HIGH TECH MARSEILLE

28-30 JANVIER 2026

MARSEILLE
PALAIS DU PHARO

Tricuspide: réparation ou remplacement ?

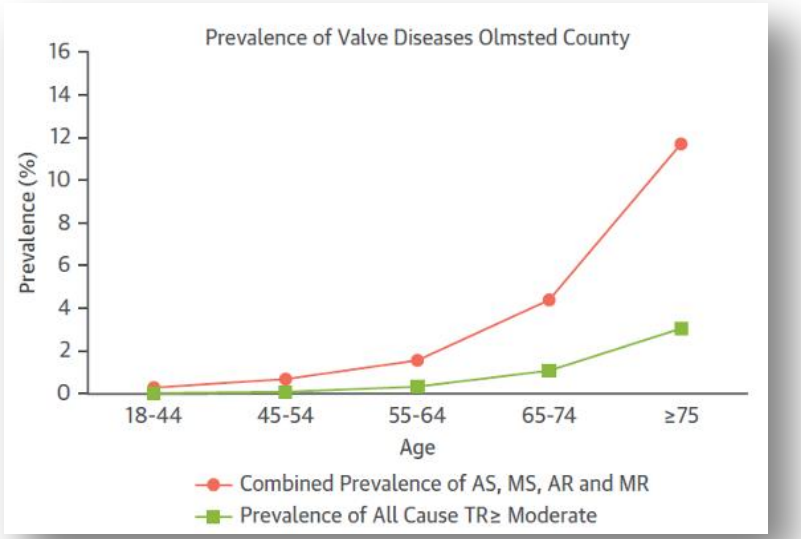
Guillaume LEURENT
CHU de RENNES

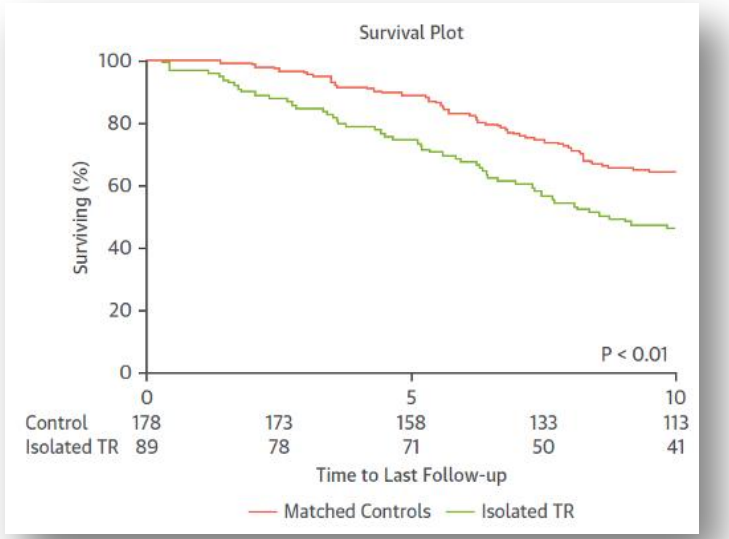
CONFLITS D'INTÉRÊTS

Abbott Medical: proctor, consultant, orateur

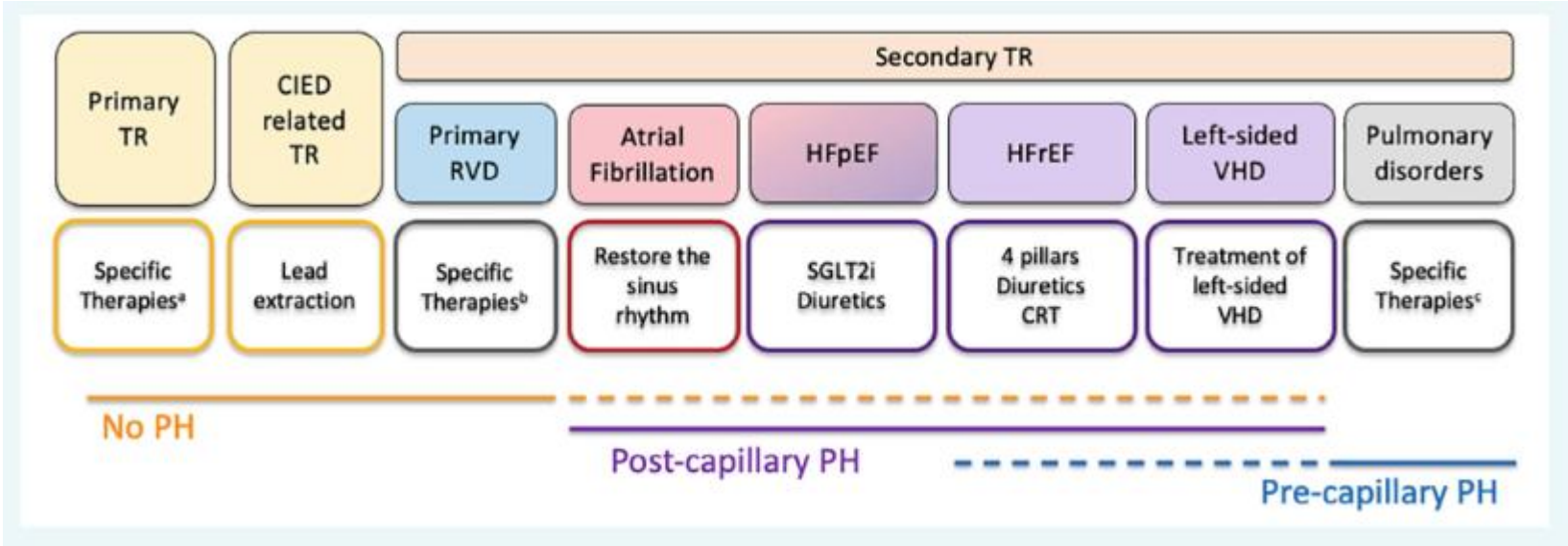
Edwards Lifescience: proctor, orateur

Coramaze: consultant





Topilsky Y. JACC Imaging 2019;12:433–42



Adamo M. Eur J Heart Failure 2024; 26: 18-33

Transcatheter treatment of symptomatic secondary severe tricuspid regurgitation may be considered in inoperable patients at a Heart Valve Centre with expertise in the treatment of tricuspid valve disease.[f]	IIb	C	© ESC/EACTS 2021

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.[713,733,735,738,748–751]	IIa	A	© ESC/EACTS 2025

Praz F. European Heart Journal (2025) 00, 1–102

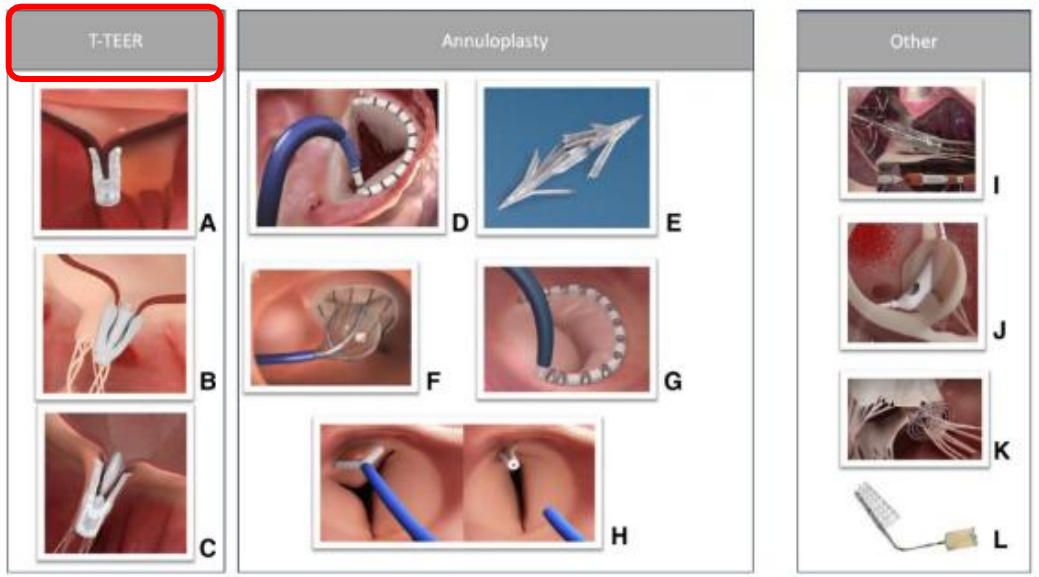


Figure 5 Repair technologies approved for clinical use in Europe or actively under investigation. (*A*) Triclip (CE marked); (*B*) PASCAL (CE marked); (*C*) Dragonfly; (*D*) Cardioband (CE marked); (*E*) MIA-T; (*F*) Cardiac Implants Tri-Ring; (*G*) Dragon Ring; (*H*) F-clip; (*I*) Coramaze; (*J*) PivotTR; (*K*) Mitrelix; (*L*) Croivalve Duo

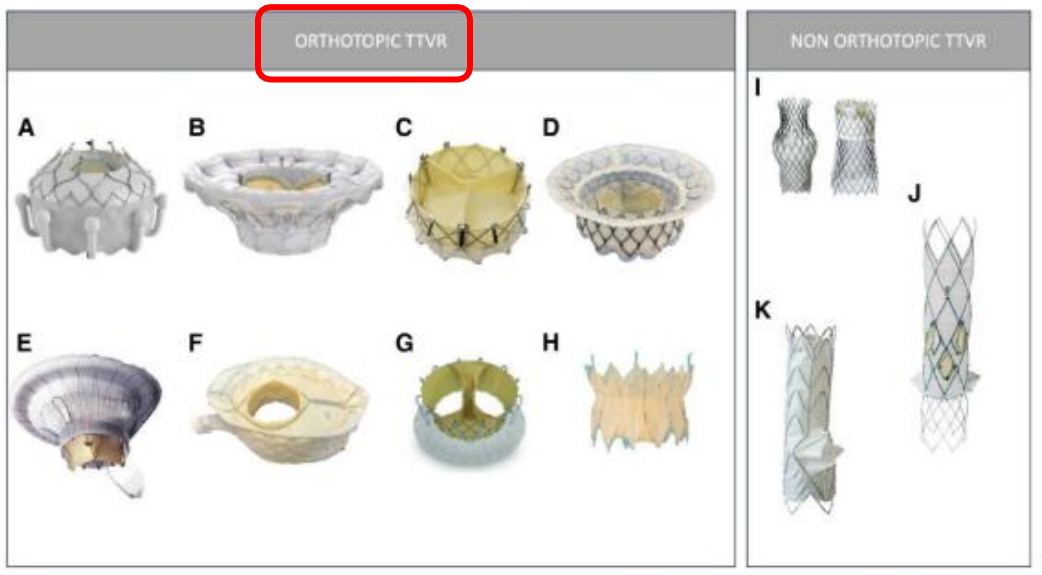
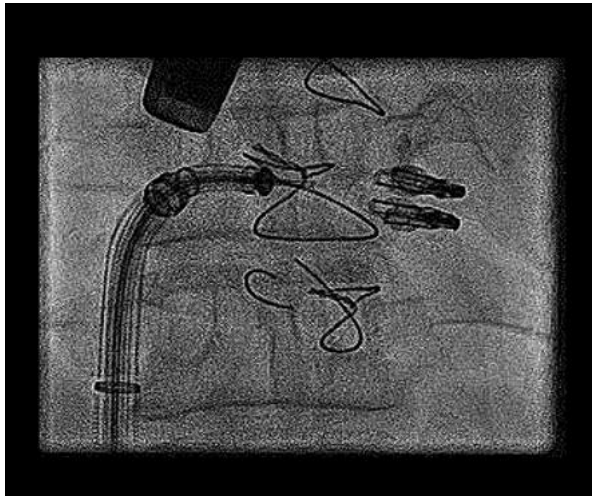
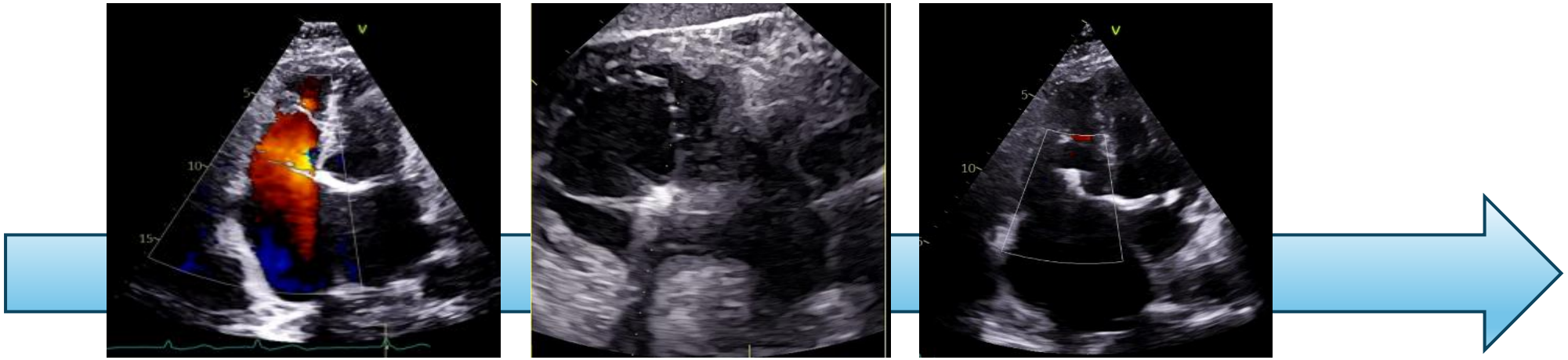


Figure 7 Transcatheter tricuspid valve replacement devices. Orthotopic devices: (*A*) Evoque; (*B*) Cardiovalve; (*C*) Gate; (*D*) Intrepid; (*E*) Lux valve; (*F*) V-Dyne, (*G*) Trisol; (*H*) Topaz Heterotopic devices; (*I*) Tric Valve; (*J*) Trillium; (*K*) Tricento

Maisano F. European Heart Journal (2024) 45, 876–894

T-TEER

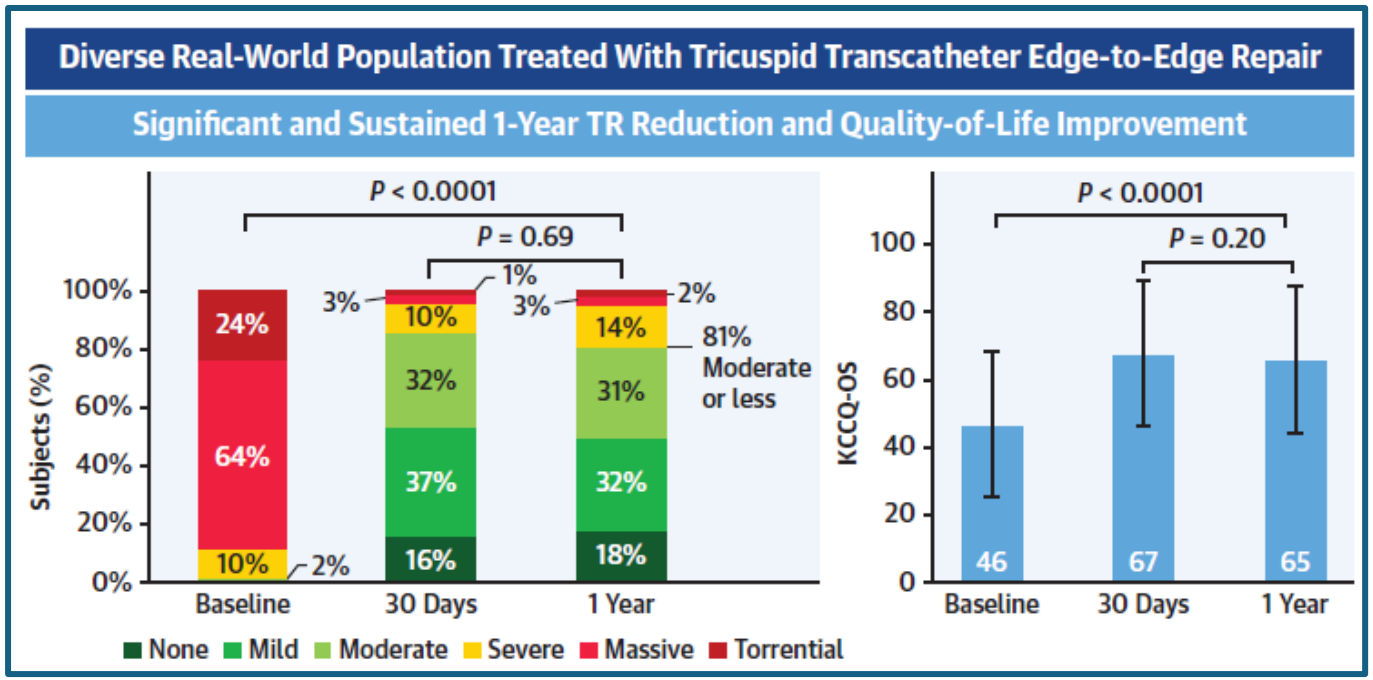




T-TEER

TABLE 1 Baseline Characteristics of Subjects Enrolled in bRIGHT (N = 511)

Age, y	79 ± 7
Female	56
NYHA functional class III or IV	80
KCCQ overall summary score	45 ± 23
Previous CRT/CRT-D/ICD/pacemaker	23
HFH 1 y before study procedure	40
TR etiology	
Functional/mixed	10
Secondary	90
Baseline TR severity	
Severe	10
Massive	61
Torrential	27
EuroSCORE, %	7.6 ± 8.0



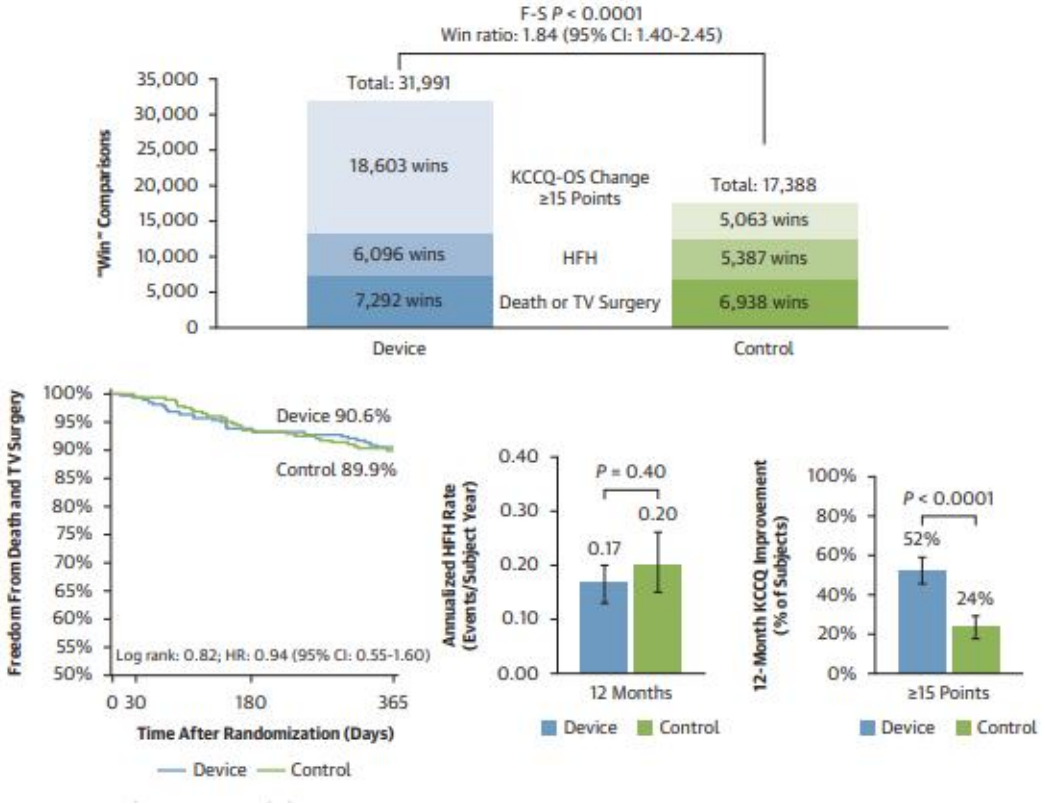
✓Safety
✓Effectiveness

TABLE 2 Safety Profile Through 1 Year (N = 511)

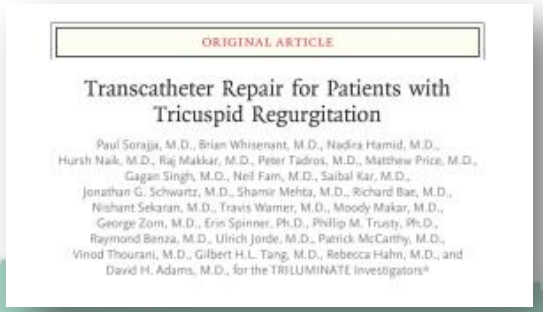
	30 Days	1 Year
Major bleeding[a]	7.0 (36)	10.8 (55)
Device embolization	0.0 (0)	0.0 (0)
Single leaflet device attachment	3.5 (18)	3.9 (20)
Nonelective cardiovascular surgery for device-related adverse event	0.2 (1)	0.2 (1)
TV reintervention	0.2 (1)	3.5 (18)
TV reoperation	0.4 (2)	1.2 (6)
New pacemaker implantation	0.0 (0)	0.8 (4)
New-onset renal failure	1.4 (7)	5.5 (28)
All-cause mortality[b]	1.0 (5)	15.1 (72)
Cardiovascular mortality	0.8 (4)	8.8 (45)

Values are % (n). [a]Major bleeding defined as bleeding Bleeding Academic Research Consortium (BARC) Type 3A. [b]By Kaplan-Meier.
TV = tricuspid valve.

T-TEER- les études



SUMMARY End Points		GDMT N = 148	T-TEER N = 152	Effect Estimate (95% CL)	P Value
Primary					
Clinical Composite Score* Improved		58 (40.6)	109 (74.1)		
	Unchanged	17 (11.9)	8 (5.44)	0.67 (0.61-0.72)	<.0001
	Worse	68 (47.6)	30 (20.4)		
Secondary listed in hierarchical order					
1. TR grade* at 1 yr.	Less than 4+	59 (46.5)	124 (93.2)		
	4+	49 (38.6)	5 (3.76)	0.73 (0.68-0.78)	<.0001
	5+	19 (15.0)	4 (3.01)		
2. Change in KCCQ score from baseline to 1 yr. — points†		55.0 ± 2.35	70.4 ± 2.33	14.5 ± 3.45	<.0001
3. PGA* at 1 yr.	Improved	51 (39.5)	100 (74.6)		
	Unchanged	36 (27.9)	19 (14.2)	0.68 (0.63-0.74)	<.0001
	Worse	42 (32.6)	15 (11.2)		
4. Hierarchical composite endpoint of time to death or tricuspid valve surgery, or heart failure hospitalizations, and improvement of ≥ 15 points in KCCQ score at 1 yr. ‡				2.06 (1.38-3.08)	0.0004
5. Kaplan–Meier estimate of percentage of patients free from MACE through 1 yr. §		0.801	0.844	0.78 (0.45-1.36)	0.38
6. Kaplan–Meier estimate of percentage of patients free from cardiovascular death at 1 yr. §		0.942	0.966	0.60 (0.20-1.84)	0.37


ORIGINAL ARTICLE

Transcatheter Repair for Patients with Tricuspid Regurgitation

Paul Sorajja, M.D., Brian Whisenant, M.D., Nadira Hamid, M.D., Hursh Naik, M.D., Raj Makkar, M.D., Peter Tadros, M.D., Matthew Price, M.D., Gagan Singh, M.D., Neil Fam, M.D., Saibal Kar, M.D., Jonathan G. Schwartz, M.D., Shamir Mehta, M.D., Richard Bae, M.D., Nishant Sekaran, M.D., Travis Warner, M.D., Moody Makar, M.D., George Zorn, M.D., Erin Spinner, Ph.D., Phillip M. Trusty, Ph.D., Raymond Benza, M.D., Ulrich Jorde, M.D., Patrick McCarthy, M.D., Vinod Thourani, M.D., Gilbert H.L. Tang, M.D., Rebecca Hahn, M.D., and David H. Adams, M.D., for the TRILUMINATE Investigators*


JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. ■, NO. ■, 2024

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

1-Year Outcomes From the TRILUMINATE Randomized Cohort

Gilbert H.L. Tang, MD, MSc, MBA,[a,*] Rebecca T. Hahn, MD,[b,*] Brian K. Whisenant, MD,[c] Nadira Hamid, MD,[d] Hursh Naik, MD,[e] Raj R. Makkar, MD,[f] Peter Tadros, MD,[g] Matthew J. Price, MD,[h] Gagan D. Singh, MD,[i] Neil P. Fam, MD,[j] Saibal Kar, MD,[k] Shamir R. Mehta, MD,[l] Richard Bae, MD,[d] Nishant K. Sekaran, MD,[e] Travis Warner, MD,[e] Moody Makar, MD,[f] George Zorn, MD,[g] Raymond Benza, MD,[c] Ulrich P. Jorde, MD,[m] Patrick M. McCarthy, MD,[n] Vinod H. Thourani, MD,[o] Qian Ren, PhD,[p] Phillip M. Trusty, PhD,[p] Paul Sorajja, MD,[d] David H. Adams, MD,[e] the TRILUMINATE Pivotal Investigators

HHF: 20 vs 15
Death: 8 vs 5

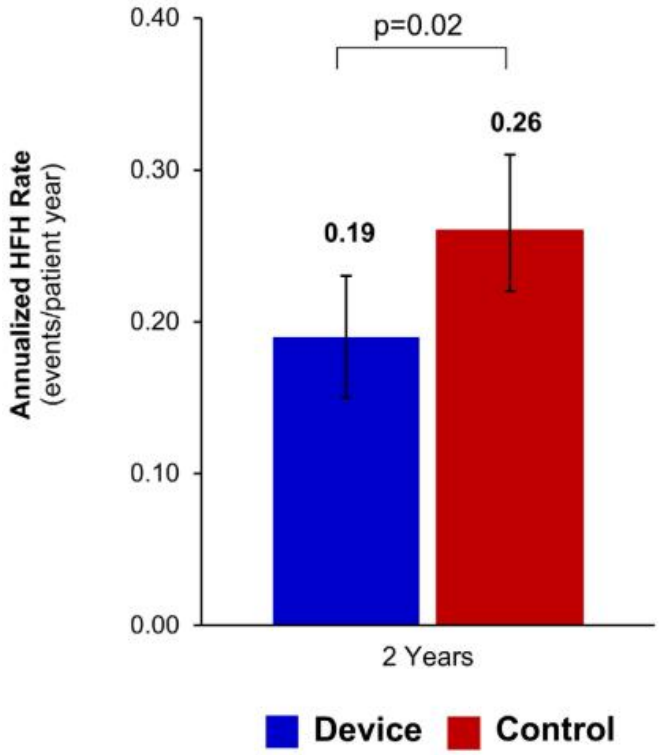

JAMA | Original Investigation

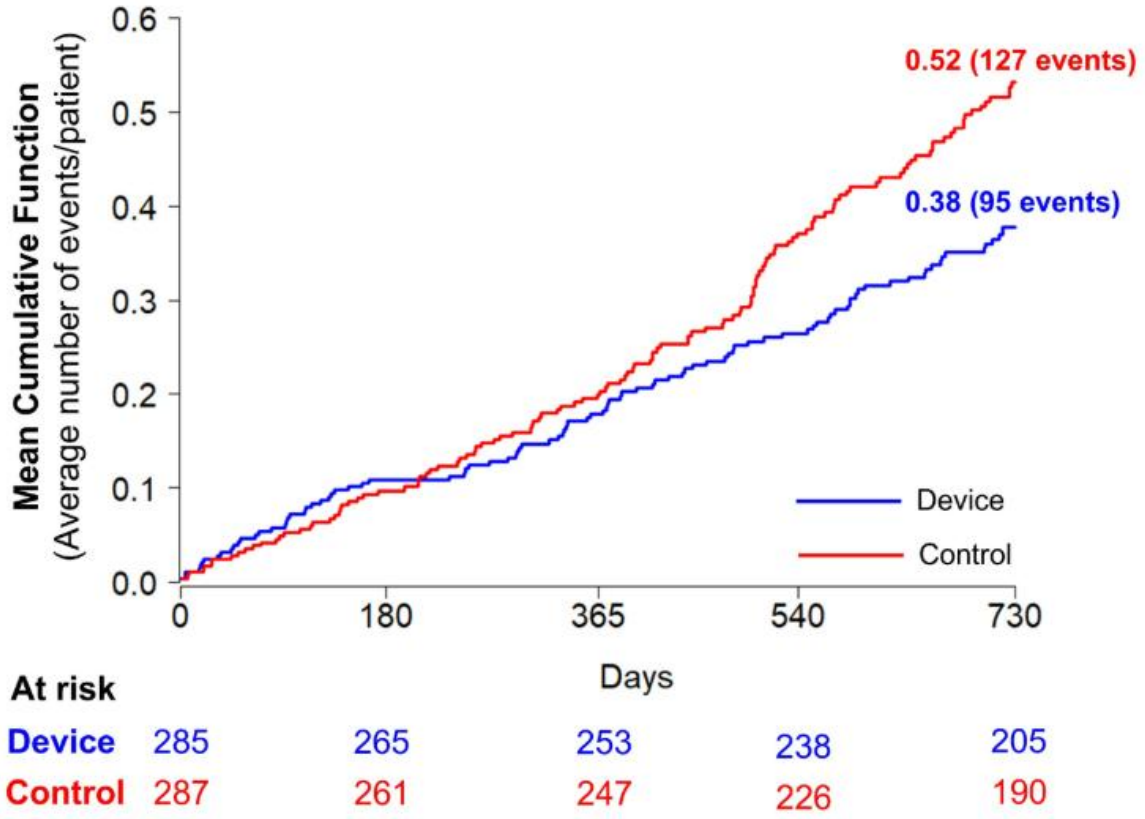
Transcatheter Edge-to-Edge Repair for Severe Isolated Tricuspid Regurgitation

The Tri.Fr Randomized Clinical Trial

Erwan Donal, MD, PhD; Julien Dreyfus, MD, PhD; Guillaume Leurent, MD; Augustin Coisne, MD, PhD; Pierre-Yves Leroux, MD; Anne Ganivet, MSc; Catherine Sportouch, MD, PhD; Yoan Lavie-Badie, MD; Patrice Guerin, MD, PhD; Frédéric Rouleau, MD; Christelle Diakov, MD; Jan van der Heyden, MD; Stéphane Lafitte, MD, PhD; Jean-François Obadia, MD, PhD; Mohammed Nejjari, MD; Nicole Karam, MD, PhD; Anne Bernard, MD, PhD; Antoinette Neylon, MD; Romain Pierrard, MD; Didier Tchetche, MD; Said Ghostine, MD; Gregory Ducrocq, MD, PhD; Thizri Si Moussi, MD; Antoine Jeu, MD; Marcel Peltier, MD, PhD; Bernard Cosyns, MD, PhD; Yvan Le Dolley, MD; Gilbert Habib, MD, PhD; Vincent Auffret, MD, PhD; Florent Le Ven, MD, PhD; François Picard, MD; Nicolas Piriou, MD; Thierry Laperche, MD; Elena Galli, MD, PhD; Sabina Istratoaie, MD, PhD; Jerome Jouan, MD, PhD; Guillaume Bonnet, MD; Pascal de Groote, MD, PhD; Amedeo Anselmi, MD, PhD; Jean-Noel Trochu, MD, PhD; Emmanuel Oger, MD, PhD; for the Tri-Fr Investigators

T-TEER- les études





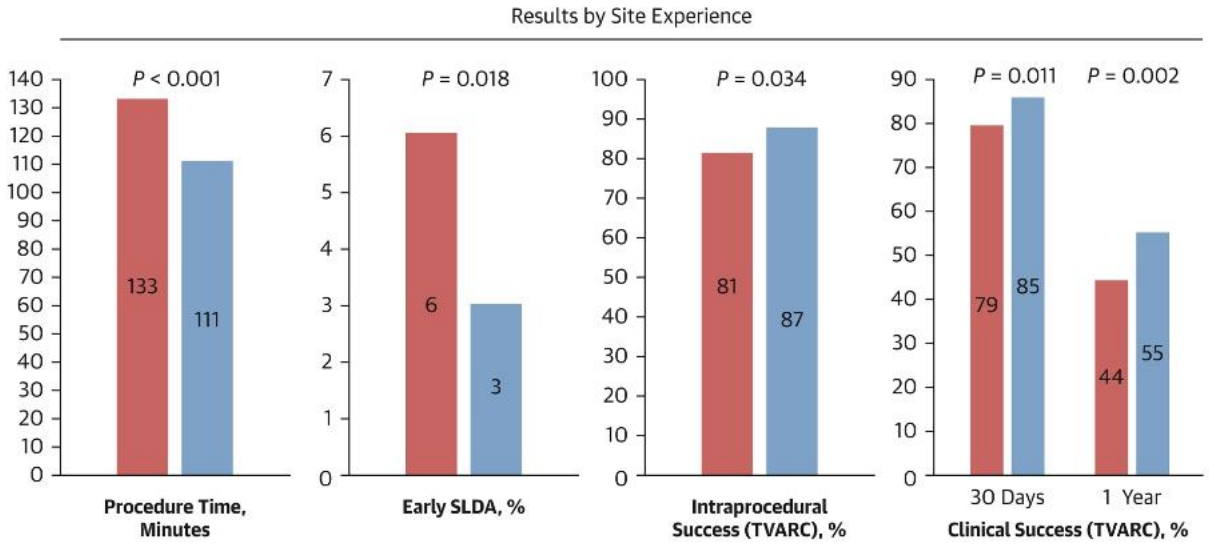
Circulation
Volume 151, Issue 23, 10 June 2025; Pages 1630-1638
https://doi.org/10.1161/CIRCULATIONAHA.125.074536

ORIGINAL RESEARCH ARTICLE

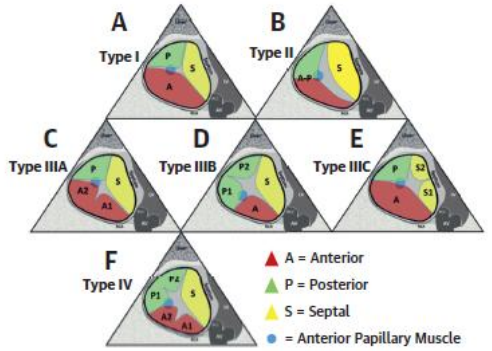
Two-Year Outcomes of Transcatheter Edge-to-Edge Repair for Severe Tricuspid Regurgitation: The TRILUMINATE Pivotal Randomized Controlled Trial

HIGHTECH

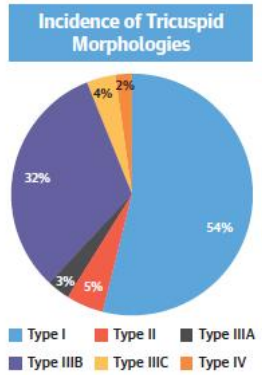
T-TEER



Wild MG, et al. JACC. 2024;10.1016/j.jacc.2024.10.068



Hahn, R.T. et al. J Am Coll Cardiol Img. 2021;14(7):1299-305.



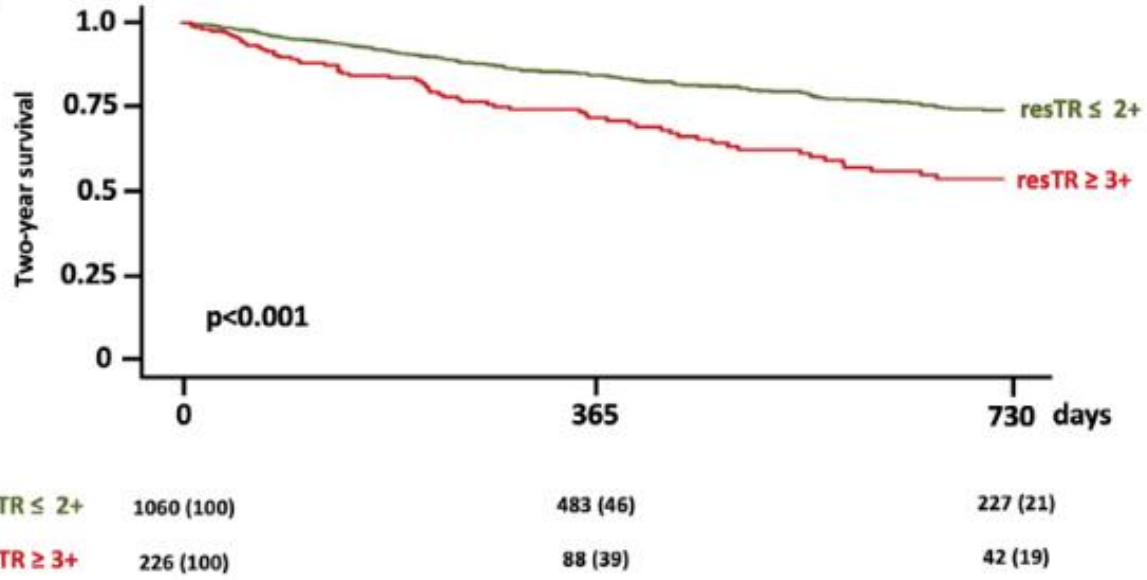
Anatomie variable

Echo difficile

✓Difficile (courbe d'apprentissage ++)

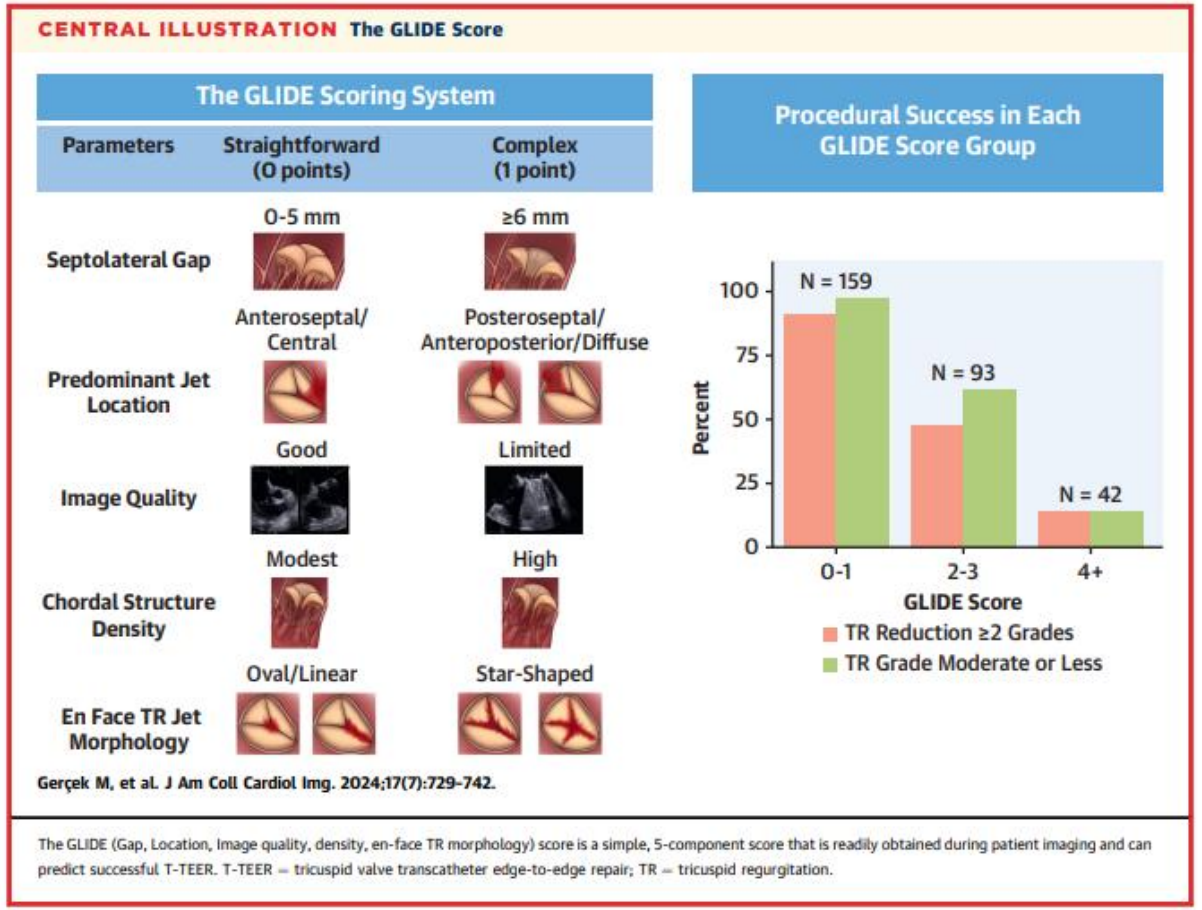
HIGHTECH

T-TEER



resTR ≤ 2+	1060 (100)	483 (46)	227 (21)
resTR ≥ 3+	226 (100)	88 (39)	42 (19)

Registre EuroTR
17%: TR résiduelle ≥ grade 3



✓**Echecs de procédure ?**

FIGURE 9 Anatomical Factors Involved in the Decision to Repair or Replace the Tricuspid Valve

Favorable anatomy for T-TEER

- Small septolateral coaptation gap ≤7 mm
- Anteroseptal jet location
- Localized prolapse or flail
- Bileaflet or trileaflet morphology
- No CIED lead
- Good echocardiographic window for leaflet visualization

Feasible anatomy for T-TEER

- Septolateral coaptation gap >7 but ≤8.5 mm
- Posteroseptal jet location
- Multiple leaflets (>3)
- Lead-associated TR without permanent leaflet interaction
- Sufficient echocardiographic window for leaflet visualization

Criteria favoring replacement

- Large septolateral coaptation gap >8.5 mm
- Anteroposterior jet location
- Multiple leaflets (>3) and indentations
- Leaflet thickening/shortening (rheumatic, carcinoid)/perforation
- Pronounced leaflet tethering
- CIED-related TR (impingement, adhesion, perforation, subvalvular entanglement)
- Insufficient echocardiographic leaflet visualization

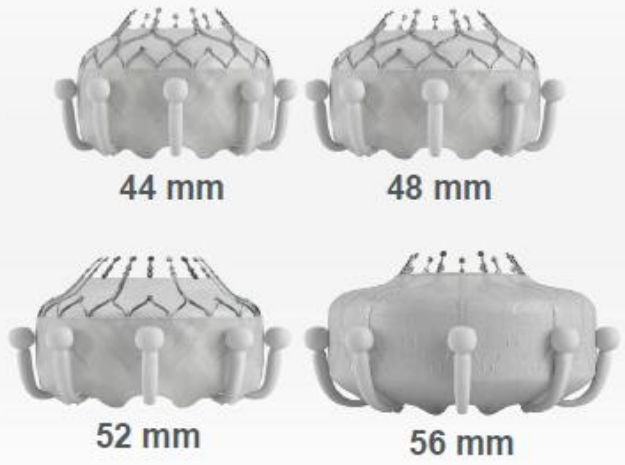
T-TEER = transcatheter tricuspid edge-to-edge repair; TTVI = transcatheter tricuspid valve intervention; other abbreviations as in Figures 3 and 8.

Hausleiter J. JACC. 2025;85(3):265–291.

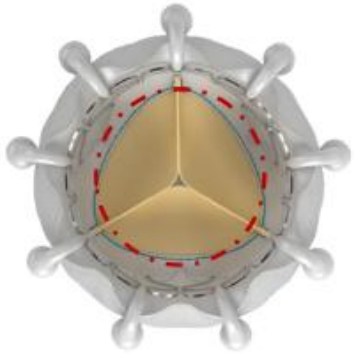
TTVR

prothèse EVOQUE

Multiple valve sizes



28 mm
Tissue Valve Equivalent



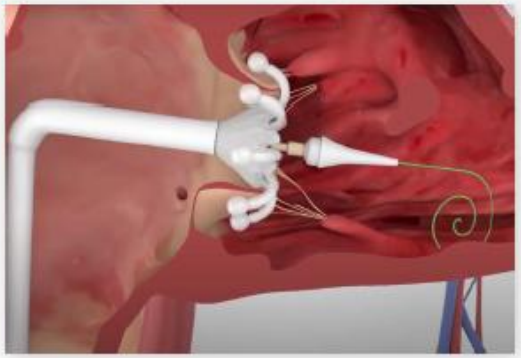
- Bovine Pericardial Leaflets
- Nitinol Self-Expanding Frame
- 9 Ventricular Anchors
- Intra-Annular Sealing Skirt

ACCESS

Transfemoral 28F outer diameter delivery system with 3 planes of movement

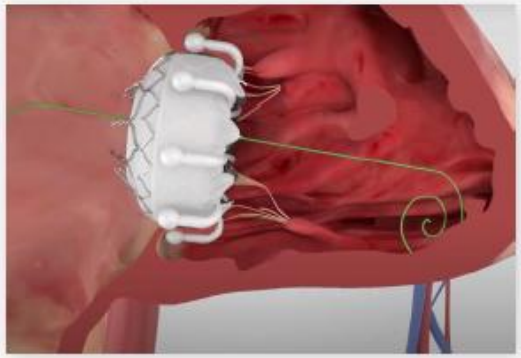
POSITION

Expose anchors to engage the leaflets and the annulus



DEPLOY

Expand valve and gradually release system



HIGHTECH

2024

TRISCEND II

M

EVOQUE Transcatheter Tricuspid Valve Replacement

An international, multicenter, randomized controlled trial

Objective: To assess the safety and efficacy of Evoque transcatheter tricuspid valve replacement (TTVR) among patients with symptomatic severe tricuspid regurgitation (TR).

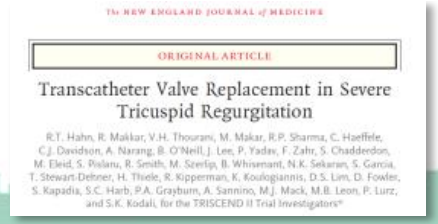
400 Patients

Inclusion criteria: Severe functional/degenerative TR, signs or symptoms despite stable diuretic therapy, prior HF hospitalization for TR, suitable anatomy for Evoque valve. **Exclusion criteria:** LVEF <25%, severe RV dysfunction, previous tricuspid surgery, prior heart transplantation, or eGFR ≤25 mL/min/1.73 m^2.

Evoque Group (n = 267)

VS.

Control Group (n = 133)



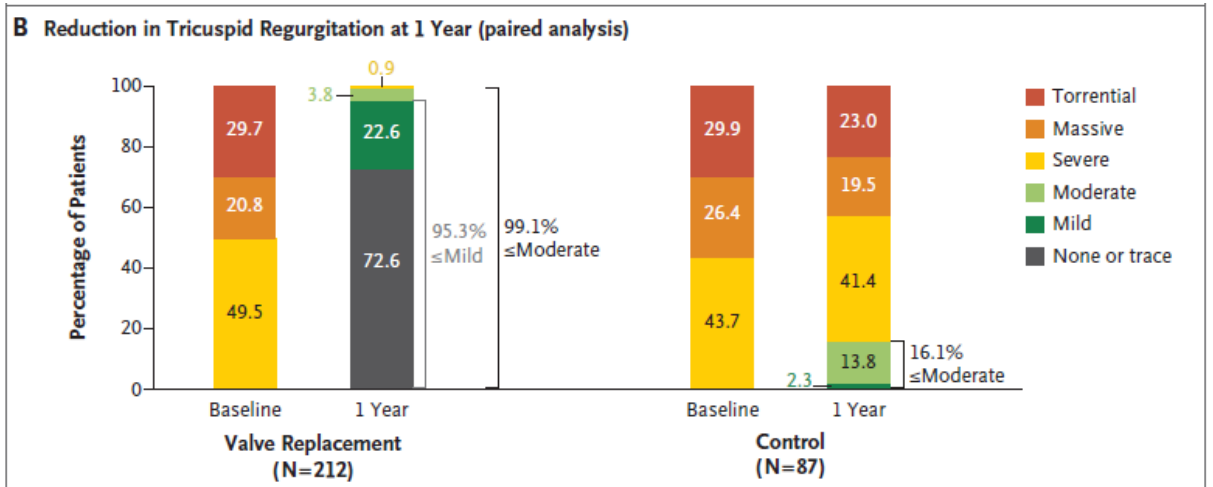
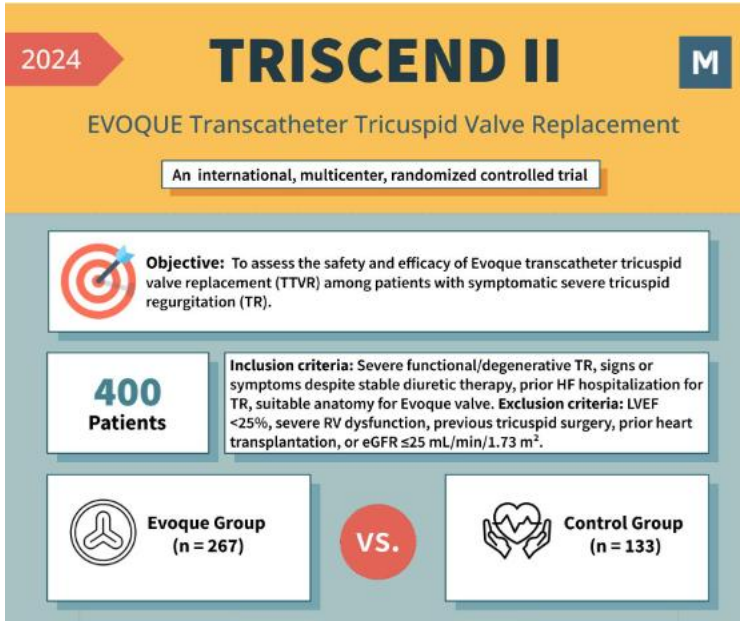


Figure 3. Clinical, Functional, Quality-of-Life, and Tricuspid-Regurgitation Changes at 1 Year.

Panel A shows an improvement of at least 10 points in the score on the KCCQ-OS, an improvement of at least one NYHA functional class, and an improvement of at least 30 m on the 6-minute walk distance at 1 year. Analyses were performed in the modified intention-to-treat safety population. Panel B shows the reduction in tricuspid regurgitation at 1 year in paired analysis. Analyses were performed in the patients in the modified intention-to-treat effectiveness population who had paired data available at baseline and 1 year.

HIGHTECH



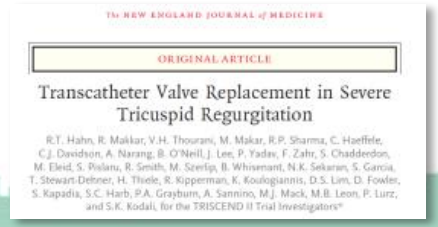


Table 2. Safety Outcomes.*

Safety Event	Early Events (≤30 Days)†		Late Events (31 to 365 Days)‡		Cumulative Events (0 to 365 Days)†		P Value§
	Valve Replacement (N=259)	Control (N=133)	Valve Replacement (N=247)	Control (N=128)	Valve Replacement (N=259)	Control (N=133)	
	number of patients (percent)						
Death from any cause¶	9 (3.5)	0	21 (8.5)	14 (10.9)	30 (11.6)	14 (10.5)	0.87
Death from cardiovascular cause	8 (3.1)	0	14 (5.7)	10 (7.8)	22 (8.5)	10 (7.5)	0.85
Myocardial infarction	2 (0.8)	0	3 (1.2)	1 (0.8)	5 (1.9)	1 (0.8)	0.67
Stroke	1 (0.4)	0	3 (1.2)	0	4 (1.5)	0	0.30
New renal-replacement therapy‖	4 (1.5)	NA	4 (1.6)	NA	8 (3.1)	NA	NA
Severe bleeding**	27 (10.4)	2 (1.5)	13 (5.3)	6 (4.7)	40 (15.4)	7 (5.3)	0.003
Nonelective tricuspid-valve reintervention††	2 (0.8)	1 (0.8)	0	3 (2.3)	2 (0.8)	4 (3.0)	0.19
Major access-site and vascular complication‖	8 (3.1)	NA	0	NA	8 (3.1)	NA	NA
Major cardiac structural complication‖	3 (1.2)	NA	0	NA	3 (1.2)	NA	NA
Device-related pulmonary embolism‖	2 (0.8)	NA	1 (0.4)	NA	2 (0.8)	NA	NA
Arrhythmia and conduction disorder resulting in permanent pacing	41 (15.8)	0	5 (2.0)	3 (2.3)	46 (17.8)	3 (2.3)	<0.001
New pacemaker or cardiac implantable electronic device‡‡							
In all patients	40 (15.4)	0	5 (2.0)	3 (2.3)	45 (17.4)	3 (2.3)	<0.001
In patients without pre-existing pacemaker§§	40/162 (24.7)	0/80	5/118 (4.2)¶¶	3/76 (3.9)¶¶	45/162 (27.8)	3/80 (3.8)	<0.001

Device	Access Route	Delivery System (French)	Anchoring Mechanism	Valve Sizes (mm)
LUX-VALVE PLUS	Transjugular	33 F	Septal anchor + anterior/posterior leaflet graspers	40, 45, 50, 55, 60, 65, 70
EVOQUE	Transfemoral	28 F	Intra-annular skirt + leaflet anchors	44, 48, 52, 56 (selected sizes CE-approved)
CARDIOVALVE	Transfemoral	32 F	Leaflet graspers + atrial flange	M, L, XL
TRISOL	Transjugular	30 F	Axial force + leaflet anchors	1 size (40–53 mm)
TOPAZ	Transfemoral	29 F	Subannular anchors	45, 55
VDYNE	Transfemoral	28 F	RVOT anchor + proximal loop	5 sizes (42–56 mm)

Donal E. Structural Heart. In press

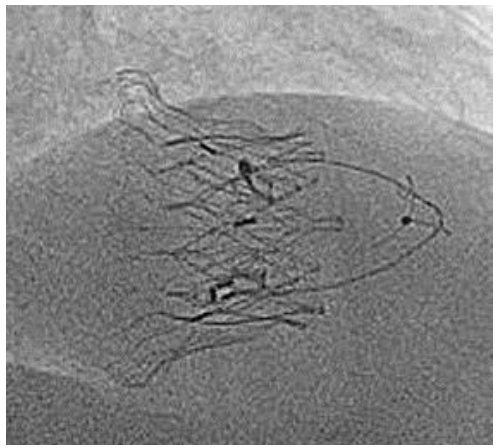


TABLE 4 Clinical 1-Month Outcomes (N = 61)

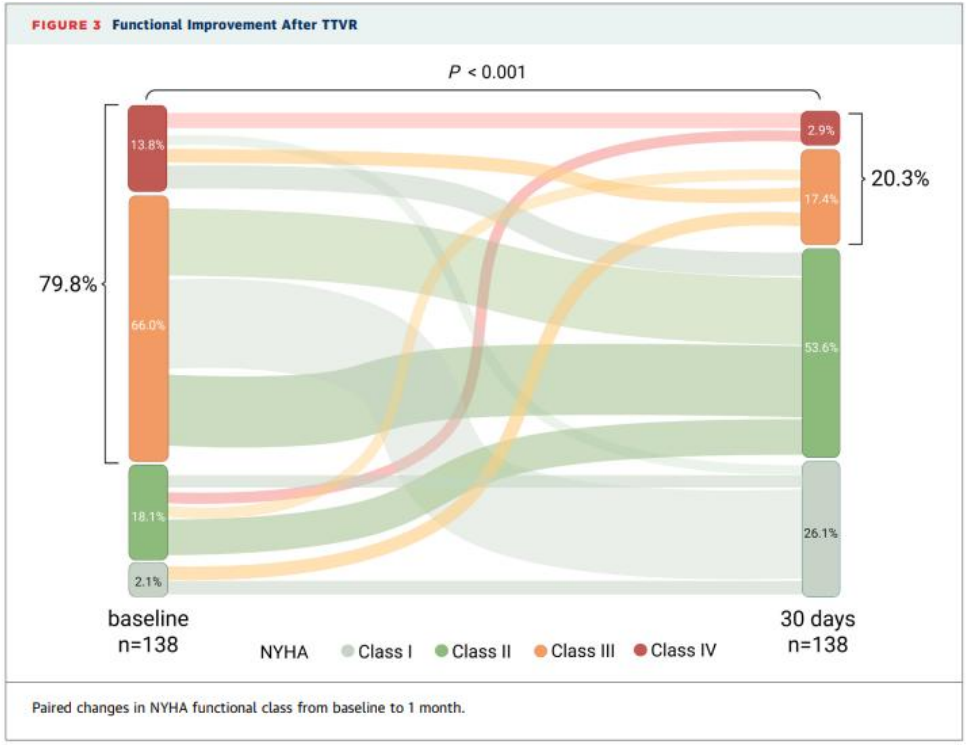
Clinical success according to TVARC at 30 days	56 (91.8)
Major bleeding	1 (1.6)
Myocardial infarction	0 (0.0)
Stroke	0 (0.0)
Pulmonary embolism	0 (0.0)
Reintervention/surgery	2 (3.3)
TricValve (Products & Features) after detachment of septal anchor	1 (1.6)
TVR	1 (1.6)
Pacemaker implantation	1 (1.6)
New-onset dialysis	0 (0.0)
Valve thrombosis	0 (0.0)
TR severity follow-up	
0+	29 (47.5)
1+	24 (39.3)
2+	5 (8.2)
3+	1 (1.6)
4+	2 (3.3)
5+	0 (0.0)
NYHA functional class	
I	24 (43.6)
II	23 (41.8)
III	4 (7.3)
IV	4 (7.3)

Values are n (%). 61 patients were eligible for the 1-month follow-up.
Abbreviations as in Tables 2 and 3.

Stolz L. JACC interv 2024

Tricuspide : réparer ou remplacer ?

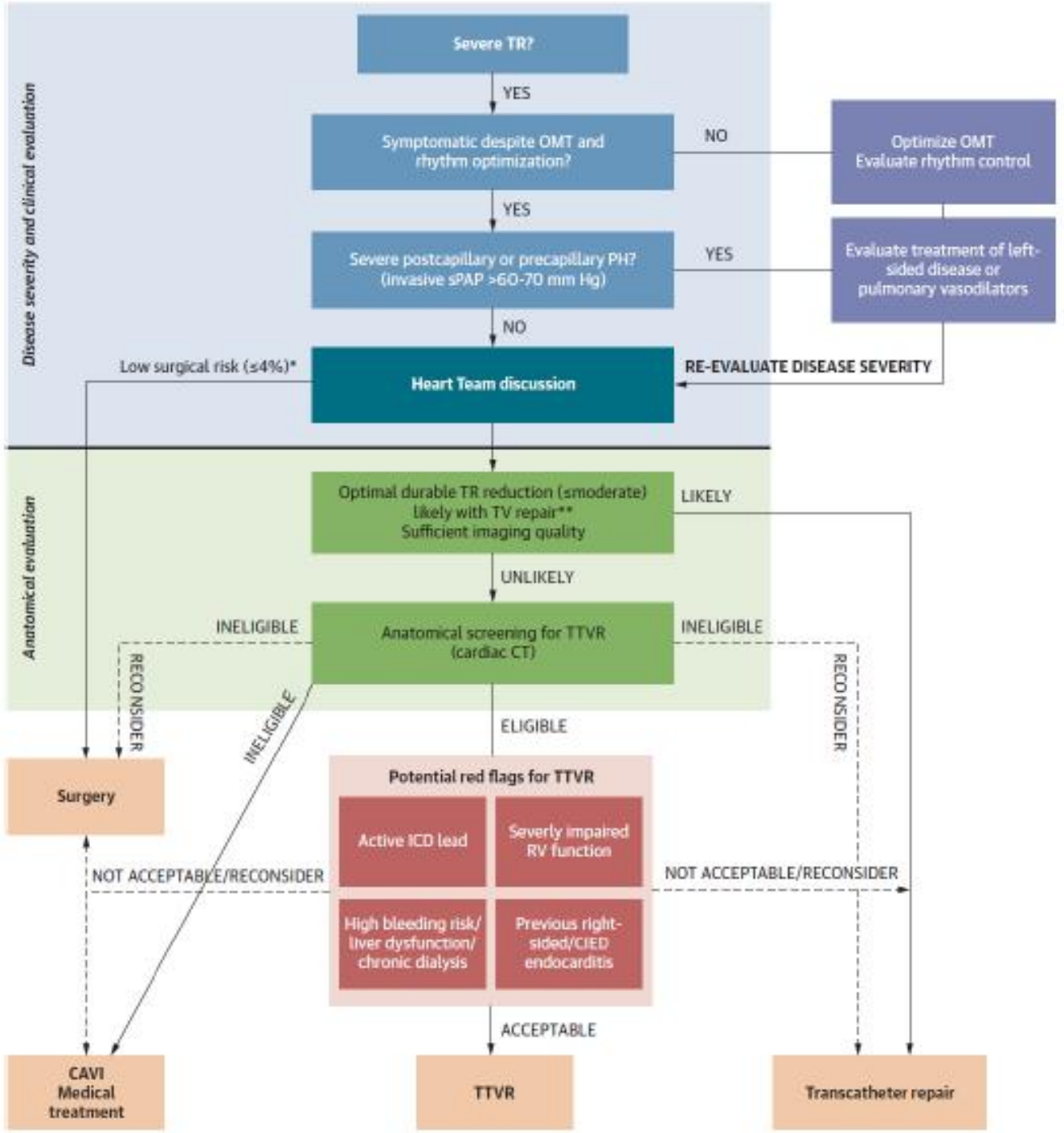
- ❑ Ø études randomisées TTVR vs TTVr
- ❑ Ø remboursement
- ❑ Echec de screening
- ❑ Pertinence et timing de l'indication ?
- ❑ Quid du « *lifetime management* » ?



Tricuspide : réparer ou remplacer ?

- Discussion en heart team !
- Considérations
  - cliniques
  - anatomiques
  - (- pratiques)

guillaume.leurent@chu-rennes.fr



HIGH TECH MARSEILLE

28-30 JANVIER 2026

MARSEILLE
PALAIS DU PHARO

Tricuspide: réparation ou remplacement ?

Guillaume LEURENT
CHU de RENNES