Ablace fibrilace síní přispívá ke zmenšení mitrální regurgitace

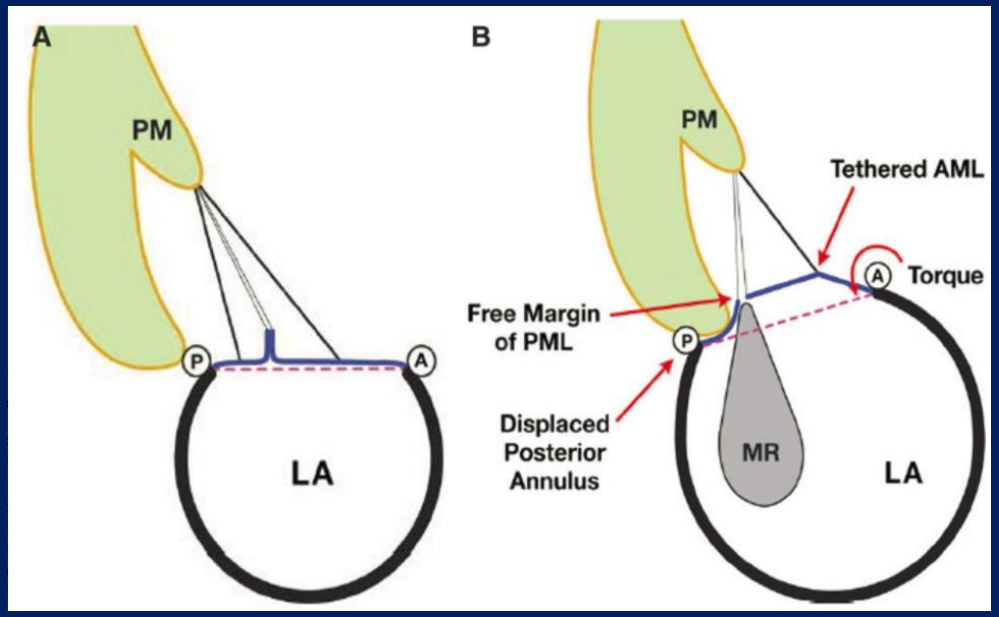
Jan Škoda

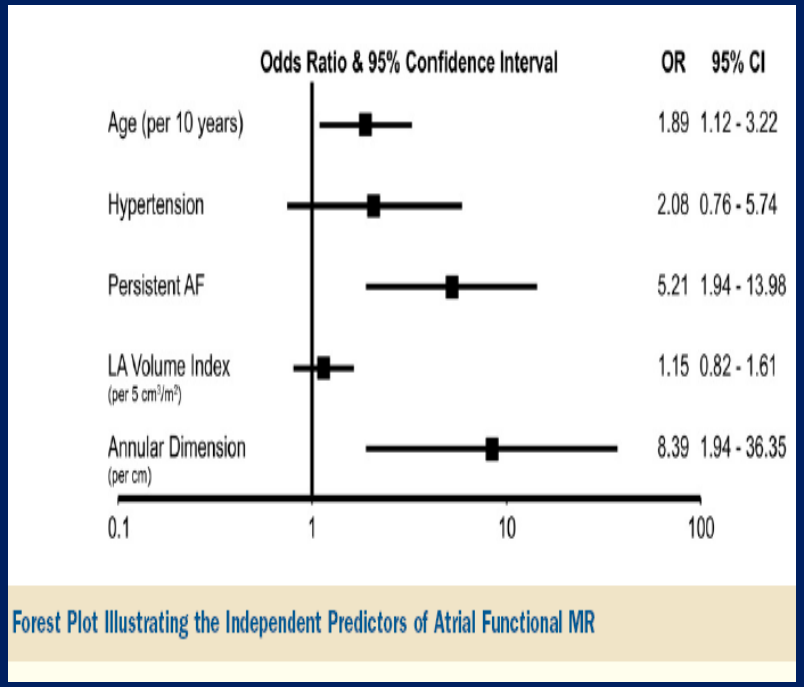
Nemocnice Na Homolce

Mechanismy zhoršení sekundární MR při fibrilaci síní

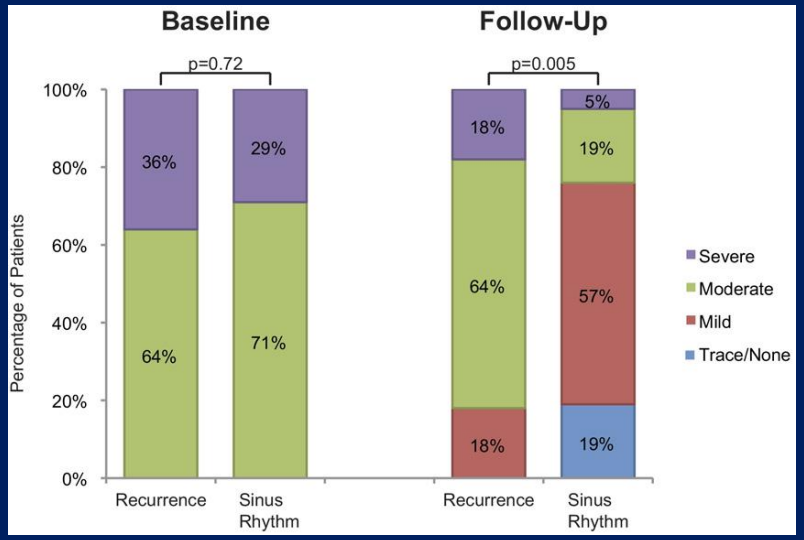
- atriální myopatie
- strukturální síňová remodelace (atriální a anulární dilatace, fibrotizace, prozánětlivé a neurohumorální změny)
- elektrofyziologické změny a autonomní dysregulace
- ventrikulární myopatie (displacement papilárních svalů, progrese systolické/diastolické dysfunkce, rychlá komorová odpověď FiS, síňokomorová asynchronie)

Atriální funkční mitrální reg.





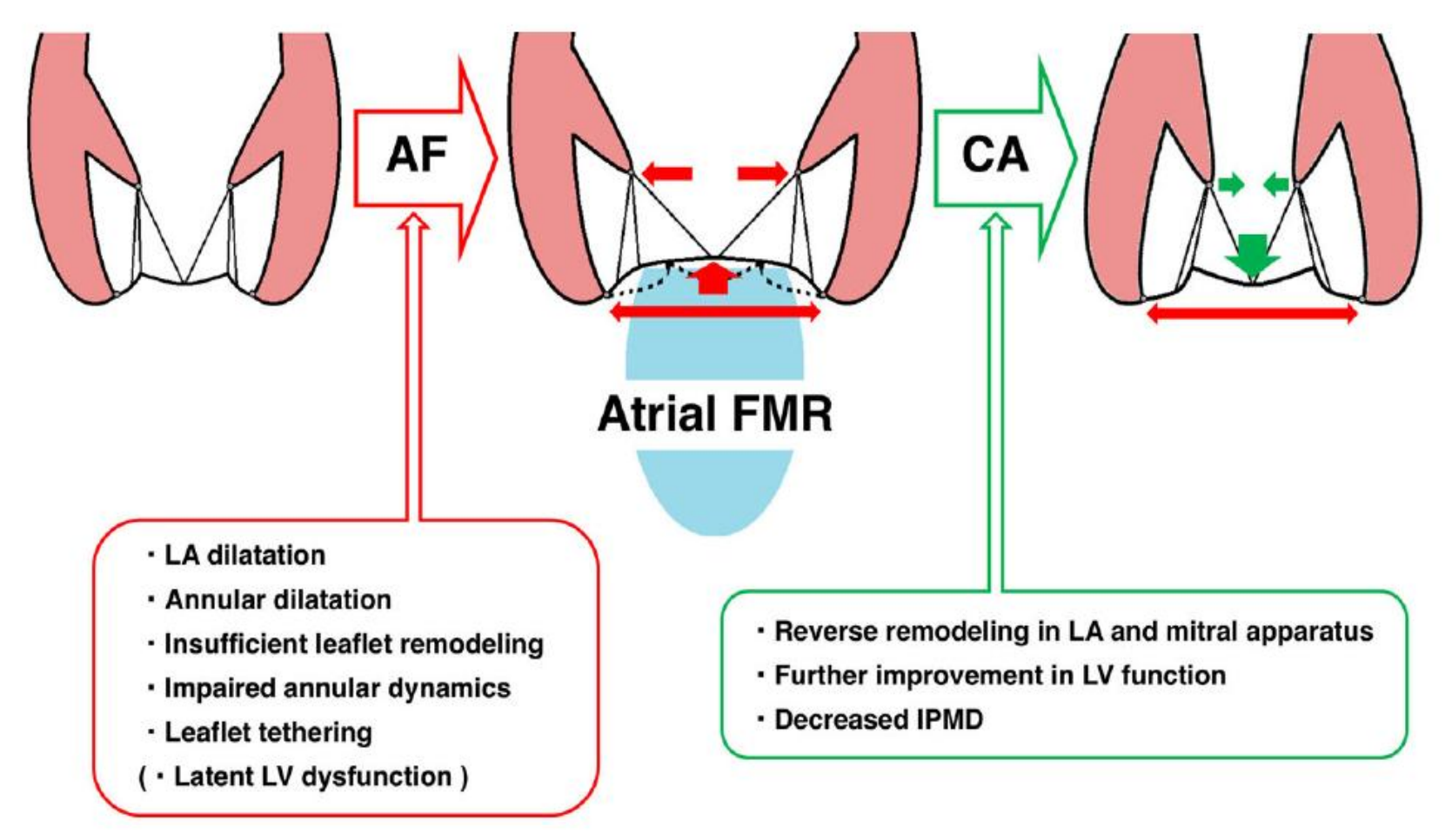
Forest Plot Illustrating the Independent Predictors of Atrial Functional MR



Gertz *et al.*
Atrial Functional MR Due to AF

JACC Vol. 58, No. 14, 2011
September 27, 2011:1474–81

Mechanismy zhoršení sekundární MR při fibrilaci síní



Tsujisaka Y, *J Card Surg*. 2022;37:314-321.

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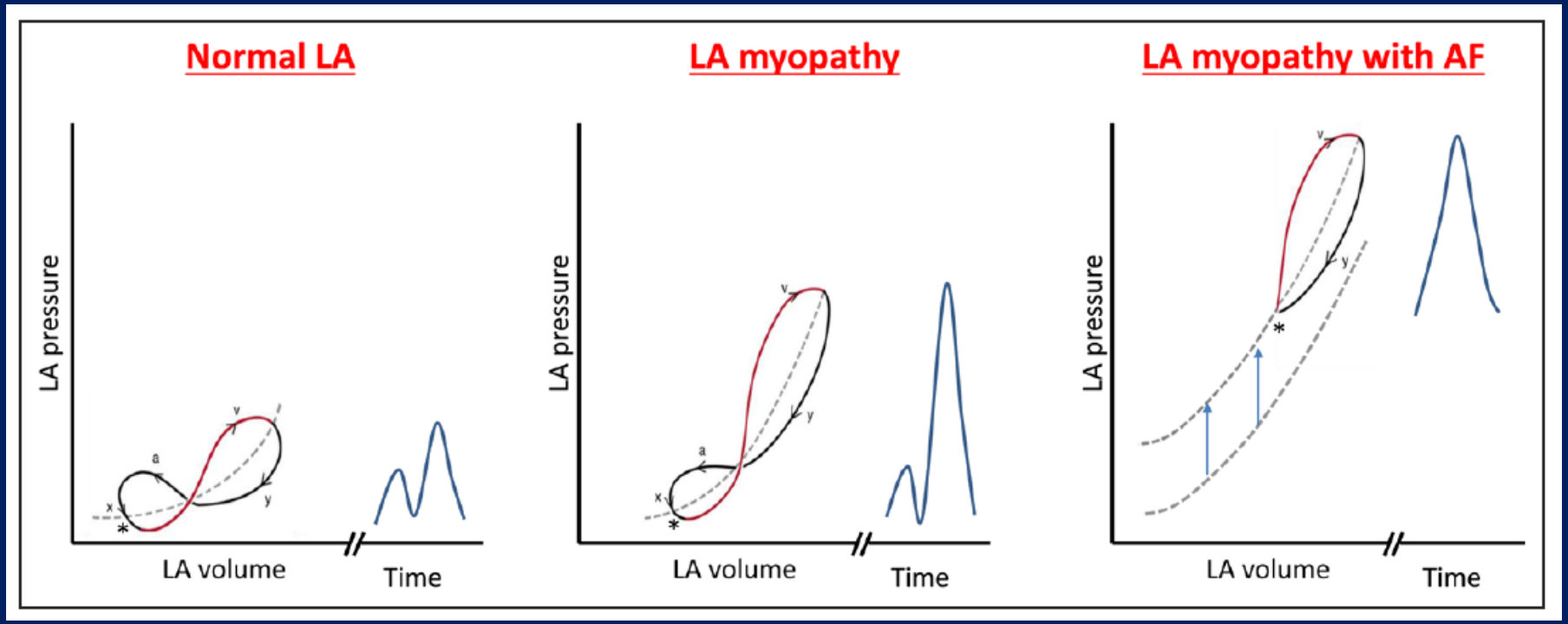
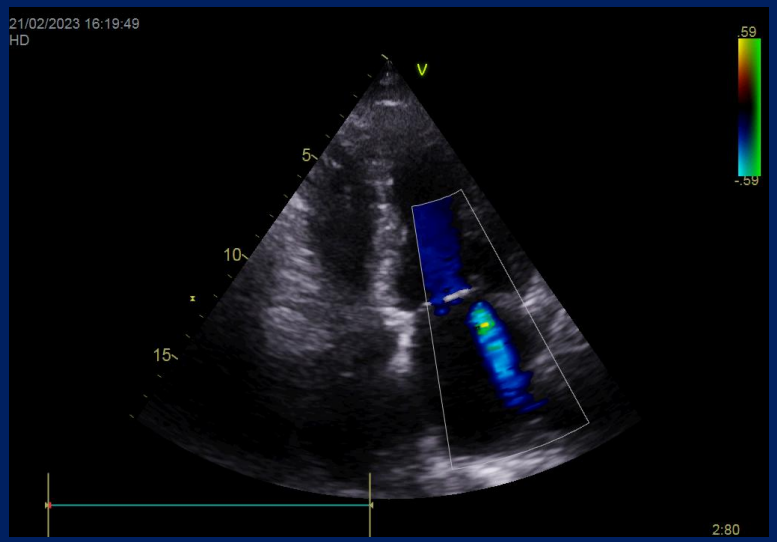
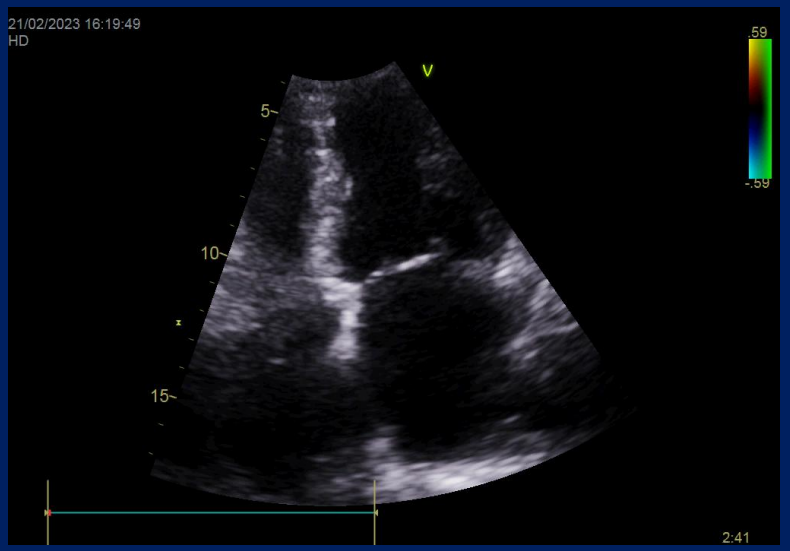
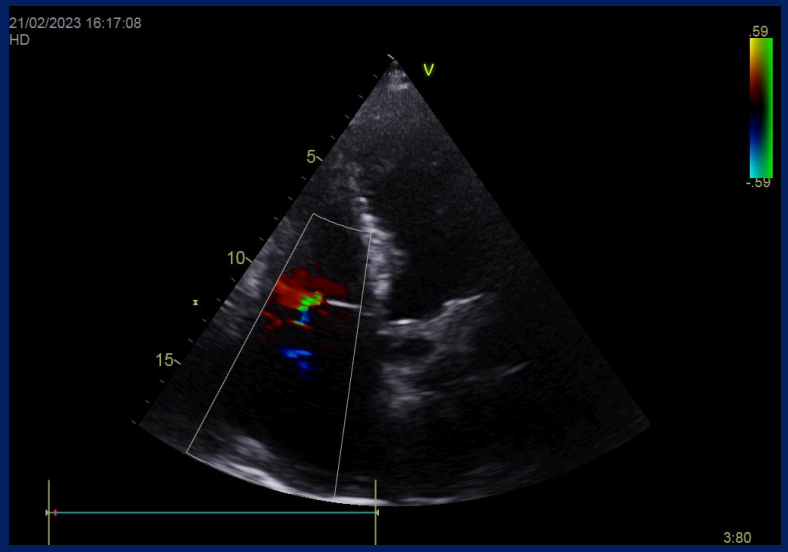


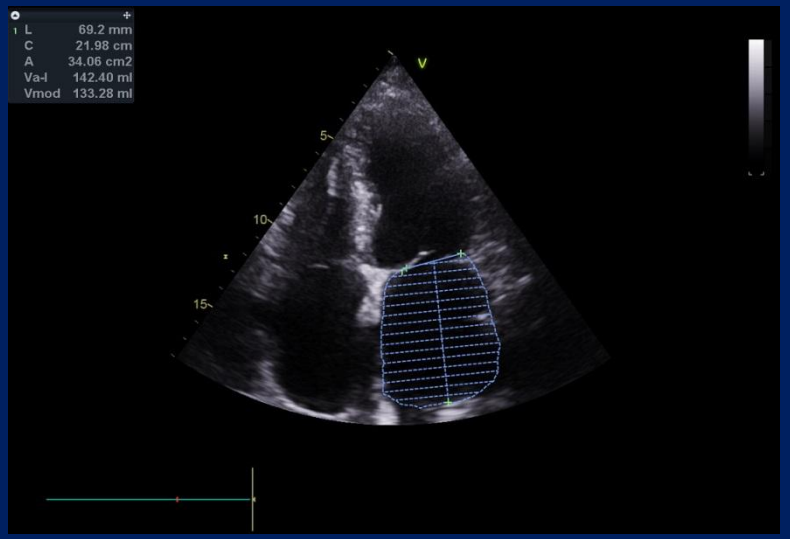
Reddy et al *Circulation*. 2022;146:339–357.

Dlouhodobě perzist FiS - sekundární MR









Katetrizační ablace FiS: regrese sekundární MR

ESC HEART FAILURE
ESC Heart Failure 2022; **9**: 1901–1913
Published online 15 March 2022 in Wiley Online Library (wileyonlinelibrary.com) **DOI:** 10.1002/ehf2.13896

ORIGINAL ARTICLE

Influence of catheter ablation for atrial fibrillation on atrial and ventricular functional mitral regurgitation

Masaharu Masuda*, Kimiko Sekiya, Mitsutoshi Asai, Osamu Iida, Shin Okamoto, Takayuki Ishihara, Kiyonori Nanto, Takashi Kanda, Takuya Tsujimura, Yasuhiro Matsuda, Yosuke Hata, Hiroyuki Uematsu, Taku Toyoshima, Naoko Higashino and Toshiaki Mano

Kansai Rosai Hospital Cardiovascular Center, Amagasaki, Japan

- retrospektivní unicentr. analýza po 1. RFA-IPV perzist FiS n=513
- ukončení elKV a mapování voltáže (Carto-STcool, Penta, LassoN)
- lehká-střední- závažná funkční MR (2-3-4/4)
- AFMR (dilatace LA n=136) VFMR (EFLK do 40% n=31)
- monitorace FiS, echo: zlepšení o 1st během 6M

Baseline charakteristika

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	AFMR (n = 136)	VFMR (n = 31)	P
Age, years	70.0 ± 7.9	66.3 ± 10.2	0.063
Male, n (%)	82 (60)	23 (74)	0.15
Body mass index, kg/m^2	23.1 ± 3.6	22.8 ± 2.5	0.57
Systolic blood pressure, mmHg	124 ± 15	113 ± 14	<0.0001
AF history			
Duration	11 (7, 16)	7 (4, 12)	0.009
Long-standing persistent AF[a], n (%)	27 (20)	2 (7)	0.057
Coronary artery disease, n (%)	17 (13)	3 (10)	0.47
Hypertension, n (%)	74 (54)	11 (36)	0.057
Diabetes mellitus, %	19 (14)	6 (19)	0.45
History of symptomatic heart failure, n (%)	45 (33)	23 (74)	<0.0001
History of stroke, n (%)	11 (8)	6 (19)	0.061
CHA_2DS_2 VASc score	2.7 ± 1.4	2.8 ± 1.7	0.68
Heart rate, beats per minute	89 ± 22	105 ± 30	0.004
Haemoglobin, g/dL	13.9 ± 1.5	14.4 ± 1.7	0.21
eGFR, mL/min/1.73 m^2	60.0 ± 16.5	59.2 ± 21.3	0.84
NT-pro BNP, pg/mL	895 (664, 1577)	1509 (850, 3166)	0.12
Echocardiography			
LA volume, mL	82.8 ± 28.4	102.4 ± 33.5	0.004
LA volume index, mL/m^2	50.9 ± 18.7	63.0 ± 23.2	0.010
Anterior–posterior mitral annular diameter, mm	34.8 ± 3.6	36.7 ± 5.5	0.067
Medical-lateral mitral annular diameter, mm	36.5 ± 3.5	39.6 ± 4.4	<0.0001
Mitral valve leaflet motion			<0.0001
Normal, n (%)	132 (97)	20 (65)	
Restricted, n (%)	4 (3)	11 (36)	
Mitral valve tethering height, mm	4.1 ± 1.8	7.0 ± 3.2	<0.0001
Tricuspid valve regurgitation			
Severity grade, n (%)			0.20
None or trivial	18 (13)	2 (7)	
Mild	77 (57)	22 (71)	
Moderate	38 (28)	5 (16)	
Severe	3 (2)	2 (7)	
Pressure gradient[b]	25.4 ± 6.8	25.1 ± 6.4	0.83
LV ejection fraction, %	59.8 ± 8.3	29.2 ± 6.6	<0.0001
LV diastolic diameter, mm	46.7 ± 6.1	55.8 ± 8.4	<0.0001
LV diastolic diameter index, mm/m^2	28.6 ± 4.3	34.1 ± 5.6	<0.0001
LV systolic diameter, mm	31.7 ± 5.3	48.8 ± 7.0	<0.0001
LV systolic diameter index, mm/m^2	19.4 ± 3.5	29.8 ± 4.9	<0.0001

Výsledky: Regrese FMR

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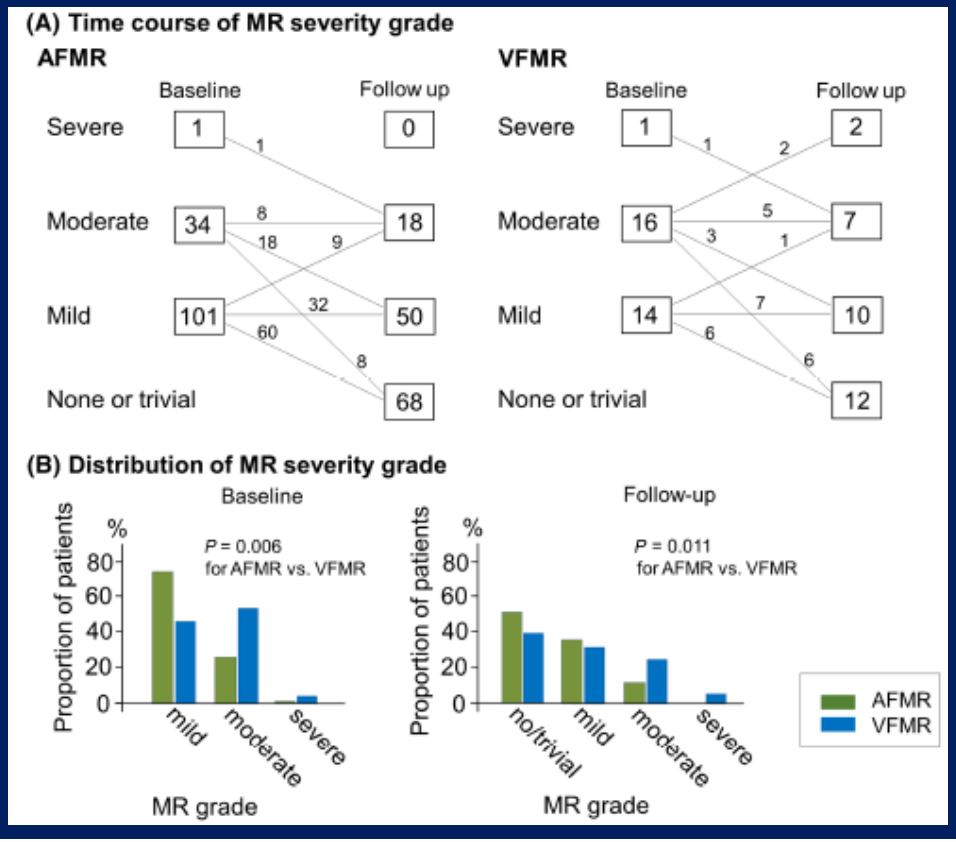

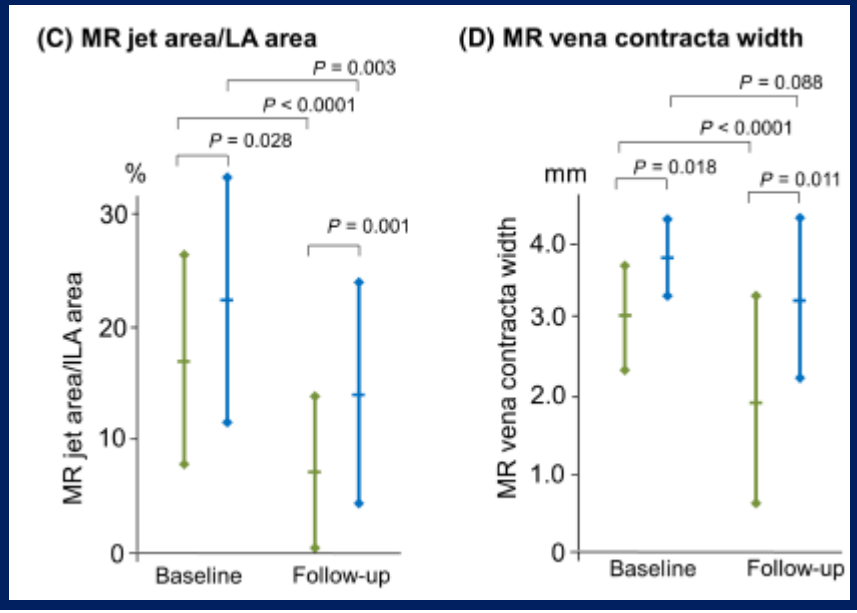

	AFMR improvement			VFMR improvement		
	With (n = 87)	Without (n = 49)	P	With (n = 16)	Without (n = 15)	P
LA volume index						
Baseline, mL/m^2	48.8 ± 15.3	54.6 ± 23.3	0.081	56.9 ± 20.6	69.5 ± 24.6	0.14
Change[a], mm/m^2	−11.4 ± 15.1[b]	−2.3 ± 21.1	0.010	−12.3 ± 16.7[b]	−17.5 ± 16.9[b]	0.39
Change ratio, %	−17.8 ± 35.3	1.9 ± 46.2	0.012	−19.1 ± 26.4	−24.4 ± 26.4	0.58
Mitral valve regurgitation						
Baseline severity grade, n (%)			0.15			0.47
Mild	60 (69)	41 (84)		6 (38)	8 (53)	
Moderate	26 (30)	8 (16)		9 (56)	7 (47)	
Severe	1 (1)	0 (0)		1 (6)	0 (0)	
Change in grades, grade	−1.1 ± 0.3[b]	0.2 ± 0.4	0.001	−1.4 ± 0.5[b]	0.2 ± 0.4	0.001

Voltážové charakteristiky a recidivy FiS/AT

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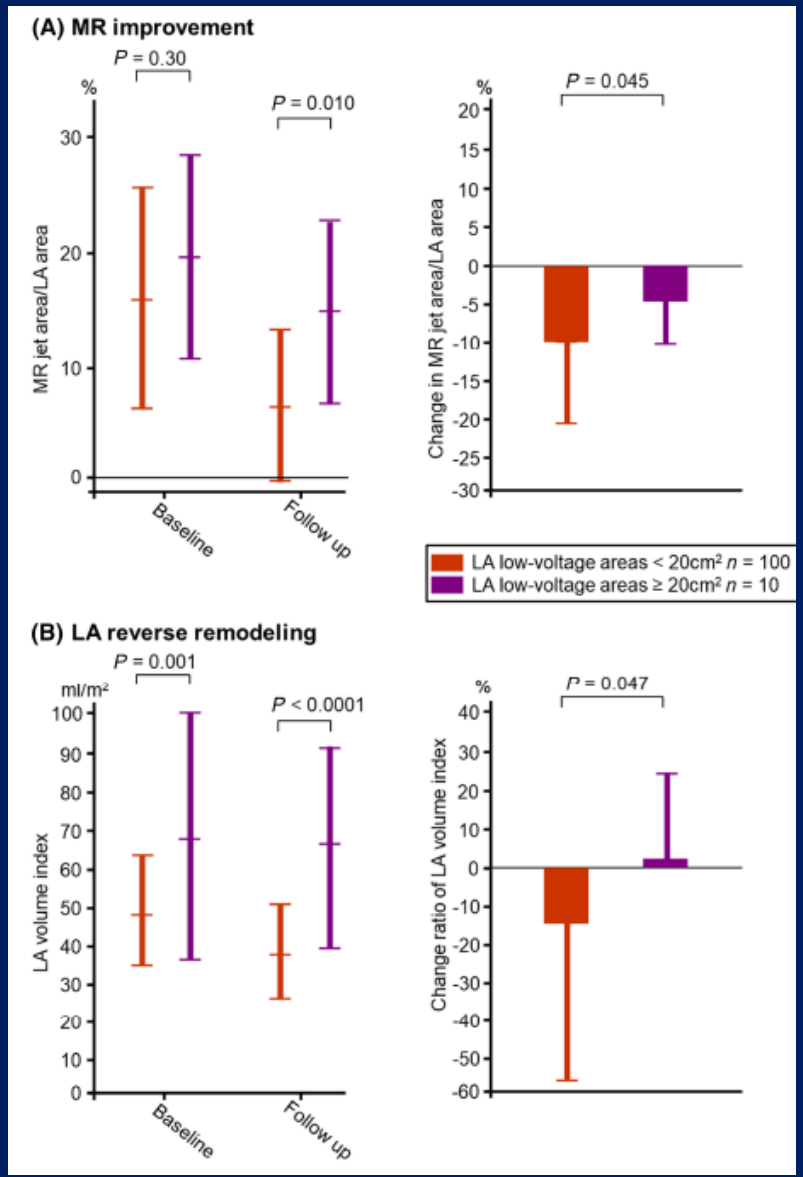

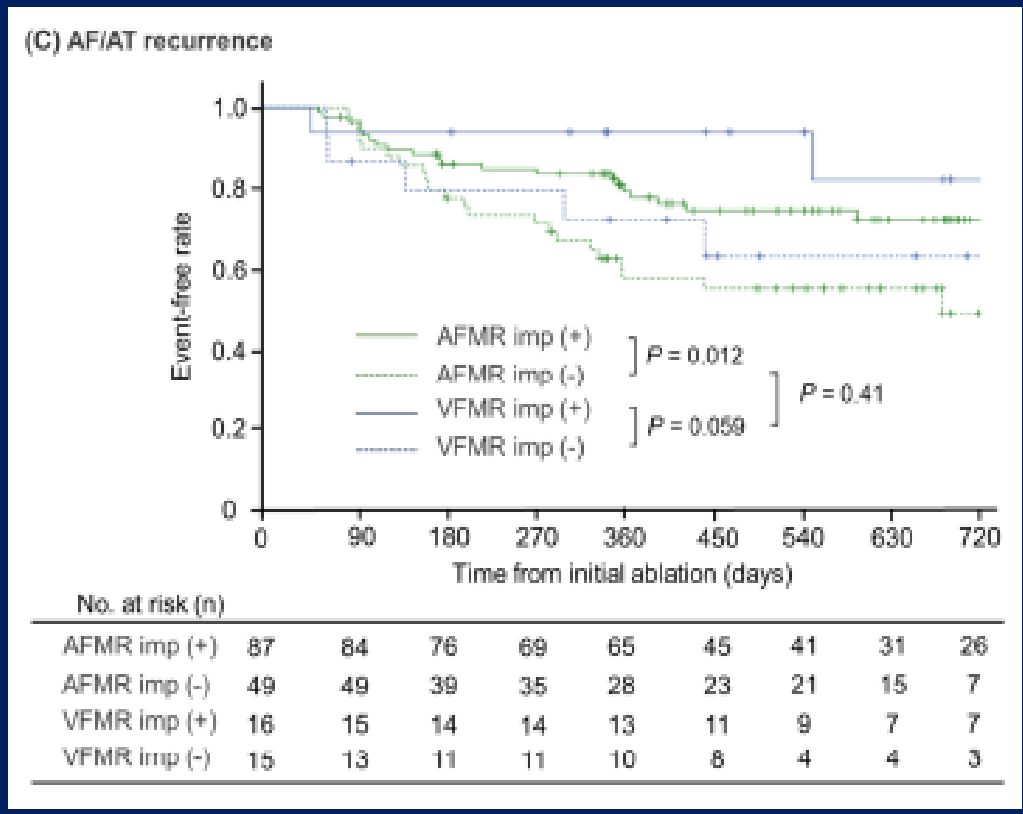

Výsledky:
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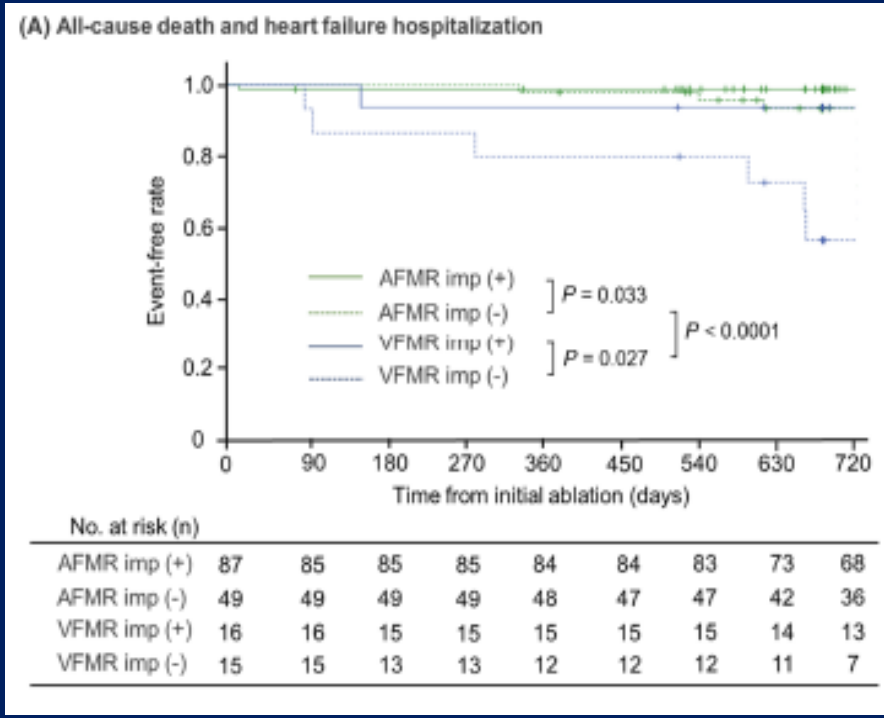

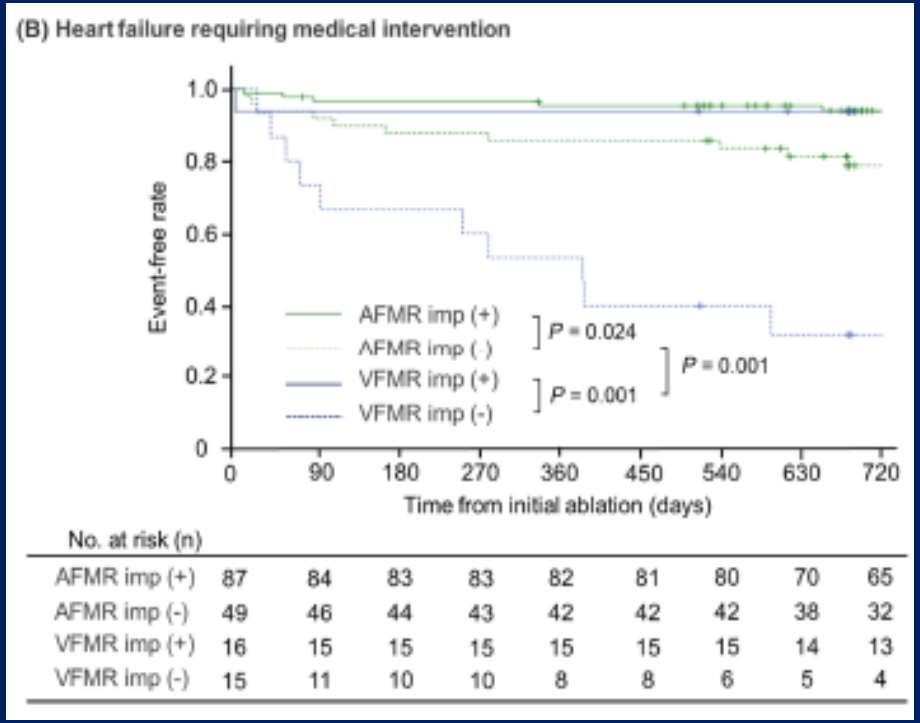

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Mechanism of improvement in atrial functional mitral regurgitation after catheter ablation for atrial fibrillation: Three-dimensional analysis using multislice computed tomography

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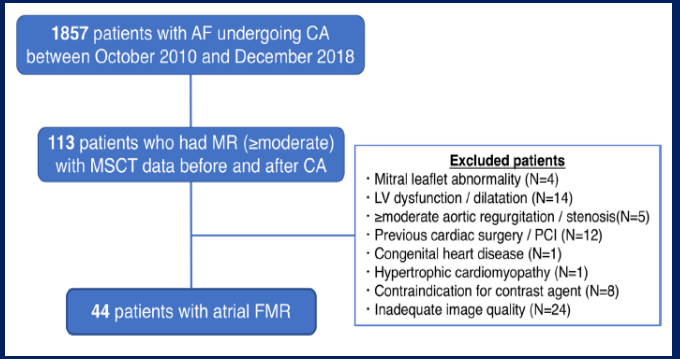

TABLE 1 Patient characteristics

	Atrial FMR (*N* = 44)
Baseline characteristics	
Age, y	71 ± 8
Sex, male, *n* (%)	31 (70%)
Hypertension, *n* (%)	23 (52.3%)
Chronic heart failure, *n* (%)	10 (22.7%)
Persistent AF, *n* (%)	22 (55.0%)
Heart rate, beats/min	69 ± 13
Echocardiographic parameter	
LVDd, mm	48 ± 5
LVDs, mm	32 ± 5
LVEF, %	60 ± 6
LA diameter, mm	41 ± 7
Regurgitant JA, cm^2	6.2 ± 2.5
Vena contracta width, mm	4.0 ± 1.4

TABLE 2 Mitral apparatus geometry, LA and LV volumes, and MR severity before and after CA for AF

	Atrial FMR (N = 44)		
	Before CA	After CA	*p*
Measurement using CT			
anteroposterior diameter, mm	33 ± 4	33 ± 4	.50
commissure-commissure diameter, mm	40 ± 5	40 ± 4	.72
MAA, mm^2	1116 ± 261	1102 ± 210	.58
TLA, mm^2	1364 ± 344	1387 ± 292	.51
Anterior leaflet area, mm^2	734 ± 178	740 ± 152	.75
Posterior leaflet area, mm^2	630 ± 197	647 ± 176	.46
TLA/MAA	1.2 ± 0.1	1.3 ± 0.2	.028
IPMD, mm	29 ± 5	29 ± 4	.93
LV volume, ml	126 ± 33	120 ± 31	.06
LA volume, ml	107 ± 36	94 ± 30	<.001
Measurement in echocardiography			
Regurgitant JA, cm^2	6.2 ± 2.5	3.6 ± 2.7	<.001
Vena contracta width, mm	4.0 ± 1.4	2.4 ± 1.1	<.001
LVEF	60 ± 6	62 ± 6	.005

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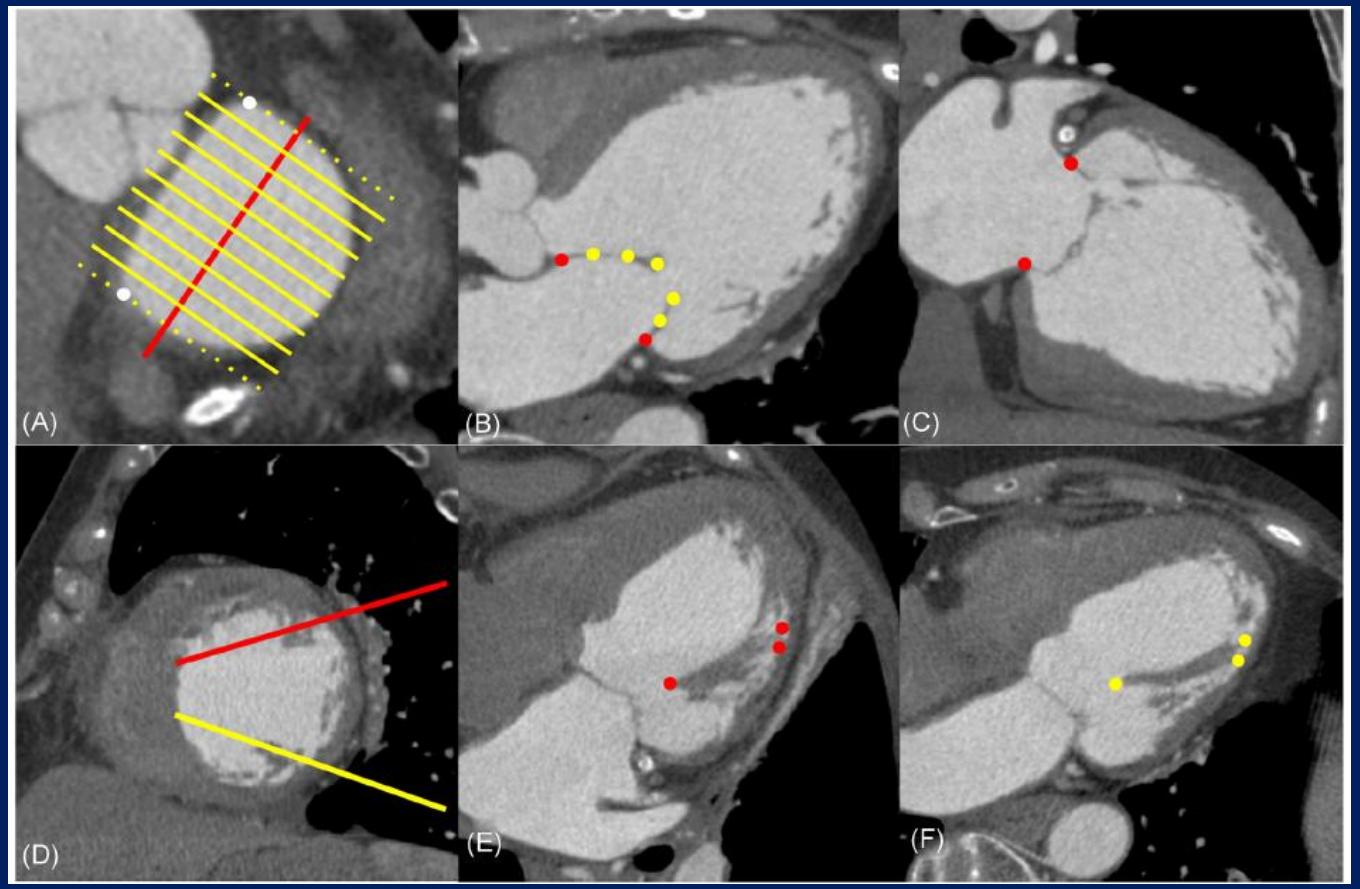

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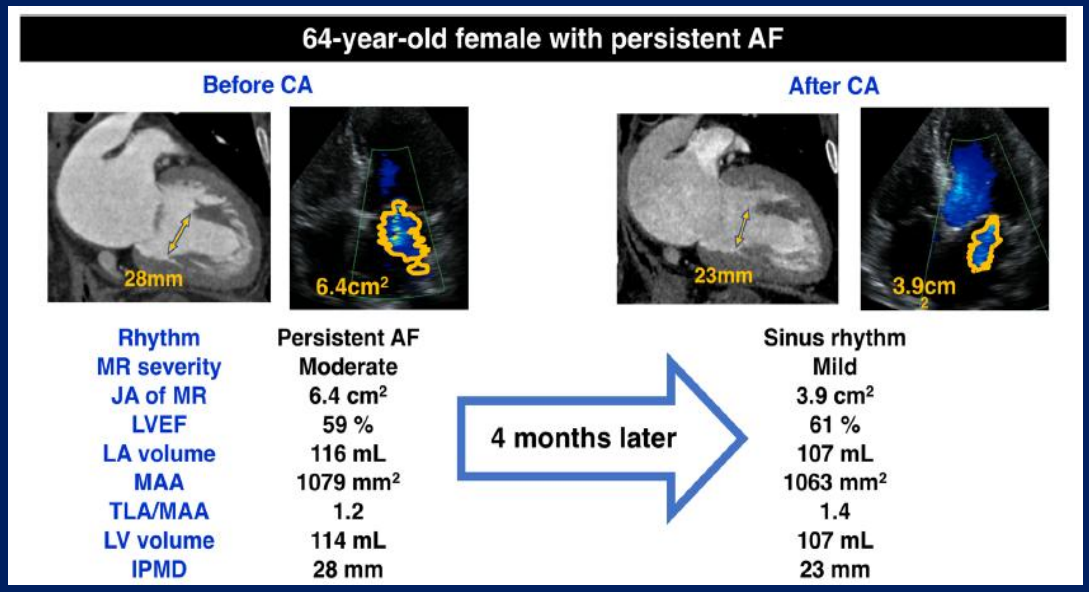
TABLE 3 Determinants of the improvement in MR severity (ΔJA) in patients with atrial FMR undergoing CA for AF

	Univariate		Multivariate	
	r	*P*	*β*	*P*
ΔMAA	.13	.38		
ΔIPMD	.43	.004	.26	.004*
ΔTLA/MAA	−.26	.09		
ΔLV volume	.11	.49		
ΔLA volume	.25	.10		

Abbreviations: AF, atrial fibrillation; CA, catheter ablation; FMR, functional mitral regurgitation; IPMD, interpapillary muscle distance; JA, jet area; LA, left atrium; LV, left ventricle; MAA, mitral annular area; TLA, total leaflet area.

*R^2 of the model selected for multivariable analysis, β, standardised regression coefficient.



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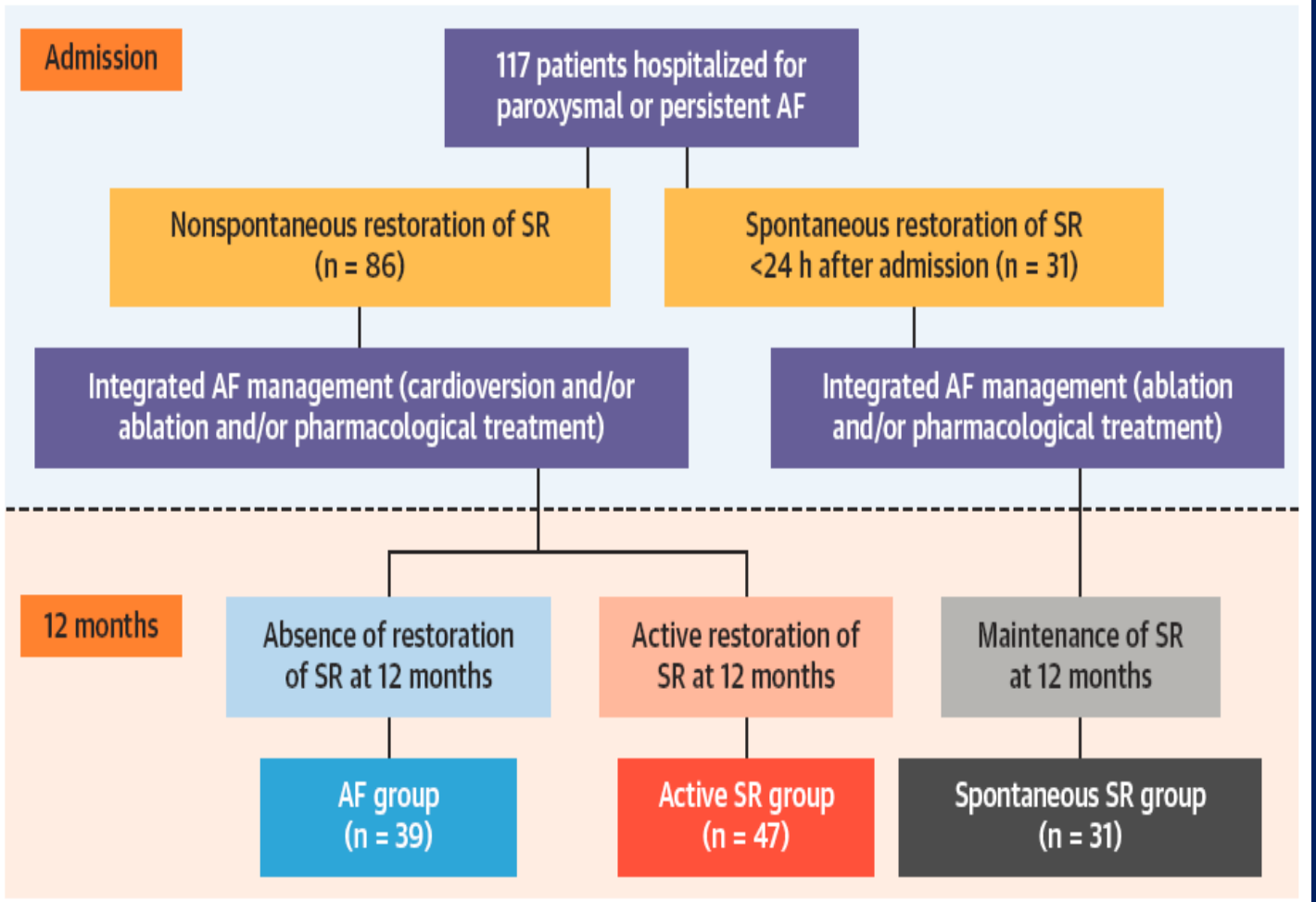

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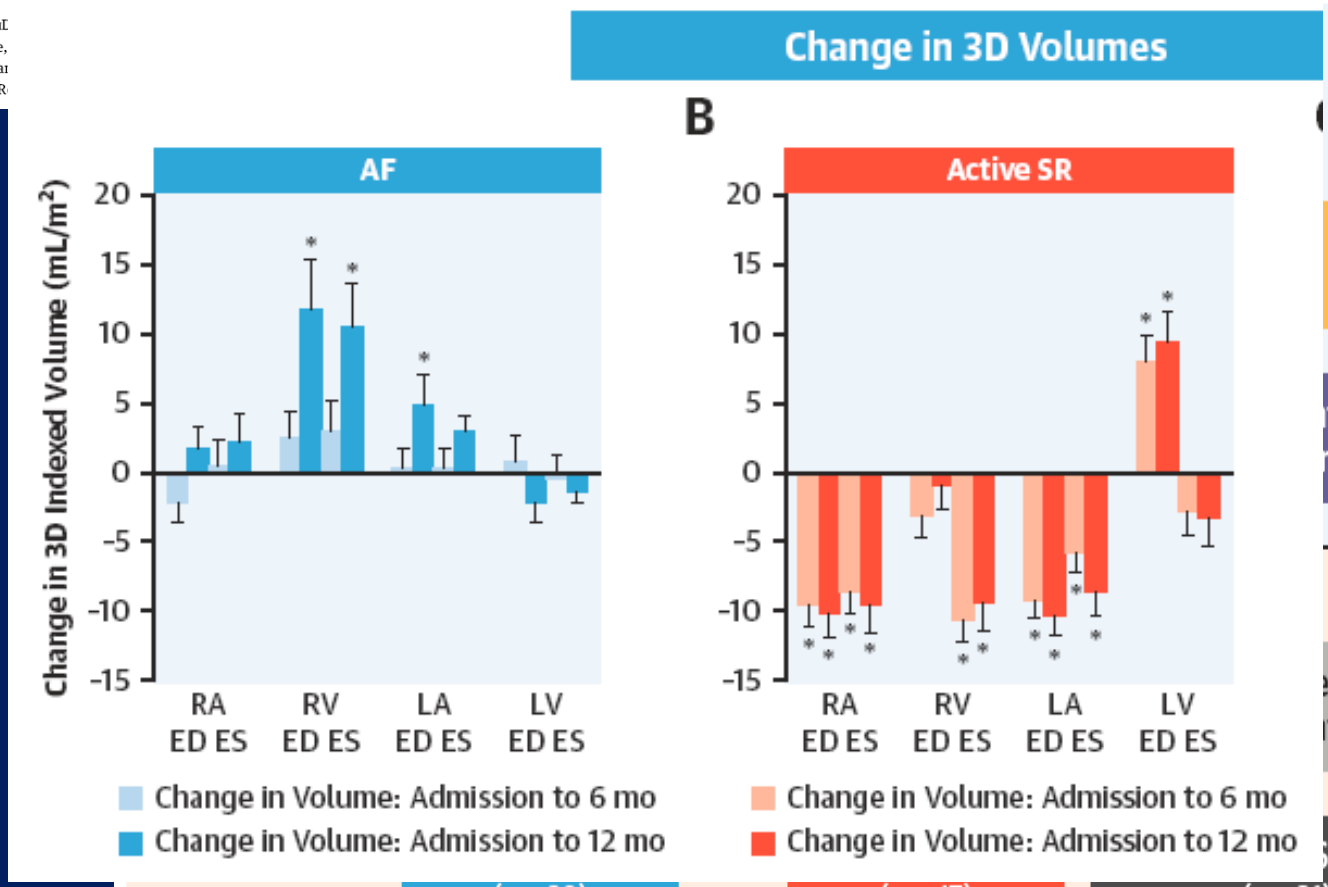

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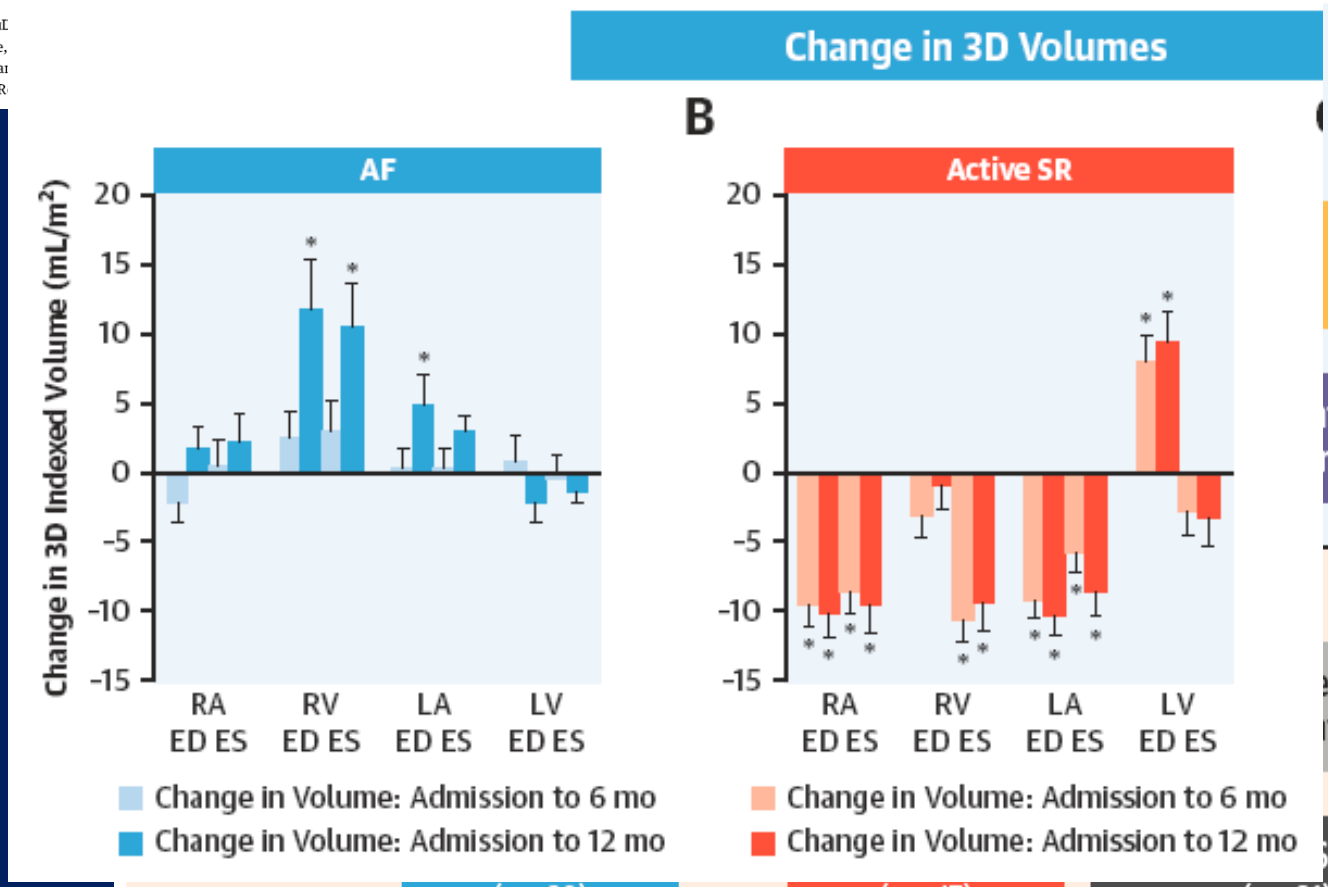

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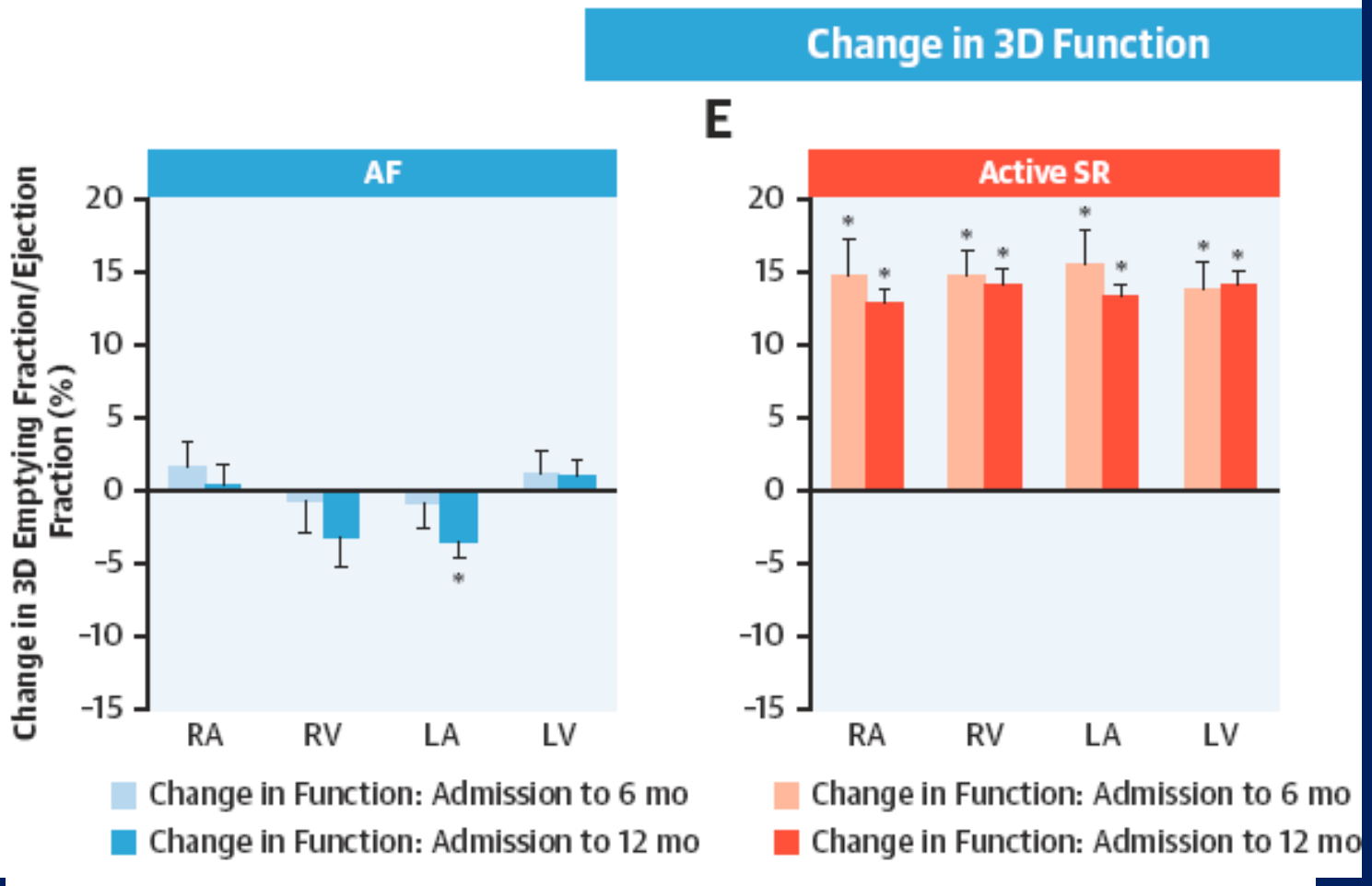

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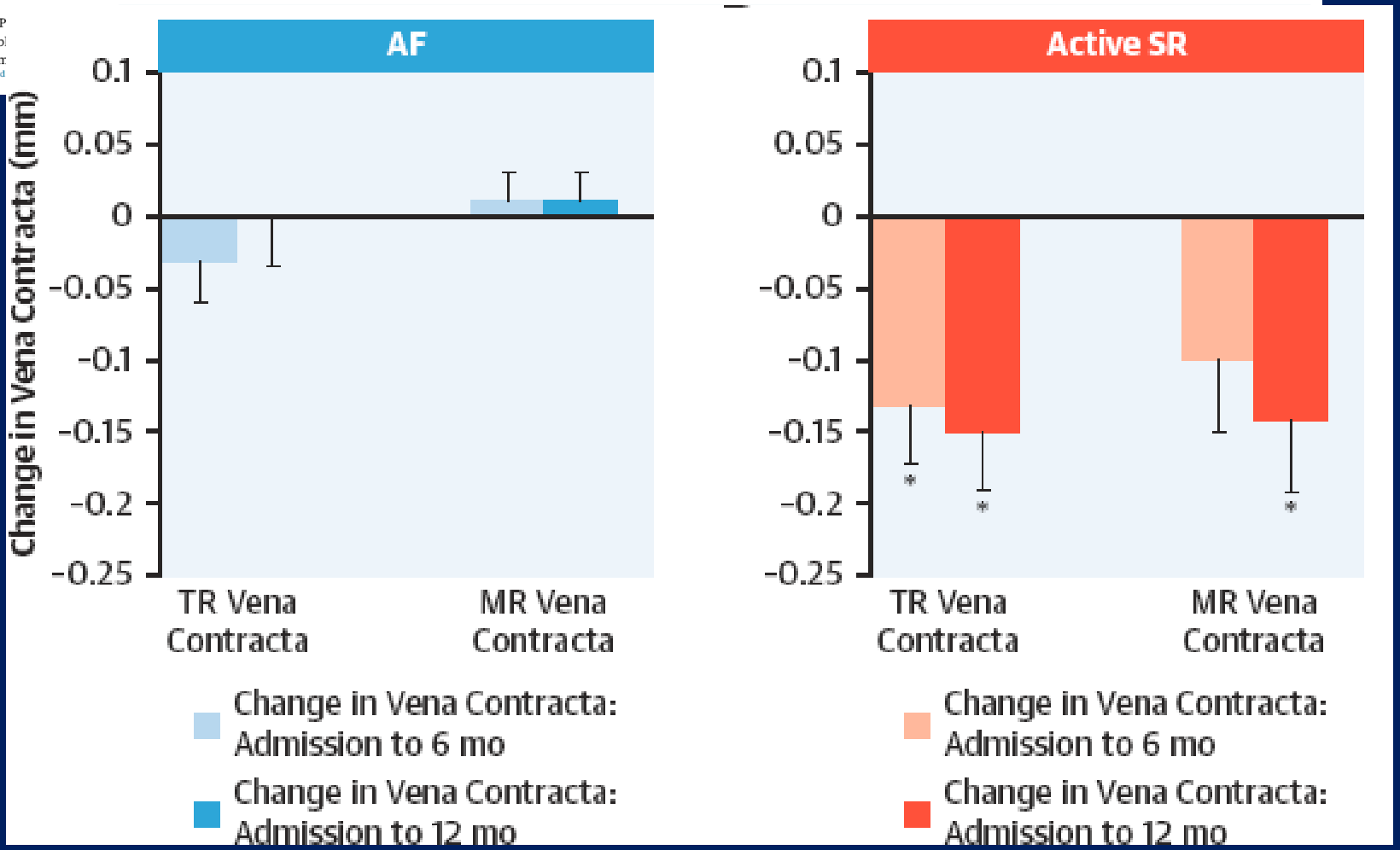

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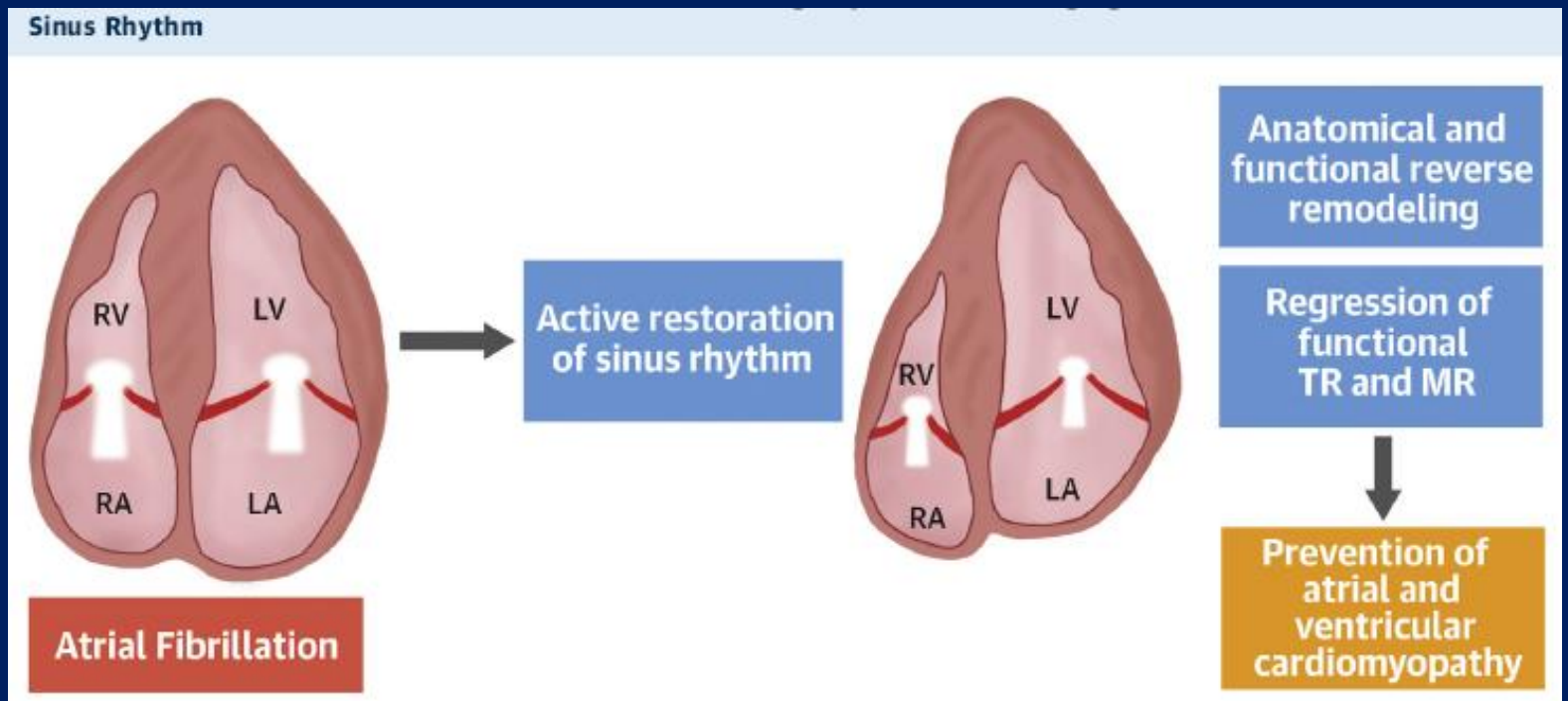
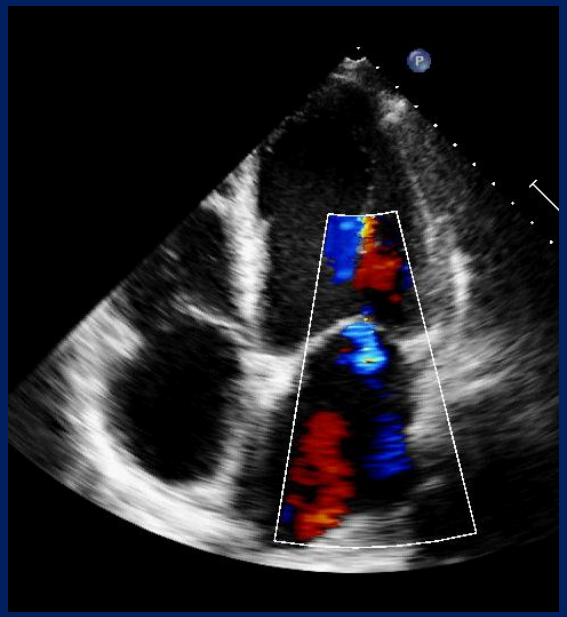
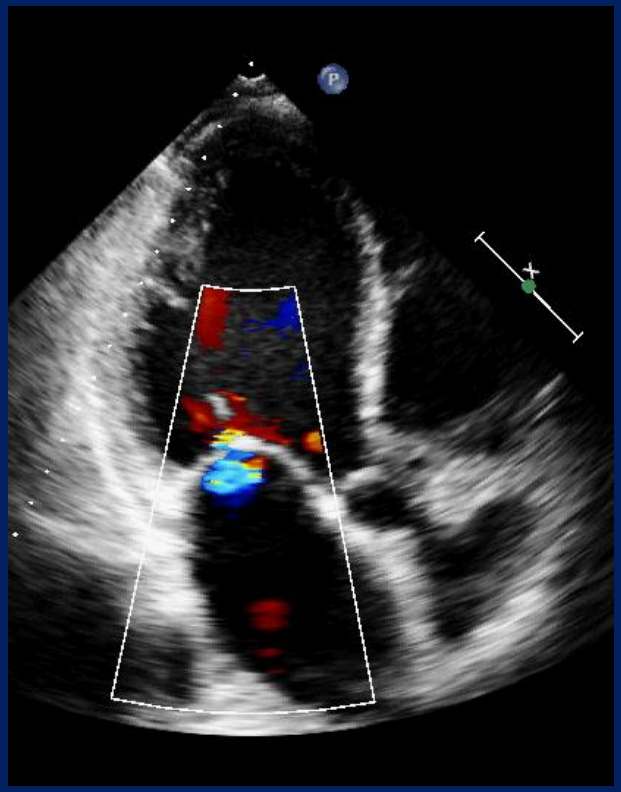


Soulat-Dufour, L. et al. J Am Coll Cardiol. 2022;79(10):951-961.

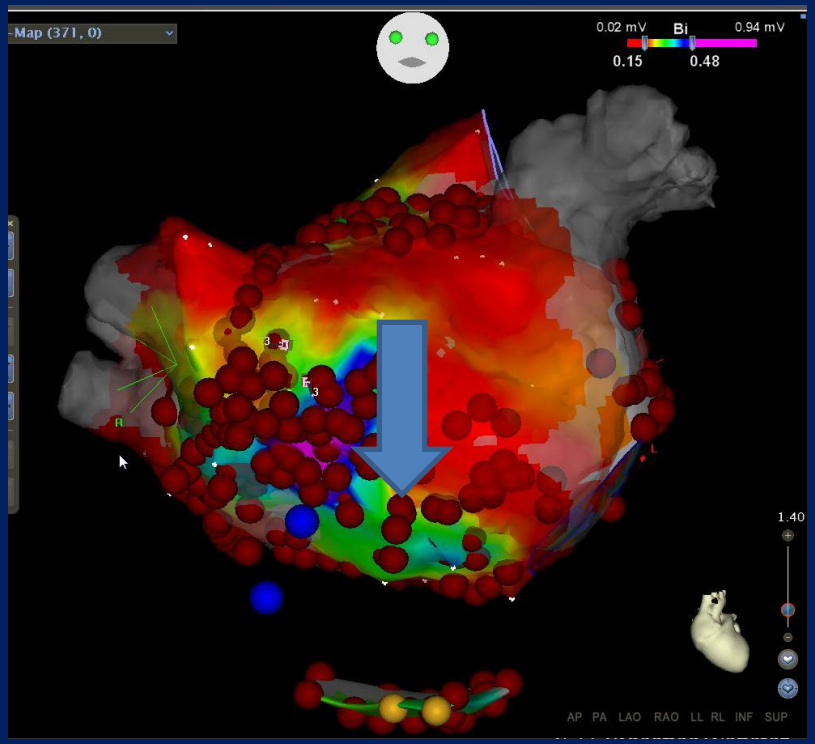
At 1 year of follow-up in atrial fibrillation, active restoration of sinus rhythm induced cardiac anatomical (atrial indexed volume, end-systolic right ventricular indexed volume) and/or functional (4 chambers) reverse remodeling and a regression of functional TR and MR. An active management of atrial fibrillation focused on restoration of sinus rhythm could prevent both atrial and ventricular cardiomyopathy and reduce functional atrioventricular regurgitation. LA = left atrium; LV = left ventricle; MR = mitral regurgitation; RA = right atrium; RV = right ventricle; TR = tricuspid regurgitation.

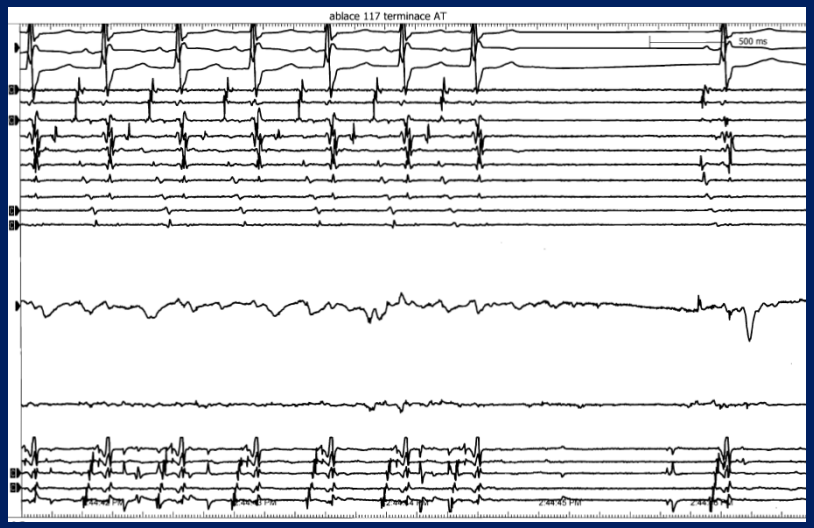
Tachy-FiS indukovaná KMP, kompletní restituce EFLK

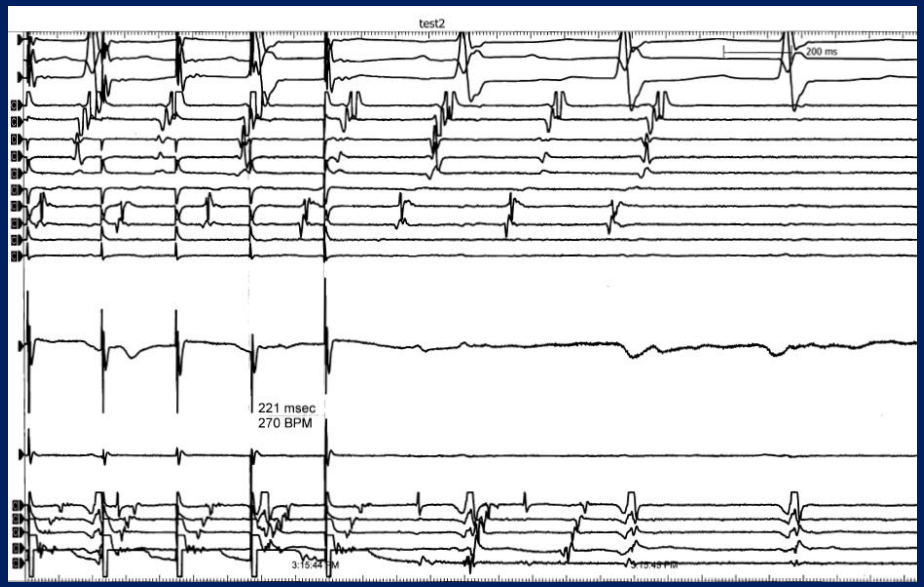




RFA dlouhodobě perzist. FiS

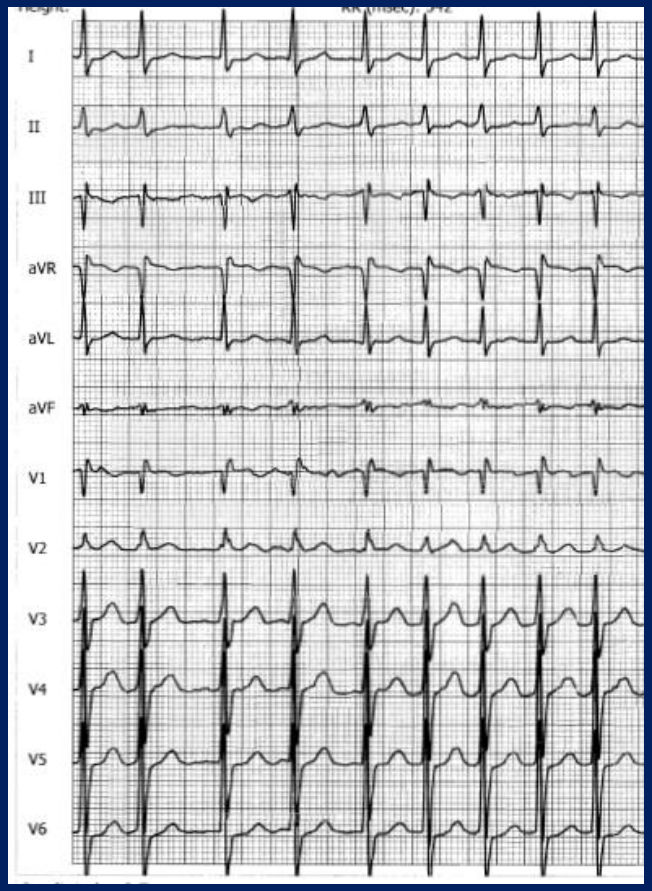






NEMOCNICE NA HOMOLCE

Sinusový rytmus QRSd 122ms



TTE před - po výkonu 1 měs.

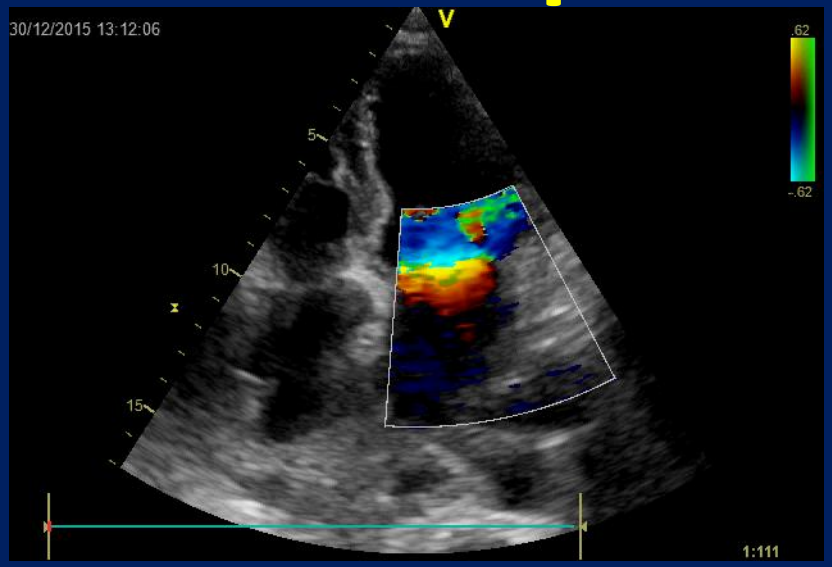
	před RFA-FiS	*po RFA 1měs.*
LV d/s	58/51mm	54/41mm
EFLK	25%	60%
LA plax	53mm	51mm
LA A4c	65x50mm	59x48mm
RA	62x48mm	60x45mm
Mitrální regurgitace	střední	stopová-lehká
Trikuspidální regurg	střední	lehká
Max Trikusp. gradient	37 torr	20 torr
IVC/respirace	29mm nekolabuje	17mm kolabuje

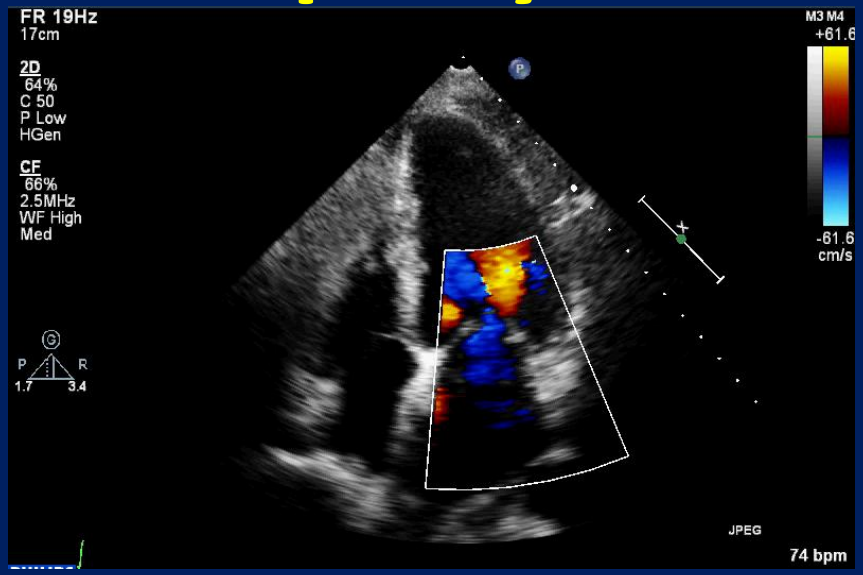
NA HOMOLCE NEMOCNICE

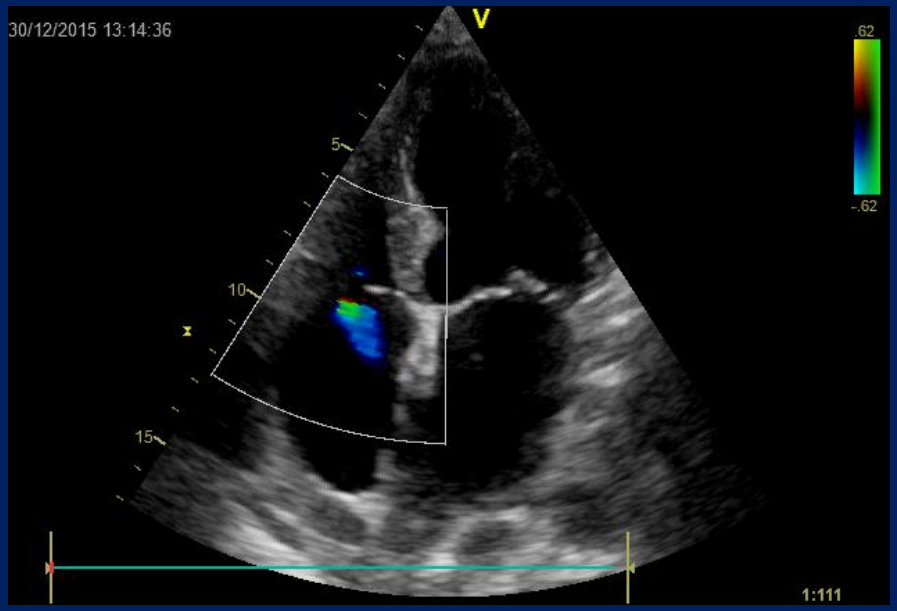
Pacient 2

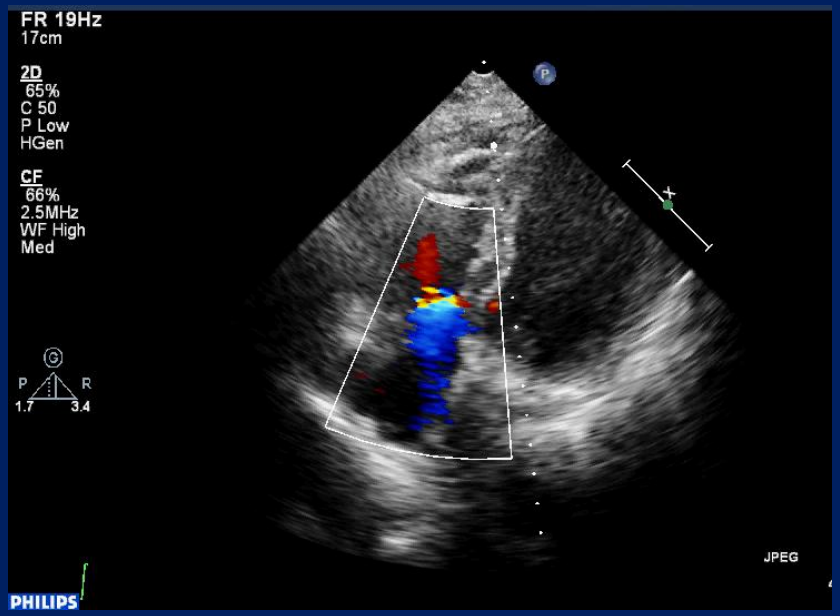
- 66 let , HTN, DM PAD, BMI 28
- roky parox, 1 rok perzist FiS, neúsp elKV... antrální IPV – perimi. flutter term. (2x)
- střední až význ. mitrální, střední trikusp.
- LS 42mm PLAX, 58x51 A4C = malá dilatace

Pac. 2: TTE před – 27M po výkonu

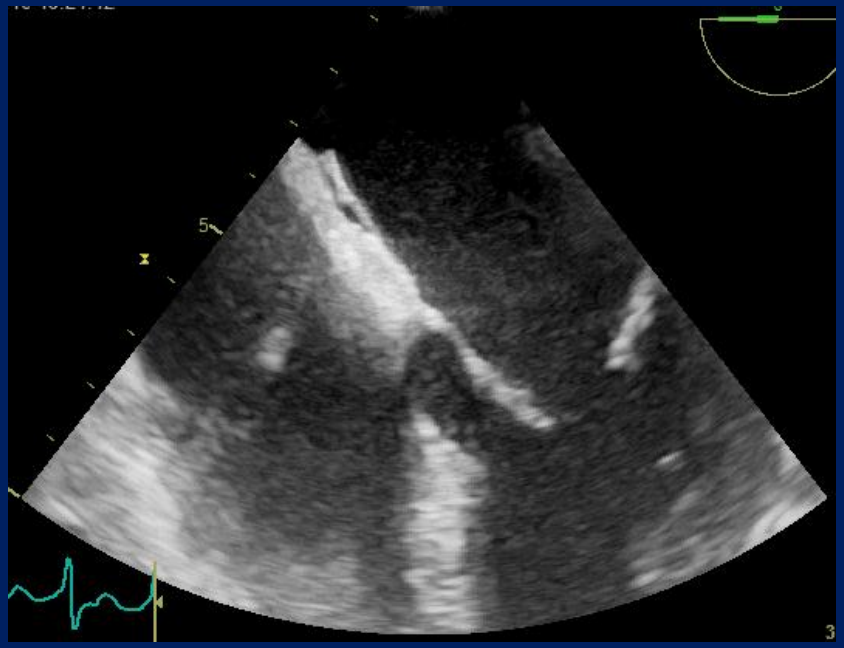


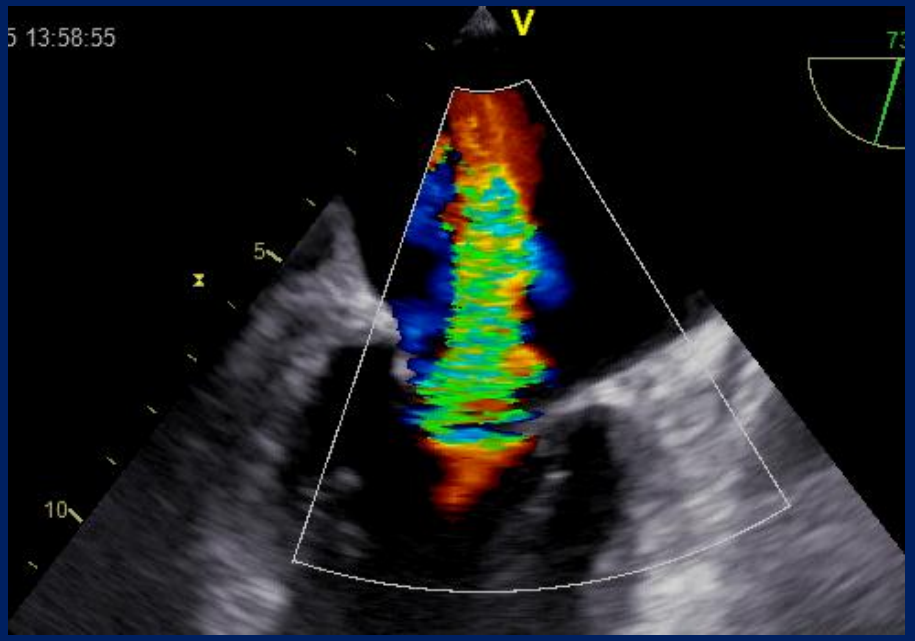






Pac. 2: TEE před výkonem





NEMOCNICE NA HOMOLCE

Pac.2: TTE před - po výkonu 27 měs.

	před RFA-FiS	*po RFA 27měs.*
LV d/s	48/38mm	44/31mm
EFLK	50-55% tachyFiS	65% sinus
LA plax	42mm	41mm
LA A4c	58x51mm	LAVi 33ml/m2
RA	46x55mm	39x?mm
Mitrální regurgitace	střední-významná	střední
Trikuspidální regurg	střední	lehká-střední
Max Trikusp. gradient	43 torr	36 torr
IVC/respirace	20mm kolabuje	17mm kolabuje

NA HOMOLCE NEMOCNICE

Závěr: Ablace FiS a funkční MR

- Katetrizační ablace především parox-perzist. fibrilace síní vede k redukci funkční mitrální regurgitace.
- Regrese mitrální reg. je častější tam, kde byla odstraněna dominující funkční složka (dilatace a remodelace LK, dilatace LS a normalizace tvaru mitrálního anulu)
- U pokročilých stadií atriální funkční MR (mnohaleté dlouhodobě perzist FiS) je stupeň myopatie již obtížně ovlivnitelný byť úspěšnou katetrizační ablací, cílem je indikovat především pacienty v časných stadiích (méně perzistentních FiS).