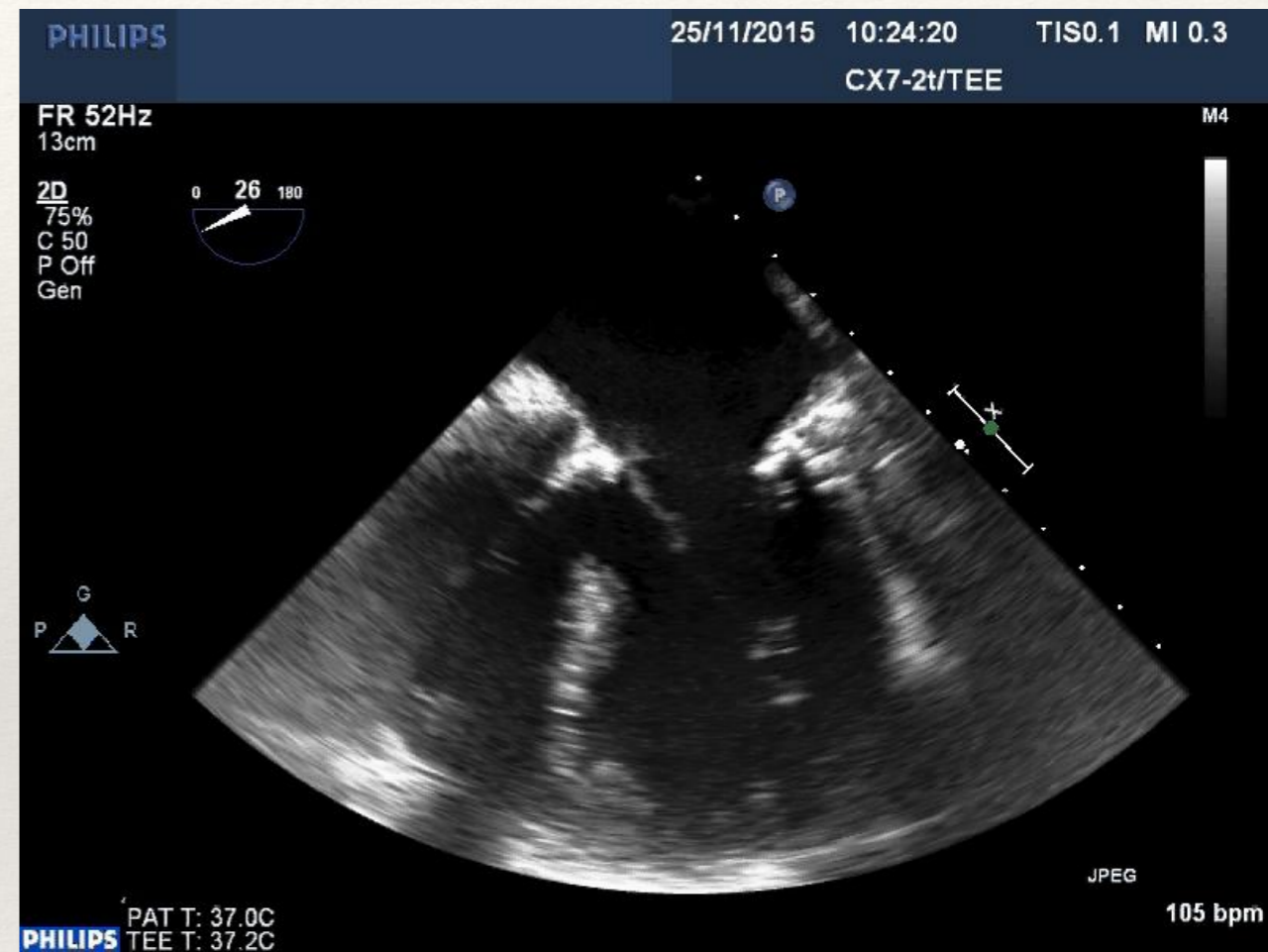
□ Trikuspidální

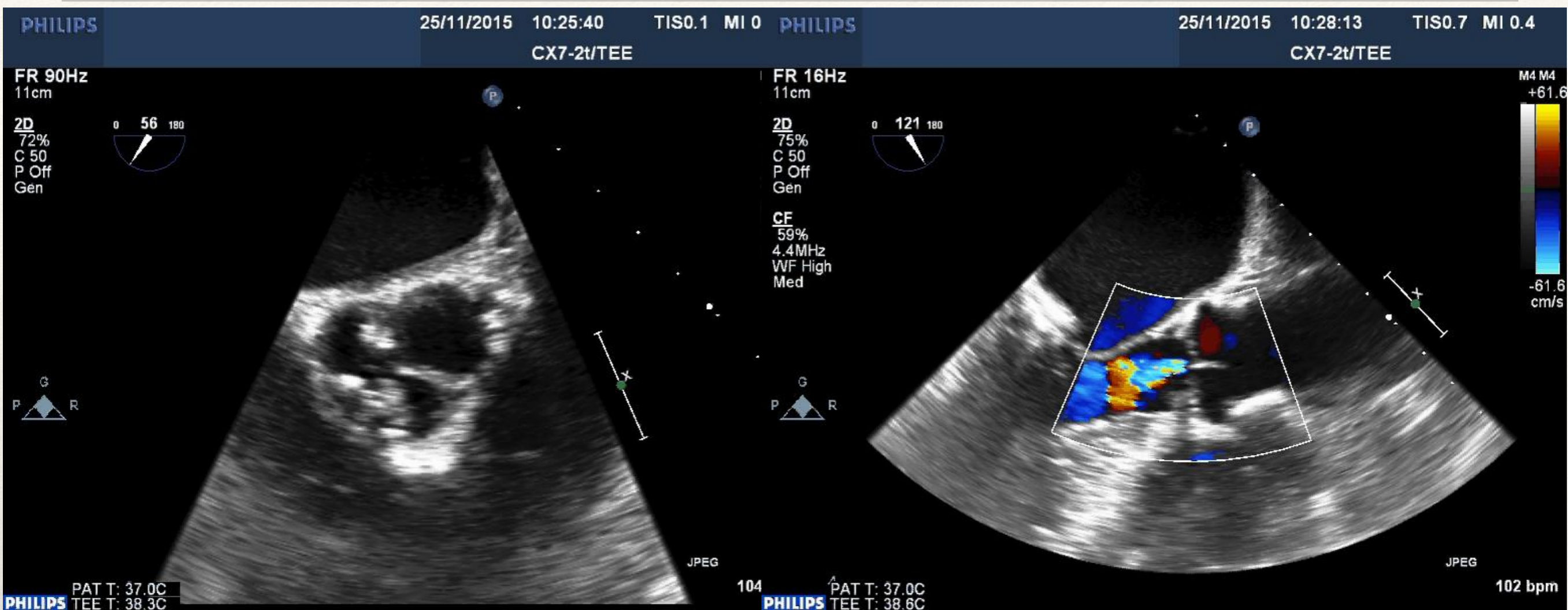


Ferda J, Linhartová K, Kreuzberg B. Eur J Radiol 2008;68:471-5

Žena 67 let

- ❖ 155 cm, 104 kg, BMI 43,3
- ❖ Arteriální hypertenze
- ❖ Dyslipidemie
- ❖ Hyperurikemie
- ❖ St.p.operaci žalduku Billroth I, pro benigní tu 2013
- ❖ Léčena pro mikrocytární hypochromní anémii 2013
- ❖ Chronický VAS Th páteře
- ❖ Medikace: ARB, betablokátor, statin, furosemid 40 mg, alopurinol, PAD
- ❖ Chodí o dvou francouzských holích, NYHA III, bez stenokardií
- ❖ Lab: GF MDRD 0, 34 ml/min/1,73 m² G3b





EDd	50
EF LK	65
IVS	13
max/střední grad	42/25
AVA	1,00

- ❖ SKG
- ❖ ACS -ostiální stenóza kmene, těsná stenóza RIA proximálně, RC těsná bifurkační stenóza RMS II
- ❖ ACD těsná stenóza proximálně, významná stenóza na malé RIVP

Euroscore II 4.98 %

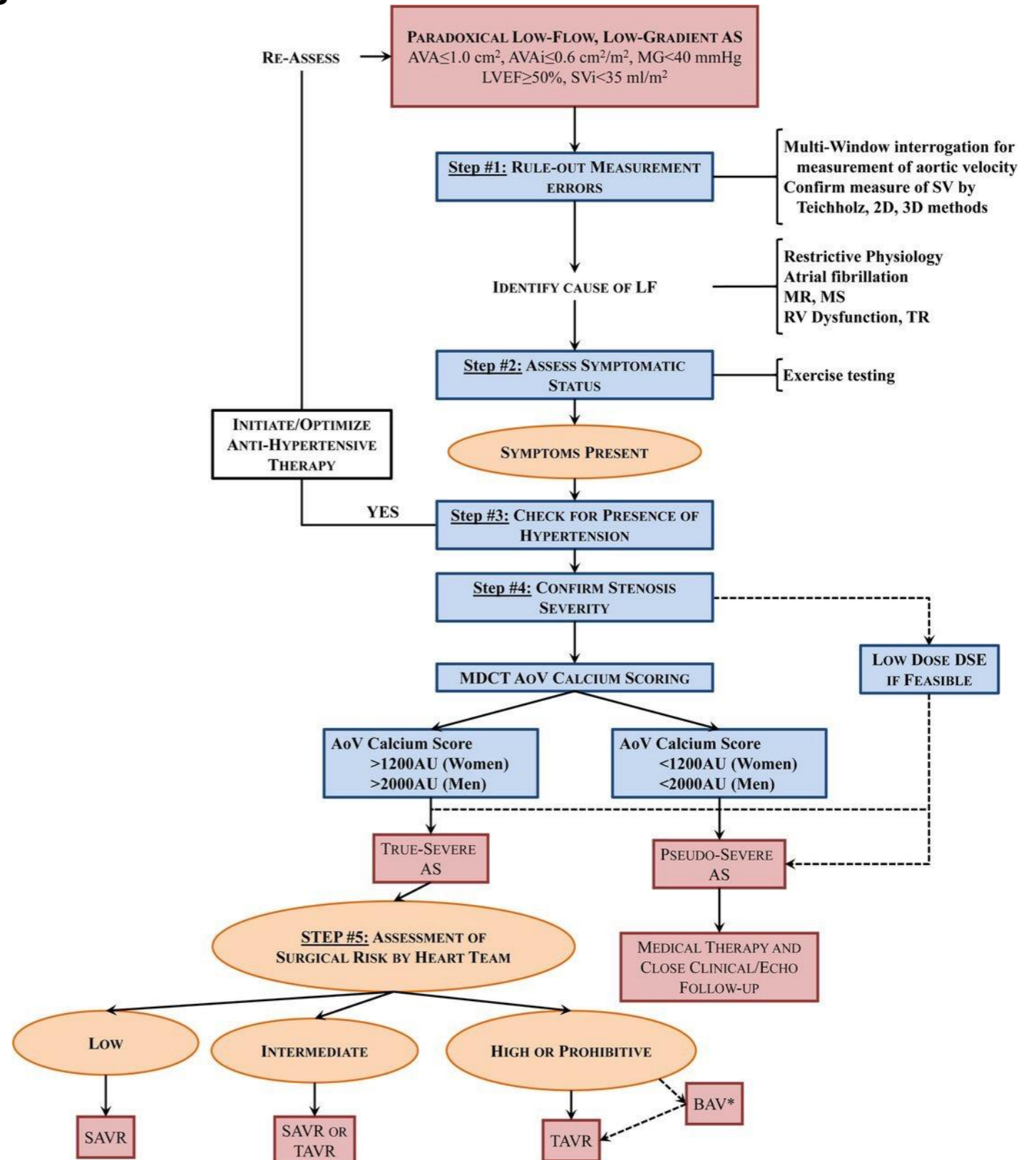
Algorithm for the management of paradoxical (preserved left ventricular ejection fraction) low-flow, low-gradient aortic stenosis.

Chyby měření?
Nonapikální projekce
3D
FiS, MR

Symptomy?

Potvrdit stupeň AS
Kalciové skóre

....
Operační riziko



Clavel et al. Eur Heart J 2016;eurheartj.ehw096

❖ Děkuji za pozornost



Eur Heart J. 2016 Feb 22. pii: ehw033. [Epub ahead of print]

Aortic stenosis and transthyretin cardiac amyloidosis: the chicken or the egg?

[Galat A1](#), [Guellich A1](#), [Bodez D1](#), [Slama M2](#), [Dijos M3](#), [Zeitoun DM4](#), [Milleron O4](#), [Attias D5](#), [Dubois-Randé JL1](#), [Mohty D6](#), [Audureau E7](#), [Teiger E1](#), [Rosso J8](#), [Monin JL1](#), [Damy T9](#).

Author information

Abstract

BACKGROUND:

Aortic stenosis (AS) and transthyretin cardiac amyloidosis (TTR-CA) are both frequent in elderly. The combination of these two diseases has never been investigated.

AIMS:

To describe patients with concomitant AS and TTR-CA.

METHODS:

Six cardiologic French centres identified retrospectively cases of patients with severe or moderate AS associated with TTR-CA hospitalized during the last 6 years.

RESULTS:

Sixteen patients were included. Mean \pm SD age was 79 ± 6 years, 81% were men. Sixty per cent were NYHA III-IV, 31% had carpal tunnel syndrome, and 56% had atrial fibrillation. Median (Q1;Q4) NT-proBNP was 4382 (2425;4730) pg/mL and 91% had elevated cardiac troponin level. Eighty-eight per cent had severe AS ($n = 14/16$), of whom 86% ($n = 12$) had low-gradient AS. Mean \pm SD interventricular septum thickness was 18 ± 4 mm. Mean left ventricular ejection fraction and global LS were $50 \pm 13\%$ and $-7 \pm 4\%$, respectively. Diagnosis of TTR-CA was histologically proven in 38%, and was based on strong cardiac uptake of the tracer at biphosphonate scintigraphy in the rest. Eighty-one per cent had wild-type TTR-CA ($n = 13$), one had mutated Val122I and 19% did not had genetic test ($n = 3$). Valve replacement was surgical in 63% and via transcatheter in 13%. Median follow-up in survivors was 33 (16;65) months. Mortality was of 44% ($n = 7$) during the whole follow-up period.

CONCLUSIONS:

Combination of AS and TTR-CA may occur in elderly patients particularly those with a low-flow low-gradient AS pattern and carries bad prognosis. Diagnosis of TTR-CA in AS is relevant to discuss specific treatment and management.