



# Má smysl implantovat MitraClip u pacientů s pravostranným srdečním selháním ?

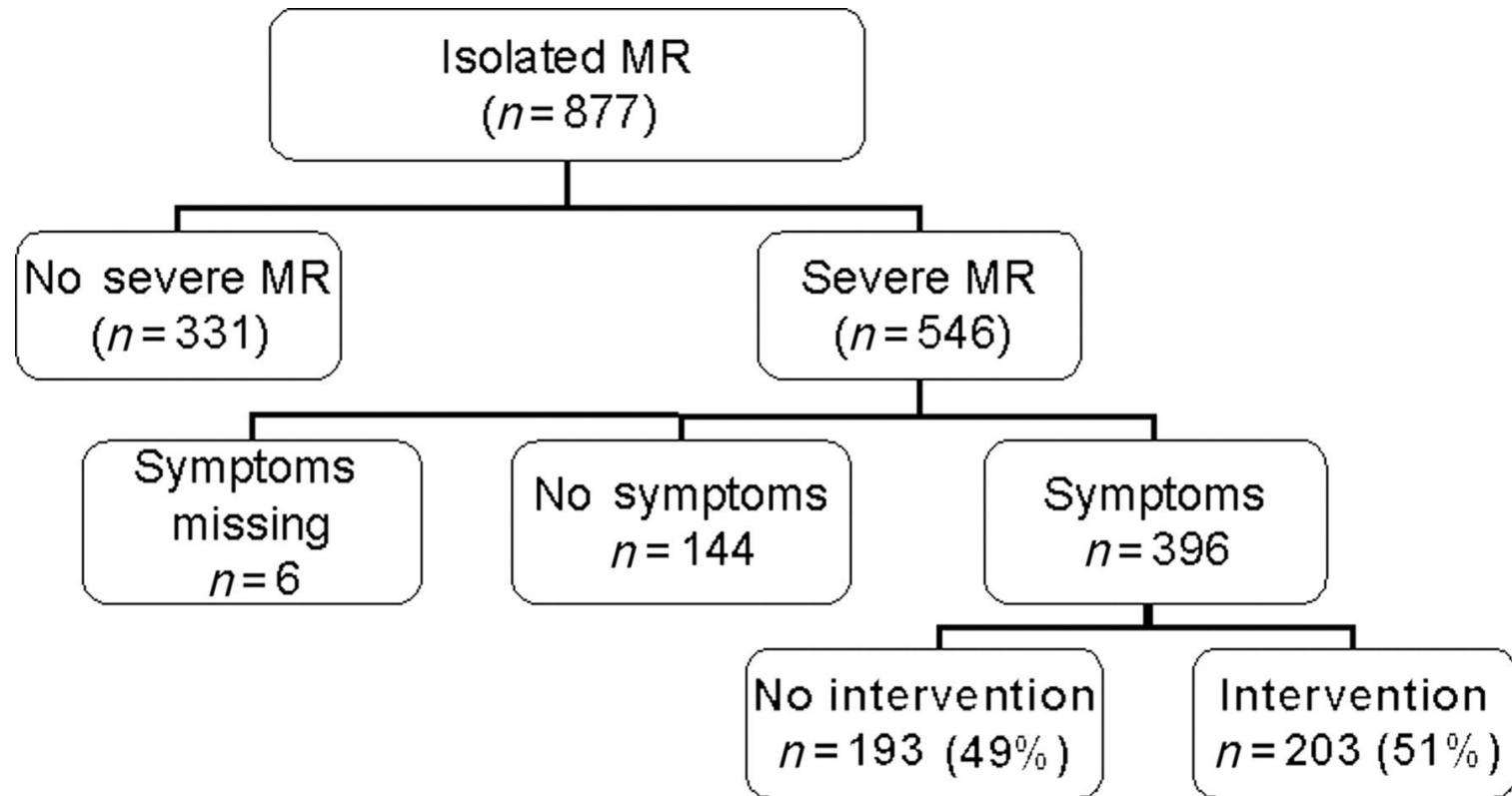
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# Indikace k chirurgickému řešení

MR je po aortální stenóze druhá nejčastější chlopenní vada v dospělosti



# Perkutánní intervence

- implantace zařízení do mitrálního prstence (cestou koronárního sinu, přímá anuloplastika, remodelace RF ablací či UZ)
- arteficiální chordy
- remodelace levé komory ( systém Coapsys , Atrial Approach PS<sup>3</sup> systém)
- perkutánní ošetření cípů
- perkutánní náhrady mitrální chlopně



# Doporučení pro léčbu MR- ESC guidelines

## Primární ( degenerativní) MR

Mitra clip lze zvažovat u pacientů se symptomatickou významnou MR, kteří splňují echo kriteria k implantaci, pro vysoké riziko nebyli indikováni k chirurgickému řešení a mají životní prognózu delší než I rok ( třída IIbC)

LV function, who cannot be revascularized or who present with cardiomyopathy, are questionable. Repair may be considered in selected patients if feasibility is high in order to avoid or postpone transplantation. In the other patients, optimal medical treatment is currently the best option, followed, in the event of failure, by extended HF treatment (diuretic, neurohormonal therapy (ACEi), ventricular assist device, cardiac resynchronization therapy, heart transplantation).

The percutaneous mitral clip procedure may be considered in patients with symptomatic severe primary MR despite optimal medical therapy (including CRT if indicated), who fulfil the echo criteria of eligibility, are judged inoperable or at high surgical risk by a team of cardiologists and cardiac surgeons, and who have a life expectancy greater than 1 year (recommendation class IIb, level of evidence C).

There is conflicting data regarding the management of moderate to severe MR in patients undergoing CABG in such cases, valve repair is preferred. In patients undergoing CABG, mitral valve surgery is more likely to be considered if the following are present and if feasibility is low in patients undergoing CABG, mitral valve surgery should be considered if the following are present and if feasibility is low in patients undergoing CABG and a large increase in the early and late postoperative very pressure load is anticipated.

There are no data to support surgical correction of mild MR.

**6.2.4 Medical treatment**

Optimal medical therapy (antidysrhythmic) should be the first step in the management of all patients with secondary MR and should be given in line with the guidelines on the management of AF<sup>17</sup>. This includes ACE inhibitors and beta blockers, with the addition of an aldosterone antagonist in the presence of HF. A diuretic is required in the presence of fluid overload. Diuretics may be useful for managing acute dyspnoea, secondary to a large dysplastic component.

The indication for neurohormonal therapy should be as in aortic valve mitral guidelines.<sup>18</sup> In responders, CRT may immediately reduce MR severity through improved diastolic force and neurohormonal therapy modulation.<sup>19</sup> A further reduction in MR and its dynamic component can occur through a reduction in left ventricular volume in AF with remodeling.

**7. Mitral stenosis**

Rheumatic fever, which is the predominant aetiology of MS, has greatly decreased in industrialized countries; nevertheless, MS still results in significant morbidity and mortality worldwide.<sup>20</sup> Percutaneous mitral commissurotomy (PMC) has had a significant impact upon the management of rheumatic MS.

**7.1 Evaluation**

The patient with MS may not have symptomatic for years and therefore with a gradual decrease in activity. The diagnosis is usually established by physical examination, chest X-ray, ECG, and echocardiography.

The general principle for the use of invasive and noninvasive investigations follow the recommendations made in the General comments (Section 3).<sup>21</sup>

Specific issues in MS are as follows:

- Echocardiography is the main method used to assess the severity and consequences of MS as well as the extent of aortic lesions.
- Valve area should be measured using planimetry and the pressure half-time method, which are complementary. Planimetry, when it is feasible, is the method of choice, in particular immediately after PMC. Contrast echocardiography and proximal isovelocity could be used when additional assessment is needed. Measurements of mean transvalvular gradient, obtained using Doppler velocities, are highly rate- and flow-dependent, but are useful to check consistency in the assessment of severity, particularly in patients in sinus rhythm. MS does not usually have clinical consequences at rest when valve area is >1.5 cm<sup>2</sup> (Class IIb).
- A comprehensive assessment of valve morphology is important for the treatment strategy. Scoring systems have been developed to help assess suitability, taking into account valve thickness, mobility, calcification, subvalvular deformity, and commissural area.<sup>22,23</sup>
- Echocardiography also evaluates pulmonary artery pressures, aortic regurgitation, concomitant valve disease, and LA size. Due to the prevalence of MS with other valve diseases, a comprehensive evaluation of mitral and aortic valves is recommended, especially prior to the preparation for routine management.
- CRT should be performed in suitable LA stenosis (Class IIb) or after an aortic valve surgery (Class IIb) provides additional information on anatomy or, in selected cases, on valve disease.
- ECF improves the evaluation of valve morphology in severely regurgitant cases.
- Echocardiography also plays an important role in monitoring the results of PMC during the procedure.
- Stress testing is indicated in patients with no symptoms or symptoms equivalent or discordant with the severity of MS. Obstructive, preferably exercise, echocardiography may provide additional information by assessing changes in mitral gradient and pulmonary pressures.<sup>24</sup>

**7.2 Natural history**

Survival in asymptomatic patients is usually good up to 10 years, progression being highly variable with sudden deterioration, which is usually precipitated by pregnancy or complications such as AF or embolism.<sup>25</sup> Symptomatic patients have a poor prognosis without intervention.<sup>26</sup>

**7.3 Results of intervention**

**7.3.1 Percutaneous mitral commissurotomy**

Technical success and complications are related to patient selection and the operator's experience. Good initial results, defined as valve area >1.5 cm<sup>2</sup> with no MR >3+, are achieved in over 85% of cases. Major complications include mitral regurgitation 5–4%, haemopericardium 0.3–10%, embolism 0.5–2%, and early 0.5–4%.

Mitra clip lze zvažovat u pacientů se symptomatickou významnou MR přes optimální medikamentózní léčbu vč. CRT ( je-li indikována), kteří splňují echo kriteria a pro vysoké riziko nebyli indikováni k chirurgickému řešení a mají životní prognózu delší než I rok ( třída IIbC)

## Sekundární ( funkční) MR

rheumatic lesions, aortic valve prolapse, and (even more so) MR with leaflet calcification or extensive annular calcification is not as consistent with in experienced hands.<sup>27</sup> In current practice, surgical expertise in mitral valve repair is growing and becoming widespread.<sup>28</sup>

Patients with predictable complex repair should undergo surgery in experienced repair centres with high repair rates and low operative mortality.<sup>29,30,31</sup>

When repair is not feasible, mitral valve replacement with preservation of the subvalvular apparatus is preferred.

**6.1.4 Percutaneous intervention**

Catheter-based interventions have been developed to correct MS percutaneously. The only one which has been evaluated in large-scale trials is the edge-to-edge procedure. Data from the EVEREST (Echocardiographic Valve Edge-to-Edge Repair Study) trial<sup>32</sup> and the results of registries in Europe<sup>33</sup> and the USA suggest that the MitraClip procedure has a predictable success rate (periprocedural MR <2+) of around 75% is modestly advanced and generally well tolerated, even by patients in poor clinical condition. One-year freedom from death, mitral valve surgery or more than moderate MR is 55%. The procedure reduces MR less effectively than mitral valve surgery. The follow-up remains limited to a maximum of 3 years and recurrence or worsening of MR is more likely to occur during follow-up. Areas of patients requiring intervention within 1 year in EVEREST. It is applicable to the procedure is limited because precise echocardiographic criteria have to be respected to make a patient eligible.<sup>34</sup> Mitral valve repair has been reported after an unsuccessful clip procedure, although valve replacement may be necessary in up to 50% of such patients.

**6.1.5 Indications for intervention**

Urgent surgery is indicated in patients with acute severe MR. Rupture of a papillary muscle, haemodynamic urgent surgical treatment after stabilization of haemodynamic status, using an intra-aortic balloon pump, positive inotropic agents and, when possible, vasodilators. Valve surgery consists of valve replacement in most cases.

The indication for surgery in severe chronic primary MR are shown in Table 12 and Figure 3.

The indication of whether to replace or repair depends mostly on valve anatomy, surgical expertise available, and the patient's condition.

Surgery is indicated in patients who have symptoms due to chronic MR, but no contraindications to surgery.

When CMR or CTCA, a device repair can all improve symptoms, although the effect on survival is largely unknown. In such cases, the decision as to whether to operate will take into the response to medical therapy, comorbidity, and the patient's overall risk-benefit ratio.

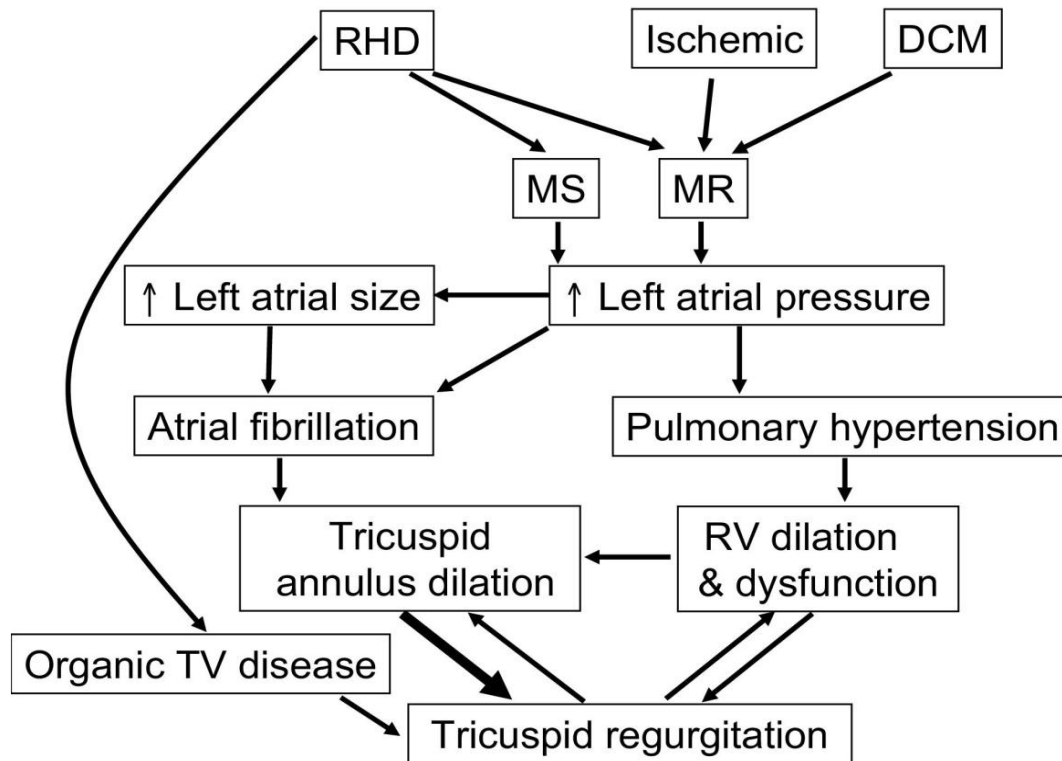
Percutaneous edge-to-edge procedure may be considered in patients with symptomatic severe primary MR who fulfil the echo criteria of eligibility, are judged inoperable or at high surgical risk by a heart team, and have a life expectancy greater than 1 year (recommendation class IIb, level of evidence C).

**Table 12 Indications for surgery in severe primary mitral regurgitation**

	Class <sup>a</sup>	Level <sup>b</sup>	Ref <sup>c</sup>
Flow valve repair should be the preferred technique when it is expected to be durable.	I	C	
Repair is indicated in asymptomatic patients with MR >3+ and/or Q2 <15 mL/min.	II	B	(27, 28)
Repair is indicated in symptomatic patients with Q2 >15 mL/min and/or Q2 <15 mL/min.	II	C	
Repair should be considered in asymptomatic patients with preserved LV function and low surgical risk (Class IIb) who are judged inoperable or at high surgical risk by a heart team, and have a life expectancy greater than 1 year.	IIb	C	
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ESC/ACC Guidelines, 2012. <sup>a</sup>Class of recommendation. <sup>b</sup>Level of evidence. <sup>c</sup>Reference. <sup>d</sup>Class of recommendation. <sup>e</sup>Level of evidence. <sup>f</sup>Reference.

# Patogeneze sekundární trikuspidální regurgitace a dysfunkce PK



# Doporučení pro chirurgické řešení MR a sekundární TR

-2012 ESC /EATSC Guidelines for the Management of Valvular Heart Disease

- 2014 AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease

-2017 Focused Update of the 2014 Guideline for the Management of Patients with Valvular Heart Disease

	Class <sup>a</sup>	Level <sup>b</sup>
Surgery is Indicated in symptomatic patients with severe TS. <sup>c</sup>	I	C
Surgery is Indicated in patients with severe TS undergoing left-sided valve intervention. <sup>d</sup>	I	C
Surgery is Indicated in patients with severe primary or secondary TR undergoing left-sided valve surgery.	I	C
Surgery is Indicated in symptomatic patients with severe isolated primary TR without severe right ventricular dysfunction.	I	C
Surgery should be considered in patients with moderate primary TR undergoing left-sided valve surgery.	IIa	C
Surgery should be considered in patients with mild or moderate secondary TR with dilated annulus ( $\geq 40$ mm or $>21$ mm/m <sup>2</sup> ) undergoing left-sided valve surgery.	IIa	C
Surgery should be considered in asymptomatic or mildly symptomatic patients with severe isolated primary TR and progressive right ventricular dilatation or deterioration of right ventricular function.	IIa	C
After left-sided valve surgery, surgery should be considered in patients with severe TR who are symptomatic or have progressive right ventricular dilatation/dysfunction, in the absence of left-sided valve dysfunction, severe right or left ventricular dysfunction, and severe pulmonary vascular disease.	IIa	C

## Klinické indikace implantace MitraClipu

- vysoké riziko KCH výkonu – významné komorbidity: CHOPN, renální selhání, diabetes mellitus
- již prodělaný KCH výkon v anamnéze s vysokého operačního rizika při reoperaci (např. MR po CABG)
- odmítnutí kardiologického výkonu

## Kontraindikace implantace MitraClipu

- při intenzivní periprocedurální antikoagulační / postprocedurální duální antiagregační léčbě
- aktivní endokarditida na mitrální chlopni
- revmatická mitrální vada
- intrakardiální tromby, trombóza v. cava inferior či v. femoralis
- špatná TEE vyšetřitelnost

Má smysl implantovat MitraClip u pacientů s pravostranným srdečním selháním ?

- A. Ano, vždy
- B. Ne
- C. Ano, ale jen po pečlivém zvážení všech faktorů
- D. Nevím



# Kazuistika I

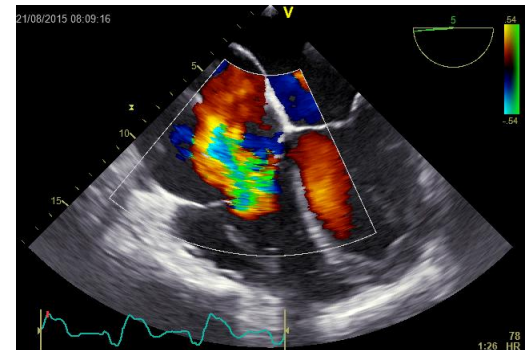
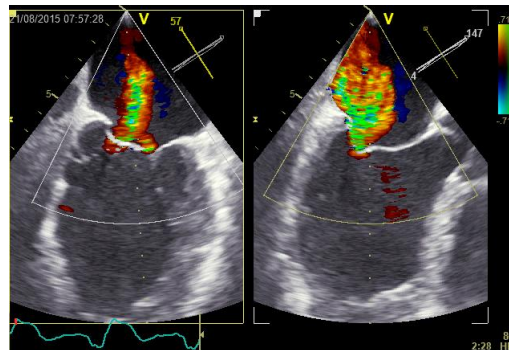
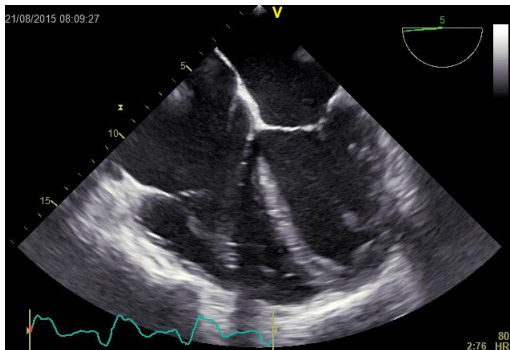
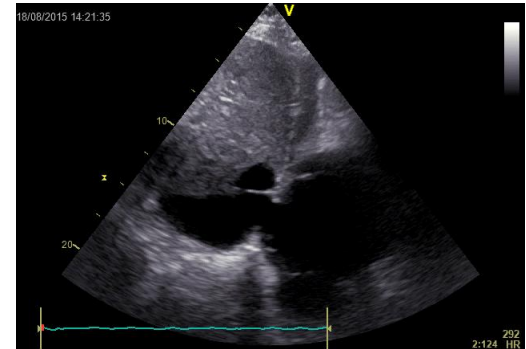
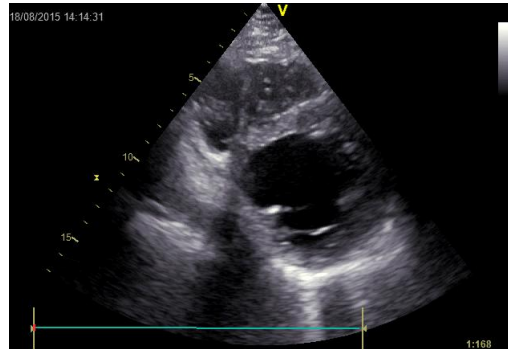
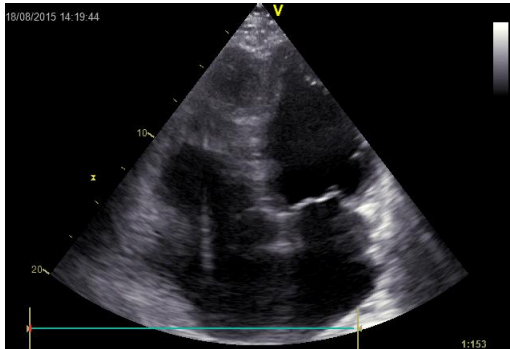
## Anamnestická data:

Muž 63 let

- ICHS, st.p. IM spodní stěny a IM přední stěny,  
1998 3 x CABG ,2002 reoperace v r.2002 pro uzávěr všech bypassů s revizí  
ACD a bypassu na RIA
- st.p. opakovaných PCI bypassů i nativních tepen
- st.p.implantaci BiV ICD
- st.p. opakovaných hospitalizací pro kardiální dekompenzaci v r. 2013  
2015 (celkem 7x)
- CHRI, ci hepatitis,
- DM II. typu , hypertenzní nemoc
- CHOPN



# Kazuistika I



LK 62 mm, EF 35 %, asynchronní kontrakce, LS 55 mm  
PK 38 mm PLAX, 52 mm 4ACH, TAPSE 12 mm, STDI 5 cm/s, FAC 28%  
Mi chl: regurgitace 3-4/4, Tri chl: regurgitace 4/4, triangulární  
charakter, TR V max 2 m/s

# Další postup?

A. Konzervativně

B. MitraClip

C. Transplantace srdeční

# Další postup?

A. Konzervativně

B. MitraClip

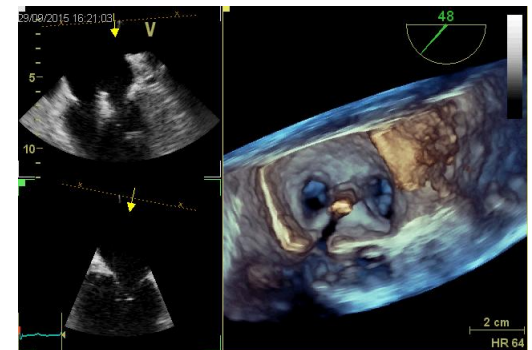
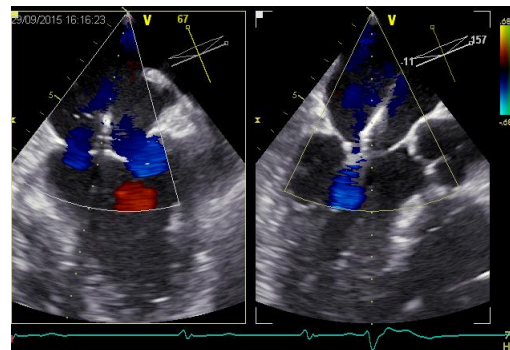
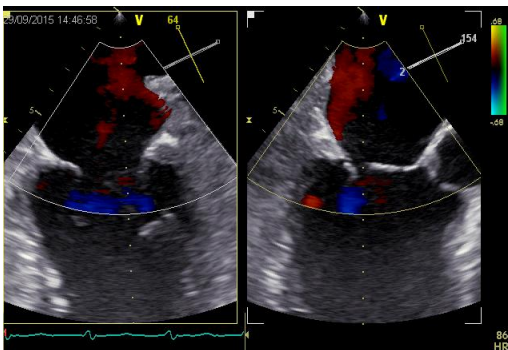
C. Transplantace srdeční

# Kazuistika I

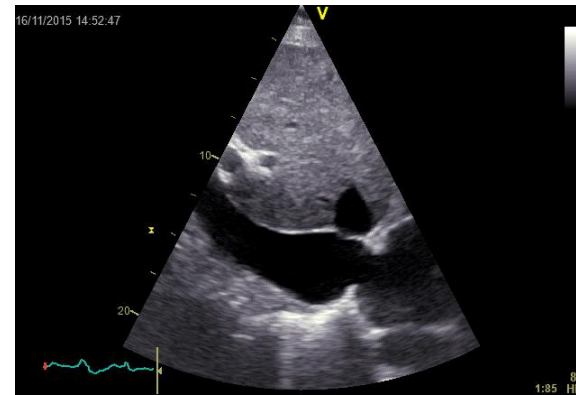
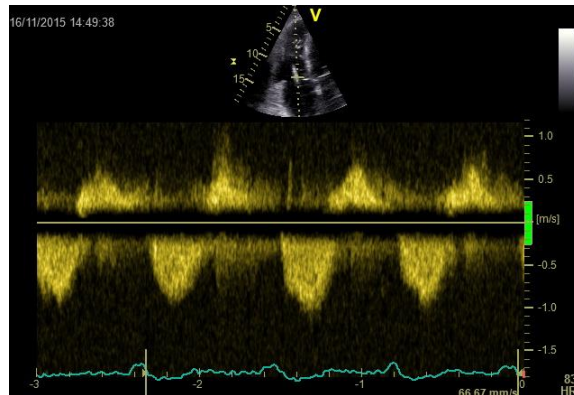
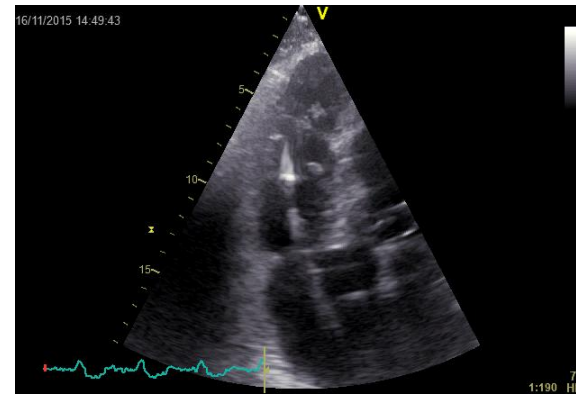
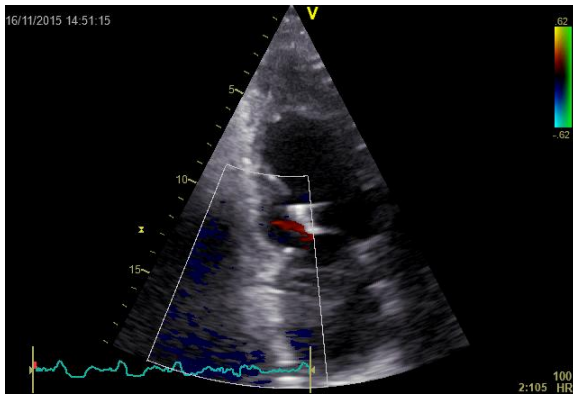
- po odmítnutí oTS byla u pacienta „heart teamem“ indikována implantace MitraClipu
- oboustranná SKG: EF 30%, středně až více významná MR, těžká postkapilární plicní hypertenze
- Hemodynamické parametry:  
LK 130/25 mm Hg, Ao 130/ 90 mm Hg, PS 15/17( 16) mm Hg, PK 60/12 mm Hg, plicnice 60/25 (40) mm Hg, PCW 20/45 (28) mm Hg

# Kazuistika I

	před výkonem	anestezie – úvod	konec výkonu	1.den
LK	107/67/82	103/63/76	105/58/73	95/50/65
Plic.	32/18/23	30/13/22	30/17/23	32/16/23
PCWP	19	15	13	12
CVP	11	17	16	15
HR	80	80	80	80
CI	2.7	2.4	3.0	3.0
SVRI	1778	1967	1520	1333
PVRI	119	233	267	293



# Kazuistika I



ECHO:

MR 2/4, PG mean 3 mmHg, LK EF 35%, PK dilatovaná s těžkou dysfunkcí, TR triangulární charakter

Po 6 měsících opakované hospitalizace pro srdeční selhání ,  
exitus 8 měsíců po implantaci MitraClipu

# Kazuistika II

## **Anamnestická data:**

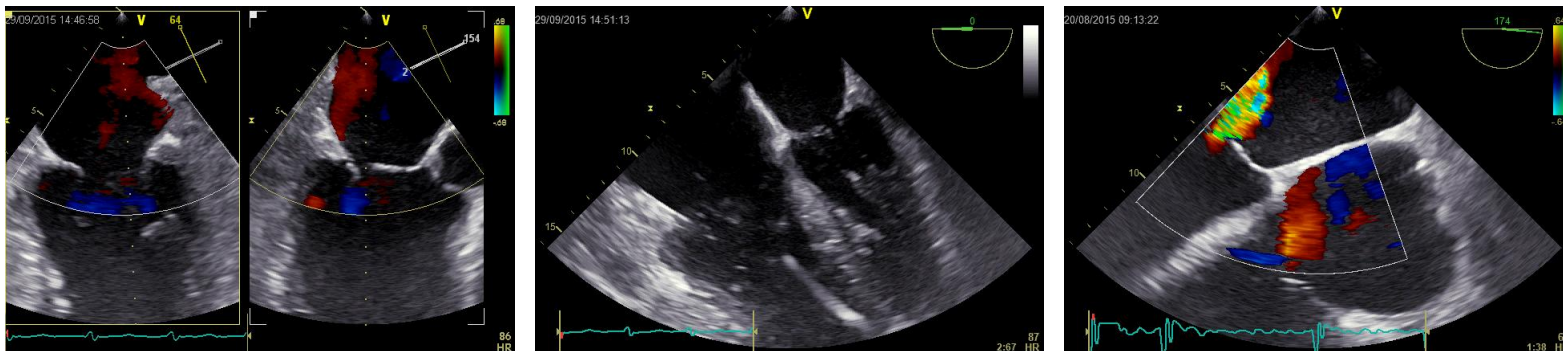
Muž 71 let

- 2008 fibrilace síní na antikoagulační léčbě
- 2013 dilatační kardiomyopatie
- 2014 implatace ICD
- DM na PAD
- obezita

NO: dušnost NYHA III-IV, otoky DK – oboustranná kardiální dekompenzace



# Kazuistika II



## ECHO:

LK 66 mm, EF 25-30%, LS 61 mm, PK 40 mm PLAX, 48 mm 4 ACH, TAPSE 16 mm, STDI 10 cm/s, DDŽ 28/17 mm  
MR 3+/4, TR 3/4, TR 48 mm Hg

## Hemodynamické parametry:

LK 140/22 mm Hg, Ao 140/80 mm Hg, PS 21/23 (17) mm Hg, PK 75/16 mm Hg, plicnice 75/38 (50) mm Hg, PCW se nepodařilo změřit. Bez přítomnosti evkalizace diastol. tlaků v PK a LK  
EF 25%, MR 3 st.

# Další postup?

A. Konzervativně ?

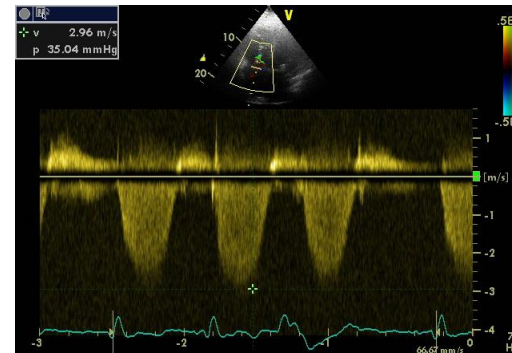
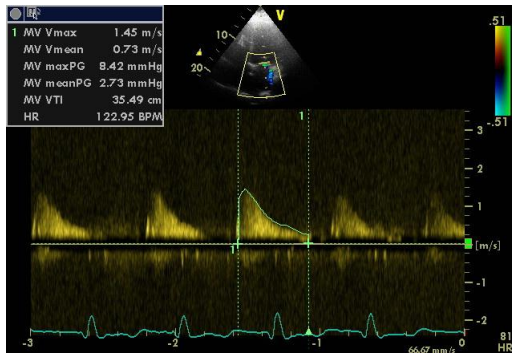
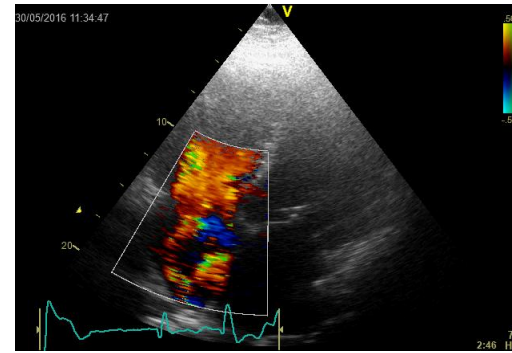
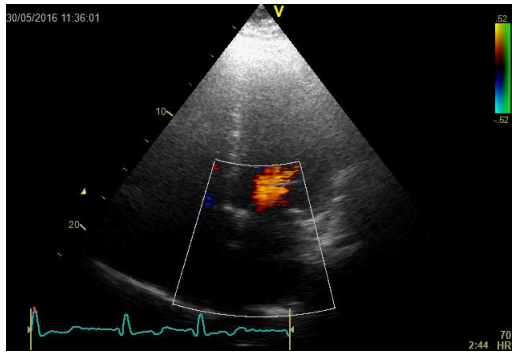
B. MitraClip ?

# Další postup?

A. Konzervativně

B. **MitraClip**

# Kazuistika II



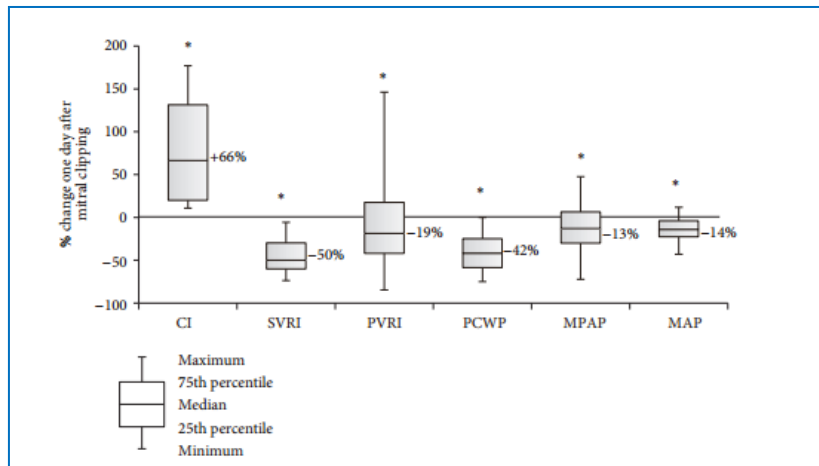
ECHO:

MR 2/4, PG mean 2.7 mm Hg, LK EF 35%, PK , TR ¾ , TR 38 mm Hg, TAPSE 17 mm, STDI 10 cm/s

1 rok po: NYHA II-III, přechodný otok DK, po navýšení diuretik regrese

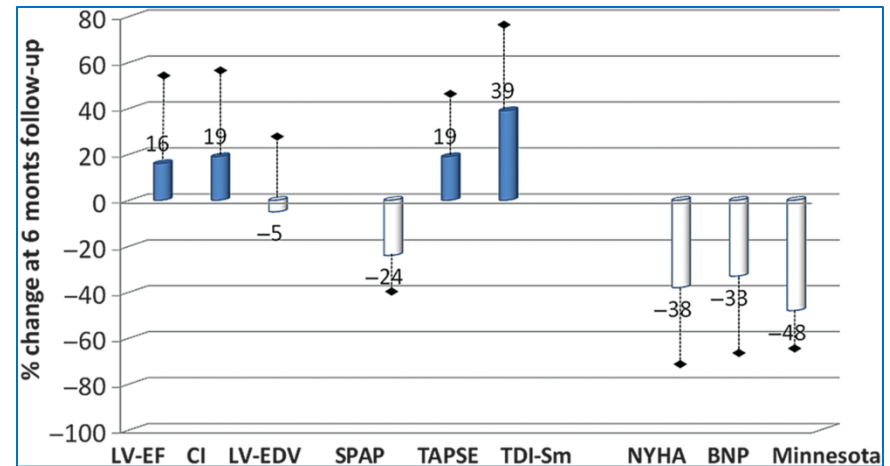
# Efekt implantace MC

## Bezprostřední na hemodynamiku



Bednář F, *Bio Med Research International* 2016

## Vliv na remodelaci levé a pravé komory



Gianini C, *Eur. H Journa.*, 2014

Godino et al. *IJC Heart and Vasculature*, 2016

60 pacientů. Implantace MC u pacientů s funkční MR a DPK vedla k signifikatnímu zlepšení funkce PK v 6 měsíčním FU (TAPSE  $15 \pm 3$  vs.  $19 \pm 4.5$ ,  $p = 0.007$ ; STDI  $7 \pm 1.2$  vs.  $2.8$ ,  $p = 0.0001$ ).

# Vliv funkce PK a TR na prognózu pacientů po MC

*Kaneko et. al, Am J Cardiol, 2016*

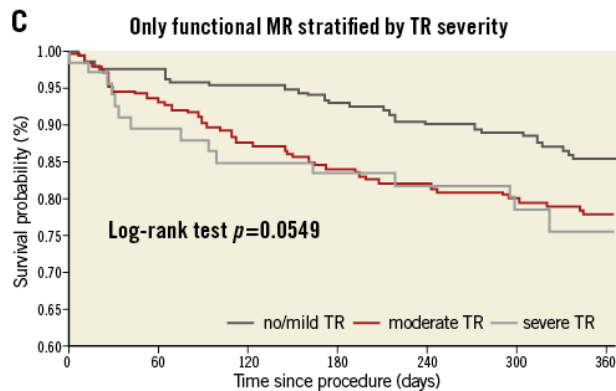
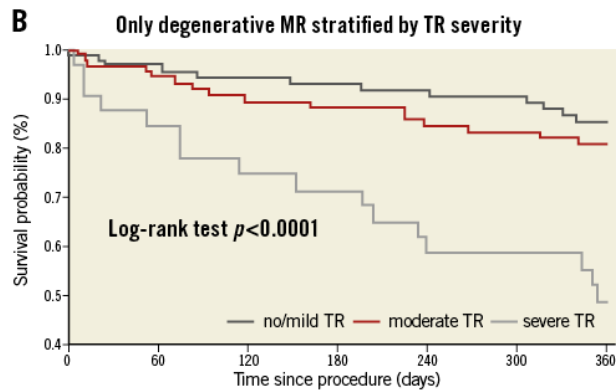
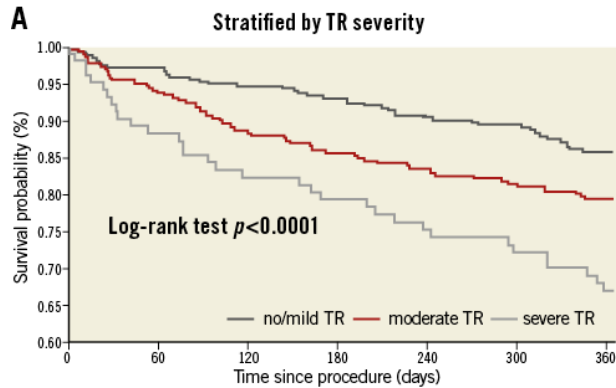
117 pacientů, průměr přežívání byl signifikantně nižší ve skupině s DPK (36.2% vs. 69,6 %  $p= 0,008$ ), )

Dysfunkce PK je asociována s horší prognózou u pacientů se sek.MR indikovaných k implantaci MC.

*Ohno et al. Eur H Journal, 2014*

146 pacientů , v obou zlepšení NYHA. Skupina se středně/ významnou TR měla horší NYHA ( NYHA > II 33.3 % vs. 9,2 % ,  $p= 0.001$  ve 30 dni a 38.5% vs. 12.3%  $p= 0.006$  v 1 ročním FU ). Primární endpoint ( úmrtí, MR >3 byla) shodná , kombinovaný endpoint ( úmrtí a nutnost rehospitalizace) vyšší ve skupině se středně/významnou TR

# Vliv TR na prognózu pacientů po MC



*Kalbacher D., Eurointervention 2017*

766 pacientů

Počet MC byl vyšší u pacientů s významnou TR, ale zlepšení TR nebylo asociováno s úspěšností výkonu. Významná TR je prediktorem 1 roční mortality (HR= 2.01,  $p = 0.004$ ), ale ne pro rehospitalizaci pro srdeční selhání.

Má smysl implantovat MitraClip u pacientů s pravostranným srdečním selháním ?

A. Ano, vždy

B. Ne

C. Ano, ale jen po pečlivém zvážení všech faktorů

D. Nevím



# Možný vliv dalších faktorů na funkci PK po implantaci?

- A. Iatrogenní DSS
- B. Iatrogenní mitrální stenóza
- C. Obě možnosti
- D. Nemá vliv

# Možný vliv dalších faktorů na funkci PK po implantaci?

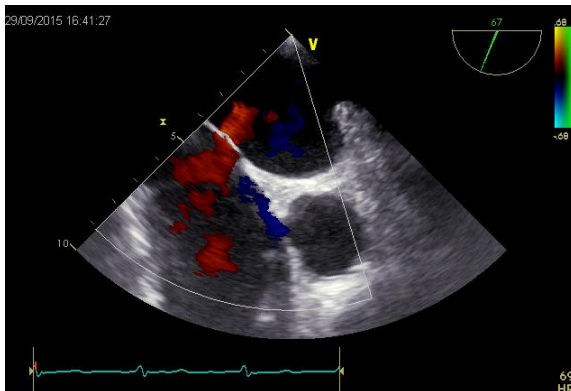
- A. Iatrogenní defekt septa síní (DSS)
- B. Iatrogenní mitrální stenóza
- C. **Obě možnosti**
- D. Nemá vliv

# Iatrogenní DSS po transseptální punkci

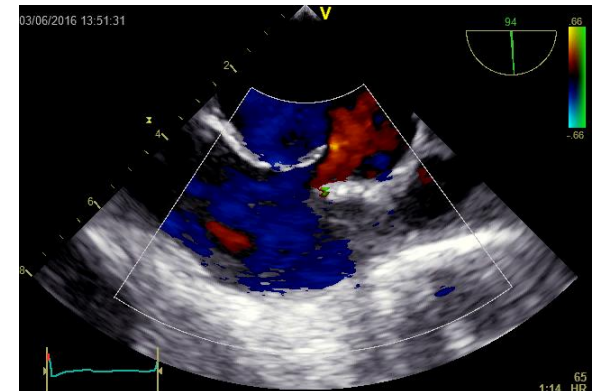
Study	Procedure	Sheath Size, Fr	iASD Incidence	Follow Up, m	Detection Method	Diameter, mm	Echo Parameters	Clinical Events
Yoshida et al <sup>5</sup>	PBMV	14	3/15 (20%)	6	TEE	1.1	NR	None
Ishikura et al <sup>7</sup>	PBMV	14	2/46 (4.4%)	12	2D TTE	NR	NR	None
Devarakonda et al <sup>6</sup>	PBMV	14	21/110 (19%)	12	3D TTE	5.4±3.1	NR	None
Singh et al <sup>4</sup>	LAA Closure	14	14/253 (7%)	12	2D TEE	<3 (50%)	NR	No Δ in stroke
→ Smith et al <sup>2</sup>	TMVR	22	8/30 (27%)	12	2D TTE	6.6±3.1	No Δ in RVD	None
→ Schueler et al <sup>3</sup>	TMVR	22	33/66 (50%)	6	2D TEE	4.3×3.8	↑ RVSP, RAD, RVD	↑Death, HF

Δ indicates change; 2D, 2-dimensional; 3D, 3-dimensional; Fr, french; HF, heart failure; iASD, iatrogenic atrial septal defects; LAA, left atrial appendage; NR, not reported; PBMV, percutaneous balloon mitral valvuloplasty; RAD, right atrial dimension; RVD, right ventricular dimension; RVSP, right ventricular systolic pressure; TEE, transesophageal echo; TMVR, transcatheter mitral valve repair; and TTE, transthoracic echo.

Alkhoul M et al *Circulation: Cardiovascular Interventions*. 2016;9:1.,



st.p. MitraClipu



st.p. katetrizační MVR

# Závěr

- Hodnocení funkce pravé komory je zásadní u pacientů s významnou MR a srdečním selháním
- TAPSE < 15 mm je negativní prediktivní faktor dlouhodobé prognózy pacientů
- V případě snížené funkce PK by měla být indikace Mitraclipu pečlivě zvážena

Děkuji za pozornost