

Izolovaná trikuspidální regurgitace – z pohledu intervenčního kardiologa

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II. interní klinika

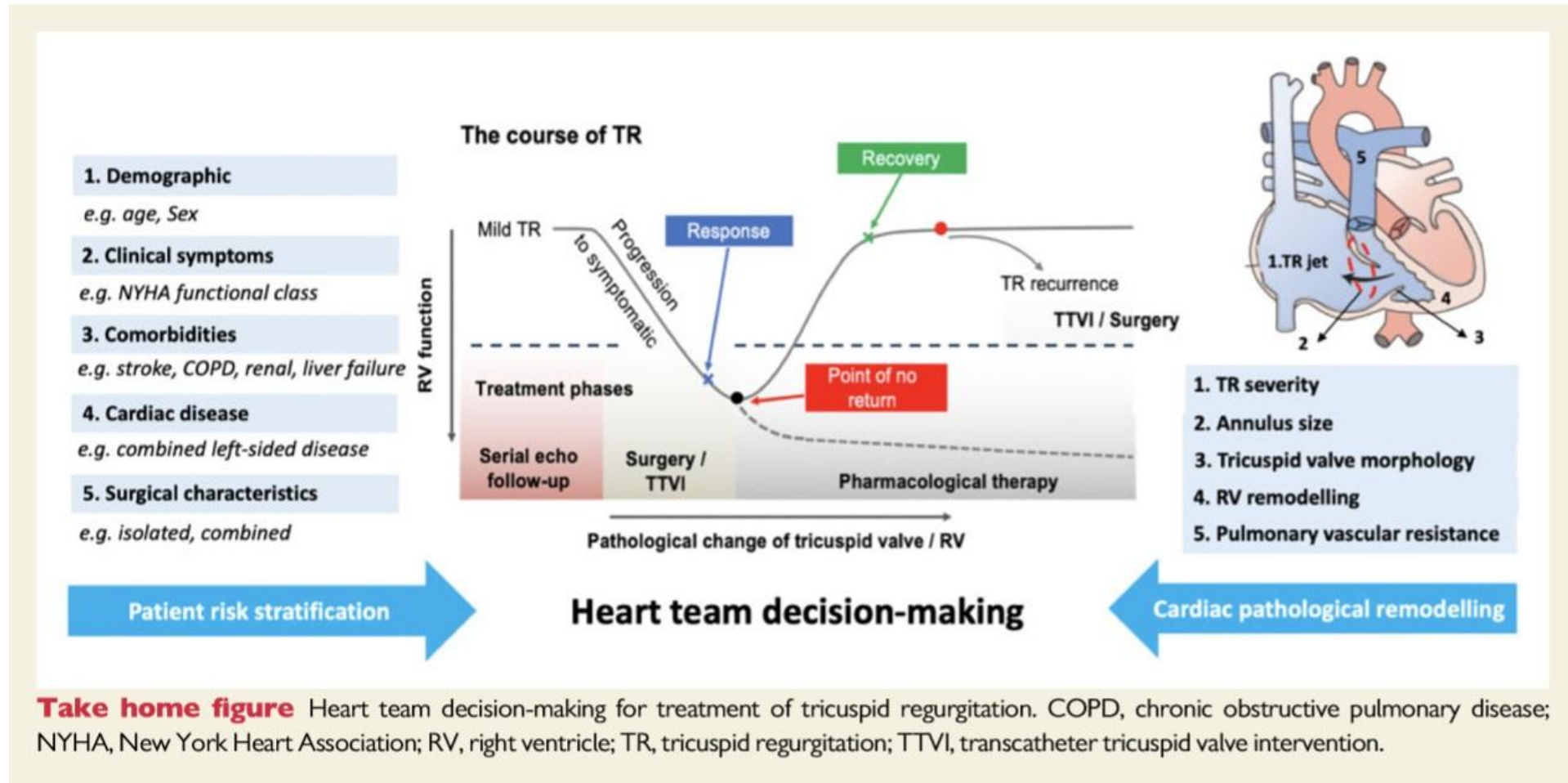
kardiologie a angiologie

Komplexní kardiovaskulární centrum

VFN a 1. LF UK Praha



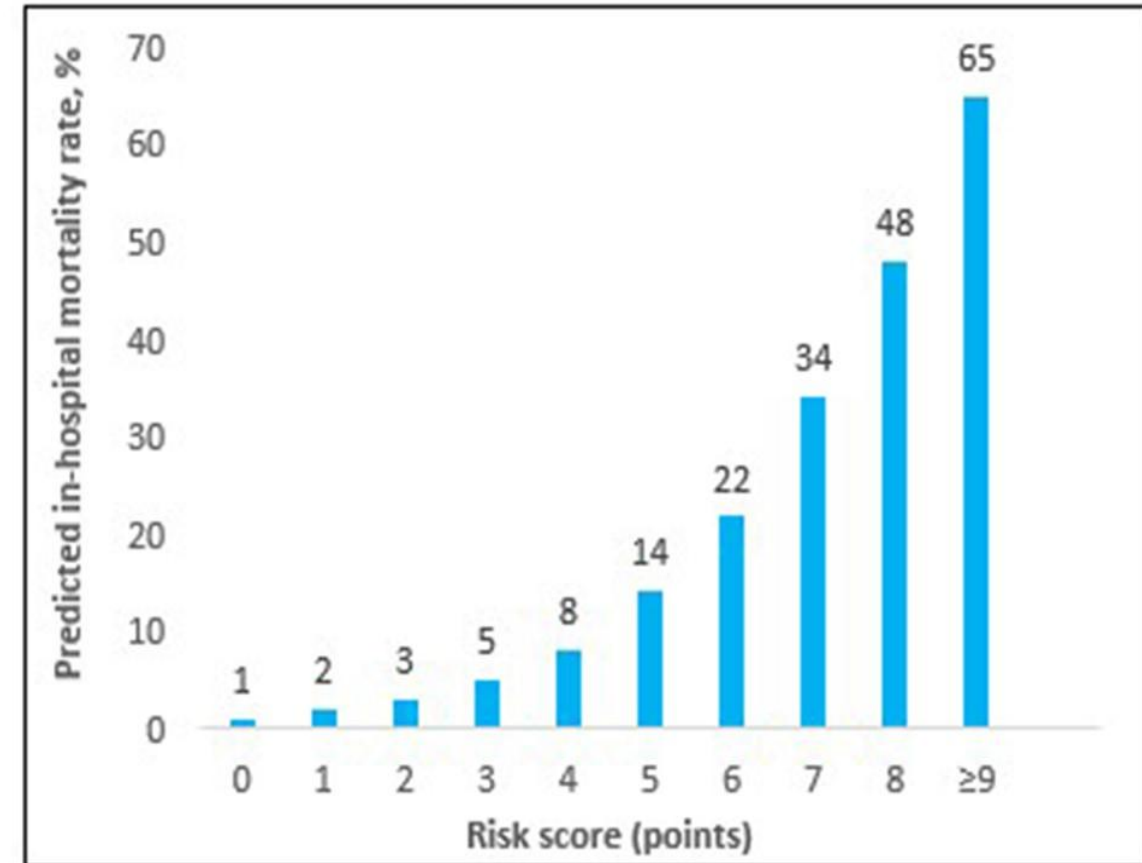
Strategie léčby trikuspidální regurgitace



Tri-Score – odhad časné mortality operace izolované TR

Časná operační mortalita podle Tri-Score

Risk factors (final model from multivariate analysis)	Scoring
Age \geq 70 years	1
NYHA functional class III-IV	1
Right-sided heart failure signs	2
Daily dose of furosemide \geq 125mg	2
Glomerular filtration rate $<$ 30 ml/min	2
Elevated total bilirubin	2
Left ventricular ejection fraction $<$ 60%	1
Moderate/severe right ventricular dysfunction	1
Total	12



Dreyfus G. EHJ 2022, 43 (7): 654–662

TRIGISTRY: multicenter registry (33 centers - 10 countries)
2,413 patients with severe isolated functional tricuspid regurgitation

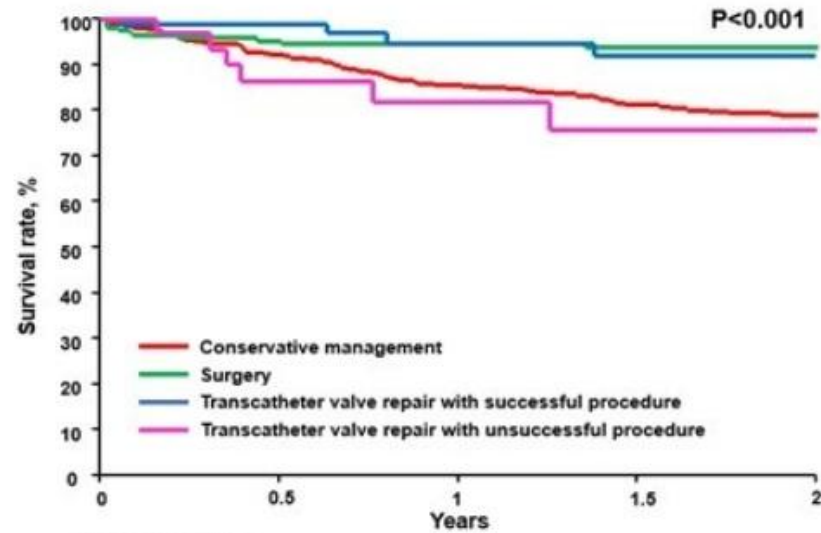
Comparison of the survival rates at 2 years between the different treatment modalities according to the TRI-SCORE category (low, intermediate and high).

1217 patients conservatively managed

551 underwent an isolated tricuspid valve surgery

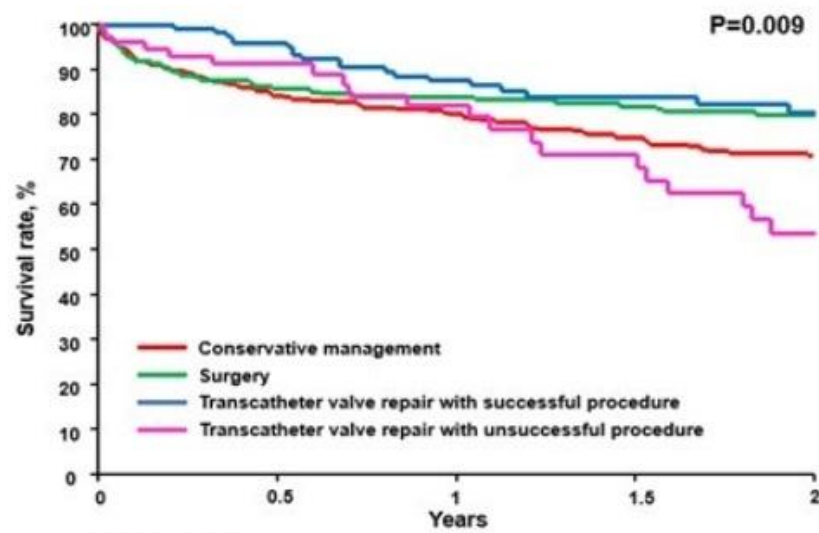
645 underwent a transcatheter valve repair

LOW TRI-SCORE (≤ 3)



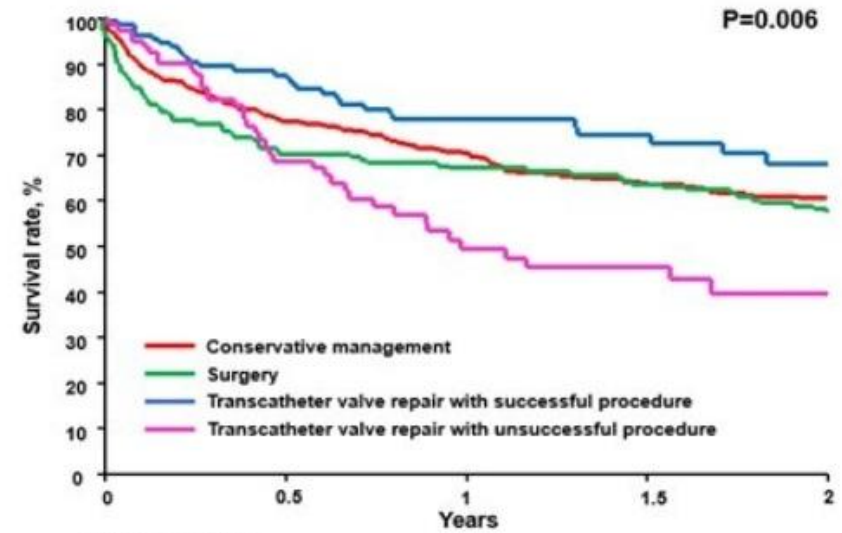
Patients at risk			
Conservative management	433	349	286
Surgery	183	139	119
Transcatheter valve repair with successful procedure	100	41	20
Transcatheter valve repair with unsuccessful procedure	45	17	6

INTERMEDIATE TRI-SCORE (4-5)



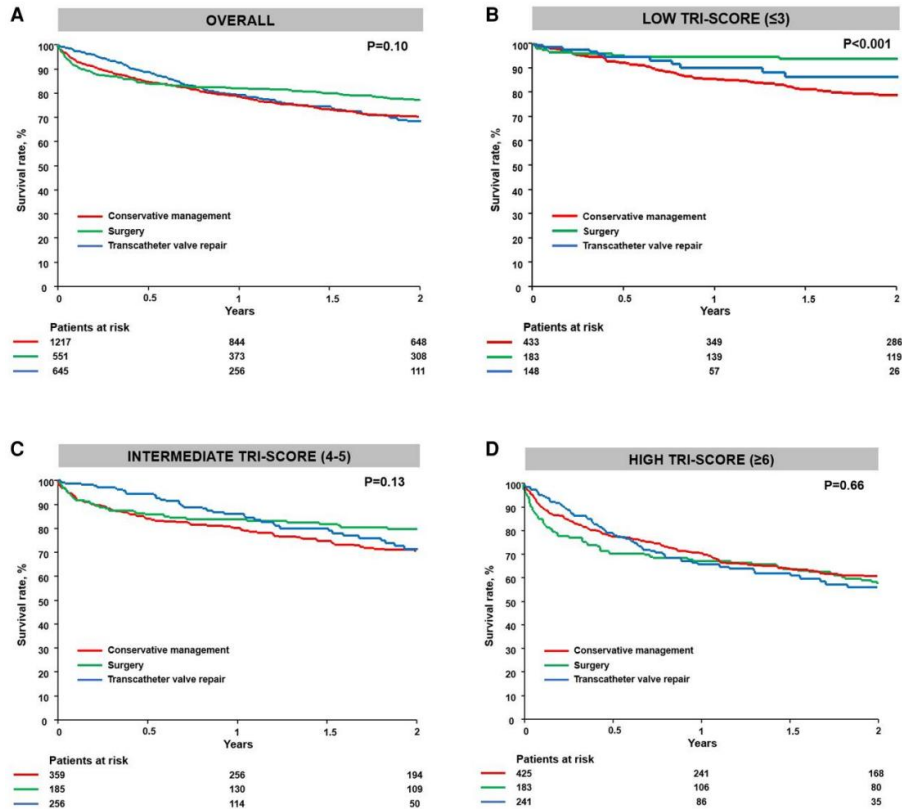
Patients at risk			
Conservative management	359	256	194
Surgery	185	130	109
Transcatheter valve repair with successful procedure	172	79	36
Transcatheter valve repair with unsuccessful procedure	83	36	14

HIGH TRI-SCORE (≥ 6)



Patients at risk			
Conservative management	425	241	168
Surgery	183	106	80
Transcatheter valve repair with successful procedure	141	59	24
Transcatheter valve repair with unsuccessful procedure	94	27	11

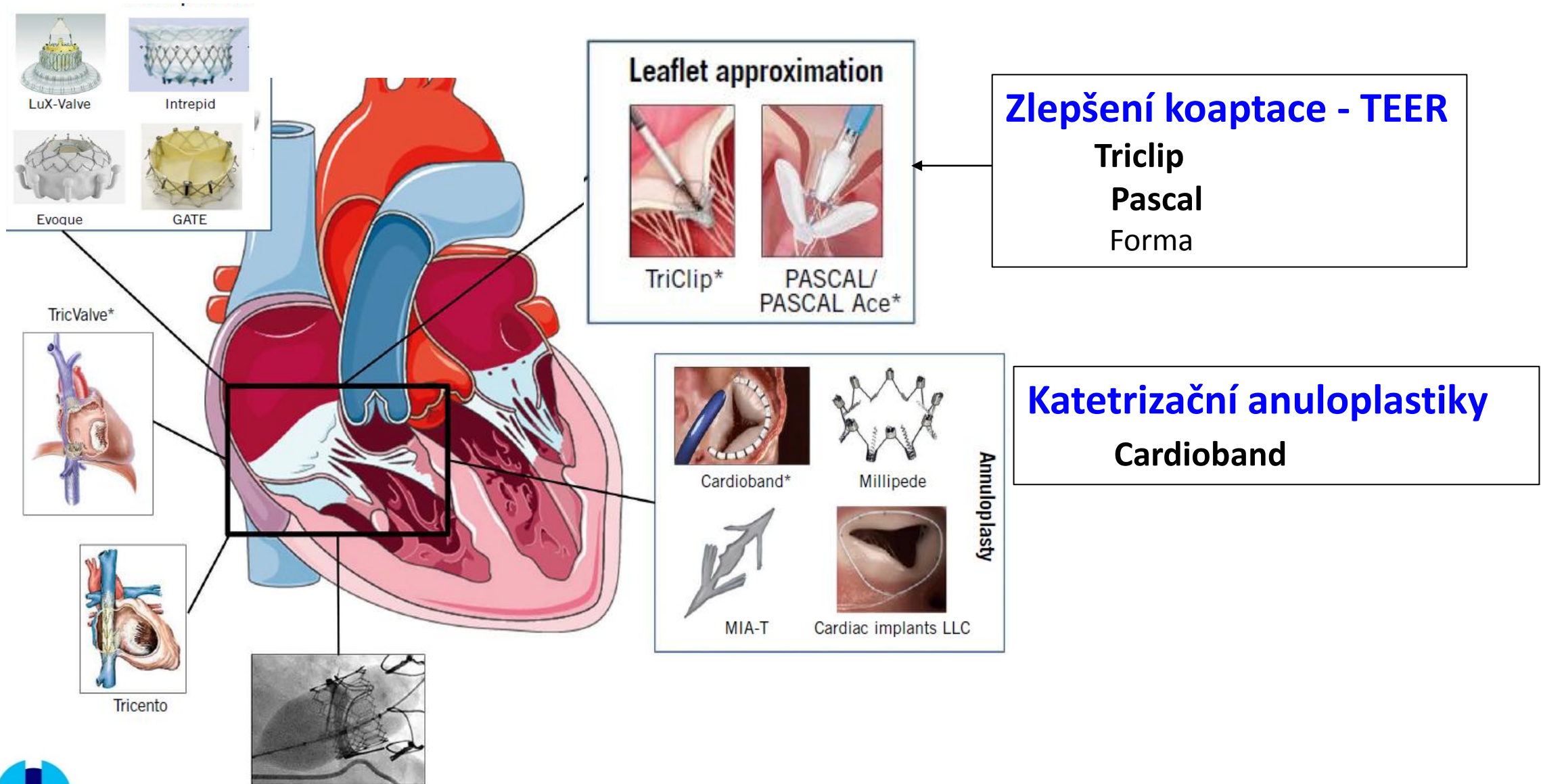
Tri-Score a TriR



Characteristics	Overall (n = 2413)	Conservative management (n = 1217)	Isolated tricuspid valve surgery (n = 551)	Transcatheter tricuspid valve repair (n = 645)	P-value
Clinical					
Age—years	72 ± 12	71 ± 13	68 ± 11	77 ± 8	<.001
Age ≥ 70years—no. (%) ^a	1618 (67)	769 (63)	283 (51)	566 (88)	<.001
Female sex—no. (%)	1270 (53)	535 (44)	348 (63)	387 (60)	<.001
Diabetes mellitus—no./total no. (%)	619/2410 (26)	339 (28)	118 (21)	162/642 (25)	.003
Chronic lung disease—no./total no. (%)	466/2412 (19)	241 (20)	90 (16)	135/644 (21)	.002
Coronary artery disease—no. (%)	917 (38)	529 (43)	132 (24)	256 (40)	<.001
Permanent pacemaker—no./total no. (%)	651/2406 (27)	319 (26)	145/544 (27)	187 (29)	.43
Prior left heart valve intervention—no./total no. (%)	633/2412 (26)	157/1216 (13)	257 (47)	219 (34)	<.001
New York Heart Association functional class III–IV—no. (%) ^a	1562 (65)	637 (52)	366 (66)	559 (87)	<.001
Right-sided heart failure signs—no. (%) ^a	1431 (59)	660 (54)	364 (66)	407 (63)	<.001
Daily dose of loop diuretics—mg	50 [40–80]	40 [30–80]	60 [40–120]	60 [40–120]	<.001
Daily dose of loop diuretics ≥125 mg—no. (%) ^a	401 (17)	145 (12)	129 (23)	127 (20)	<.001
Atrial fibrillation—no./total no. (%)	1532/2317 (66)	685/1204 (57)	367 (67)	480/562 (85)	<.001
Laboratory					
Haemoglobin—g/dL	11.7 ± 2.4	12.1 ± 2.2	12.2 ± 1.9	10.4 ± 2.6	<.001
Creatinine—μmol/L	124 ± 78	129 ± 90	112 ± 63	124 ± 59	<.001
Glomerular filtration rate—mL/min	62 ± 33	67 ± 39	64 ± 29	51 ± 21	<.001
Glomerular filtration rate < 30 mL/min—no. (%) ^a	266 (11)	148 (12)	37 (7)	81 (13)	.009
Elevated total bilirubin—no. (%) ^a	688 (29)	373 (31)	169 (31)	146 (23)	<.001
Echocardiographic					
Left ventricle ejection fraction—%	51 ± 14	45 ± 15	57 ± 10	54 ± 11	<.001
Left ventricle ejection fraction < 60%—no. (%) ^a	1605 (66)	871 (72)	265 (48)	468 (73)	<.001
Moderate/severe RV dilatation—no./total no. (%)	1471/2336 (63)	594/1217 (49)	442 (80)	435/568 (77)	<.001
Moderate/severe right ventricular dysfunction—no. (%) ^a	1001 (41)	657 (54)	173 (31)	171 (27)	<.001
Systolic pulmonary artery pressure—mmHg	49 ± 18	54 ± 19	42 ± 11	43 ± 16	<.001



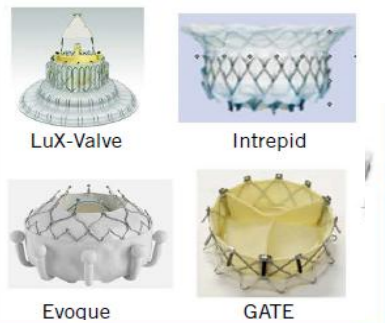
Katetrizační výkony na trikuspidální chlopi (TTVI)



Katetrizační výkony na trikuspidální chlopni (TTVI)

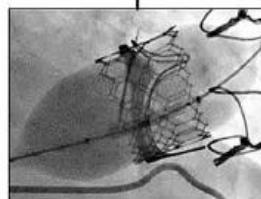
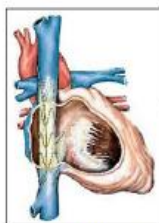
Katetrizační náhrada

Gate
Evoque
Vdyne



Heterotopická implantace protězy

TricValve
Tricento

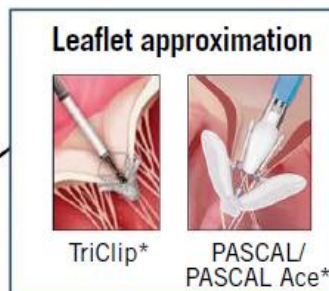


Valve-in-valve

Sapien 3, XT

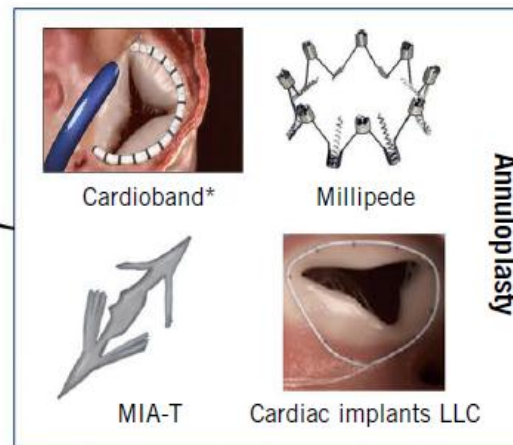
Zlepšení koaptace - TEER

Triclip
Pascal
Forma



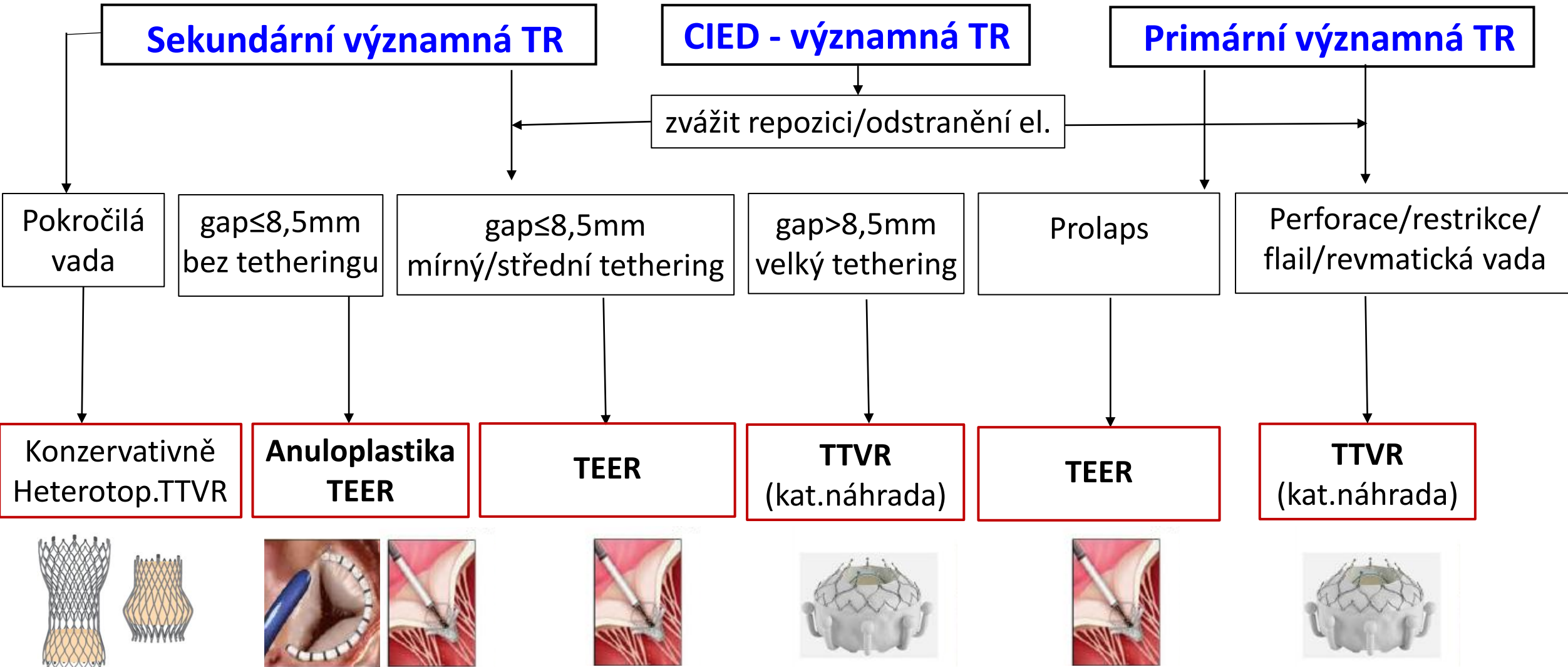
Katetrizační anuloplastiky

Cardioband



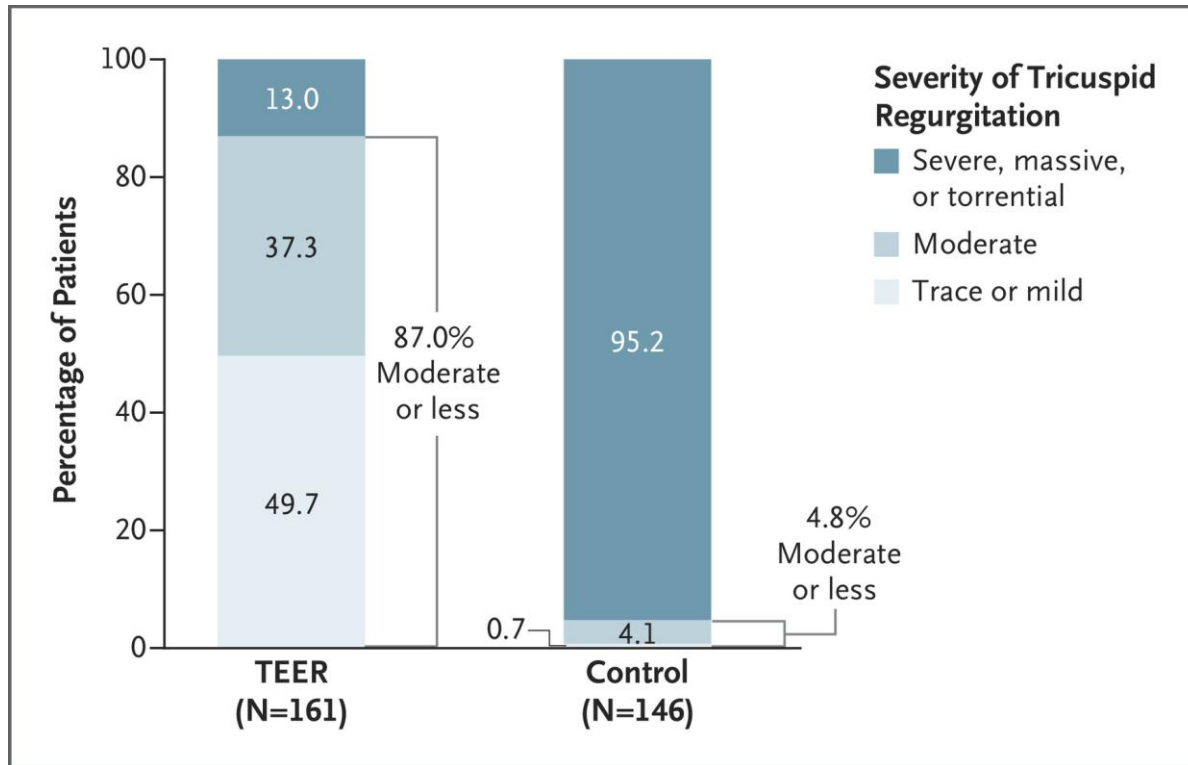
VFN PRAHA

Výběr typu katetrizační intervence (TTVI)



TRILUMINATE study

Závažnost trikuspidální regurgitace po 30 dnech



Sorajja P et al. NEJM 2023



BACKGROUND

Severe tricuspid regurgitation is a debilitating condition that is associated with substantial morbidity and often with poor quality of life. Decreasing tricuspid regurgitation may reduce symptoms and improve clinical outcomes in patients with this disease.

METHODS

We conducted a prospective randomized trial of percutaneous tricuspid transcatheter edge-to-edge repair (TEER) for severe tricuspid regurgitation. Patients with symptomatic severe tricuspid regurgitation were enrolled at 65 centers in the United States, Canada, and Europe and were randomly assigned in a 1:1 ratio to receive either TEER or medical therapy (control). The primary end point was a hierarchical composite that included death from any cause or tricuspid-valve surgery; hospitalization for heart failure; and an improvement in quality of life as measured with the Kansas City Cardiomyopathy Questionnaire (KCCQ), with an improvement defined as an increase of at least 15 points in the KCCQ score (range, 0 to 100, with higher scores indicating better quality of life) at the 1-year follow-up. The severity of tricuspid regurgitation and safety were also assessed.

RESULTS

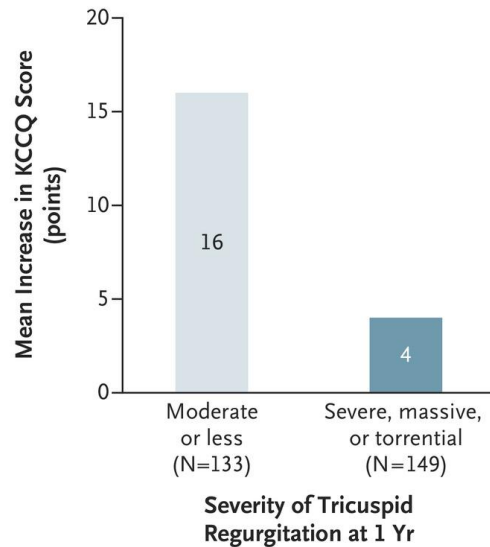
A total of 350 patients were enrolled; 175 were assigned to each group. The mean age of the patients was 78 years, and 54.9% were women. The results for the primary end point favored the TEER group (win ratio, 1.48; 95% confidence interval, 1.06 to 2.13; $P=0.02$). The incidence of death or tricuspid-valve surgery and the rate of hospitalization for heart failure did not appear to differ between the groups. The KCCQ quality-of-life score changed by a mean (\pm SD) of 12.3 ± 1.8 points in the TEER group, as compared with 0.6 ± 1.8 points in the control group ($P<0.001$). At 30 days, 87.0% of the patients in the TEER group and 4.8% of those in the control group had tricuspid regurgitation of no greater than moderate severity ($P<0.001$). TEER was found to be safe; 98.3% of the patients who underwent the procedure were free from major adverse events at 30 days.

CONCLUSIONS

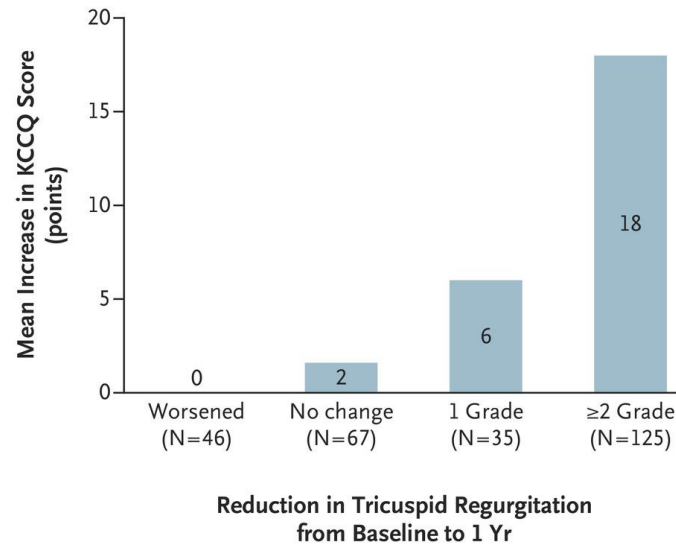
Tricuspid TEER was safe for patients with severe tricuspid regurgitation, reduced the severity of tricuspid regurgitation, and was associated with an improvement in quality of life. (Funded by Abbott; TRILUMINATE Pivotal ClinicalTrials.gov number, [NCT03904147](https://clinicaltrials.gov/ct2/show/study/NCT03904147).)

TRILUMINATE study

A Change in Quality of Life According to Severity of Residual Tricuspid Regurgitation



B Change in Quality of Life According to Magnitude of Reduction in Tricuspid Regurgitation



Sorajja P et al. NEJM 2023

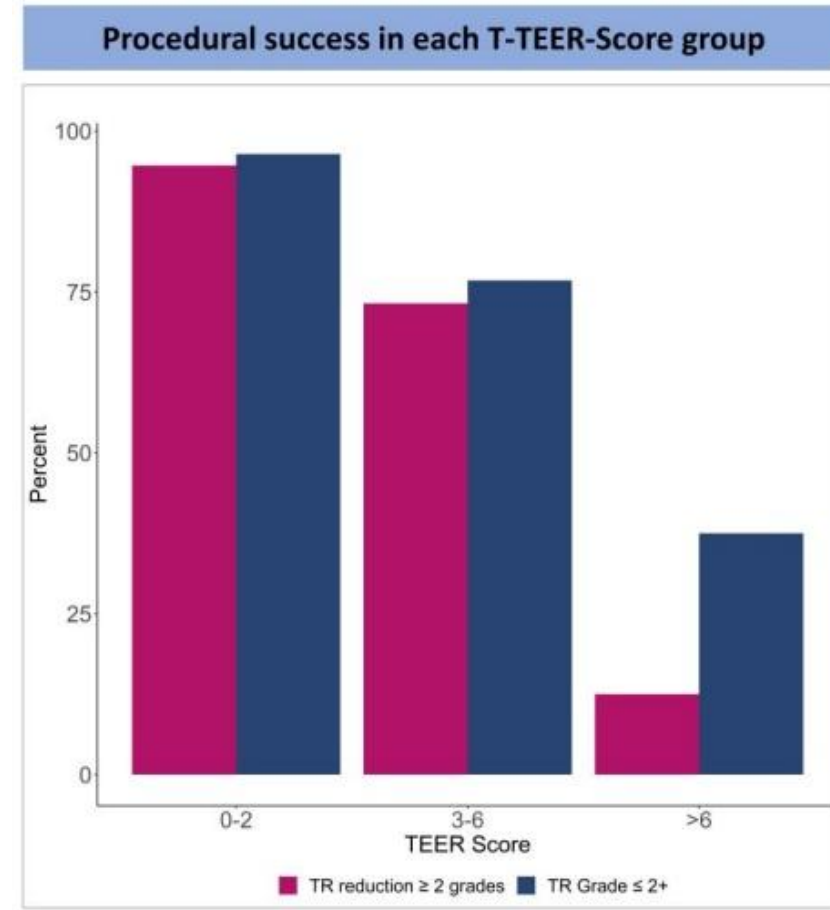


Subgroup	No. of Patients	TEER Group patients with ≥15-point improvement in KCCQ/total no. (%)	Control Group patients with ≥15-point improvement in KCCQ/total no. (%)	Odds Ratio (95% Confidence Interval)
All Patients	295	73/147 (49.7)	39/148 (26.4)	2.76 (1.69–4.49)
Age				
<78 yr	140	37/71 (52.1)	13/69 (18.8)	4.69 (2.19–10.05)
≥78 yr	155	36/76 (47.4)	26/79 (32.9)	1.83 (0.96–3.52)
Sex				
Male	126	24/60 (40.0)	11/66 (16.7)	3.33 (1.46–7.63)
Female	169	49/87 (56.3)	28/82 (34.1)	2.49 (1.33–4.64)
Tricuspid regurgitation severity				
Grade 3	85	22/40 (55.0)	10/45 (22.2)	4.28 (1.67–10.94)
Grade 4	56	13/33 (39.4)	5/23 (21.7)	2.34 (0.70–7.86)
Grade 5	139	36/69 (52.2)	18/70 (25.7)	3.15 (1.54–6.44)
New York Heart Association class				
I or II	138	23/68 (33.8)	12/70 (17.1)	2.47 (1.11–5.49)
III or IV	157	50/79 (63.3)	27/78 (34.6)	3.26 (1.69–6.26)
Hospitalization for heart failure within the past year				
No	230	54/117 (46.2)	28/113 (24.8)	2.60 (1.49–4.56)
Yes	65	19/30 (63.3)	11/35 (31.4)	3.77 (1.35–10.56)
Kidney disease				
No	199	53/101 (52.5)	25/98 (25.5)	3.22 (1.77–5.87)
Yes	96	20/46 (43.5)	14/50 (28.0)	1.98 (0.85–4.62)
Previous mitral or aortic intervention				
No	189	45/90 (50.0)	26/99 (26.3)	2.81 (1.53–5.16)
Yes	106	28/57 (49.1)	13/49 (26.5)	2.67 (1.18–6.07)
KCCQ				
<50	118	42/53 (79.2)	28/65 (43.1)	5.05 (2.21–11.52)
≥50	177	31/94 (33.0)	11/83 (13.3)	3.22 (1.50–6.93)
6-min walk distance				
<240 m	121	33/61 (54.1)	22/60 (36.7)	2.04 (0.98–4.21)
≥240 m	164	37/79 (46.8)	14/85 (16.5)	4.47 (2.17–9.21)
Left ventricular ejection fraction				
<50%	33	12/19 (63.2)	4/14 (28.6)	4.29 (0.97–18.97)
≥50%	234	55/118 (46.6)	30/116 (25.9)	2.50 (1.44–4.34)
Right ventricular end-diastolic dimension				
<5 cm	133	37/71 (52.1)	18/62 (29.0)	2.66 (1.30–5.46)
≥5 cm	156	35/75 (46.7)	18/81 (22.2)	3.06 (1.53–6.12)
Right atrial volume				
<150 ml	186	50/101 (49.5)	24/85 (28.2)	2.49 (1.35–4.60)
≥150 ml	103	22/45 (48.9)	12/58 (20.7)	3.67 (1.55–8.69)
Tricuspid annular plane systolic excursion				
<1.7 cm	151	36/72 (50.0)	21/79 (26.6)	2.76 (1.40–5.45)
≥1.7 cm	134	36/74 (48.6)	13/60 (21.7)	3.43 (1.59–7.36)
Central venous pressure				
<10 mm Hg	66	17/35 (48.6)	6/31 (19.4)	3.94 (1.30–11.95)
≥10 mm Hg	99	22/44 (50.0)	17/55 (30.9)	2.24 (0.98–5.09)
Mean pulmonary artery pressure				
<25 mm Hg	138	34/74 (45.9)	11/64 (17.2)	4.10 (1.85–9.06)
≥25 mm Hg	157	39/73 (53.4)	28/84 (33.3)	2.29 (1.20–4.38)
Cardiac output				
<4 liters/min	96	26/44 (59.1)	14/52 (26.9)	3.92 (1.66–9.25)
≥4 liters/min	198	47/103 (45.6)	24/95 (25.3)	2.48 (1.36–4.54)

0.2 0.5 1.0 2.5 5.0 10.0 20.0
Control Better TEER Better

T-TEER prognostické skóre

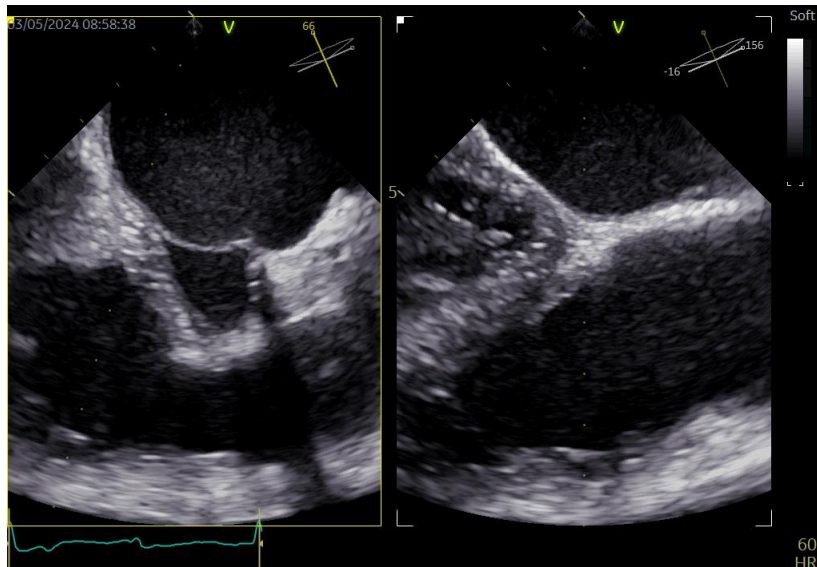
The Tricuspid TEER Scoring system			
Parameters	Straightforward (0 points)	Moderate (1 point)	Complex (2 points)
	0 - 2 mm	3 - 6 mm	> 6 mm
Septolateral Gap			
Septal Leaflet Mobility/Tethering	> 75 % ¹ 	25 - 75 % ¹ 	< 25 % ¹
Leaflet Number/Morphology	Type I-II 	Type III 	Type IV
Predominant Jet location	Anteroseptal 	Posteroseptal 	Anteroposterior
Shadowing/Image Quality	Good (0 points) 	Limited (1 point) 	
En-face TR Jet Morphology	oval/linear (0 points) 	star-shaped (1 point) 	



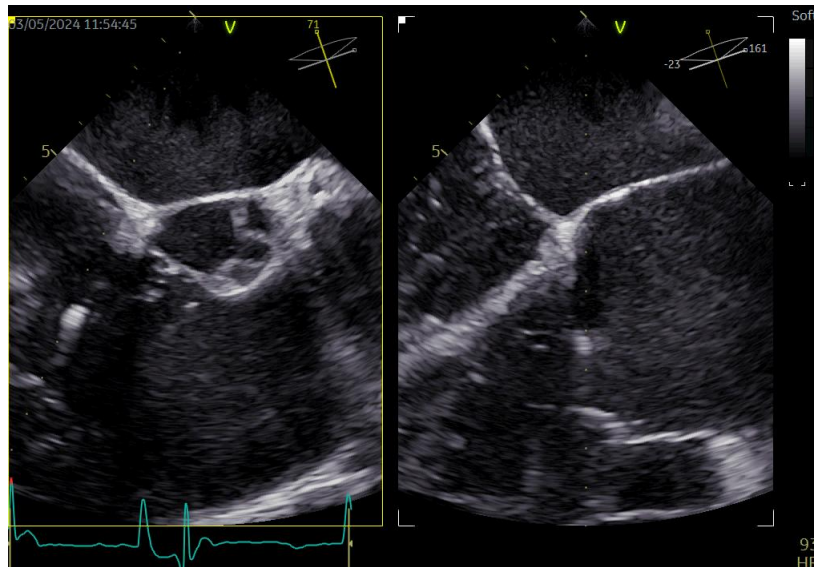
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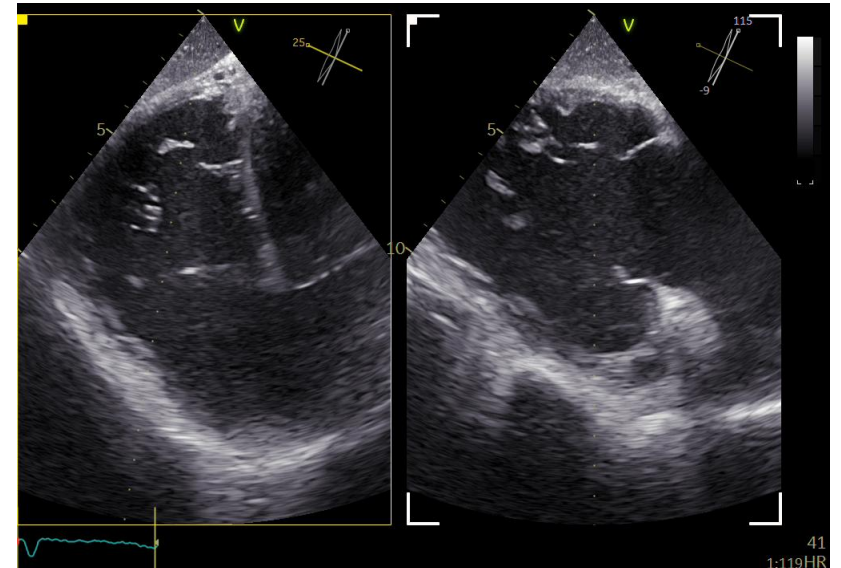
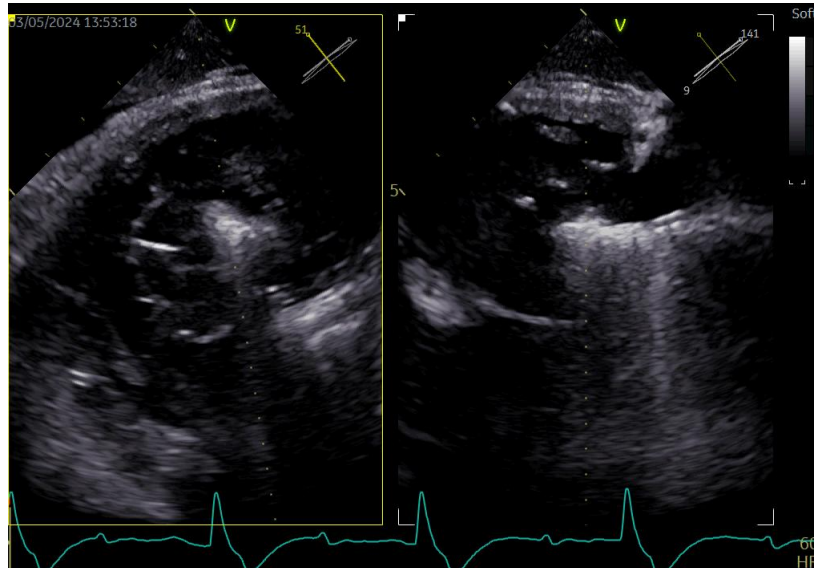
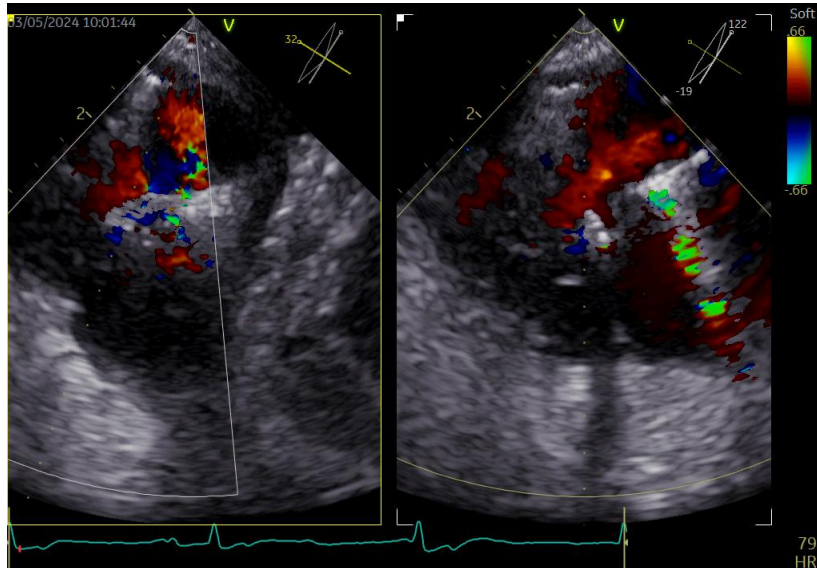
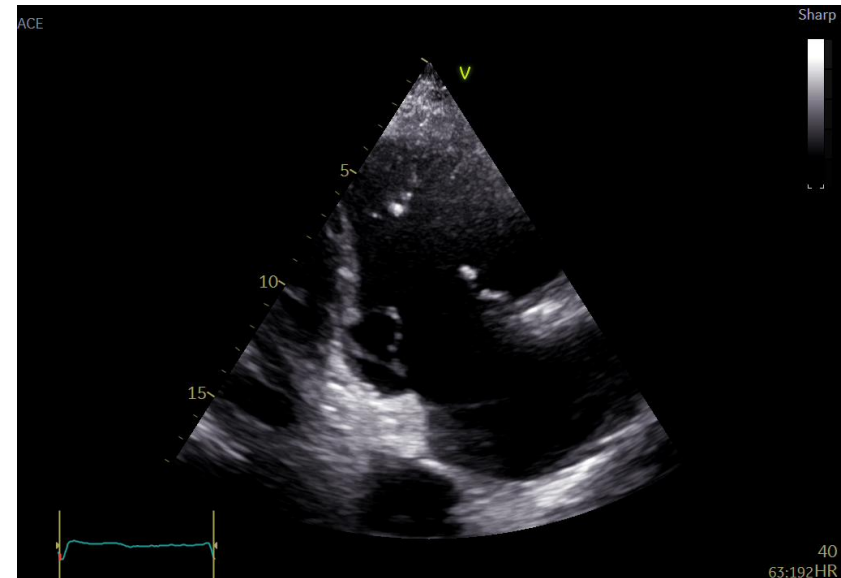
Vhodný pacient



Méně vhodný pacient



Méně vhodný pacient



Ortotopická implantace chlopně

- **Výhody:**

- fyziologické
- prakticky bez regurgitace

- **Nevýhody:**

- riziko AV bloku
- degenerace bioprotézy, trombóza
- selhání pravé komory

Specifická situace – „valve-in-valve“ a „valve-in-ring“

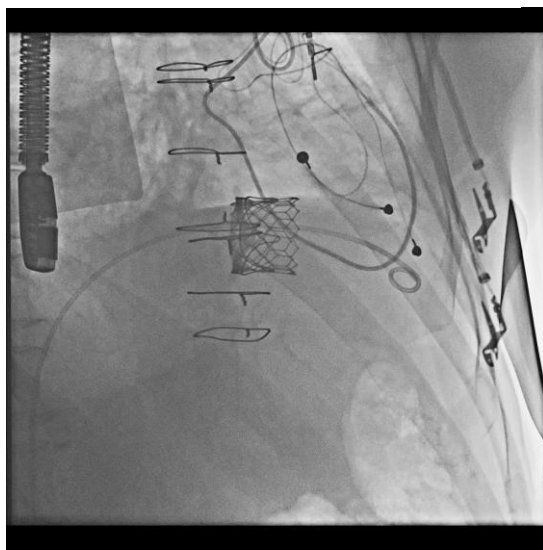
Heterotopická implantace chlopně

- **Výhody:**

- není závislá na kvalitě zobrazení
- může být zhoršená systolická funkce pravé komory (?)

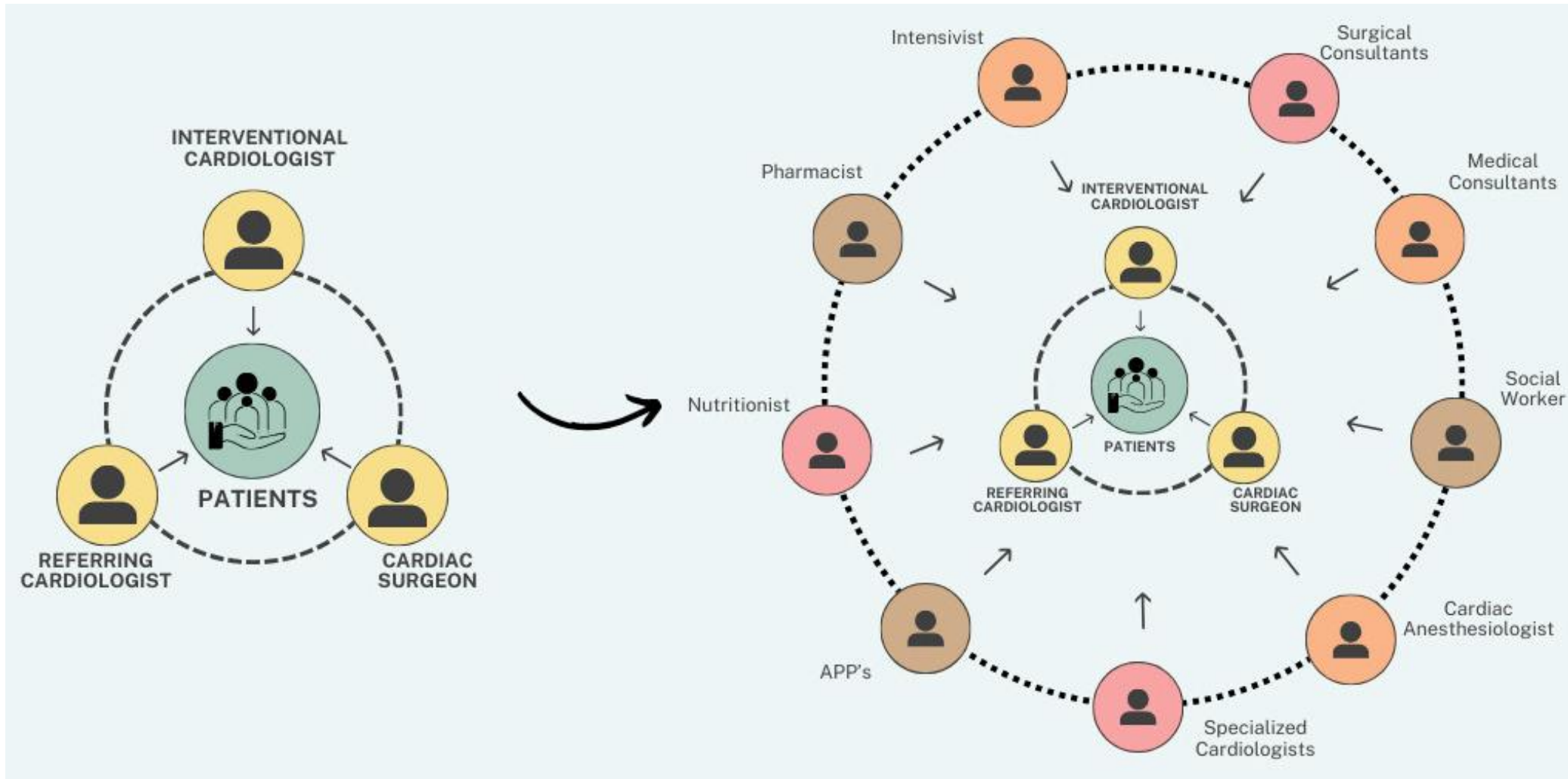
- **Nevýhody:**

- není to fyziologické
- limitace rozměrem chlopní
- nutnost antikoagulační léčby
- limitovaná data



z obrazového archívu VFN

„Heart team“ - rozhodnutí o způsobu léčby



Závěr

- Trikuspidální regurgitace je jednou z nejčastějších chlopenních vad a je prokázáno, že její přítomnost je spojena s horší prognózou pacientů → pozornost věnovaná její léčbě
- Možnosti léčby dnes zahrnují, jak chirurgické možnosti, tak řadu katetrizačních technik
- Rozhodnutí o způsobu léčby by měl provést „heart team“ po zvážení řady faktorů
- Přesto zůstává řada otázek dosud nezodpovězena (především kdy a jakým způsobem léčit)



DĚKUJI ZA POZORNOST!

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