

Echokardiografie a pulmonální vady



FN MOTOL

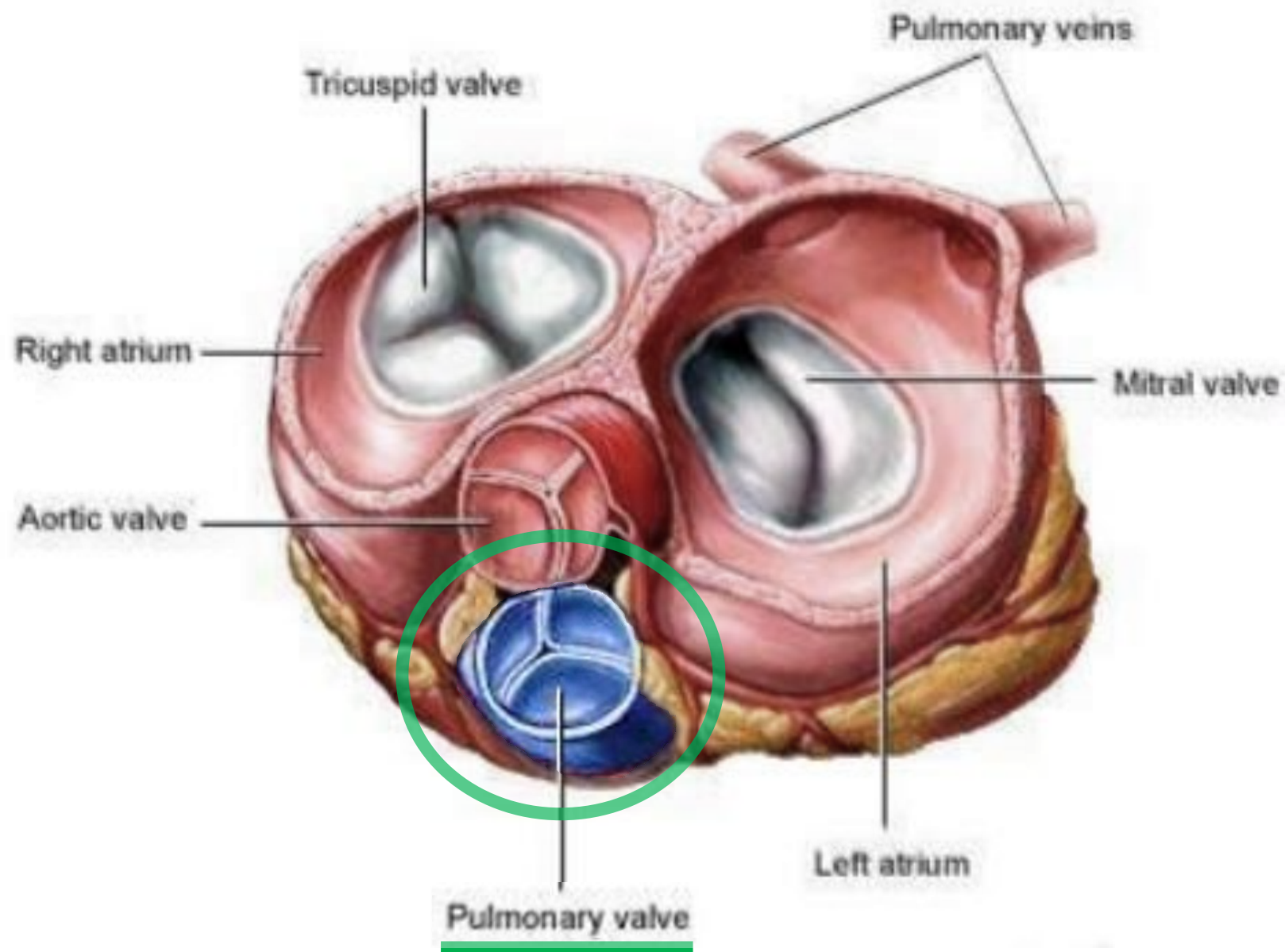


**KARDIOLOGICKÁ
KLINIKA**



2. LF UK

Martin Horváth

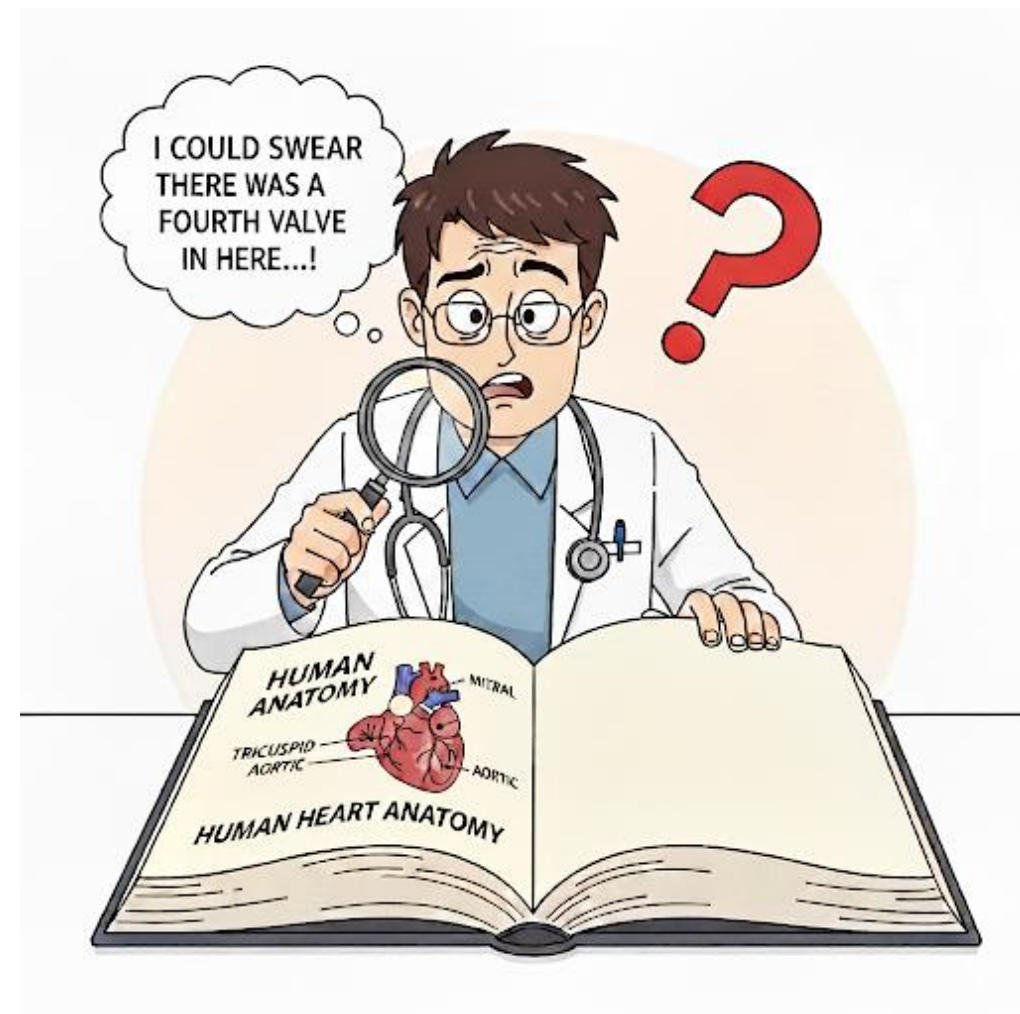


2025 ESC/EACTS Guidelines for the management of valvular heart disease

Developed by the task force for the management of valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

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ACC/AHA CLINICAL PRACTICE GUIDELINE

2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease

A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

if there is no significant pulmonary hypertension or severe RV systolic dysfunction, operation for severe symptomatic isolated TR years after surgery for left-sided disease may improve symptoms of right-sided HF, if done before the onset of severe RV dysfunction or end-organ damage with either hepatic or renal dysfunction.^{11,18}

sultation with a Comprehensive Valve Center.

Recommendation-Specific Supportive Text

1. The complex nature of mixed valve disease requires a comprehensive imaging approach that involves assessing each lesion separately and then collectively judging how the lesions affect the patient's overall presentation. TTE is the standard modality for measuring jet velocities, valve areas, regurgitant flow, and regurgitant orifice areas. TTE establishes the baseline for pathoanatomy and pathophysiology from which comparison is made as the lesions progress over time. Doppler hemodynamics have been validated for patients with single-valve disease but have not necessarily been studied in patients with multivalve disease. Limitations exist for assessment of calculations, such as those for valve areas, because of differential flows with multivalve disease.²⁻⁵
2. The complex nature of mixed valve disease makes it necessary to consider all available data to reach a final management decision. Although natural history data for many types of mixed valve disease are lacking, it is reasonable to assume that the onset of symptoms is a non-

9. PULMONIC VALVE DISEASE

See guidelines for the management of adults with congenital heart disease.¹

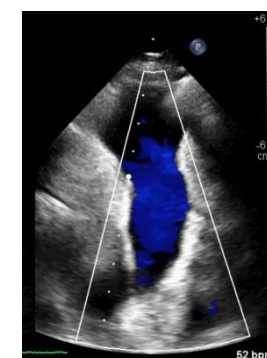
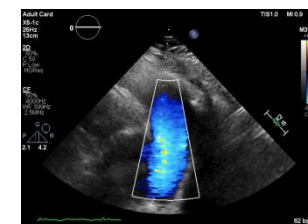
10. MIXED VALVE DISEASE

10.1. Diagnosis of Mixed VHD

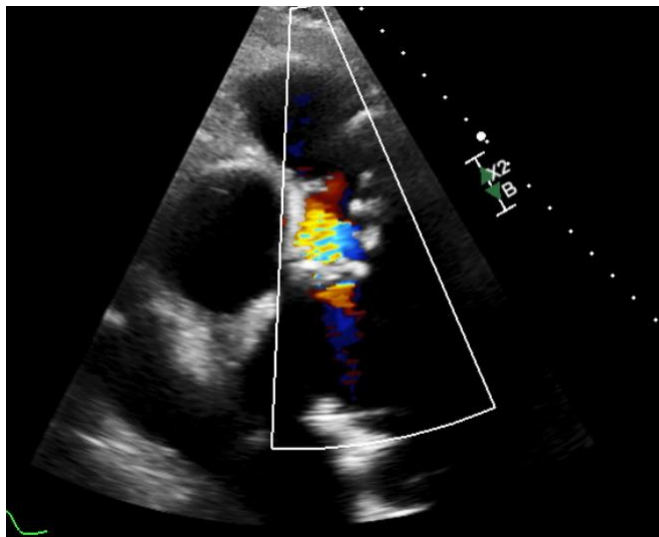
Recommendations for Diagnosis and Follow-Up of Patients With Mixed Valve Disease		
COR	LOE	Recommendations
1	C-EO	1. For patients with mixed valve disease, TTE is recommended to assess the etiology, severity, and pathophysiological impact.
2a	C-EO	2. In patients with ambiguous symptoms that are suspected to be attributable to mixed mitral valve disease, further assessment of

Pulmonální vady

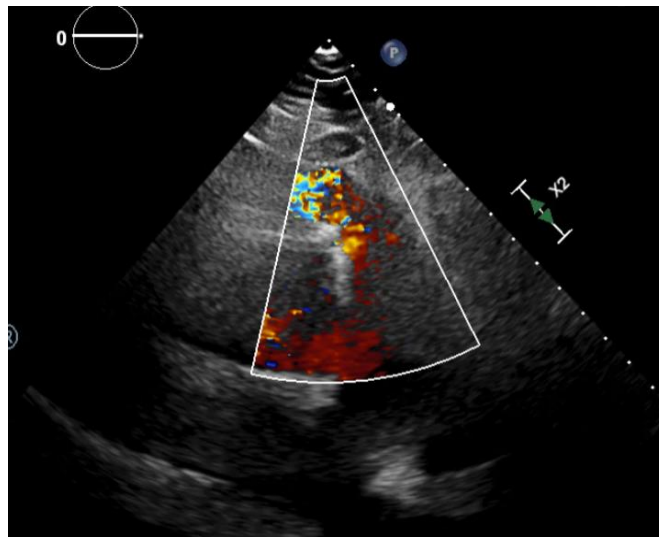
- PR je častá, ale většinou ji není příliš nutné brát v úvahu
- Prevalence HD nevýznamné PR při ECHO vyšetřeních je až 78%
- Prevalence těžké PR byla ve studii z MAYO clinic 0.11%



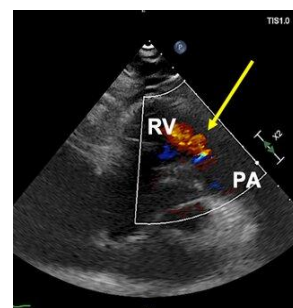
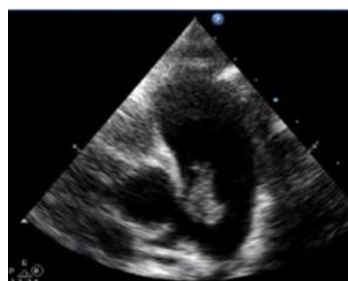
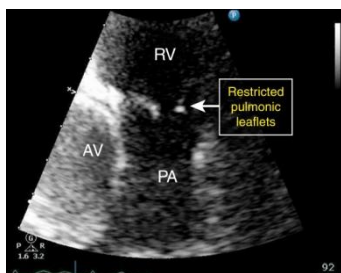
Primární



Fallotova tetralogie



Degenerované homografty- Ross



Revmatická choroba Endokarditida

Carcinoid

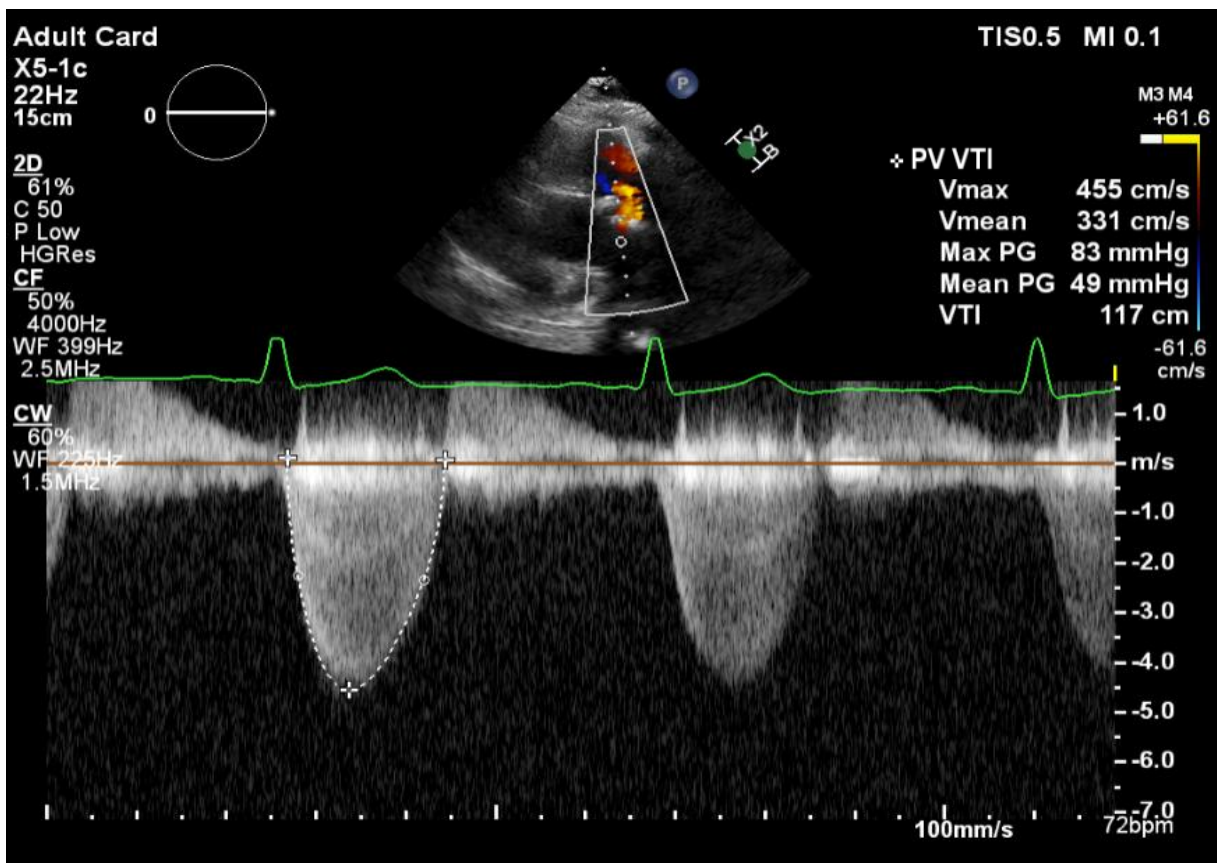
Úraz

Sekundární

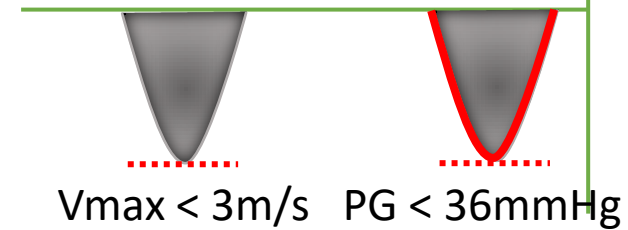


Plicní hypertenze

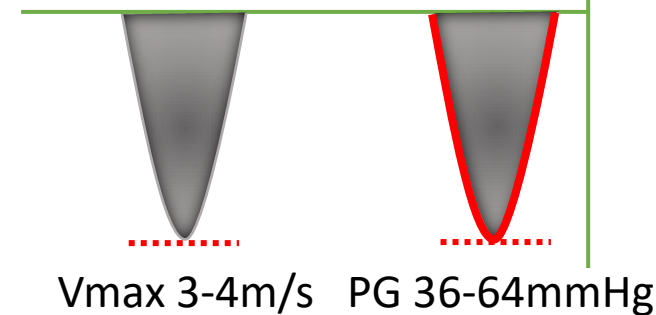
Pulmonální stenóza



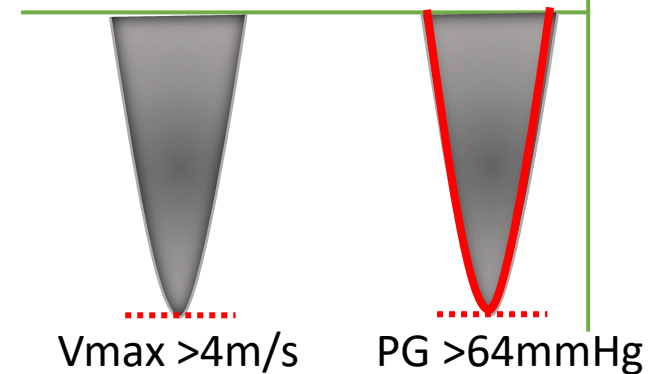
Lehká



Střední



Těžká



Recommendations for intervention in right ventricular outflow tract obstruction

Recommendations	Class ^a	Level ^b
In valvular PS, balloon valvuloplasty is the intervention of choice, if anatomically suitable.	I	C
Provided that no valve replacement is required, RVOTO intervention at any level is recommended regardless of symptoms when the stenosis is severe (Doppler peak gradient is >64 mmHg ^c).	I	C
If surgical valve replacement is the only option, it is indicated in patients with severe stenosis who are symptomatic. ^d	I	C
If surgical valve replacement is the only option ^d in patients with severe stenosis who are asymptomatic, it is indicated in the presence of one or more of the following. ● Objective decrease in exercise capacity. ● Decreasing RV function and/or progression of TR to at least moderate. ● RVSP >80 mmHg. ● R–L shunting via an ASD or VSD.	I	C
Intervention in patients with a Doppler peak gradient <64 mmHg should be considered in the presence of one or more of the following. ● Symptoms related to PS. ● Decreasing RV function and/or progressive TR to at least moderate. ● R–L shunting via an ASD or VSD.	IIa	C

Pulmonální regurgitace



Table 16 Echocardiographic and Doppler parameters useful in grading PR severity

Parameter	Mild	Moderate	Severe
Pulmonic valve	Normal	Normal or abnormal	Abnormal and may not be visible
RV size	Normal*	Normal or dilated	Dilated [†]
Jet size, color Doppler [‡]	Thin (usually <10 mm in length) with a narrow origin	Intermediate	Broad origin; variable depth of penetration
Ratio of PR jet width/pulmonary annulus			>0.7 [§]
Jet density and contour (CW)	Soft	Dense	Dense; early termination of diastolic flow
Deceleration time of the PR spectral Doppler signal			Short, <260 msec
Pressure half-time of PR jet			<100 msec
PR index [¶]		<0.77	<0.77
Diastolic flow reversal in the main or branch PAs (PW)			Prominent
Pulmonic systolic flow (VTI) compared to systemic flow (LVOT VTI) by PW [#]	Slightly increased	Intermediate	Greatly increased
RF**	<20%	20%-40%	>40%

PW, Pulsed wave Doppler.

*Unless there are other reasons for RV enlargement.

†Acute PR.

‡Jet limit of 50-70 cm/sec.

§CMR-derived PR fraction $\geq 40\%$.

¶the duration of the PR signal divided by the total duration of diastole, with this cutoff identifying a CMR-derived PR fraction > 25%.

||in the presence of high RV end diastolic pressure.

#es for RVol and fraction are not well validated.

¶eration is not specific for severe PR.

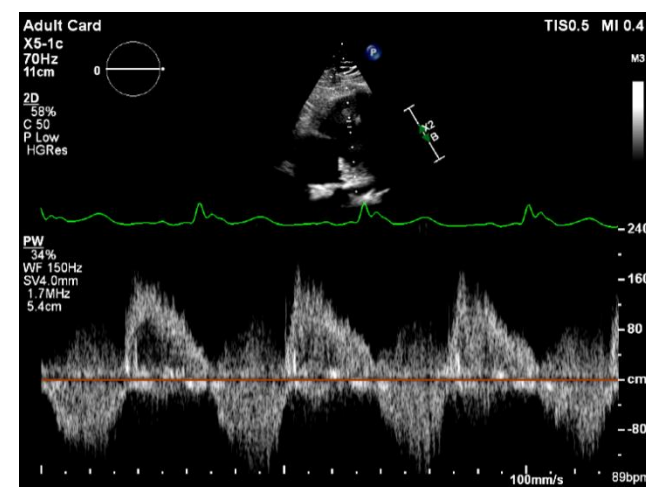
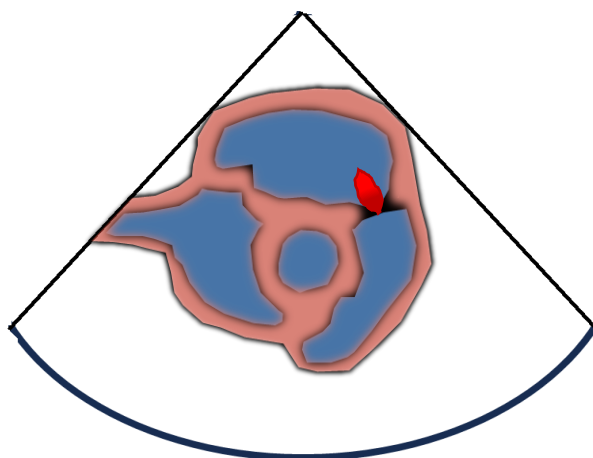
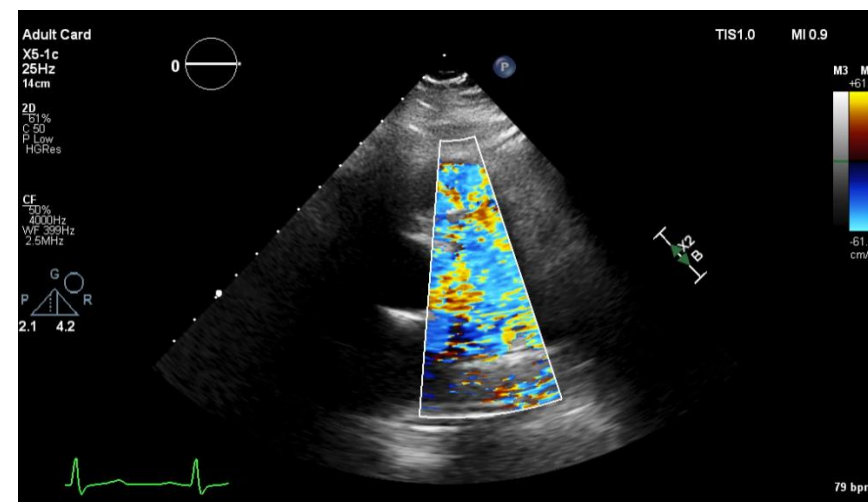
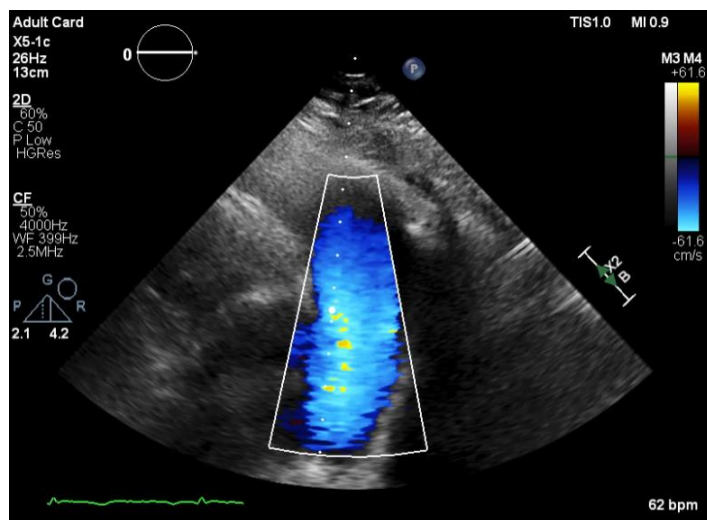
**primarily derived from CMR with limited application with echocardiography.



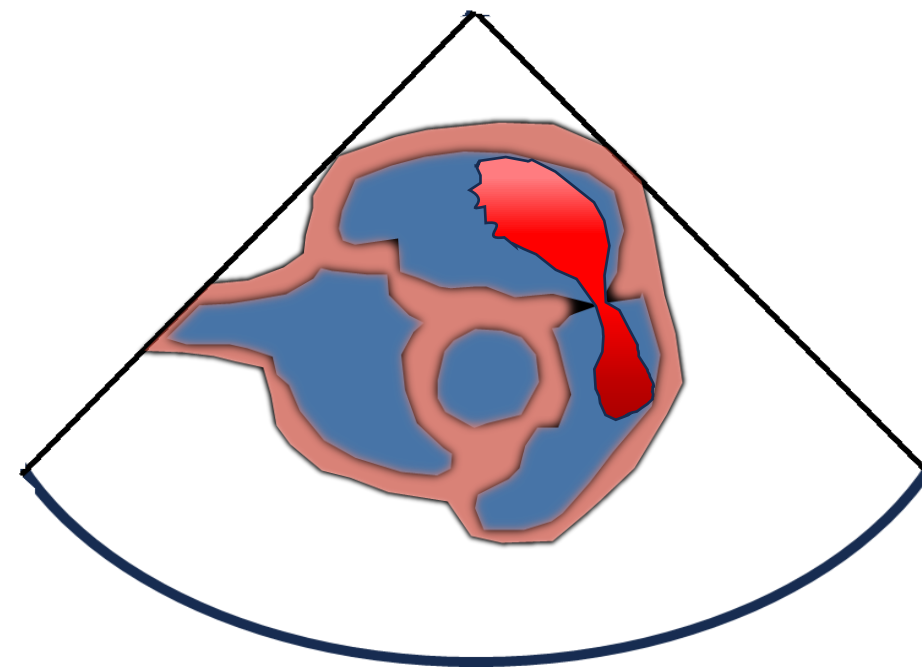
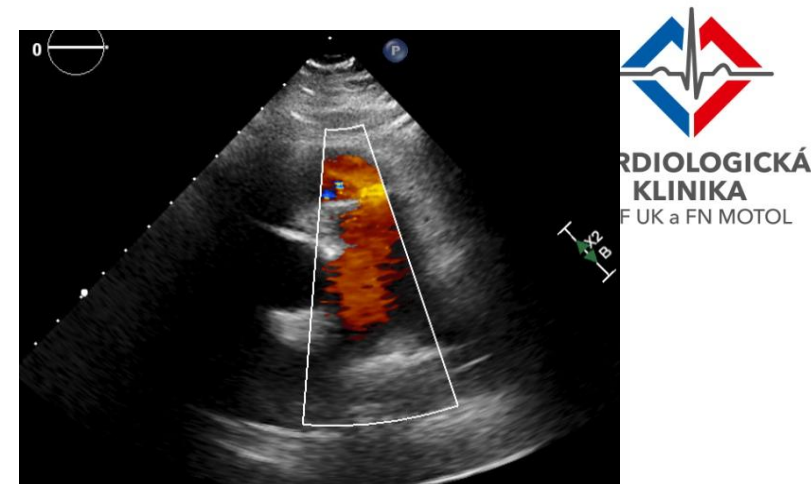
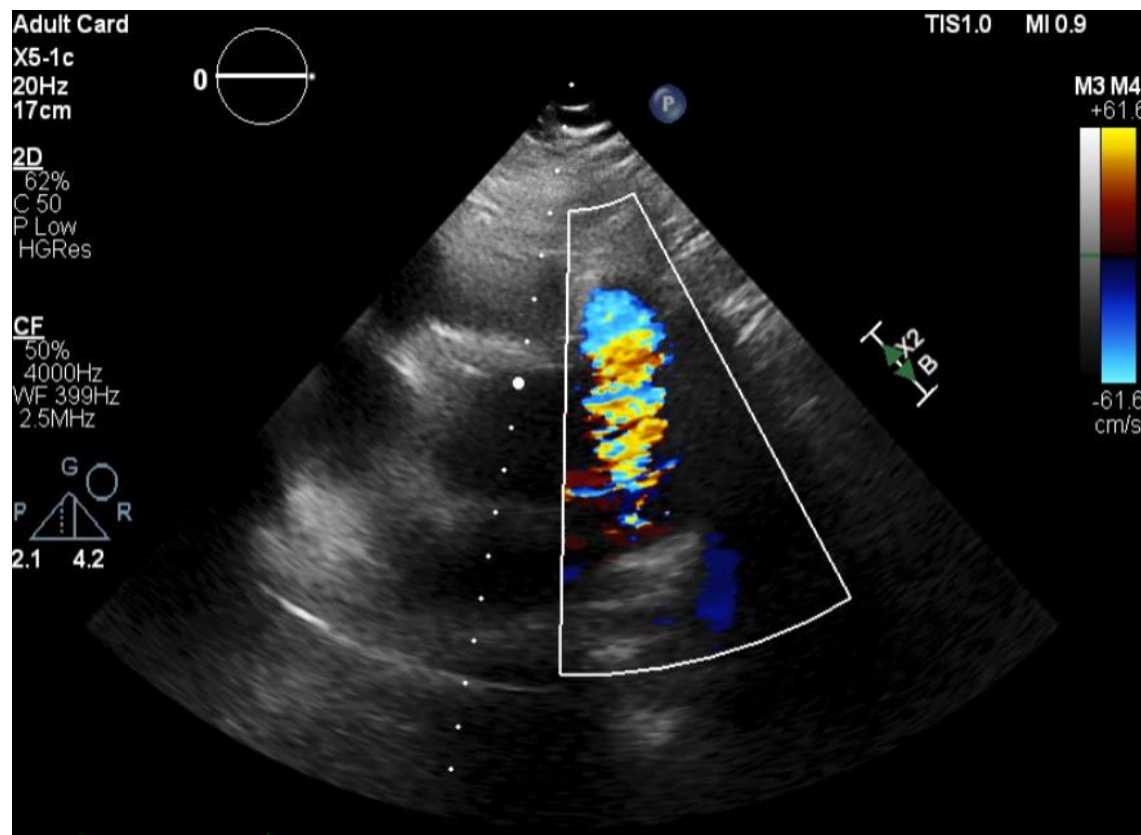
Pulmonální regurgitace



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Pulmonální regurgitace



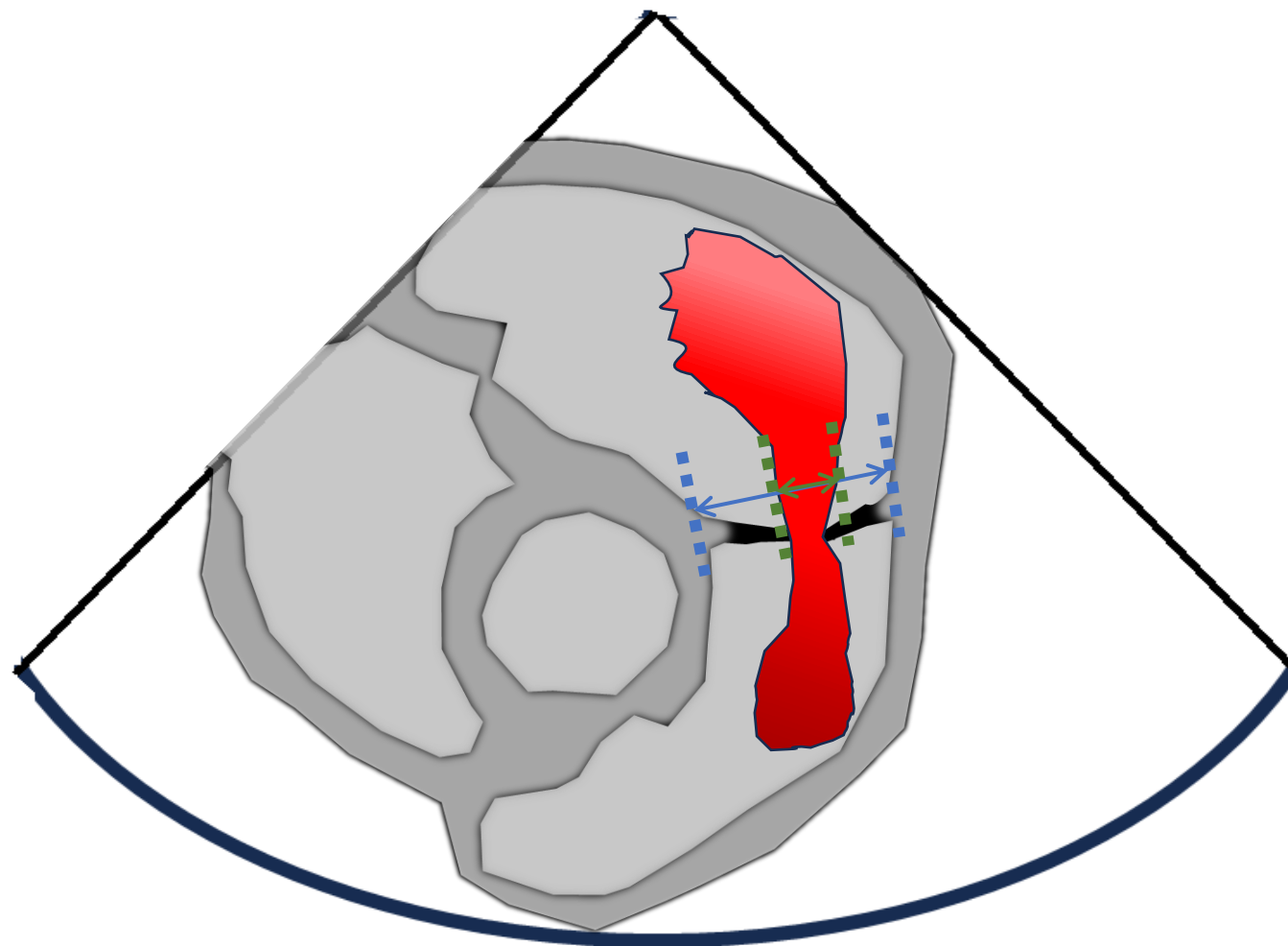
Pulmonální regurgitace

Maximální šířka trysky pulmonální regurgitace

Měříme v diastole ihned pod pulmonální chlopní

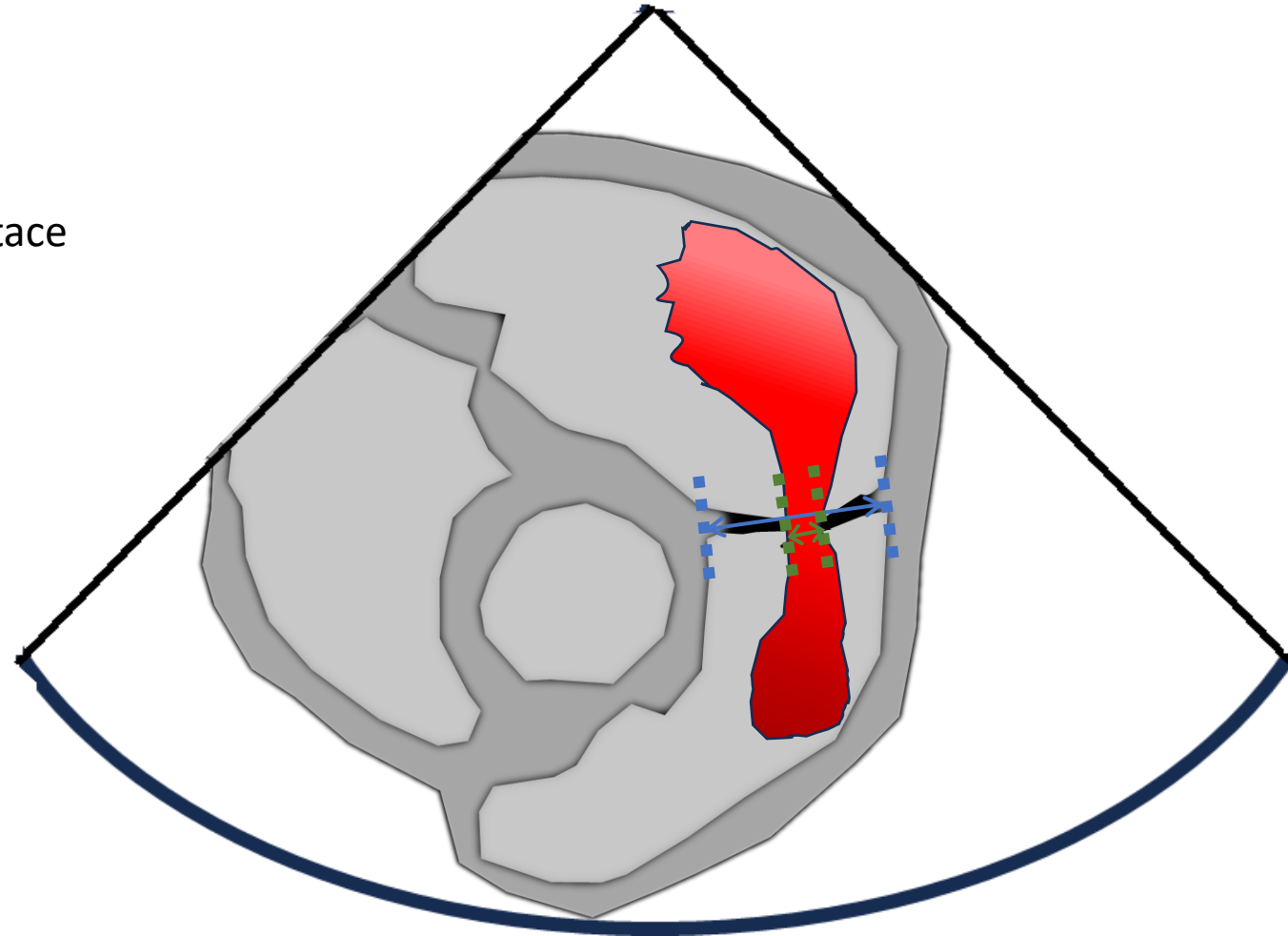
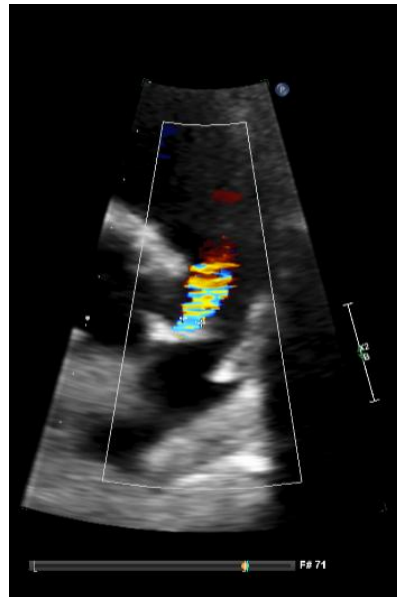
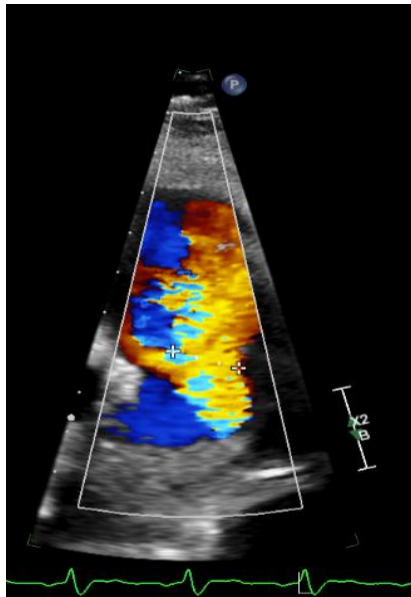
Poměr šíře jetu pulmonální regurgitace k RVOT2
>65% je známkou těžké regurgitace

Pozor může být závislý na rovině řezu

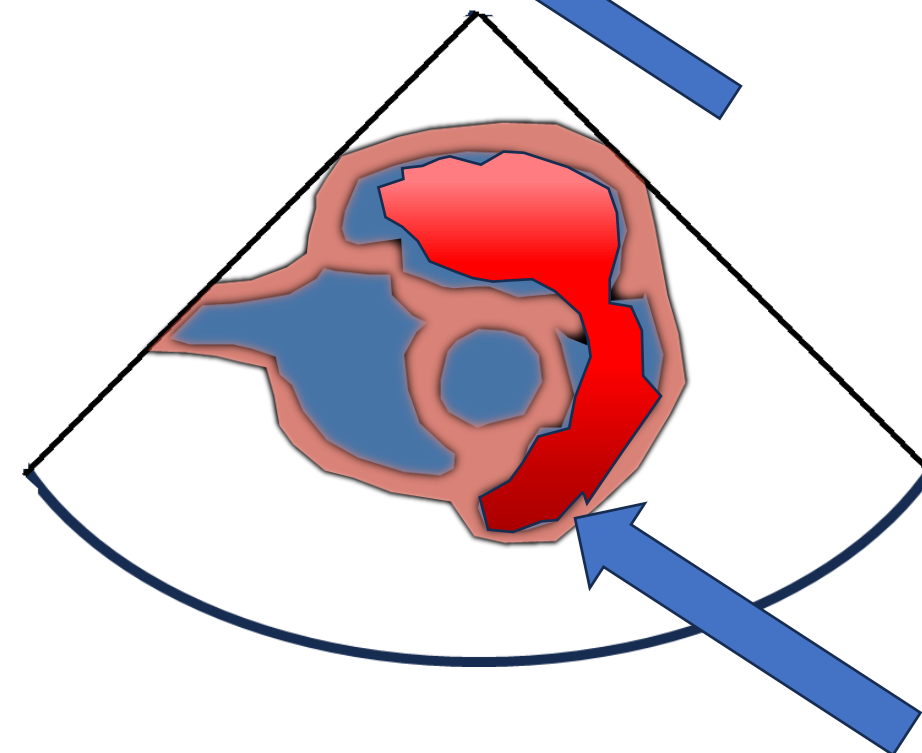
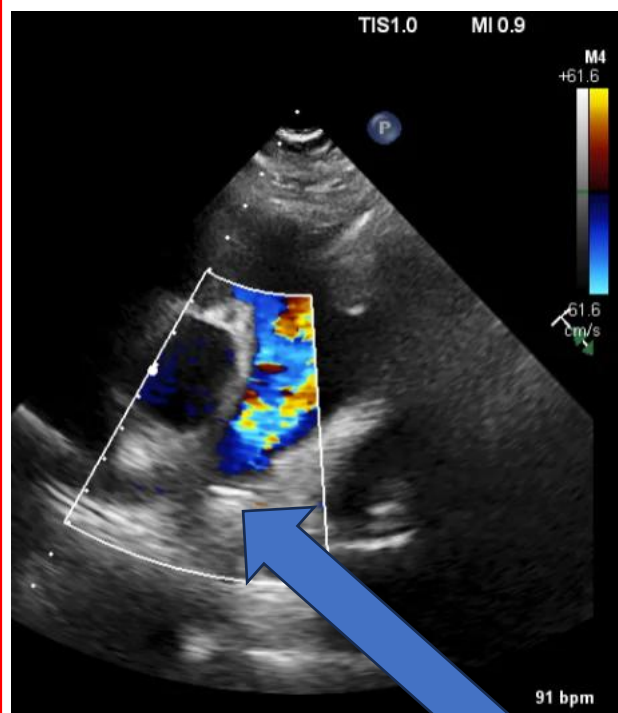
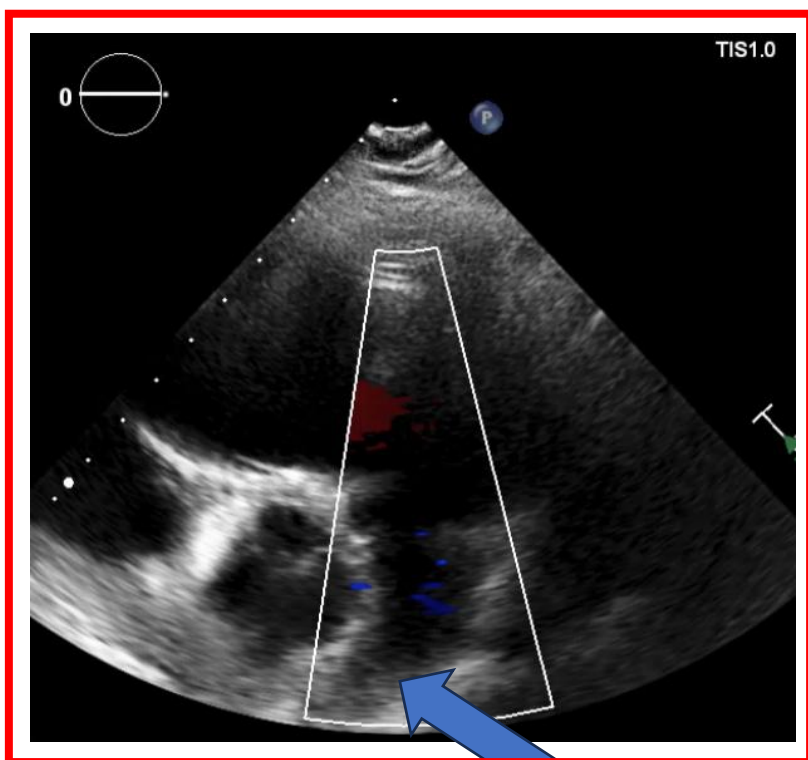
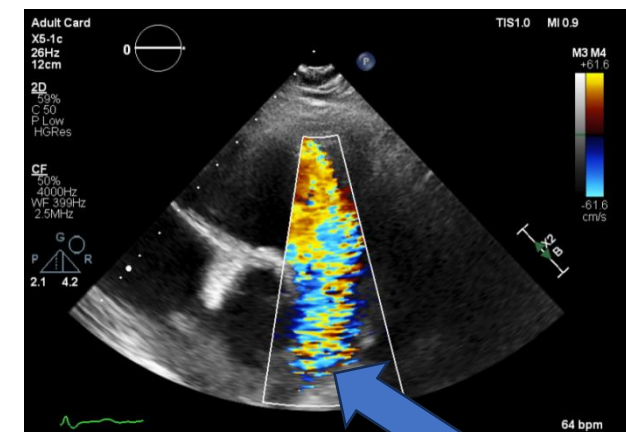


Pulmonální regurgitace

- Poměr šíře vena contracta a anulu
- Poměr $\geq 50\%$ je indikátorem více než mírné regurgitace
- Poměr $\geq 70\%$ je jasnou známkou těžké regurgitace

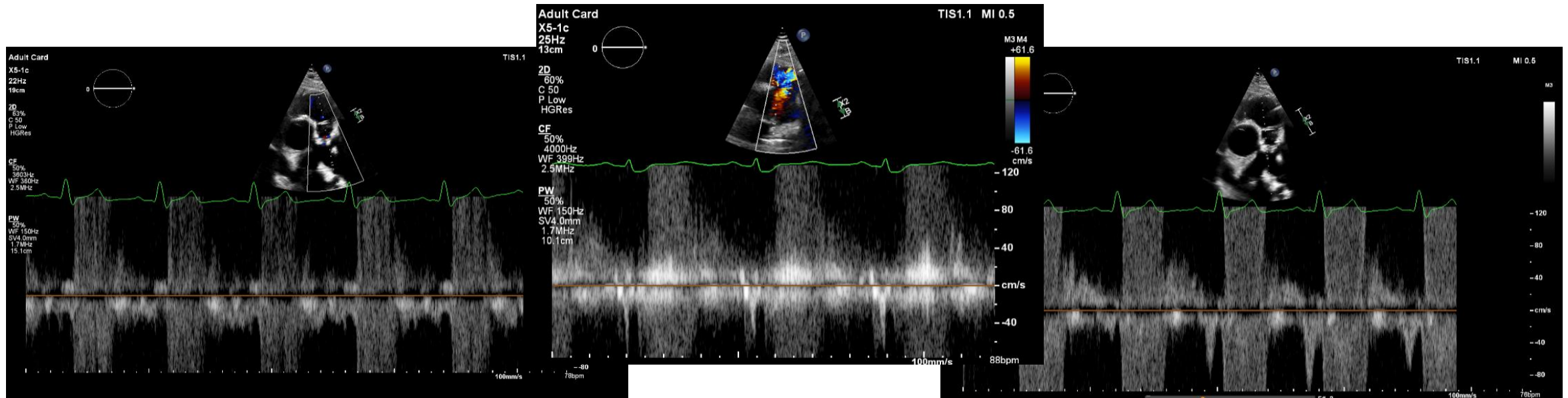
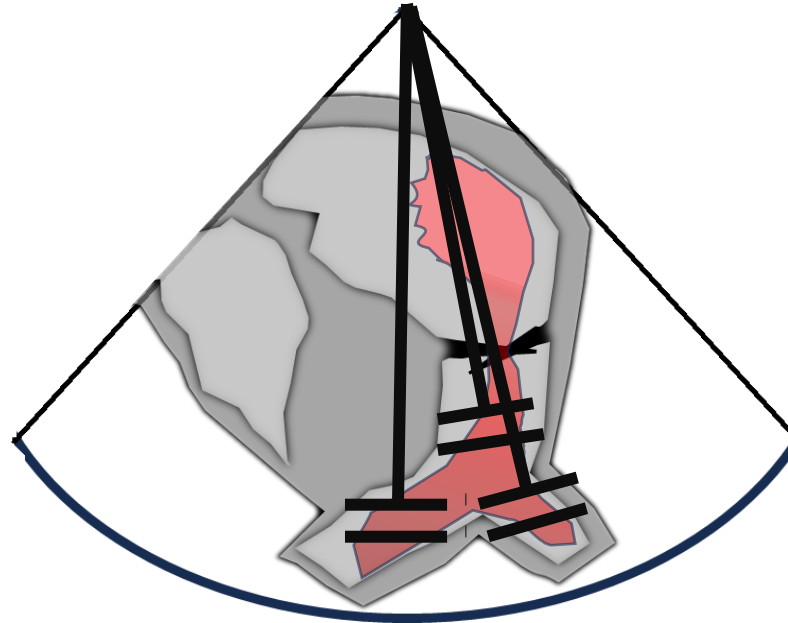


Pulmonální regurgitace

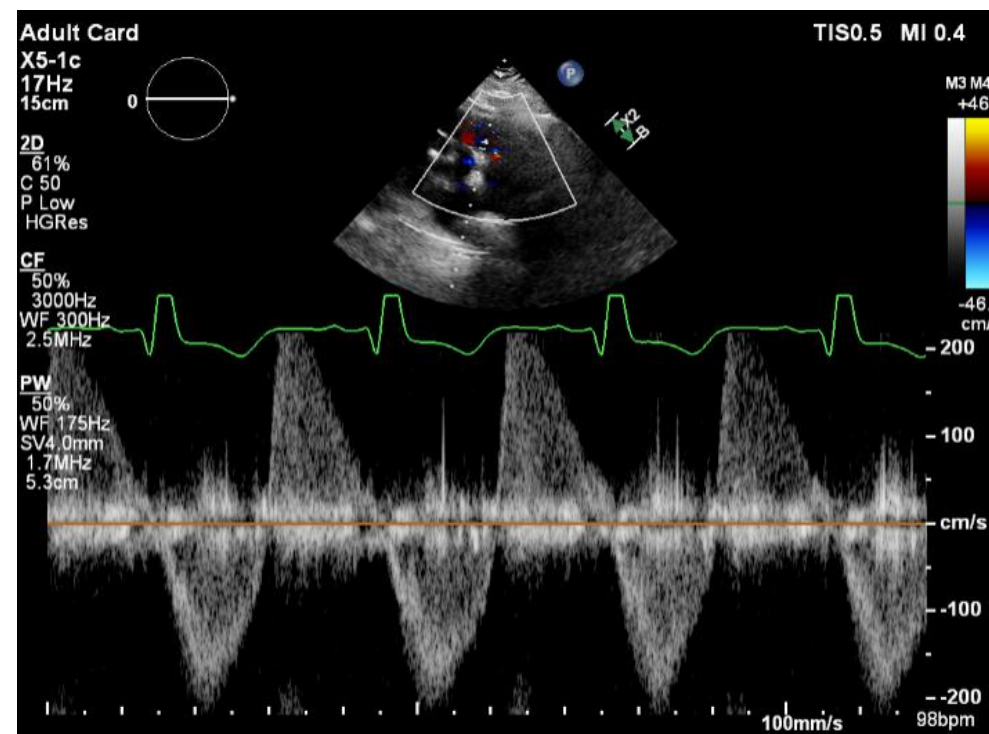
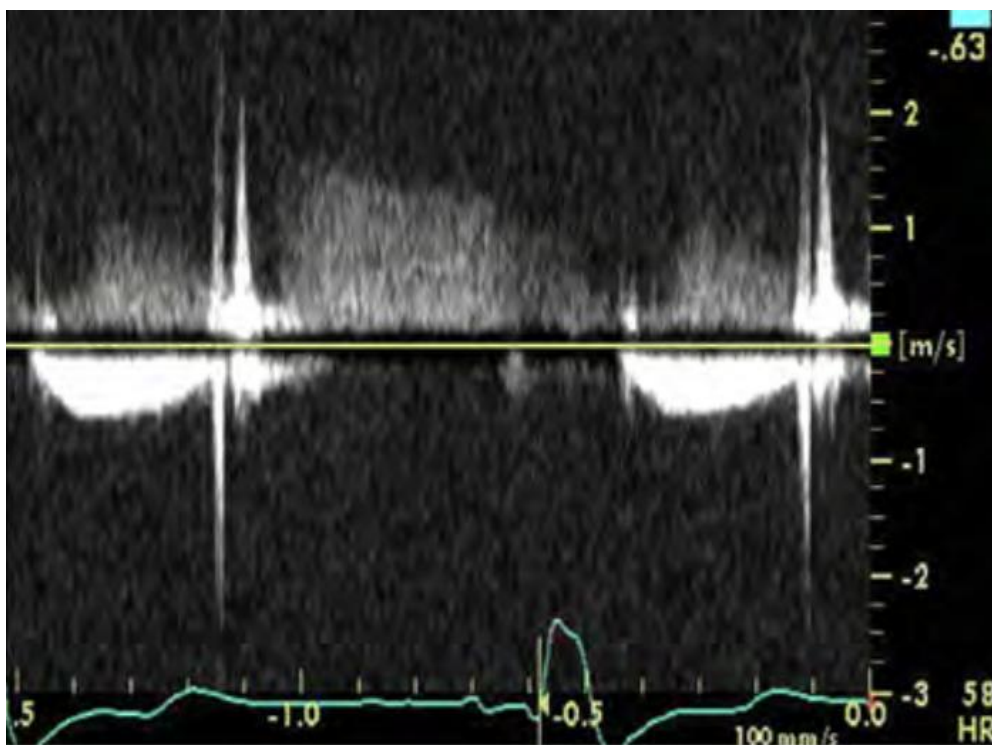
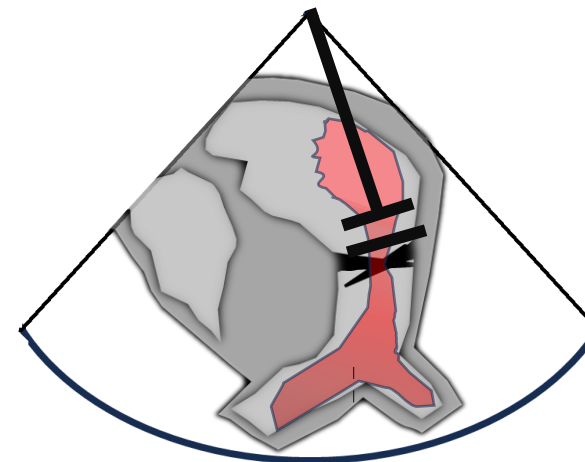




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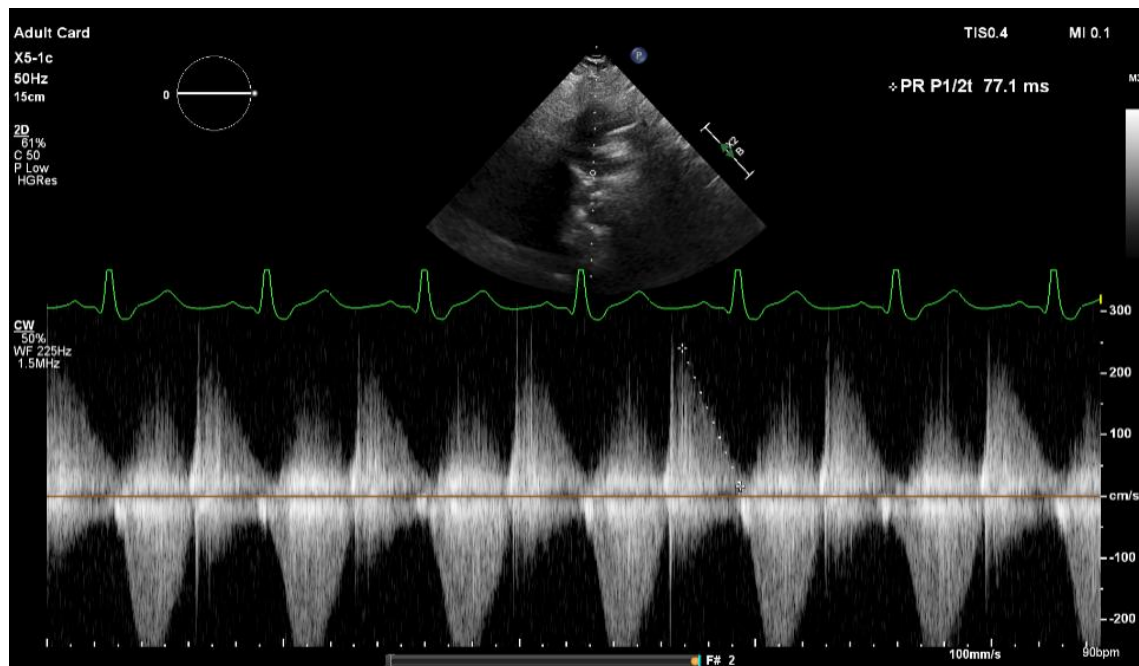
Pulmonální regurgitace



Zoghbi WA et al. JASE 2017

Zaidi, A. et al. Echo Res Pract 2020

Pulmonální regurgitace

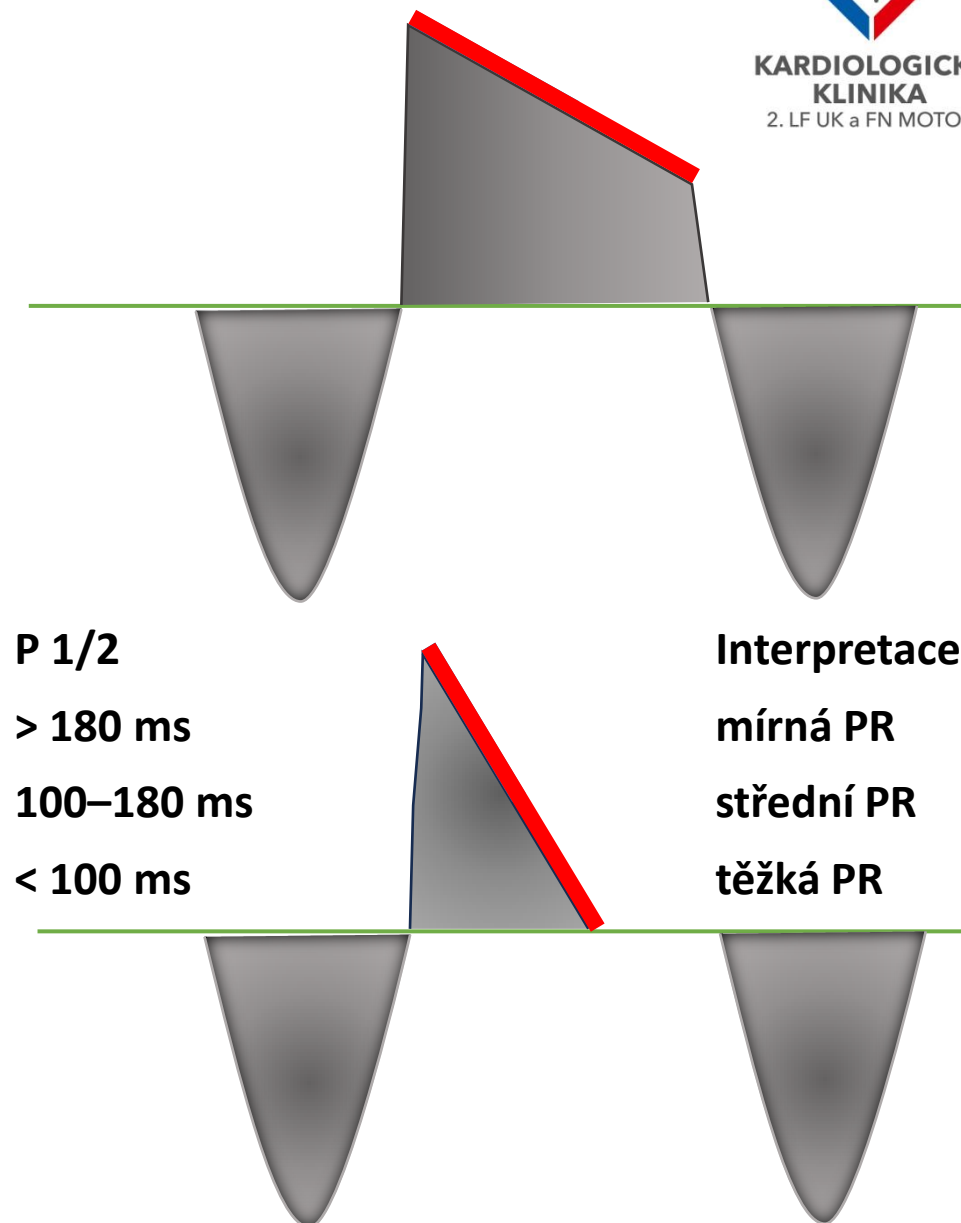


PHT < 100 ms

těžká PR

DTI < 260 ms → významná ($\geq$ střední) PR

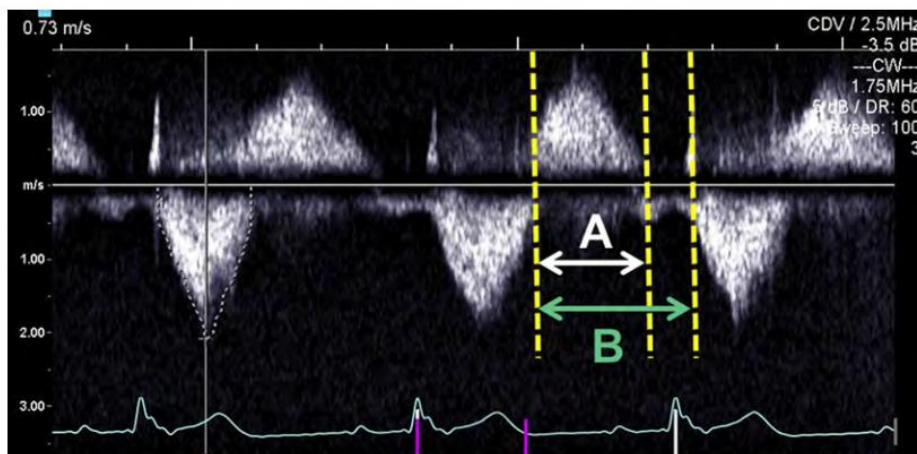
CAVE zkreslení při snížené compliance, resp. diastolické dysfunkci PK



PR index

Poměr doby regurgitačního toku a celkového trvání diastoly

CW doppler v PSAX přes výtokový trakt



PR index

> 0,77

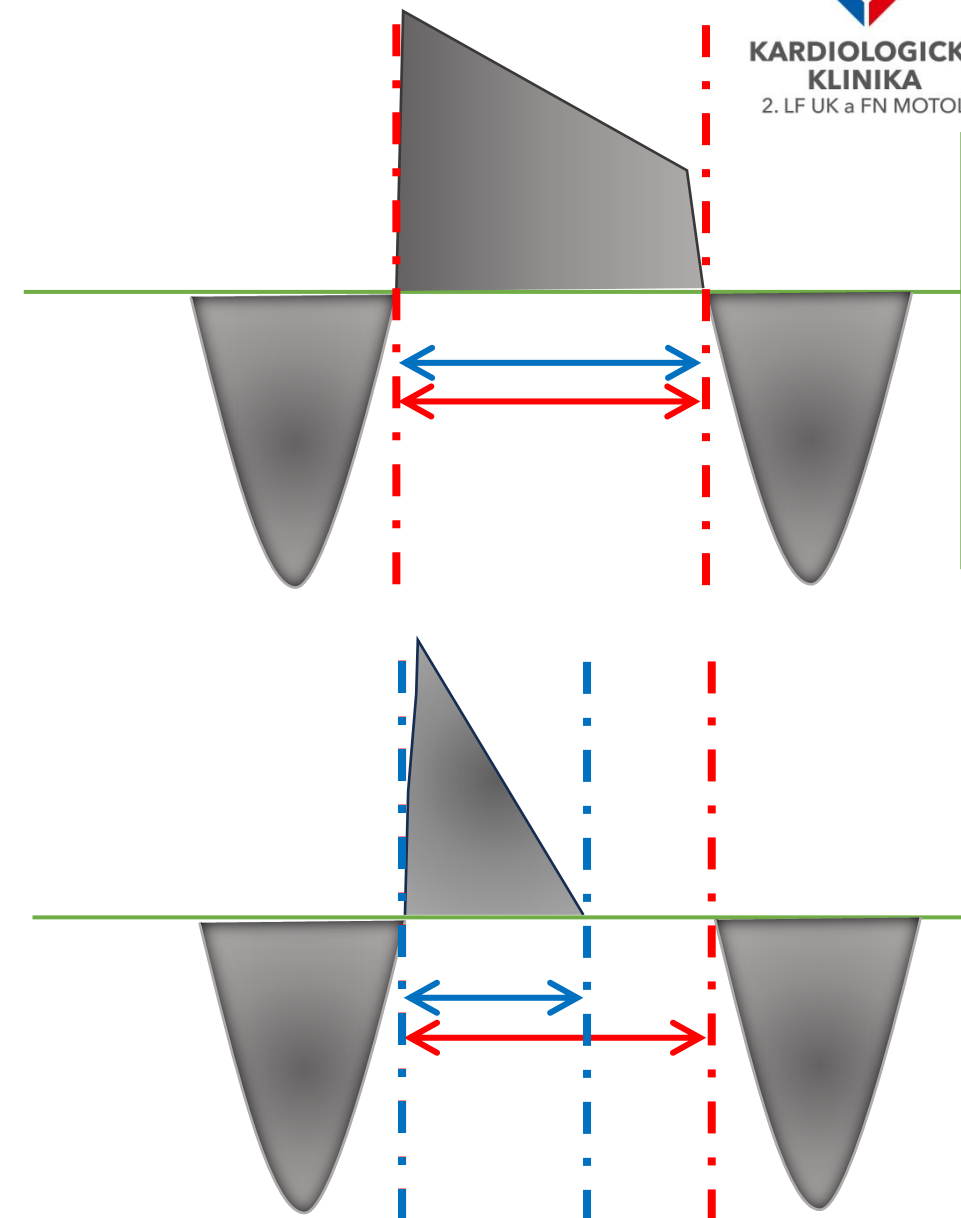
0,50–0,77

< 0,50

mírná PR

Minimálně středně těžká PR

těžká PR



Regurgitační objem/frakce

- Kvantitativní metoda
- Porovnání systolického objemu levé a pravé komory
- Možné využít jako doplňující metodu

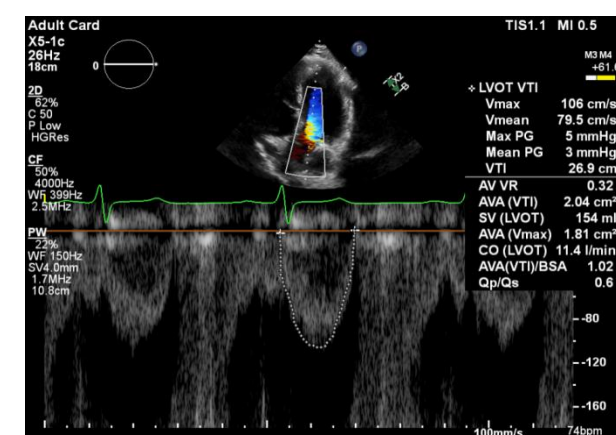
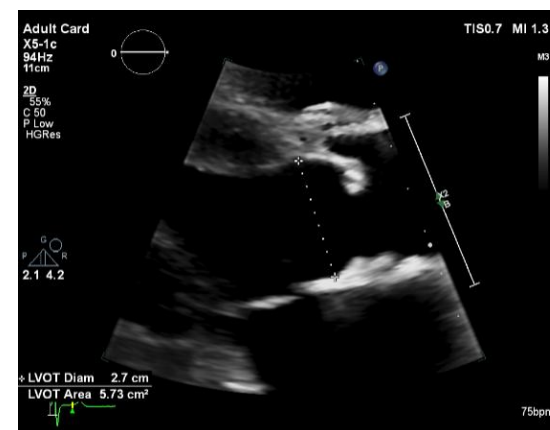
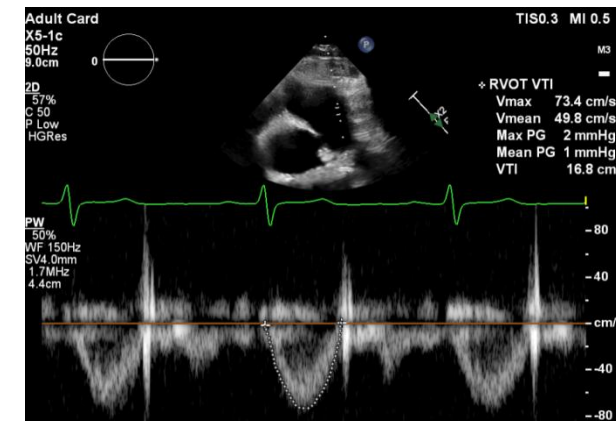
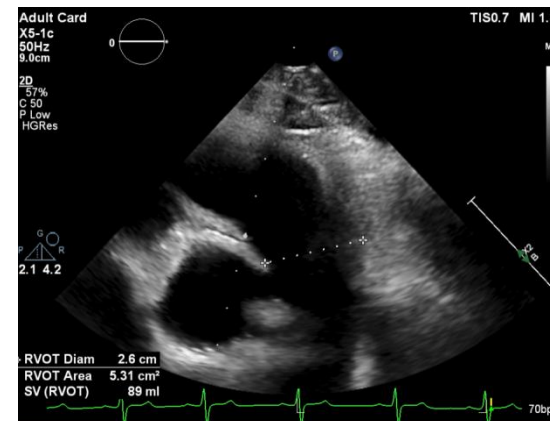
$$RV = SV_{RVOT} - SV_{LVOT} \text{ ml}$$

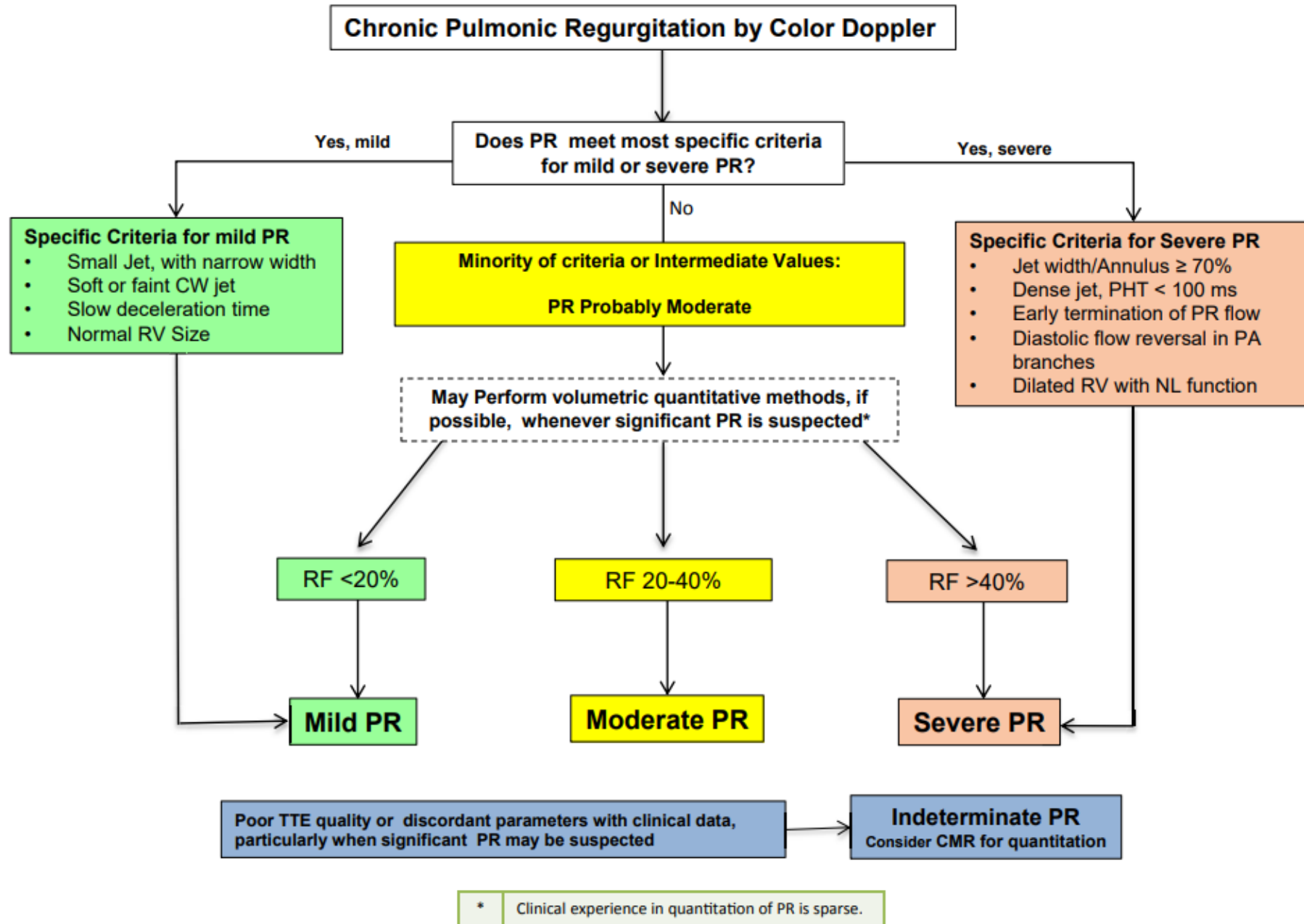
$$RF = (RV) / SV_{RVOT} \times 100\%$$

- Aproximací z MR vyšetření-
 - Lehká RF < 20%
 - Střední 20–40 %
 - Těžká RF > 40%

CAVE:

1. Absence validace
2. Nepřesnosti měření v rámci rovnice kontinuity (zejména diametru RVOT)
3. Zkreslení jinou regurgitační/zkratovou vadou



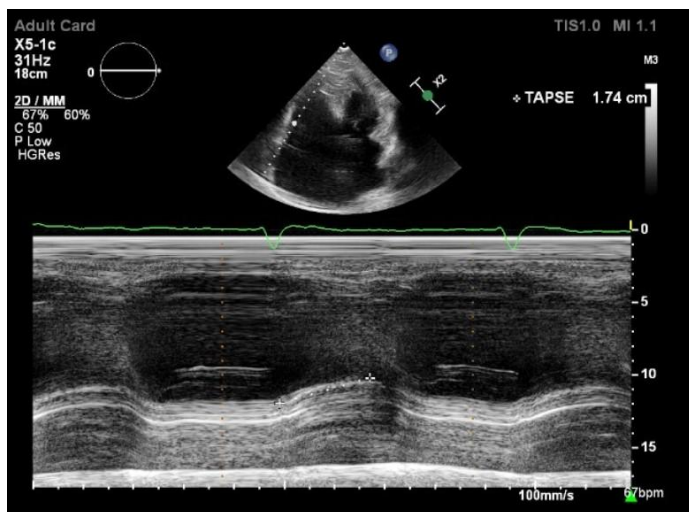


2020 ESC Guidelines for the management of adult congenital heart disease

Recommendations for intervention after repair of tetralogy of Fallot

Recommendations	Class ^a	Level ^b
PVRep is recommended in symptomatic patients		
PVRep should be considered in asymptomatic patients with severe PR and/or RVOTO when one of the following criteria is present. ● Decrease in objective exercise capacity. ● Progressive RV dilation to $RVESVi \geq 80 \text{ mL/m}^2$, and/or $RVEDVi \geq 160 \text{ mL/m}^2$, and/or progression of TR to at least moderate. ● Progressive RV systolic dysfunction. ● RVOTO with $RVSP > 80 \text{ mmHg}$.	IIa	C

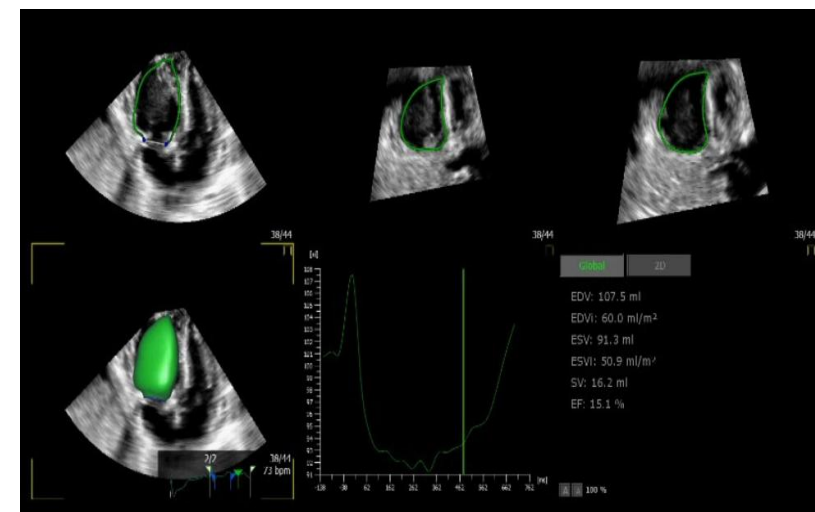
Zhodnocení funkce pravé komory



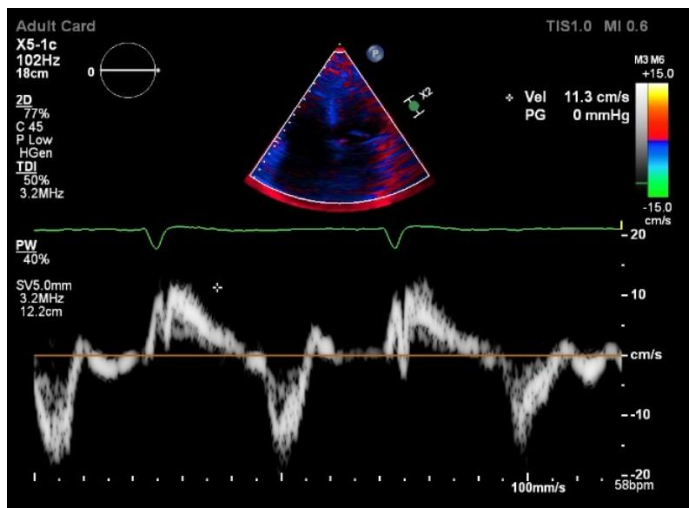
TAPSE < 17mm



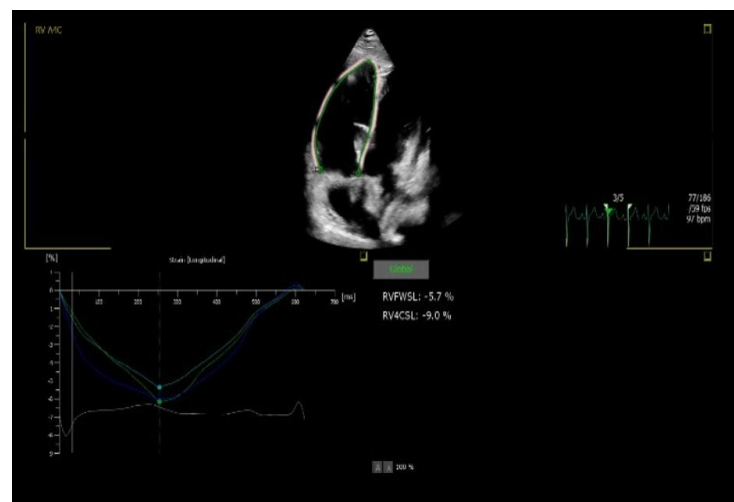
FAC < 35%



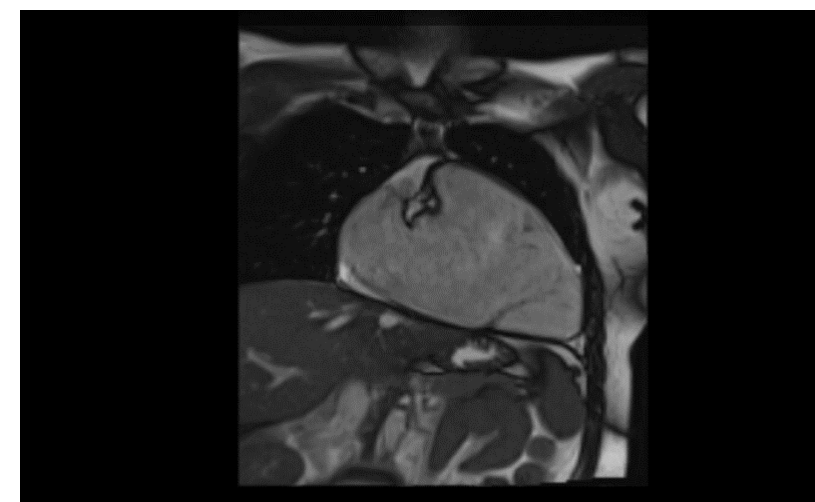
EF < 44%



Sm < 9,5cm/s



GLS > -17%, Free wall strain > -19%

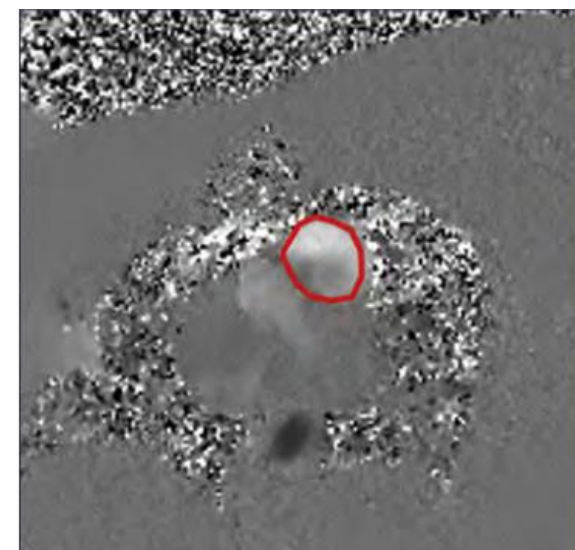
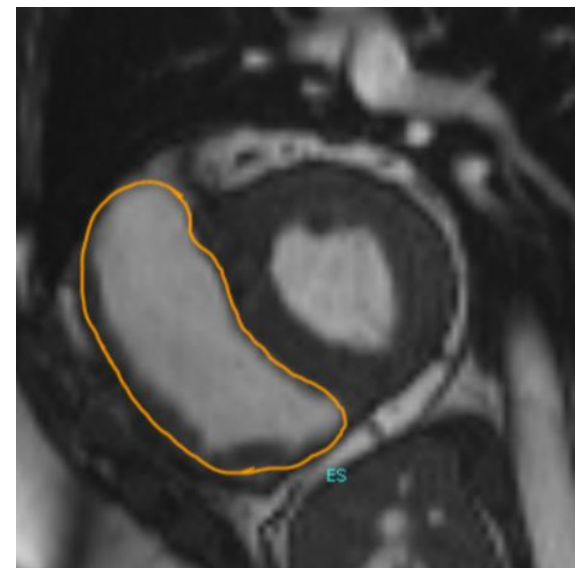
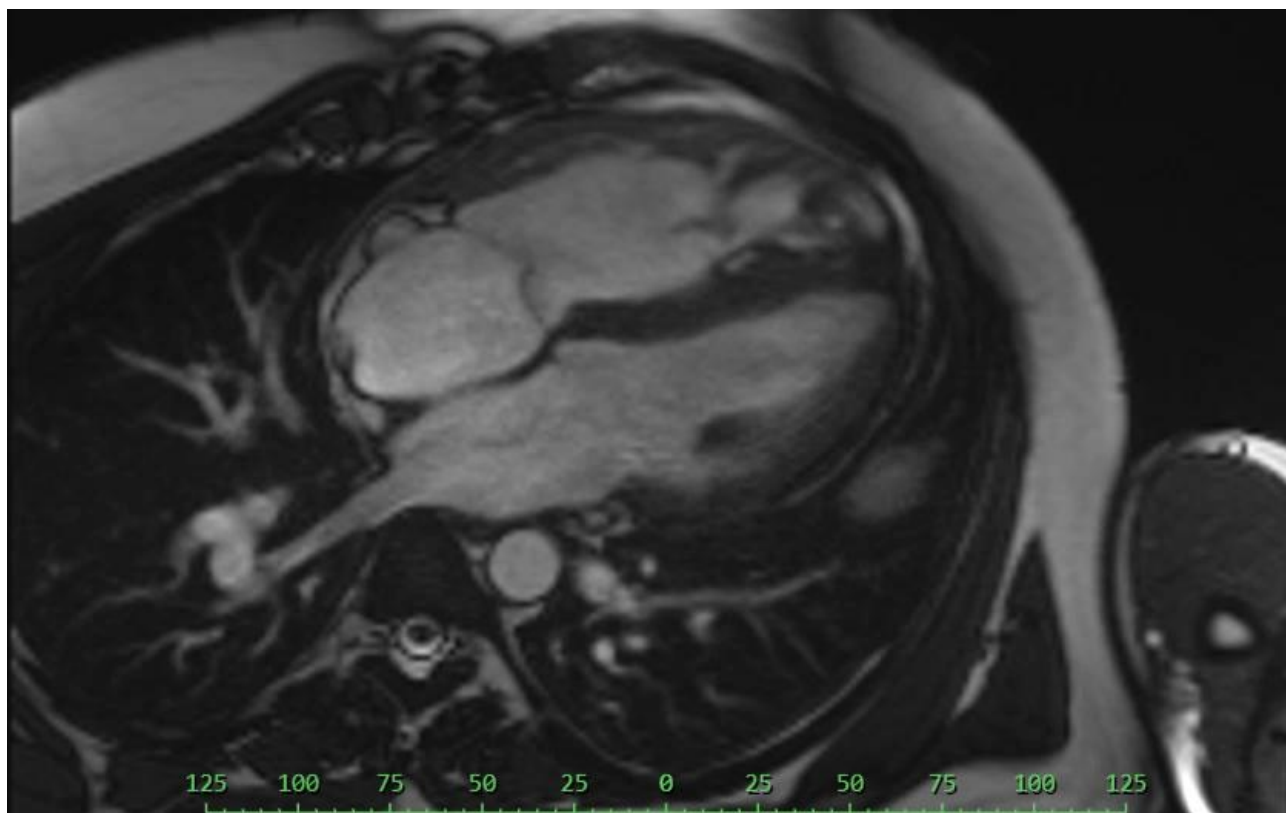


MR srdce

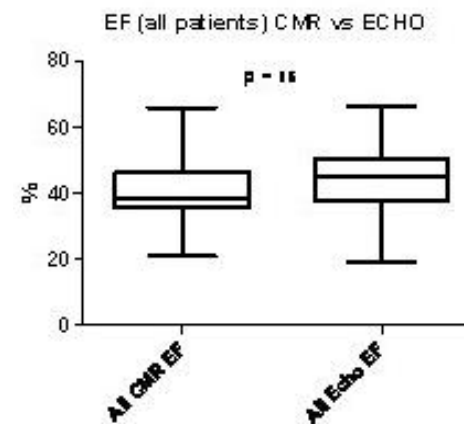
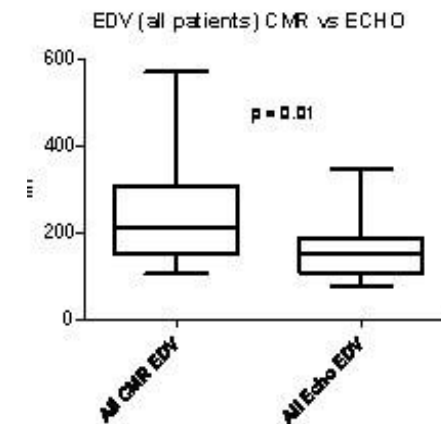
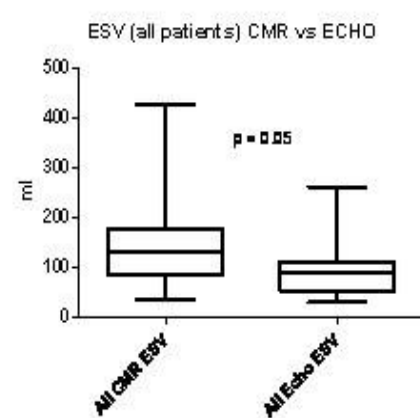
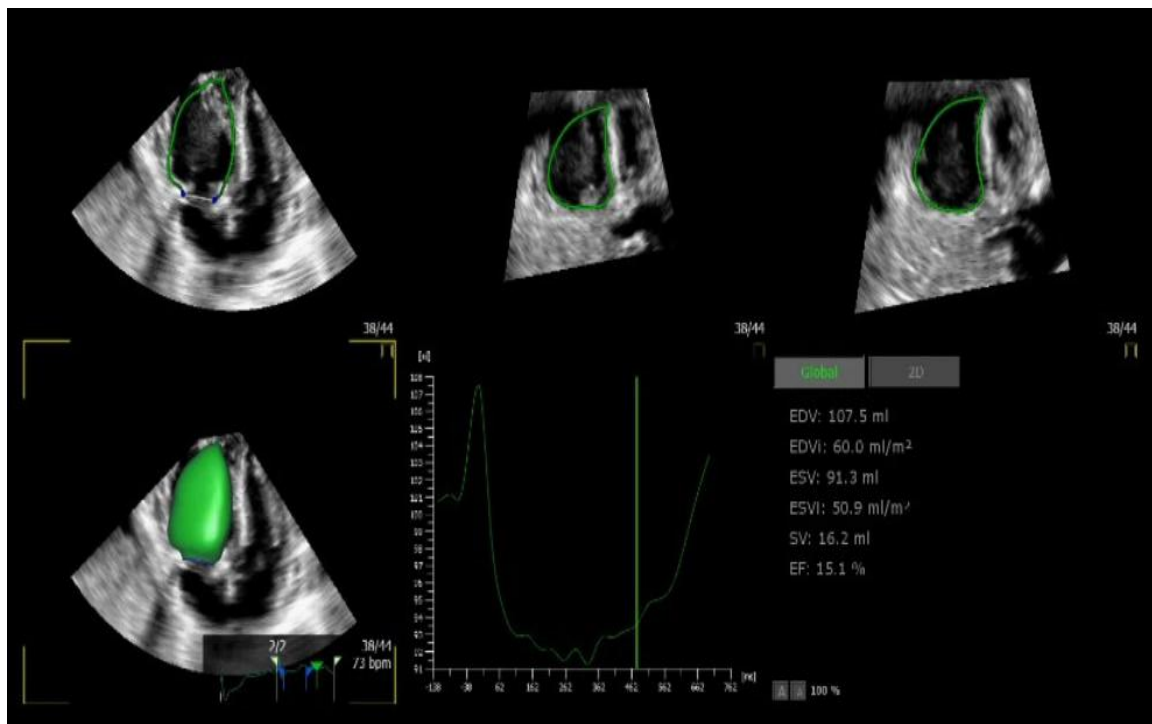
MR srdce



KARDIOLOGICKÁ
KLINIKA
2. LF UK a FN MOTOL



3D hodnocení



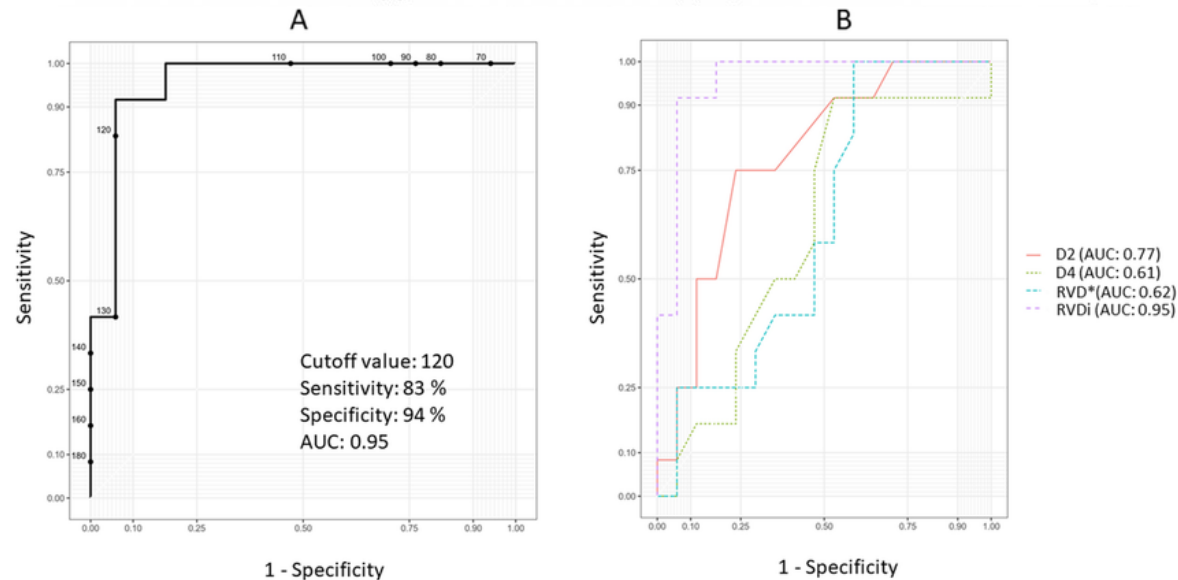
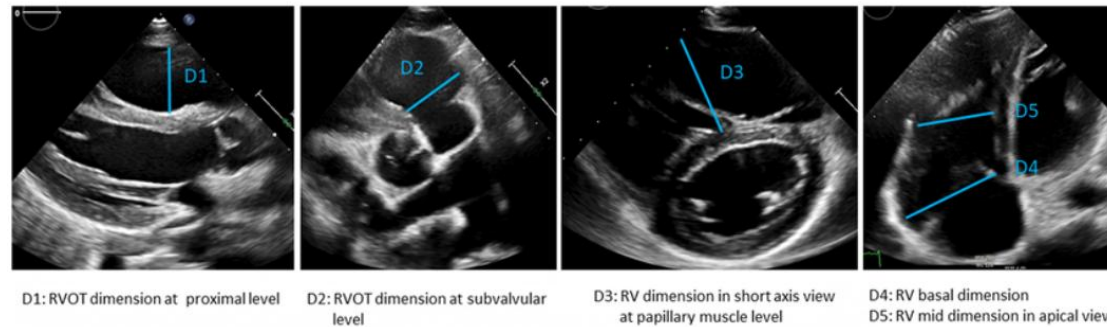


Usefulness of a New Transthoracic Echocardiography Score to Assess Right Ventricular Volumes in Patients with Repaired Tetralogy of Fallot

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Děkuji za pozornost

