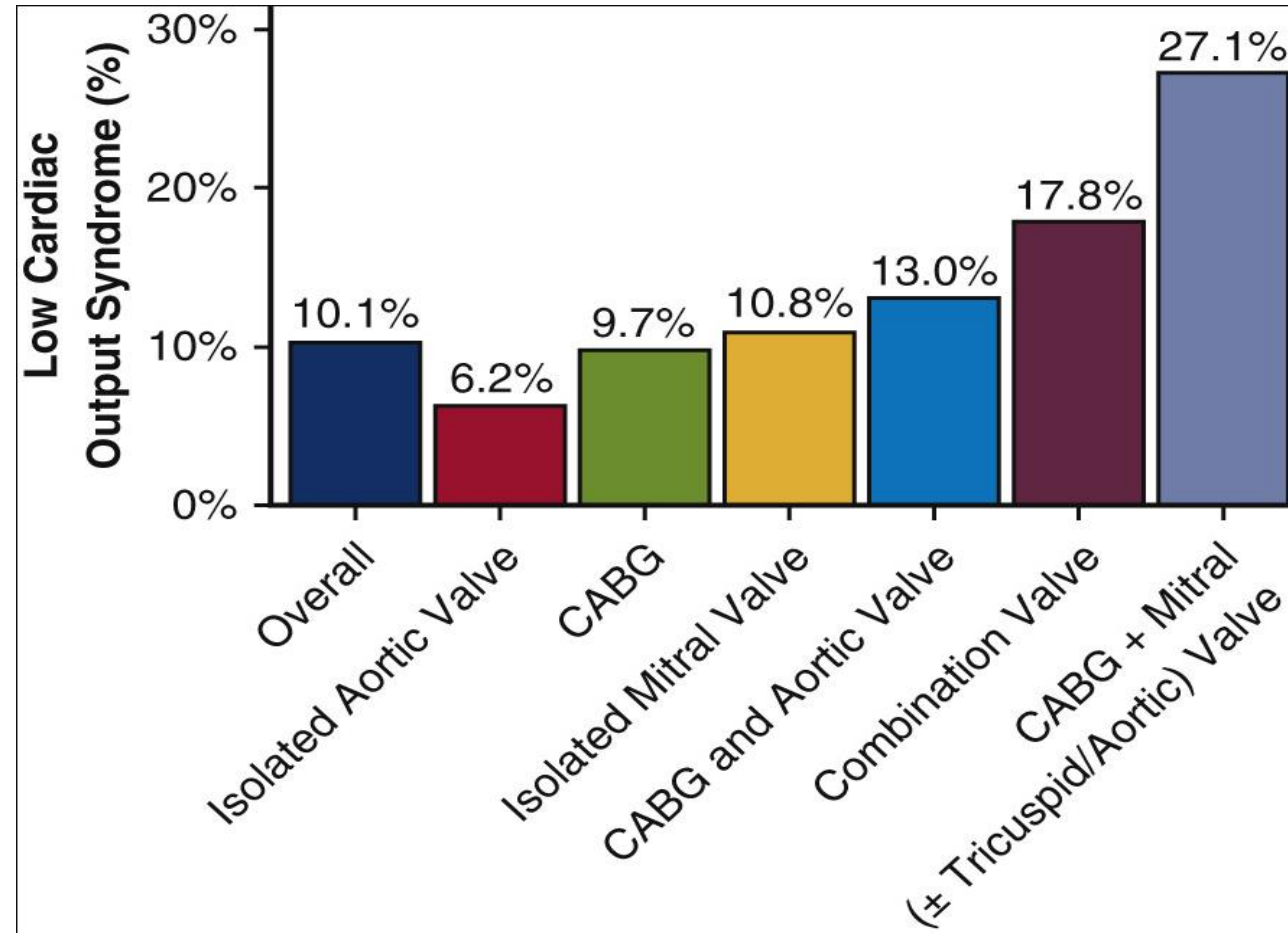


Protektivní kardiochirurgie v kontextu současných doporučení EACTS – zkušenosti týmu na Homolce

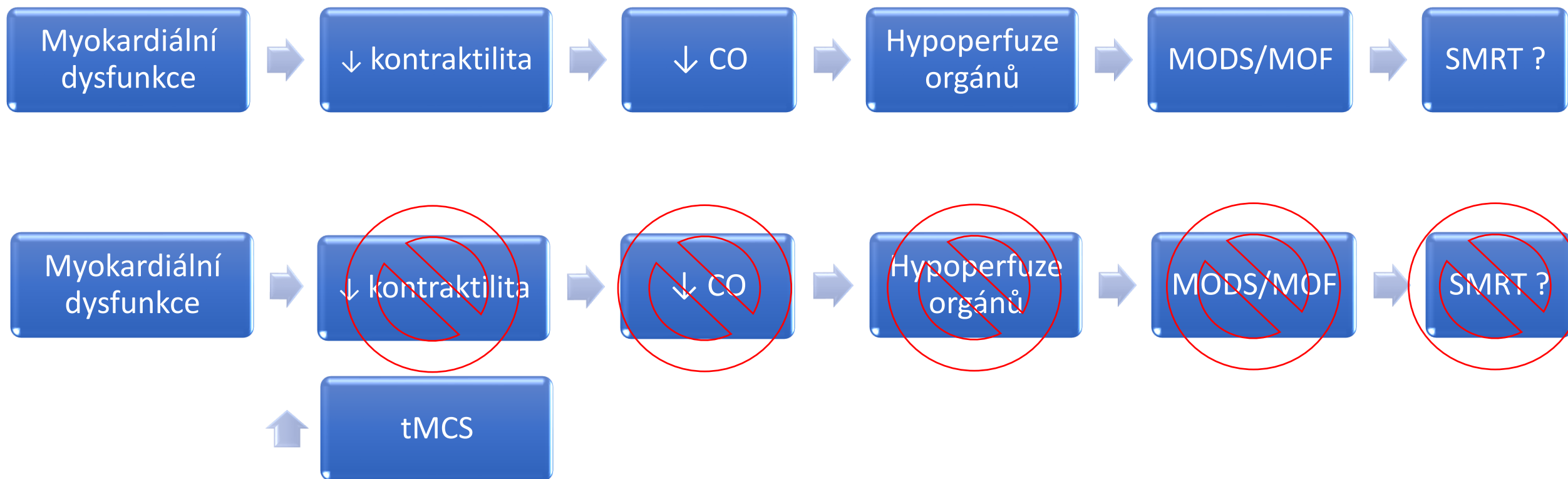
MUDr. Jan Šindelář

Co je „Protected Cardiac Surgery“?



Duncan AE, Kartashov A, Robinson SB, Randall D, Zhang K, Luber J, James RA, Halvorson S, Bokesch P. Risk factors, resource use, and cost of postoperative low cardiac output syndrome. *J Thorac Cardiovasc Surg*. 2022 May;163(5):1890-1898.e10. doi: 10.1016/j.jtcvs.2020.06.125. Epub 2020 Jul 16. PMID: 32800368.

LCOS



09 OCT 2025

EACTS/STS/AATS Guidelines on temporary mechanical circulatory support in adult cardiac surgery

Temporary mechanical circulatory support (tMCS) has evolved significantly over the past decade. The distinction between temporary and durable mechanical circulatory support (dMCS) is based on discharge potential: Patients supported with tMCS are not eligible for hospital discharge. Modern tMCS devices demonstrate improved haemocompatibility and significantly reduced device-related complications compared to earlier generations. Enhanced safety and broader clinical applicability have led to wider adoption. Notably, use of microaxial flow pumps (mAFPs) and extracorporeal life support (ECLS) has increased substantially.^{2,3} In the United States, changes to the donor heart allocation system have led to a sharp rise in tMCS use as a bridge to a transplant (BTT),^{4,5} and the number of patients bridged to a heart transplant (HTx) with tMCS has tripled since 2018.⁵ Similar trends have been observed internationally.



09 OCT 2025

EACTS Expert Consensus Document on protected cardiac surgery: pre-emptive use of temporary mechanical circulatory support in adult cardiac surgery patients at high risk for perioperative low cardiac output syndrome

This Expert Consensus Document from the European Association for Cardio-Thoracic Surgery (EACTS) presents the first dedicated guidance on the pre-emptive use of tMCS in high-risk adult cardiac surgical patients. Developed by a multidisciplinary task force, it emphasises structured risk stratification, early initiation, and individualised device management informed by interdisciplinary Heart Team discussions.

Acquired Cardiac Disease

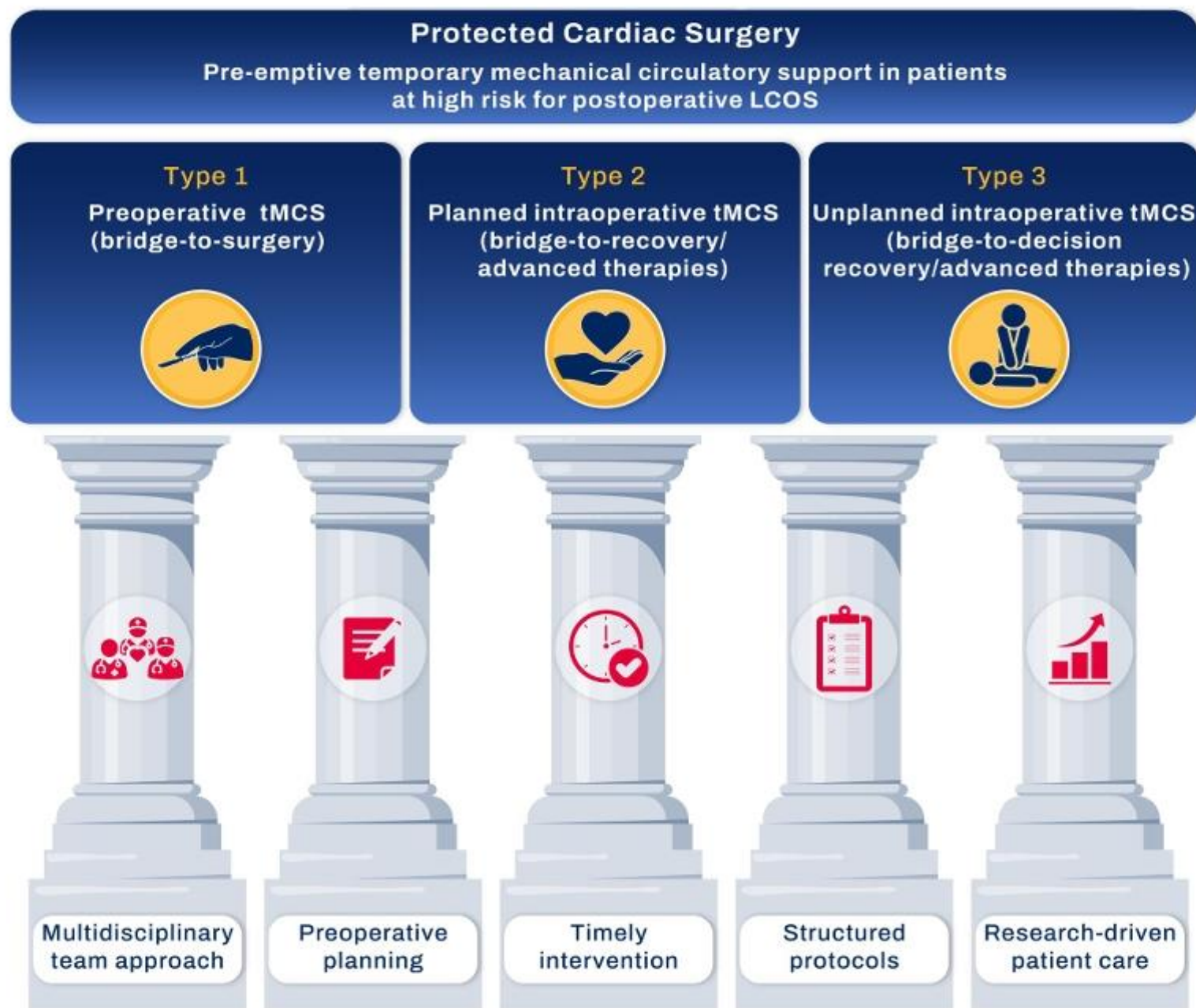


Jaký je pohled EACTS?

RESCUE



PREVENENCE



Central Illustration. Pre-Emptive Temporary Mechanical Circulatory Support (tMCS) in Patients at High-Risk for Postoperative Low Cardiac Output Syndrome (LCOS): A Protected Cardiac Surgery Model.

Indikační kritéria

Algorytmy

Timing

tMCS

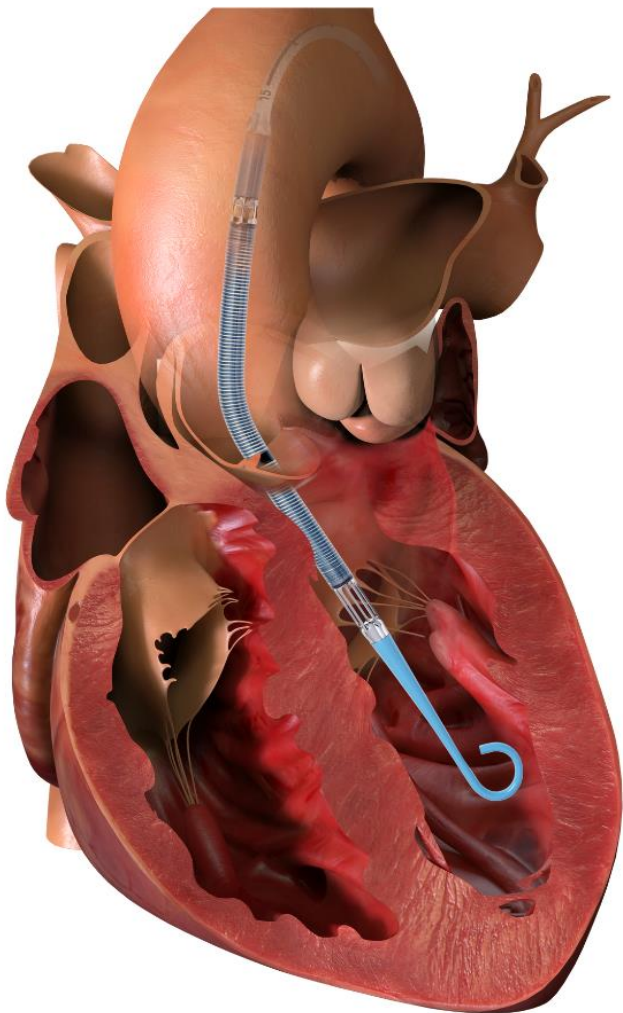
Volba tMCS

Table 4. Device profile and suitability for protected cardiac surgery

Device/device combination	End-organ support	Suggestions for protected cardiac surgery
IAPB	↑	+
Partial-support mAFP	↑↑	++
Full-support mAFP	↑↑↑	+++
VA-ECLS	↑↑↑	++
VA-ECLS + IAPB	↑↑↑	++
VA-ECLS + mAFP	↑↑↑↑	+++

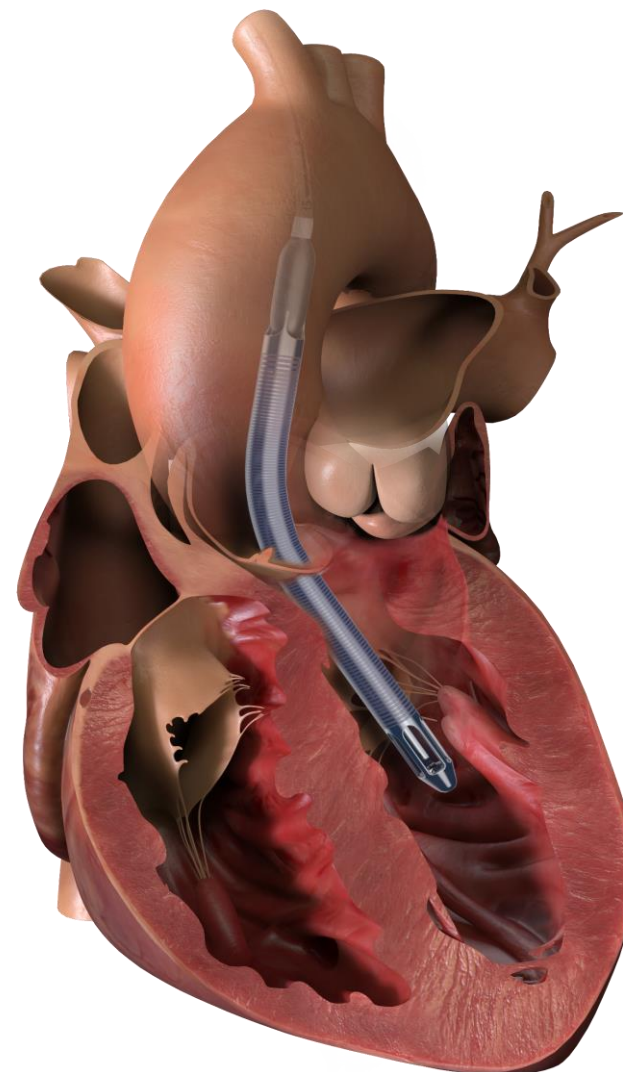
Abbreviations: IABP: intra-aortic balloon pump; mAFP: micro-axial flow pump; VA-ECLS: veno-arterial extracorporeal life support.

Impella CP



Zdroj: www.abiomed.com/en-eu/news-and-media/impella-cp-in-heart-illustration

Impella 5.5



zdroj: <https://www.abiomed.com/de-de/ueber-uns/presse-und-news/media-kit>

Table 1. Relevant pre/intraoperative determinants of haemodynamic instability for therapy and transition to tMCS decision-making

Category	Criteria	Cut-off or range of values	Implications
1. Vasoactive and inotropic support ⁵⁸	High VIS	VIS > 30 ⁵⁹	Strong indication for early tMCS. Prolonged use of high-dose inotropes/ vasopressors should be avoided in favour of prompt tMCS initiation.
	Moderate VIS + additional evidence of instability	VIS 20–30 ⁵⁹	Monitor closely for hypoperfusion or worsening haemodynamics.
2. Haemodynamic performance	Low CI	CI ≤ 2.2 l/min/m ² ⁶⁰	Requires consideration of tMCS if sustained and accompanied by MAP < 60 mmHg and/or high-dose inotropes/ vasopressors to maintain the MAP above this target.
	Low CPI Elevated PCWP	CPI < 0.6 W/m ² ⁶⁰ PCWP ≥ 16 mmHg ^{60,61}	Requires consideration of tMCS if sustained. Indicates elevated LV filling pressures, consistent with acute LV dysfunction.
	Quantifying systemic congestion with Point-of-Care ultrasound	Inferior vena cava > 20 mm and Venous Excess Ultrasound (VExUS) grade 3 (severe) ⁶²	Associated with worse organ failure. Limitation: severe TR.
3. Clinical evidence of hypoperfusion	High or rising lactate levels	Lactate level ≥ 8 mmol/l ^{59,60,63}	High lactate levels and failure to clear them are associated with increased mortality.
	Low SvO ₂	SvO ₂ < 50% ⁶⁴	Evidence of inadequate oxygen delivery relative to demand.
4. Phenotype	RV failure RV dilation, reduced contractility, TAPSE, fwRVLS, RVFAC	TAPSE < 14 mm, fwRVLS > -20%, CVP ≥ 20 mmHg, RVFAC ≤ 30 % ⁶⁵	Indicates RV systolic dysfunction or RV overload; often associated with venous congestion and hypoperfusion.
	Elevated CVP/PCWP ratio	CVP/PCWP ≥ 0.8 ⁶⁰	Suggests RV pressure overload relative to LV performance.
	Reduced PAPI	PAPI < 1.85 ^{60,66}	Suggests severe RV dysfunction.
	LV failure Reduced LVEF, LVOT-VTI	LVEF < 30%, LVOT-VTI < 13 cm ⁶⁷	Suggests systolic dysfunction and reduced stroke volume.
	Elevated PCWP with normal CVP	PCWP ≥ 16 mmHg; CVP < 12 mmHg ⁶⁸	Suggests LV pressure overload relative to RV performance.
	BiV failure BiV dilation, reduced BiV contractility	LVEF < 30%, LVOT-VTI < 13, TAPSE < 14 mm, fwRVLS > -20%, RVFAC ≤ 30 % ^{65,67}	Suggests BiV dysfunction.
	Elevated PCWP and CVP	PCWP ≥ 16 mmHg; CVP ≥ 20 mmHg, ⁶⁸ clinical signs of volume overload (peripheral oedema, lung oedema, venous congestion)	Suggests BiV pressure overload.

Abbreviations: VIS: Vasoactive and inotropic score; BiV: biventricular; CI: cardiac index; CPI: cardiac power index; CVP: central venous pressure; fwRVLS: free wall right ventricular longitudinal strain; LV: left ventricle; LVEF: left ventricular ejection fraction; LVOT-VTI: left ventricular outflow tract velocity-time integral; MAP: mean arterial pressure; PAPI: pulmonary artery pulsatility index; PCWP: pulmonary capillary wedge pressure; RV: right ventricle; RVFAC: right ventricular fractional area change; SvO₂: mixed venous oxygen saturation; TAPSE: tricuspid annular plane systolic excursion; tMCS: temporary mechanical circulatory support; TR: tricuspid regurgitation.

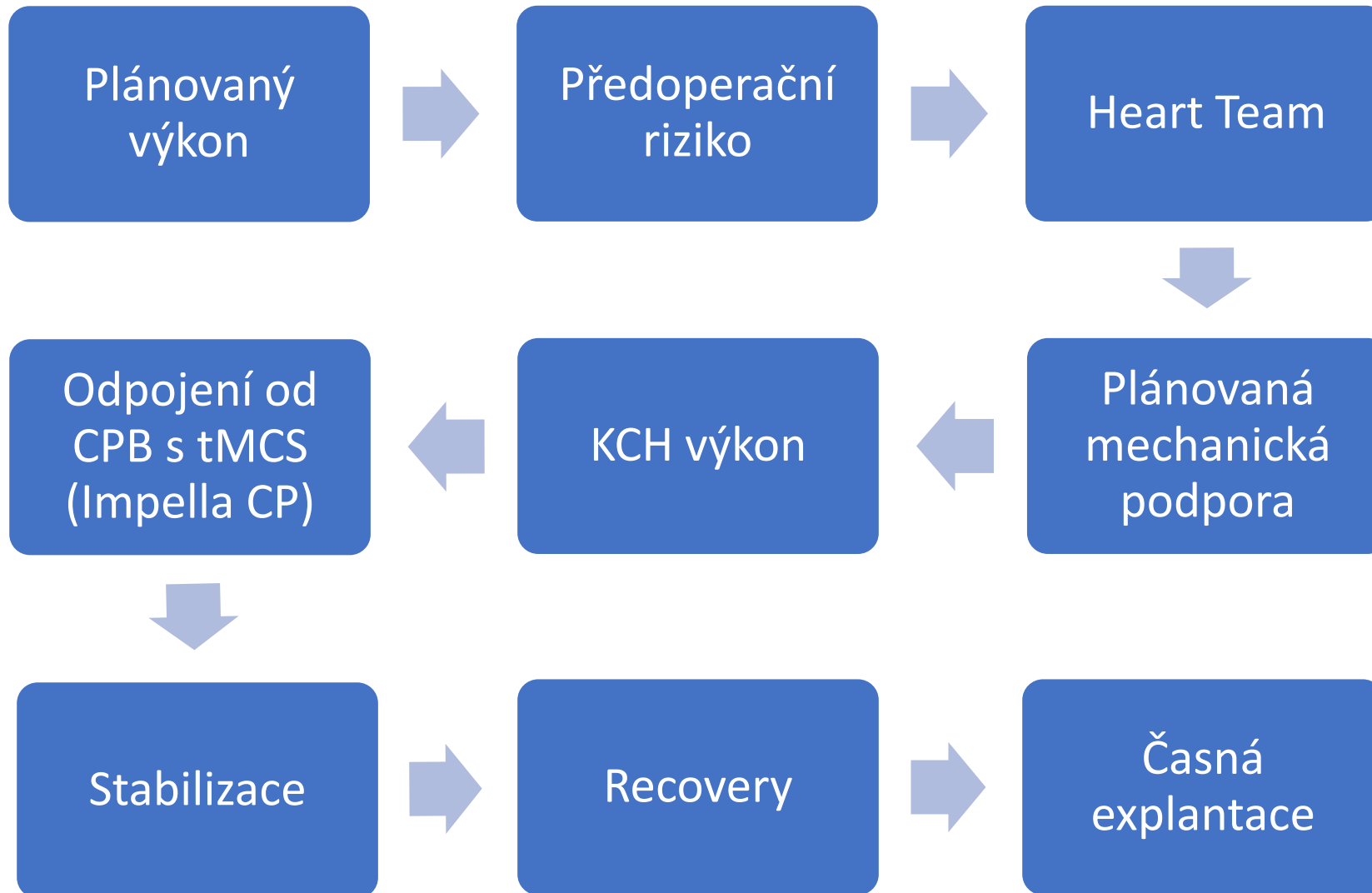
VIS 2020:

$10,000 \times \text{Vasopressin dose (U/kg/min)} +$
 $100 \times \text{Epinephrine dose (}\mu\text{g/kg/min)} +$
 $100 \times \text{Norepinephrine dose (}\mu\text{g/kg/min)} +$
 $50 \times \text{Levosimendan dose (}\mu\text{g/kg/min)} +$
 $25 \times \text{Olprinone dose (}\mu\text{g/kg/min)} +$
 $20 \times \text{Methylene blue dose (mg/kg/h)} +$
 $10 \times \text{Milrinone dose (}\mu\text{g/kg/min)} +$
 $10 \times \text{Phenylephrine dose (}\mu\text{g/kg/min)} +$
 $10 \times \text{Terlipressin dose (}\mu\text{g/min)} +$
 $0.25 \times \text{Angiotensin II dose (ng/kg/min)} +$
 $\text{Dobutamine dose (}\mu\text{g/kg/min)} +$
 $\text{Dopamine dose (}\mu\text{g/kg/min)} +$
 $\text{Enoximone dose (}\mu\text{g/kg/min)}$

Co z kritérií vyplývá...?

- Interpretace v kontextu
- Hodnoty selhávajícího srdce,
známky LCO a hypoperfuze

HOMOLKA koncept





HOMOLKA koncept

**„Nečekáme na vznik LCOS,
předcházíme mu“**

HOMOLKA koncept



Why
wait...?

Co dělá Impella?

- Odlehčení levé komory
 - ↓ LVEDV
 - ↓ LVEDP
 - ↓ napětí stěny
 - ↓ spotřeby O_2

- Zajištění systémové perfuze
 - ↑ forward flow
 - ↑ orgánová perfuze

- Umožňuje srdci zotavit se

HOMOLKA koncept

Proč Impella CP?

- Dostačující
- Miniinvazivní
- Méně anastomóz = méně potenciálních zdrojů
- Nechirurgická implantace
- Nechirurgická explantace
- Bez reziduálních cizích materiálů
- Menší riziko infekčních komplikací

HOMOLKA koncept

Co je nové?

- Zahájení tMCS ještě před splněním kritérií EACTS
- Impella CP v kardiochirurgii
- Echograficky navigovaná implantace
- Prevence dislokace po extubaci – technické řešení



HOMOLKA koncept

Jak to vypadá v praxi?

Kazuistika

59-letý pacient (M) s AoS, AVAi 0,4 a stř. AoReg., EF LK 15%, dilatace LK s EDD 63, dilatace asc. Ao - 44mm, funkční TriReg., těžká PH (PASP 60torr)

Předop. – v rámci Heart Teamu rozhodnuto o periop. tMCS

0. den - KCH výkon – AVR + plastika kořene Ao + TVP + Impella CP
SIRS, kombi vasoaktivní podpora

1. den – extubace

2. den – explantace Impella (perkutánní uzávěr systémem MANTA)

4. den – zcela vysazeny vasopresory, chůze po RES

6. den – překlád na JIMP

10. den – dimise do lázní (KO ECHO – EFLK 40%)

Kazuistika

Adult Echo

X8-2t

32Hz

12cm

xPlane

68%

68%

50dB

P Off

Gen

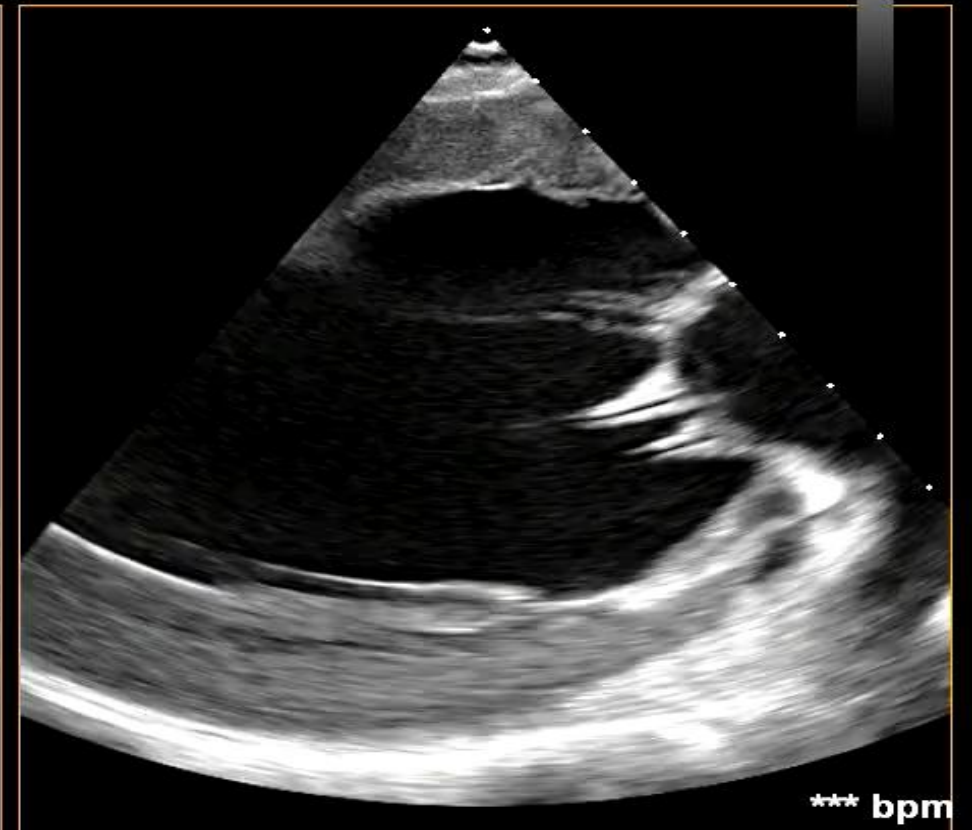
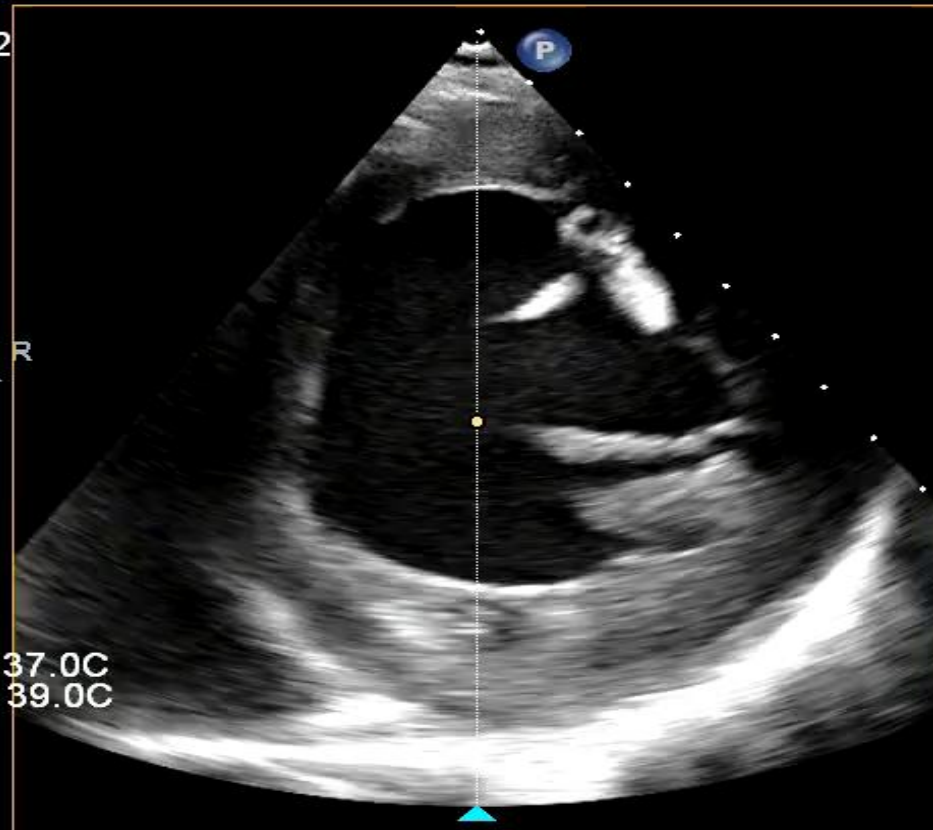
XRES 2

TIS0.2 MI 0.5

M4

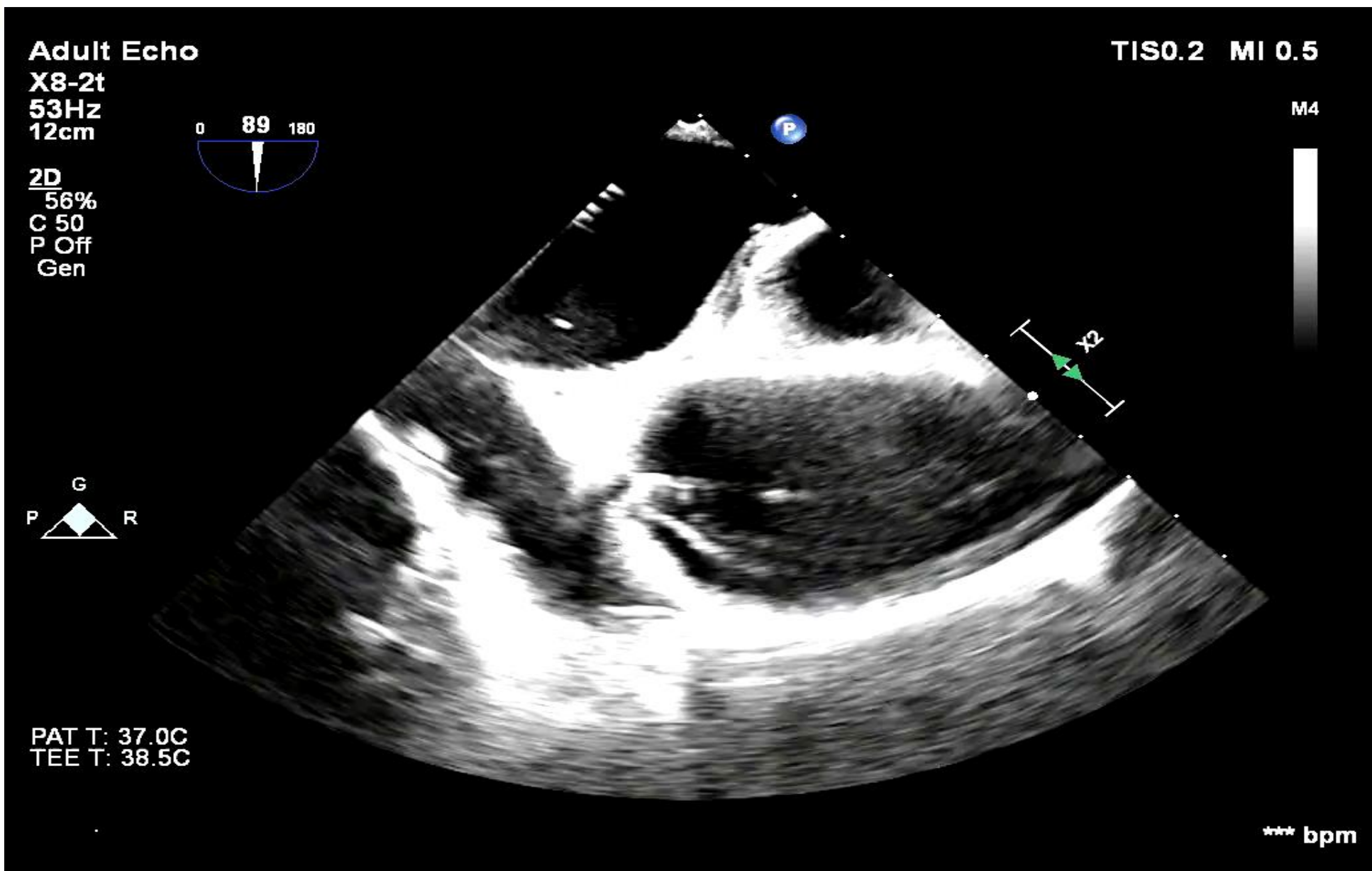


PAT T: 37.0C
TEE T: 39.0C

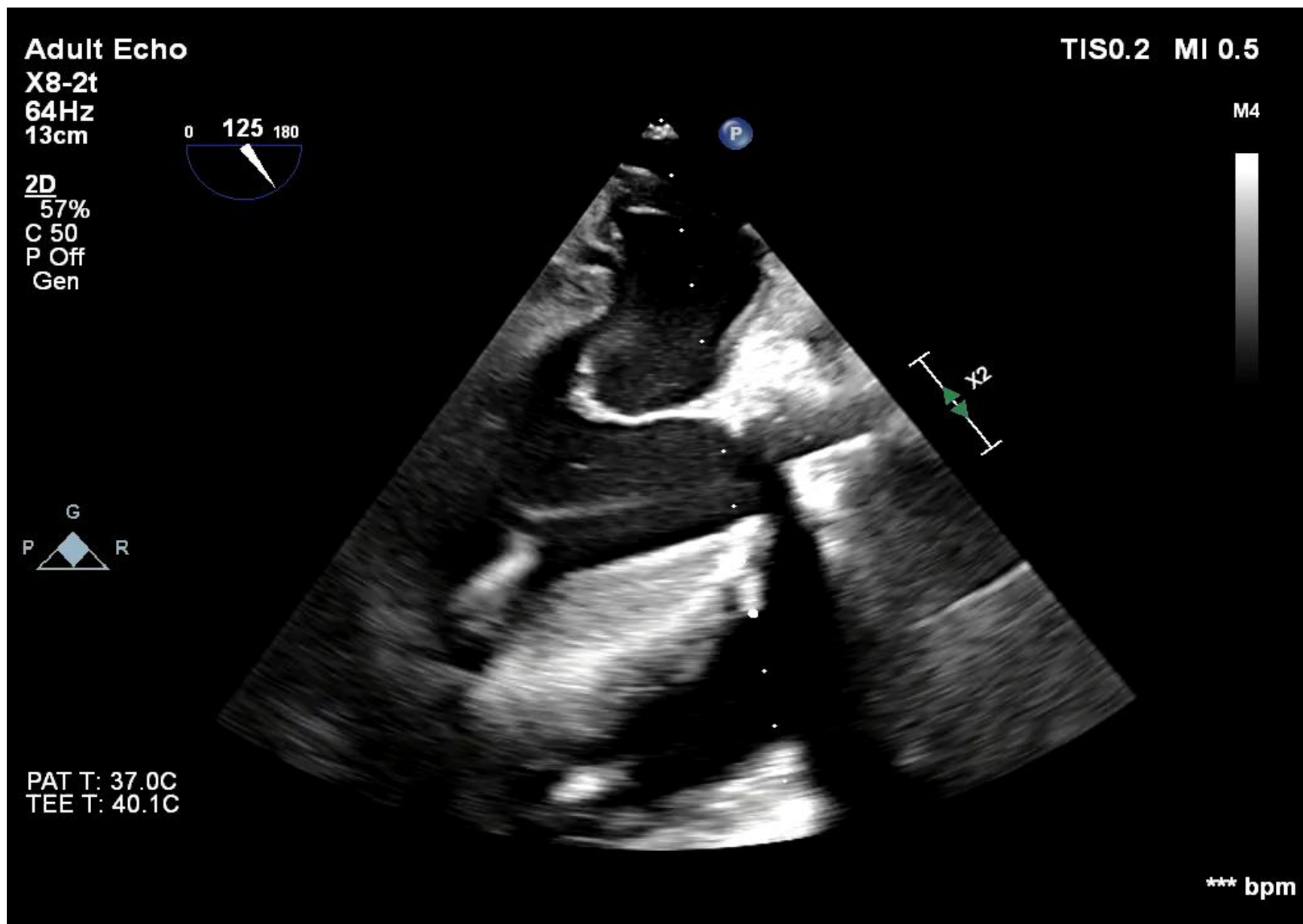


*** bpm

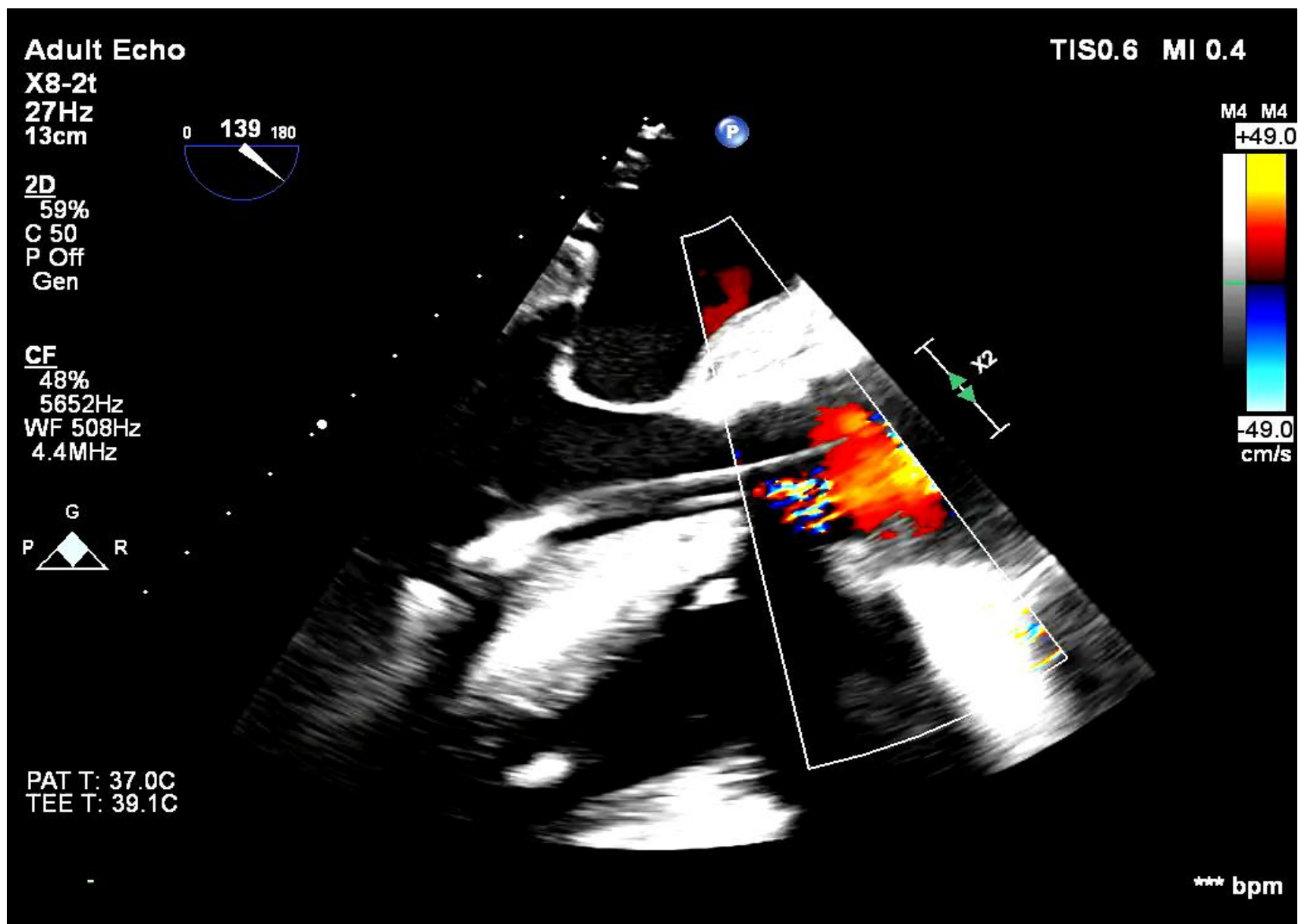
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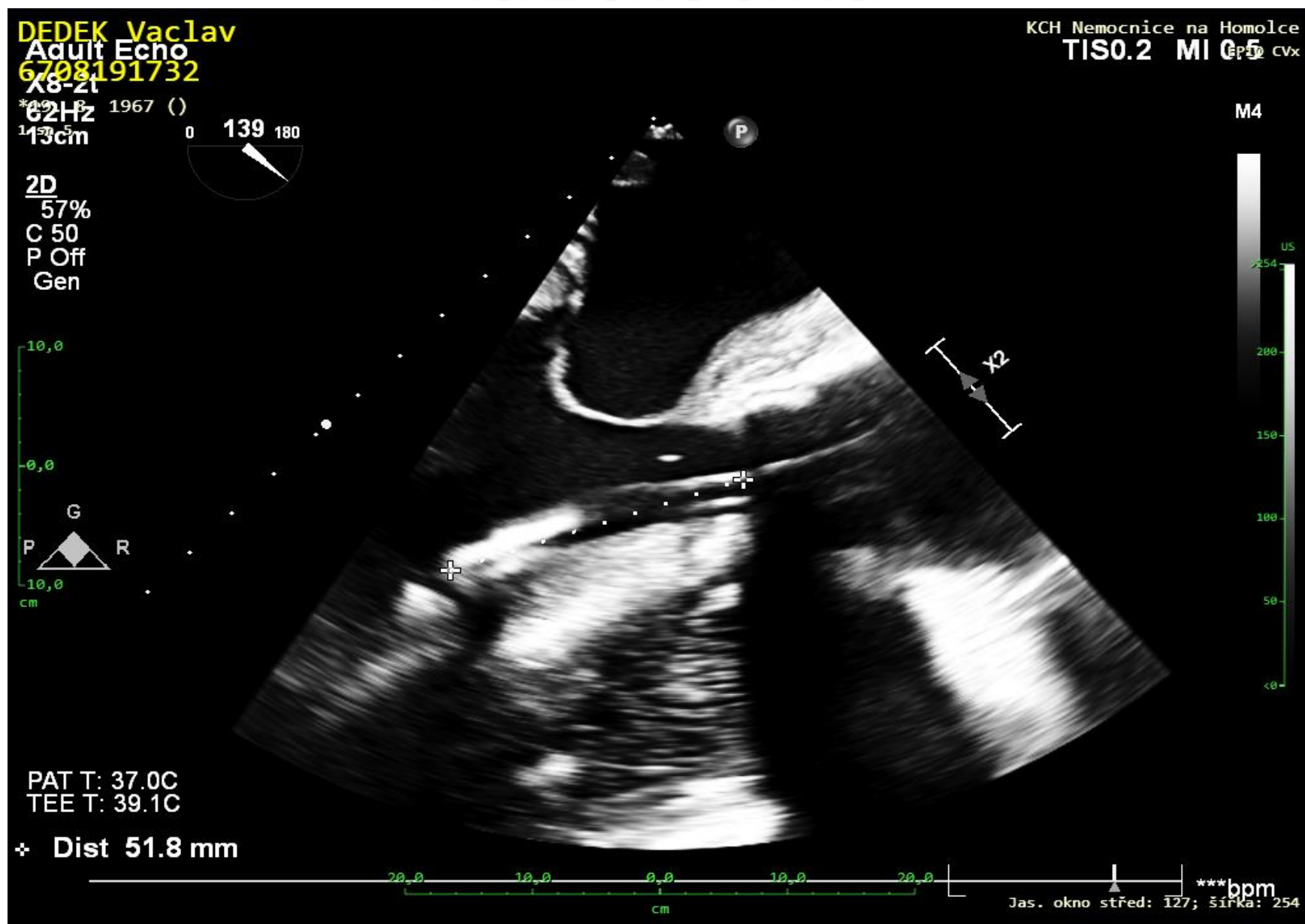
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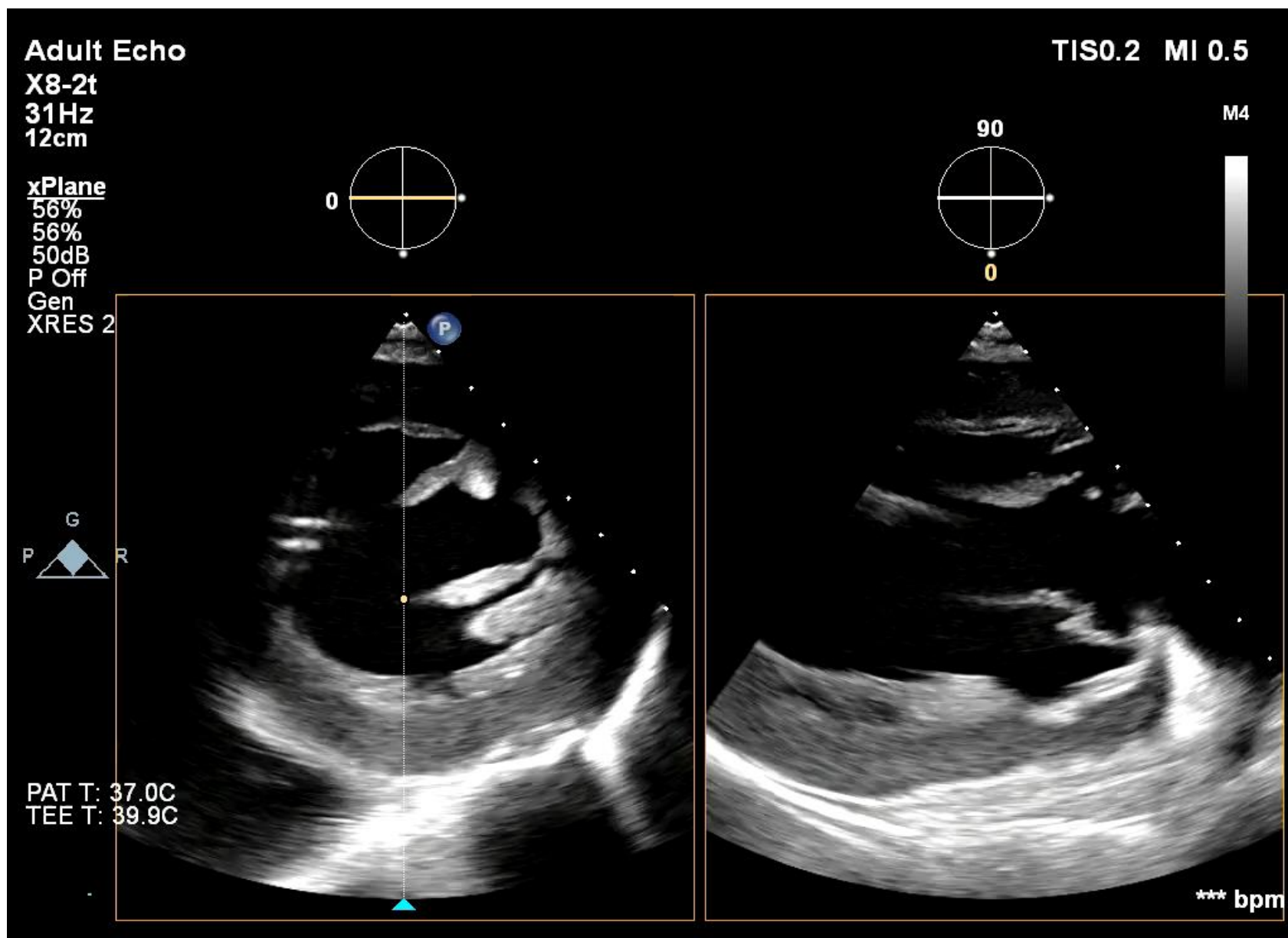
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Kazuistika



Kazuistika



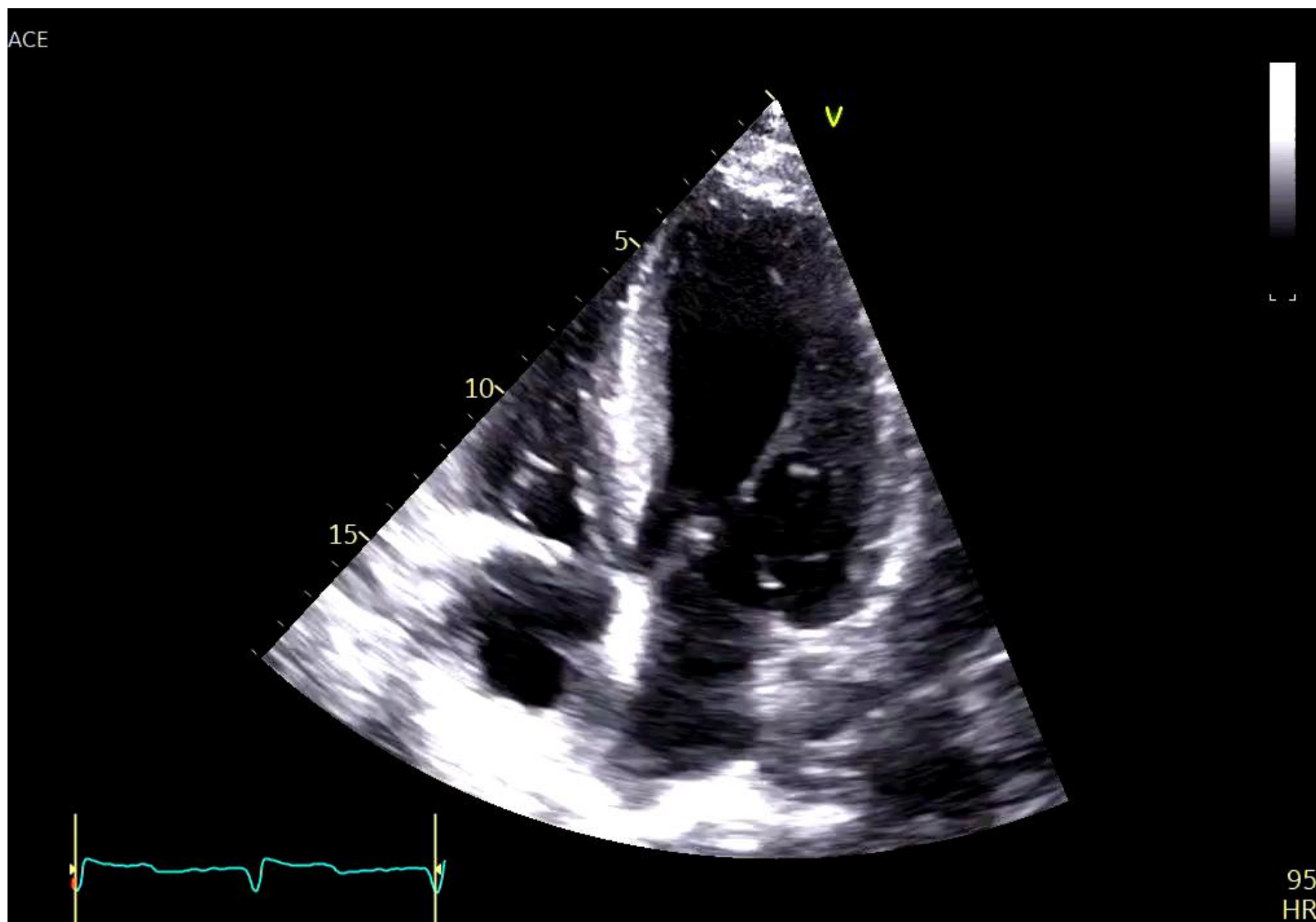
Kazuistika



Kazuistika



Kazuistika



Take home message

tMCS nemusí být až poslední možnost

Nečekejte na selhání

Plánujte, predikujte, buďte připraveni!