ISCHEMICKÁ MITRÁLNÍ REGURGITACE: OPEROVAT?

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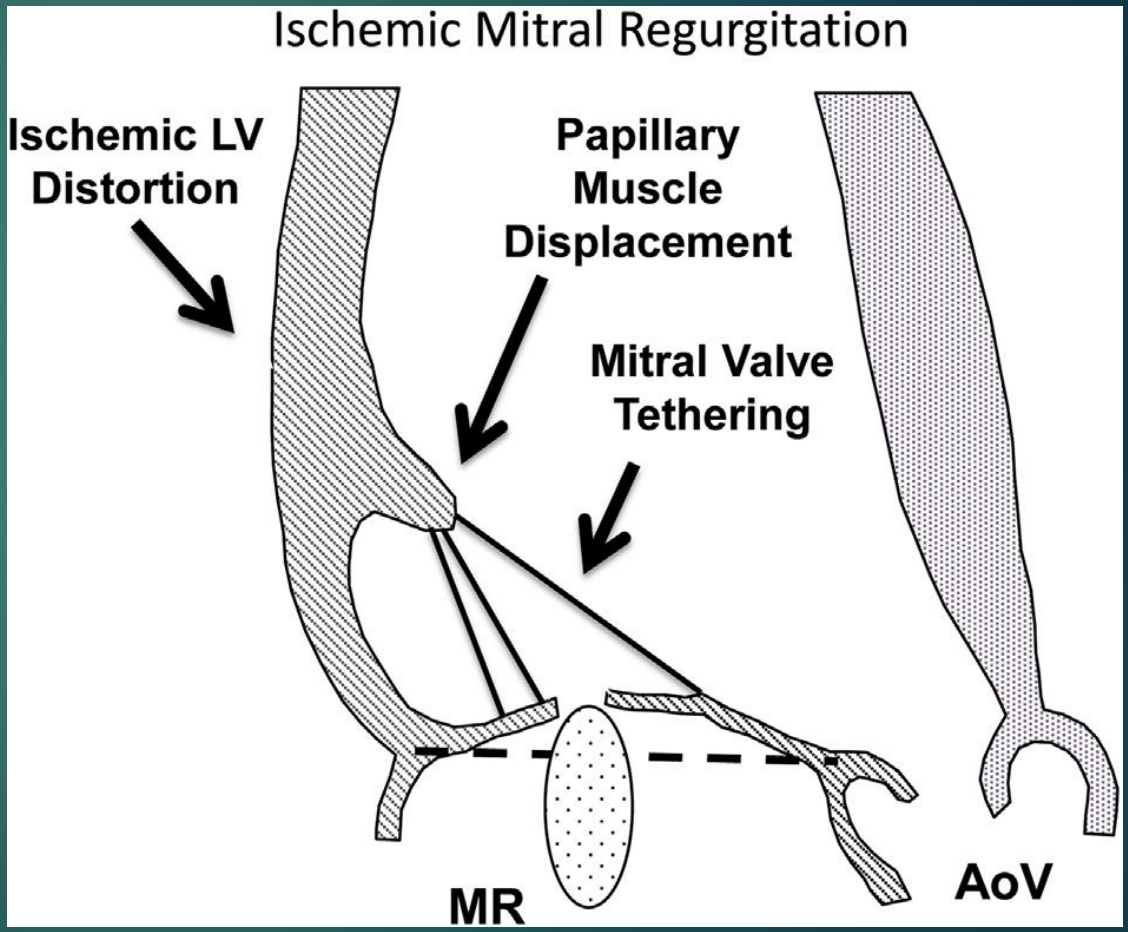
Ischemická mitrální regurgitace

- 1. Etiologie: ICHS - jizva po IM - regionální nebo globální dysfce, dilatace levé komory
- 2. Léze
- 3. Dysfce

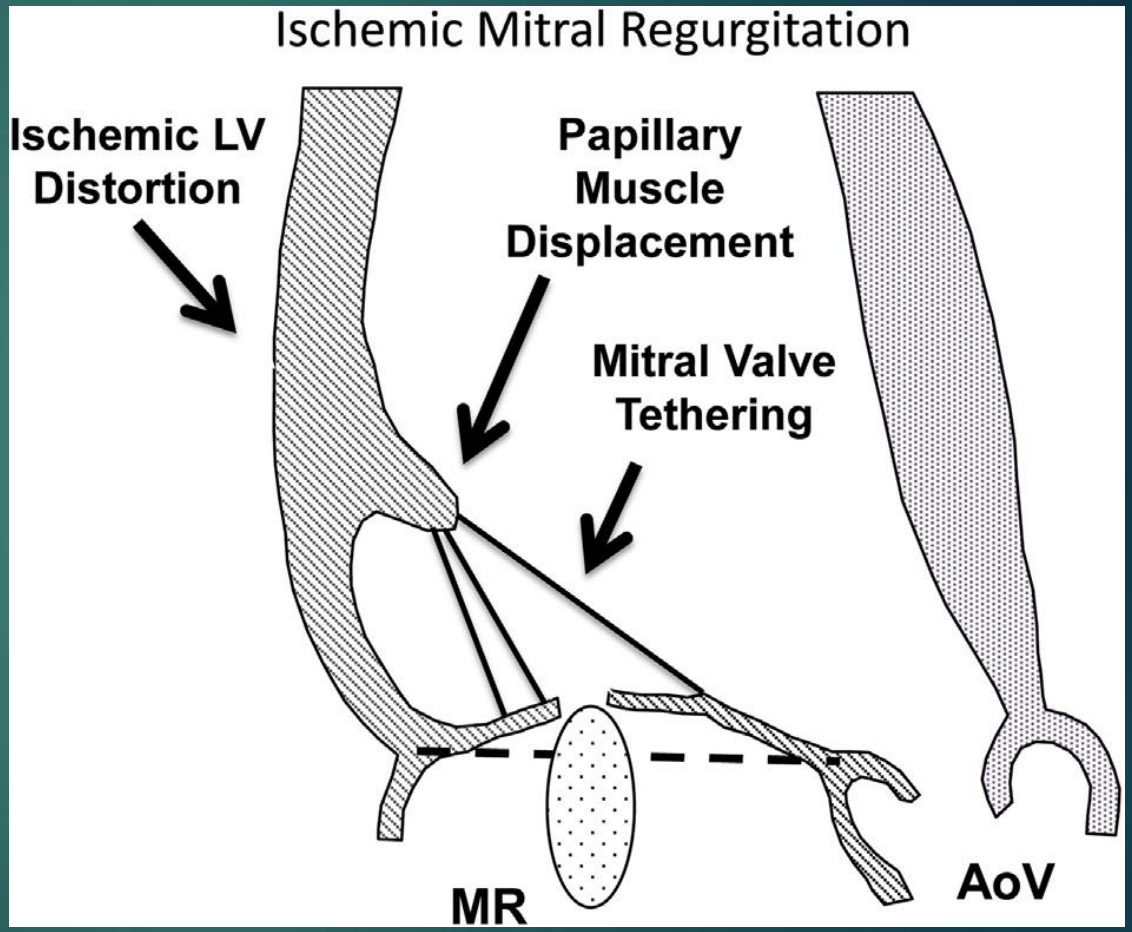


Kron, Guidelines AATS, 2016

Ischemická mitrální regurgitace

- 2. Léze:
- Primárně dislokace cípů

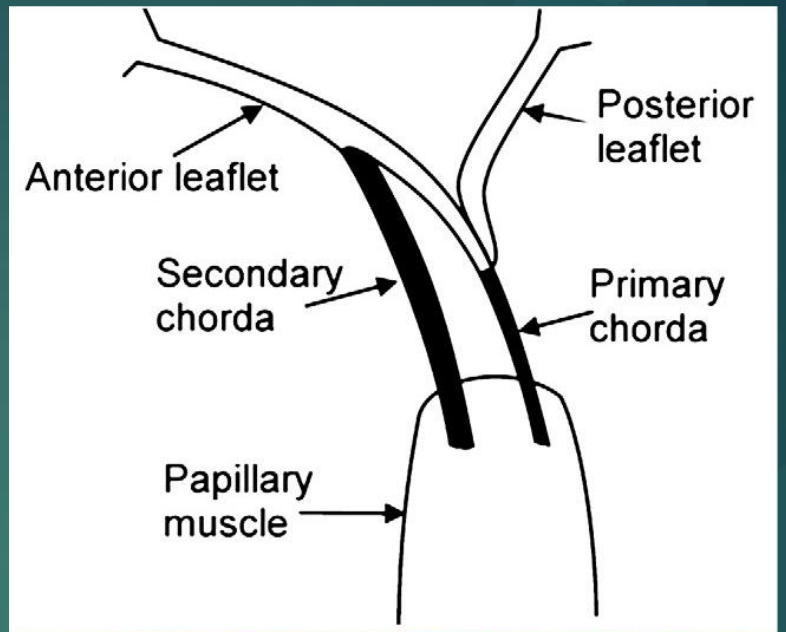
  v důsledku remodelace dané ischemickým poškozením levé komory
- \+ dilatace anulu –menší než u degenerativní MR

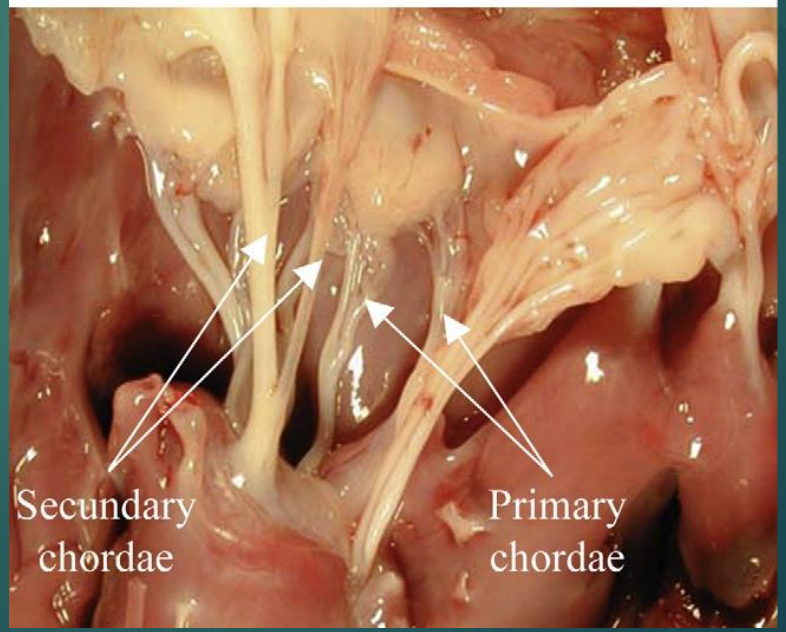


Kron, Guidelines AATS, 2016

Chordy

- Primární chordy se upínají k vedoucímu okraji
- Sekundární chordy k bříšku papilárního svalu





Nielsen S, JCTS 2011:141, 732-7

Zobrazení

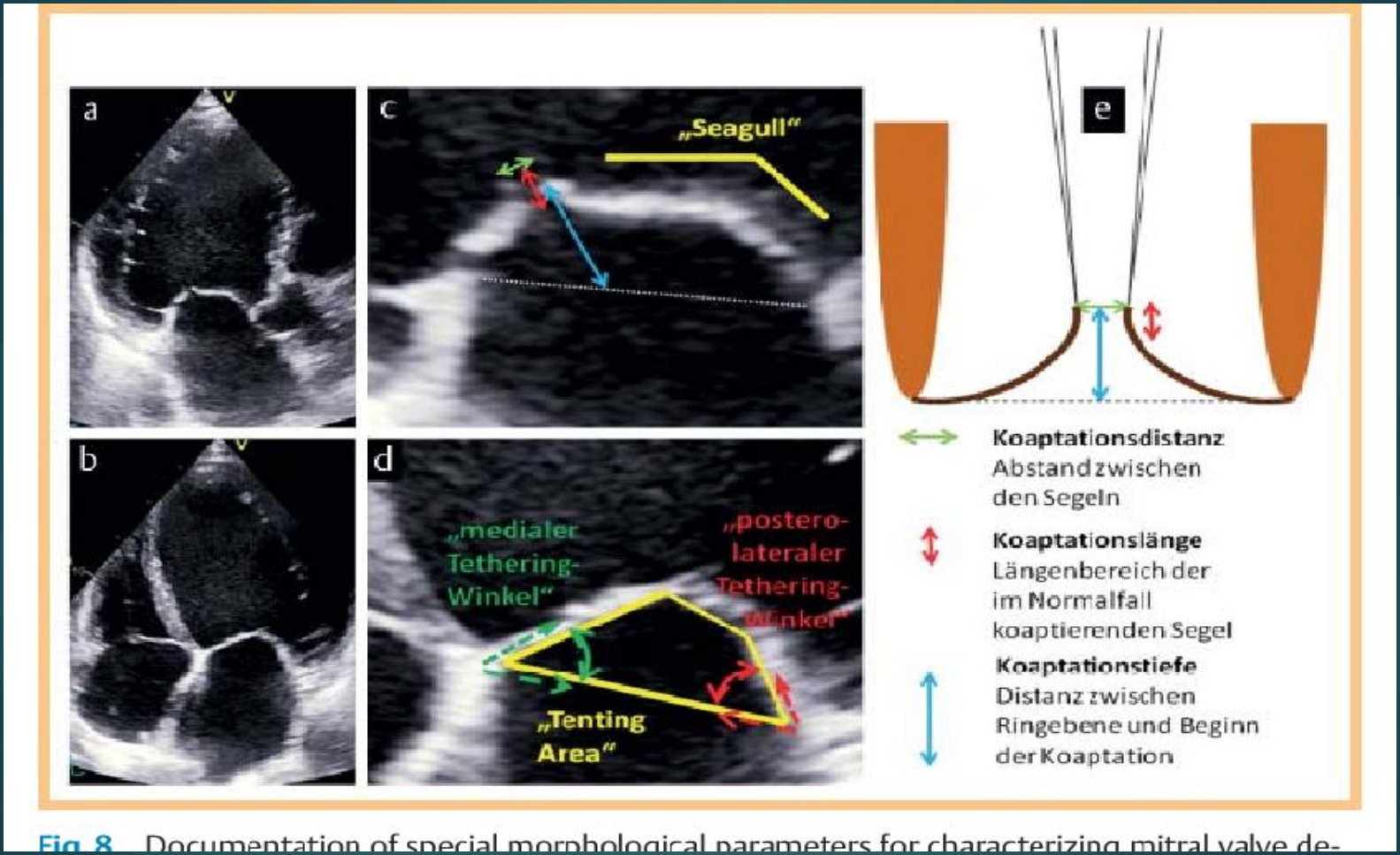
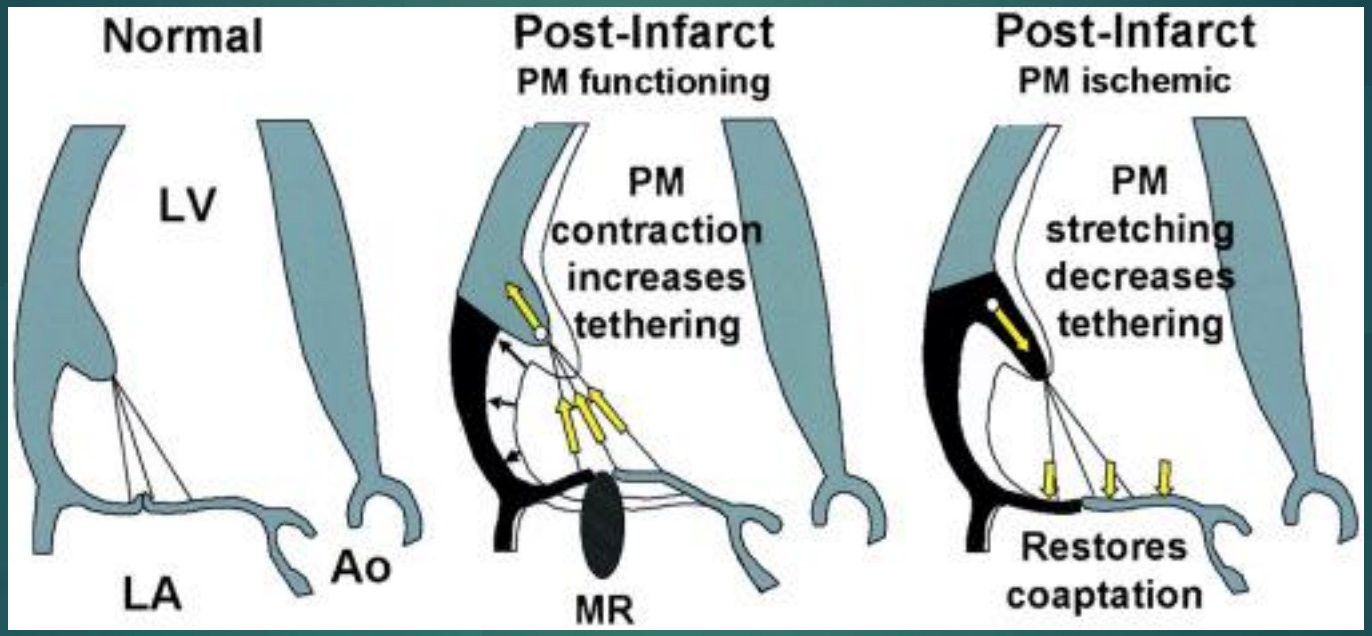


Fig. 8 Documentation of special morphological parameters for characterizing mitral valve de-

Hagendorff, A, Ultraschall in Med 2015; 36: 10–34

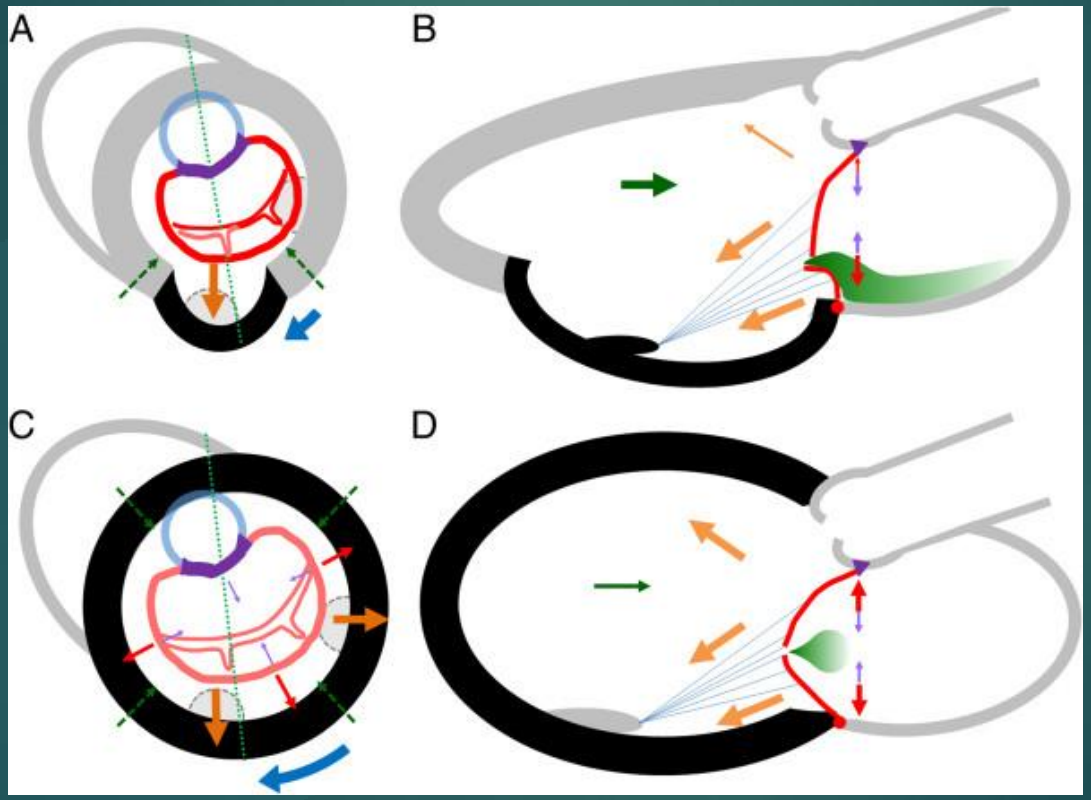
Ischemická MR a rozsah ischemie



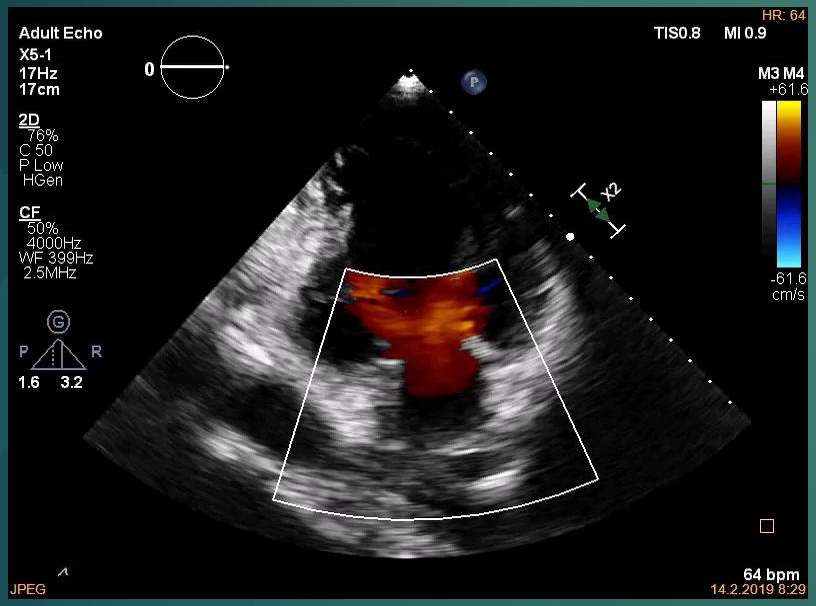
Messas EJ. Circulation. 2001; 104: 19521957

Ischemická mitrální regurgitace

- 3. Dysfunkce : symetrický vs asymetrický fenotyp



Dudzinski D. Cardiovascular Ultrasound 2014, 12:46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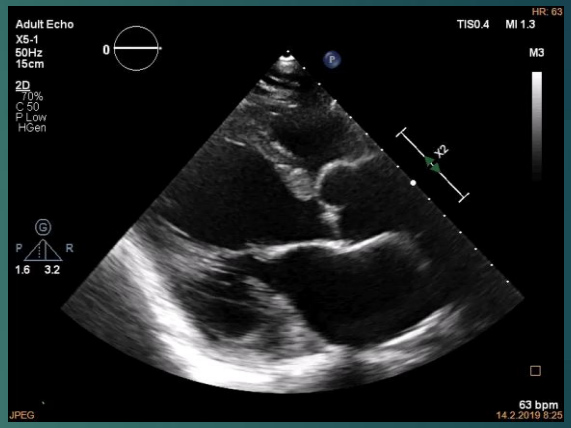
X5-1
17Hz
17cm
2D
76%
C 50
P Low
HGen
CF
50%
4000Hz
WF 399Hz
2.5MHz
1.6 3.2
TIS0.8 MI 0.9
HR: 64
M3 M4
+61.6
-61.6
cm/s
64 bpm
14.2.2019 8:29
JPEG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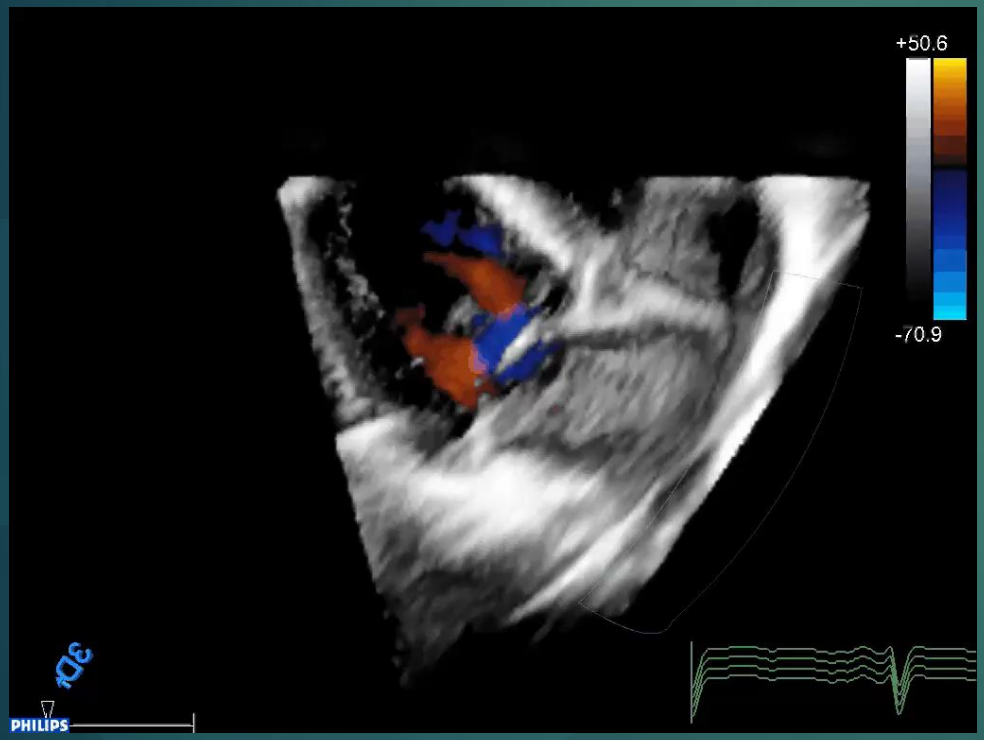
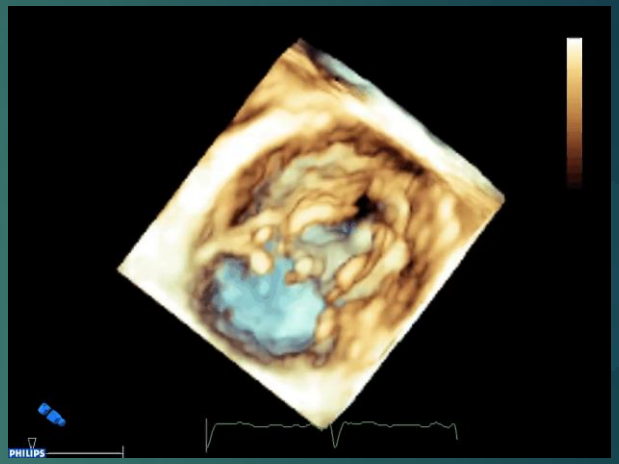
X5-1
50Hz
15cm
2D
70%
C 50
P Low
HGen
1.6 3.2
TIS0.4 MI 1.3
HR: 63
M3
63 bpm
14.2.2019 8:25
JPEG


Adult Echo
X5-1
35Hz
17cm
Z 2.4
xPlane
73%
73%
50dB
P Low
HGen
1.6 3.2
TIS0.5 MI 1.3
HR: 66
M3
14
270
JPEG


+50.6
-70.9
3D
PHILIPS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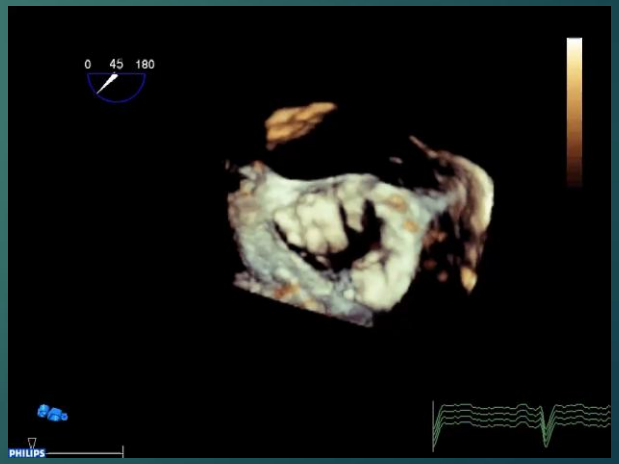
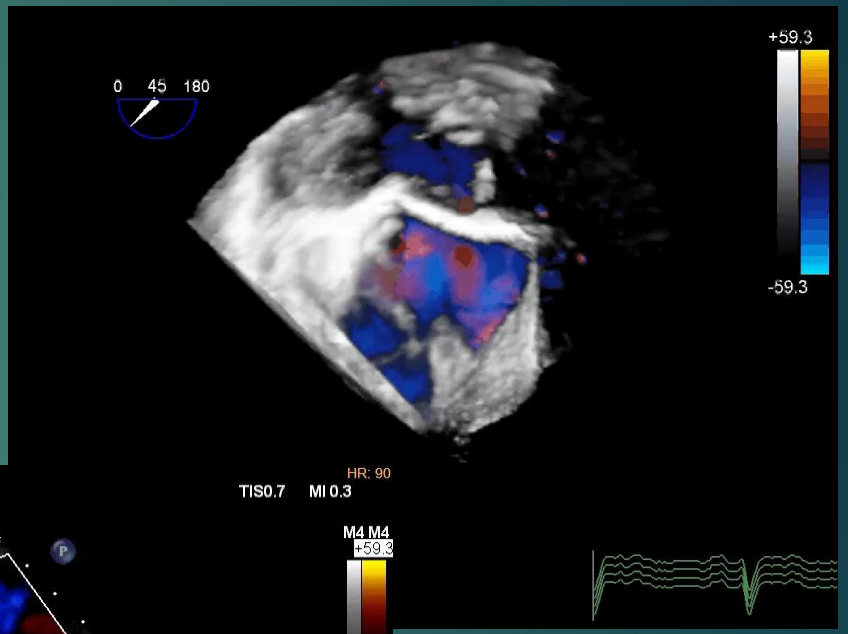
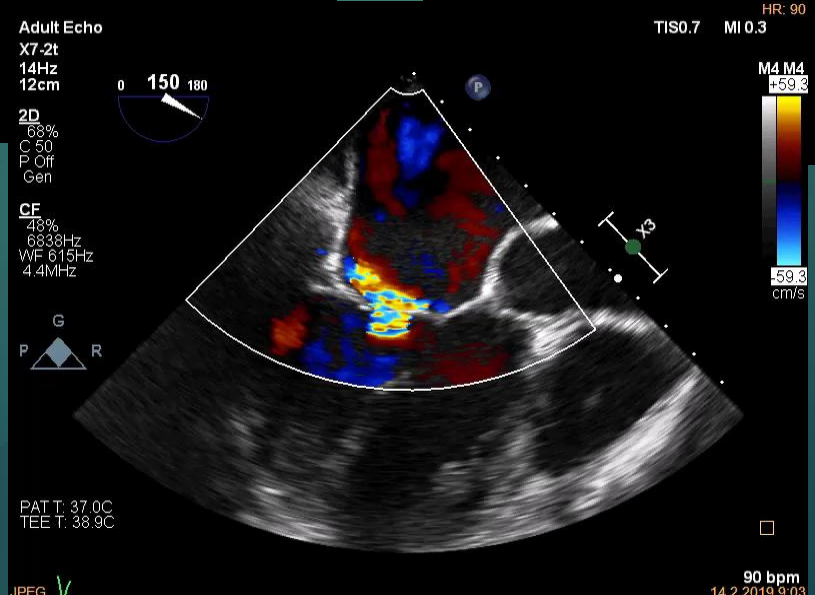
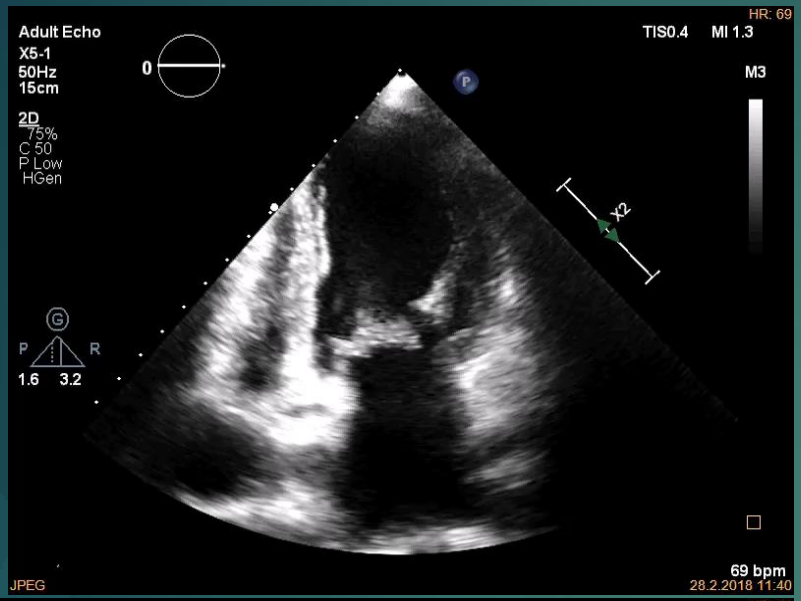
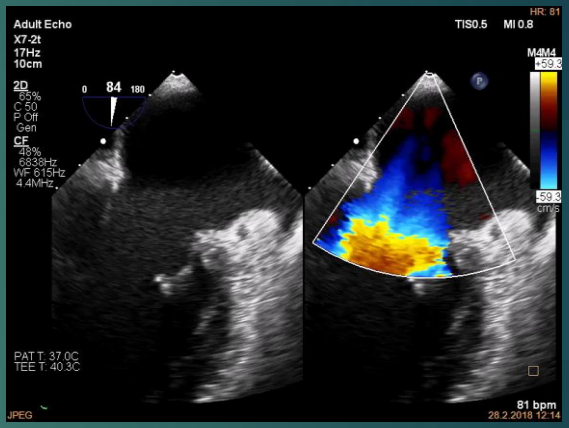

0 45 180
PHILIPS

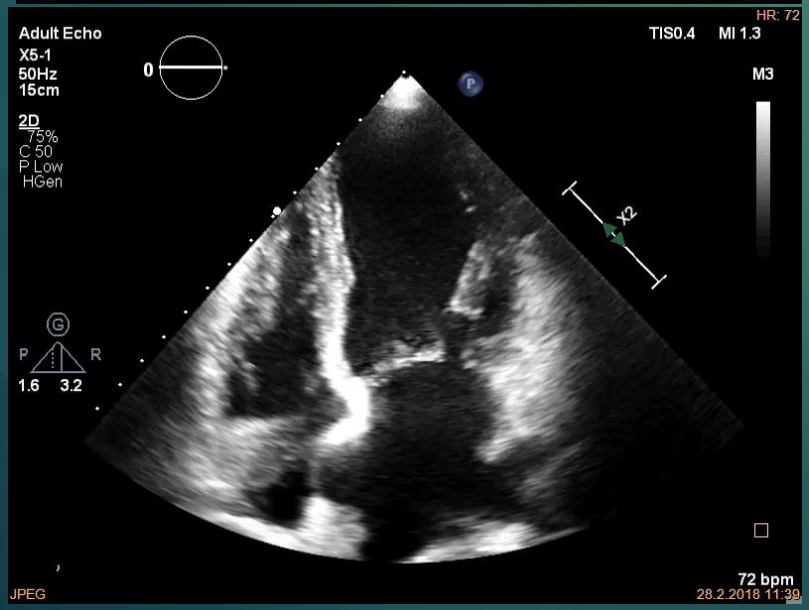

0 45 180
PHILIPS

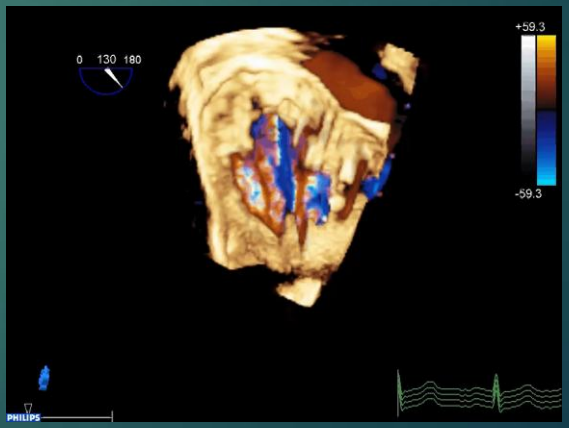

0 45 180
+59.3
-59.3
HR: 90
TIS0.7 MI 0.3


Adult Echo
X7-2t
14Hz
12cm
0 150 180
2D
68%
C 50
P Off
Gen
CF
48%
6838Hz
WF 615Hz
4.4MHz
G
P R
M4 M4
+59.3
-59.3
cm/s
X3
PAT T: 37.0C
TEE T: 38.9C
90 bpm

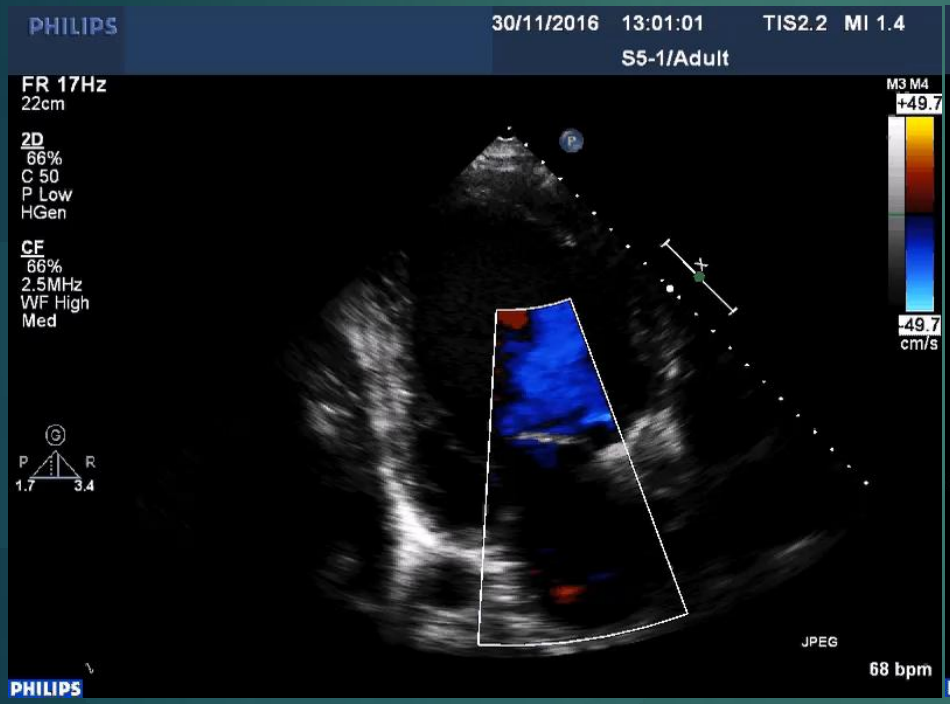

Adult Echo
X5-1
50Hz
15cm
2D
75%
C 50
P Low
HGen
HR: 69
TIS0.4
MI 1.3
M3
X2
1.6
3.2
69 bpm
28.2.2018 11:40
JPEG

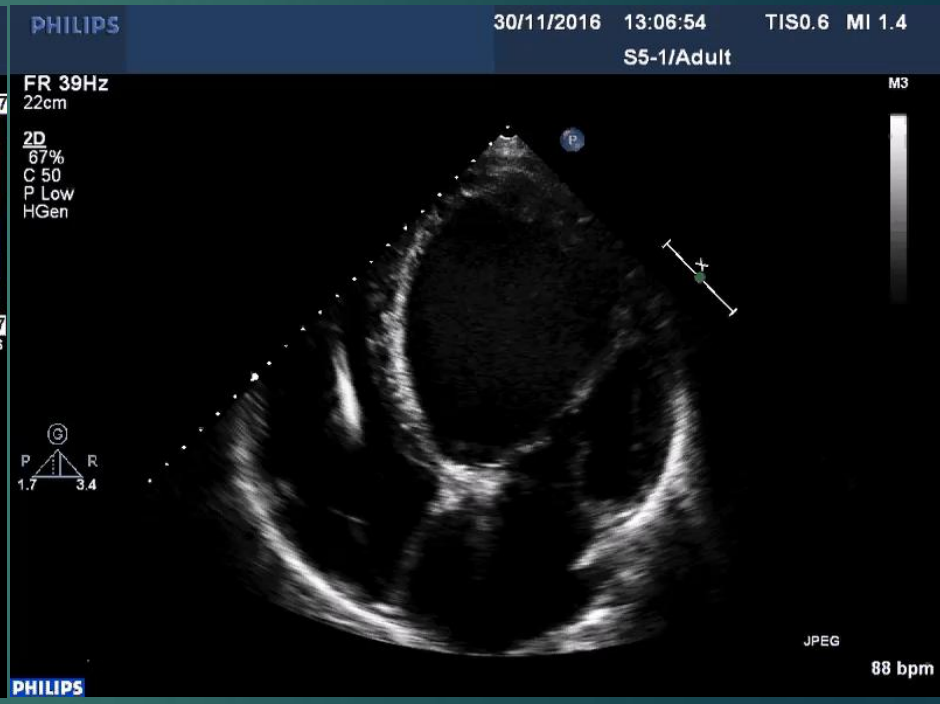

Adult Echo
X7-2t
17Hz
10cm
2D
65%
C 50
P Off
Gen
CF
48%
6838Hz
WF 615Hz
4.4MHz
HR: 81
TIS0.5
MI 0.8
84
PAT T: 37.0C
TEE T: 40.3C
81 bpm
28.2.2018 12:14
JPEG


Adult Echo
X5-1
50Hz
15cm
2D
75%
C 50
P Low
HGen
HR: 72
TIS0.4
MI 1.3
M3
X2
1.6
3.2
72 bpm
28.2.2018 11:39
JPEG


130
+59.3
-59.3
PHILIPS

Funkční MR při dysfunkci LK - tenting





Význam IMR – korelace s (nepříznivou) prognózou

- Korelace s prognózou
- 194 (64%) z 303 pt po IM mělo IMR
- IMR byla nezávislým prediktorem mortality RR 1.88; 95% CI, 1, 23 – 2, 86; P=0, 003.
- Duke Cardiovascular Databank, MR 3-4 angiograficky u 29,8% z 2057 HF pt s EF LK<40%
- Nezávislý prediktor 5-leté mortality (HR, 1.23; 95% CI, 1.13-1.34)

Grigioni F, Circulation. 2001;103:1759-64.
Trichon BH Am J Cardiol. 2003;91:538-43.

Léčba ?

- Medikamentózní léčba
- CRT-D
  - Těžká IMR se po CRT zlepší u 50% a toto zlepšení identifikuje zlepšení prognózy.
  - Ve studii 85 pacientů se srdečním selháním a IMR 3-4 se 6 měsíců zlepšilo po CRT 42 (49%).
  - U MR responderů bylo 2 leté přežití 92 versus 67% u nonresponderů (P<.001)

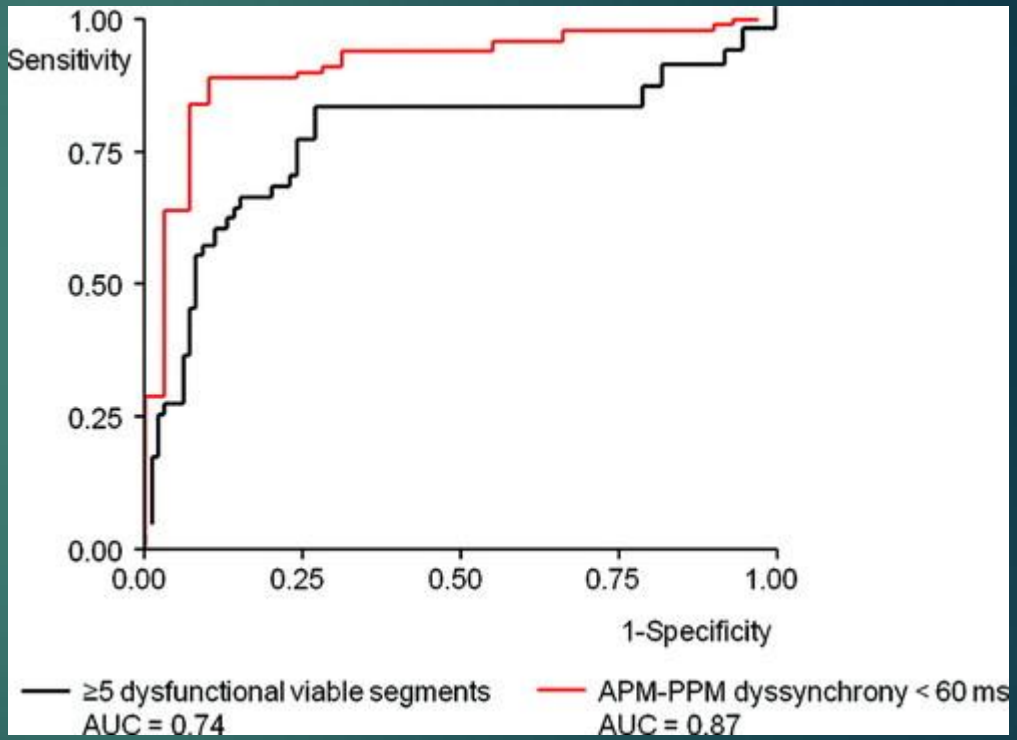
van Bommel RJ. Circulation. 2011;124:912-9.
Wu AH, J Am Coll Cardiol. 2005;45:381-7

Chirurgická korekce IMR??

- Plastika mitrální chlopně
- Chlopenní náhrada
- …LVAD, Tx srdce.
- Nebylo prokázáno, že (chirurgická) eliminace IMR vede ke zlepšení prognózy.

Prediktory zlepšení nekorigované střední IMR po CABG

- N=135 65±9 let 81% mužů
- Sledování 12 m
- 14 zemřelo
- 57 zlepšení MR (0-1)
- 64 se nezlepšilo
- Spolehlivé zlepšení střední IMR po izolovaném CABG bylo pozorováno pouze u pacientů s viabilním myokardem a v nepřítomnosti dyssynchronie papilárních svalů.



Pěnička M. Circulation 2009; 15:1474-81

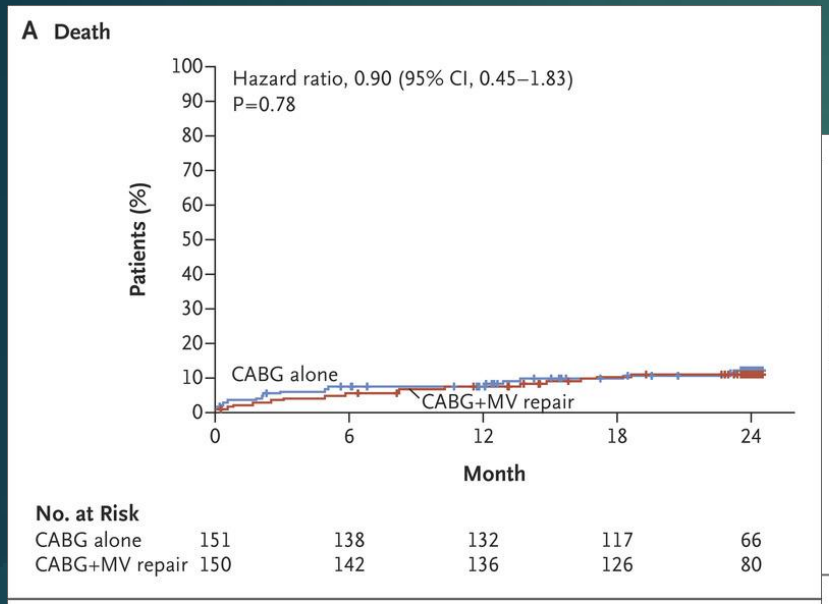
CABG +/- plastika mitrální chlopně u střední ischemické mitrální regurgitace

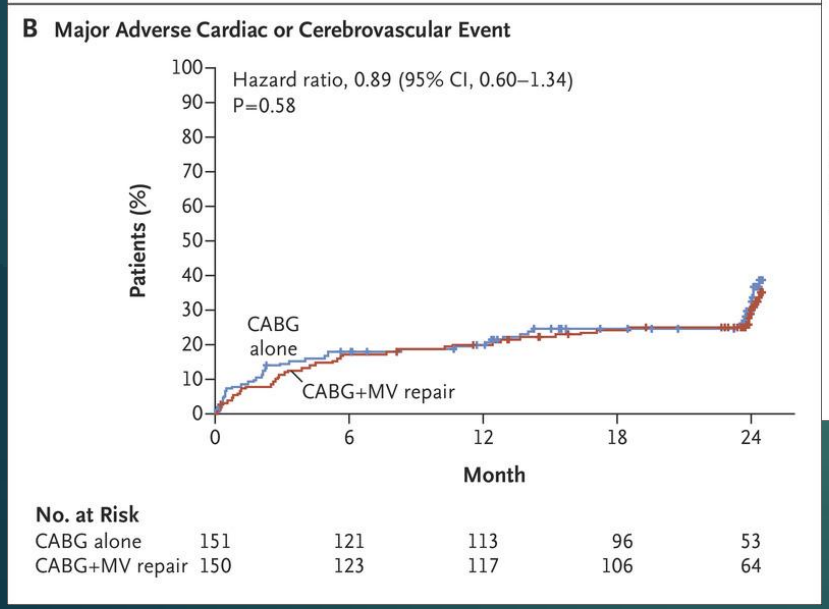
Table 1. Clinical End Points, Serious Adverse Events, and Hospitalizations.*

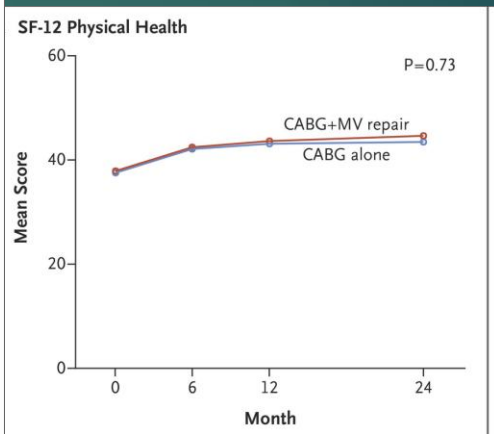
End Point or Event	From Baseline to 1 Yr			From 1 Yr to 2 Yr†			From Baseline to 2 Yr		
	CABG (N=151)	CABG plus Repair (N=150)	P Value	CABG (N=128)	CABG plus Repair (N=137)	P Value	CABG (N=151)	CABG plus Repair (N=150)	P Value
	no. of patients (%)			*no. of patients (%)*			*no. of patients (%)*		
Clinical end point									
Death	11 (7.3)	10 (6.7)	0.83	5 (3.9)	5 (3.6)	1.0	16 (10.6)	15 (10.0)	0.86
Stroke	2 (1.3)	6 (4.0)	0.17	0	0	NA	2 (1.3)	6 (4.0)	0.17
Increase of ≥1 NYHA class‡	9 (7.7)	12 (9.4)	0.63	14 (14.0)	12 (10.4)	0.42	14 (14.0)	12 (10.4)	0.42
Rehospitalization for heart failure	20 (13.2)	22 (14.7)	0.72	6 (4.7)	6 (4.4)	0.90	22 (14.6)	26 (17.3)	0.51
Mitral-valve surgery after index procedure	0	2 (1.3)	0.25	2 (1.6)	0	0.23	2 (1.3)	2 (1.3)	1.0
LVAD or heart transplantation	1 (0.7)	4 (2.7)	0.21	0	1 (0.7)	1.0	1 (0.7)	4 (2.7)	0.21
Composite MACCE end point	38 (25.2)	38 (25.3)	0.97	24 (18.8)	19 (13.9)	0.28	48 (31.8)	46 (30.7)	0.83
	no. of events (no./100 patient-yr)			*no. of events (no./100 patient-yr)*			*no. of events (no./100 patient-yr)*		
Serious adverse events									
Any	158 (118.9)	192 (141.1)	0.11	42 (40.0)	43 (36.0)	0.63	200 (84.0)	235 (92.0)	0.35
Heart failure	30 (22.6)	31 (22.8)	0.97	9 (8.6)	9 (7.5)	0.79	39 (16.4)	40 (15.7)	0.84
Neurologic dysfunction									
Any	4 (3.0)	14 (10.3)	0.02	0	0	NA	4 (1.7)	14 (5.5)	0.02
Stroke	2 (1.5)	7 (5.1)	0.10	0	0	NA	2 (0.8)	7 (2.7)	0.11
Myocardial infarction									
Nonperioperative	1 (0.8)	1 (0.7)	0.99	1 (1.0)	0	0.32	2 (0.8)	1 (0.4)	0.53
Perioperative	1 (0.8)	0	0.32	0	0	NA	1 (0.4)	0	0.32
Renal failure	4 (3.0)	4 (2.9)	0.97	3 (2.9)	2 (1.7)	0.56	7 (2.9)	6 (2.3)	0.69
Bleeding	4 (3.0)	2 (1.5)	0.40	2 (1.9)	0	0.16	6 (2.5)	2 (0.8)	0.14
Arrhythmia									
Supraventricular	11 (8.3)	24 (17.6)	0.03	0	0	NA	11 (4.6)	24 (9.4)	0.04
Ventricular	5 (3.8)	2 (1.5)	0.25	0	2 (1.7)	0.16	5 (2.1)	4 (1.6)	0.66
Localized infection	19 (14.3)	18 (13.2)	0.81	3 (2.9)	7 (5.9)	0.28	22 (9.2)	25 (9.8)	0.84
Endocarditis	0	2 (1.5)	0.16	1 (1.0)	0	0.32	1 (0.4)	2 (0.8)	0.60
Sepsis	7 (5.3)	9 (6.6)	0.65	0	0	NA	7 (2.9)	9 (3.5)	0.72
Respiratory failure	8 (6.0)	10 (7.3)	0.67	1 (1.0)	0	0.32	9 (3.8)	10 (3.9)	0.94
Hospitalization									
Any readmission	96 (75.2)	89 (68.6)	0.54	37 (35.4)	40 (33.8)	0.83	133 (57.3)	129 (52.0)	0.43
Readmission for cardiovascular causes	51 (40.0)	46 (35.5)	0.56	20 (19.2)	18 (15.2)	0.48	71 (30.6)	64 (25.8)	0.32

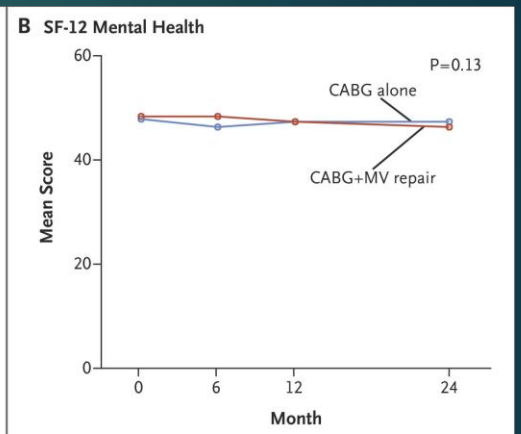
* CABG denotes coronary-artery bypass grafting, LVAD left ventricular assist device, MACCE major adverse cardiac or cerebrovascular event, NA not applicable, and NYHA New York Heart Association.
† During the period from 1 year to 2 years, the number of patients includes all those with MACCE, which was defined as death, stroke, subsequent mitral-valve surgery, hospitalization for heart failure, or worsening New York Heart Association class. Excluded from the number of patients who were evaluated were patients who died, withdrew, or were lost to follow-up by 1 year. Several patients had events both before and after 1 year. In the CABG-alone group, 10 of 14 patients with worsening NYHA class had their first event after 1 year, 2 of 6 patients were readmitted to the hospital for heart failure for the first time after 1 year, and 13 of 24 with MACCE had their first event after 1 year. In the combined-procedure group, the numbers of patients were 6 of 12 for worsening NYHA class, 4 of 6 for hospital readmission, and 11 of 19 with MACCE. In the combined-procedure group, 1 patient received an LVAD during year 1 and underwent heart transplantation in year 2.
‡ Changes in the NYHA class were evaluated in 117 patients in the CABG group and in 127 patients in the combined-procedure group at 1 year and in 100 patients and 115 patients, respectively, at 2 years.

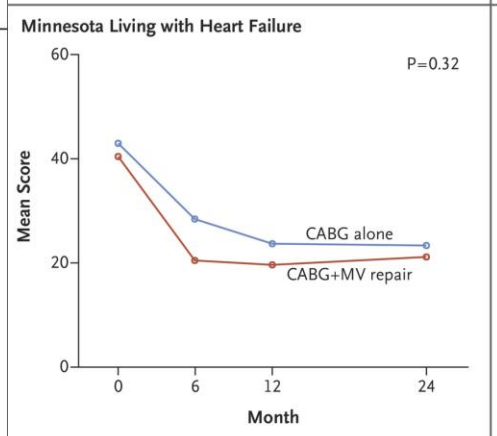
Michler RE. N Engl J Med. 2016;374:1932-41.

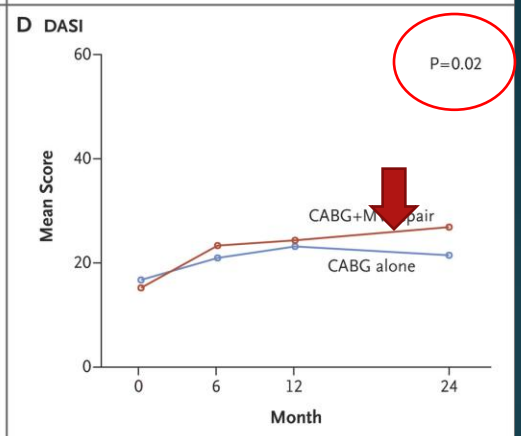










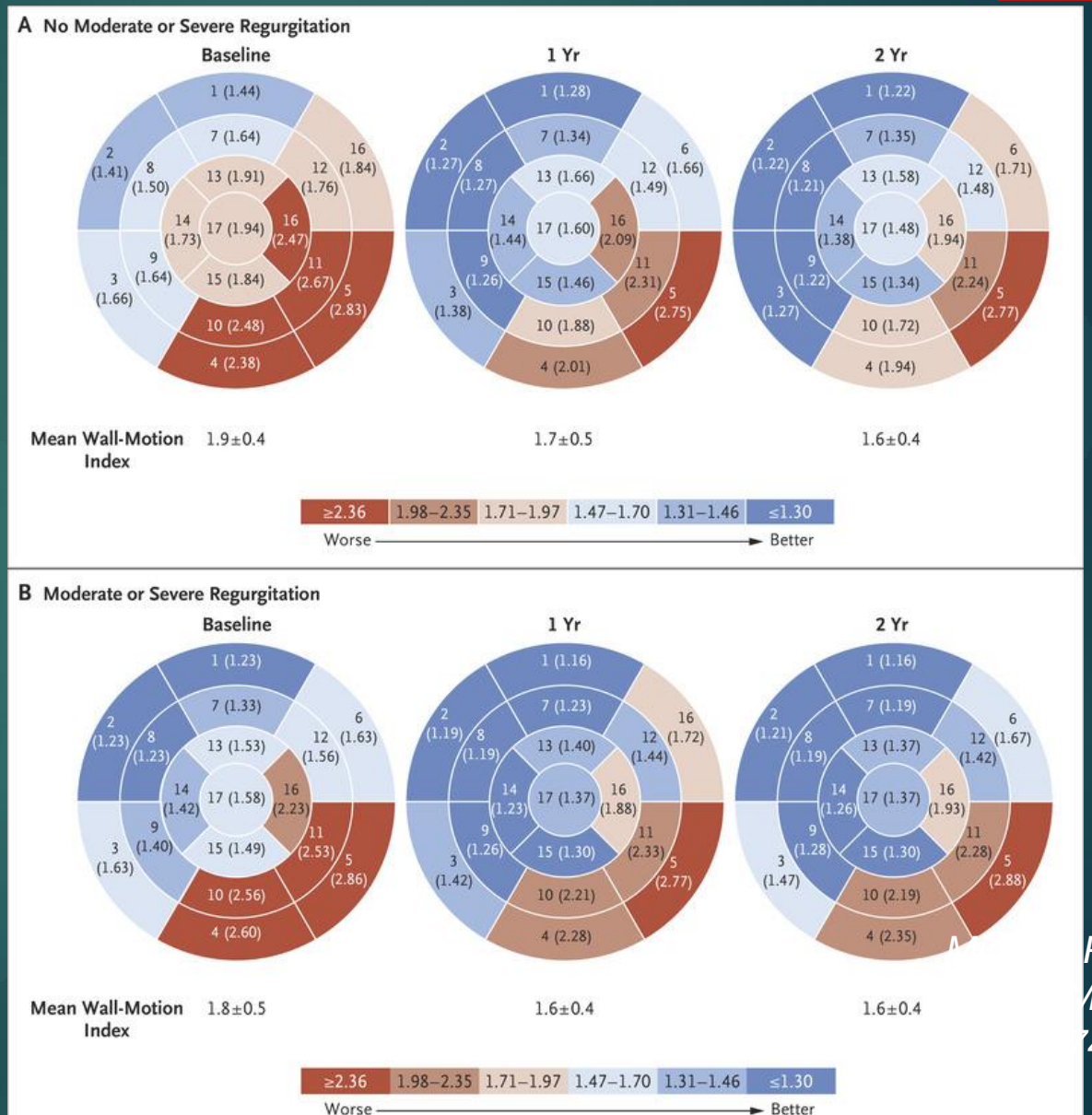


Vyšší DASI skóre ~zvýšená schopnost vykonávat úkony s vyššími metabolickými nároky

Michler RE. N Engl J Med. 2016;374:1932-41.

Větší zlepšení kinetiky spojeno s absencí střední/těžké MR

- Bez rozdílu ve stupni reverzní remodelace mezi oběma skupinami



RE. N Med. 4:1932-

Plastika vs. náhrada mitrální chlopně (a zachování subvalvulárního aparátu) u těžké ischemické mitrální regurgitace s nebo bez CABG 2 leté výsledky

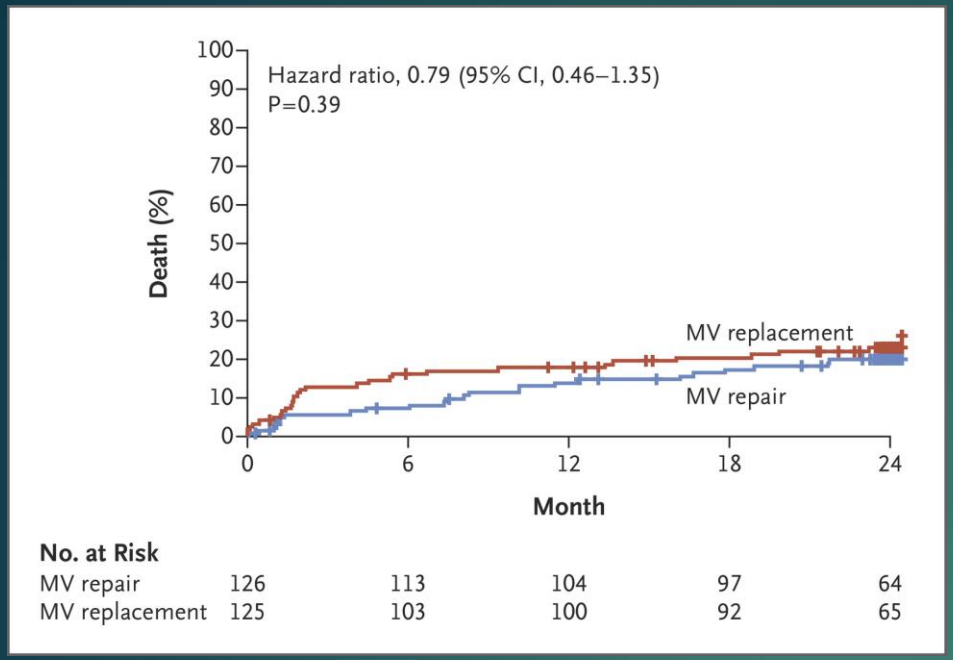
Table 1. Clinical End Points, Serious Adverse Events, and Hospitalizations at 2 Years.

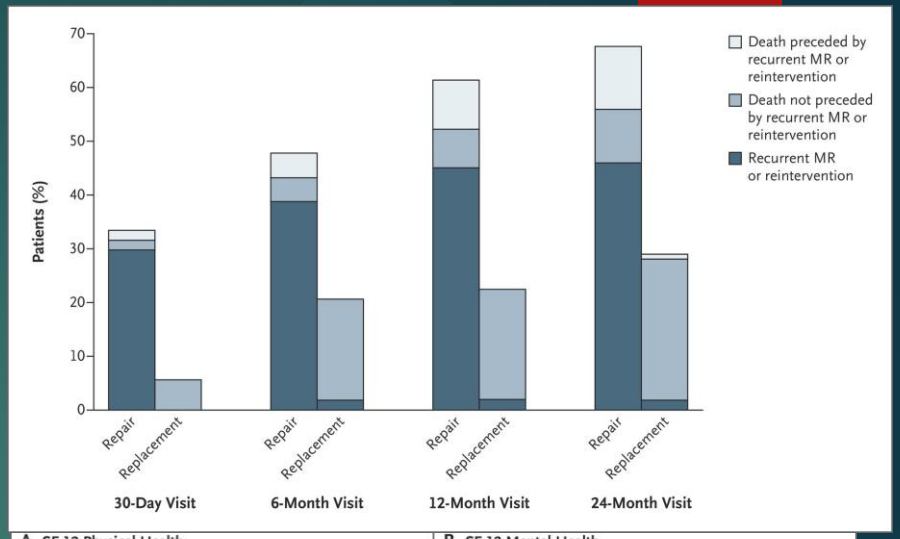
Variable	Repair (N=126)	Replacement (N=125)	P Value*
	no./total no. of patients (%)		
Clinical end point			
Death	24/126 (19.0)	29/125 (23.2)	0.42
Stroke	10/126 (7.9)	7/125 (5.6)	0.46
Worsening New York Heart Association class†	5/85 (5.9)	5/84 (6.0)	1.0
Rehospitalization for heart failure	27/126 (21.4)	22/125 (17.6)	0.44
Failed index mitral-valve procedure	6/126 (4.8)	0	0.03
Mitral-valve reoperation	4/126 (3.2)	1/125 (0.8)	0.37
Moderate or severe recurrent mitral regurgitation	57/97 (58.8)	3/79 (3.8)	<0.001
MACCE‡	53/126 (42.1)	53/125 (42.4)	0.96
Canadian Cardiovascular Society class III or IV	4/82 (4.9)	0/80	0.19
	no. of events (rate/100 patient-yr)		
Serious adverse event			
Any event	291 (145.6)	247 (129.8)	0.18
Heart failure	48 (24.0)	29 (15.2)	0.05
Neurologic dysfunction	19 (9.5)	10 (5.3)	0.12
Stroke	12 (6.0)	6 (3.2)	0.19
Other condition	7 (3.5)	4 (2.1)	0.41
Myocardial infarction			
Nonperioperative	5 (2.5)	1 (0.5)	0.11
Perioperative	0	2 (1.1)	0.16
Renal failure	6 (3.0)	11 (5.8)	0.19
Bleeding	7 (3.5)	10 (5.3)	0.41
Arrhythmia			
Supraventricular	26 (13.0)	19 (10.0)	0.38
Ventricular	12 (6.0)	17 (8.9)	0.29
Localized infection	25 (12.5)	29 (15.2)	0.47
Endocarditis	0	2 (1.1)	0.16
Sepsis	12 (6.0)	6 (3.2)	0.19
Respiratory failure	14 (7.0)	19 (10.0)	0.31
Hospitalization			
Rehospitalization	152 (78.9)	121 (66.0)	0.14
Readmission for cardiovascular event	93 (48.3)	59 (32.2)	0.01

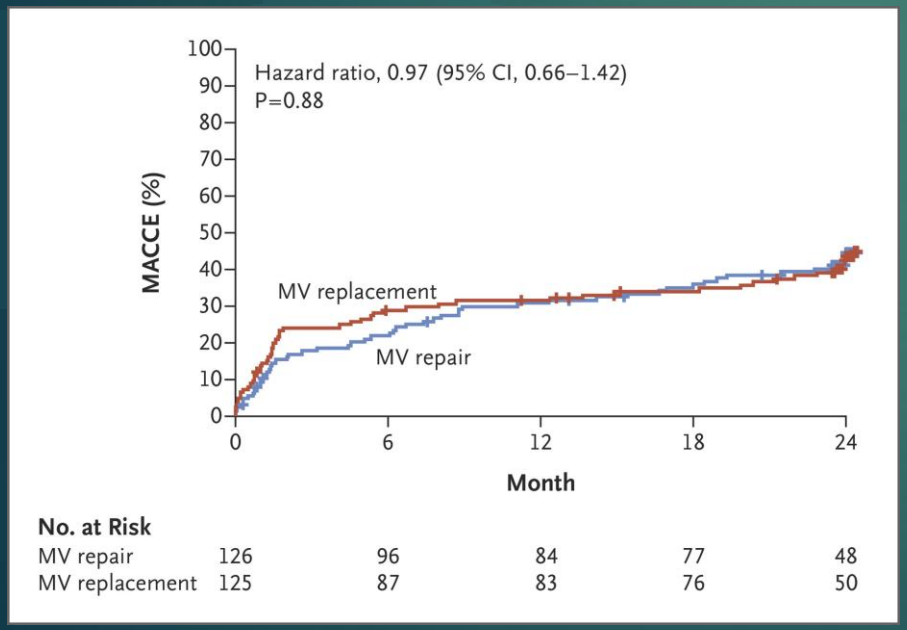
* P values were calculated by means of the chi-square test or Fisher's exact test for the clinical end points and Poisson

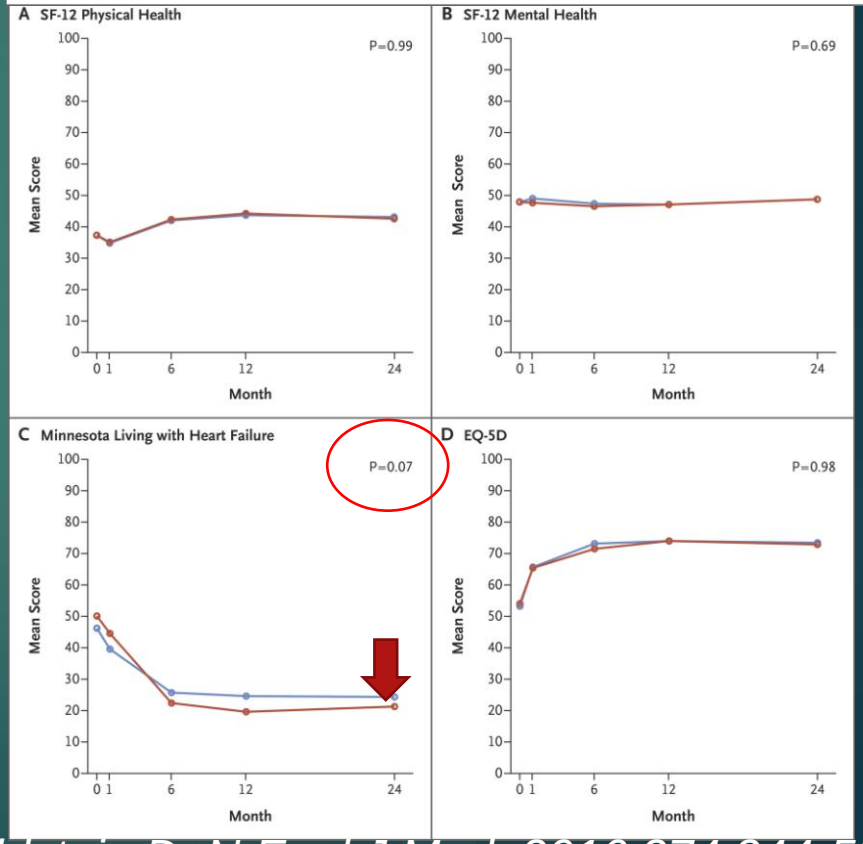
- V obou skupinách došlo k reverzní remodelaci LK – bez rozdílu dle způsobu korekce.
- Recidiva střední/těžké MR častěji ve skupině MV plastik (58.8% vs. 3.8%, P<0.001).
- Ve skupině plastik bylo více příhod souvisejících se srdečním selháním (P=0.05)
- a rehospitalizací (P=0.01).

Goldstein D, N Engl J Med. 2016;374:344-53.









Goldstein D, N Engl J Med. 2016;374:344-53.

Chirurgická korekce IMR

- STS databáze 2016:
  - 2885 podstoupilo CABG a náhradu mitrální chlopně

    s 9, 5% 30-denní operační mortalitou
  - 3464 podstoupilo CABG a plastiku mitrální chlopně

    s 4, 6% mortalitou.

D'Agostino RS, Ann Thorac Surg. 2018;105:15-23.

Klasifikace sekundární/ funkční mitrální regurgitace

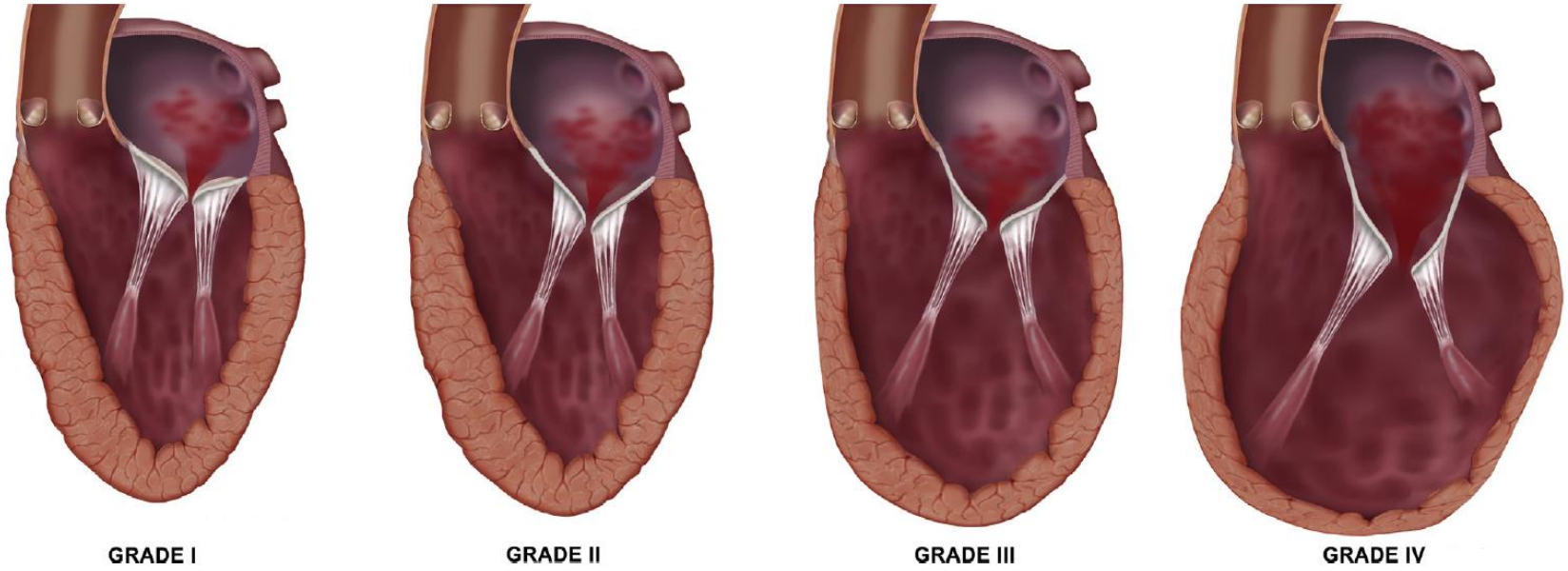


TABLE 2. Pathoanatomic classification of secondary mitral regurgitation

Grade	Annular dilatation	Ejection fraction (%)	Leaflet tethering
1	Mild to moderate (3-4 cm)	>45	Mild (<5 mm)
2	Moderate to severe (4-5 cm)	35-45	Moderate (5-10 mm)
3	Severe (>5 cm)	25-35	Severe (>10 mm)
4	Severe (>5 cm)	<25 or presence of inferobasal dysfunction	Severe (>10 mm)

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Klasifika itace

TABLE 3. Pathoanatomic management of secondary mitral regurgitation

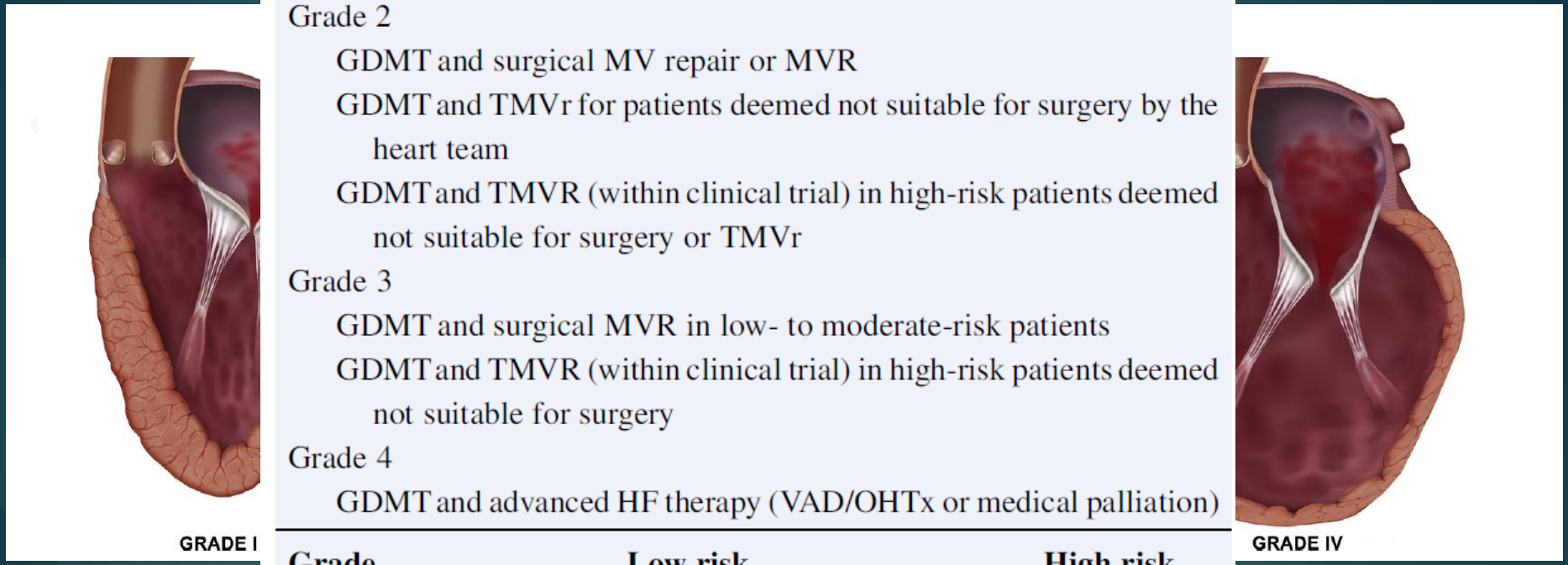
Grade 1
- GDMT and surgical MV repair in setting of concomitant operations in low- to moderate-risk patients
- GDMT and TMVr for patients deemed not suitable for surgery by the heart team

Grade 2
- GDMT and surgical MV repair or MVR
- GDMT and TMVr for patients deemed not suitable for surgery by the heart team
- GDMT and TMVR (within clinical trial) in high-risk patients deemed not suitable for surgery or TMVr

Grade 3
- GDMT and surgical MVR in low- to moderate-risk patients
- GDMT and TMVR (within clinical trial) in high-risk patients deemed not suitable for surgery

Grade 4
- GDMT and advanced HF therapy (VAD/OHTx or medical palliation)

Grade	Low risk	High risk
1	MVr ± CABG	TMVr
2	MVR ± CABG	TMVr or TMVR
3	TMVR	
4	VAD/OHTx	



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Závěr

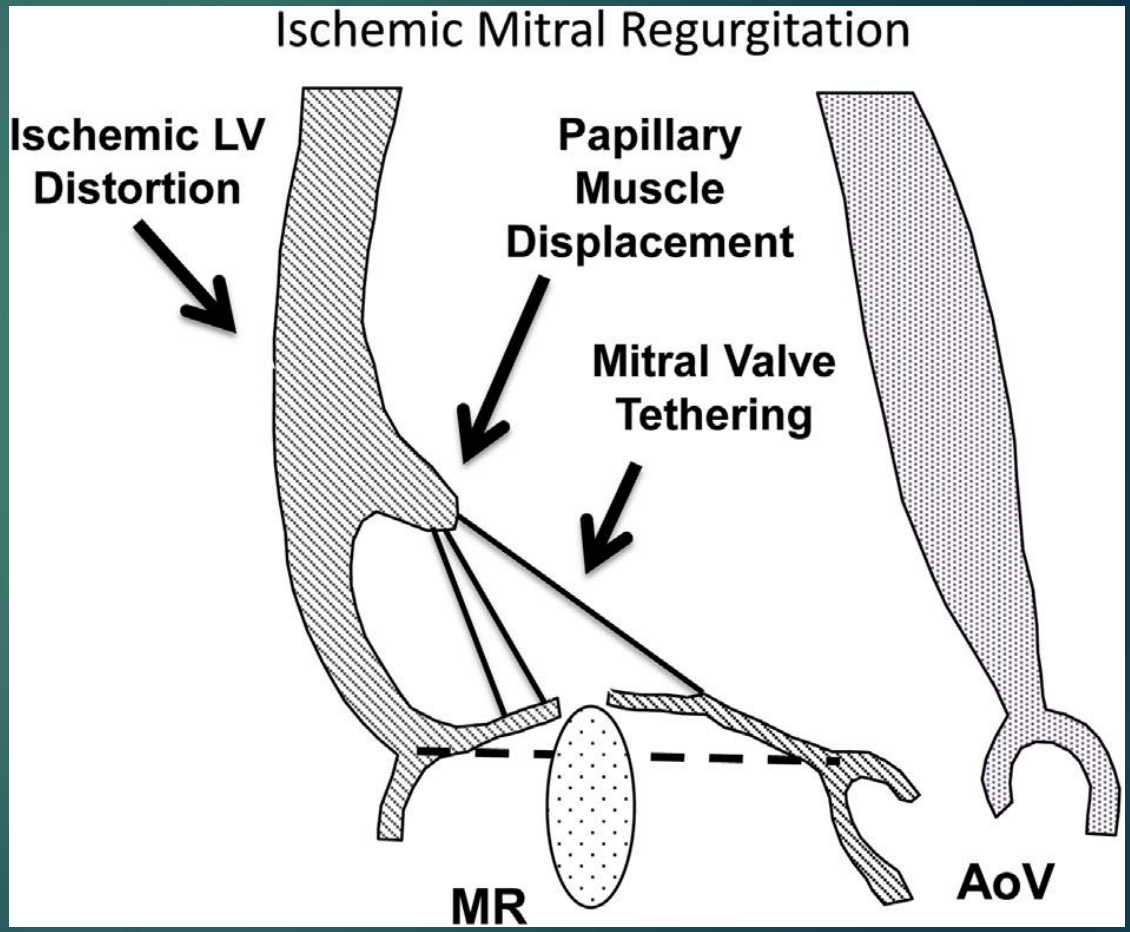
- U sekundární MR není prokázán vliv chirurgické intervence na mortalitu.
- U těžké IMR je indikována korekce při revaskularizaci.
- Pokud neni indikována revaskularizace, je u těžké IMR indikace k chirurgické korekci u pacientů symptomatických navzdory optimální léčbě dle guidelines a s nízkým /středním operačním rizikem.

  Náhrada vs. plastika - dle posouzení operatéra

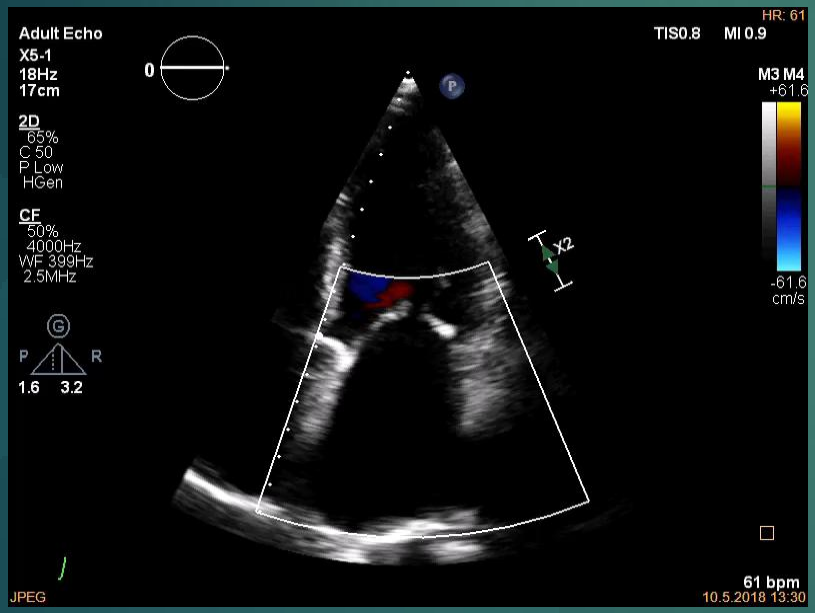
  - Náhrada při těžké dilataci LK a aneurysmatu spodní stěny, se zachováním kompletního papilárního aparátu
  - Plastika kompletním rigidním undersized ringem

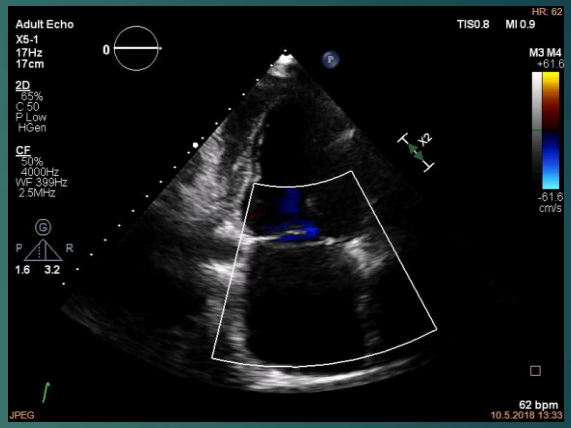
Ischemická mitrální regurgitace

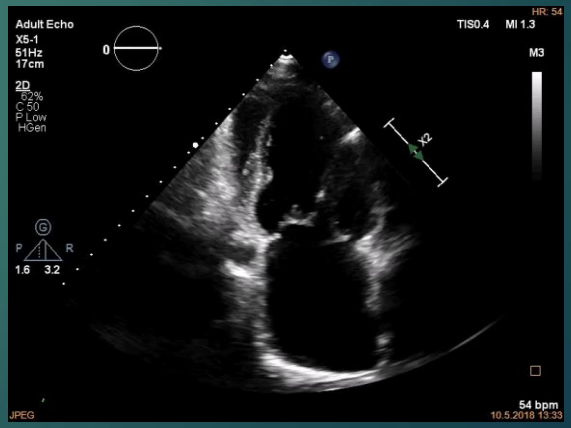
- Dislokace cípů
  - tah – tethering cípů dané remodelací levé komory po ischemickém inzultu – posteromediální a apikální posun papilárních svalů – tenting a restrikce volných okrajů cípů a omezená koaptace
  - Napětí sekundárních chord vede k seagull/hockey sign
  - Dislokace obou skupin papilárních svalů, obvykle více zadních, proto nejagresivnější tethering P3
  - U zadního IM – nejlépe patrný tethering P3 – excentrický posteriorně, laterálně orientovaný jet
  - IM v povodní RIA – více centrální jet , globální remodelace, tethering difuzněji, centrální jet
  - Prodloužení a prolaps cípů vzácně



Kron, Guidelines AATS, 2016


Adult Echo
X5-1
18Hz
17cm
2D
65%
C 50
P Low
HGen
CF
50%
4000Hz
WF 399Hz
2.5MHz
1.6 3.2
HR: 61
TIS0.8 MI 0.9
M3 M4
+61.6
-61.6
cm/s
61 bpm
10.5.2018 13:30
JPEG


Adult Echo
X5-1
17Hz
17cm
2D
65%
C 50
P Low
HGen
CF
50%
4000Hz
WF 399Hz
2.5MHz
1.6 3.2
HR: 62
TIS0.8 MI 0.9
M3 M4
+61.6
-61.6
cm/s
62 bpm
10.5.2018 13:33
JPEG


Adult Echo
X5-1
51Hz
17cm
2D
62%
C 50
P Low
HGen
1.6 3.2
HR: 54
TIS0.4 MI 1.3
M3
54 bpm
10.5.2018 13:33
JPEG