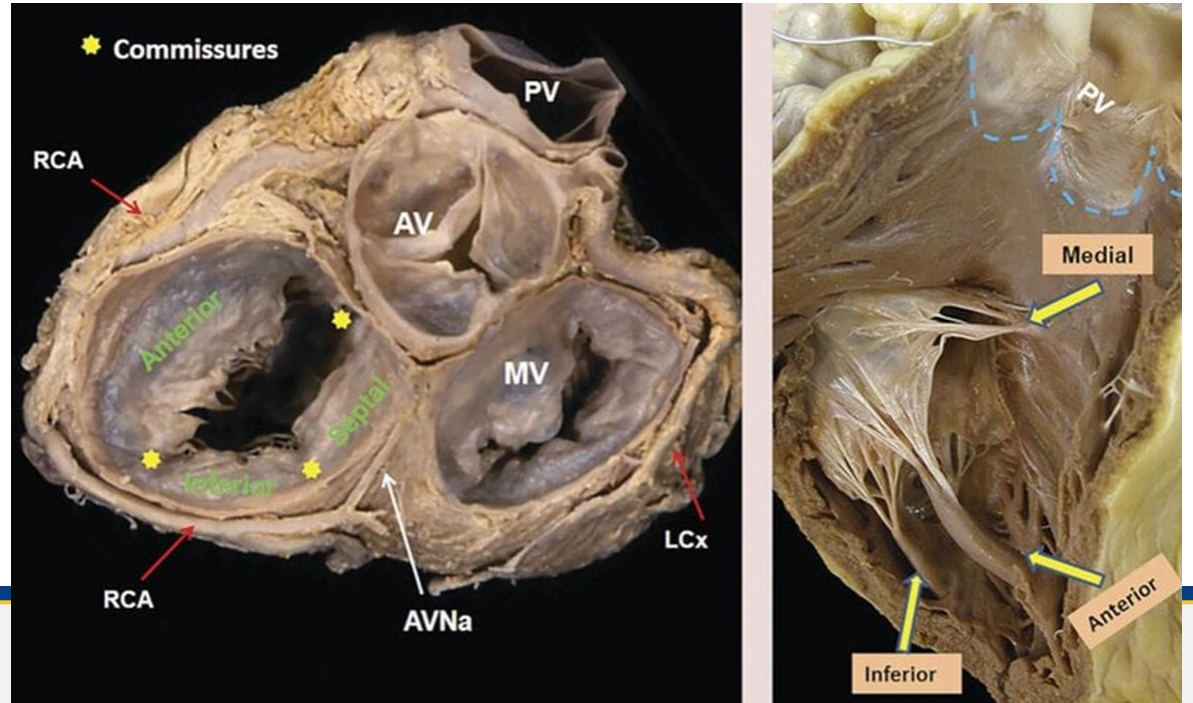
Intervenční a chirurgická léčba trikuspidálních vad: kritický pohled.

Petr Widimský
Kardiocentrum FNKV a 3. LF UK Praha



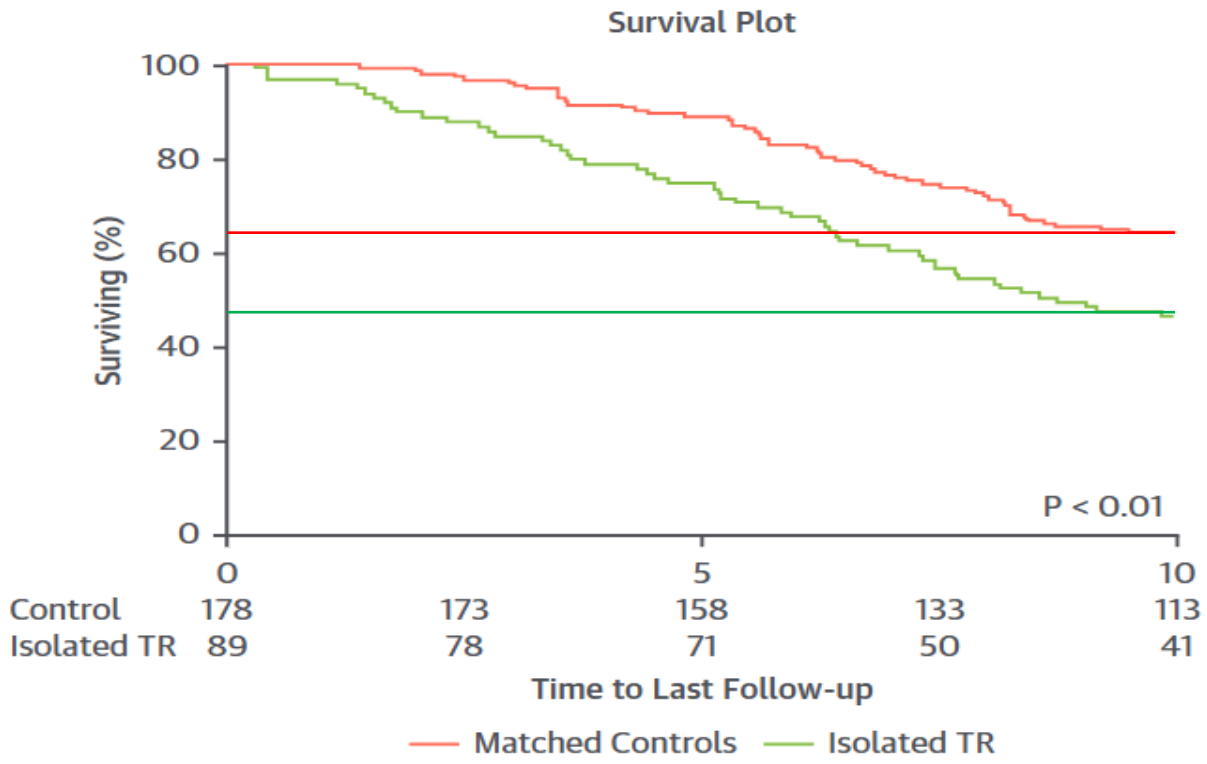
Onemocnění trikuspidální chlopně

Primární trikuspidální insuficience či stenoza	Sekundární trikuspidální insuficience (>90% TRI vad)
Infekční endokarditida (iv. narkomani)	Následek plicní hypertenze (pre- i postkapilární)
Iatrogenní (poškození stimulační elektrodou apod.)	Následek dilatace pravé komory (IM PK) a/nebo síně (FS)
Porevmatická stenoza	Následek neléčené stenozy plícnice
Karcinoidní fibrotické ztluštění = insuficience + stenoza	
Ebsteinova anomálie	
Trikuspidální atrezie	

Přirozenýprůběh (středně) závažné trikuspidální insuficience: ↓ 10-leté přežití o 17%

Topilski Y et al., JACC CV Imaging 2019

FIGURE 5 **Overall Survival Under Medical Management in Patients With Isolated TR Compared With Matched Cases With Trivial TR**



The graph shows the overall survival after diagnosis (matched trivial tricuspid regurgitation [TR] patients are represented by the **pink line;** greater or equal to moderate isolated TR patients are represented by the **green line**). The p value was <0.01. Note that there is decrease in survival with greater or equal to moderate isolated TR even when matched for all comorbidities.

Má smysl intervenovat trikuspidální chlopeň, která je morfologicky normální?

Další část přednášky bude především o nejčastější vadě:

Sekundární regurgitaci na morfologicky nepoškozené chlopni.

(Situace s morfologickým poškozením samotné chlopně vyžadují přísně individuální přístup.)

TRILUMINATE Pivotal Trial

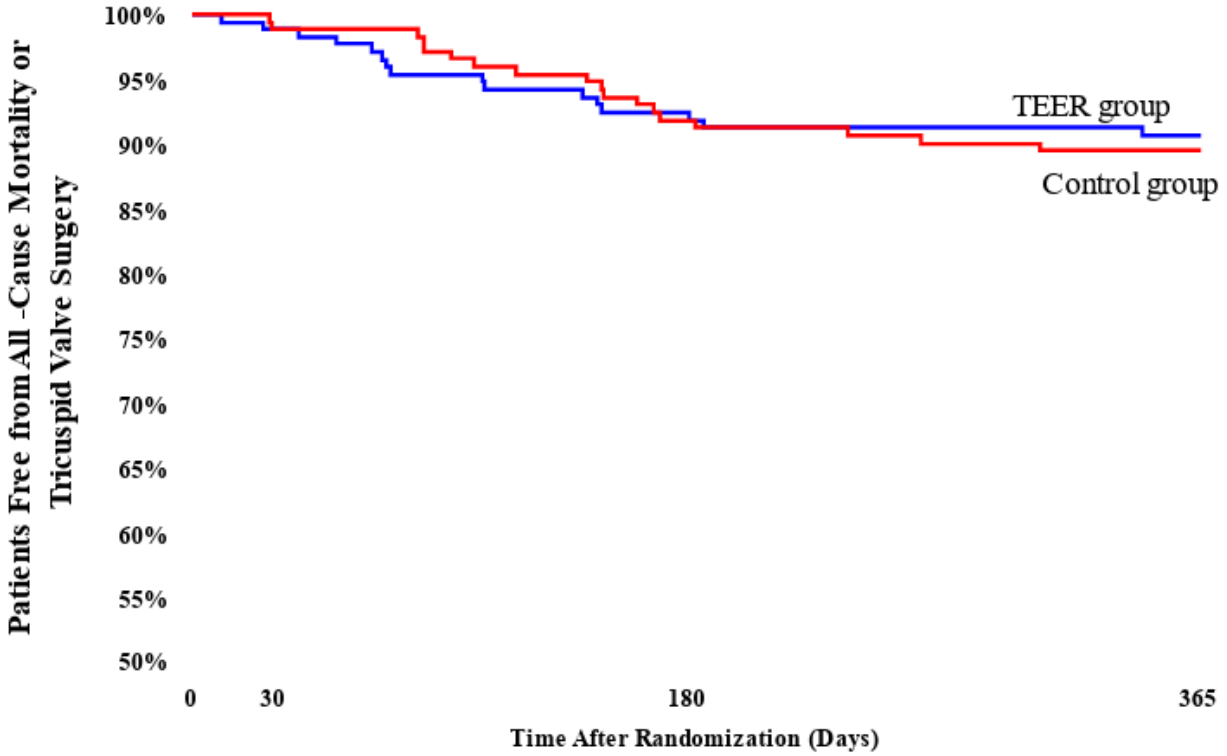
Sorajja P et al., NEJM 2023

- TEER (TriClip) vs. konzerv. léčba těžké funkční trikuspidální regurgitace
- N= 350 (jen 22% ze všech, kteří podepsali inform. souhlas!), prům.věk 78 let, sledování 1 rok.
- Prim. hierarchický E-P: smrt / operace TRI / hospitalizace pro srd.selhání / kvalita života
- 25F přístup, celková anestezie
- Systol. tlak v AP <70 mmHg (prekapil. PH byla vylučovacím kriteriem!)
- Střední nebo vysoké operační riziko při KCH
- Prům EF LK 59%

Výsledky

- PEP: 11348 vítězství TEER vs. 7643 vítězství v kontrolní skupině (win ratio 1.48; 95% CI 1.06 - 2.13; P=0.02)
- Smrt : 16 pac. TEER vs. 14 pac. kontrolních
- Roční riziko hospitalizace pro srdeční selhání: 0.21 / pac. / rok TEER vs. 0.17 pac. / rok kontrolní skupina.
- U 8 pac. po výkonu vznik trikuspidální stenozy (gradient ≥5 mmHg)
- Zlepšení kvality života po TEER
- **Žádné periprocedurální úmrtí**

Freedom from All -Cause Mortality or Tricuspid Valve Surgery



Freedom from First Heart Failure Hospitalization

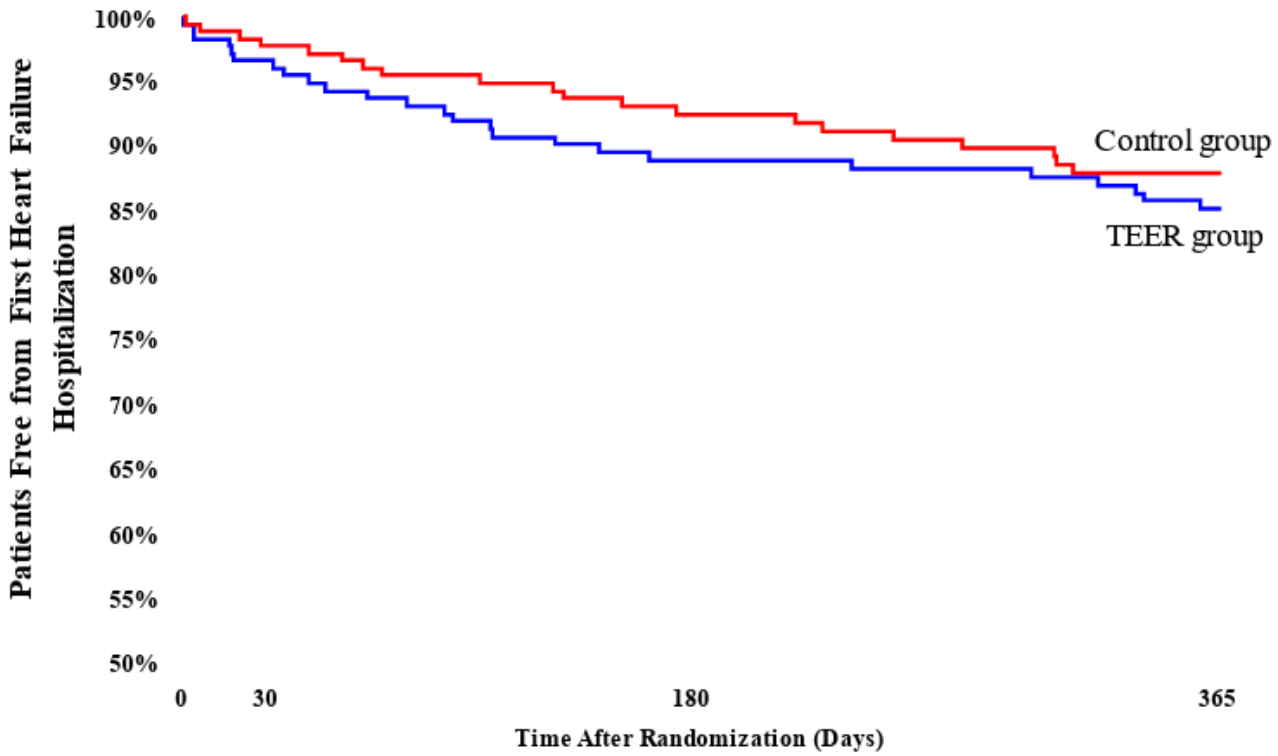


Table S4. Baseline Echocardiographic and Hemodynamic Data.

	TEER Group (N=175)	Control Group (N=175)
Left ventricular ejection fraction — %	59.3 ± 9.3	58.7 ± 10.5
Left ventricular ejection fraction <50% — no. (%)	23 (14)	21 (14)
Left ventricular end diastolic volume — mL	81.5 ± 33.2	84.5 ± 37.2
Left ventricular end systolic volume — mL	34.1 ± 18.4	36.8 ± 26.0
Functional etiology of tricuspid regurgitation — no. (%)	165 (94.8)	158 (92.9)
Severity of tricuspid regurgitation — no. (%)		
Moderate	4 (2.3)	2 (1.2)
Severe	44 (25.4)	49 (29.7)
Massive	37 (21.4)	30 (18.2)
Torrential	88 (50.9)	84 (50.9)
Coaptation gap — mm	5.5 ± 1.8	5.2 ± 1.7
Tricuspid annular plane systolic excursion		
≥1.7 cm — no. (%)	83 (48.0)	68 (41.2)
Right ventricular fractional area change — %	36.6 ± 5.5	37.2 ± 6.3
Right ventricular end diastolic diameter — cm	5.0 ± 0.8	5.2 ± 0.8
Right atrial volume — mL	143.2 ± 85.4	153.2 ± 83.2
Tricuspid annulus diameter[#] — cm	4.3 ± 0.7	4.5 ± 0.8
Cardiac output — L/min	4.1 ± 1.2	4.2 ± 1.1
Central venous pressure* — mmHg	11.7 ± 5.2	12.0 ± 6.0
Pulmonary artery systolic pressure* — mmHg	39.7 ± 9.2	40.1 ± 10.1
Mean pulmonary artery pressure* — mmHg	25.5 ± 5.7	25.6 ± 6.4
Pulmonary capillary wedge pressure* — mmHg	14.8 ± 4.6	15.1 ± 4.3
Systolic blood pressure* — mmHg	121.4 ± 13.1	122.1 ± 12.8

Table S13. Adjudicated Events Through 365 Days

	TEER Group[1]	Control Group[1]
All-cause mortality — no. (%)	15 (8.8)	13 (7.7)
Cardiovascular death	11 (6.5)	8 (4.7)
Heart failure-related	7 (4.1)	5 (3.0)
Not heart failure-related	4 (2.4)	3 (1.8)
Non-cardiovascular death	4 (2.5)	5 (3.1)
Heart failure hospitalization — no. (%)	25 (14.9)	20 (12.1)
Stroke[2] — no. (%)	3 (1.8)	2 (1.3)
Myocardial infarction[2] — no. (%)	0 (0.0)	0 (0.0)
Major bleeding[3] – no. (%)	9 (5.2)	2 (1.1)
New-onset renal failure[4] — no. (%)	4 (2.3)	1 (0.6)
Tricuspid valve surgery — no. (%)	3 (1.8)	6 (3.6)
Non-elective cardiac surgery for device AE — no. (%)	0 (0.0)	0 (0.0)
Tricuspid intervention — no. (%)	4 (2.3)	3 (2.0)
Endocarditis requiring surgery — no. (%)	0 (0.0)	0 (0.0)
Cardiogenic shock[5] — no. (%)	0 (0.0)	1 (0.6)

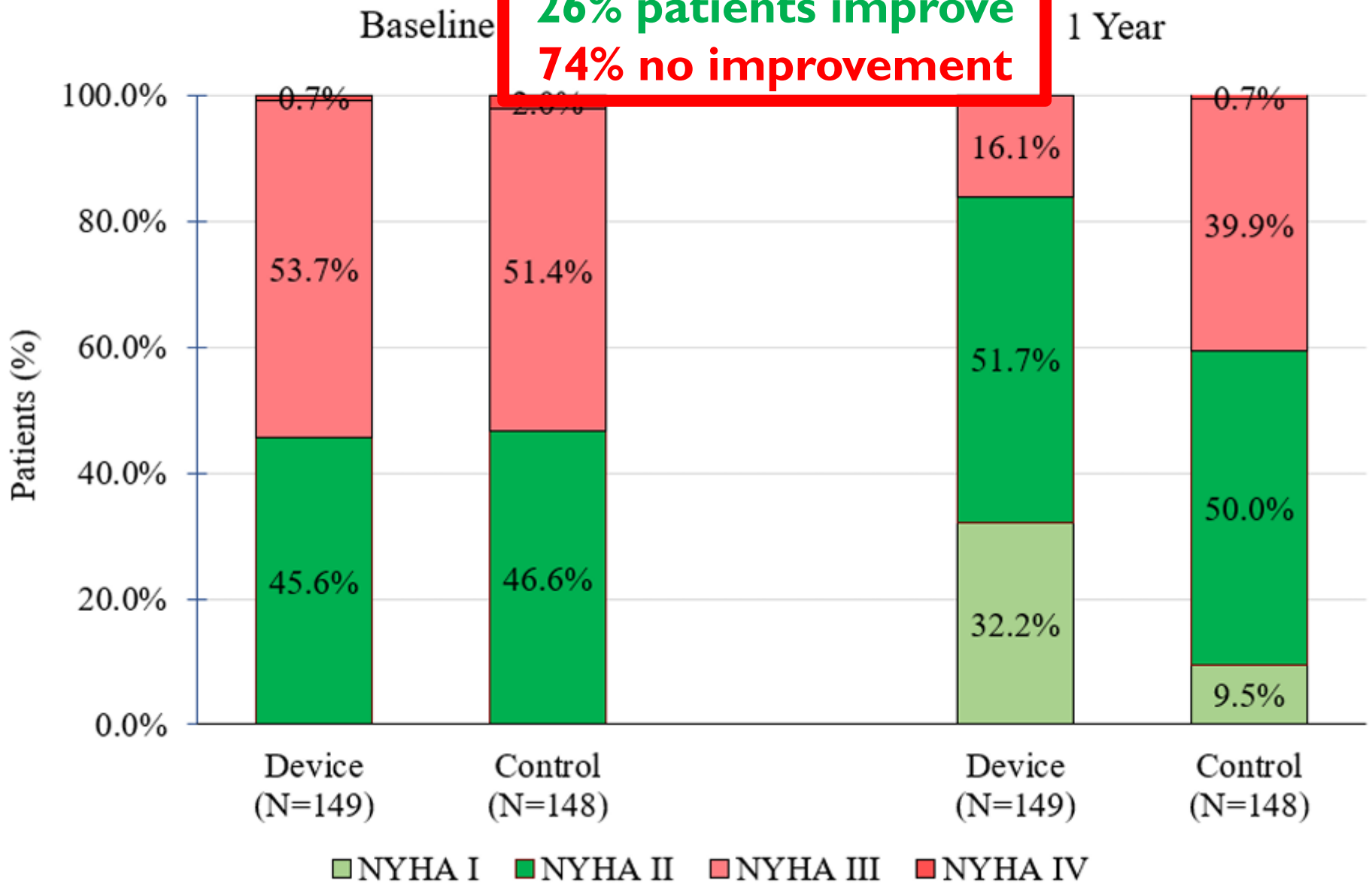
Table RD. Site Reported Serious Adverse Event Summary through 12 Months

System Organ Class Preferred Term	Device (N=175) Number of Events	Device (N=175) Number of Subjects *No./Total No. (percentage)*	Control (N=175) Number of Events	Control (N=175) Number of Subjects *No./Total No. (percentage)*
Any SAE	216	84/175 (48.0)	156	72/175 (41.1)
Blood and lymphatic system disorders	11	8/175 (4.6)	4	4/175 (2.3)
Anaemia	5	5/175 (2.9)	3	3/175 (1.7)
Leukocytosis	3	2/175 (1.1)	0	0/175 (0.0)
Thrombocytopenia	3	3/175 (1.7)	1	1/175 (0.6)
Cardiac disorders	67	47/175 (26.9)	51	38/175 (21.7)
Atrial fibrillation	10	10/175 (5.7)	10	7/175 (4.0)
Atrial flutter	1	1/175 (0.6)	2	2/175 (1.1)
Atrioventricular block complete	1	1/175 (0.6)	0	0/175 (0.0)
Bradycardia	3	3/175 (1.7)	1	1/175 (0.6)
Cardiac arrest	0	0/175 (0.0)	2	2/175 (1.1)
Cardiac failure	35	26/175 (14.9)	23	20/175 (11.4)
Cardiac failure acute	2	2/175 (1.1)	1	1/175 (0.6)
Cardiac failure congestive	2	1/175 (0.6)	1	1/175 (0.6)
Cardiogenic shock	0	0/175 (0.0)	1	1/175 (0.6)
Chordae tendinae rupture	1	1/175 (0.6)	0	0/175 (0.0)
Coronary artery disease	1	1/175 (0.6)	0	0/175 (0.0)
Myocardial infarction	1	1/175 (0.6)	0	0/175 (0.0)
Pericardial effusion	0	0/175 (0.0)	1	1/175 (0.6)

Nervous system disorders	14	11/175 (6.3)	7	6/175 (3.4)
Cerebrovascular accident	3	3/175 (1.7)	2	2/175 (1.1)
Dizziness	0	0/175 (0.0)	1	1/175 (0.6)
Encephalopathy	1	1/175 (0.6)	0	0/175 (0.0)
Hepatic encephalopathy	0	0/175 (0.0)	1	1/175 (0.6)
Metabolic encephalopathy	0	0/175 (0.0)	2	2/175 (1.1)
Normal pressure hydrocephalus	1	1/175 (0.6)	0	0/175 (0.0)
Parkinson's disease	0	0/175 (0.0)	1	1/175 (0.6)
Peripheral sensorimotor neuropathy	1	1/175 (0.6)	0	0/175 (0.0)
Subarachnoid haemorrhage	1	1/175 (0.6)	0	0/175 (0.0)
Syncope	4	4/175 (2.3)	0	0/175 (0.0)
Toxic encephalopathy	1	1/175 (0.6)	0	0/175 (0.0)
Transient ischaemic attack	2	2/175 (1.1)	0	0/175 (0.0)
Vascular disorders	28	21/175 (12.0)	11	8/175 (4.6)
Aortic stenosis	0	0/175 (0.0)	1	1/175 (0.6)
Haemorrhage	19	14/175 (8.0)	9	7/175 (4.0)
Hypertension	2	2/175 (1.1)	0	0/175 (0.0)
Hypotension	5	5/175 (2.9)	0	0/175 (0.0)
Peripheral arterial occlusive disease	1	1/175 (0.6)	1	1/175 (0.6)
Vena cava thrombosis	1	1/175 (0.6)	0	0/175 (0.0)

Figure S6: New York Heart Association Functional Class at Baseline and 1 Year *

Overall effect of TEER:
26% patients improve
74% no improvement



Pokud pacientovi nabízíme TriClip, měli bychom ho informovat, že šance na klinický benefit je pouze 26% a že s pravděpodobností 74% mu výkon nepomůže.

Kritická interpretace studie TRILUMINATE – I.

- **Studie nezahrnula opravdu závažné pacienty (závažnější formy PH, prekapil. PH, dysfunkce LK)**
- **Zvolený primární end-point je pro běžné lékaře naprosto nesrozumitelný**

- **2,5 hodiny trvající personálně náročný výkon v celkové anestezii nezlepšil žádný klinický ukazatel kromě subjektivně hodnocené kvality života *(a i to je divné, protože hospitalizací pro srdeční selhání bylo více ve skupině TEER!!)*.**

Kritická interpretace studie TRILUMINATE – 2.

Klinická komplikace	Počet pacientů navíc proti kontrolní skupině
Úmrtí	+2
Neurologické komplikace	+7
Srdeční selhání	+8
Renální selhání	+3
Závažné krvácení	+10
Vznik trikuspidální stenozy	+8

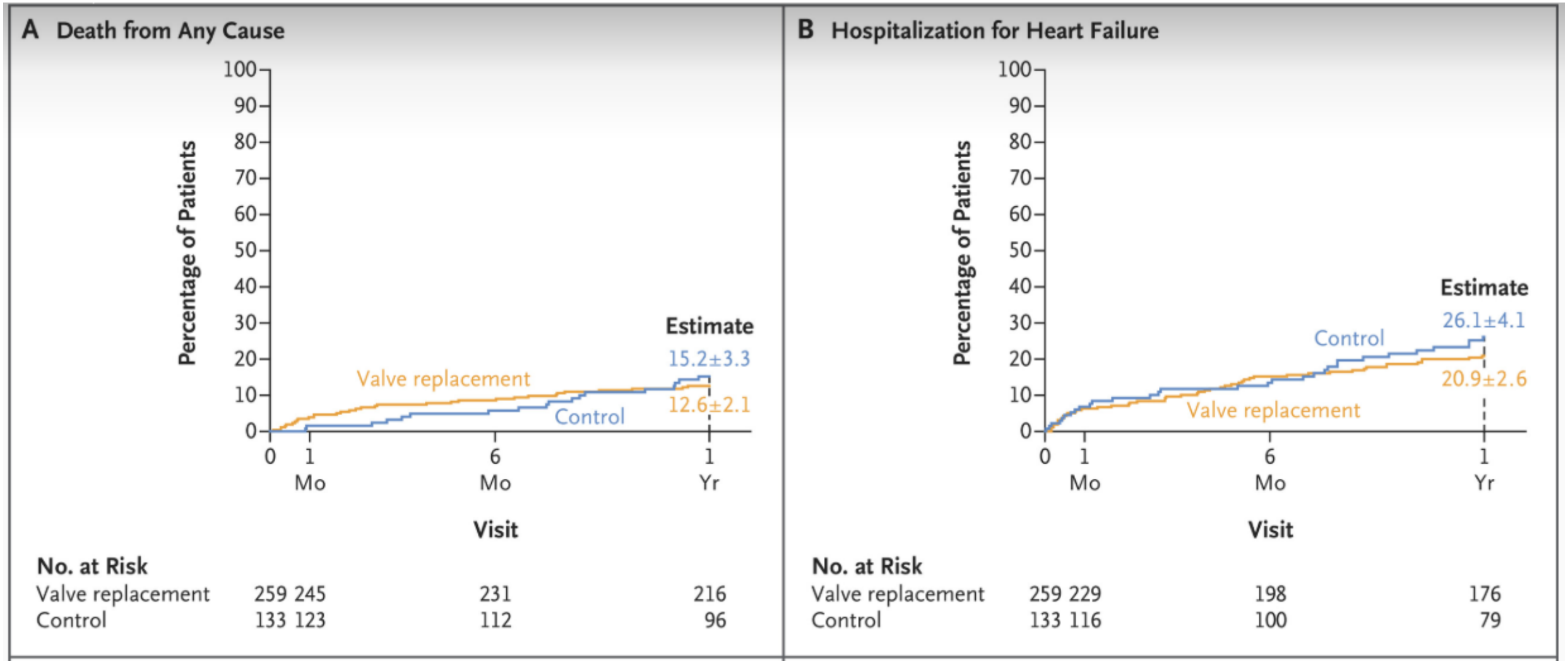
CLASP TR Trial
Kodali SK et al., JACC 2023

- Observační registr (single-arm) nové perkutánní metody (systém PASCAL)
- N= 65, prům. věk 77 let
- 30-d mortalita 3.1%, CMP 1.5%
- 1-roč. mortalita 7.7%, CMP 4,6%
- 1-roč. smrt nebo hospitalizace pro srd.selhání 21,5%
- Zlepšení TR (echo) u 86% pac.
- Zlepšení NYHA a QoL
- **Závěr: nový systém PASCAL zmenší echokardiografickou závažnost trikuspidální regurgitace a zlepší subjektivně hodnocenou kvalitu života.**

TRISCEND II Trial

Hahn RT et al., NEJM 2025

- 400 pac. se závažnou TR, prům. věk 79 let, randomizace 2:1 (267 katetrizační náhrada TRI chlopně vs. 133 konzervativní léčba).
- EVOQUE percutaneous tricuspid valve-replacement system
- Průměrné EuroScore II: 5.5 (4.9 – 6.4), stř. tlak v AP 38 mmHg, ascites u 20% pac.
- Vylučovací kritéria: ↓ ↓ funkce PK, pokročilé renální selhání, aj.
- Hierarchický end-point: smrt / implantace srd.podpory / HTX / re-intervence / hospitalizace pro srd.selhání / zlepšení kvality života / zlepšení NYHA třídy / prodloužení 6-minutové chůze o ≥30 m.
- Poměr vítězství (win ratio) pro náhradu chlopně 2.02 (95% CI, 1.56 - 2.62; P<0.001).


A Death from Any Cause
Percentage of Patients
100
90
80
70
60
50
40
30
20
10
0
Valve replacement
Control
Estimate
15.2±3.3
12.6±2.1
0
1 Mo
6 Mo
1 Yr
Visit
No. at Risk
Valve replacement 259 245 231 216
Control 133 123 112 96
B Hospitalization for Heart Failure
Percentage of Patients
100
90
80
70
60
50
40
30
20
10
0
Estimate
Control
26.1±4.1
20.9±2.6
Valve replacement
0
1 Mo
6 Mo
1 Yr
Visit
No. at Risk
Valve replacement 259 229 198 176
Control 133 116 100 79

TRISCEND II: hlavní výsledky

	Náhrada trikusp. chlopně	Konz. léčba
30-d mortalita	3.5%	0
1-r mortalita	11.6%	10.5%
IM/CMP (1 r.)	3.4%	0.8%
Závažné krvácení (1 r.)	15.4%	5.3%
Arytmie s nutností impl. KS	17.8%	2.3%
Závažné komplikace výkonu	5.1%	0
Hospitalizace pro srdeční selhání	21%	26%

Kritická interpretace studie TRISCEND II.

- Studie zahrnula závažnější pacienty než TRILUMINATE
- Zvolený primární end-point je ještě méně srozumitelný než u TRILUMINATE

- Žádný benefit v zásadních klinických end-pointech kromě subjektivně hodnocené kvality života
- Stejně jako u TRILUMINATE více závažných klinických příhod v intervenované skupině (byť rozdíly n.s. kvůli malé velikosti souboru)

JACC: CARDIOVASCULAR INTERVENTIONS VOL. 18, NO. 3, 2025

ORIGINAL RESEARCH

STRUCTURAL

Tricuspid Regurgitation Disease Stages and Treatment Outcomes After Transcatheter Tricuspid Valve Repair

Florian Schlotter, MD,[a] Lukas Stolz, MD,[b] Karl-Patrik Kresoja, MD,[a] Jennifer von Stein, MD,[c] Vera Fortmeier, MD,[d]

1-year mortality	Conservative *N= 585 (126+323+136)*	T-TEER *N= 1300 (269+850+181)*
Early disease (p=0.53)	**8%**	**5%**
Intermediate disease (p=0.03)	**21%**	**13%**
Advanced disease (p=0.78)	**30%**	**33%**

JAMA | Original Investigation

Transcatheter Edge-to-Edge Repair for Severe Isolated Tricuspid Regurgitation

The Tri.Fr Randomized Clinical Trial

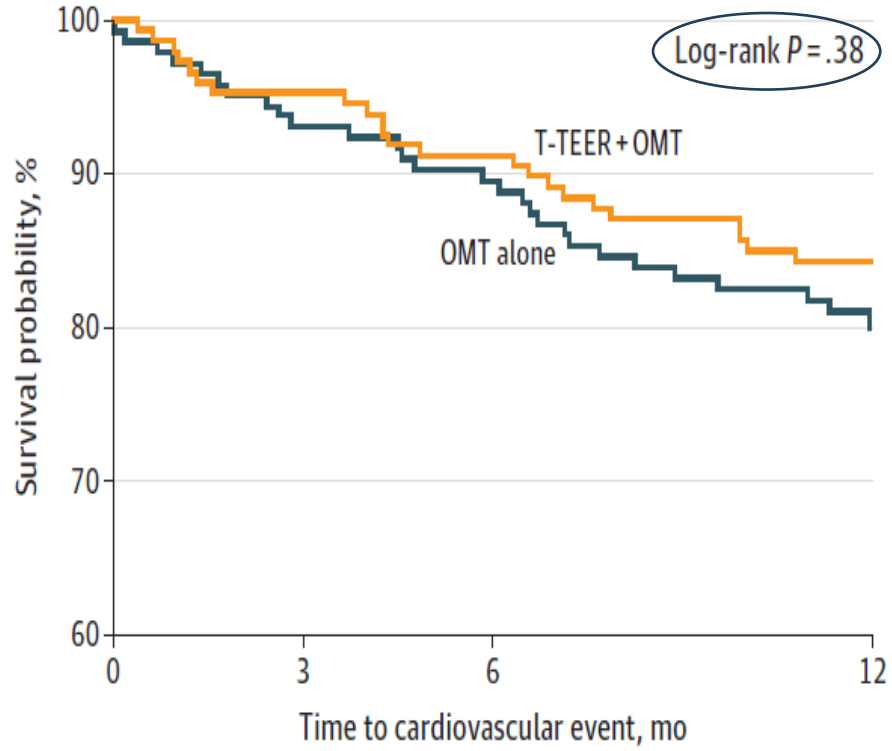
Mean age 78 yrs., mean syst. PAP 22 mmHg, mean RAP 9 mmHg

Table 2. Primary and Secondary End Points

End point	T-TEER + OMT (n = 152)	OMT alone (n = 148)
Primary		
Clinical Composite Score, No. (%)[a]		
Improved	109 (74.1)	58 (40.6)
Unchanged	8 (5.44)	17 (11.9)
Worse	30 (20.4)	68 (47.6)
Missing, No.	5	5

The primary outcome was a composite clinical end point at 1 year patient global assessment, or occurrence of major cardiovascular

Figure 4. Survival Curves for Patients in the T-TEER + OMT Group and the OMT-Alone Group



No. at risk

T-TEER + OMT	152	134	108
OMT alone	147	128	85

OMT indicates optimized medical therapy; and T-TEER, tricuspid transcatheter edge-to-edge repair.

Circulation

ORIGINAL RESEARCH ARTICLE

Two-Year Outcomes of Transcatheter Edge-to-Edge Repair for Severe Tricuspid Regurgitation: The TRILUMINATE Pivotal Randomized Controlled Trial

Saibal Kar, MD; Raj R. Makkar, MD; Brian K. Whisenant, MD; Nadira Hamid, MD; Hursh Naik, MD; Peter Tadros, MD; Matthew J. Price, MD; Gagan Singh, MD; Jonathan G. Schwartz, MD; Samir Kapadia, MD; Oluseun Alli, MD; Samuel Horr, MD; Puvi Seshiah, MD; Wayne Batchelor, MD; Brandon M. Jones, MD; Mustafa I. Ahmed, MD; Raymond Benza, MD; Ulrich Jorde, MD; Vinod H. Thourani, MD; Andrew A. Ghobrial, MD; Gilbert H.L. Tang MD; Phillip M. Trusty, PhD; Dina Huang, PhD; Rebecca T. Hahn, MD; David H. Adams, MD; Paul Sorajja, MD; for the TRILUMINATE Pivotal Investigators

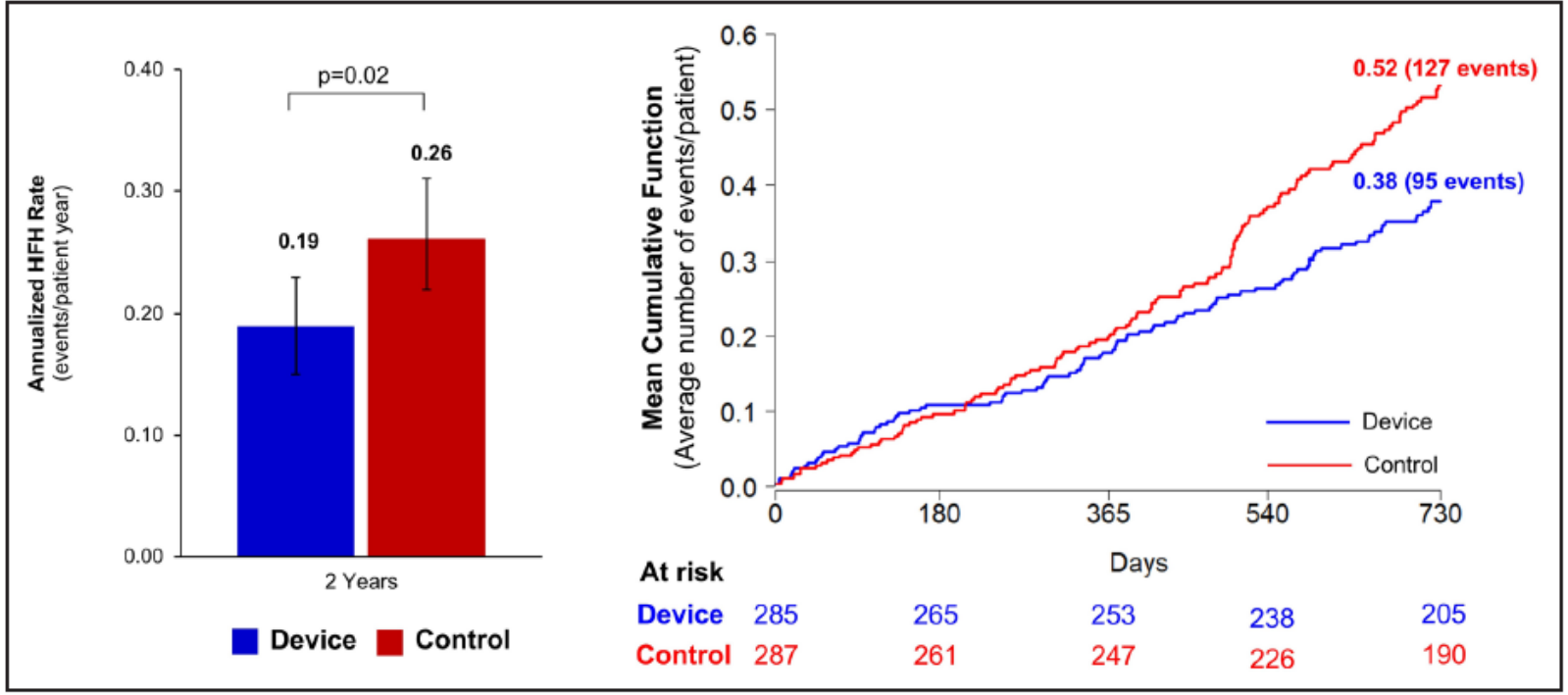
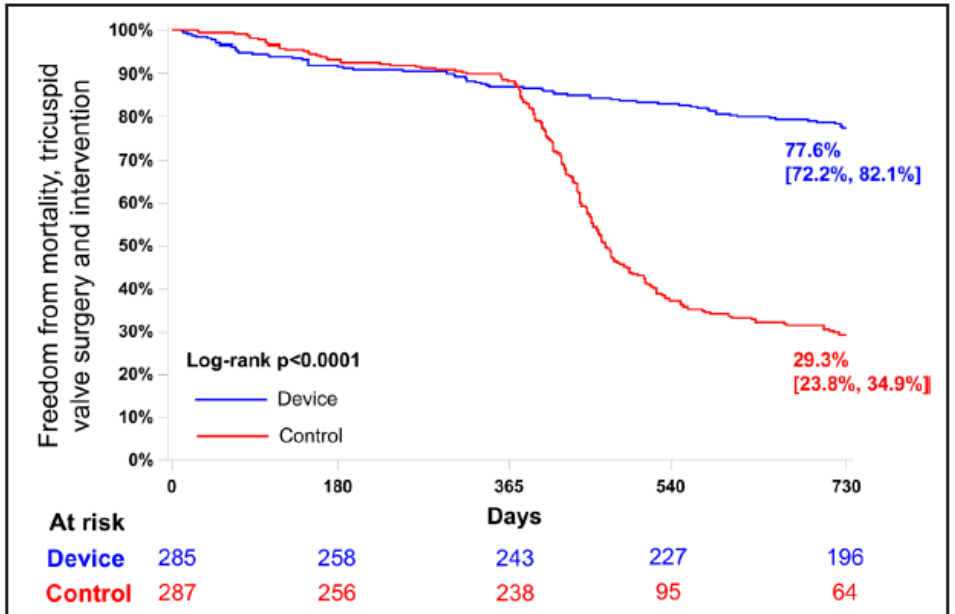


Figure 1. Recurrent HFH through 2 years.



Component	Device N=285	Control N=287	p-value
Composite of mortality/TVS/TVI	**22.4% (62)**	**70.7% (185)**	**<0.0001**
All-cause mortality	17.9% (49)	17.1% (45)	
TVS	2.3% (6)	4.3% (11)	
TVI	3.8% (10)	61.5% (142)	

Figure 2. Freedom from mortality, tricuspid valve surgery, and tricuspid valve intervention through 2 years. A statistically significant difference in freedom from mortality, tricuspid valve surgery, and tricuspid valve intervention by intention-to-treat analysis was observed at 2 years. Rates shown as freedom-from-events rate (95% CI). TVI indicates tricuspid valve intervention post-treatment visit; and TVS, tricuspid valve surgery.

Table. Adverse Events Through 2 Years in Intention-to-Treat Population by Kaplan-Meier Time-to-Event Analysis

Adverse event through 2 y	Device (n=285), % (n)	Control (n=287), % (n)
All-cause mortality	17.9 (49)	17.1 (45)
Cardiovascular death (VARC 2)	12.4 (33)	9.6 (24)
Heart failure–related death	8.8 (23)	7.3 (18)
Non–heart failure–related death	4.0 (10)	2.4 (6)
Noncardiovascular death (VARC 2)	5.8 (15)	8.3 (21)
Hospitalization	58.8 (161)	54.0 (146)
HFH	22.9 (61)	25.5 (65)
Other cardiovascular hospitalization	19.2 (49)	15.3 (38)
Noncardiovascular hospitalization	39.6 (105)	37.5 (98)

A jaké důkazy mluví pro chirurgickou léčbu trikuspidální insuficience?

ESC Guidelines 2025

Recommendations on indications for intervention in tricuspid regurgitation

Recommendations	Class	Level
Patients with tricuspid regurgitation and left-sided valvular heart disease requiring surgery		
Concomitant TV surgery is recommended in patients with severe primary or secondary TR.	I	B
Concomitant TV repair should be considered in patients with moderate primary or secondary TR, to avoid progression of TR and RV remodelling.	IIa	B
Concomitant TV repair may be considered in selected patients with mild secondary TR and tricuspid annulus dilatation (≥40 mm or >21 mm/m^2), to avoid progression of TR and RV remodelling.	IIb	B

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Concomitant Tricuspid Repair in Patients with Degenerative Mitral Regurgitation

The incidence of a primary-end-point event was different between the 2 strategies when moderate TR was present at baseline but not when TR was less than moderate

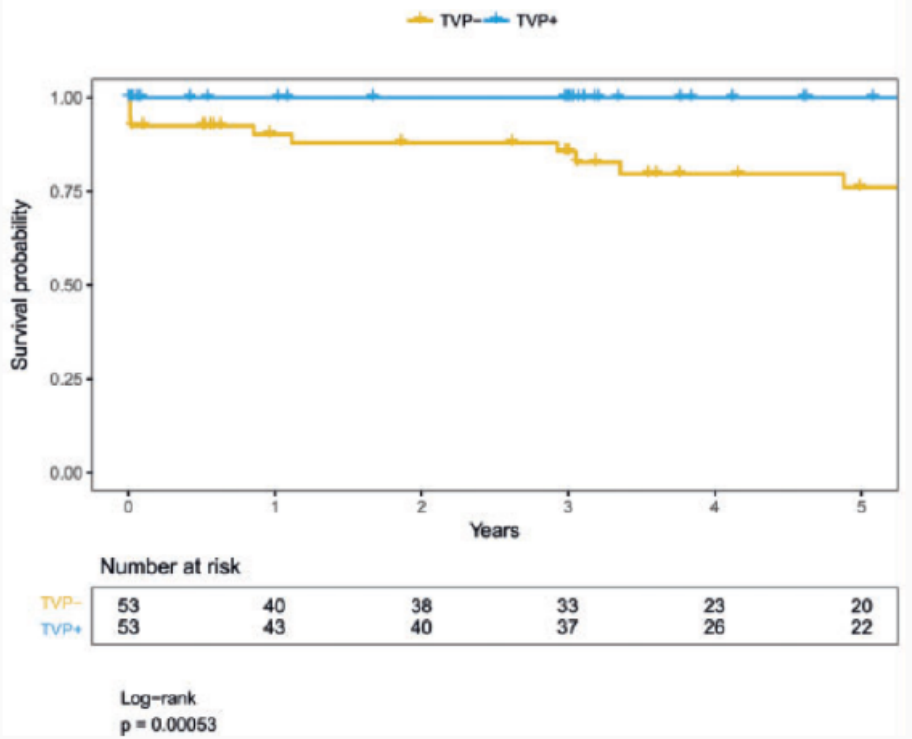
Tricuspid valve repair resulted in more frequent permanent pacemaker implantation (14% vs 2.5%)

Table 2. Primary End Point.*

Composite End Point	Mitral-Valve Surgery Alone (N=203)	Mitral-Valve Surgery plus TA (N=198)	Relative Risk (95% CI)	P Value
Imputed calculation — % (95% CI)	10.2 (6.0–14.5)	3.9 (1.1–6.7)	0.37 (0.16–0.86)	0.02
Observed calculation — no./total no. (%)	20/188 (10.6)	7/185 (3.8)	0.35 (0.15–0.81)	—
Reoperation for tricuspid regurgitation	0	0	—	—
Progression of tricuspid regurgitation	11/179 (6.1)	1/179 (0.6)	0.09 (0.01–0.69)	—
Death	9/199 (4.5)	6/190 (3.2)	0.69 (0.25–1.88)	—

Gammie et al, NEJM 2022

Ailawadi et al, J Thorac Cardiovasc Surg 2022



Pettinari et al, Eur J Cardiothorac Surg 2019

Recommendations	Class	Level
Patients with severe tricuspid regurgitation without left-sided valvular heart disease requiring surgery		
TV surgery is recommended in symptomatic patients with severe primary TR without severe RV dysfunction or severe PH.	I	C
TV surgery should be considered in asymptomatic patients with severe primary TR who have RV dilatation/RV function deterioration, but without severe LV/RV dysfunction or severe PH.	IIa	C
TV surgery should be considered in patients with severe secondary TR who are symptomatic or have RV dilatation/RV function deterioration, but without severe LV/RV dysfunction or PH.	IIa	B

Recommendations	Class	Level
Patients with severe tricuspid regurgitation without left-sided valvular heart disease requiring surgery		
Transcatheter TV treatment should be considered to improve quality of life and RV remodelling in high-risk patients with symptomatic severe TR despite optimal medical therapy in the absence of severe RV dysfunction or pre-capillary PH.	IIa	A

Isolated Tricuspid Operations: The Society of Thoracic Surgeons Adult Cardiac Surgery Database Analysis.

Chen Q et al., Ann Thorac Surg 2023

- Endpoints: operative mortality and composite major comorbidities (permanent stroke, renal failure, prolonged ventilation > 24 hours, deep sternal wound infection, cardiac reoperations, and new permanent pacemaker implantation).
- Median annual center volume was 2 cases (range, 1-81).
- **median age 65 years (12-14 years younger than pts. in TEER trials)**

- **Operative mortality was 7.3%**
- New permanent pacemaker implant 10.8%.
- **Mortality higher in tricuspid replacement versus repair** (OR, 1.56). Beating heart operation was associated with a lower adjusted risk of pacemaker implant (OR, 0.69), renal failure (OR, 0.75), and blood transfusions (OR, 0.8) compared with full cardioplegic arrest (all $P < .05$).

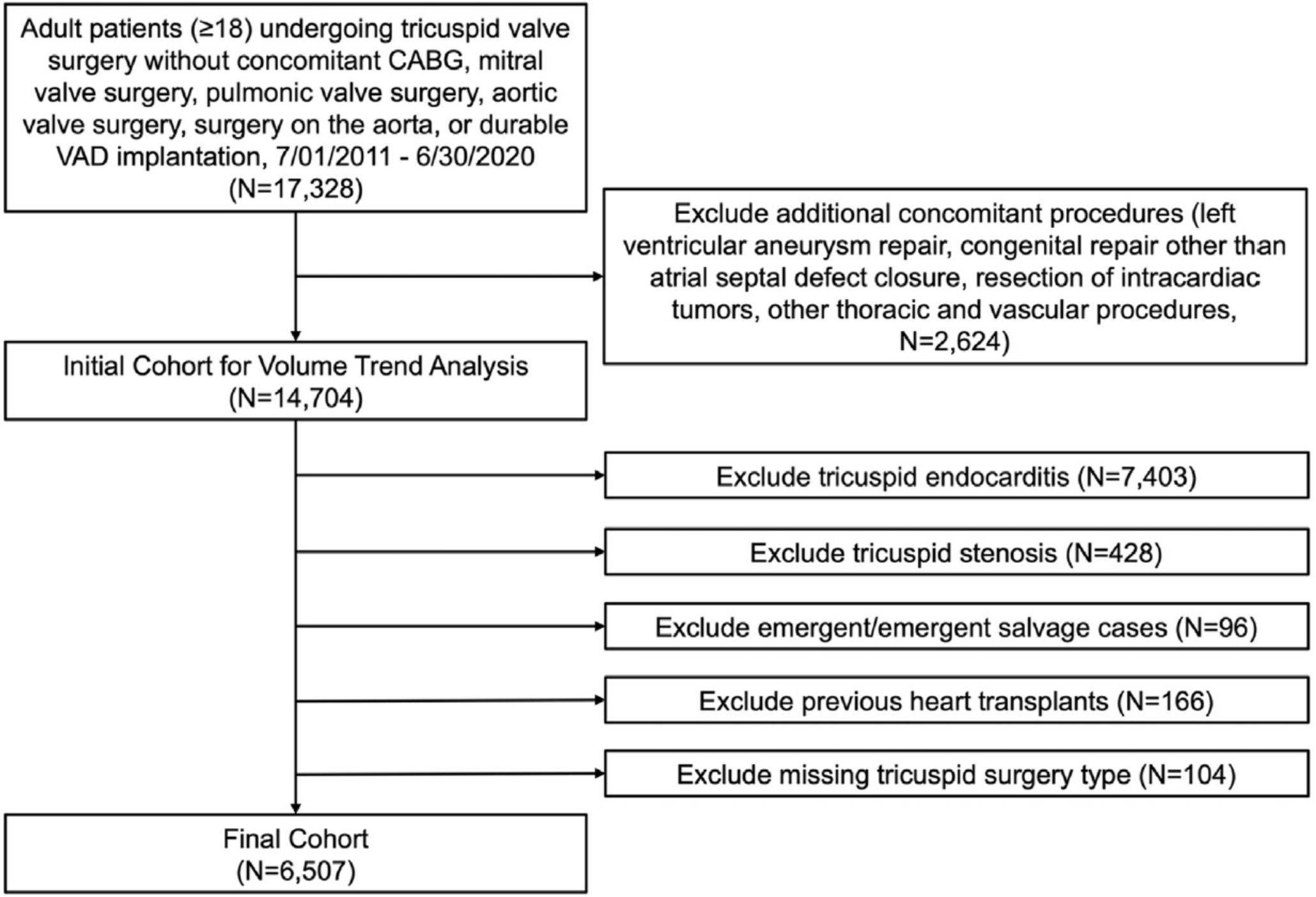

Adult patients (≥18) undergoing tricuspid valve surgery without concomitant CABG, mitral valve surgery, pulmonic valve surgery, aortic valve surgery, surgery on the aorta, or durable VAD implantation, 7/01/2011 - 6/30/2020 (N=17,328)
Exclude additional concomitant procedures (left ventricular aneurysm repair, congenital repair other than atrial septal defect closure, resection of intracardiac tumors, other thoracic and vascular procedures, N=2,624)
Initial Cohort for Volume Trend Analysis (N=14,704)
Exclude tricuspid endocarditis (N=7,403)
Exclude tricuspid stenosis (N=428)
Exclude emergent/emergent salvage cases (N=96)
Exclude previous heart transplants (N=166)
Exclude missing tricuspid surgery type (N=104)
Final Cohort (N=6,507)

TABLE 3 Short-term Outcomes Stratified by Tricuspid Repair vs Replacement and Beating Heart vs Full Arrest Operations

Characteristics	All Patients (n = 6507)	Repair (n = 3308)	Replacement (n = 3199)	*P* Value	Beating Heart (n = 2435)	Full Arrest (n = 3901)	*P* Value
Operative mortality	7.3 (474)	5.2 (173)	9.4 (301)	<.001	9.2 (225)	6.0 (235)	<.001
Composite major complications	32.0 (2082)	23.1 (765)	41.3 (1320)	<.001	34.7 (845)	30.2 (1179)	<.001
Permanent stroke	1.5 (100)	1.2 (38)	1.9 (62)	.01	1.9 (47)	1.2 (48)	.03
Prolonged ventilation	20.2 (1315)	14.8 (490)	25.8 (825)	<.001	24.4 (594)	17.4 (677)	<.001
Cardiac reoperation	4.3 (281)	5.1 (167)	7.4 (238)	<.001	7.4 (179)	5.6 (217)	.004
New PPM/ICD implantation	10.8 (702)	6.1 (200)	15.7 (502)	<.001	9.2 (223)	11.9 (464)	<.001
Renal failure	6.8 (444)	4.5 (148)	9.3 (296)	<.001	8.1 (196)	6.1 (237)	.003
New dialysis requirement	5.5 (359)	3.4 (113)	7.7 (246)	<.001	6.7 (163)	4.8 (186)	.001
Deep sternal wound infection	0.4 (28)	0.3 (9)	0.6 (19)	.05	0.4 (10)	0.5 (18)	.77
Blood product transfusions	46.4 (3022)	37.6 (1242)	55.6 (1779)	<.001	52.7 (1284)	42.2 (1646)	<.001
Hospital length of stay, d	8 (6-12)	7 (5-11)	9 (6-14)	<.001	9 (6-14)	7 (5-11)	<.001

Values are in % (n) or median (interquartile range). ICD, implantable cardioverter-defibrillator; PPM, permanent pacemaker.

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Concomitant Tricuspid Annuloplasty During Degenerative Mitral Valve Repair: A Systematic Review and Meta-Analysis

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Table 1
Characteristics of the studies comparing mitral valve repair with or without concomitant tricuspid annuloplasty.

Study	Study design	Period	Total sample – *n*	MVr – *n*	MVr + TA – *n*	Indication for TA	Adjustment for possible confounders and or multivariable analysis
Chikwe et al[11]	Retrospective observational	2003–2001	645	226	419	Moderate TR, TAd (≥40 mm), or size mismatch between leaflet and annulus on direct inspection.	Multivariable analysis correcting for age, comorbidities, and echocardiography.
Dreyfus et al[14]	Retrospective observational	2005–2015	441	207	234	Concomitant severe FTR, or TAd enlargement ≥40 mm.	Multivariable analysis correcting for age, sex, DMR, and FTR severity.
Lee et al[13]	Retrospective observational	1997–2013	151	66	85	Atrial fibrillation, mild FTR, and, TAd (≥40 mm or >21 mm/m^2).	IPTW-adjusted analysis and PS matching.
Gammie et al[7]	Randomized controlled trial	2016–2018	401	203	198	Moderate TR, or mild TR with TAd (≥40 mm or >21 mm/m^2).	NA
Brescia et al[12]	Retrospective observational	2011–2021	1485	1068	417	Concomitant severe TR, or TAd enlargement ≥40 with mild-to-moderate TR.*	Multivariable regression incorporating pre and intraoperative risk factors.

Study design, time period, total sample size, number of patients in each treatment group, indications for TA, and statistical adjustments for potential confounders are reported.
MVr = mitral valve repair; TA = tricuspid annuloplasty; TAd = tricuspid annular diameter; FTR = functional tricuspid regurgitation; DMR = degenerative mitral regurgitation; TR = tricuspid regurgitation; IPTW = inverse probability of treatment weighting; PS = propensity score; NA = not applicable.
* Concomitant TA was performed at the surgeon's discretion.

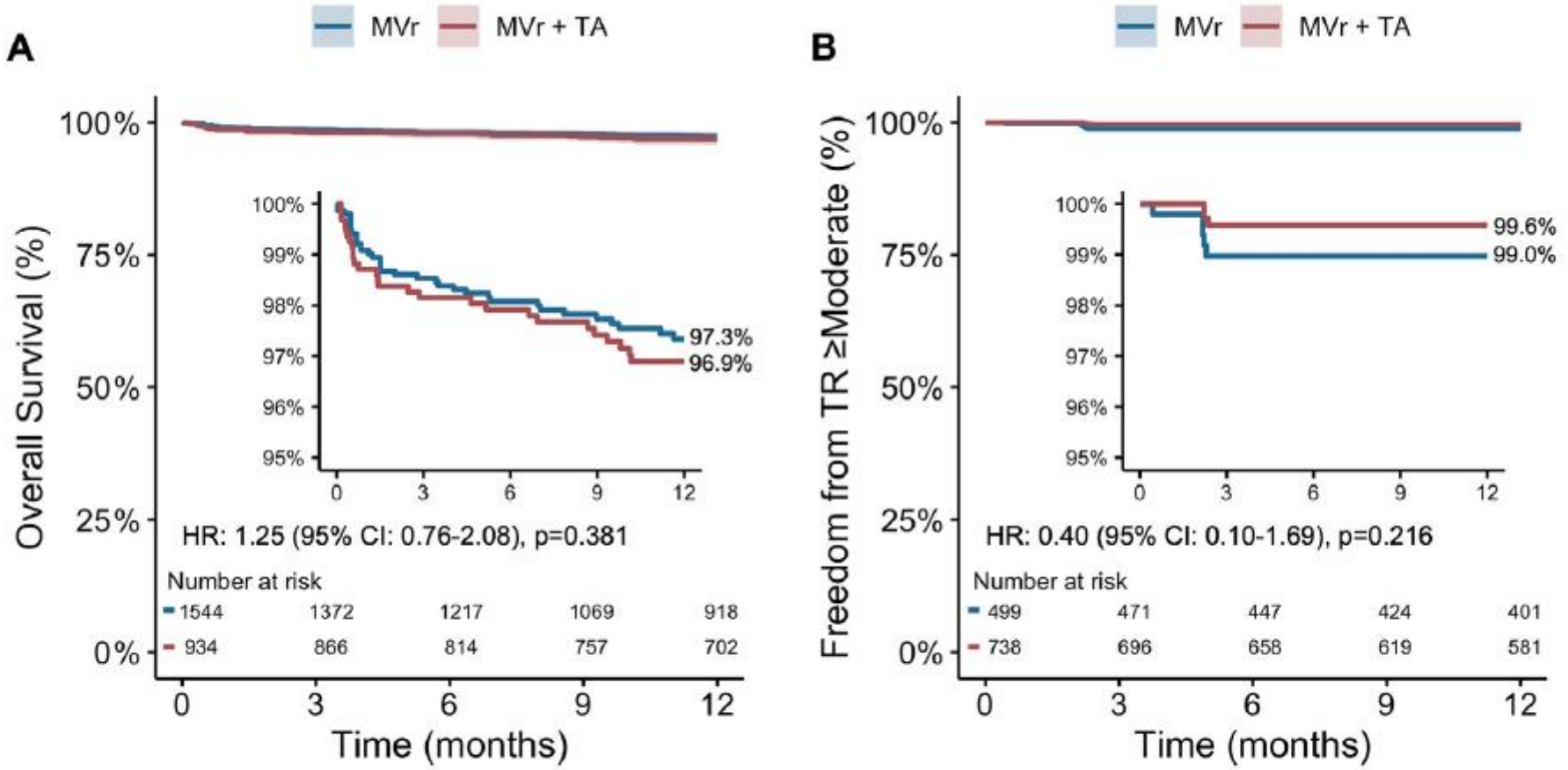

Figure 2. One-year outcomes in the overall populations. (A) Overall survival and (B) freedom from ≥Moderate TR during 1-year follow-up. Abbreviations: MVr = mitral valve repair; TA = tricuspid annuloplasty; HR = hazard ratio; CI = confidence interval.

Long-term outcomes

Median 2-years survival	MVR	MVR + TA
5 years	88%	88%
10 years	78%	80%
15 years	72%	80%

No significant differences between the 2 groups

Klinické závěry

(netýkají se primárních postižení trikuspidální chlopně!)

- Přirozený průběh závažné TR: 10-letá mortalita o 17% vyšší než u lehké TR

- Perkutánní TEER neovlivňuje vůbec mortalitu a pomůže symptomaticky jen 26% nemocných. Nelze vyloučit, že při delším sledování bude benefit výraznější.
- Perkutánní náhrada Tri je zatím v plenkách a prognózu nemocných spíše zhoršuje.

- Izolovaná chirurgická náhrada Tri se provádí ojediněle a její výsledky jsou horší než u jiných izolovaných chlopenních vad.
- Současná TA při chirurgické léčbě MR nezvyšuje operační riziko, ale ani nezlepšuje dlouhodobou prognózu.