KOMPLEXNÍ KARDIO VASKULÁRNÍ CENTRUM VFN Praha

Trikuspidální regurgitace - známá neznámá

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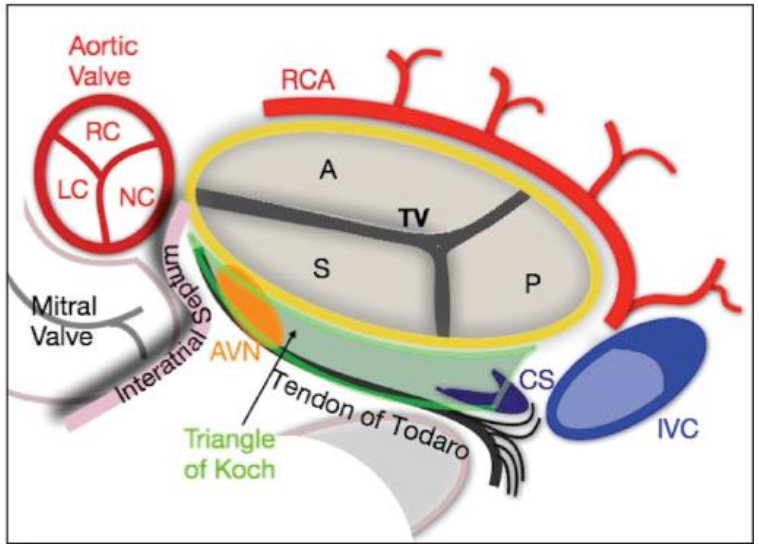
VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

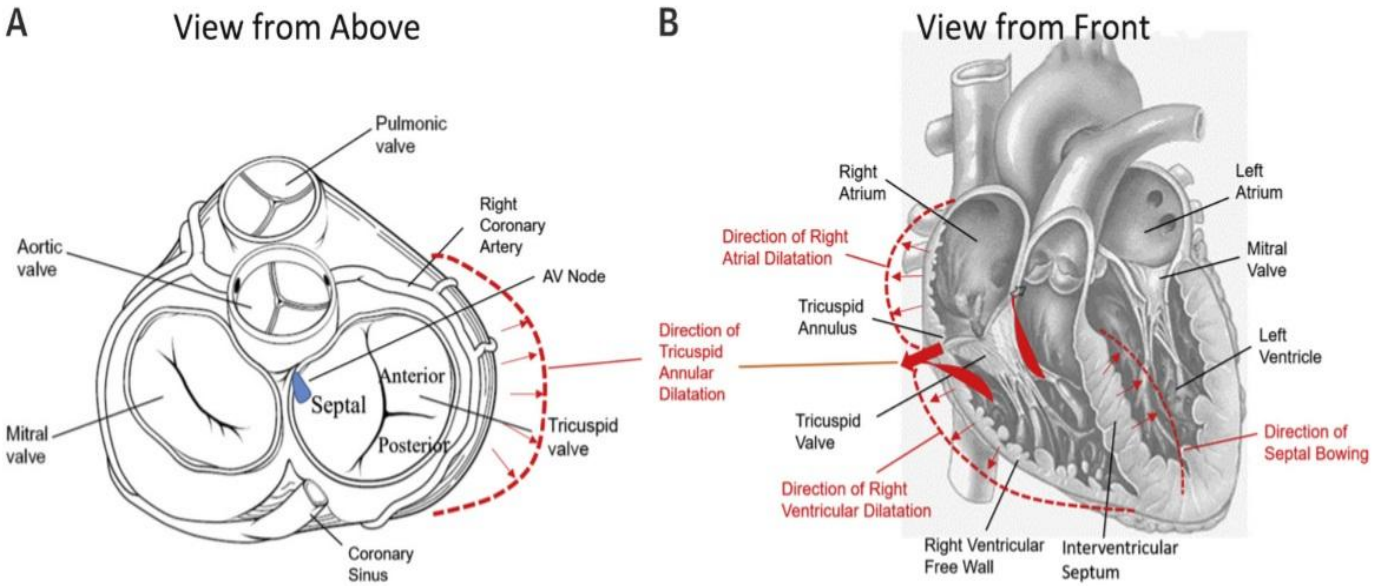
Trikuspidální regurgitace

Není zapomenutá chlopenní vada

- Komplexní struktura chlopně ve srovnání s ostatními
- Obtížné klinické hodnocení symptomů
- Obtížná kvantifikace (výrazně volum dependentní)
- Obtížně zobrazení z TEE
- Obtížné hodnocení funkce pravé komory



Kinno M et al. Cardiac Intervention Today 2018



Dahou, A. et al. J Am Coll Cardiol Img. 2019;12(3):458-68.

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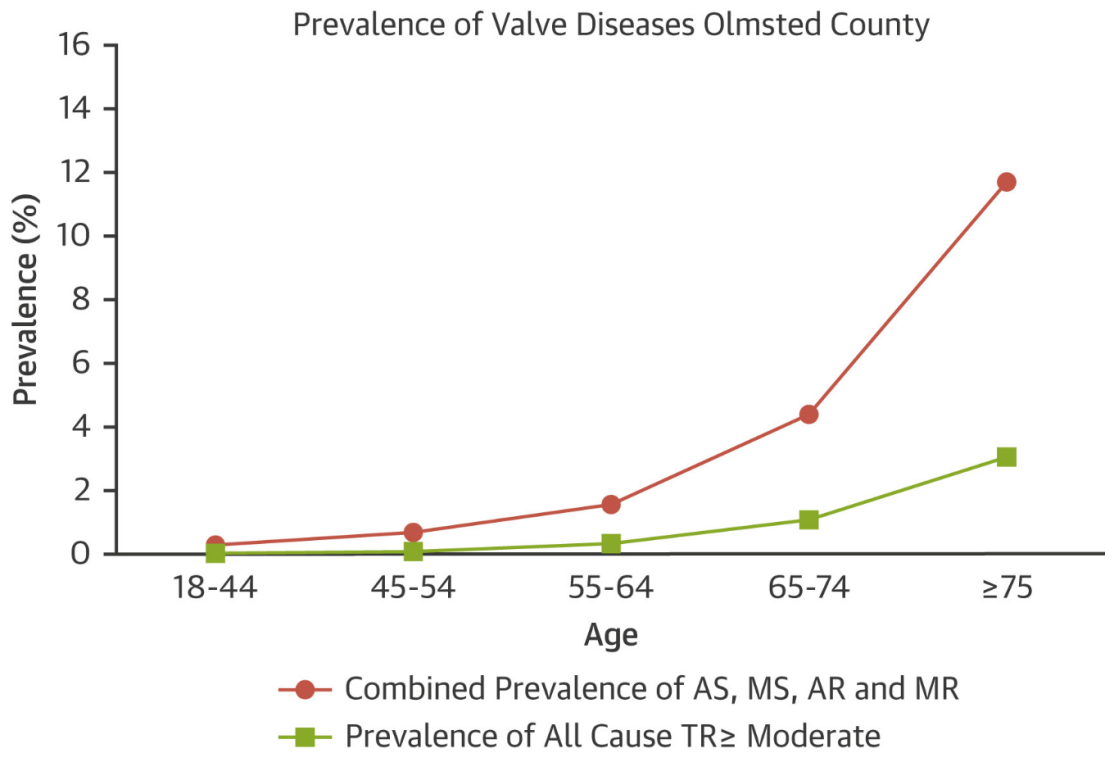
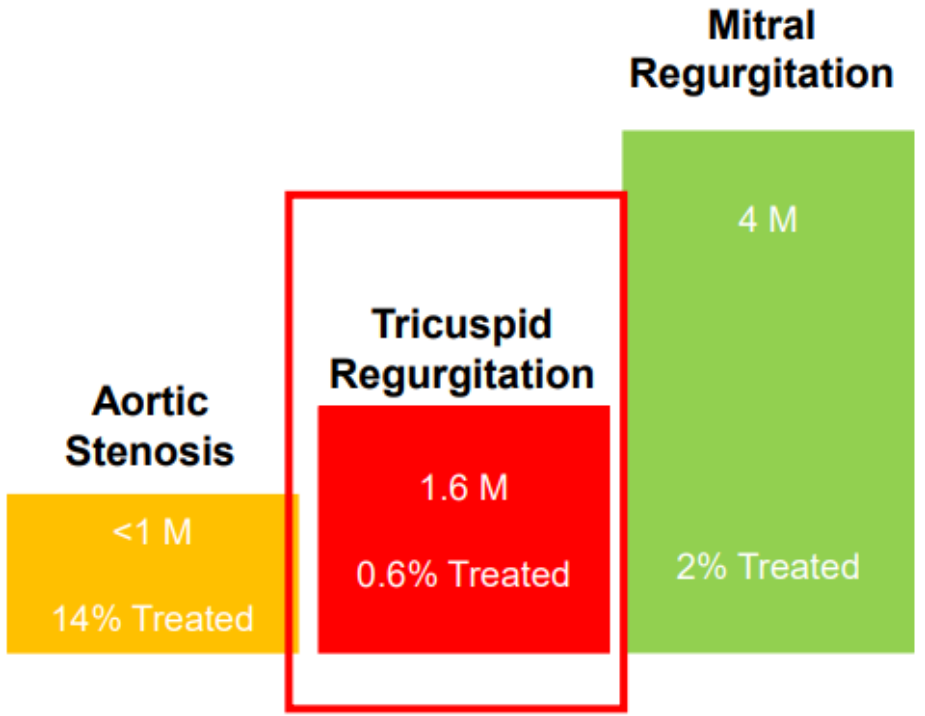
Prevalence trikuspidální regurgitace



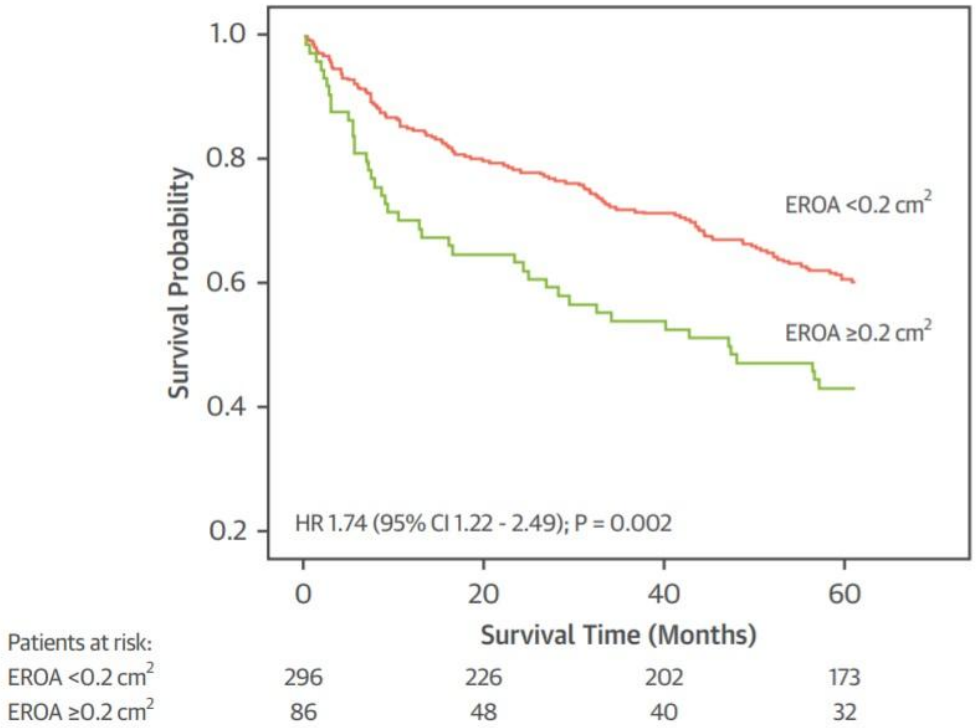
Topilsky Y et al. JACC: Cardiovasc Imag 2019



Nishimura RA al. AHA/ACC guideline for management the patient of valvular heart disease. 2014

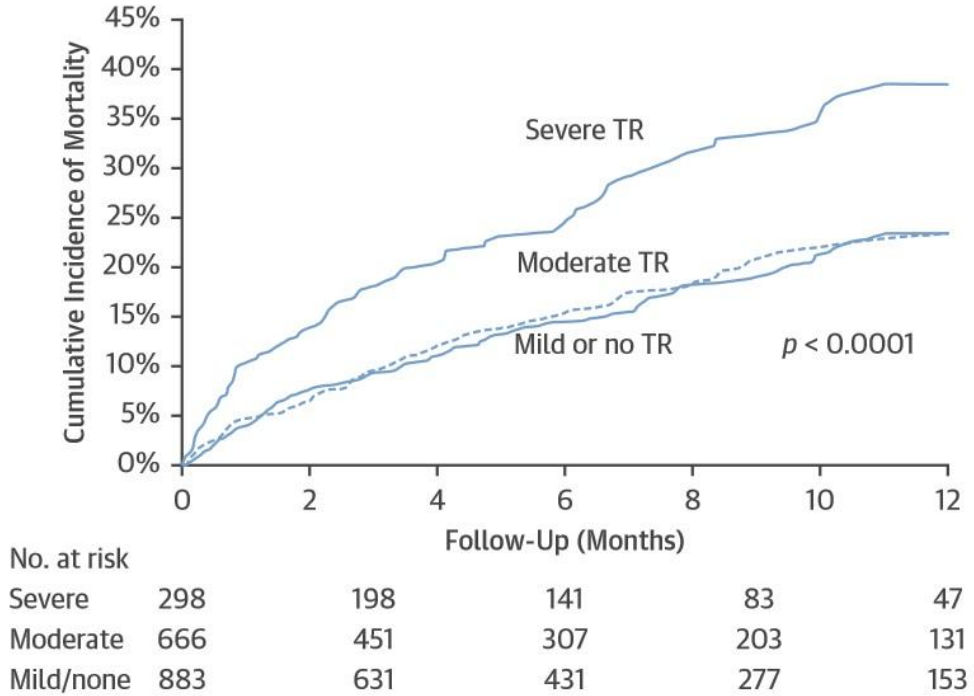
Trikuspidální regurgitace a prognóza

U srdečního selhání HFrEF



Bartko PE et al. JACC Imag 2017

Po katetrizační plastice Mi chlopně



Sorajja P et al. JACC 2017

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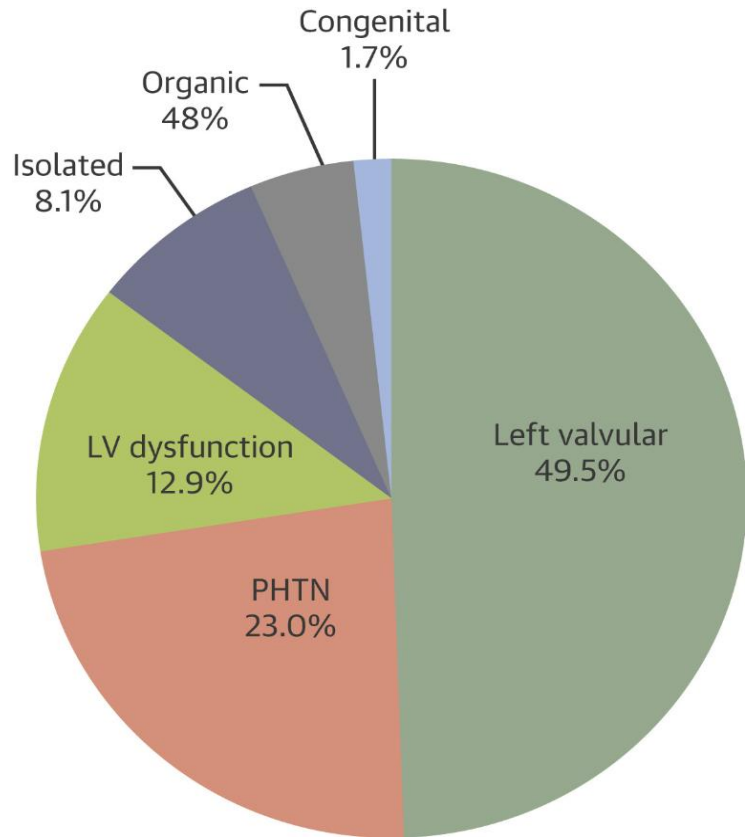
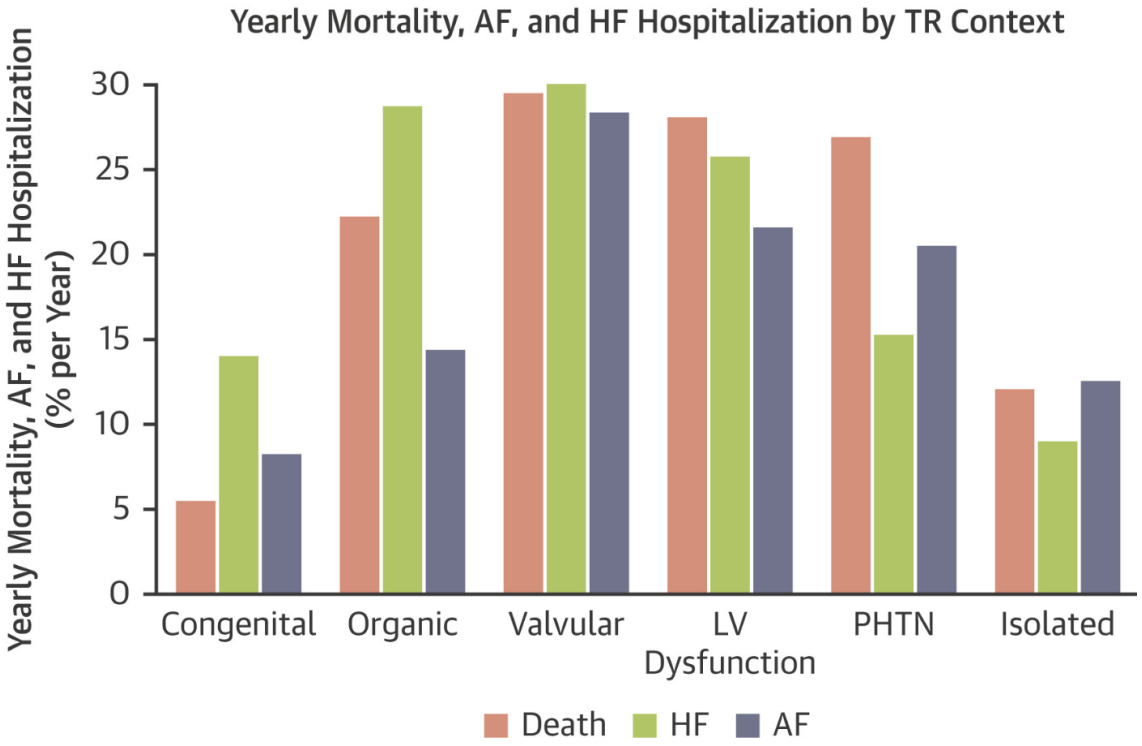
Etiologie trikuspidální regurgitace

Etiologie TriR v Olmsted country

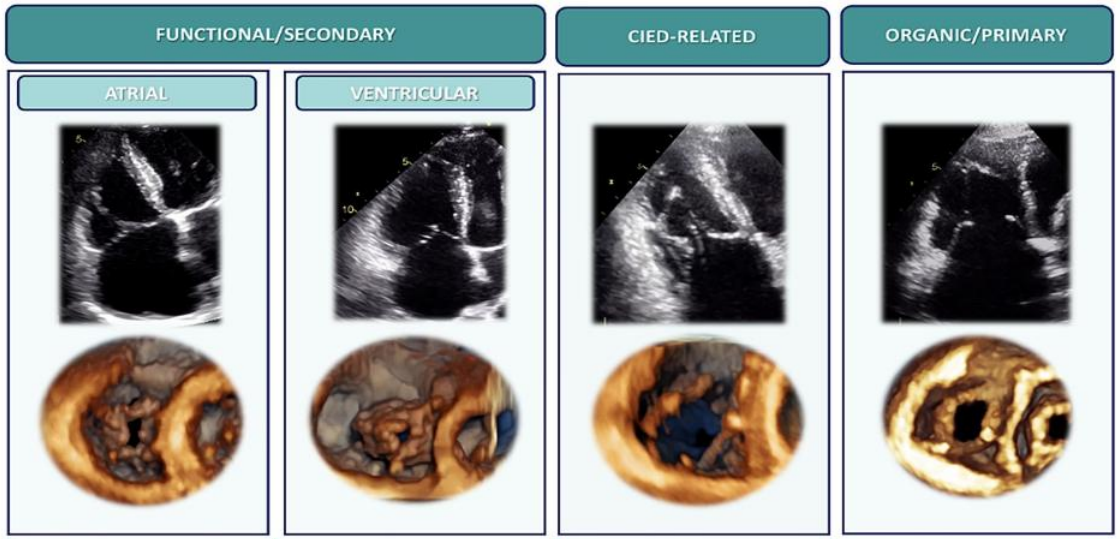


Vliv etiologie na prognózu pacientů



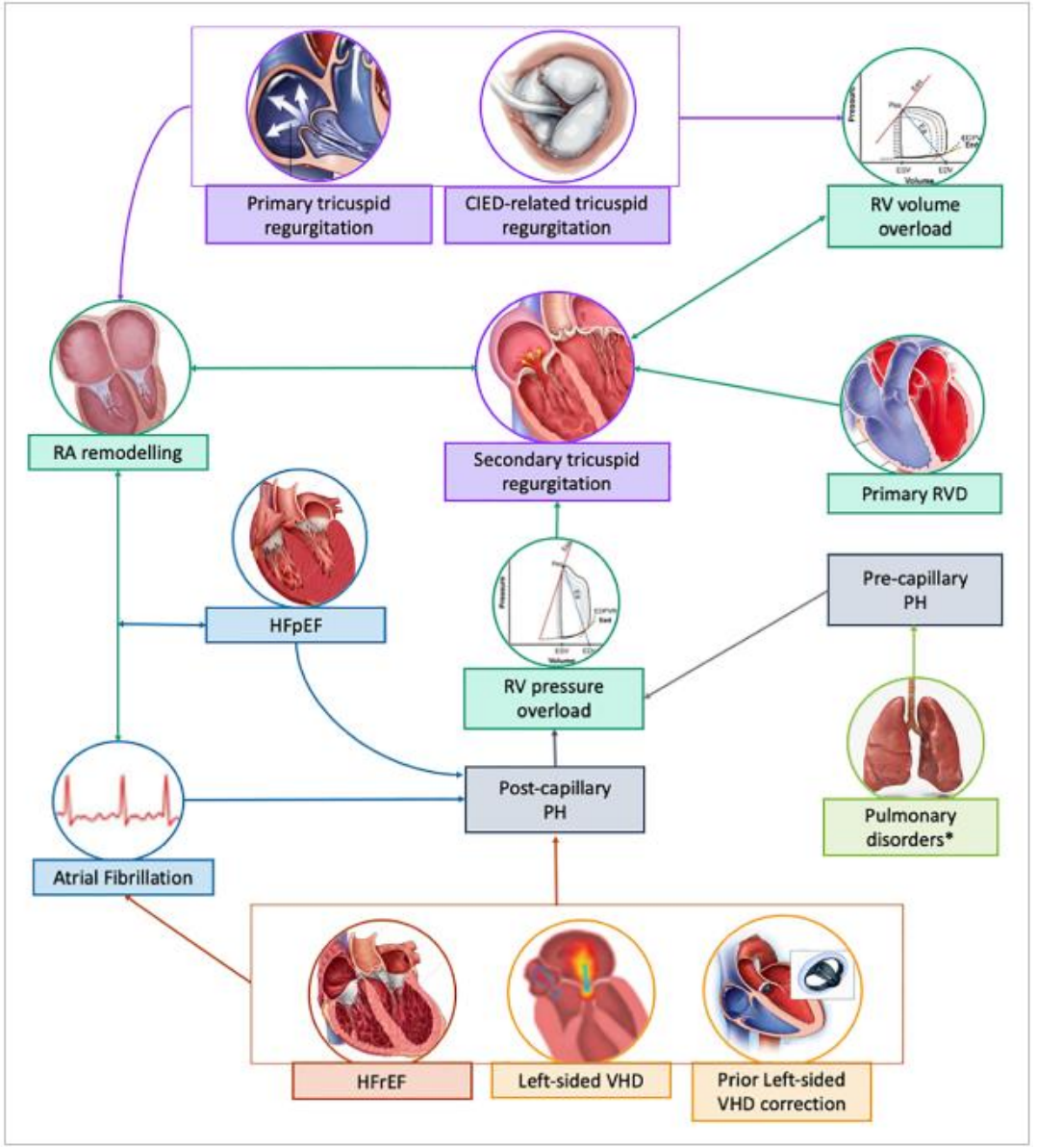
Topilsky Y et al. JACC: Cardiovasc Imag 2019

Etiologie a patofyziologie trikuspidální regurgitace



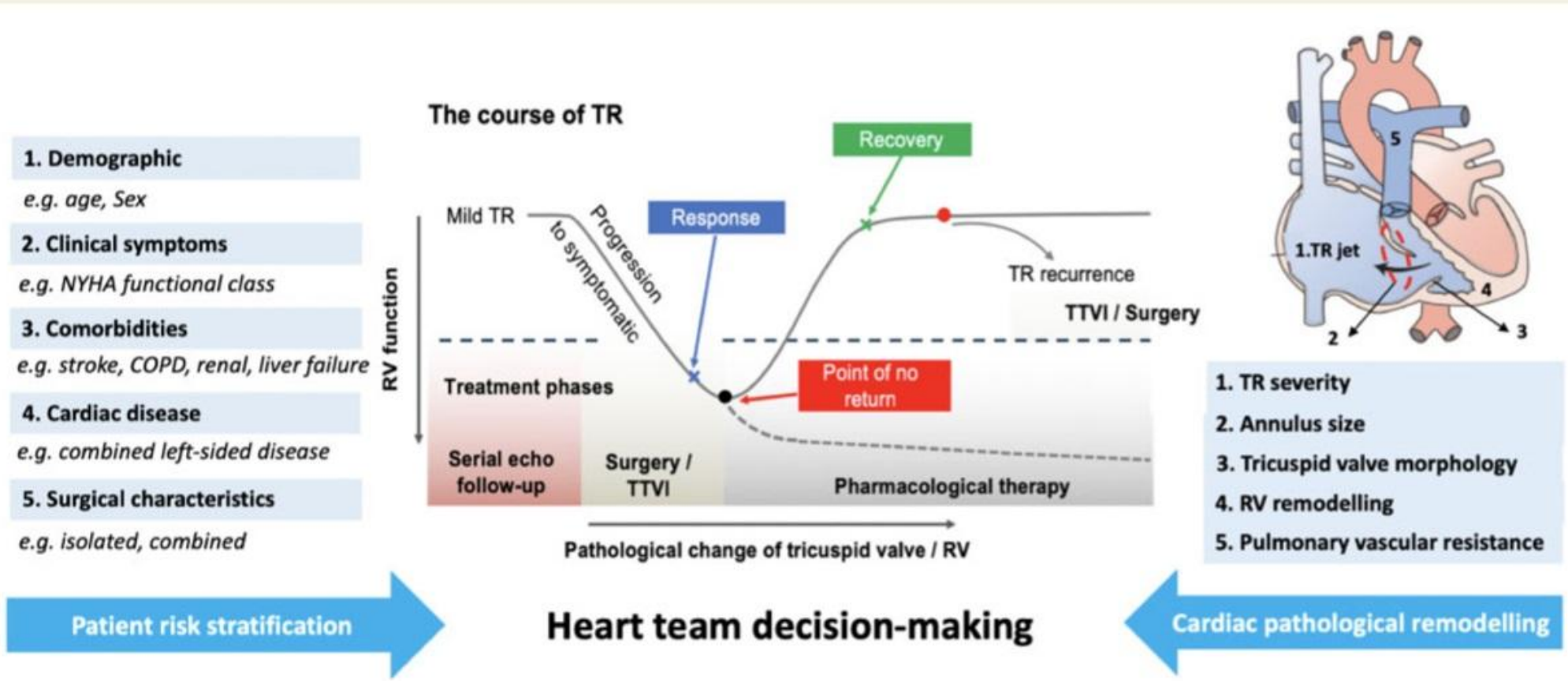
Parameter	Atrial FTR	Ventricular FTR	CIED-Related	Primary TR	
				Prolapse (I)	RHD (IIIA)
Leaflet Tethering	-	+++	++	-	-
Leaflet Restriction	-	Systole	Systole/Diastole	-	Diastole
RA/TA Dilatation	+++	++	+/-	++	++
RV Dilatation	+/-	+++	+/-	+/-	+/-
RV Dysfunction	+/-	+++	+/-	+/-	+/-

Hahn R et al. EHJ Cardiovasc Imaging 2022



Adamo M et al. Eur J Hear Failure 2024

Strategie léčby trikuspidální regurgitace



Take home figure Heart team decision-making for treatment of tricuspid regurgitation. COPD, chronic obstructive pulmonary disease; NYHA, New York Heart Association; RV, right ventricle; TR, tricuspid regurgitation; TTVI, transcatheter tricuspid valve intervention.

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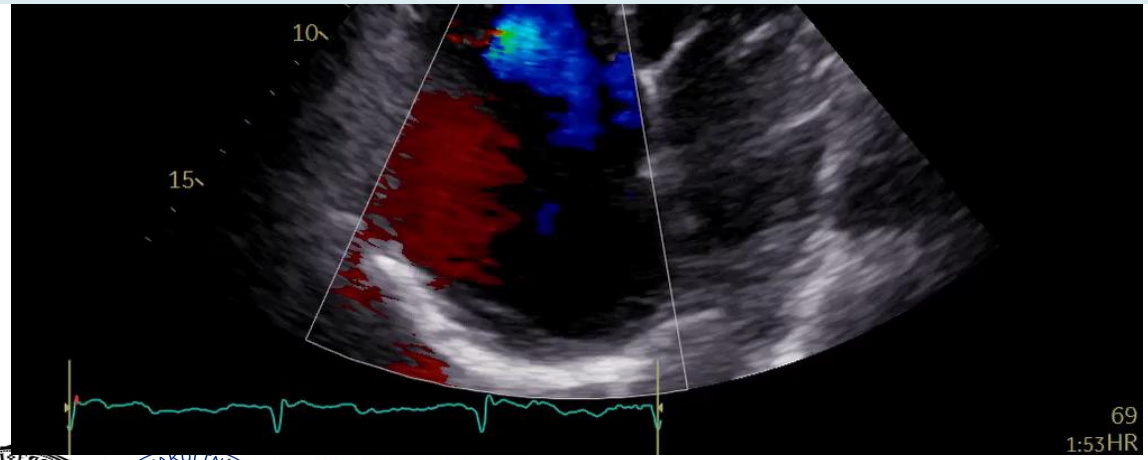
Chang Ch et al. Eur Heart J 2019

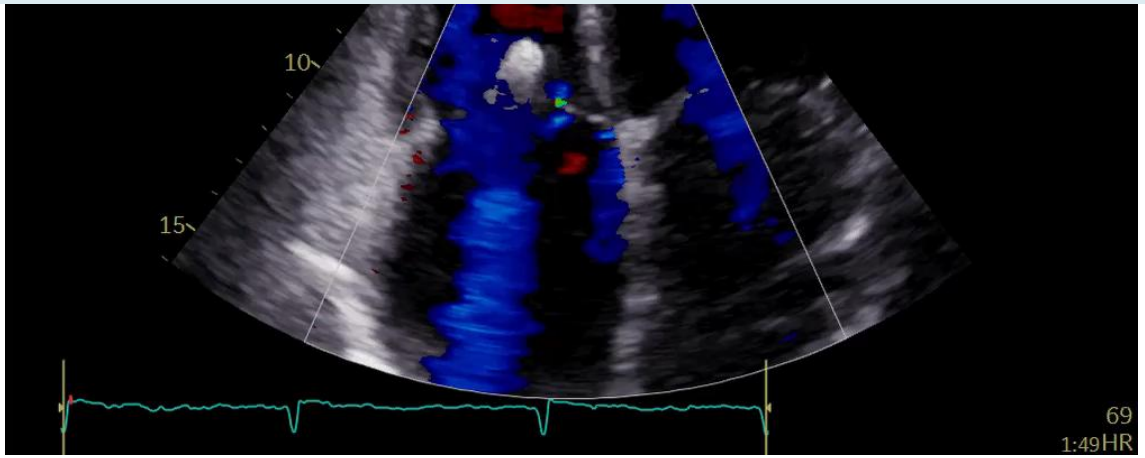
„Nová klasifikace trikuspidální regurgitace“

Table I **Proposed expansion of the ‘Severe’ grade**

Variable	Mild	Moderate	Severe	Massive	Torrential
VC (biplane)	<3 mm	3-6.9 mm	7–13 mm	14–20 mm	≥21 mm
EROA (PISA)	<20 mm^2	20–39 mm^2	40–59 mm^2	60–79 mm^2	≥80 mm^2
3D VCA or quantitative EROA[a]			75–94 mm^2	95–114 mm^2	≥115 mm^2

VC, vena contracta; EROA, effective regurgitant orifice area; 3D VCA, three-dimensional vena contracta area.
[a]3D VCA and quantitative Doppler EROA cut-offs may be larger than PISA EROA.





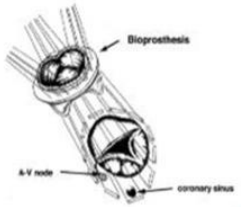
z obrazového archivu VFN

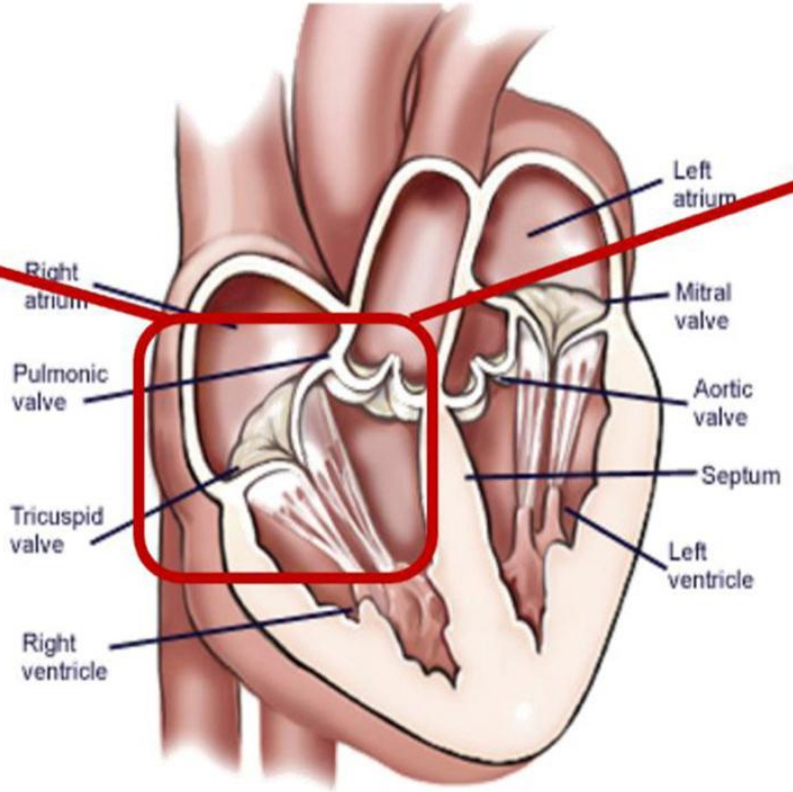
Možnosti léčby trikuspidální regurgitace

Surgical treatment

Severe isolated TR
- Mild symptomatology
- Mild RV dysfunction/remodeling
- No pulmonary hypertension
- No end-organ involvement
- Low-dose diuretic therapy

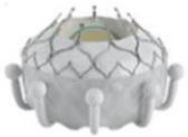
Mild-moderate TR
- Concomitant to left-sided valve surgery
- Annular dilation





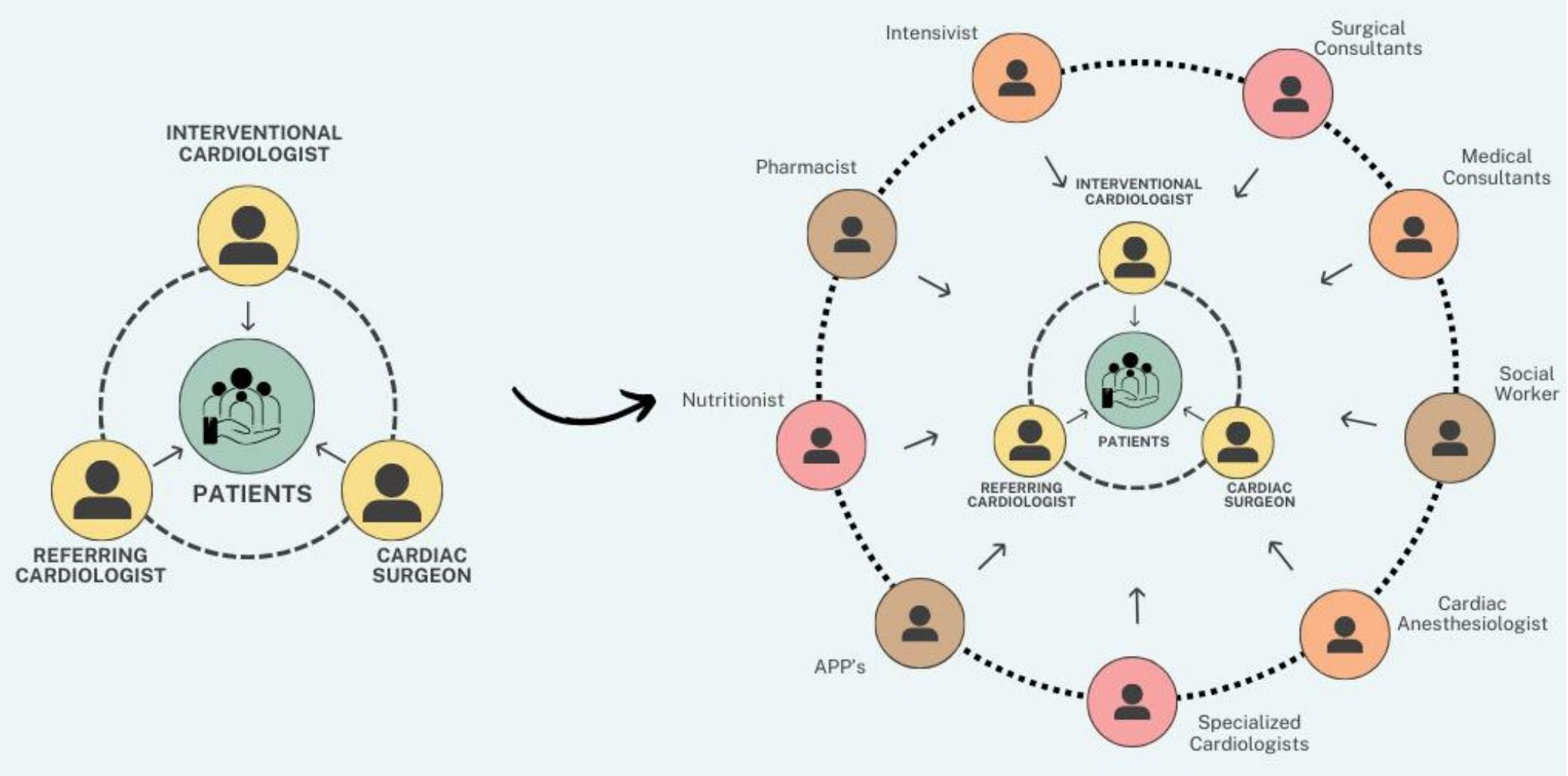
Transcatheter treatment

Severe TR
- Marked symptomatology
- Moderate RV dyfunction/remodeling
- No pulmonary hypertension
- Mild end-organ involvement
- Optimal medical therapy
- Concomitant to transcatheter mitral valve repair procedures



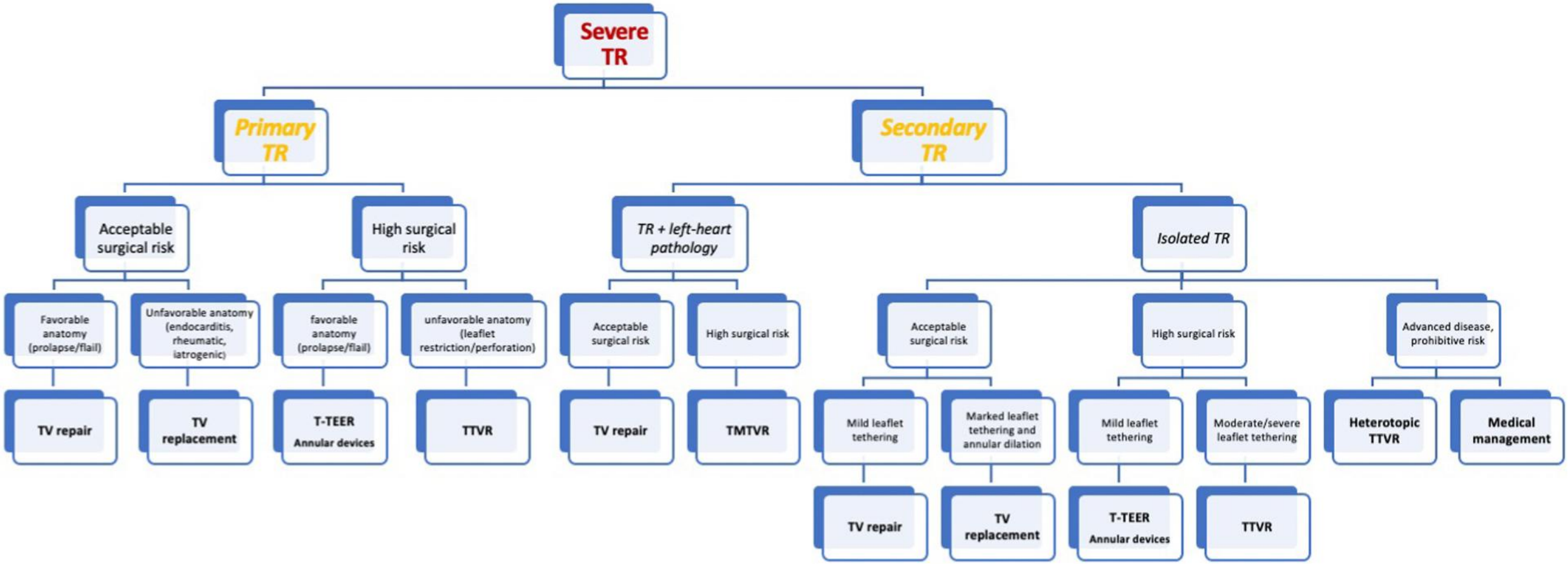
Sala A et al. J Soc CV Angio and Interv 2023

Heart team - rozhodnutí o způsobu léčby



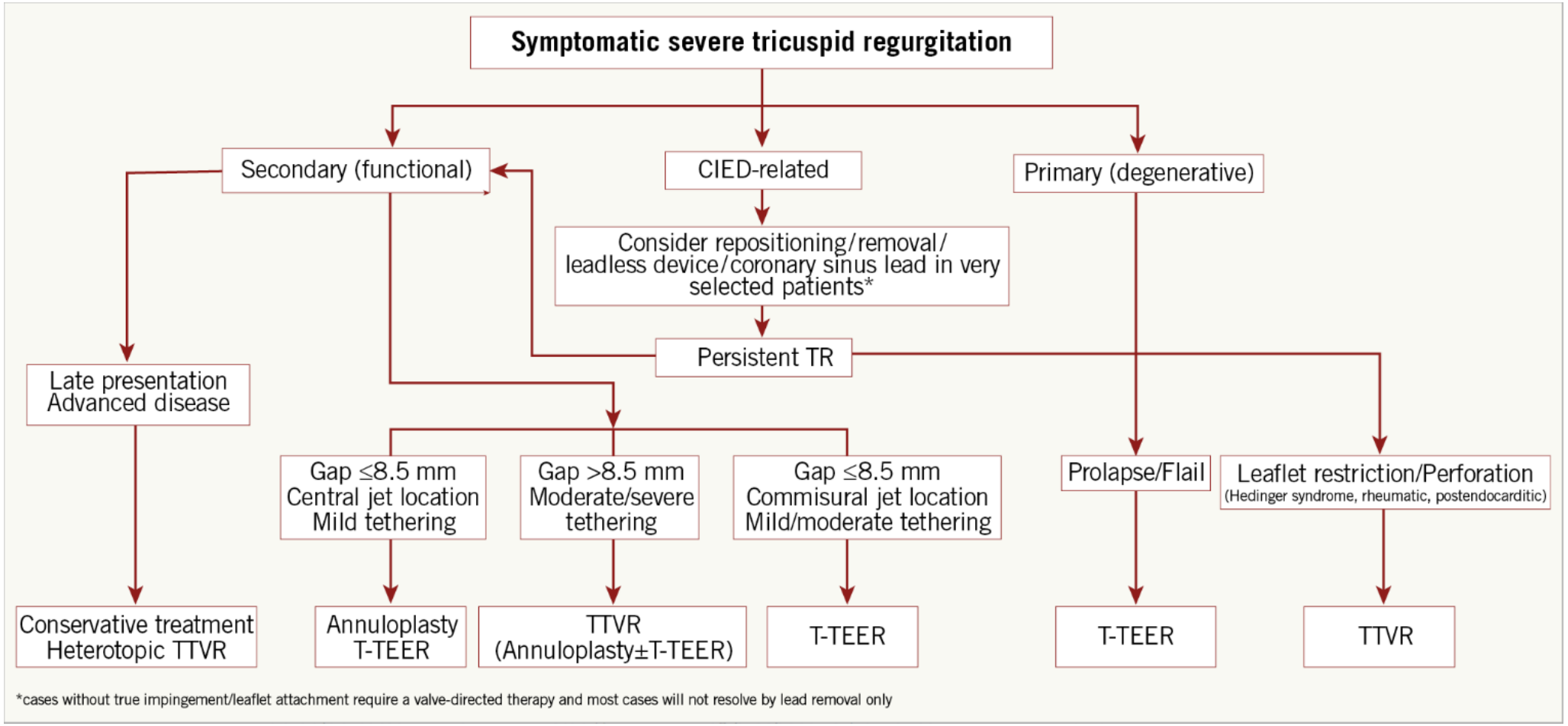
Riojas RA et al. Vessel Plus 2024

Algoritmus léčby trikuspidální regurgitace



Sala A et al. J Soc CV Angio and Interv 2023

Algoritmus katetrizační léčby trikuspidální regurgitace

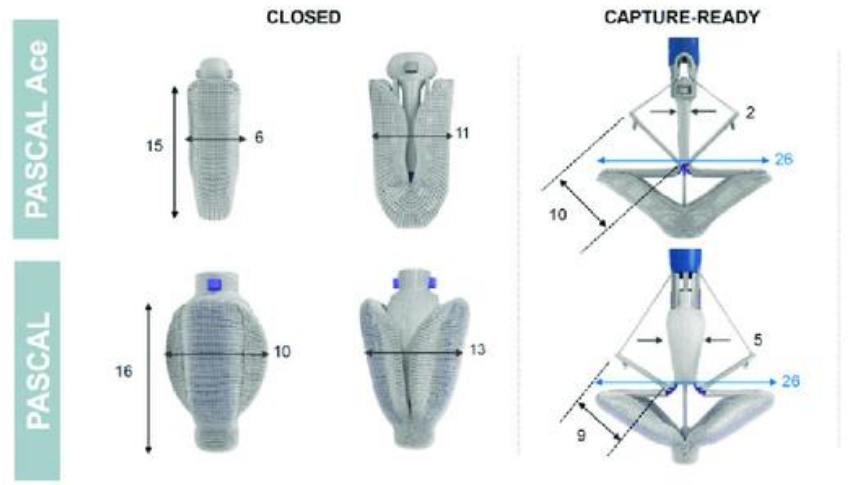


Praz F et al. EuroIntervention 2021

Katetrizační plastika cípů (TEER)

- **Nejběžnější způsob katetrizační léčby trikuspidální chlopně**
- Princip podobný jako u ošetření mitrální chlopně (klipy většinou do antero-septální a postero-septální komisury)
- TriClip (Abbott) – mírně upravený zaváděcí systém MitraClip – 2 klipy (4)
- Pascal (Edwards Lifesciences) – stejný systém, klip ACE
- **Nevýhody:**
  - závislý na kvalitě zobrazení
  - nevhodný pro pacienty s velkou ztrátou koaptace (gap ≥ 8,5 mm)

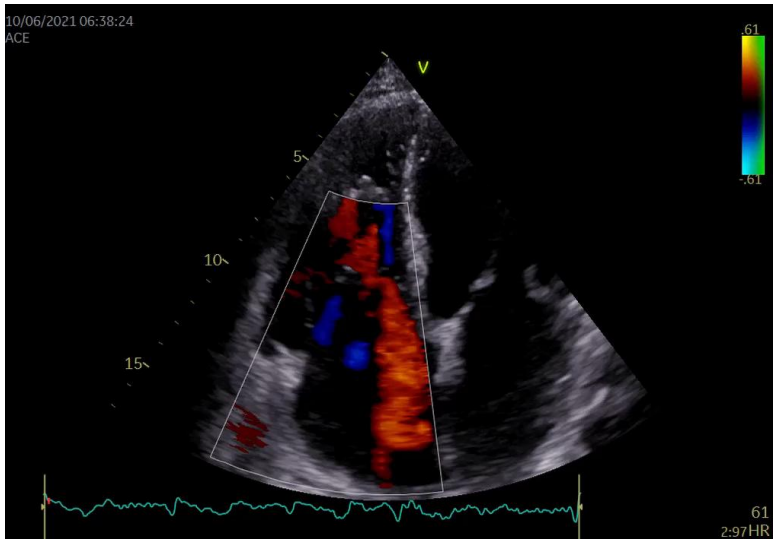
zdroj Abbott



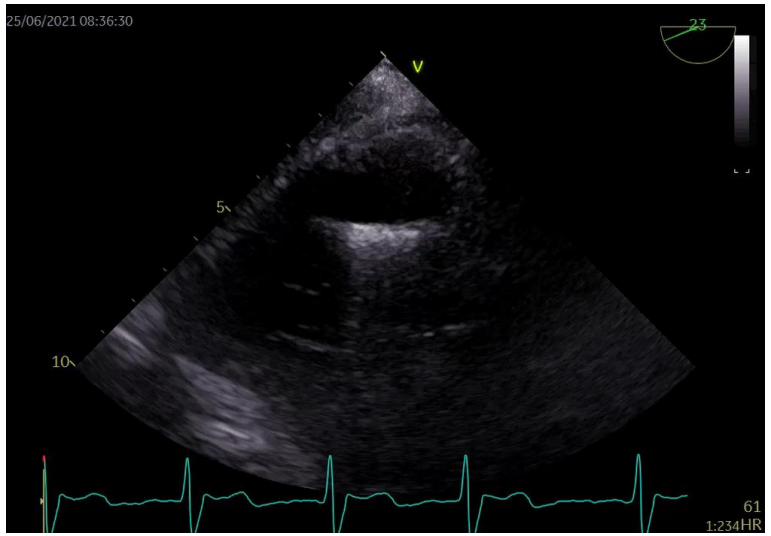
zdroj Edwards Lifesciences

Plastika cípů trikuspidální chlopně pomocí Pascal

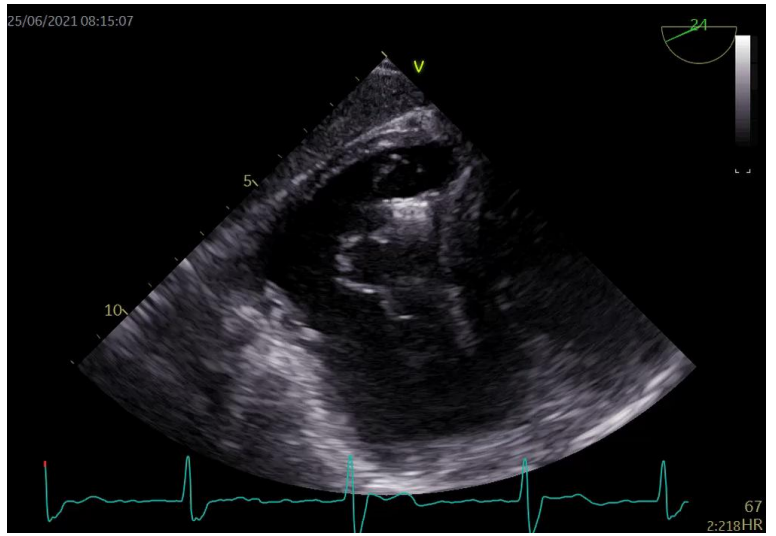
Těžká trikuspidální regurgitace



Umístění klipu v P-S komisuře



Finální výsledek



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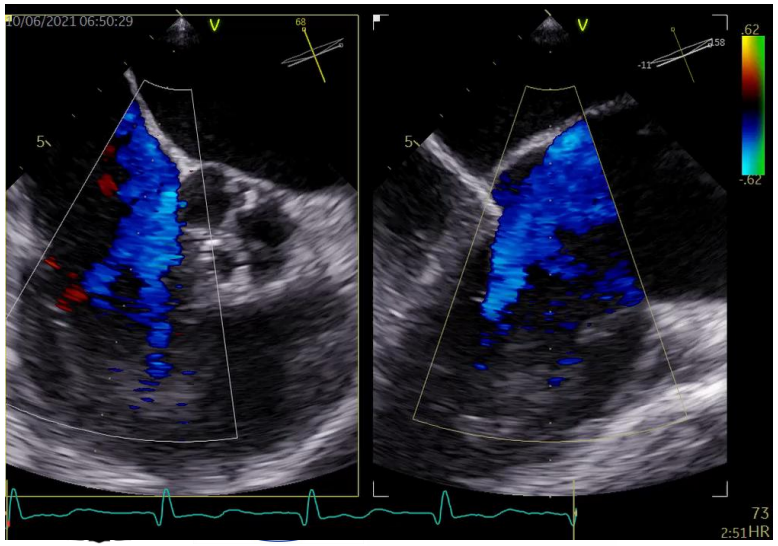
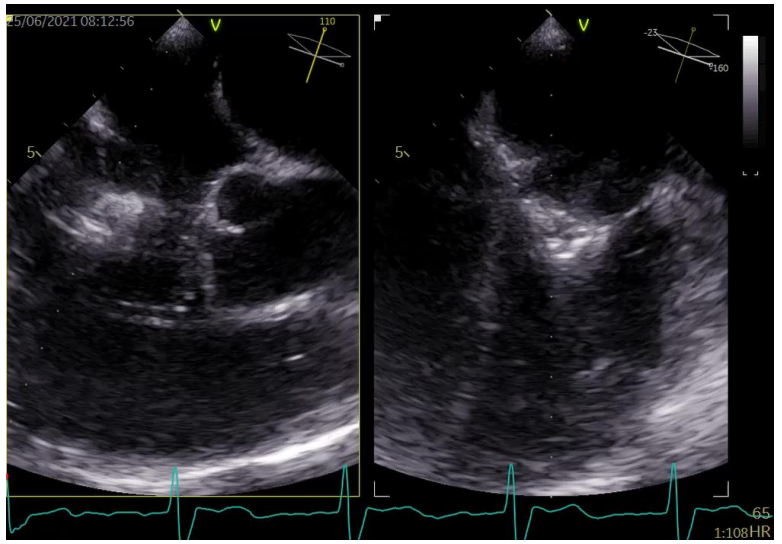
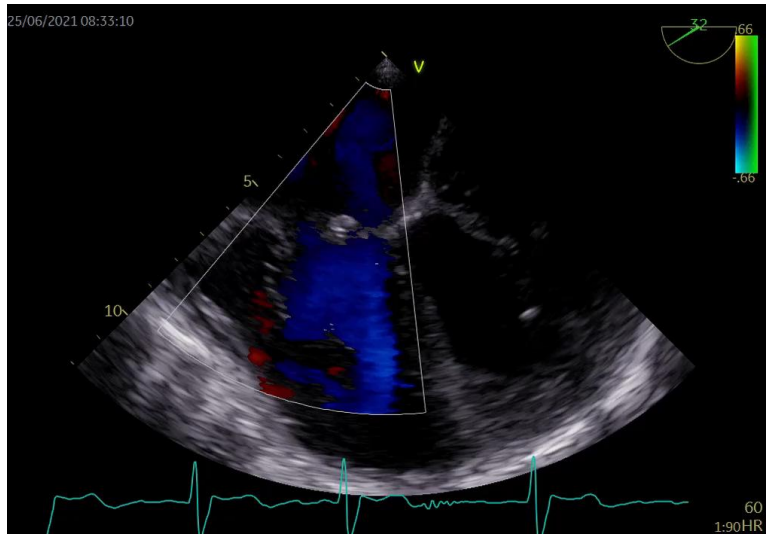
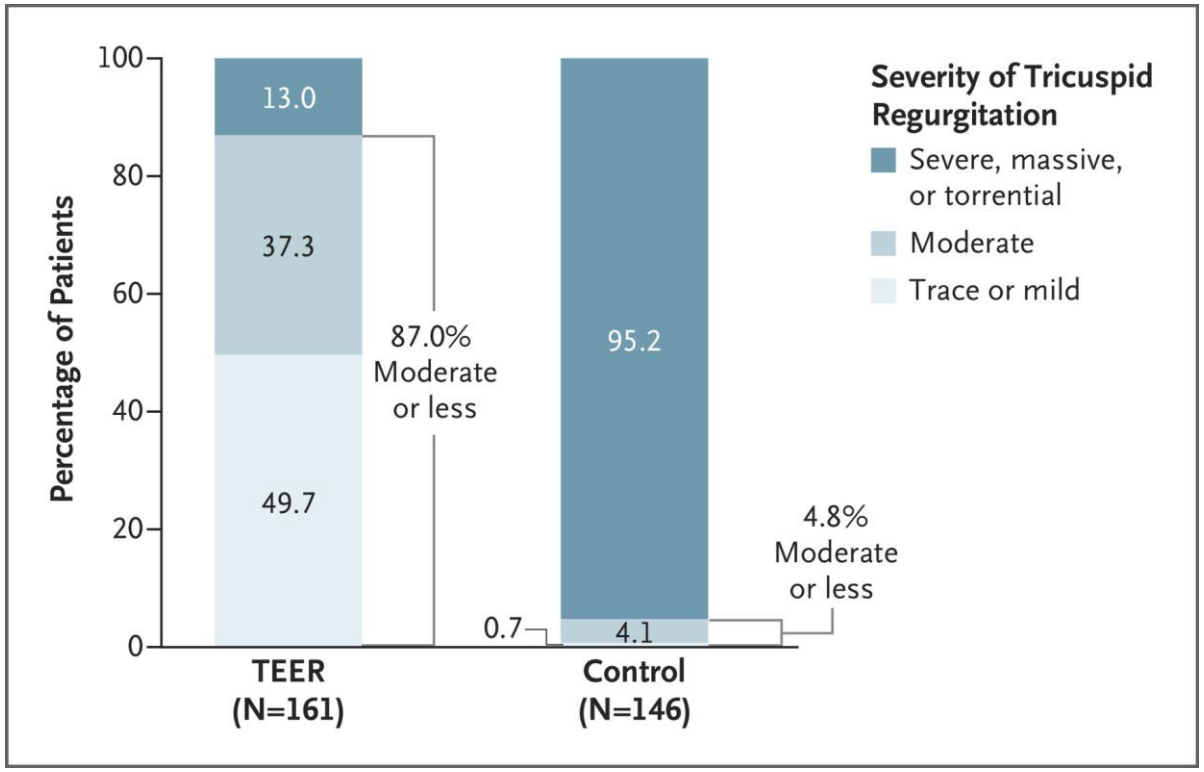






TRILUMINATE study

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 (±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.)

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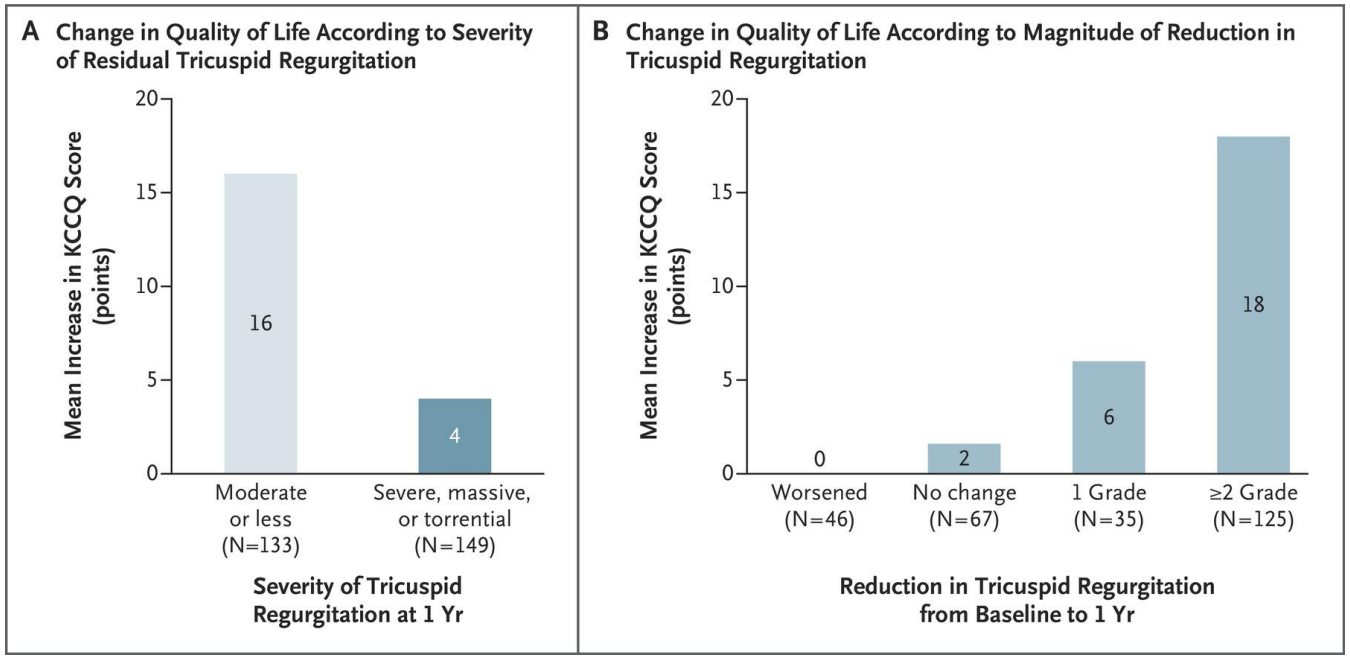
TRILUMINATE study



Sorajja P et al. NEJM 2023

Subgroup	No. of Patients	TEER Group	Control Group	Odds Ratio (95% Confidence Interval)
		patients with ≥15-point improvement in KCCQ/total no. (%)		
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)

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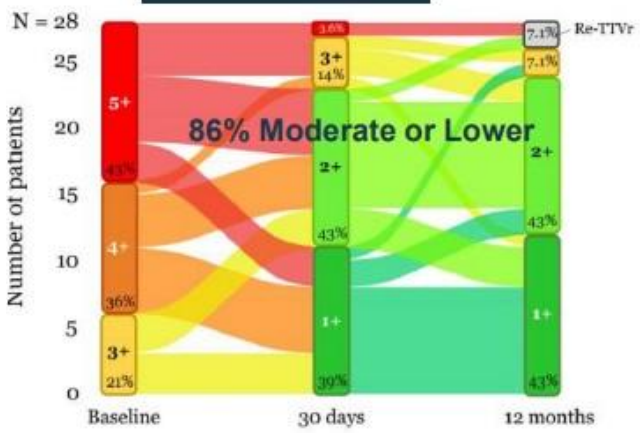
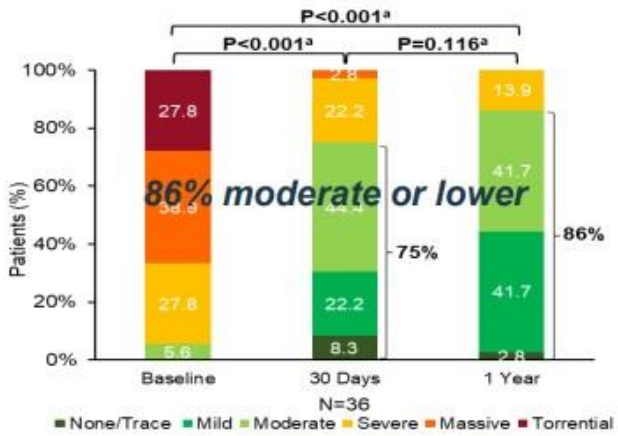
Efekt T-TEER je konzistentní

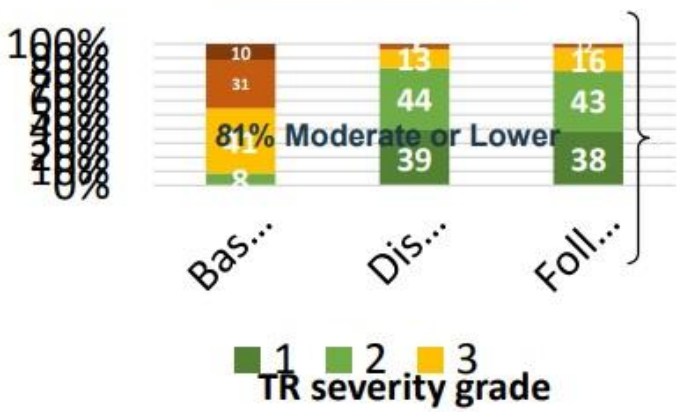
CLASP CU



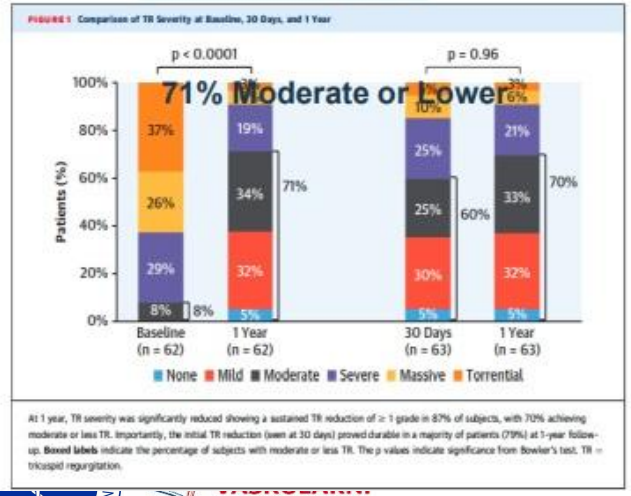
CLASP TR EFS



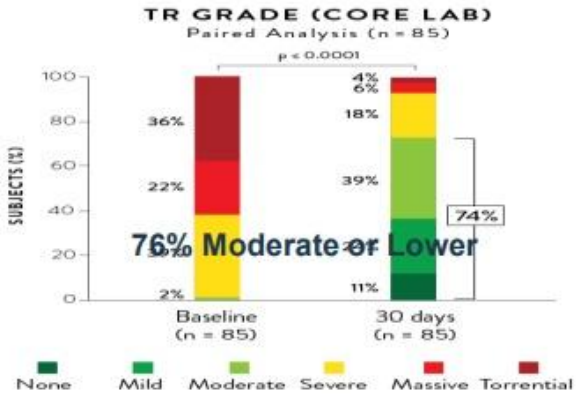
PASTE Registry



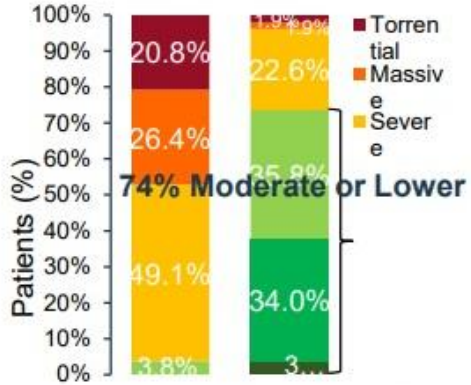
Triluminate Registry



Triluminate Pivotal Roll In



CLASP II TR Roll In



Davidson ChJ – TCT 2022

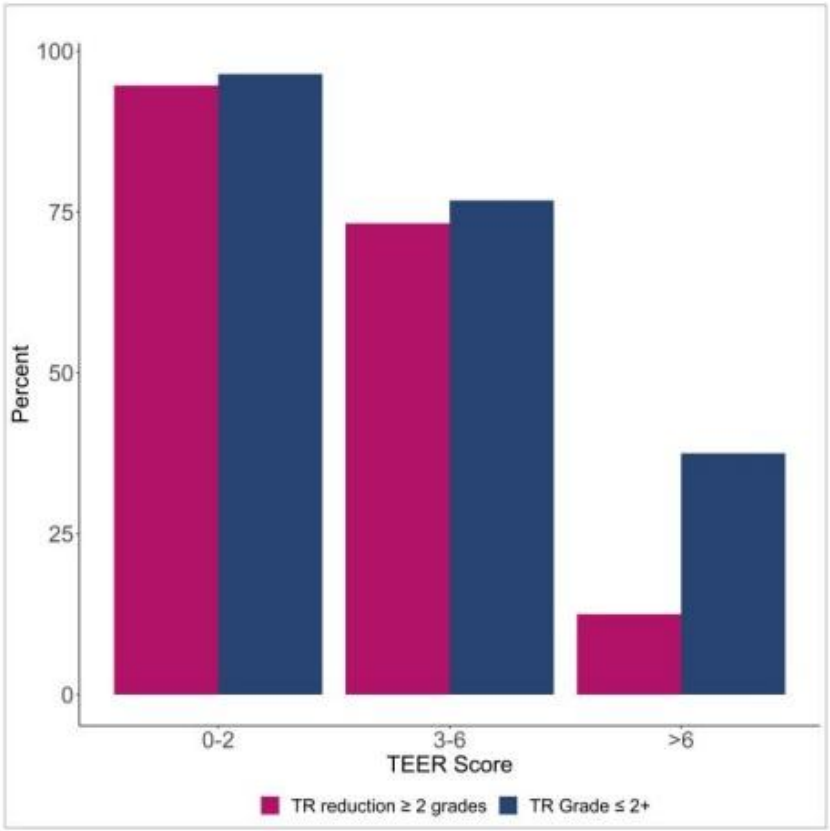
T-TEER prognostické skóre

The Tricuspid TEER Scoring system

Parameters	Straightforward (0 points)	Moderate (1 point)	Complex (2 points)
Septolateral Gap	0 - 2 mm 	3 - 6 mm 	> 6 mm 
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) 

[1]to the coaptation-line

Procedural success in each T-TEER-Score group



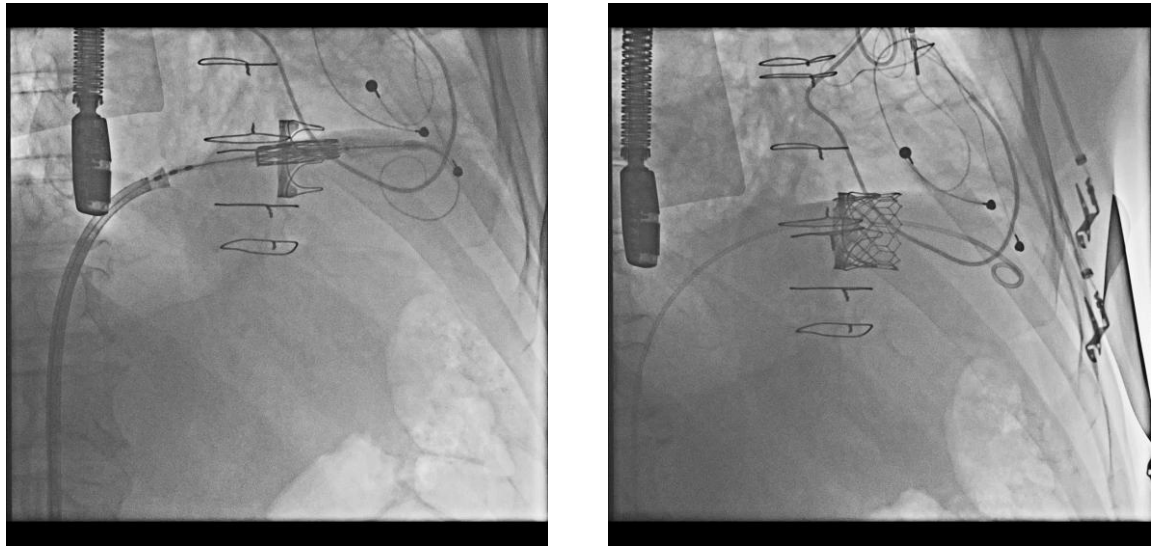
Gercek M et al. TCT 2022

KOMPLEXNÍ KARDIO VASKULÁRNÍ CENTRUM VFN Praha

Ortotopická implantace chlopně

- **Výhody:**
  - fyziologické
  - prakticky bez regurgitace
- **Nevýhody:**
  - riziko AV bloku
  - degenerace bioprotézy, trombóza
  - selhání pravé komory
- Specifická situtace – „valve-in-valve“ a „valve-in-ring“

Implantace chlopně Sapien 3 29 do bioprotézy



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Animace implantace chlopně Evoque

Edwards

zdroj youtube kanál Edwards Lifesciences

Pilotní studie Evoque

ABSTRACT

OBJECTIVES The aim of this study was to report the midterm outcomes at 1 year in the expanded first-in-human experience with the transfemoral EVOQUE system (Edwards Lifesciences) for tricuspid regurgitation (TR).

BACKGROUND Untreated TR is associated with excess mortality and morbidity. The first-in-human experience with the EVOQUE tricuspid valve replacement system reported favorable 30-day outcomes with no mortality in a compassionate use population.

METHODS Twenty-seven patients with severe TR were treated with the EVOQUE system in a compassionate use experience at 7 centers between May 2019 and July 2020. All patients had clinical right-sided heart failure (HF) and were deemed inoperable and unsuitable for transcatheter edge-to-edge repair by the institutional heart teams. The clinical outcomes collected included all-cause mortality, symptom status, TR severity, HF hospitalization, and major adverse cardiovascular events.

RESULTS At baseline, all patients (age: 77 ± 8 years, 89% female) were at high surgical risk (mean Society of Thoracic Surgeons score: 8.6% ± 5.5%), with 89% New York Heart Association functional class III/IV. TR was predominantly functional in etiology (19/27, 70%). At 1 year, mortality was 7% (2/27), 70% of patients were New York Heart Association functional class I/II, and 96% and 87% of patients had a TR grade ≤2+ and ≤1+, respectively. Between 30 days and 1 year, 2 patients experienced HF hospitalizations, and 1 patient required a new pacemaker implantation.

CONCLUSIONS In this early, compassionate use experience, the transfemoral transcatheter EVOQUE tricuspid valve replacement system demonstrated durable efficacy, persistent improvement in symptom status, and low rates of mortality and HF hospitalizations at a 1-year follow-up. Further studies are underway to validate its efficacy.

(J Am Coll Cardiol Intv 2022;15:481-491)

FIGURE 1 Comparison of TR severity and NYHA Functional Class at Baseline, 30 Days, and 1 Year

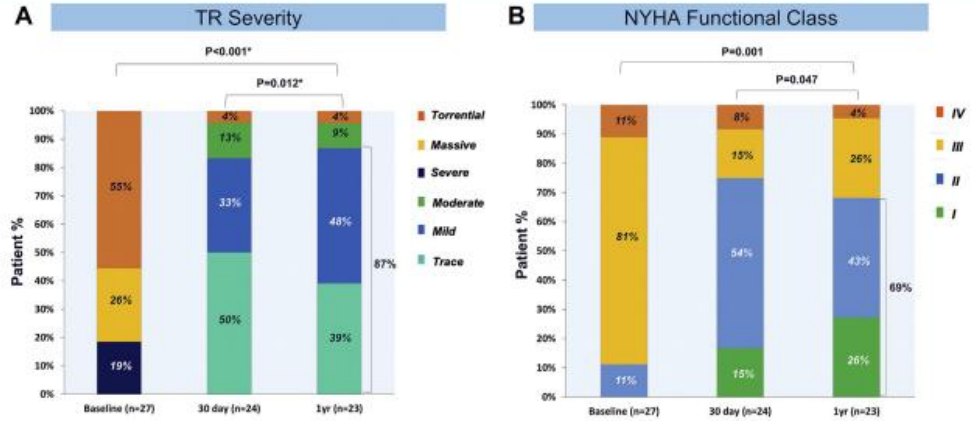
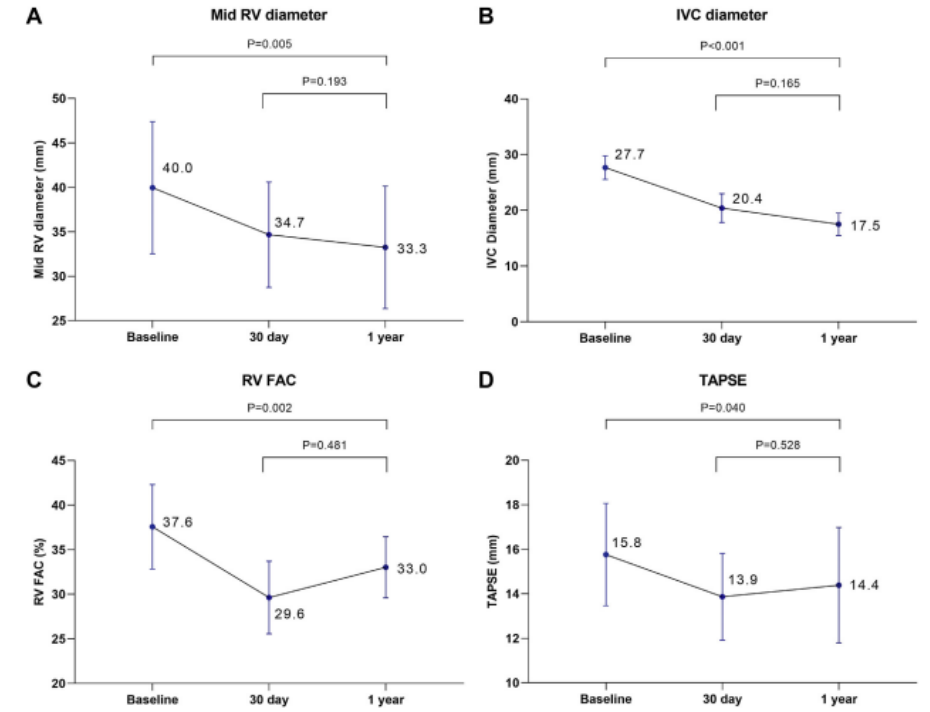


FIGURE 3 Right Ventricular Dimensions and Function and IVC Dimensions at Baseline, 30 Days, and 1 Year

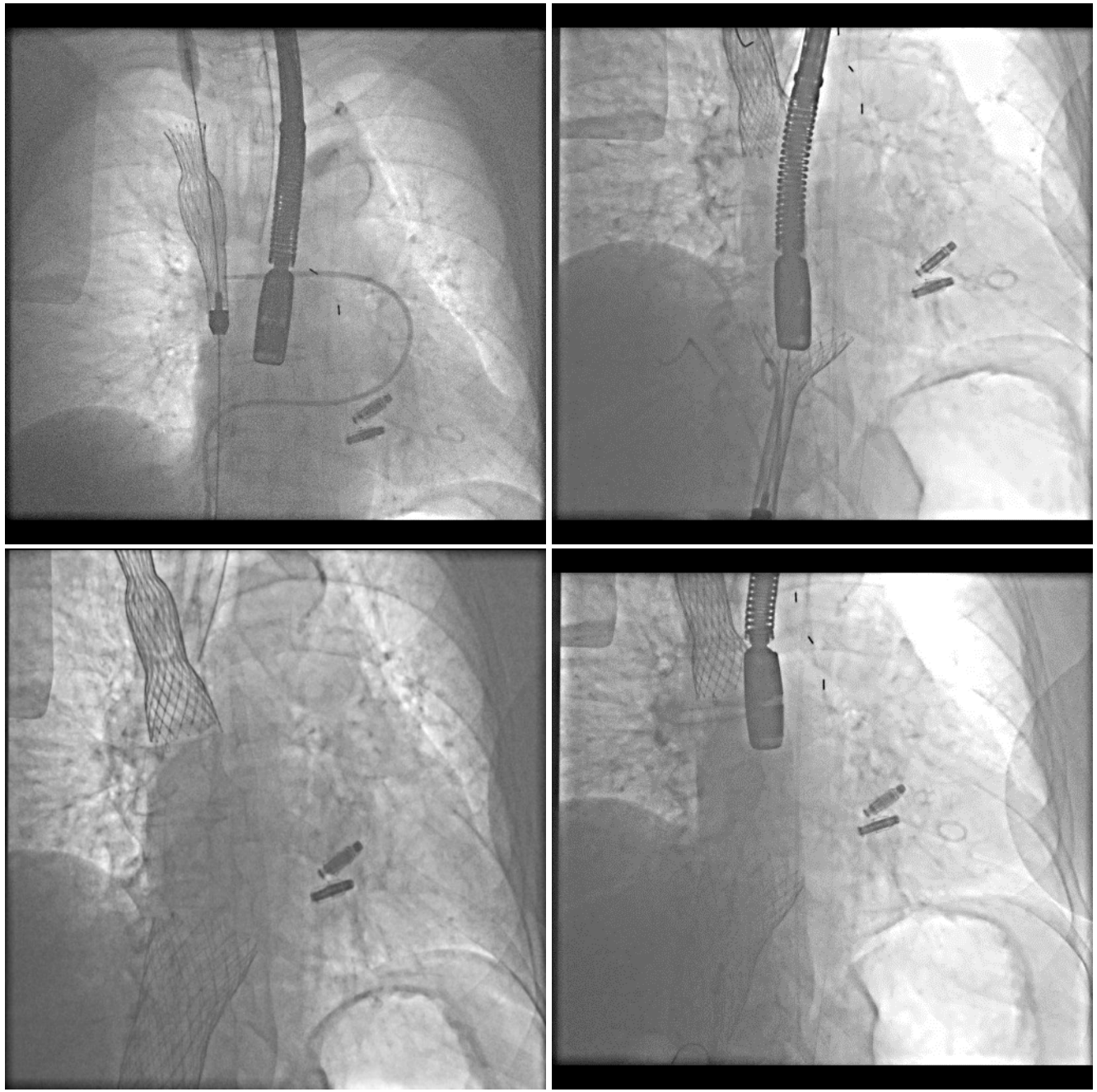


Webb J et al. JACC Cardiovasc Interv 2022

Heterotopická implantace chlopně

- **Výhody:**
  - není závislá na kvalitě zobrazení trikuspidální chlopně
  - může být zhoršená systolická funkce pravé komory (?)
- **Nevýhody:**
  - není to fyziologické
  - limitace rozměrem chlopní
  - nutnost antikoagulační léčby
  - limitovaná data

Implantace chlopně TricValve



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Závěr

- Trikuspidální regurgitace je jednou z nejčastějších chlopenních vad
- Etiologicky se jedná nejčastěji o sekundární postižení
- Je jednoznačně prokázáno, že její přítomnost je spojena s horší prognózou pacientů → pozornost věnovaná její léčbě
- Možnosti léčby dnes zahrnují, jak chirurgické možnosti (plastika a náhrada chlopně), tak celou řadu katetrizačních technik (plastika cípů nebo prstence, ortotopická a heterotopická implantace chlopně)
- Přesto zůstává řada otázek dosud nezodpovězena (především kdy a jakým způsobem léčit)

DĚKUJI ZA POZORNOST!

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