Plicní hypertenze - echokardiografie

XXIV. kongres české kardiologické společnosti, Brno – Výstaviště, 15.-18.5.2016

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I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

European Heart Journal (2014) **35**, 3033–3080
doi:10.1093/eurheartj/ehu283

ESC GUIDELINES

2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism

The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC)

Endorsed by the European Respiratory Society (ERS)

Authors/Task Force Members: Stavros V. Konstantinides* (Chairperson) (Germany/Greece), Adam Torbicki* (Co-chairperson) (Poland), Giancarlo Agnelli (Italy), Nicolas Danchin (France), David Fitzmaurice (UK), Nazzareno Galiè (Italy), J. Simon R. Gibbs (UK), Menno V. Huisman (The Netherlands), Marc Humbert† (France), Nils Kucher (Switzerland), Irene Lang (Austria), Mareike Lankeit (Germany), John Lekakis (Greece), Christoph Maack (Germany), Eckhard Mayer (Germany), Nicolas Meneveau (France), Arnaud Perrier (Switzerland), Piotr Pruszczyk (Poland), Lars H. Rasmussen (Denmark), Thomas H. Schindler (USA), Pavel Svitil (Czech Republic), Anton Vonk Noordegraaf (The Netherlands), Jose Luis Zamorano (Spain), Maurizio Zompatori (Italy)

Doporučení pro… | Guidelines

Doporučené postupy Evropské kardiologické společnosti/Evropské respirační společnosti pro diagnostiku a léčbu plicní hypertenze, verze 2015.

Stručný přehled vypracovaný Českou kardiologickou společností

ČESKÁ KARDIOLOGICKÁ SPOLEČNOST
THE CZECH SOCIETY OF CARDIOLOGY

(2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. Summary document prepared by the Czech Society of Cardiology)

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ESC/ERS GUIDELINES

2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension

The Joint Task Force for the Diagnosis and Treatment of Pulmonary Hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS)

Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC), International Society for Heart and Lung Transplantation (ISHLT)

I. INTERNÍ KLINIKA
KARDIOLOGIE
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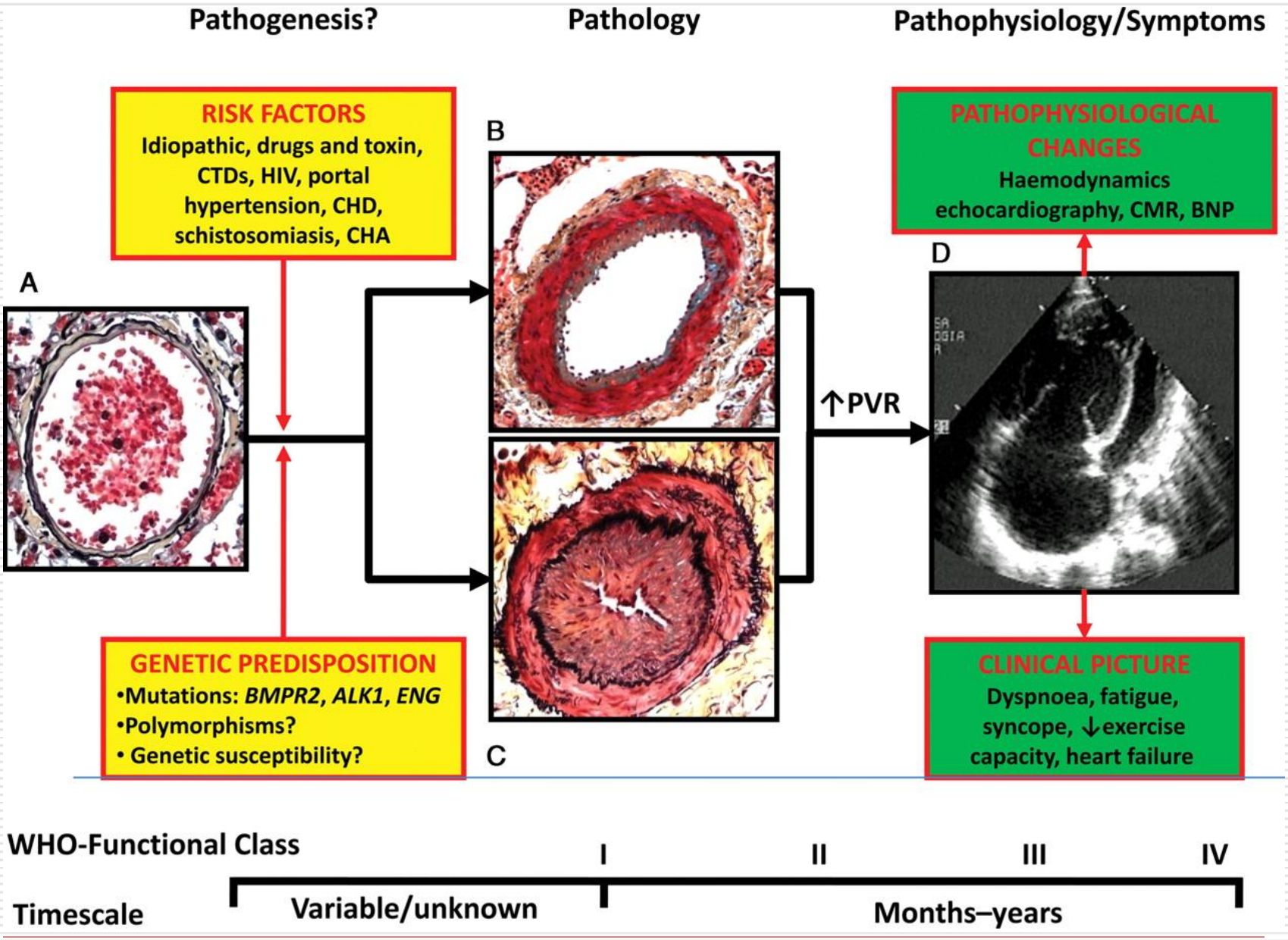
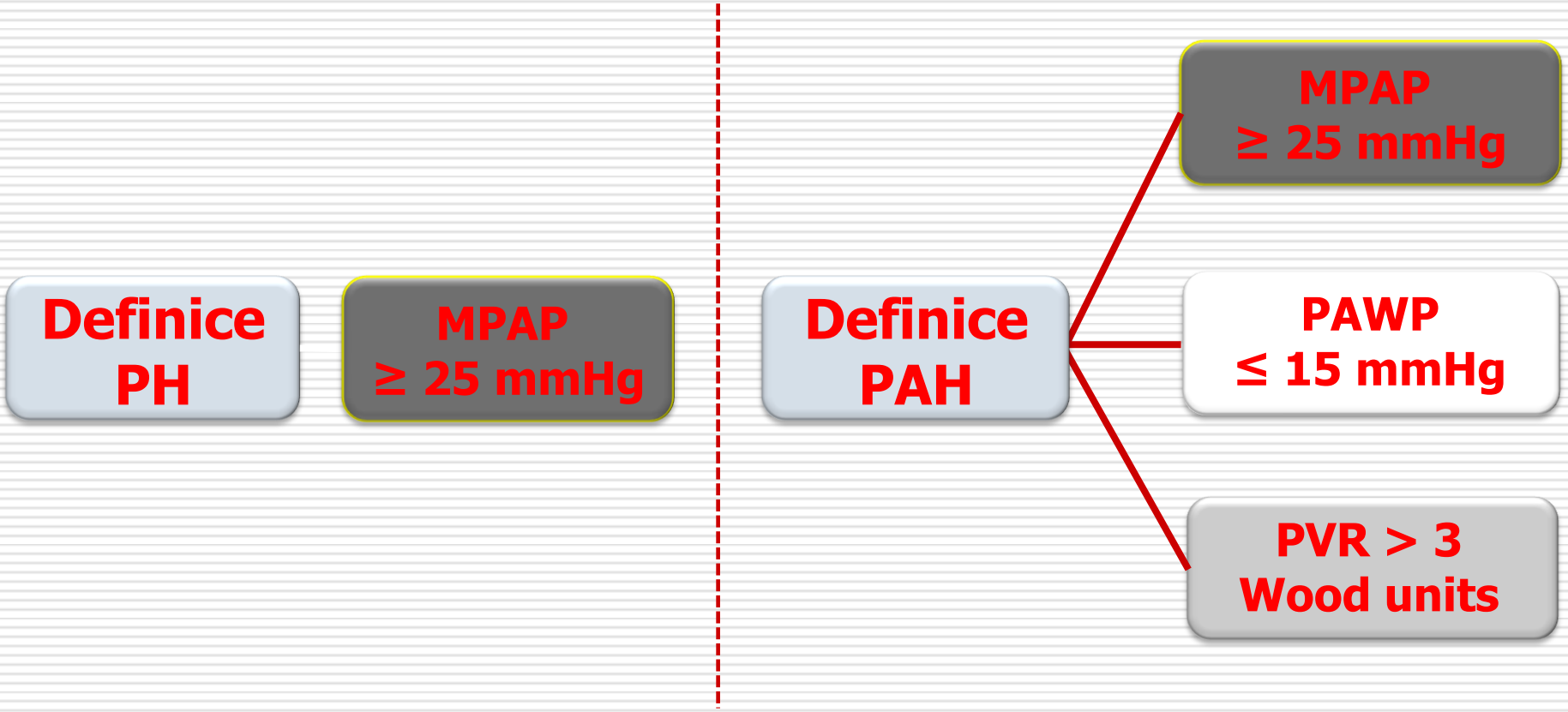


Galiè N et al. Eur Heart J 2010;31:2080-2086

Hemodynamická definice plicní hypertenze



PAP: pulmonary arterial pressure; PAWP: pulmonary artery wedge pressure; PVR: pulmonary vascular resistance

Hoeper MM, *et al. J Am Coll Cardiol* 2013; 62:D42-50.

Plicní hypertenze - definice a klasifikace

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Updated Clinical Classification of Pulmonary Hypertension

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Definition	Characteristics	Clinical group(s)[b]
Pulmonary hypertension (PH)	Mean PAP ≥25 mmHg	All
Pre-capillary PH	Mean PAP ≥25 mmHg PWP ≤15 mmHg CO normal or reduced[c]	1. Pulmonary arterial hypertension 3. PH due to lung diseases 4. Chronic thromboembolic PH 5. PH with unclear and/or multifactorial mechanisms
Post-capillary PH	Mean PAP ≥25 mmHg PWP >15 mmHg CO normal or reduced[c]	2. PH due to left heart disease
Passive	TPG ≤12 mmHg	
Reactive (out of proportion)	TPG >12 mmHg	

Prevalence of PAH in the general population
15–50 cases per million (0.0015–0.0050%)

Prevalence of PAH in at risk populations
CHD: 4–15%
Systemic sclerosis: 8–10%
Portal hypertension: 0.5–10%
HIV: 0.5%
Sickle cell disease: 2%
BMPR2 mutation carriers: 20%

1. Pulmonary arterial hypertension
   1.1 Idiopathic PAH
   1.2 Heritable PAH
   1.2.1 BMPR2
   1.2.2 ALK-1, ENG, SMAD9, CAV1, KCNK3
   1.2.3 Unknown
   1.3 Drug and toxin induced
   1.4 Associated with:
   1.4.1 Connective tissue disease
   1.4.2 HIV infection
   1.4.3 Portal hypertension
   1.4.4 Congenital heart diseases
   1.4.5 Schistosomiasis

1′ Pulmonary veno-occlusive disease and/or pulmonary capillary hemangiomatosis
1″. Persistent pulmonary hypertension of the newborn (PPHN)

2. Pulmonary hypertension due to left heart disease
   2.1 Left ventricular systolic dysfunction
   2.2 Left ventricular diastolic dysfunction
   2.3 Valvular disease
   2.4 Congenital/acquired left heart inflow/outflow tract obstruction and congenital cardiomyopathies

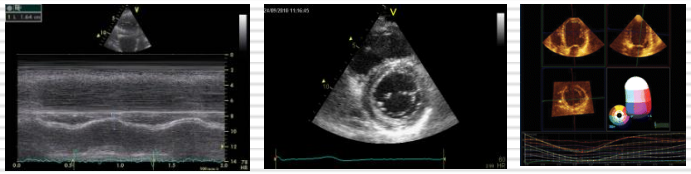
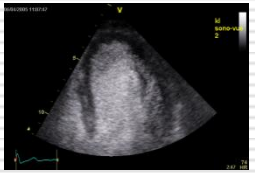
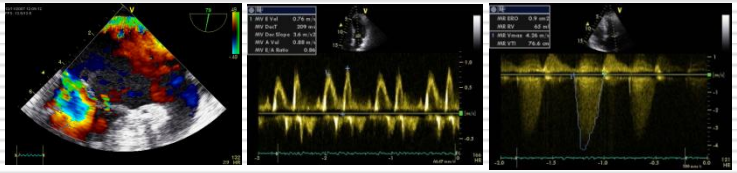
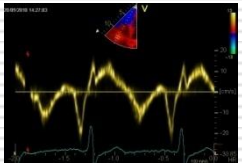
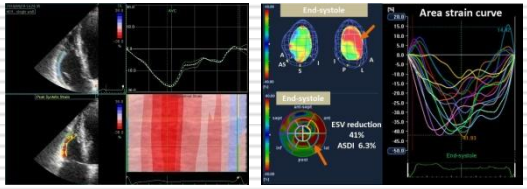
3. Pulmonary hypertension due to lung diseases and/or hypoxia
   3.1 Chronic obstructive pulmonary disease
   3.2 Interstitial lung disease
   3.3 Other pulmonary diseases with mixed restrictive and obstructive pattern
   3.4 Sleep-disordered breathing
   3.5 Alveolar hypoventilation disorders
   3.6 Chronic exposure to high altitude
   3.7 Developmental lung diseases

4. Chronic thromboembolic pulmonary hypertension (CTEPH)

5. Pulmonary hypertension with unclear multifactorial mechanisms
   5.1 Hematologic disorders: chronic hemolytic anemia, myeloproliferative disorders, splenectomy
   5.2 Systemic disorders: sarcoidosis, pulmonary histiocytosis, lymphangioleiomyomatosis
   5.3 Metabolic disorders: glycogen storage disease, Gaucher disease, thyroid disorders
   5.4 Others: tumoral obstruction, fibrosing mediastinitis, chronic renal failure, segmental PH

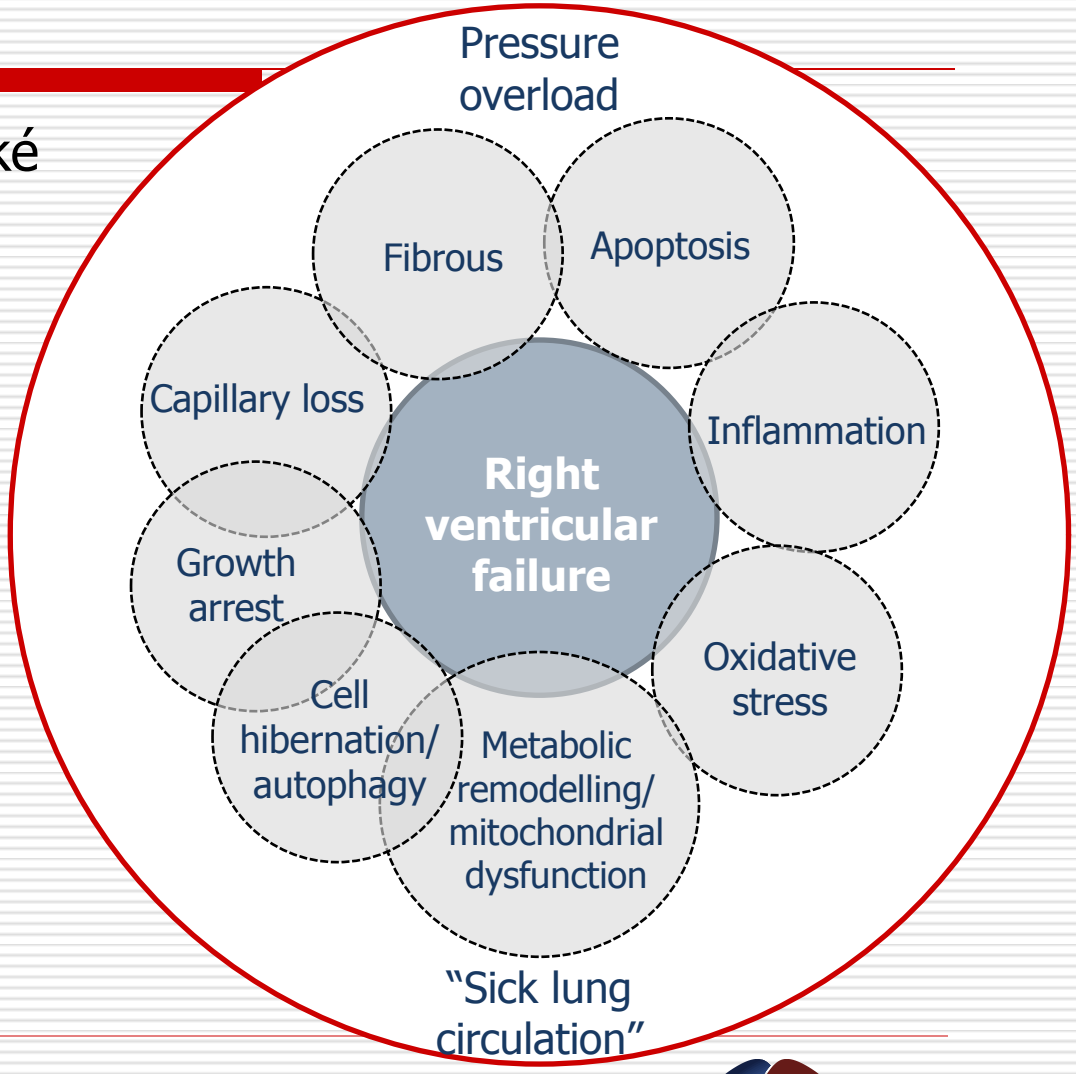
Echokardiografie - metody

- MM/2DE/RT 3DE
- CEE
- Doppler (CFM, PWD, CWD)
- Tissue Doppler imaging
- 2D/3D strain

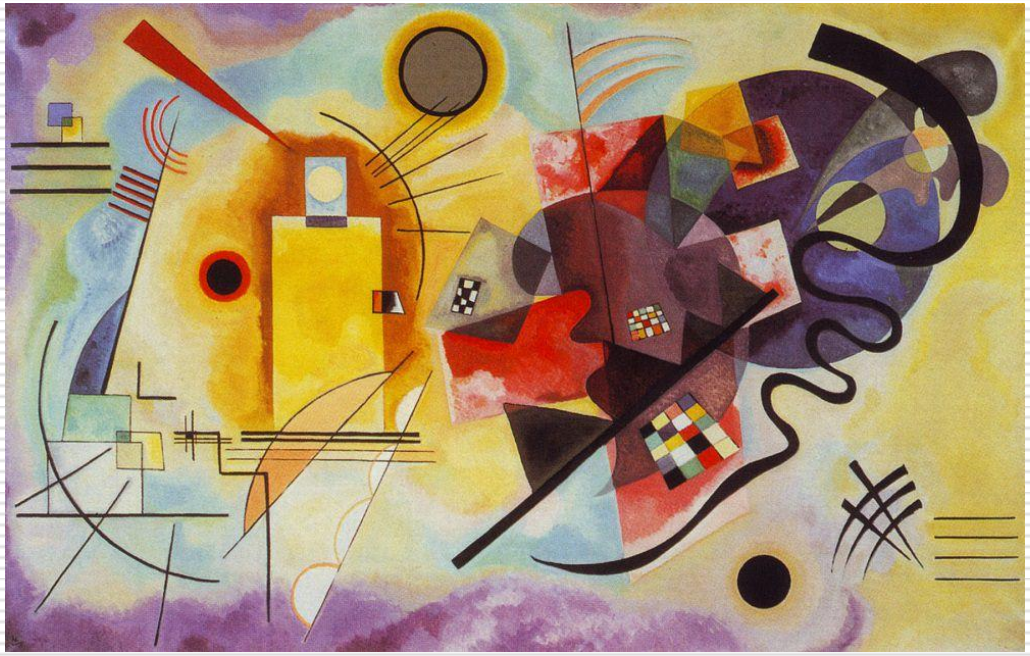
Jaké informace poskytuje echokardiografie?

- Screeningové a diagnostické
- Prognostické
- Indikační



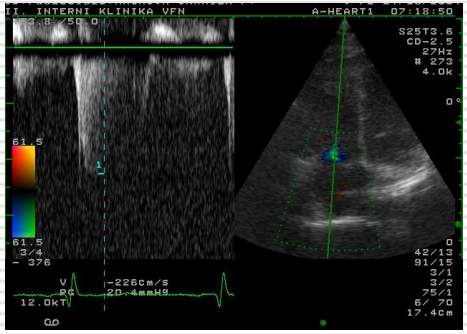
Naeije R, *et al. Eur Respir Rev* 2014; 23:476-87.

SCREENING A DIAGNÓZA

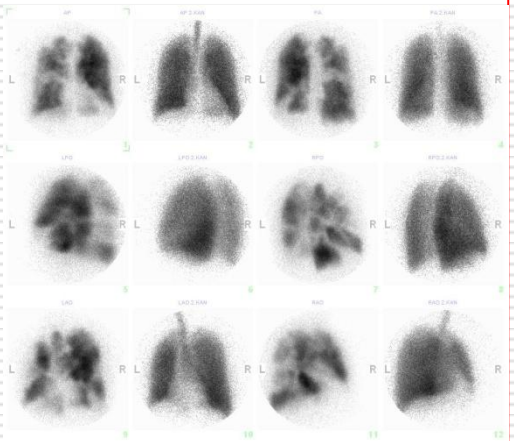


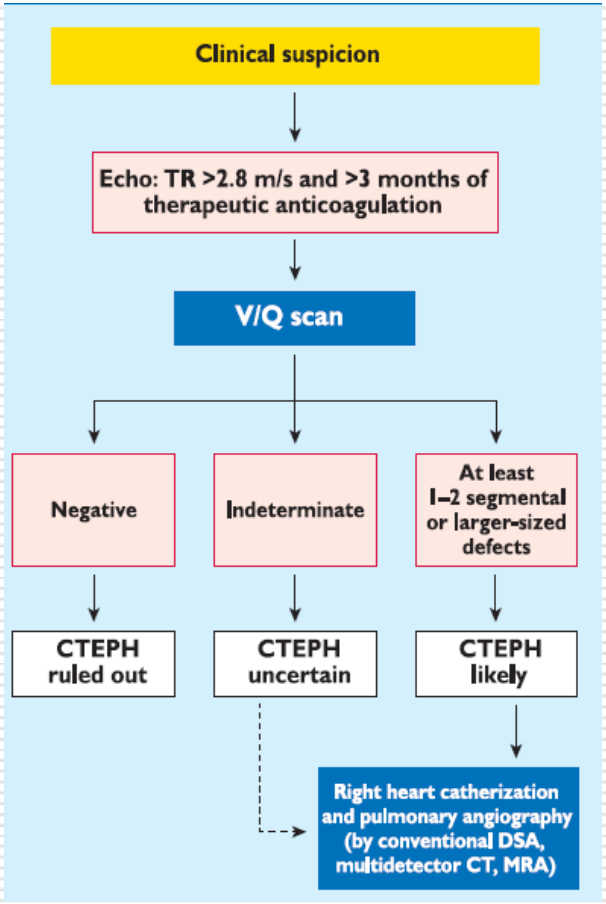
1. SCREENING A DIAGNOSTIKA PLICNÍ HYPERTENZE

- **Echokardiografie**



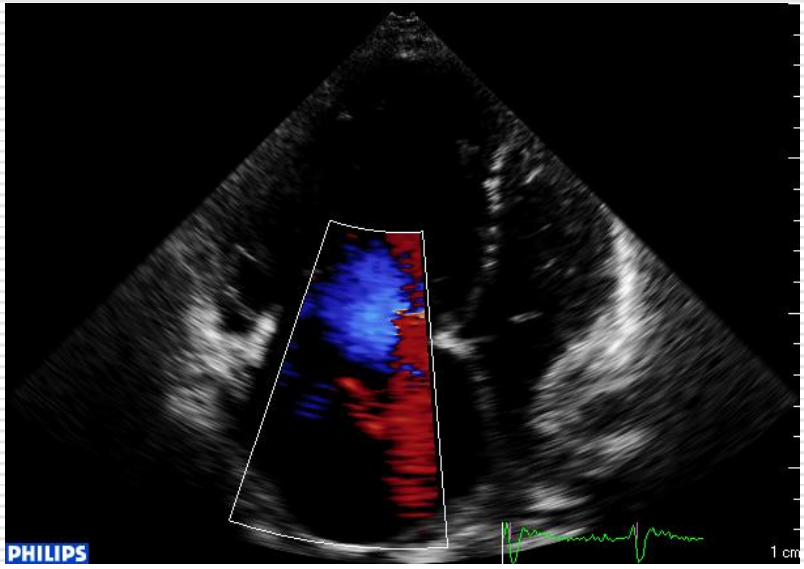
- **Scintigrafie plic**

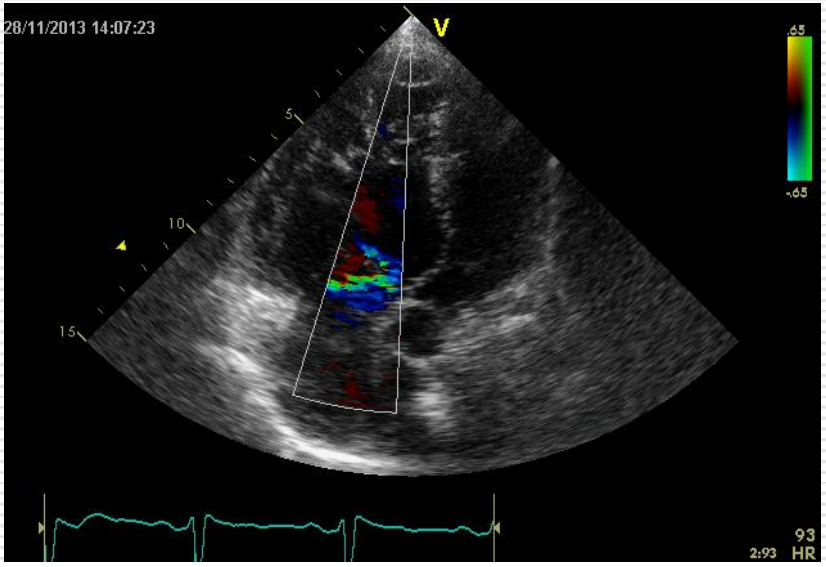


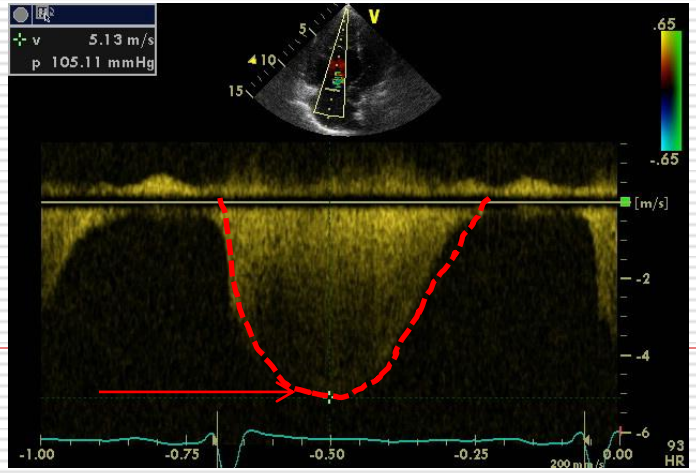


Obrázky poskytnuty laskavostí doc. Jansy

Echokardiografie - klíčové screeningové vyšetření







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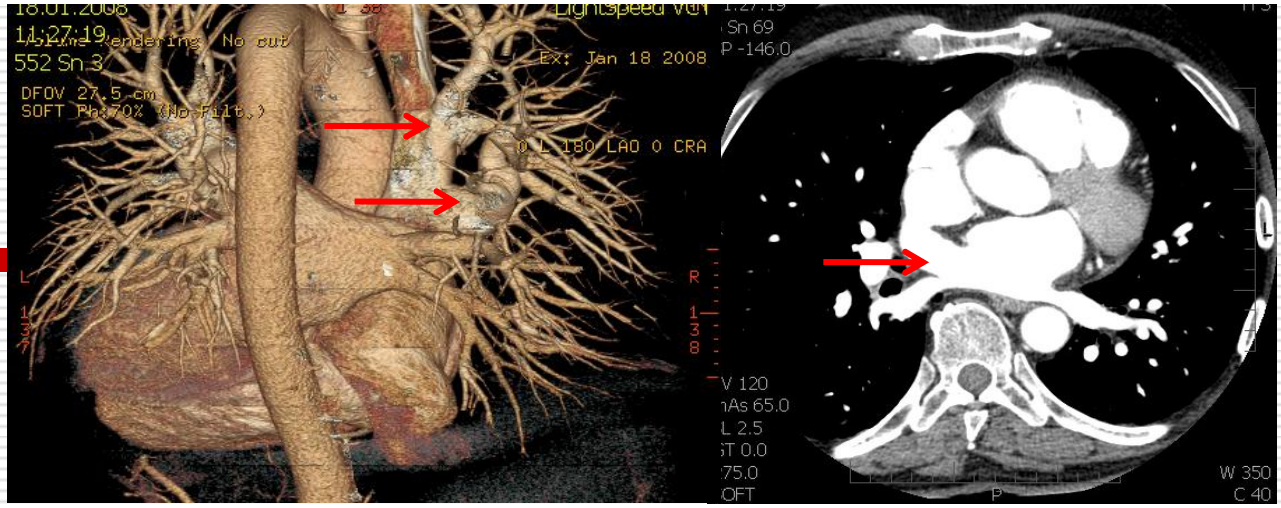
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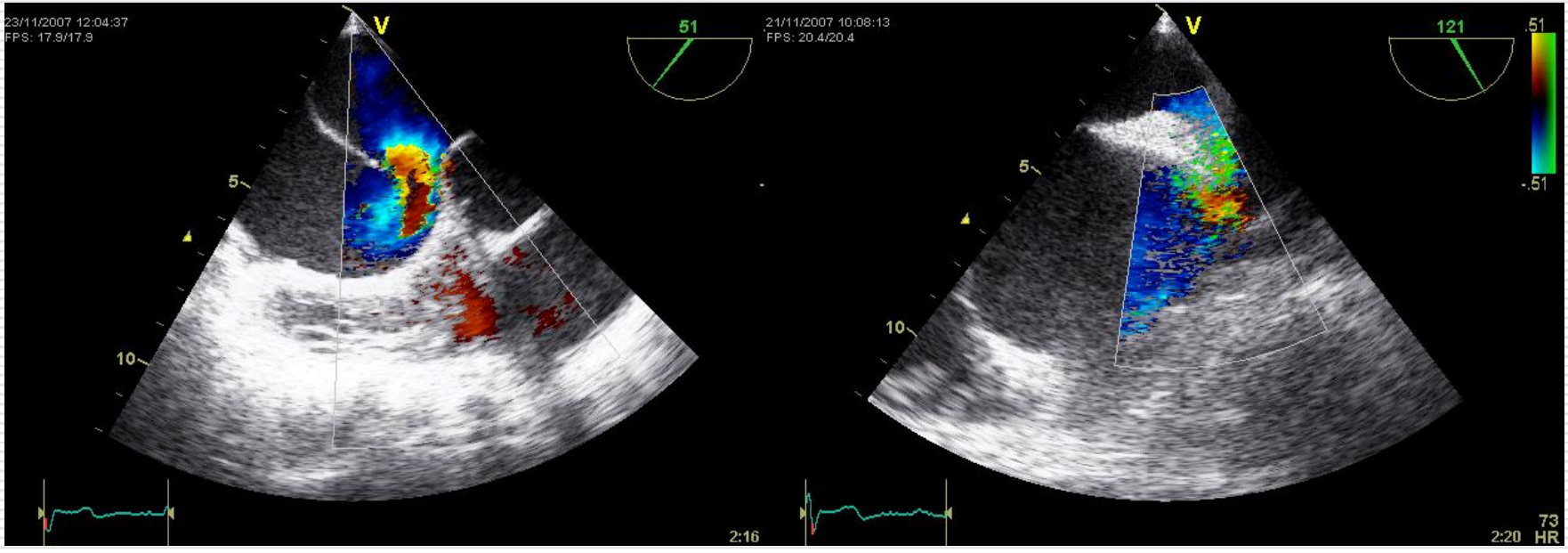
DFOV 27.5 cm
Sn 69
P -146.0
W 350
C 40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FPS: 17.9/17.9
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2:16
21/11/2007 10:08:13
FPS: 20.4/20.4
121
.51
-.51
2:20
73
HR

Morfologie a funkce pravé komory

European Heart Journal – Cardiovascular Imaging (2015) **16**, 233–271
doi:10.1093/ehjci/jev014

POSITION PAPER

Recommendations for Cardiac Chamber Quantification by Echocardiography in Adults: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging

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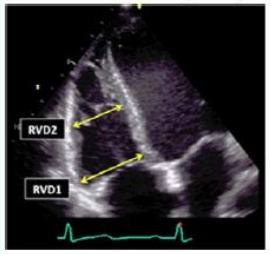
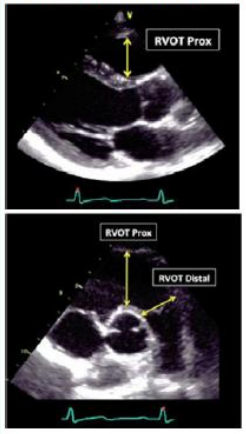
Rozměry DUTINY pravé komory

RV linear dimensions (inflow)*

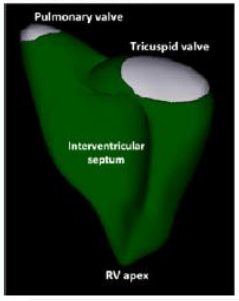


RV linear dimensions (outflow)*



RV areas (inflow)

3DE RV volumes



RV wall thickness

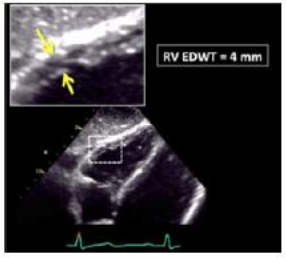
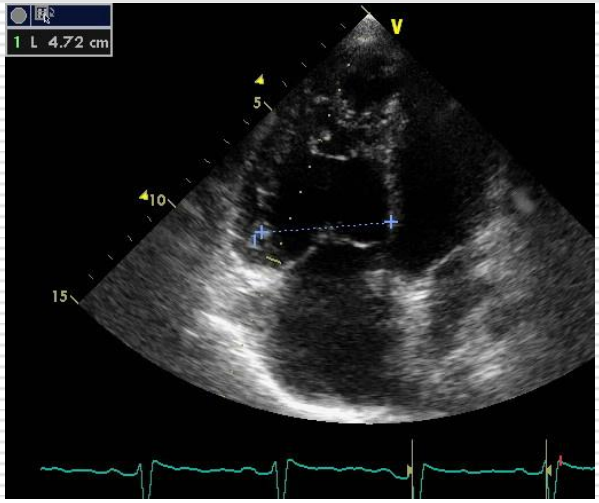
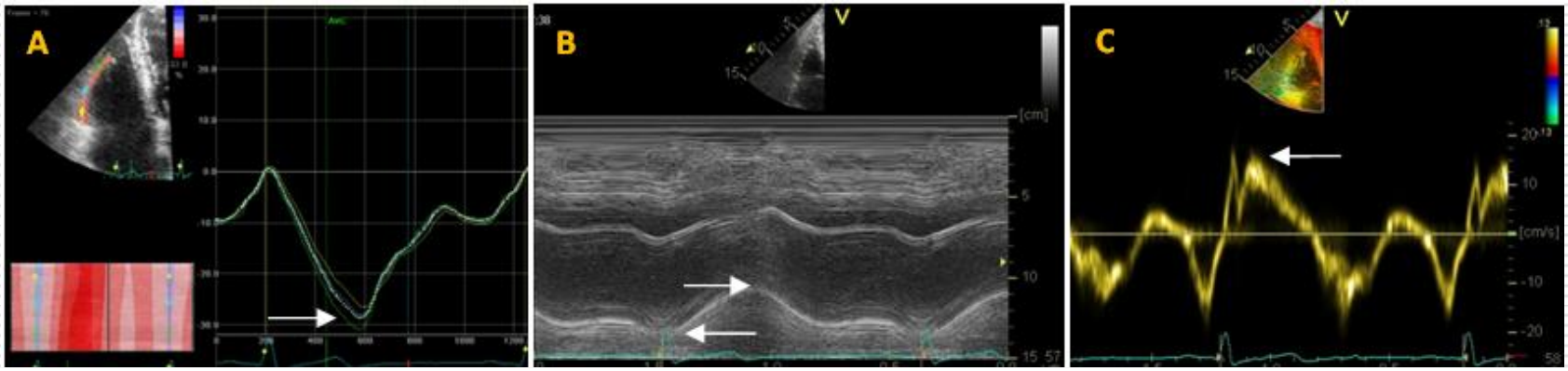


Table 8 Normal values for RV chamber size

Parameter	Mean ± SD	Normal range
RV basal diameter (mm)	33 ± 4	25–41
RV mid diameter (mm)	27 ± 4	19–35
RV longitudinal diameter (mm)	71 ± 6	59–83
RVOT PLAX diameter (mm)	25 ± 2.5	20–30
RVOT proximal diameter (mm)	28 ± 3.5	21–35
RVOT distal diameter (mm)	22 ± 2.5	17–27
RV wall thickness (mm)	3 ± 1	1–5
RVOT EDA (cm^2)		
Men	17 ± 3.5	10–24
Women	14 ± 3	8–20
RV EDA indexed to BSA (cm^2/m^2)		
Men	8.8 ± 1.9	5–12.6
Women	8.0 ± 1.75	4.5–11.5
RV ESA (cm^2)		
Men	9 ± 3	3–15
Women	7 ± 2	3–11
RV ESA indexed to BSA (cm^2/m^2)		
Men	4.7 ± 1.35	2.0–7.4
Women	4.0 ± 1.2	1.6–6.4
RV EDV indexed to BSA (mL/m^2)		
Men	61 ± 13	35–87
Women	53 ± 10.5	32–74
RV ESV indexed to BSA (mL/m^2)		
Men	27 ± 8.5	10–44
Women	22 ± 7	8–36



Systolická funkce pravé komory



A. 2D strain: normální longitudinální deformace volné stěny pravé komory v apikální 4dutinové (A4C) projekci
B. M-mode: tricuspid annular plane systolic excursion (amplituda pohybu TAPSE vyjádřená v mm)
C. Tkáňová Dopplerovská echokardiografie: systolická rychlost trikuspidálního anulu (S_T) vyjádřená v cm/s

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POSITION PAPER

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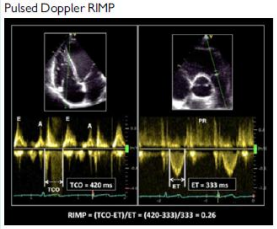
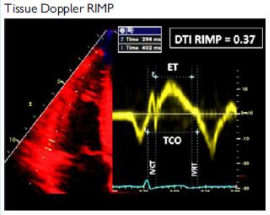
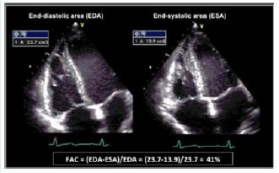
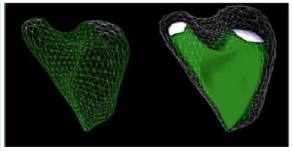
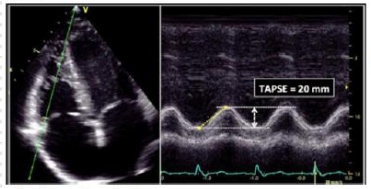
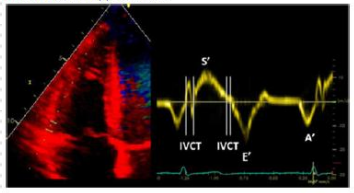
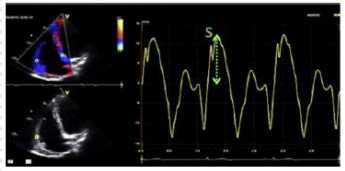
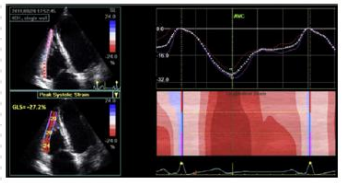
Echocardiographic imaging	Recommended methods	Advantages	Limitations
RV global function Pulsed Doppler RIMP 	RIMP (Tei index) by pulsed Doppler: RIMP = (TCO − ET)/ET	• Prognostic value • Less affected by heart rate	• Requires matching for R-R intervals when measurements are performed on separate recordings • Unreliable when RA pressure is elevated
Tissue Doppler RIMP 	RIMP by tissue Doppler: RIMP = (IVRT + IVCT)/ET = (TCO − ET)/ET	• Less affected by heart rate • Single-beat recording with no need for R-R interval matching	• Unreliable when RA pressure is elevated
RV global systolic function FAC 	RV FAC in RV-focused apical four-chamber view: RV FAC (%) = 100 × (EDA − ESA)/EDA	• Established prognostic value • Reflects both longitudinal and radial components of RV contraction • Correlates with RV EF by CMR	• Neglects the contribution of RV outflow tract to overall systolic function • Only fair inter-observer reproducibility
EF 	Fractional RV volume change by 3D TTE: RV EF (%) = 100 × (EDV − ESV)/EDV	• Includes RV outflow tract contribution to overall function • Correlates with RV EF by CMR	• Dependent on adequate image quality • Load dependency • Requires offline analysis and experience • Prognostic value not established

Echocardiographic imaging	Recommended methods	Advantages	Limitations
RV longitudinal systolic function TAPSE 	• Tricuspid annular longitudinal excursion by M-mode (mm), measured between end-diastole and peak systole • Proper alignment of M-mode cursor with the direction of RV longitudinal excursion should be achieved from the apical approach.	• Established prognostic value • Validated against radionuclide EF	• Angle dependency • Partially representative of RV global function*
Pulsed tissue Doppler S wave 	• Peak systolic velocity of tricuspid annulus by pulsed-wave DTI (cm/sec), obtained from the apical approach, in the view that achieves parallel alignment of Doppler beam with RV free wall longitudinal excursion	• Easy to perform • Reproducible • Validated against radionuclide EF • Established prognostic value	• Angle dependent • Not fully representative of RV global function, particularly after thoracotomy, pulmonary thromboendarterectomy or heart transplantation
Color tissue Doppler S wave 	• Peak systolic velocity of tricuspid annulus by color DTI (cm/sec)	• Sampling is performed after image acquisition • Allows multisite sampling on the same beat	• Angle dependent • Not fully representative of RV global function, particularly after thoracotomy, pulmonary thrombendarterectomy or heart transplantation • Lower absolute values and reference ranges than pulsed DTI S′ wave • Requires offline analysis
GLS 	• Peak value of 2D longitudinal speckle tracking derived strain, averaged over the three segments of the RV free wall in RV-focused apical four-chamber view (%)	• Angle independent • Established prognostic value	• Vendor dependent

I. INTERNÍ KLINIKA
KARDIOLOGIE
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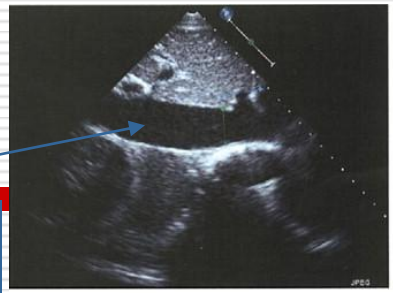
Maximální gradient regurgitace na pulmonální chlopni (PR) predikuje střední tlak v plicnici **(MAP)** .
Endiastolický gradient pulmonální regurgitace predikuje diastolický tlak v plicnici **(DAP)** .

Dolní dutá žíla **(IVC)** , její rozměr a stupeň inspiračního kolapsu predikují tlak v pravé síni **(RAP resp. CVT)**:
IVC <1.2 cm a kolaps 100% = RAP 0 mmHg

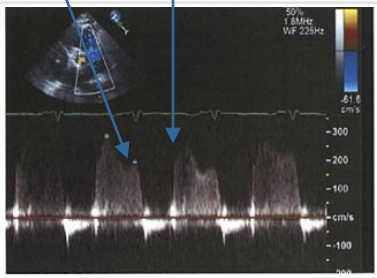
IVC 1.2-1.7 cm s >50% kolapsem = RAP 0-5 mmHg

IVC >1.7 cm s >50% kolapsem = RAP 6-10 mmHg; <50% kolapsem = RAP 10-15 mmHg

IVC >1.7 cm s 0% kolapsem = RAP >15 mmHg

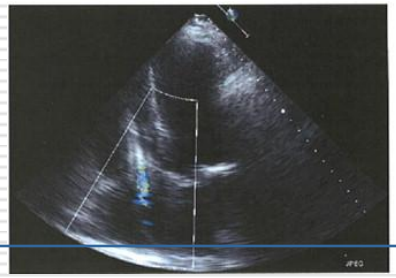


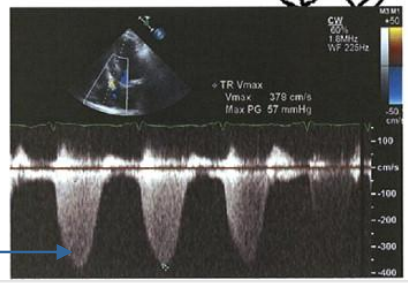
A. IVCCI--RAP

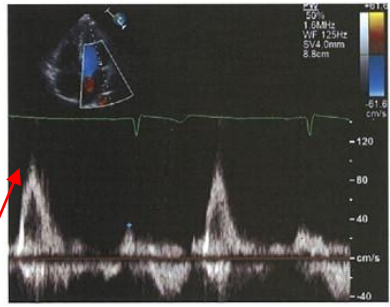


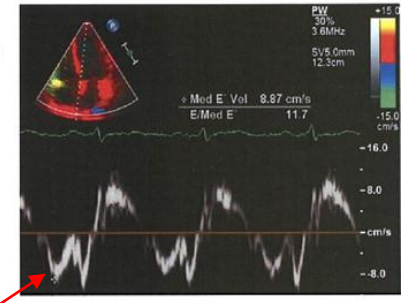
C. PR Vel.--PAPm, PAPd

B. TR Vel.--RVSP









D. E/E'--PCWP

Vrcholová systolická rychlost jetu trikuspidální regurgitace **(TR)** predikuje systolický tlak v plicnici **(SAP)**:

Poměr vrcholové systolické rychlosti časného mitrálního toku (E)/časná diastolická rychlost mitrálního anulu Em **(E/Em)** <8 nebo >15 přesně predikuje **PCWP** <15 mmHg resp. >15 mm Hg.

Kirkpatrick JN et al. Echocardiography in Heart Failure: Applications, Utility, and New Horizons. J Am Coll Cardiol 2007;50:381–96

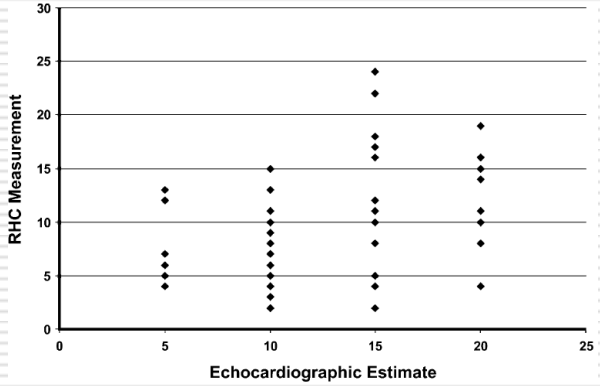
I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

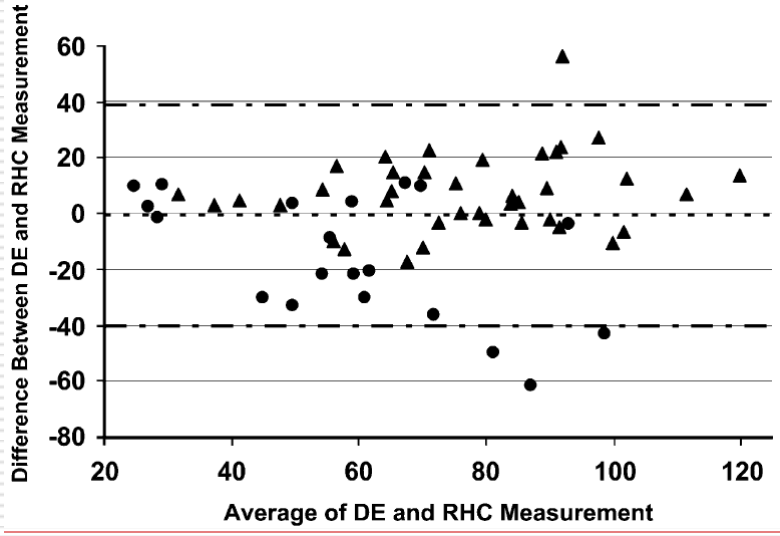
Accuracy of Doppler Echocardiography in the Hemodynamic Assessment of Pulmonary Hypertension

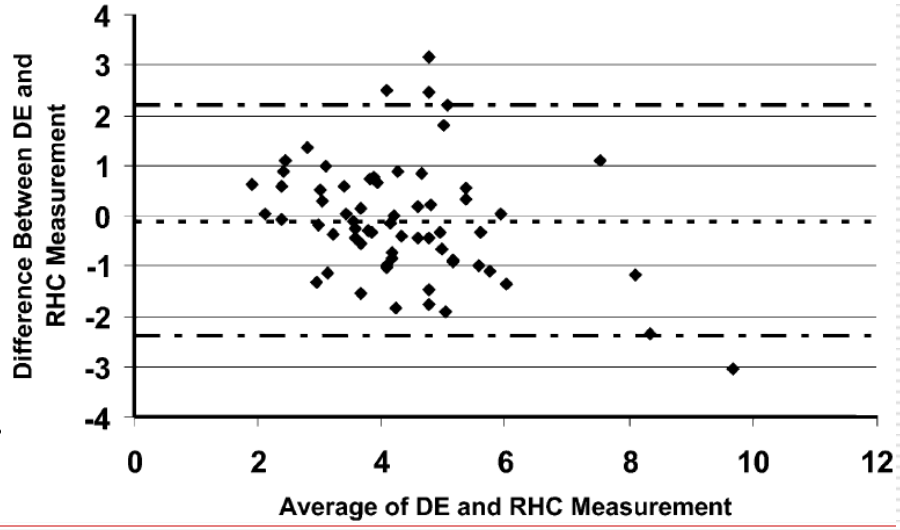
Micah R. Fisher[1]*, Paul R. Forfia[2†], Elzbieta Chamera[2], Traci Housten-Harris[1], Hunter C. Champion[2], Reda E. Girgis[1], Mary C. Corretti[2], and Paul M. Hassoun[1]

[1]Division of Pulmonary and Critical Care Medicine; [2]Division of Cardiology, Department of Medicine, Johns Hopkins University, Baltimore, Maryland

Right-Heart Catheterization	n	Mean	SD
RAP, mm Hg	65	9.4	5.0
PASP, mm Hg	65	68.5	23.9
mPAP, mm Hg	65	41.4	14.6
CO, L/min	65	4.4	1.7
Echocardiogram			
RAP, mm Hg	65	12.4	4.7
RVSP, mm Hg	59	70.2	25.1
CO, L/min	64	4.3	1.4







Micah R. Fisher et al. Am J Respir Crit Care 2009, Med Vol 179. pp 615–621,

I. INTERNÍ KLINIKA
KARDIOLOGIE
FAKULTNÍ NEMOCNICE OLOMOUC

European Journal of Echocardiography (2009) 10, 165–193
doi:10.1093/ejechocard/jep007

EAE/ASE RECOMMENDATIONS

Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography

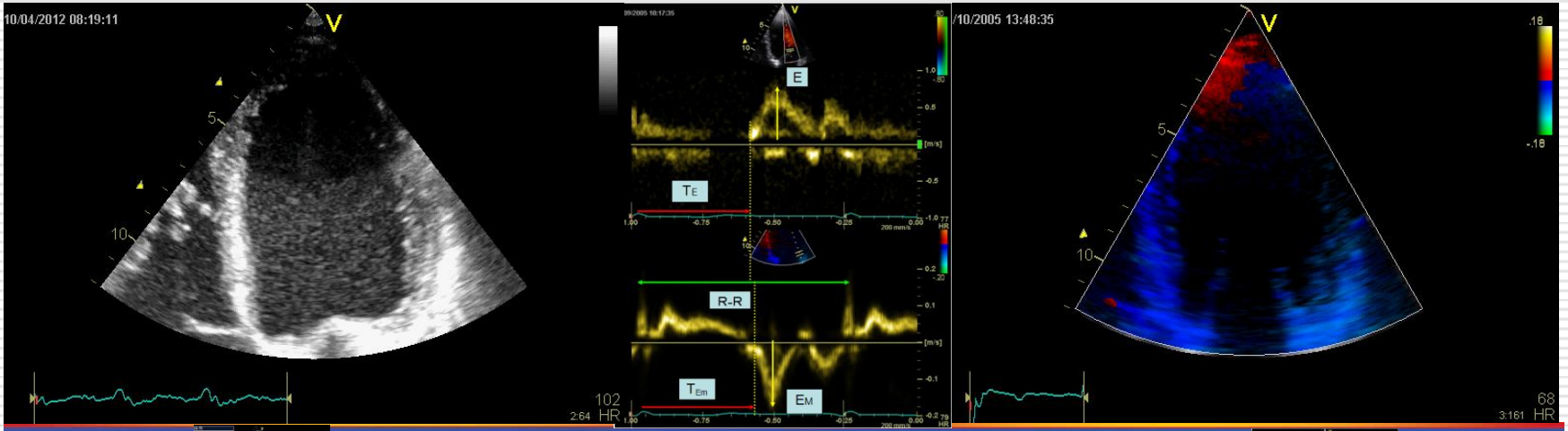
Sherif F. Nagueh, MD, Chair†, Christopher P. Appleton, MD†, Thierry C. Gillebert, MD*, Paolo N. Marino, MD*, Jae K. Oh, MD†, Otto A. Smiseth, MD, PhD*, Alan D. Waggoner, MHS†, Frank A. Flachskampf, MD, Co-Chair*, Patricia A. Pellikka, MD†, and Arturo Evangelisa, MD*

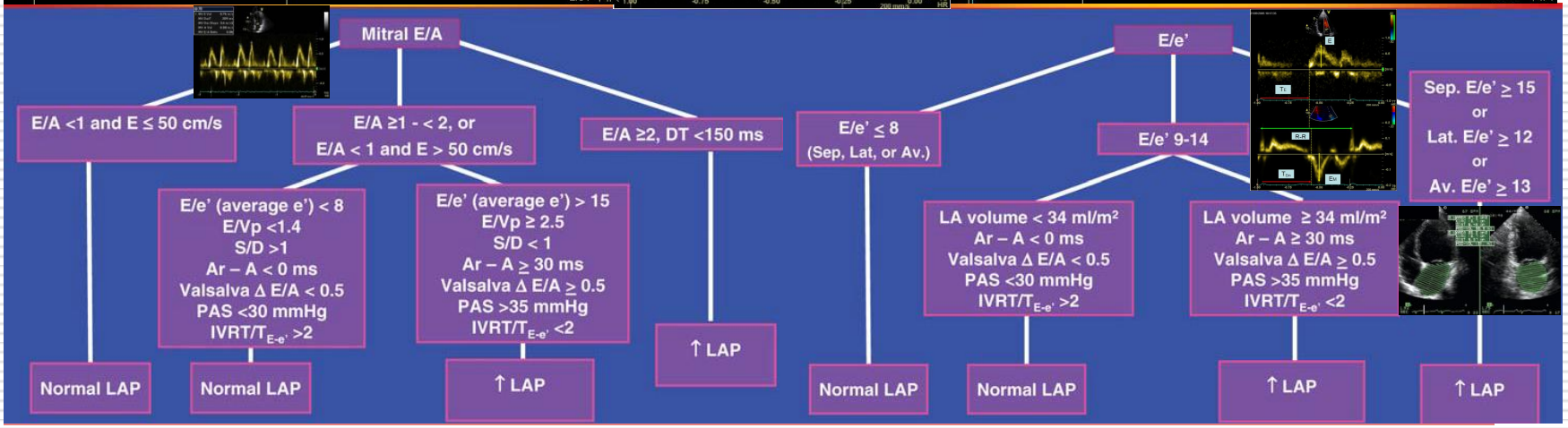
European Heart Journal
doi:10.1093/eurheartj/ehs104

ESC GUIDELINES

ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012

The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC





Snížená EF LK

Normální EF LK

I. INTERNÍ KLINIKA
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Maximální rychlost proudu krve při nedomykavosti trojcípé chlopně (m/s)	Přítomnost jiných „známek PH“ při echokardiografickém vyšetření[a]	Možnost plicní hypertenze podle echokardiografického vyšetření
≤ 2,8 nebo neměřitelná	Ne	Nízká
≤ 2,8 nebo neměřitelná	Ano	Středně vysoká
2,9–3,4	Ne	
2,9–3,4	Ano	Vysoká
> 3,4	Není nutno provádět	

European Heart Journal Advance Access published September 15, 2015

European Heart Journal
doi:10.1093/eurheartj/ehv317

ESC/ERS GUIDELINES

2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension

The Joint Task Force for the Diagnosis and Treatment of Pulmonary Hypertension of the European Society of Cardiology (ESC) and the European Respiratory Society (ERS)

Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC), International Society for Heart and Lung Transplantation (ISHLT)

PLICNÍ HYPERTENZE NEPRAVDĚPODOBNÁ

Rychlost trikuspidální regurgitace ≤ 2.8 m/s

Odhad PASP ≤36 mmHg

Bez přítomnosti hypertrofie, normální morfologie a systolická funkce pravé komory

PLICNÍ HYPERTENZE MOŽNÁ

Rychlost trikuspidální regurgitace ≤ 2.8 m/s

Odhad PASP ≤36 mmHg

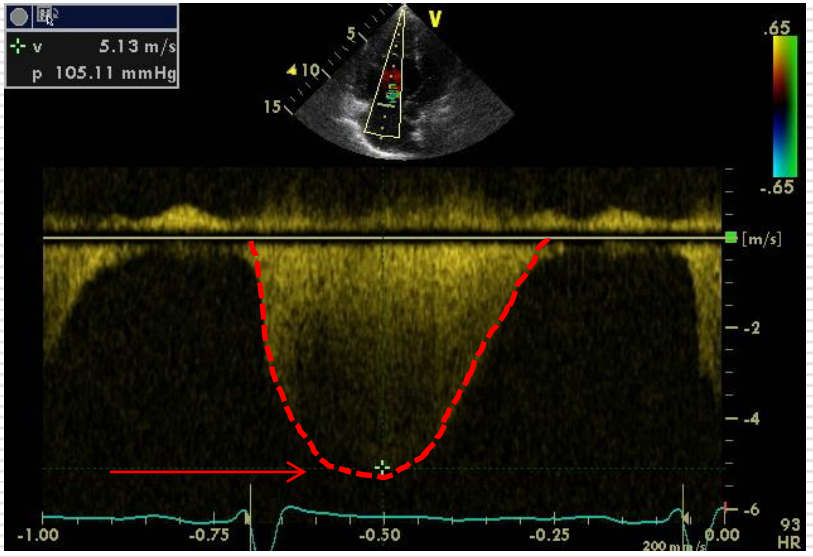
Suspektní hypertrofie, dilatace a/nebo systolická dysfunkce pravé komory

PLICNÍ HYPERTENZE PRAVDĚPODOBNÁ

Rychlost trikuspidální regurgitace > 2.8 m/s

Odhad PASP >36 mmHg

Evidence/absence přítomnosti hypertrofie, dilatace a systolické dysfunkce pravé komory



Galiè N, *et al. Eur Heart J* 2016; 37:67-119.

European Heart Journal Advance Access published September 15, 2015
European Heart Journal
doi:10.1093/eurheartj/ehv317
ESC/ERS GUIDELINES

2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension

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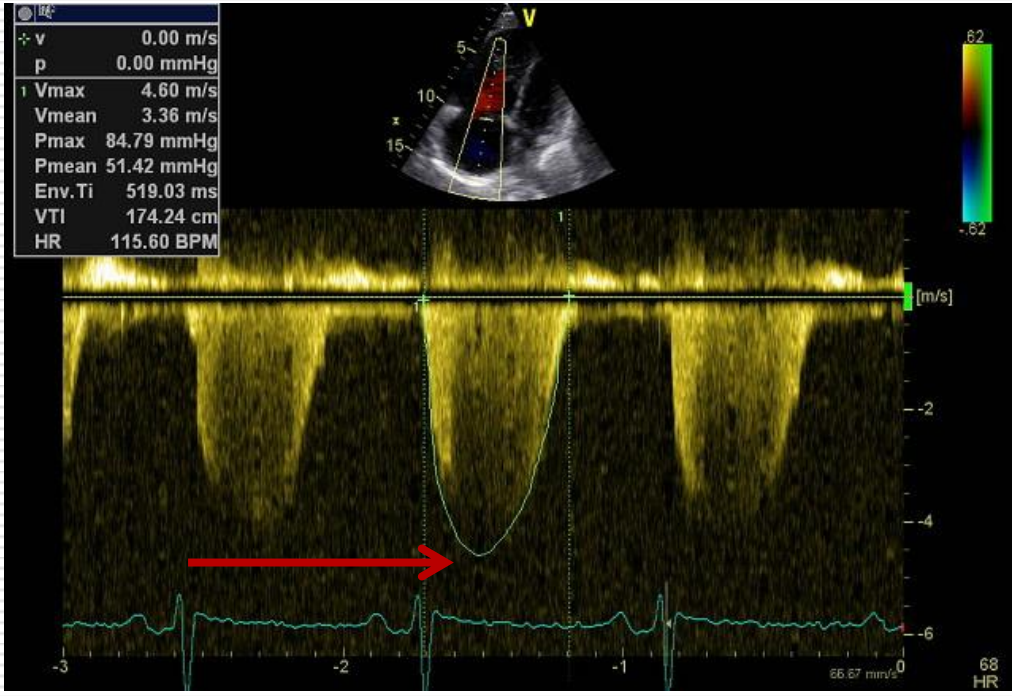
Echokardiografické známky naznačující PH, které jsou používány k posouzení pravděpodobné přítomnosti plicní hypertenze navíc k měření rychlosti proudu krve při nedomykavosti trojcípé chlopně

A: The ventricles[a]	B: Pulmonary artery[a]	C: Inferior vena cava and right atrium[a]
Right ventricle/ left ventricle basal diameter ratio >1.0	Right ventricular outflow Doppler acceleration time <105 msec and/or midsystolic notching	Inferior cava diameter >21 mm with decreased inspiratory collapse (<50 % with a sniff or <20 % with quiet inspiration)
Flattening of the interventricular septum (left ventricular eccentricity index >1.1 in systole and/or diastole)	Early diastolic pulmonary regurgitation velocity >2.2 m/sec	Right atrial area (end-systole) >18 cm^2
	PA diameter >25 mm.	

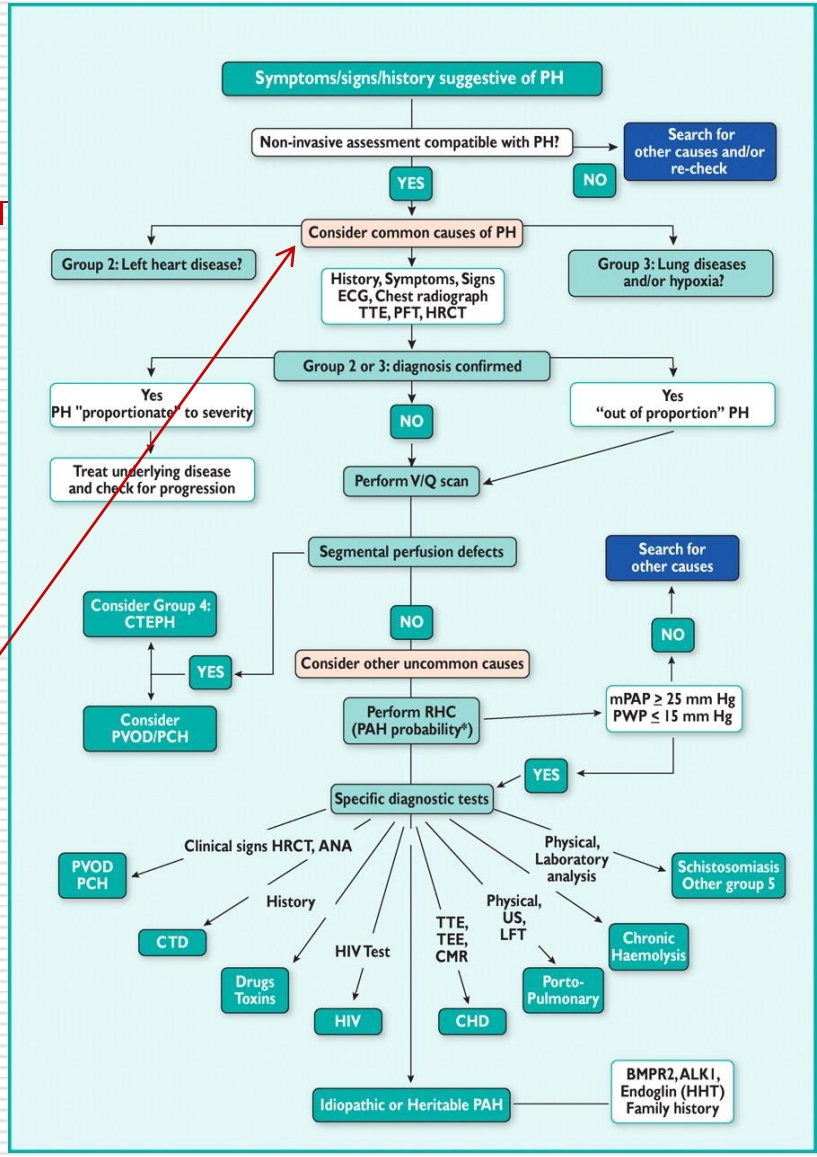


Diagnostický postup u asymptomatických nemocných s RF, případně bez RF PH nebo CTEPH – rozdělení podle pravděpodobnosti přítomné PH z echokardiografického vyšetření

Echokardiografická pravděpodobnost	Bez rizikových faktorů PAH nebo CTEPH	Třída doporučení	Úroveň důkazů	S RF PAH nebo CTEPH	Třída doporučení	Úroveň důkazů
Nízká	Bez dalšího vyšetření	II	C	Eventuální echokardiografické sledování	IIb	C
Střední	Echokardiografické sledování	IIa	C	Echokardiografické sledování doporučeno	I	B
				SS – RHC by měla být zvážena	IIa	B
Vysoká	RHC by měla být zvážena	IIa	C	RHC doporučena	I	C

Diagnostika plicní hypertenze

	Class[a]	Level[b]
Echocardiographic diagnosis: PH unlikely		
Tricuspid regurgitation velocity ≤2.8 m/s, PA systolic pressure ≤36 mmHg, and no additional echocardiographic variables suggestive of PH	I	B
Echocardiographic diagnosis: PH possible		
Tricuspid regurgitation velocity ≤2.8 m/s, PA systolic pressure ≤36 mmHg, but presence of additional echocardiographic variables suggestive of PH	IIa	C
Tricuspid regurgitation velocity 2.9–3.4 m/s, PA systolic pressure 37–50 mmHg with/without additional echocardiographic variables suggestive of PH	IIa	C
Echocardiographic diagnosis: PH likely		
Tricuspid regurgitation velocity >3.4 m/s, PA systolic pressure >50 mmHg, with/without additional echocardiographic variables suggestive of PH	I	B
Exercise Doppler echocardiography is not recommended for screening of PH	III	C

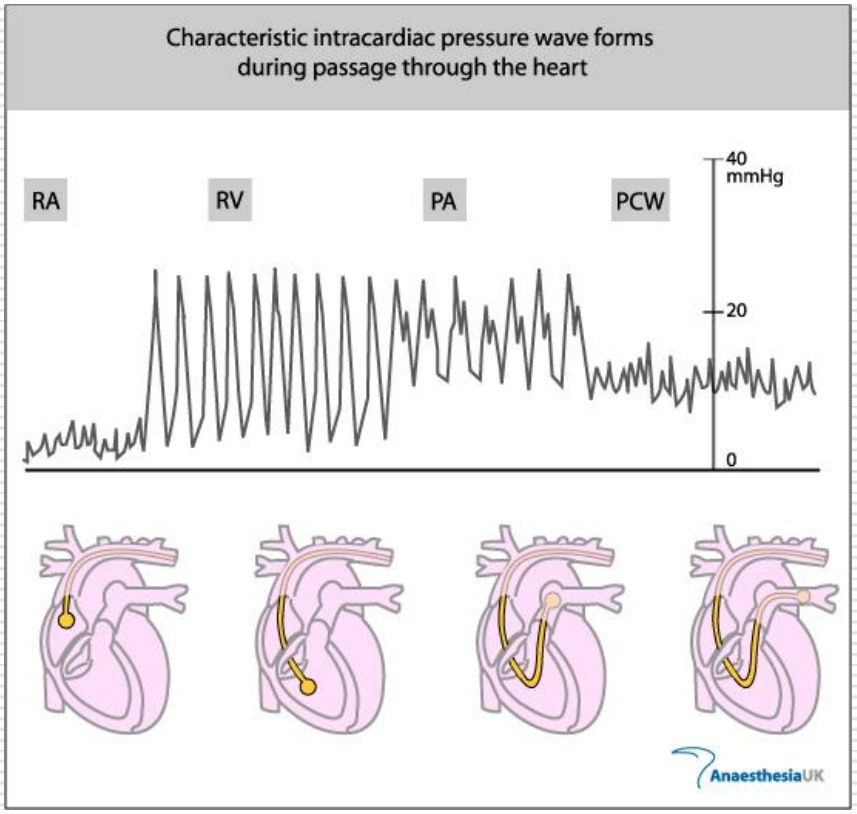


ESC guidelines. Eur Heart J 2009;30:2493-2537

European Heart Journal

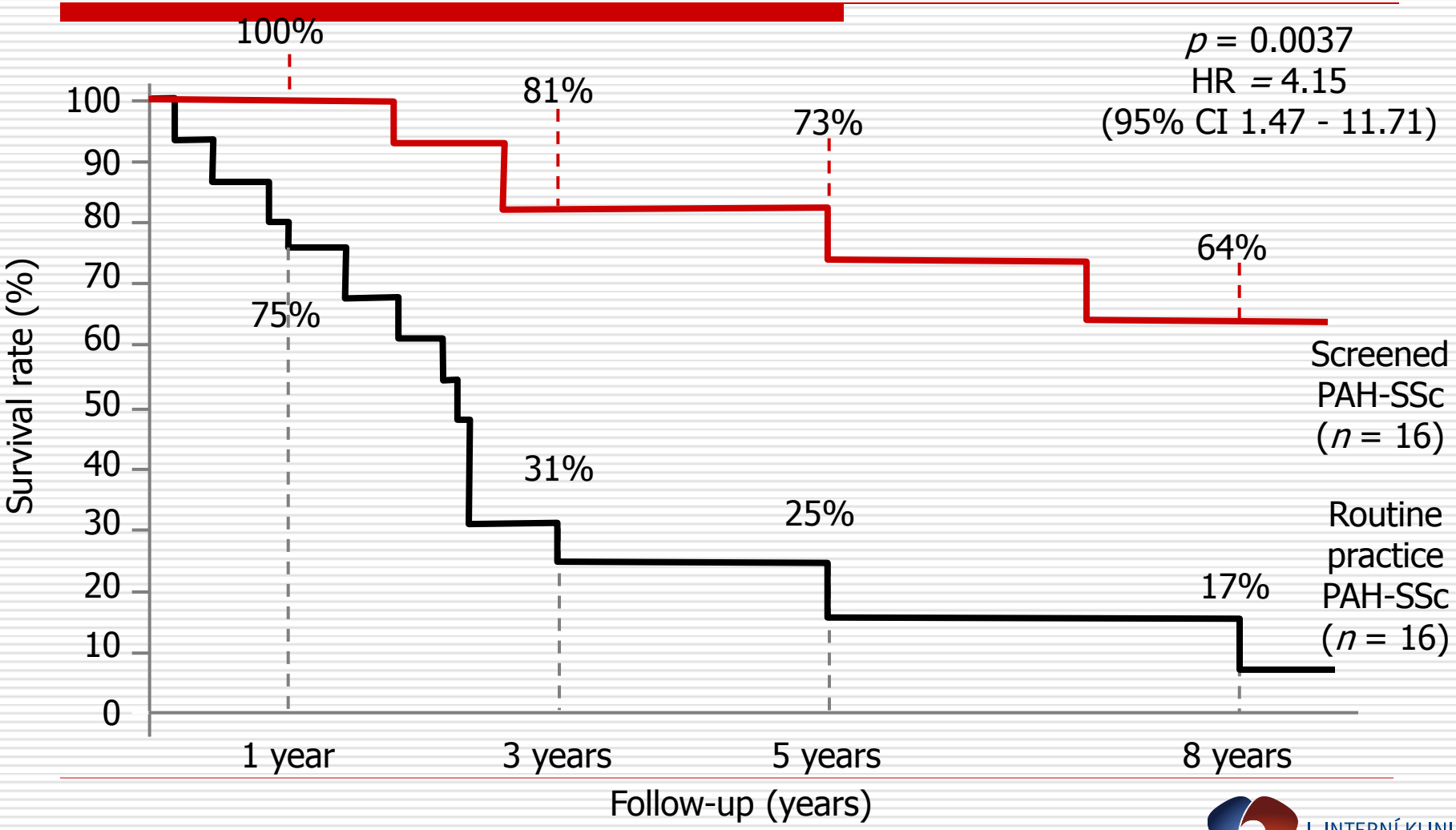
Pravostranná katetrizace - test akutní vazoreaktivity

Přípravek	Iniciální dávka	Max. dávka	Protokol
NO inh. (ppm)	10–20	–	Jednorázová inhalace
Epoprostenol i.v. (ng/kg/min)	2	12	Dávku zvýšit každých 10 min o 2 ng/kg/min
Adenosin i.v. (µg/kg/min)	50	350	Dávku zvýšit každé 2 min o 50 µg/kg/min



ESC guidelines. Eur Heart J 2009;30:2493-2537
Jansa P. Chronicka plicni hypertenze. Cor Vasa 2011;53(3)

Screening PH u pacientů se SSc



CI: Confidence interval; HR: Hazard ratio; SSc: Systemic Sclerosis

Humbert M, *et al. Arthritis Rheum* 2011; 63:3522-30.

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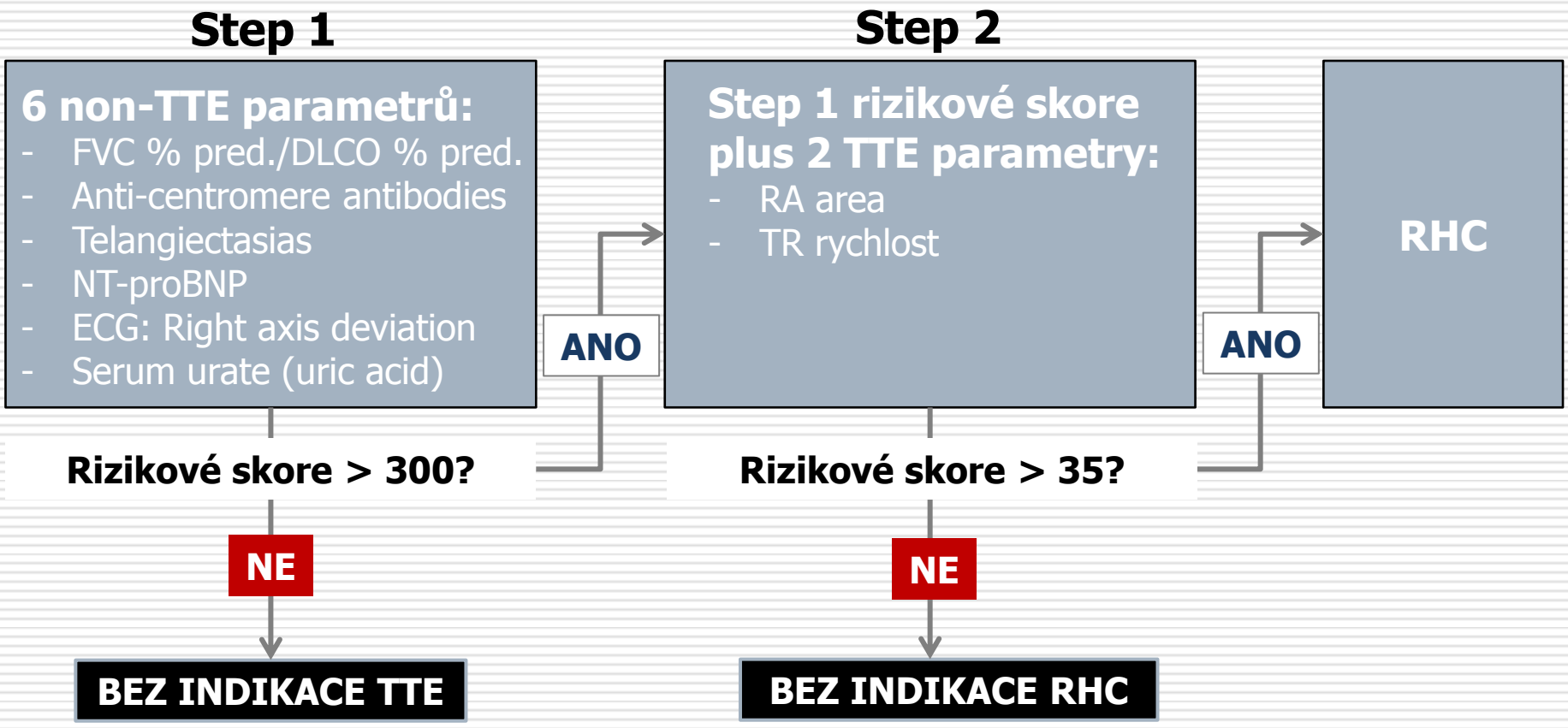
DETECT algoritmus screeningu PH u pacientů se SSc

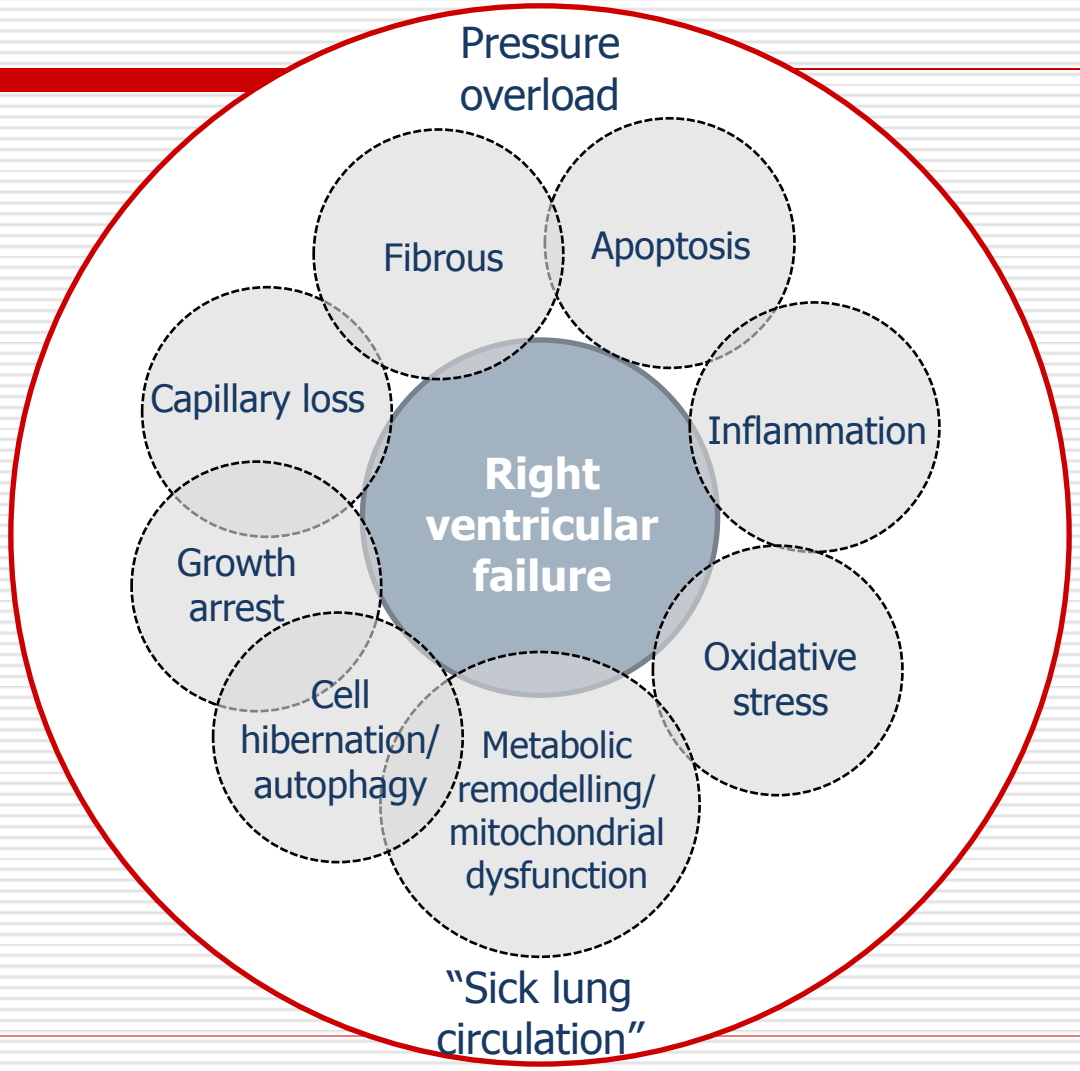


DLCO: Diffusing capacity of the lungs for carbon monoxide; ECG: Electrocardiogram; FVC: Forced vital capacity; NT-proBNP: N-terminal prohormone brain natriuretic peptide; RHC: Right heart catheterisation; SSc: Systemic Sclerosis; TR: Tricuspid regurgitation

Coghlan JG, *et al. Ann Rheum Dis* 2014; 73:1340-9.

PROGNÓZA

2. PROGNOSTICKÉ INFORMACE



Naeije R, *et al. Eur Respir Rev* 2014; 23:476-87.

Funkce PK

Echocardiography

- RA area[1]
- RV area[1]
- TAPSE[1,2]
- Tei index[3]
- RV fractional area change[2]
- Tricuspid regurgitation[2]
- Pericardial effusion[4]
- IVC collapsibility[2]
- SVC flow velocity pattern[2]
- LV eccentricity index[2]
- RV filling pressure[5]

MRI

- RV ejection fraction[6]
- Right ventricular stroke volume
- Right ventricular mass
- Right ventricular volume[1]

RHC

- Right arterial pressure[7]
- Cardiac index[8]

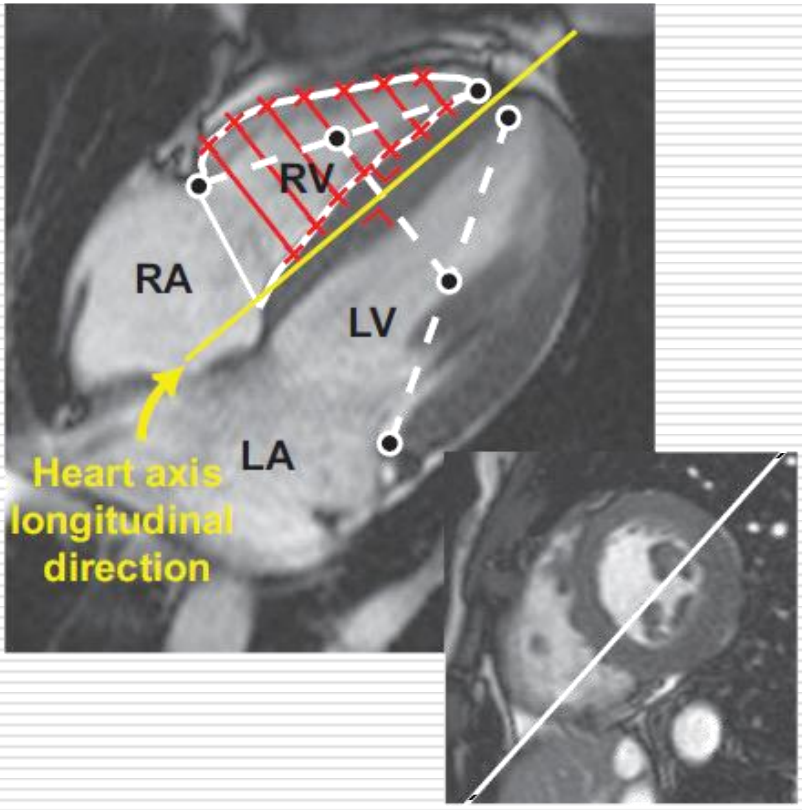
Biomarkers

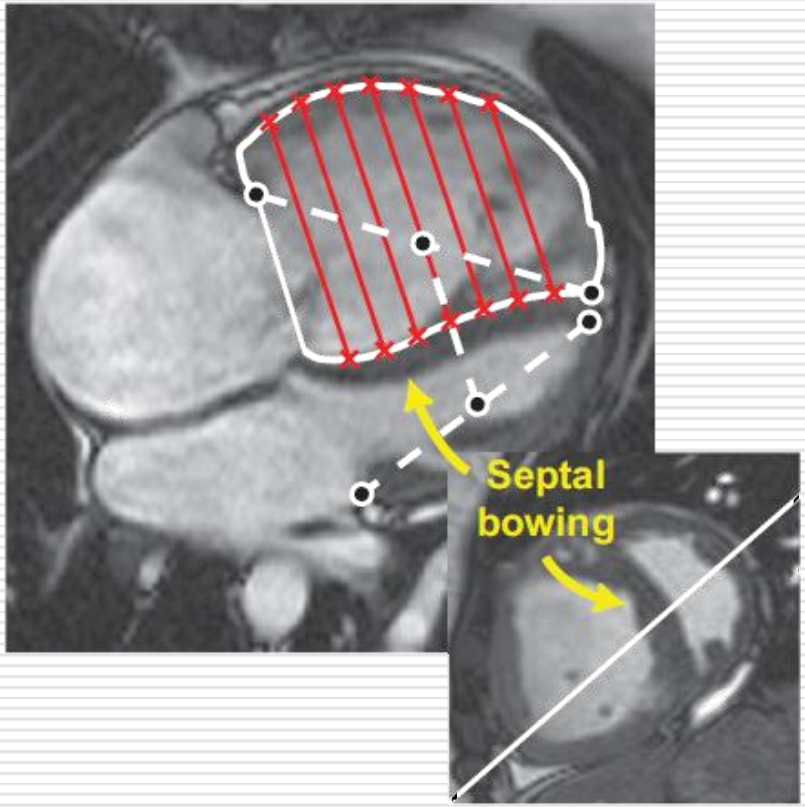
- NT-proBNP[9]
- Troponin T[10]

1. Grünig E, *et al. DMW* 2010. 2. Ghio S, *et al. Int J Cardiol* 2010. 3. Tei C, *et al. J Am Soc Echocardiogr* 1996. 4. Raymond RJ, *et al. JACC* 2002. 5. Utsunomiya H, *et al. J Am Soc* Echocardiogr 2009. 6. van de Veerdonk M, *et al. JACC* 2011.
7. McLaughlin VV, *et al. Circulation* 2002. 8. D'Alonzo GE, *et al. Ann Intern Med* 1991.
9. Nagaya N, *et al. JACC* 1998. 10. Torbicki A, *et al. Circulation* 2003.

Control

Severe PAH





Kind T, *et al. J Cardiovasc Magn Reson* 2010; 12:35.

Determinants of prognosis[a]	Low risk < 5%	Intermediate risk 5 - 10%	High risk > 10%
Clinical signs of right heart failure	Absent	Absent	Present
Progression of symptoms	No	Slow	Rapid
Syncope	No	Occasional syncope[b]	Repeated syncope[c]
WHO functional class	I, II	III	IV
6MWD	> 440 m	165 – 440 m	< 165 m
Cardiopulmonary exercise testing	Peak VO_2 > 15 ml/min/kg (> 65% pred.) VE/VCO_2 slope < 36	Peak VO_2 11 - 15 ml/min/kg (35 – 65% pred.) VE/VCO_2 slope 36 – 44.9	Peak VO_2 < 11 ml/min/kg (< 35% pred.) VE/VCO_2 ≥ 45
NT-proBNP plasma levels	BNP < 50 ng/l NT-proBNP < 300 ng/ml	BNP 50 - 300 ng/l NT-proBNP 300 - 1400 ng/l	BNP > 300 ng/l NT-proBNP > 1400 ng/l
Imaging (echocardiography, CMR imaging	RA area < 18 cm^2 No pericardial effusion	RA area 18 - 26 cm^2 No or minimal, pericardial effusion	RA area > 26 cm^2 Pericardial effusion
Haemodynamics	RAP < 8 mmHg CI ≥ 2.5 l/min/m^2 SvO_2 > 65%	RAP 8 - 14 mmHg CI 2.0 - 2.4 l/min/m^2 SvO_2 60 - 65%	RAP > 14 mmHg CI < 2.01 l/min/m^2 SvO_2 < 60%

[a]Estimated 1-year mortality. [b]Occasional syncope during brisk or heavy exercise, or occasional orthostatic syncope in an otherwise stable patient. [c]Repeated episodes of syncope, even with little or regular physical activity

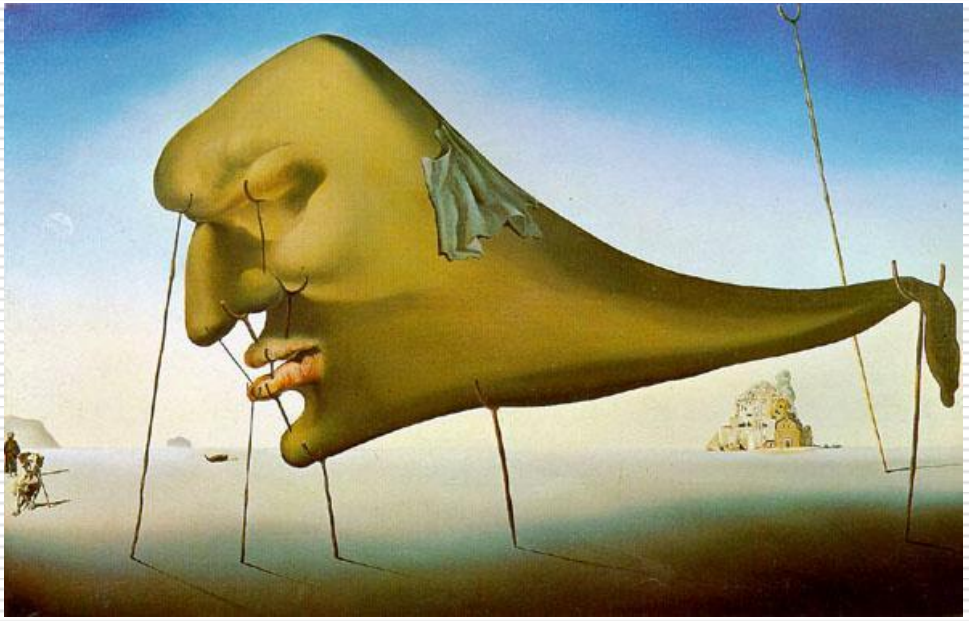
Galiè N, *et al. Eur Heart J* 2016; 37:67-119.

	Prognostická informace
Echokardiografický parametr:	
TAPSE	+
RV strain	+
RA area	+
Perikardiální výpotek	++

Table indicates the number of studies that have shown prognostic implications for each variable at baseline or follow-up
\+ One study
++ Two studies

McLaughlin VV, *et al. J Am Coll Cardiol* 2013; 62:D73-81.

INDIKACE TERAPEUTICKÉ INTERVENCE



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Constrictive Pericarditis in the Modern Era

Novel Criteria for Diagnosis in the Cardiac Catheterization Laboratory

Deepak R. Talreja, MD, FACC, Rick A. Nishimura, MD, FACC, Jae K. Oh, MD, FACC, David R. Holmes, MD, FACC

Rochester, Minnesota

Table 2 Catheterization Criterion

Criterion	Sensitivity (%)	Specificity (%)	Positive Predictive Accuracy (%)	Negative Predictive Accuracy (%)
LVEDP − RVEDP ≤5 mm Hg	46	54	58	40
PASP <55 mm Hg	90	29	73	66
RVEDP/RVSP >1/3	93	46	71	79
LVRFW >7 mm Hg	45	44	62	42
Inspiratory decrease in RAP <5 mm Hg	71	37	62	39
Systolic area index >1.1	97	100	100	95

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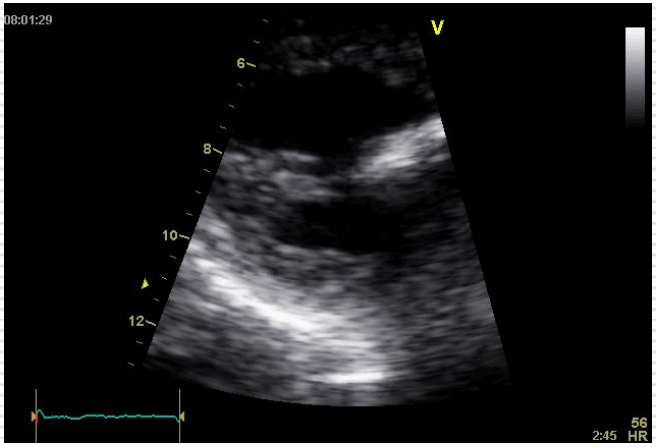
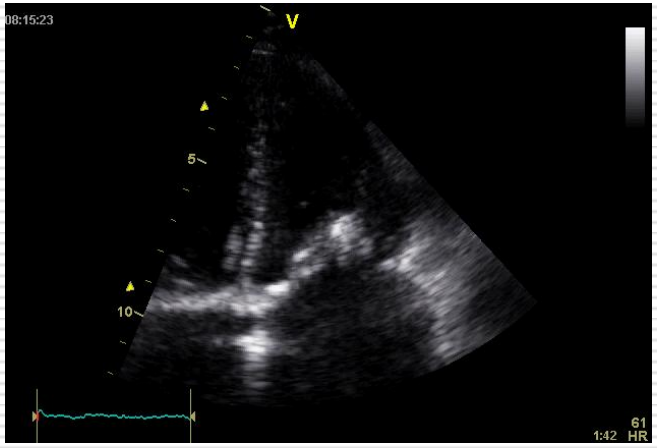
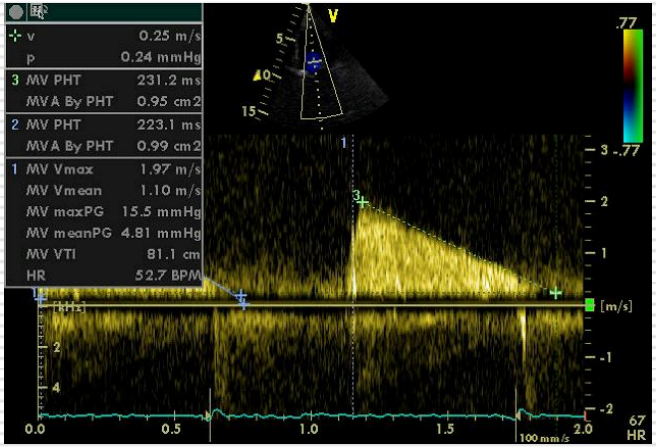
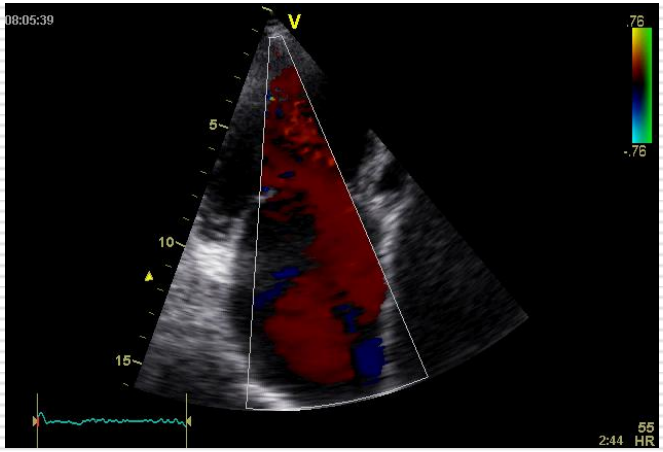
MITRÁLNÍ VADY









I. INTERNÍ KLINIKA
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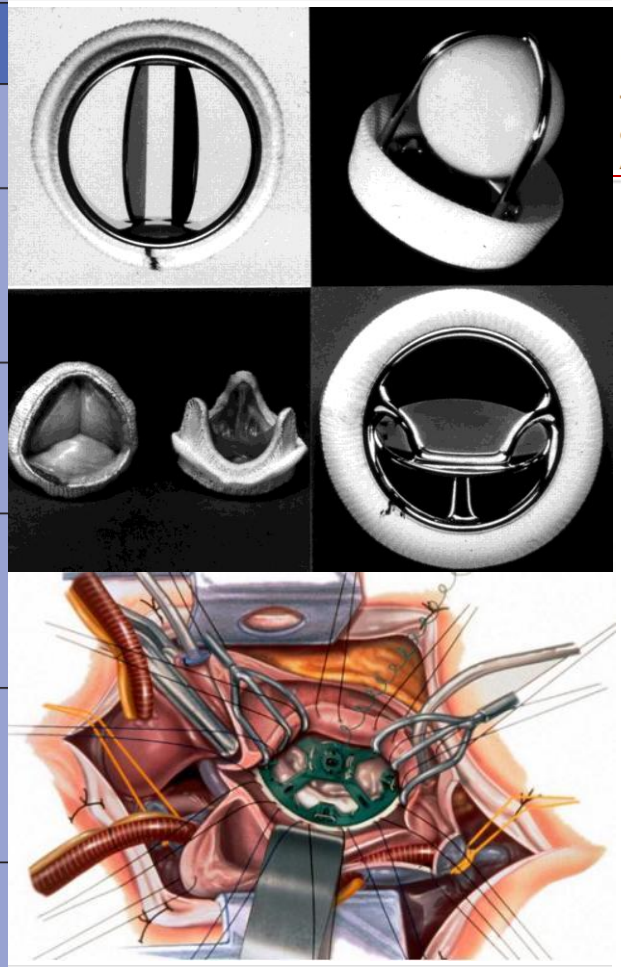
	Class [a]	Level [b]
Mitral valve repair should be the preferred technique when it is expected to be durable.	I	C
Surgery is indicated in symptomatic patients with LVEF >30% and LVESD <55 mm.	I	B
Surgery is indicated in asymptomatic patients with LV dysfunction (LVESD ≥45 mm and/or LVEF ≤60%).	I	C
Surgery should be considered in asymptomatic patients with preserved LV function and new onset of atrial fibrillation or pulmonary hypertension (systolic pulmonary pressure at rest >50 mmHg).	IIa	C
Surgery should be considered in asymptomatic patients with preserved LV function, high likelihood of durable repair, low surgical risk and flail leaflet and LVESD ≥40 mm.	IIa	C
Surgery should be considered in patients with severe LV dysfunction (LVEF <30% and/or LVESD >55 mm) refractory to medical therapy with high likelihood of durable repair and low comorbidity.	IIa	C
Surgery may be considered in patients with severe LV dysfunction (LVEF <30% and/or LVESD >55 mm) refractory to medical therapy with low likelihood of durable repair and low comorbidity.	IIb	C
Surgery may be considered in asymptomatic patients with preserved LV function, high likelihood of durable repair, low surgical risk, and: • left atrial dilatation (volume index ≥60 ml/m² BSA) and sinus rhythm, or • pulmonary hypertension on exercise (SPAP ≥60 mmHg at exercise).	IIb	C

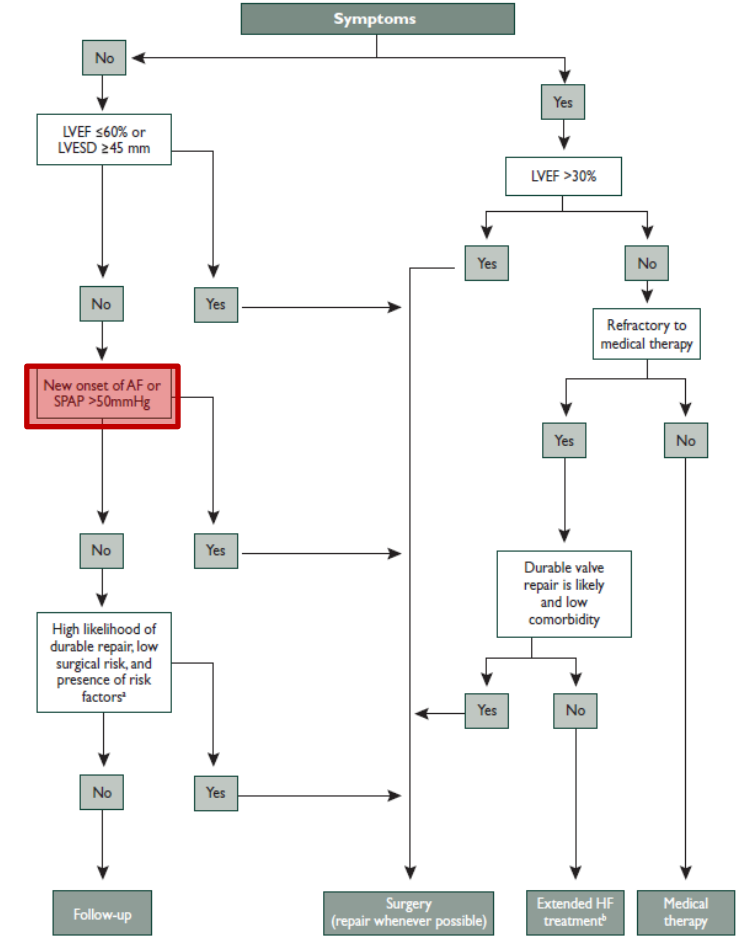


European Heart Journal (2012) 33, 2451–2496
doi:10.1093/eurheartj/ehs109

ESC/EACTS GUIDELINES

Guidelines on the management of valvular heart disease (version 2012)

The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)



European Heart Journal (2012) 33, 2451–2496
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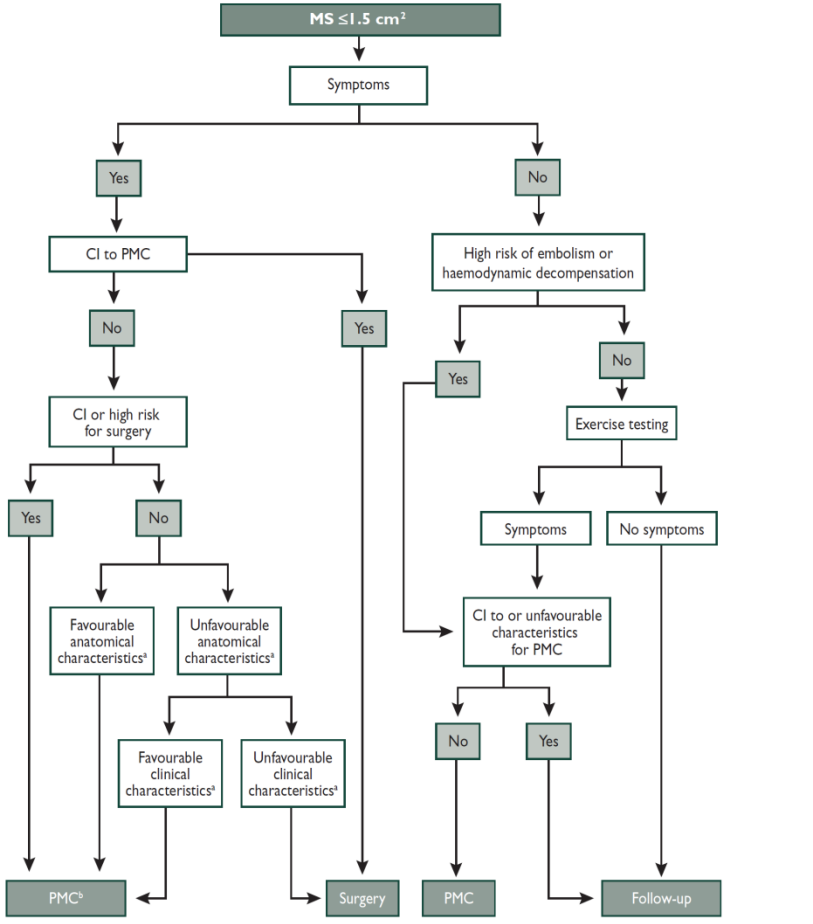
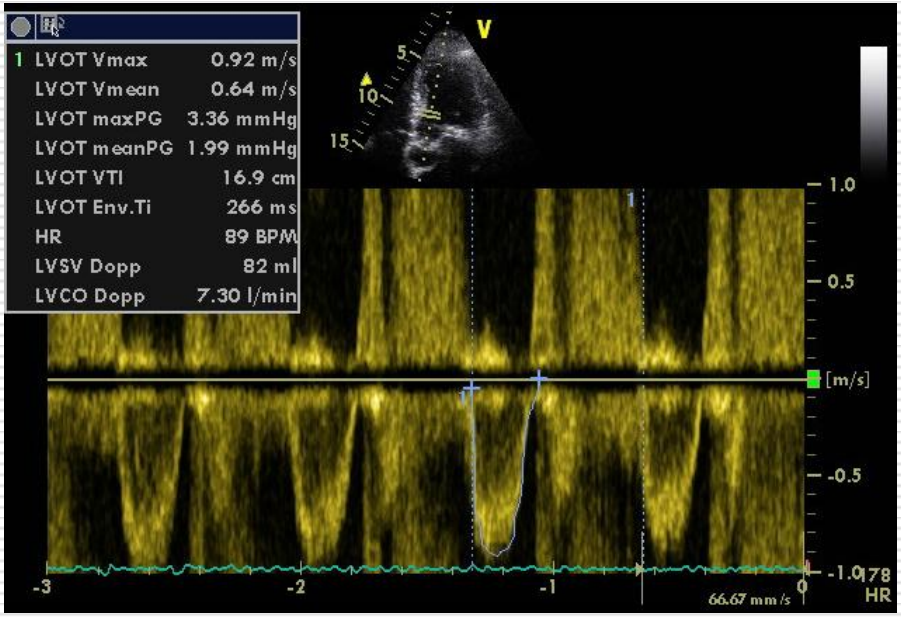
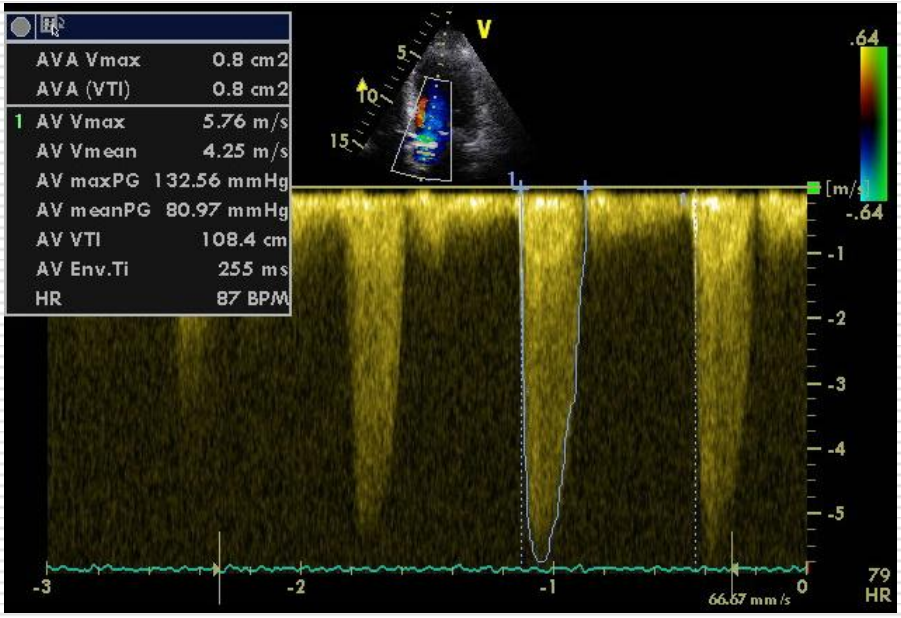
	Class [a]	Level [b]	Ref [c]
PMC is indicated in symptomatic patients with favourable characteristics.[d]	I	B	160, 170
PMC is indicated in symptomatic patients with contraindication or high risk for surgery.	I	C	
PMC should be considered as initial treatment in symptomatic patients with unfavourable anatomy but without unfavourable clinical characteristics.[d]	IIa	C	
PMC should be considered in asymptomatic patients without unfavourable characteristics[d] and • high thromboembolic risk (previous history of embolism, dense spontaneous contrast in the left atrium, recent or paroxysmal atrial fibrillation) and/or • high risk of haemodynamic decompensation (systolic pulmonary pressure >50 mmHg at rest, need for major non-cardiac surgery, desire for pregnancy).	IIa	C	



AORTÁLNÍ STENÓZA





Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
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Aortální stenóza

Determinants and Prognostic Significance of Exercise Pulmonary Hypertension in Asymptomatic Severe Aortic Stenosis
Patrizio Lancellotti, Julien Magne, Erwan Donal, Kim O'Connor, Raluca Dulgheru, Monica Rosca and Luc A. Pierard

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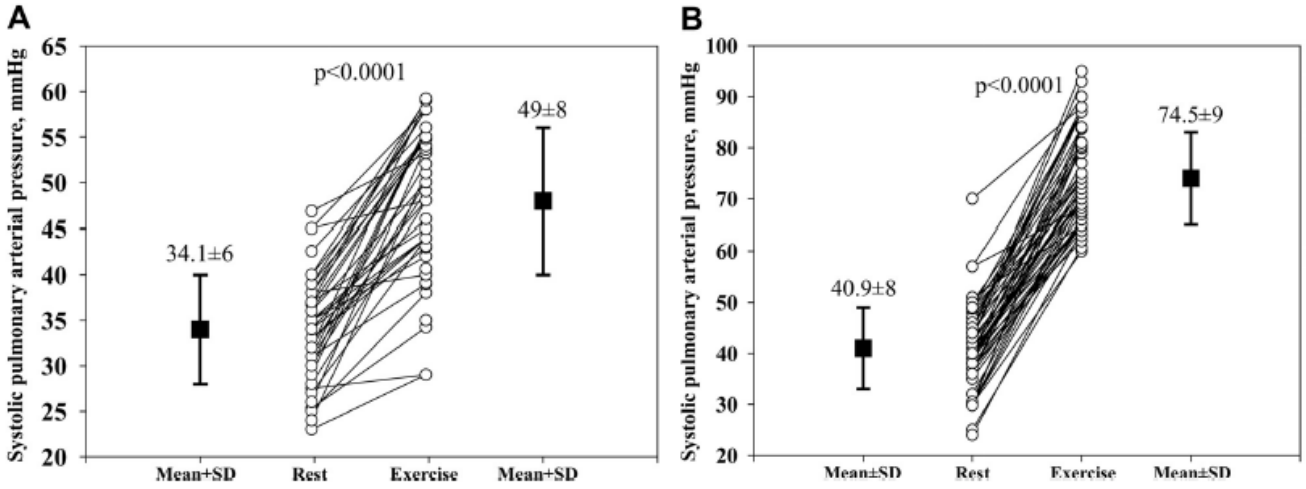

Figure 1. Impact of exercise on systolic pulmonary arterial pressure in patients without exercise pulmonary hypertension (**A**) and with exercise pulmonary hypertension (**B**).

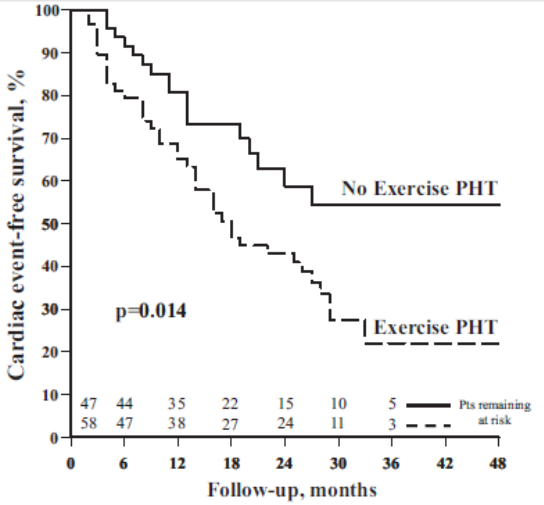

Figure 2. Cardiac event-free survival according to the presence or absence of exercise pulmonary hypertension (PHT).

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Mitrální regurgitace

Exercise Pulmonary Hypertension in Asymptomatic Degenerative Mitral Regurgitation
Julien Magne, Patrizio Lancellotti and Luc A. Piérard

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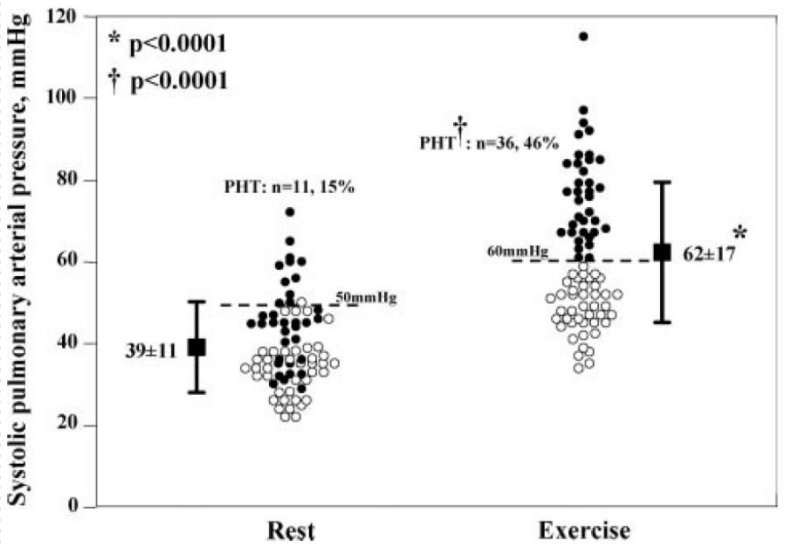

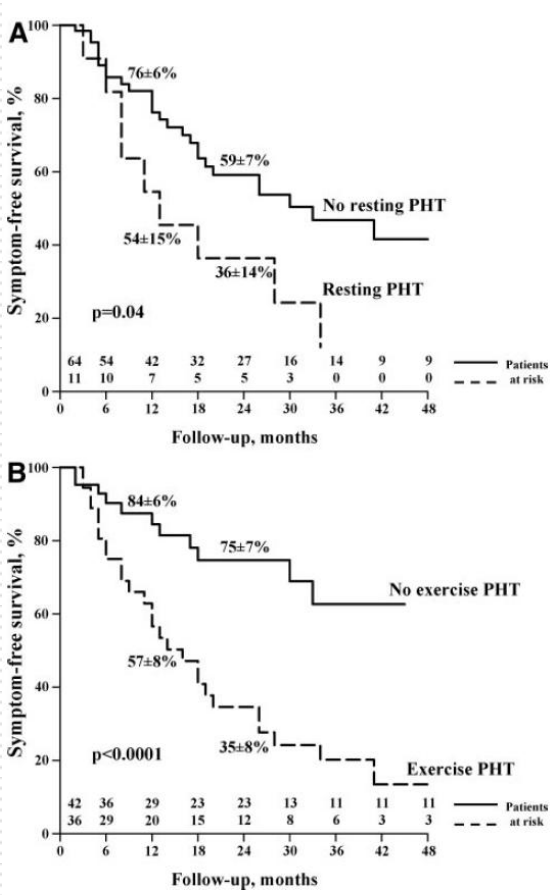

Figure 2. Symptom-free survival according to resting (A) and exercise (B) PHT.

Děkuji za pozornost

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