Transcatheter Repair in Severe TR

Data suggest repair in selected patients only

Nir Flint

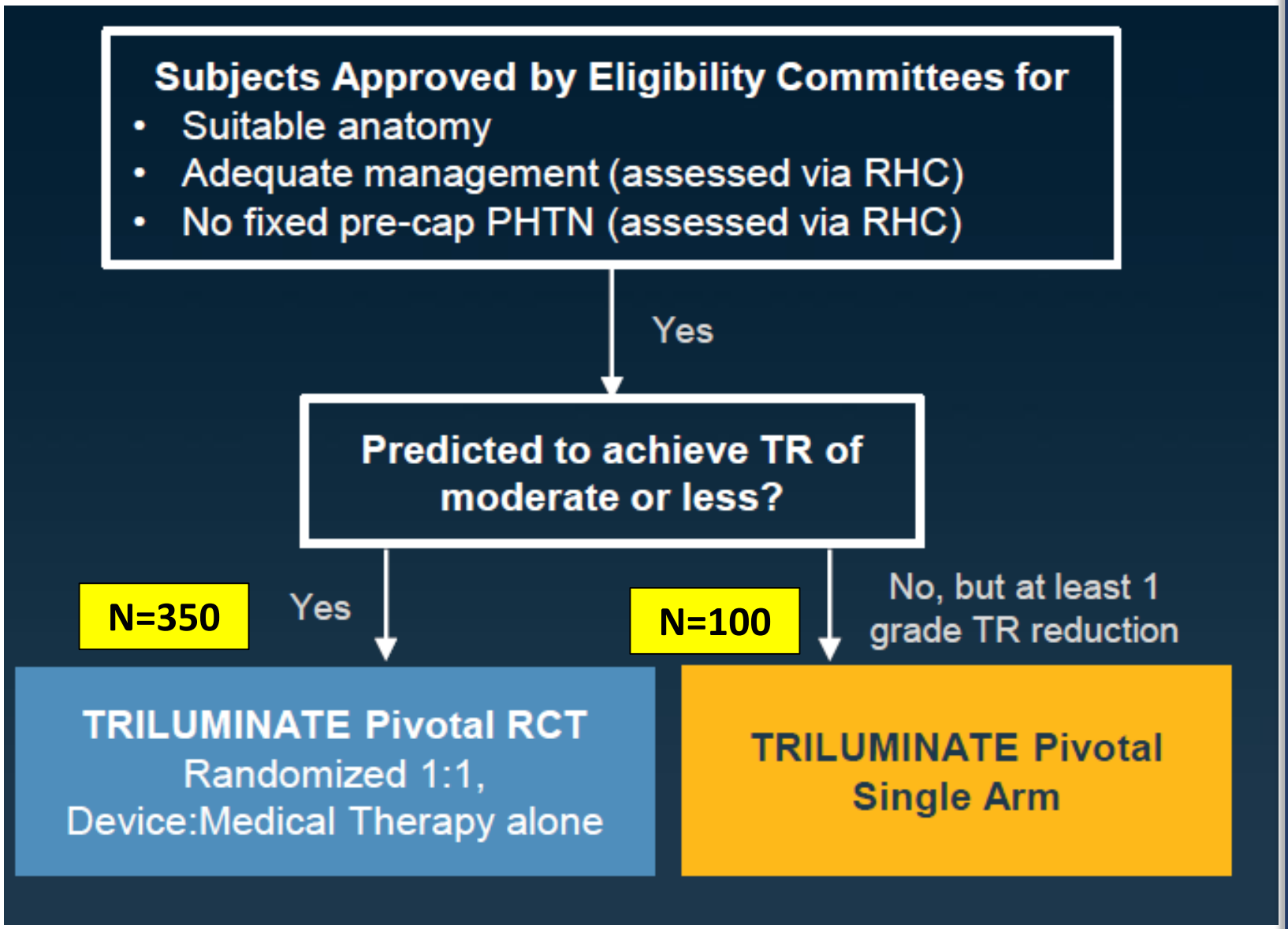
Division of Cardiology
Tel Aviv Sourasky Medical Center

TRILUMINATE Pivotal

- N=350, 65 centers
- Severe, Symptomatic (NYHA II-IV) Isolated TR
- Intermediate/High Surgical risk

- **Main Exclusion Criteria:**
  - SPAP> 70mmHG or Precapillary PHTN by RHC
  - LVEF <20%

- **Anatomical Exclusion:**
  - Calcification at grasping area
  - Coaptation defect >2cm
  - Pacemaker lead that would prevent clipping



Surajja P et al. ; NEJM May 2023 & TVT 2023

TRILUMINATE

Eligible patients:
Severe symptomatic TR
SPAP<70mmHg
GDMT for 30 days

Informed Consent
N=1573

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TRILUMINATE

Eligible patients:
Severe symptomatic TR
SPAP<70mmHg
GDMT for 30 days

Informed Consent
N=1573

Echo Core Lab and Eligibility Committee:

Predicted to achieve TR of moderate or less?

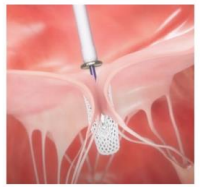
→ **Screen failure** (or **single arm**) **N= 911**

Randomized
N=350

Randomized 1:1

TriClip (N=175)

Medical Therapy (N=175)



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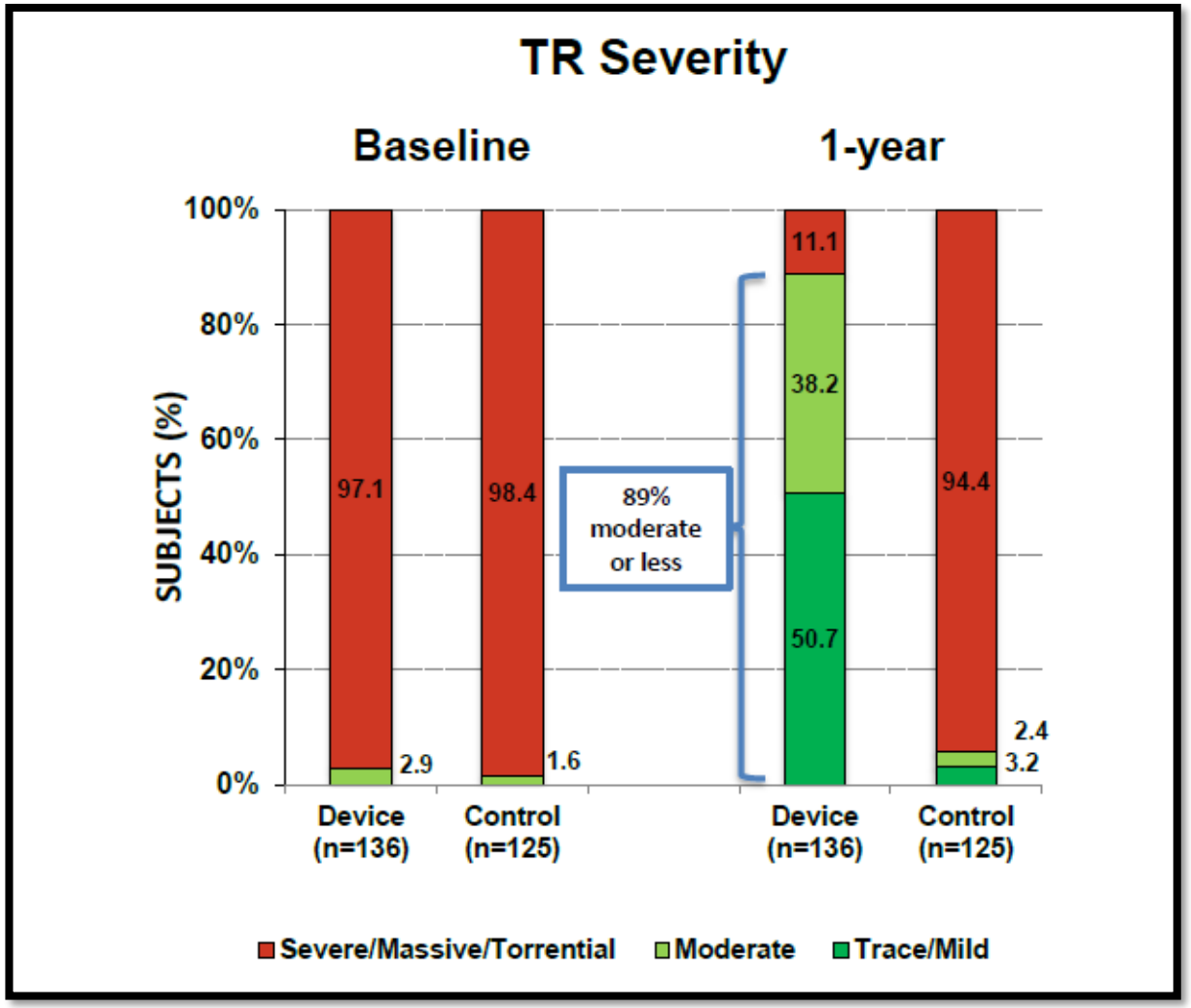
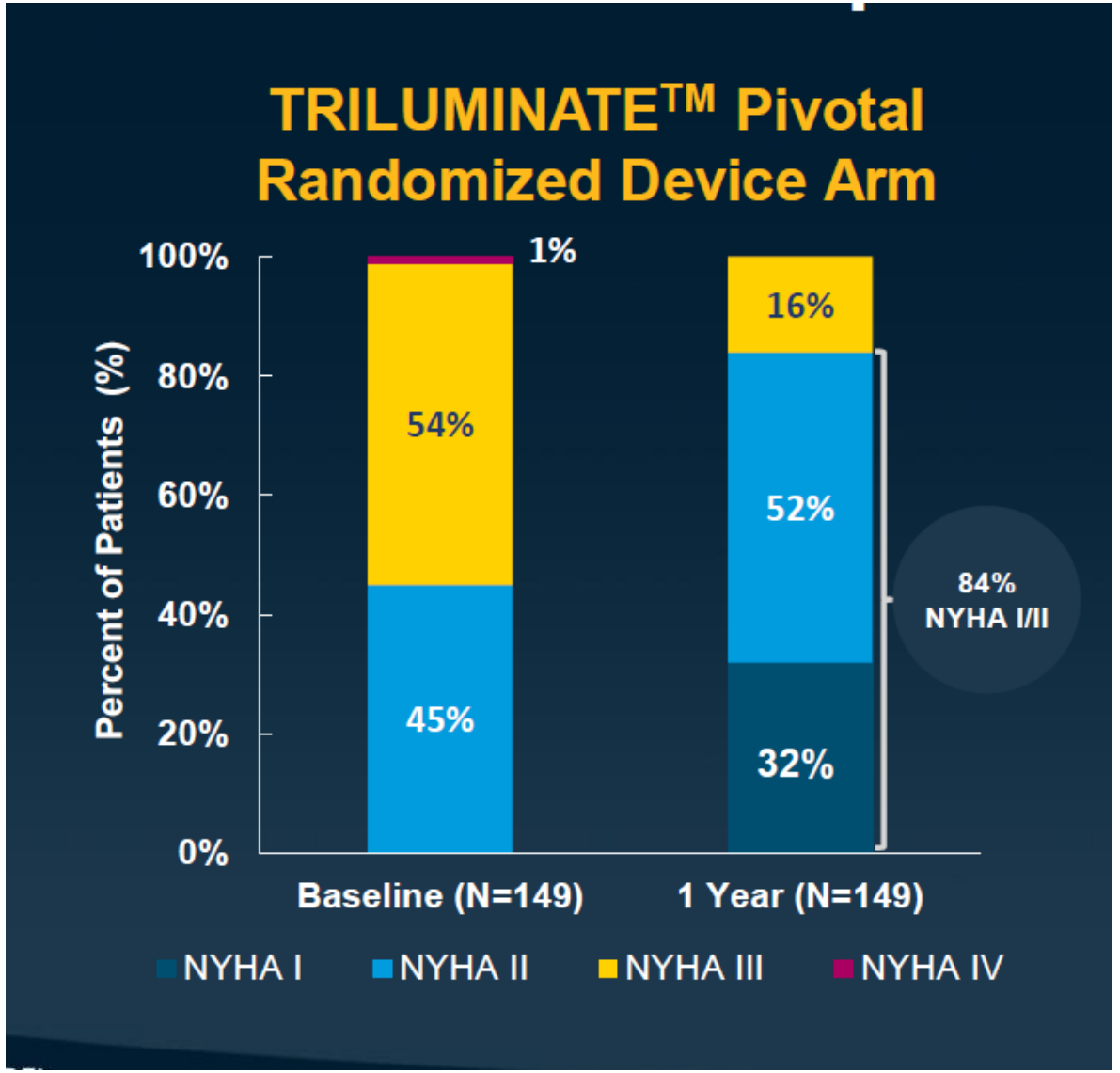
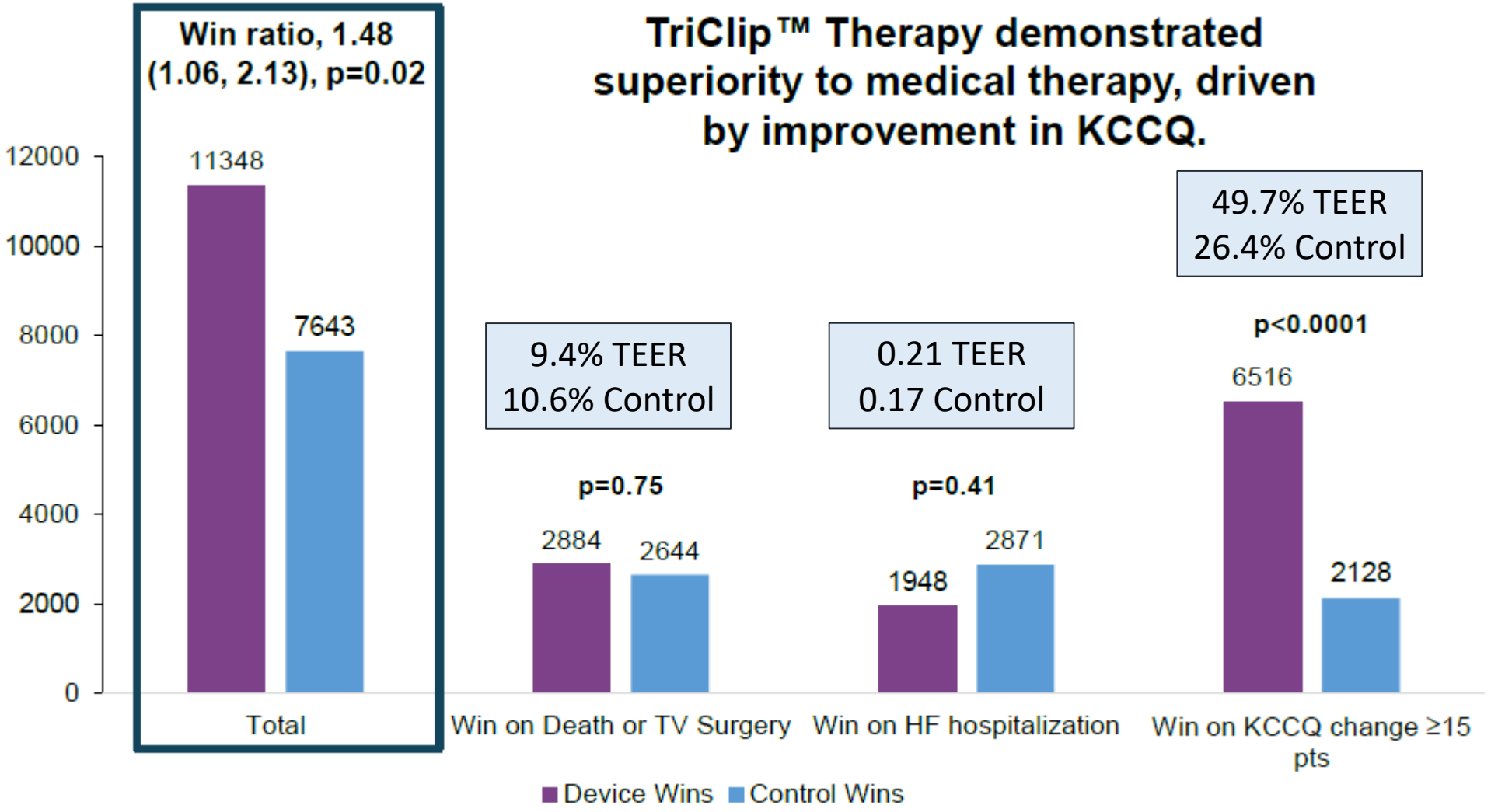
TRILUMINATE Pivotal





TRILUMINATE Pivotal

PRIMARY ENDPOINT



Surajja P et al. ; NEJM May 2023 & TVT 2023

Triluminate Vs. Real World

	TRILUMINATE N=350	bRIGHT (TriClip) N=511	PASTE (PASCAL) N=603
Massive/Torrential TR	71%	88%	56%
Prior HF Hosp. 1y pre procedure	25%	40%	--
NYHA III/IV	55%	80%	89%
Prior PM/ICD/CRT	15%	23%	28%
KCCQ Score	55	44	--

TRILUMINATE

- First RCT
- 87% Procedural success
- Met the primary outcome
- Overall safe procedure
- 5-year follow-up

- Open-label trial, no sham
- QoL benefit only
- No change in 6mW (-8m)
- Highly selective population
- 50% with moderate or more residual TR
- 5% major bleeding, 7% SLDA @ 30-day

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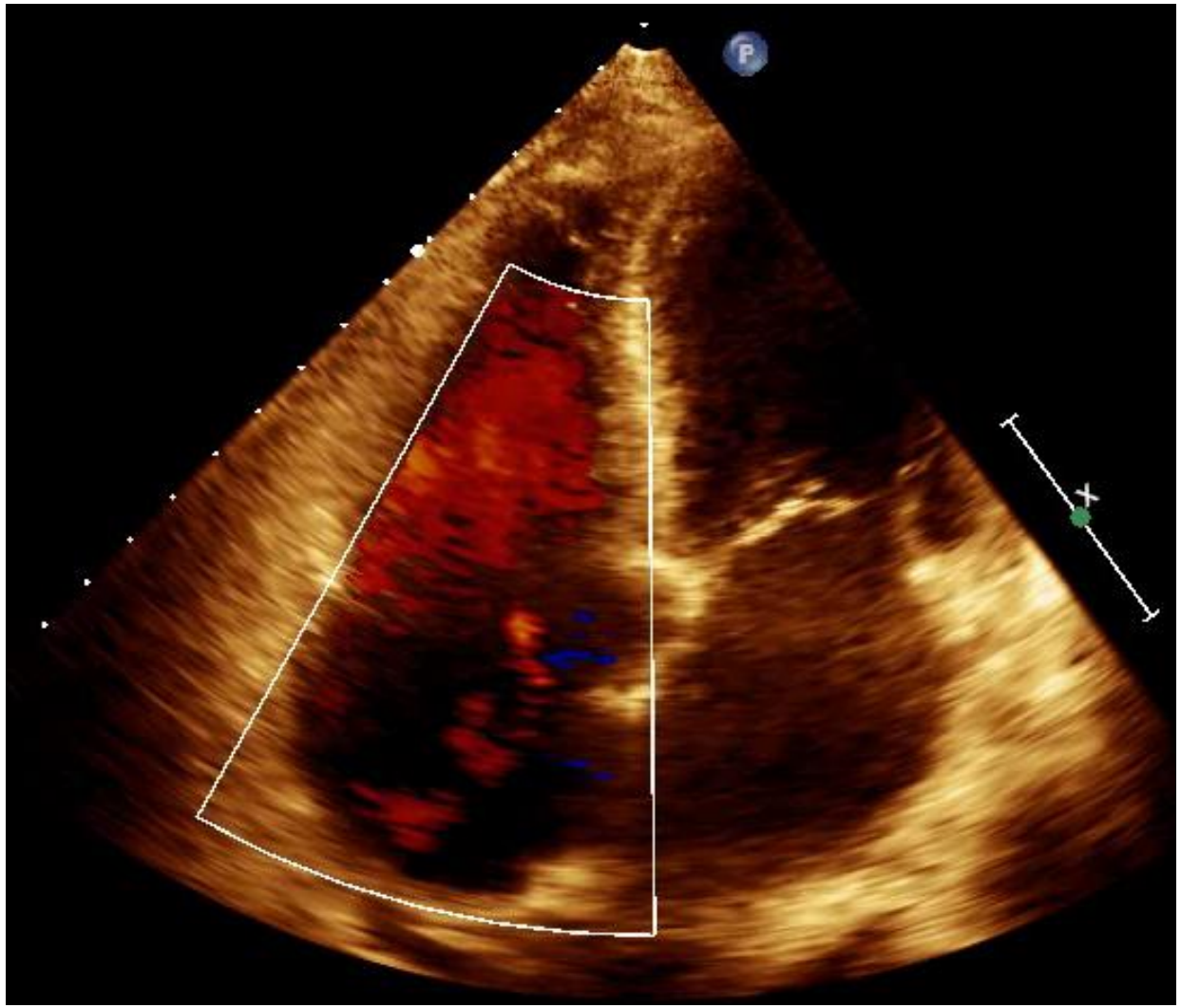
To TEER or Not to TEER?



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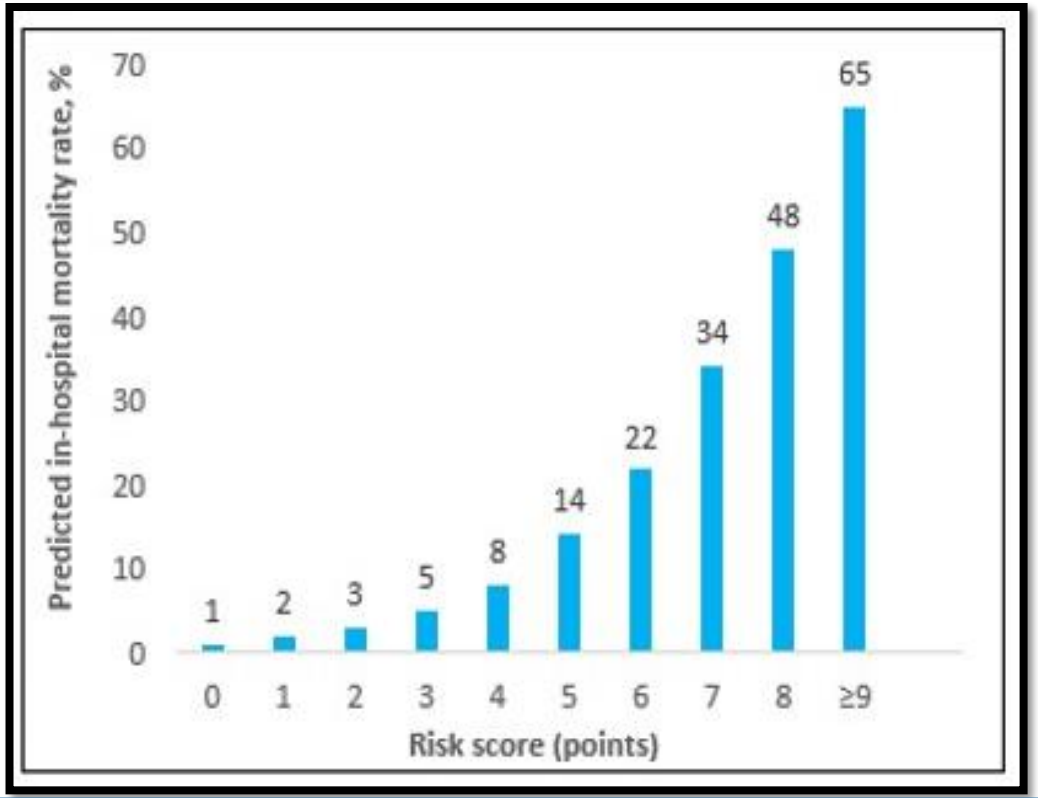
TRI-SCORE

TRI-SCORE: a new risk score for in-hospital mortality prediction after isolated tricuspid valve surgery

Julien Dreyfus [1,*,†], Etienne Audureau [2,3,†], Yohann Bohbot [4,5], Augustin Coisne [6,7], Yoan Lavie-Badie [8], Maxime Bouchery [9], Michele Flagiello [10], Baptiste Bazire [11], Florian Eggenspieler [12], Florence Viau [13], Elisabeth Riant [1,14], Yannick Mbaki [15], Damien Eyharts [8], Thomas Senage [16], Thomas Modine [6], Martin Nicol [1], Fabien Doguet [17,18], Virginia Nguyen [1], Thierry Le Tourneau [19], Christophe Tribouilloy [4,5], Erwan Donal [15], Jacques Tomasi [20], Gilbert Habib [13,21], Christine Selton-Suty [12], Richard Raffoul [22], Bernard Iung [23], Jean-François Obadia [10], and David Messika-Zeitoun [24*]

Risk factors (final model from multivariate analysis)	Scoring
Age ≥ 70 years	1
NYHA functional class III-IV	1
Right-sided heart failure signs	2
Daily dose of furosemide ≥ 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



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Dreyfus et al, EHJ 2022;43

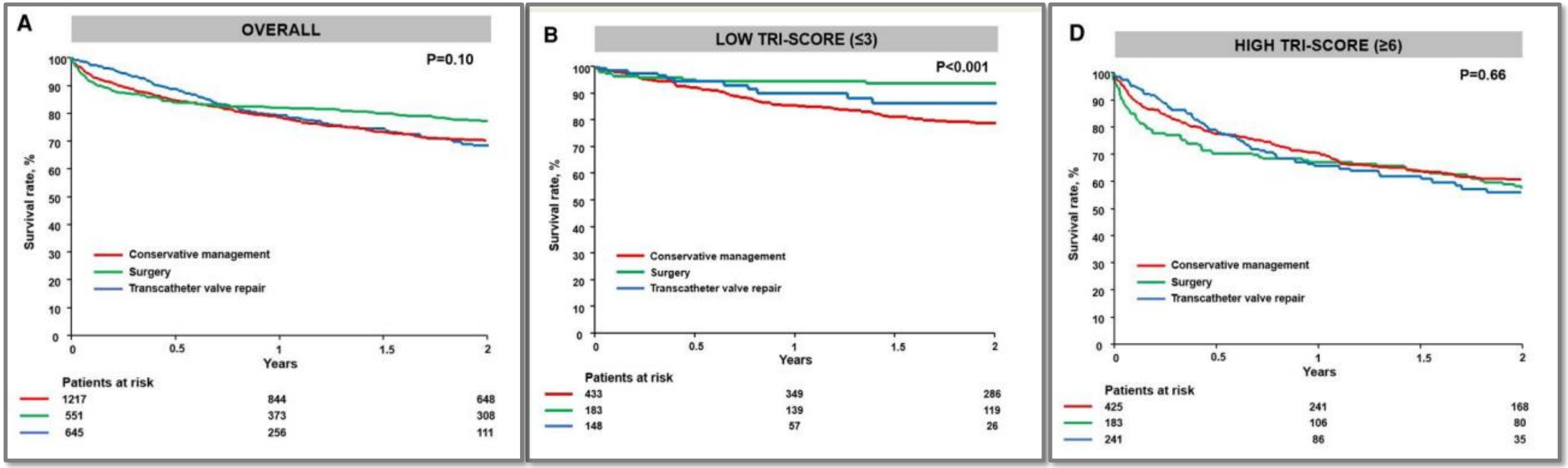
TRI-SCORE: Predicts Mortality post T-TEER

ESC European Society of Cardiology
European Heart Journal (2023) **00**, 1–12
https://doi.org/10.1093/eurheartj/ehad585
FASTTRACK CLINICAL RESEARCH
Valvular heart disease

TRI-SCORE and benefit of intervention in patients with severe tricuspid regurgitation

Isolated TR International Registry (N=2413)

- **Conservative (n=1217)**
- **Transcatheter (n=551)**
- **Surgery (n=645)**



Adjusted for age, sex, comorbidities (P=0.23)

TRI-SCORE: Predicts Mortality post T-TEER

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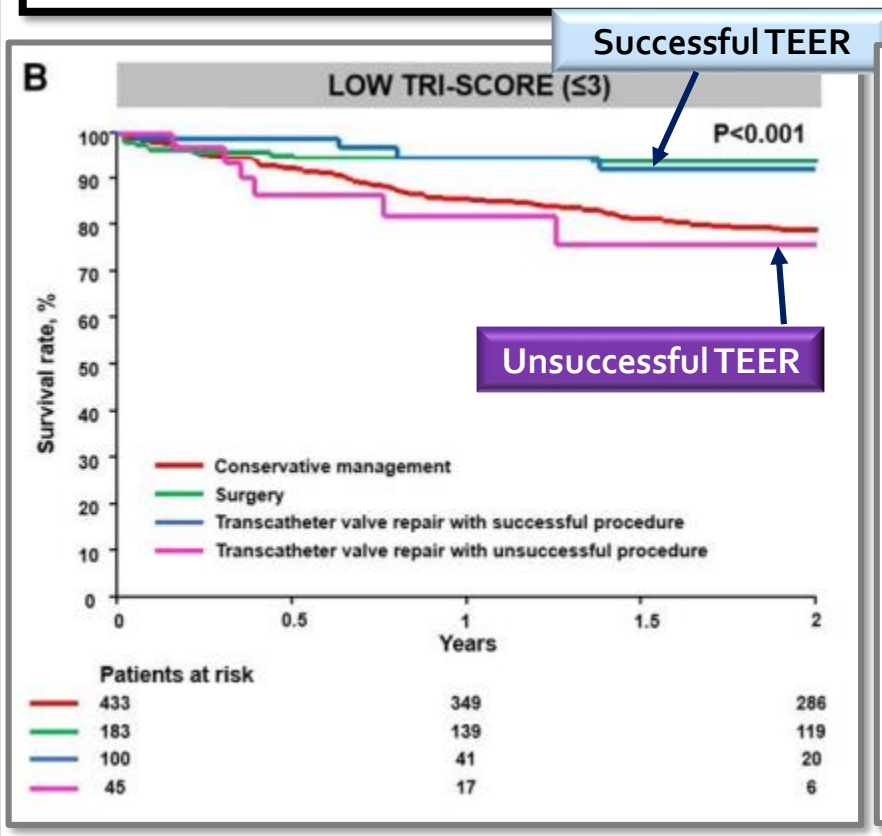
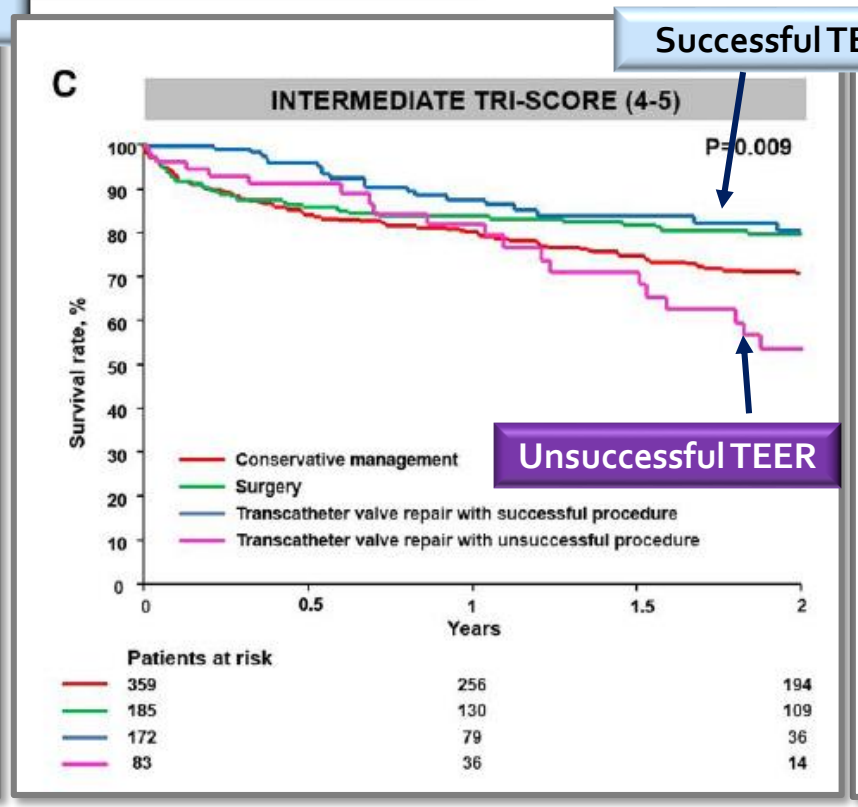
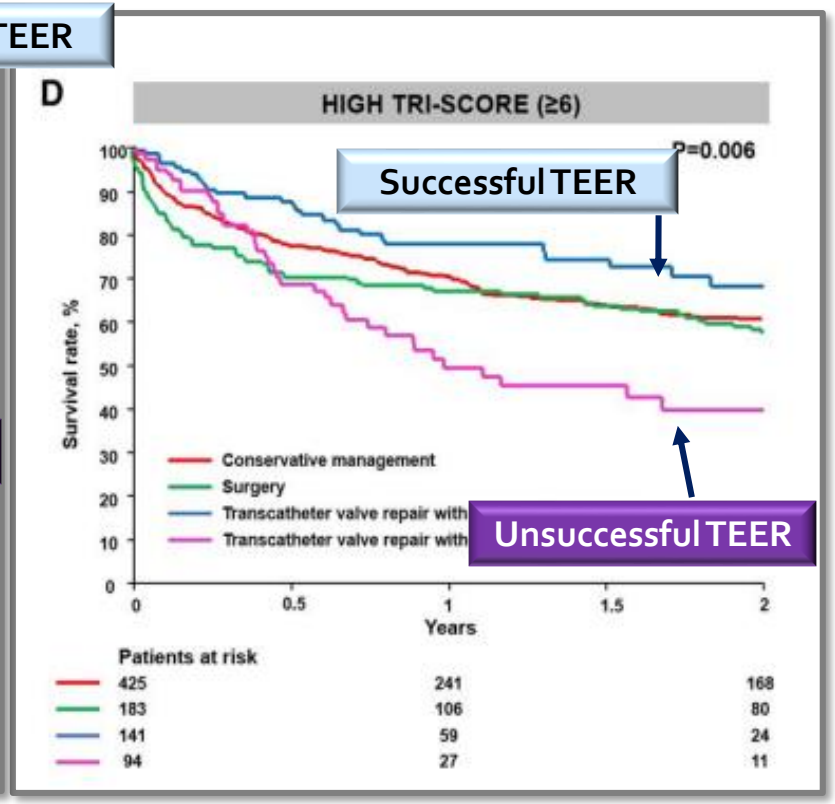




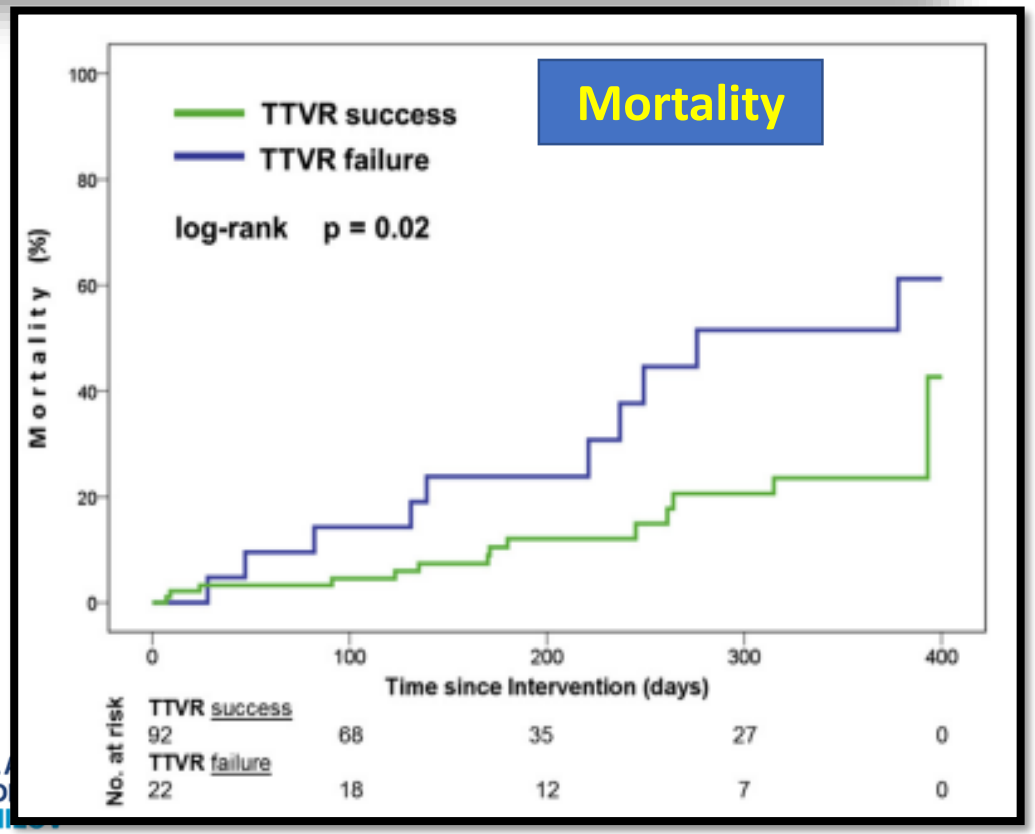


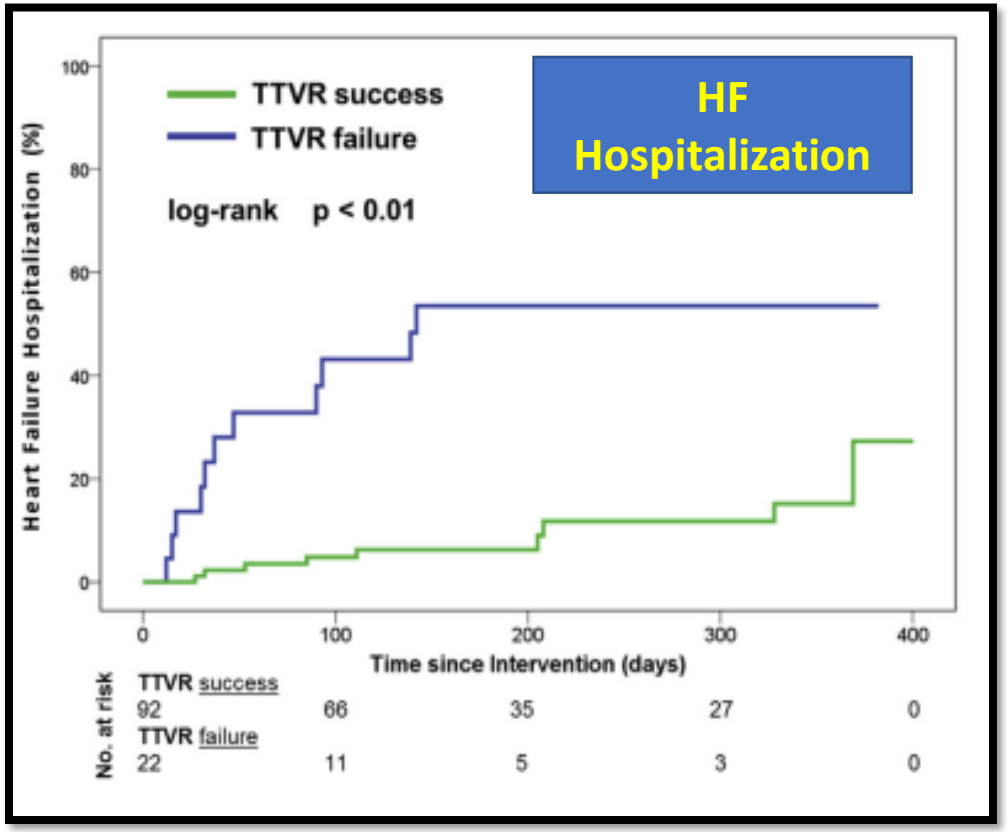
Dreyfus J et al. EHJ, August 2023

T-TEER Procedural Success

Predictors of Procedural and Clinical Outcomes in Patients With Symptomatic Tricuspid Regurgitation Undergoing Transcatheter Edge-to-Edge Repair

Christian Besler, MD,[a,*] Mathias Orban, MD,[b,c,*] Karl-Philipp Rommel, MD,[a,*] Daniel Braun, MD,[b] Mehul Patel, MD,[d] Christian Hagl, MD,[e] Michael Borger, MD, PhD,[f] Michael Nabauer, MD,[b] Steffen Massberg, MD,[b,c] Holger Thiele, MD,[a] Jörg Hausleiter, MD,[b,c,†] Philipp Lurz, MD, PhD[a,†]





T-TEER Procedural Success

1-Year Outcomes After Edge-to-Edge Valve Repair for Symptomatic Tricuspid Regurgitation

Results From the TriValve Registry

Michael Mehr, MD,[a,b,*] Maurizio Taramasso, MD,[c,*] Christian Besler, MD,[d] Tobias Ruf, MD,[e] Kim A. Conne
Marcel Weber, MD,[g] Ermela Yzeiraj, MD,[h] Davide Schiavi, MD,[i] Antonio Mangieri, MD,[i] Laura Vaskelyte, M
Hannes Alessandrini, MD,[k] Florian Deuschl, MD,[l] Nicolas Brugger, MD,[m] Hasan Ahmad, MD,[n] Luigi Biasco
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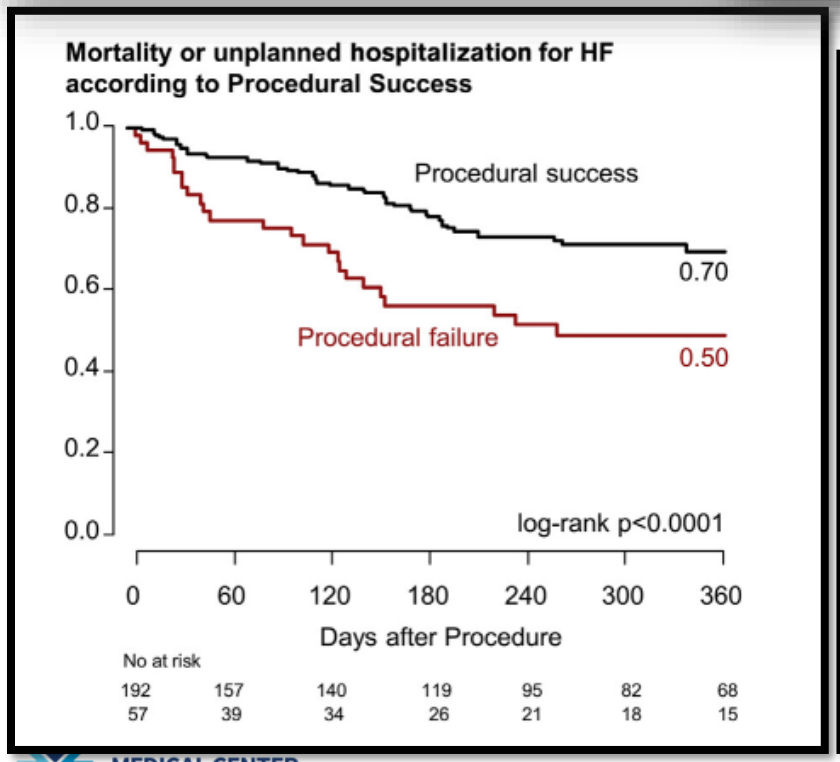
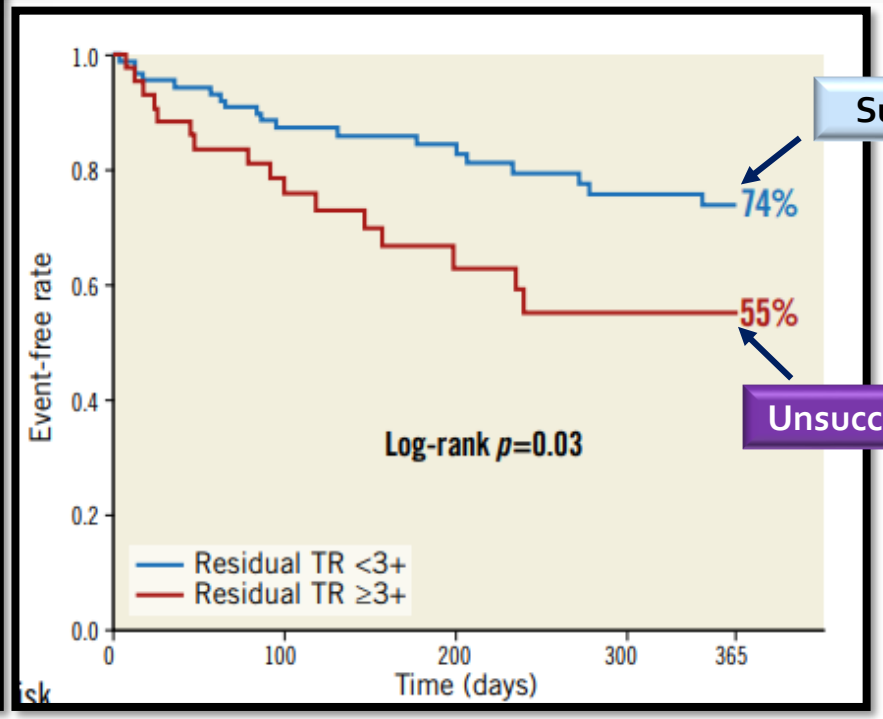
Paolo Denti, MD,[i] Azeem Latib, MD,[i] Joachim Schofer, MD,[b] Georg Nickenig, MD,[g] Neil Fam, MD,[f]
Stephan von Bardeleben, MD,[e] Philipp Lurz, MD,[d] Francesco Maisano, MD,[c,†] Jörg Hausleiter, MD[a,b,†]

Leaflet-to-annulus index and residual tricuspid regurgitation following tricuspid transcatheter edge-to-edge repair

Tetsu Tanaka, MD; Atsushi Sugiura*, MD, PhD; Refik Kavsur, MD; Johanna Vogelhuber, MD; Can Öztürk, MD; Marc Ulrich Becher, MD; Sebastian Zimmer, MD; Georg Nickenig, MD; Marcel Weber, MD

Medzinische Klinik und Poliklinik II, Universitätsklinikum Bonn, Bonn, Germany





Successful TEER

Unsuccessful TEER

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T-TEER Procedural Success

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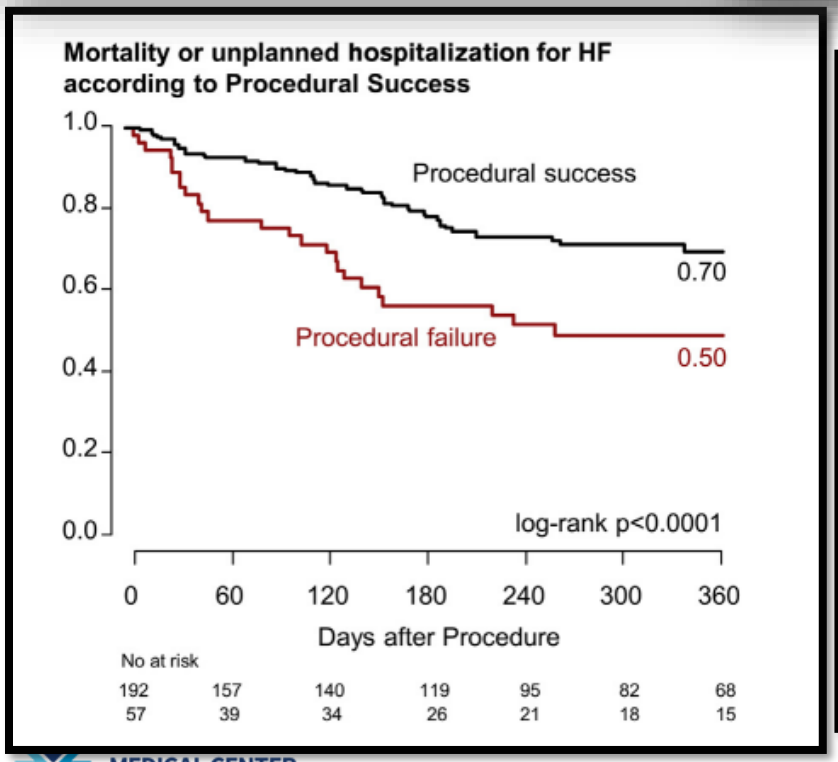
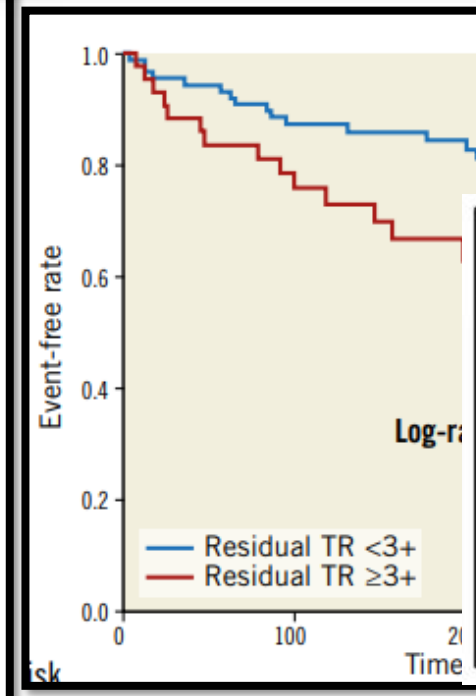
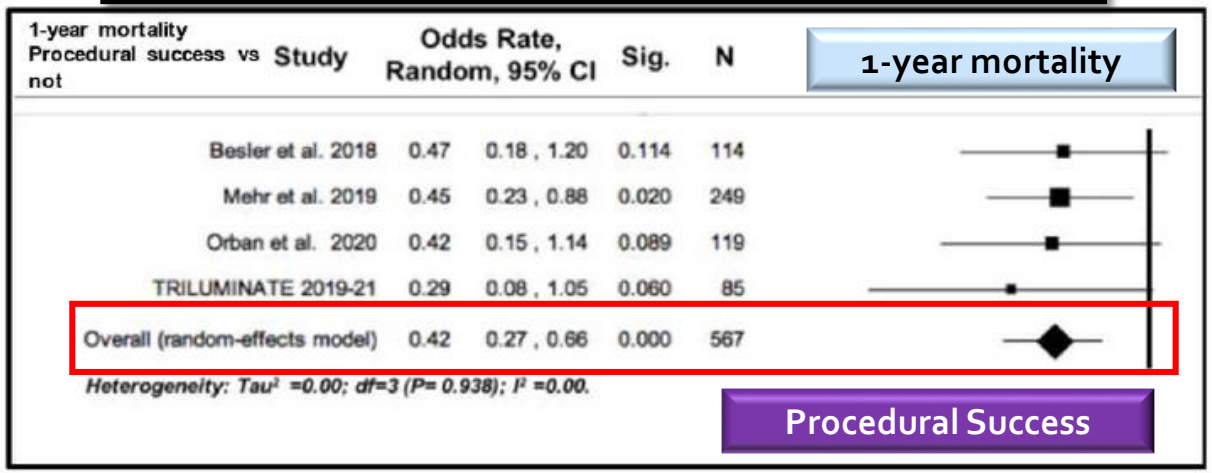
Medizinische Klinik und Poliklinik II, Universitätsklinikum

Clinical and Echocardiographic Outcomes of Transcatheter Tricuspid Valve Interventions: A Systematic Review and Meta-Analysis

Anna Sannino[1,2], Federica Ilardi[2,3], Rebecca T. Hahn[4], Patrizio Lancellotti[5,6], Philipp Lurz[7], Robert L. Smith[1], Giovanni Esposito[2] and Paul A. Grayburn[1]*







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Sannino A., Front. Cardiovasc Med. 2022;11

Predictors of T-TEER Procedural Success

Predictors of Procedural Success

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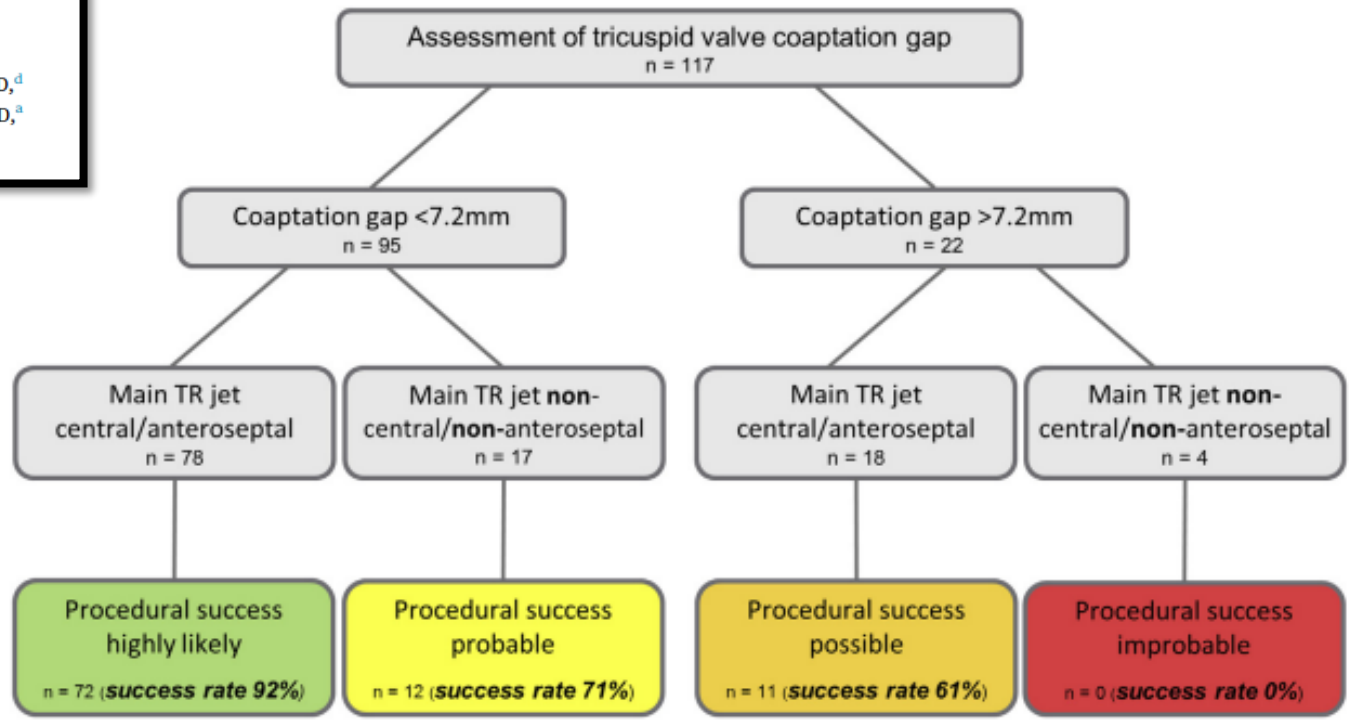
TABLE 4 Predictors of Procedural Transcatheter TV Repair Success

	Univariate		Multivariate	
	Odds Ratio	p Value	Odds Ratio	p Value
TR EROA (PISA)	0.21 (0.06-0.73)	0.01	–	–
TV tenting area	0.65 (0.45-0.94)	0.02	–	–
TR vena contracta	0.87 (0.77-0.99)	0.04	–	–
TV coaptation gap	0.74 (0.63-0.87)	<0.01	0.73 (0.62-0.88)	<0.01
TR jet non-central/ non-anteroseptal	0.22 (0.08-0.62)	<0.01	0.18 (0.06-0.56)	<0.01

Univariate and multivariate logistic regression for procedural TTVR success, displaying only significant univariate predictors. Univariate predictors were subsequently tested in a multivariate stepwise model.

Abbreviations as in Tables 1, 2, and 3.

Patient Stratification According to Procedural Success



Proposed scheme for patient stratification for transcatheter tricuspid valve edge-to-edge repair according to the determined cut-off value of 7.2 mm for tricuspid valve coaptation gap and main tricuspid regurgitant jet orientation. TR = tricuspid regurgitation.

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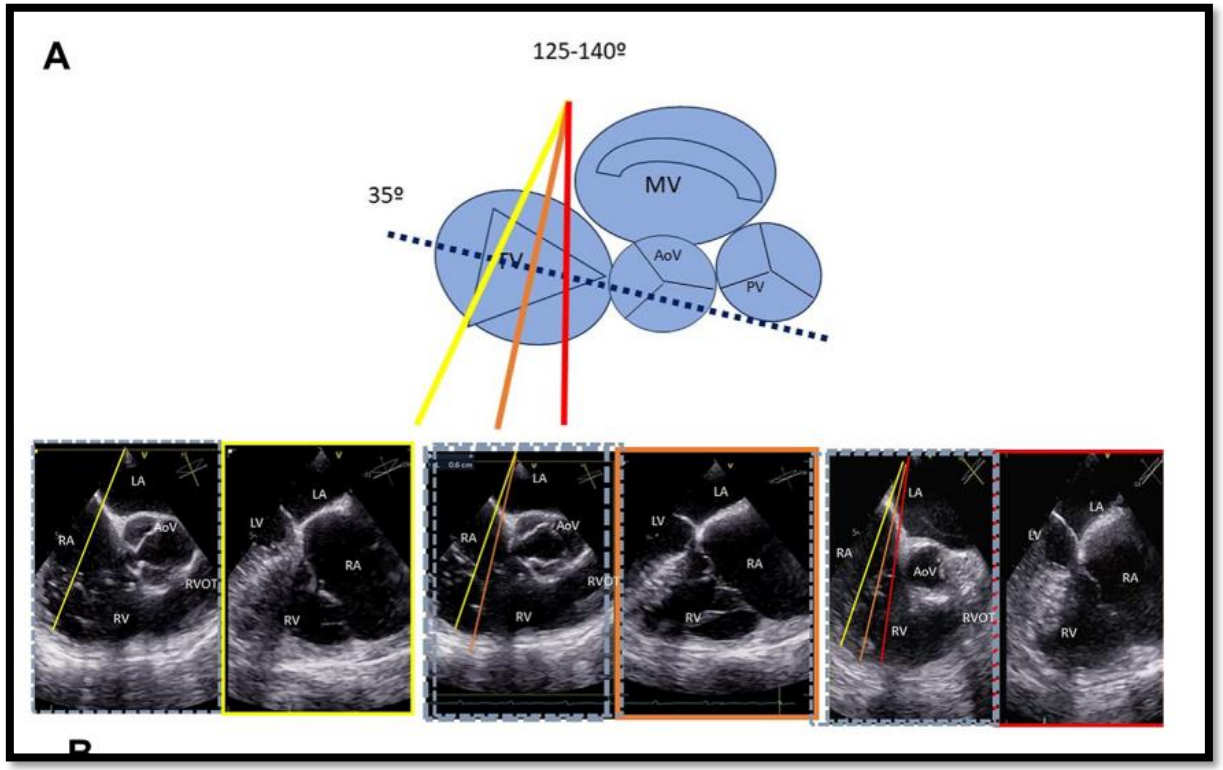
Besler C., JACC CV Interventions 2018;11(12)

Measuring TV Coaptation Gap

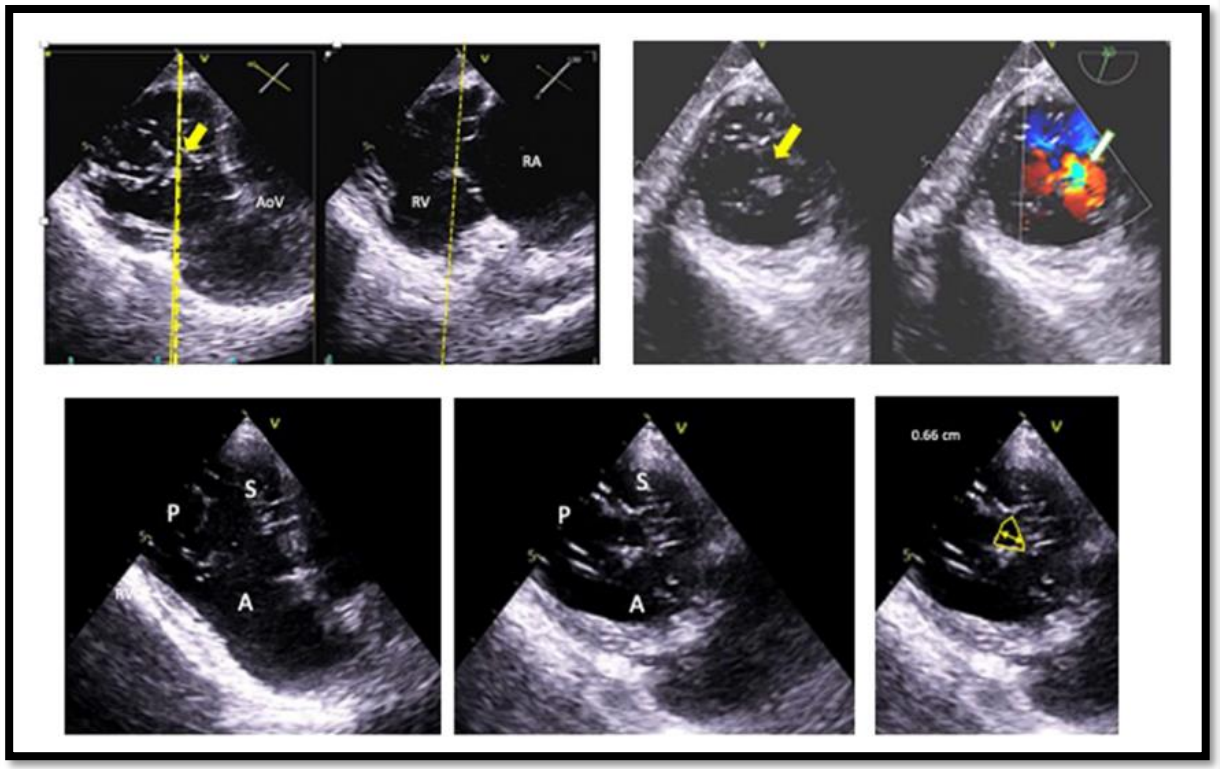
How and where to measure coaptation gap:

RV inflow/outflow



Complete scan of the TV from the anterior to posterior aspect

Transgastric SAX



Ensure measurements are taken at the tips of each leaflet and in a plane parallel to the annulus to ensure all leaflet tips are included

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Donal E. et al. JASE 2023

Measuring TV Coaptation Gap

How and where to measure coaptation gap:

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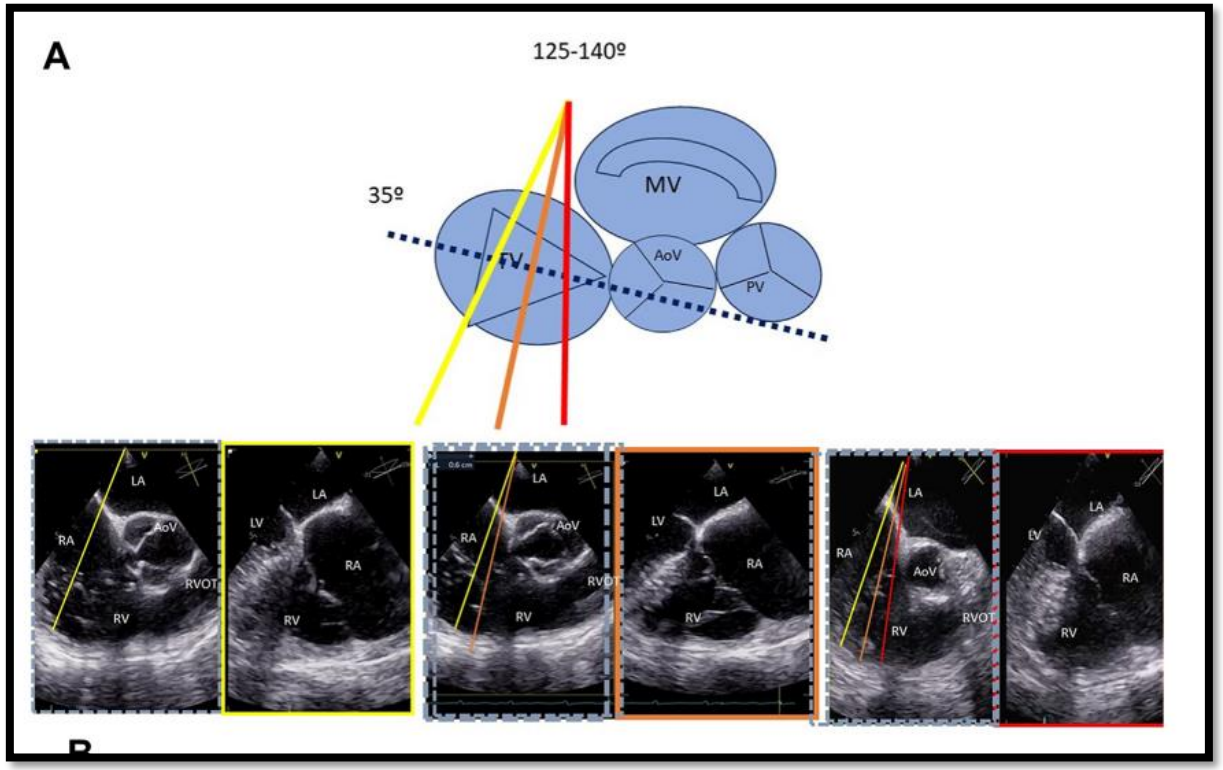

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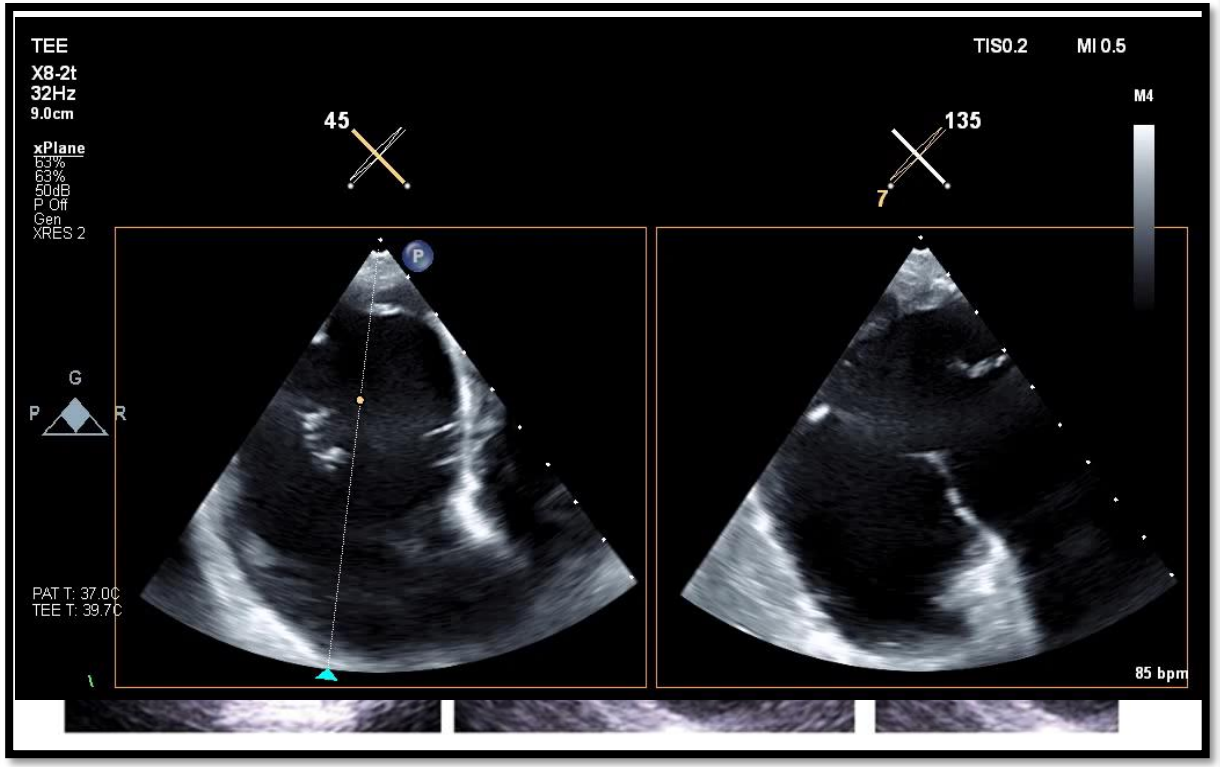

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Donal E. et al. JASE 2023

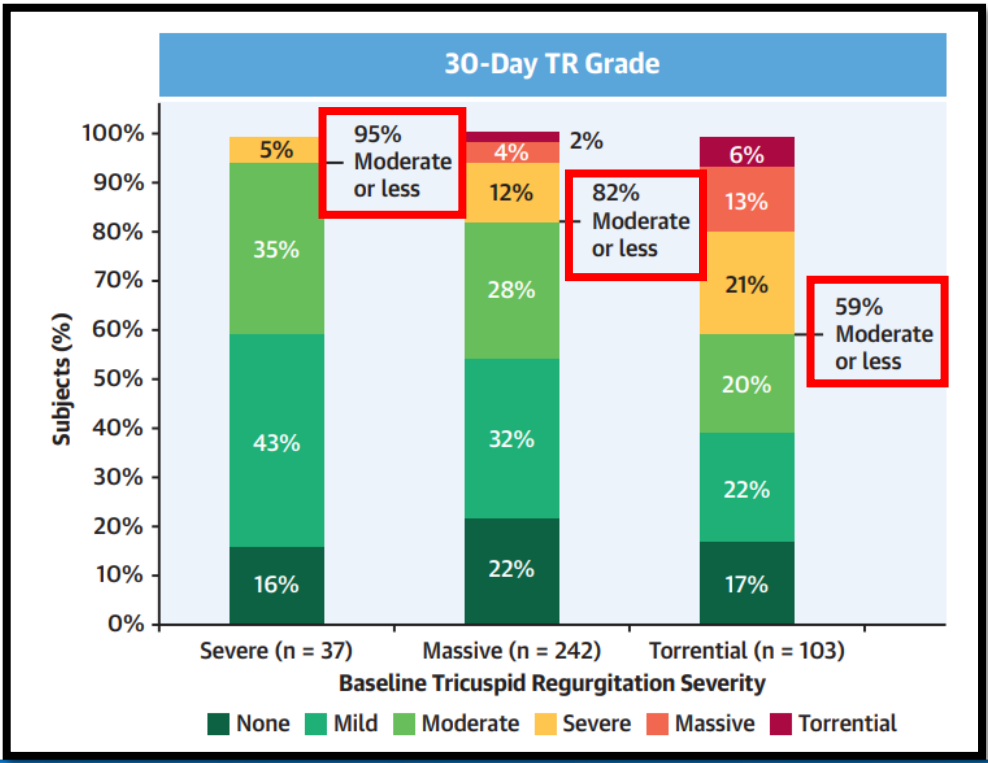
Predictors of Procedural Success

ORIGINAL INVESTIGATIONS

Short-Term Outcomes of Tricuspid Edge-to-Edge Repair in Clinical Practice

Philipp Lurz, MD, PHD,[a] Christian Besler, MD,[a] Thomas Schmitz, MD,[b] Raffi Bekeredjian, MD,[c] Georg Nickenig, MD,[d] Helge Möllmann, MD,[e] Ralph Stephan von Bardeleben, MD,[f] Alexander Schmeisser, MD,[g] Iskandar Atmowihardjo, MD,[h] Rodrigo Estevez-Loureiro, PHD, MD,[i] Edith Lubos, MD,[j] Megan Heitkemper, PHD,[k] Dina Huang, PHD,[k] Harald Lapp, MD,[l] Erwan Donal, MD,[m] on behalf of the bRIGHT PAS Principal Investigators

bRIGHT – TriClip post-approval study (N= 511)



Lurz P, JACC 2023; 82(4)

Predictors of Procedural Success

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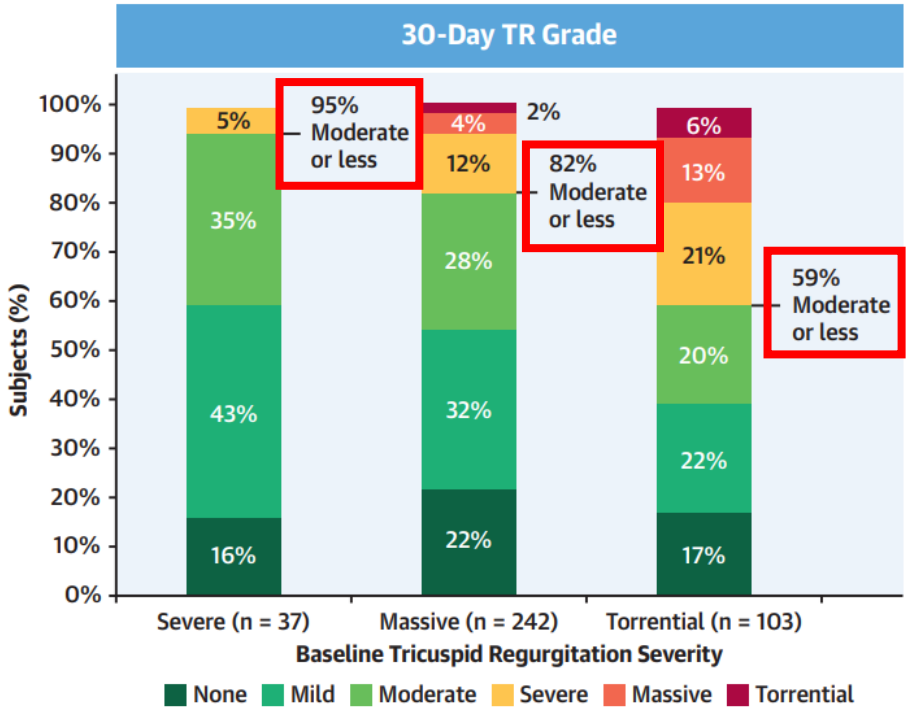
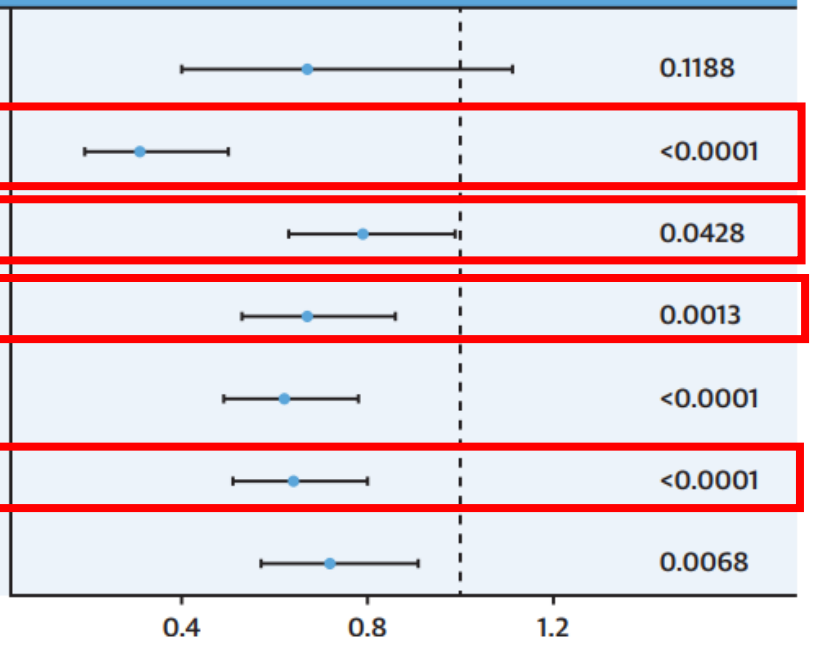


Predictors of Achieving Moderate or Less TR at Discharge (Univariate)

Variable	OR (95% CI)	OR (95% CI)	*P* Value
Presence of Pacemaker Lead	0.67 (0.40-1.11)		0.1188
Tricuspid Regurgitation*	0.31 (0.19-0.50)		<0.0001
Gap Size (cm)	0.79 (0.63-0.99)		0.0428
Tethering Distance (cm)	0.67 (0.53-0.86)		0.0013
Right Ventricular End-Diastolic Dimension (cm)	0.62 (0.49-0.78)		<0.0001
Right Atrial Volume (mL)	0.64 (0.51-0.80)		<0.0001
Tricuspid Annular Diameter (cm)	0.72 (0.57-0.91)		0.0068



Lurz P, JACC 2023; 82(4)

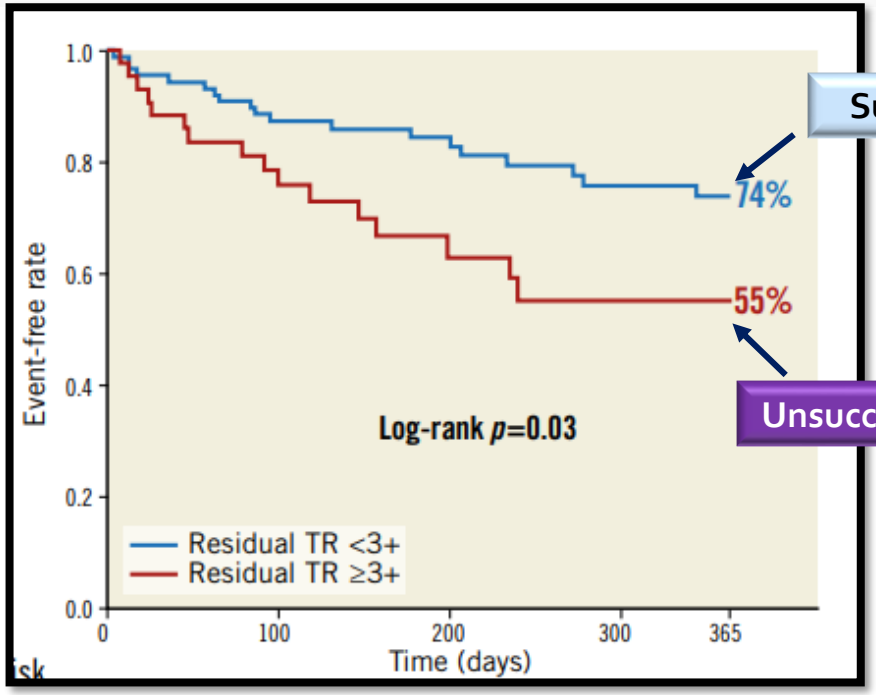
Predictors of Procedural Success

Leaflet-to-annulus index and residual tricuspid regurgitation following tricuspid transcatheter edge-to-edge repair

Tetsu Tanaka, MD; Atsushi Sugiura*, MD, PhD; Refik Kavsur, MD; Johanna Vogelhuber, MD; Can Öztürk, MD; Marc Ulrich Becher, MD; Sebastian Zimmer, MD; Georg Nickenig, MD; Marcel Weber, MD

Medzinische Klinik und Poliklinik II, Universitätsklinikum Bonn, Bonn, Germany

Consecutive T-TEER (n=140)
Procedural Success (TR≤2+):69%



Successful TEER

Unsuccessful TEER

Residual TR ≥3: independent predictor of mortality and HFH (HR=2.04, P=0.04)

Tanaka T., Eurointervention 2022, 3;18

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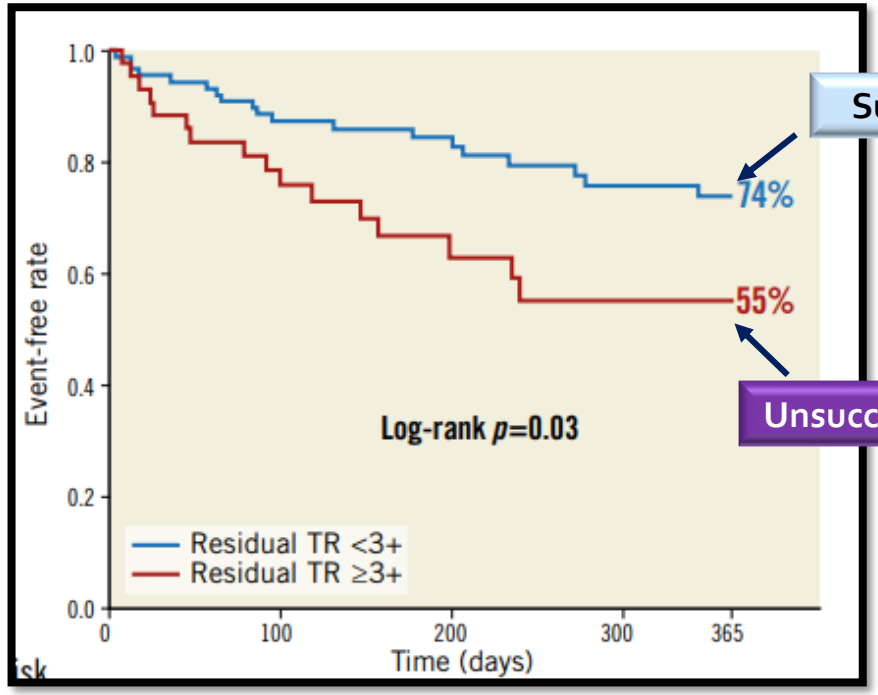
Leaflet-to-annulus index and residual tricuspid regurgitation following tricuspid transcatheter edge-to-edge

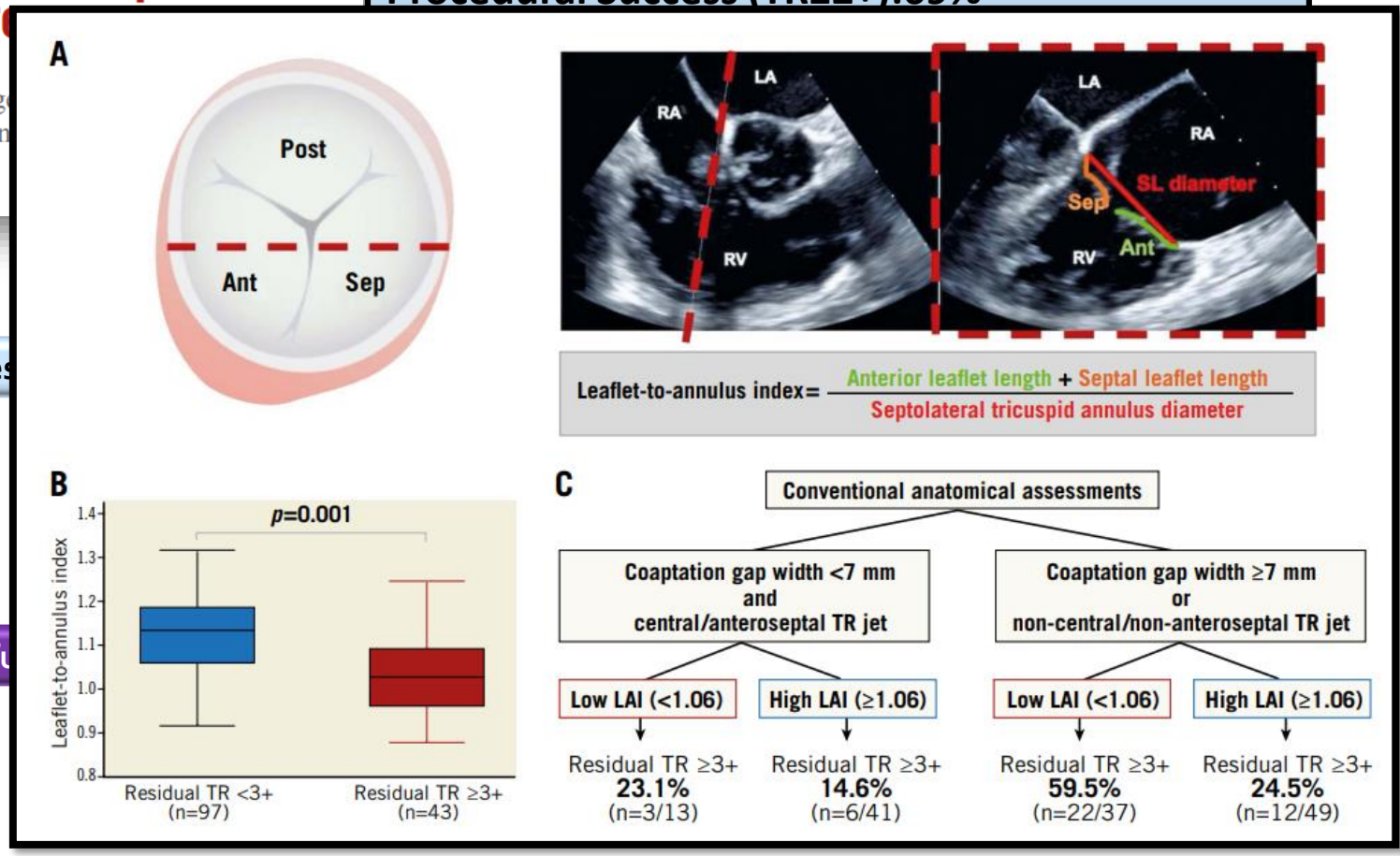
Tetsu Tanaka, MD; Atsushi Sugiura*, MD, PhD; Refik Kavsur, MD; Johanna Vog
Can Öztürk, MD; Marc Ulrich Becher, MD; Sebastian Zimmer, MD; Georg Nicken

Medizinische Klinik und Poliklinik II, Universitätsklinikum Bonn, Bonn, Germany

Consecutive T-TEER (n=140)
Procedural Success (TR≤2+):69%



Residual TR ≥3: independent predictor of mortality and HFH (HR=2.04, P=0.04)

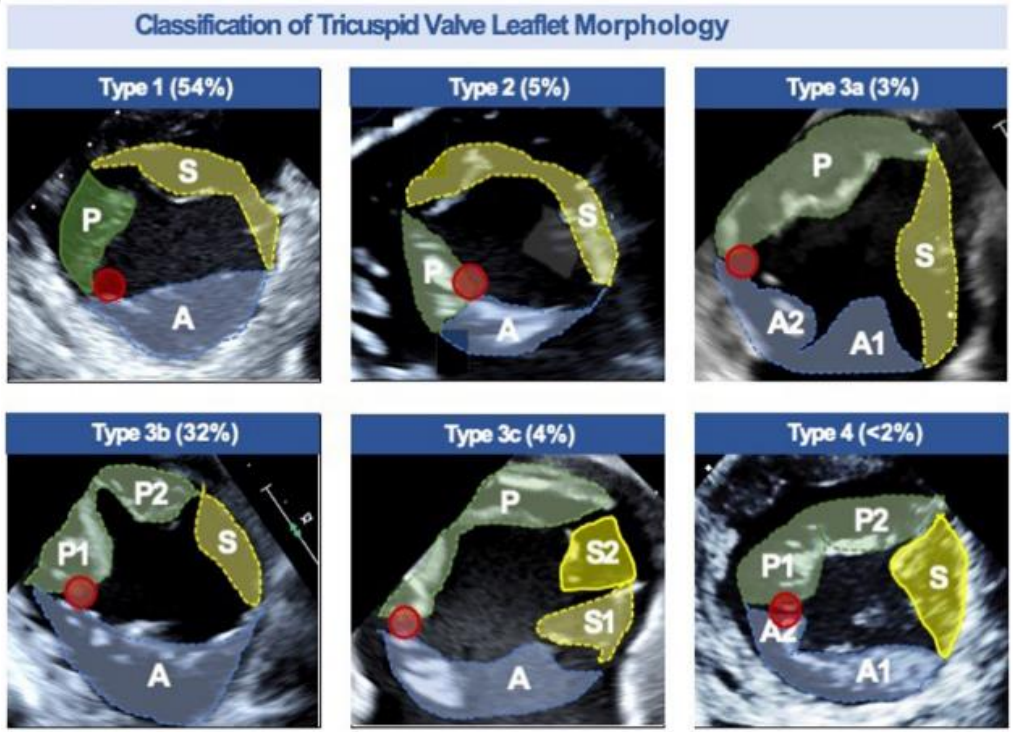


Lower Leaflet-to-annulus index was associated with residual TR ≥3+ after TEER (independent of the baseline TR grade and anatomical parameters)

Predictors of T-TEER Success

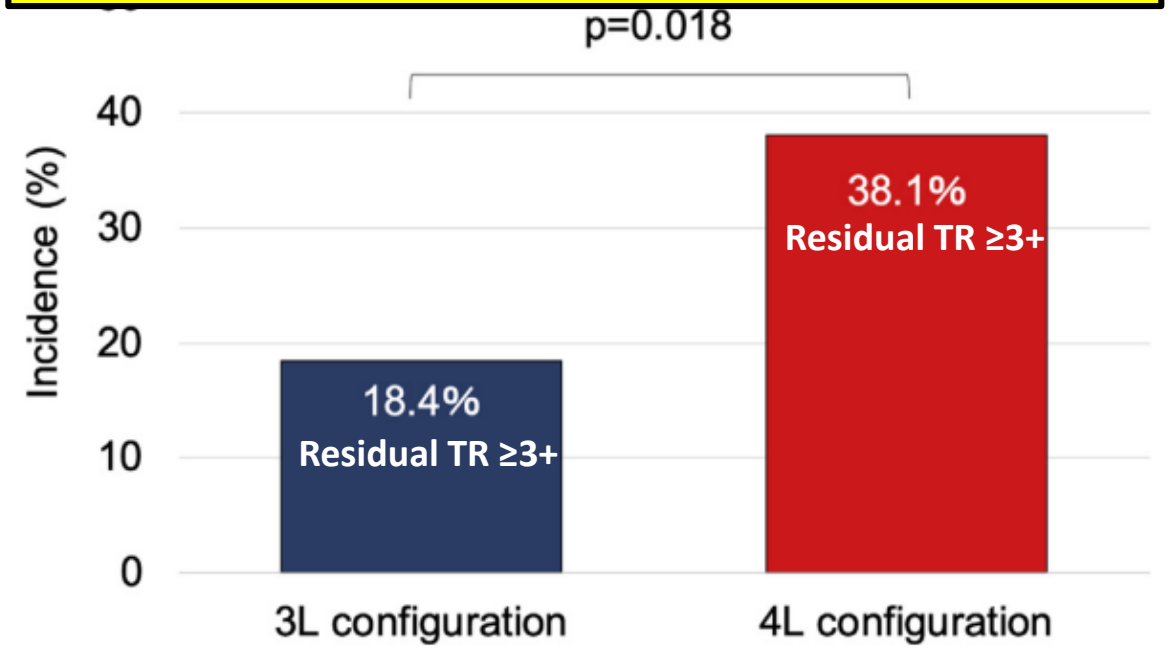
Leaflet Configuration and Residual Tricuspid Regurgitation After Transcatheter Edge-to-Edge Tricuspid Repair

Atsushi Sugiura, MD,* Tetsu Tanaka, MD,* Refik Kavsur, MD, Can Öztürk, MD, Johanna Vogelhuber, MD, Nihal Wilde, MD, Marc Ulrich Becher, MD, Sebastian Zimmer, MD, Georg Nickenig, MD, Marcel Weber, MD



39% with 4 leaflet configuration

4 Leaflet TV Configuration is associated with worse residual TR



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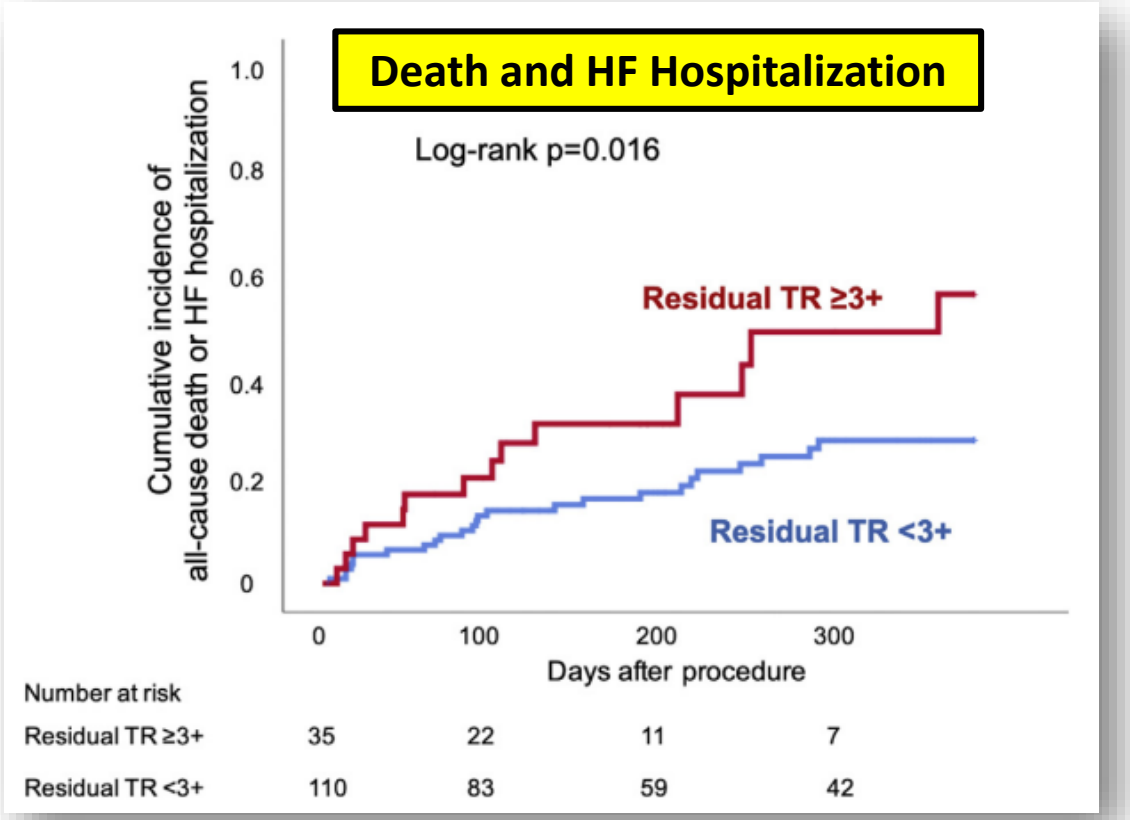
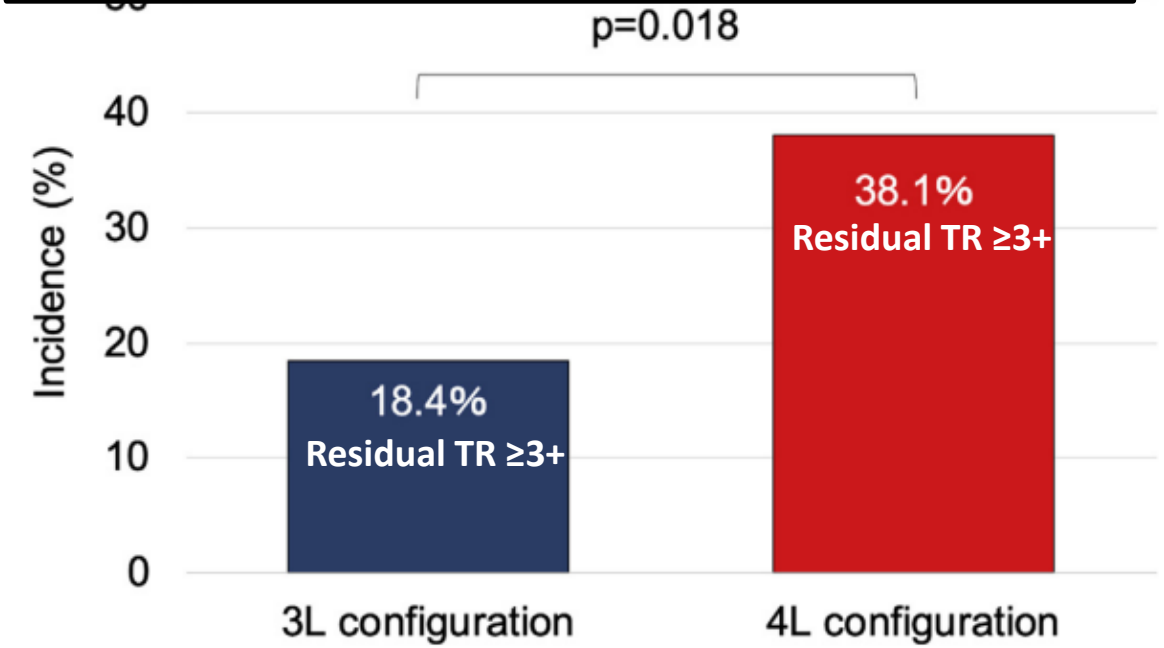
Death and HF Hospitalization



4 Leaflet TV Configuration is associated with worse residual TR



Suguira et al., JACC CV Interventions 2021;14(20)

Predictors of T-TEER Success

Table 2 Key considerations indicating low feasibility for TEER

	Favorable	Feasible	Unfavorable
Morphology	Trileaflet valve	Nontrileaflet valve	Nontrileaflet valve with dense chordae
Coaptation gap	<7 mm	>7 to 8.5 mm	≥8.5 mm
Leaflets	Normal leaflet length (≥7 mm) and mobility without flail or tethering	Primary TR with small flail gap (<10 mm), secondary TR with tethering height <9 mm	Primary TR with large flail gap (≥10 mm), short or thickened leaflets (length <7 mm), leaflet perforation, secondary TR with tethering height ≥9 mm or tenting area >2.1 cm^2
Jet location	Central TR within anteroseptal commissure	Central TR within nonanteroseptal commissure	Massive/torrential TR with either highly eccentric or multicommissural jets
CIED Leads	No leads	Lead without interaction	Lead causing impingement
Imaging	Good TEE windows	Adequate TEE ± ICE	Inadequate windows
RV remodeling	Normal to mildly dilated and/or impaired	Moderately dilated and/or impaired	Severely dilated and/or impaired (CMR or 3D TEE RVEF <45%)
Pulmonary hemodynamics	Normal peak + mean PAP, TPG and TAPSE/PASP >.41	PASP ≤ 60-65 mm Hg, pulmonary resistance ≤ 4 WU, mean PAP ≤ 30 mm Hg, TPG ≤ 17 mm Hg	PASP > 60-65 mm Hg, pulmonary resistance >4 WU, mean PAP > 30 mm Hg, and TPG >17 mm Hg, TAPSE/PASP ≤ .41
End-organ manifestations	Normal liver and renal function	Liver function test derangement/ Child-Pugh A cirrhosis moderate CKD	Child Pugh B/C cirrhosis severe CKD/dialysis dependent

CKD, Chronic kidney disease; *PAP*, PA pressure; *TPG*, transpulmonary gradient; *WU*, Wood units.

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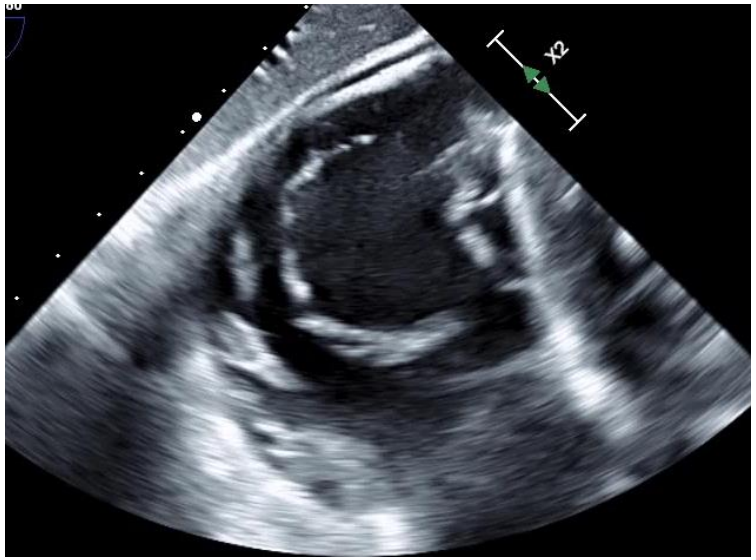
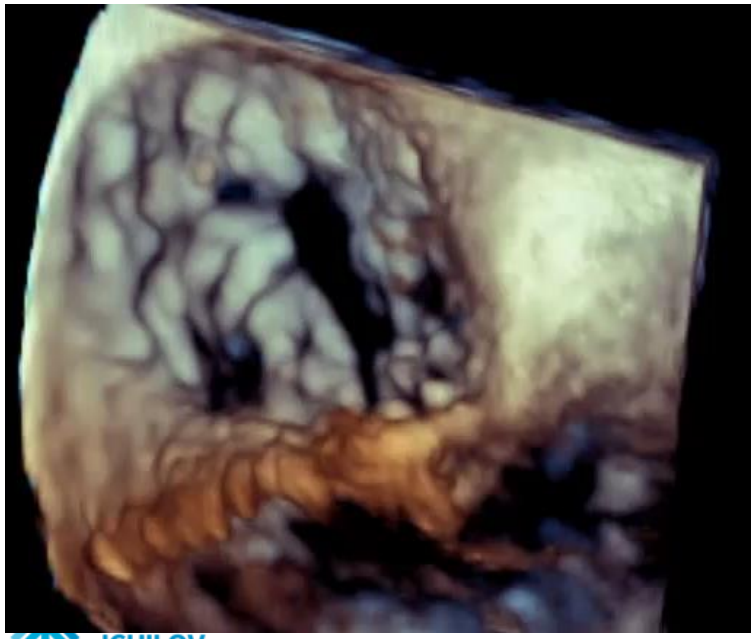
Hungerford SL., JASE 2023;36

Good Imaging is Imperative





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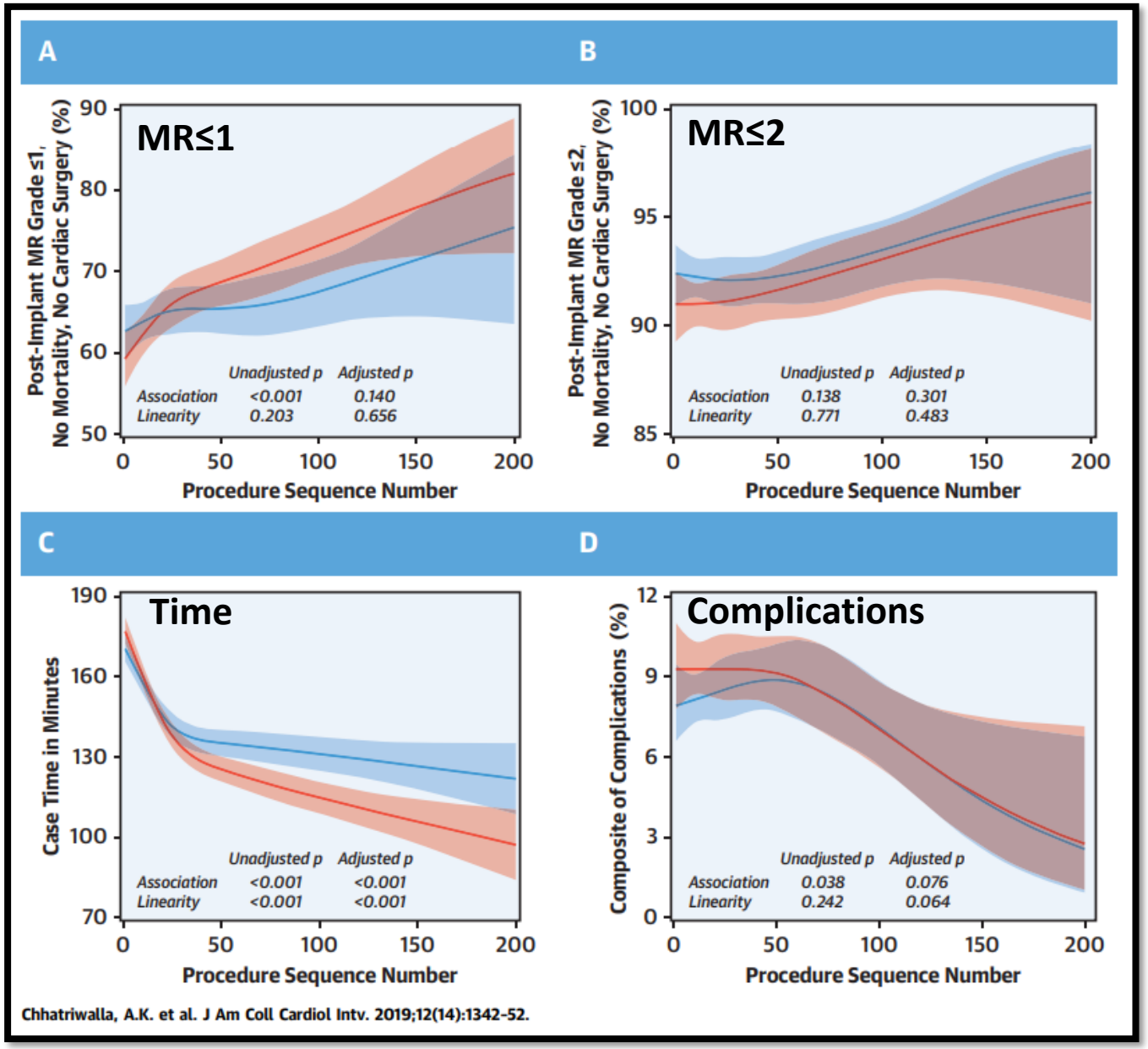
TEER Outcome and Operator Experience



Chhatriwalla, A.K. et al. J Am Coll Cardiol Intv. 2019;12(14):1342-52.

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Is Moderate Residual TR a Procedural Success?

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Moderate TR is Progressive

Tricuspid Regurgitation Progression A Natural History Cohort Study

Gary Ma MD, Ajit Raisinghani MD, Ehtisham Mahmud MD, Ori Ben-Yehuda MD

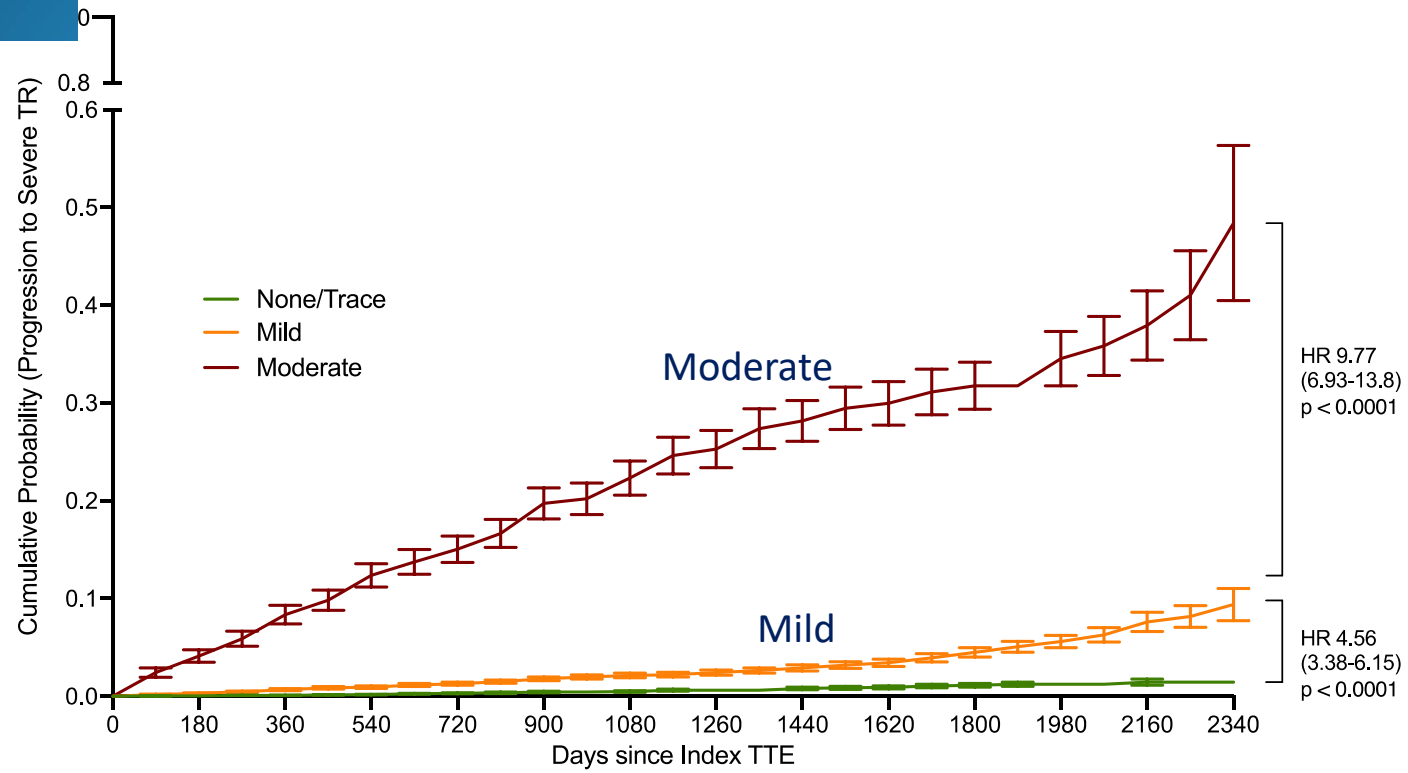
121,066 Transthoracic Echocardiograms (TTE) reviewed among 69,133 unique patients

underlying congenital heart disease

139 Patients excluded for pre-existing tricuspid valve intervention/replacement

48,830 Patients excluded due to

19,144 patients with serial TTEs included for analysis



No. at Risk

None/Trace TR	11090	9765	8183	6610	5559	4641	3792	3072	2422	1793	1306	831	428	94
Mild TR	6707	5842	4927	4103	3479	2927	2415	1936	1534	1167	835	540	283	75
Moderate TR	1030	865	689	568	465	380	302	233	187	140	106	74	31	8

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Unpublished data (Courtesy of Ori Ben-Yehuda)

Moderate TR is Progressive

Table 2 **Multivariate Cox Regression of Risk Factors for Progression to Severe TR**

	None/Trace		Mild		Moderate	
	Adjusted HR	**P-value**	**Adjusted HR**	**P-value**	**Adjusted HR**	**P-value**
Male	0.72 (0.35-1.46)	0.356	**0.63 (0.42-0.96)**	**0.03**	0.86 (0.56-1.31)	0.478
Age	**0.97 (0.94-0.99)**	**0.002**	1.0 (0.98-1.01)	0.702	1.01 (0.1.0-1.02)	0.2
Body Mass Index	**0.94 (0.90-0.99)**	**0.022**	1.00 (0.98-1.03)	0.793	1.01 (0.99-1.03)	0.293
AF/AFL	**8.53 (3.42-21.29)**	**<.001**	**2.58 (1.56-4.24)**	**<.001**	1.06 (0.59-1.90)	0.852
LV Ejection Fraction <50%	1.38 (0.51-3.71)	0.527	**2.40 (1.52-3.79)**	**<.001**	1.3 (0.83-2.05)	0.256
RV Systolic Pressure >40mmHg	**3.44 (1.17-10.15)**	**0.025**	**3.09 (1.99-4.79)**	**<.001**	0.87 (0.53-1.43)	0.573
TAPSE <18mm	1.09 (0.49-2.44)	0.833	1.2 (0.75-1.92)	0.446	1.01 (0.62-1.62)	0.982
TAPSE/RVSP <0.31	1.46 (0.27-7.88)	0.663	0.81 (0.45-1.47)	0.487	1.29 (0.77-2.16)	0.328
Lateral E/e' ≥10	1.81 (0.85-3.83)	0.122	1.32 (0.87-1.99)	0.195	1.34 (0.88-2.03)	0.178
Severe Aortic Stenosis	3.20 (0.43-24.02)	0.259	1.88 (0.59-6.044)	0.284	0.396 (0.05-2.88)	0.36
Severe Aortic Regurgitation	N/A		0 (0-7.47)	0.972	N/A	
Severe Mitral Stenosis	N/A		0 (0-5.57)	0.968	0 (0-7.72)	0.963
Severe Mitral Regurgitation	N/A		1.33 (0.473-3.751)	0.587	1.08 (0.46-2.53)	0.868

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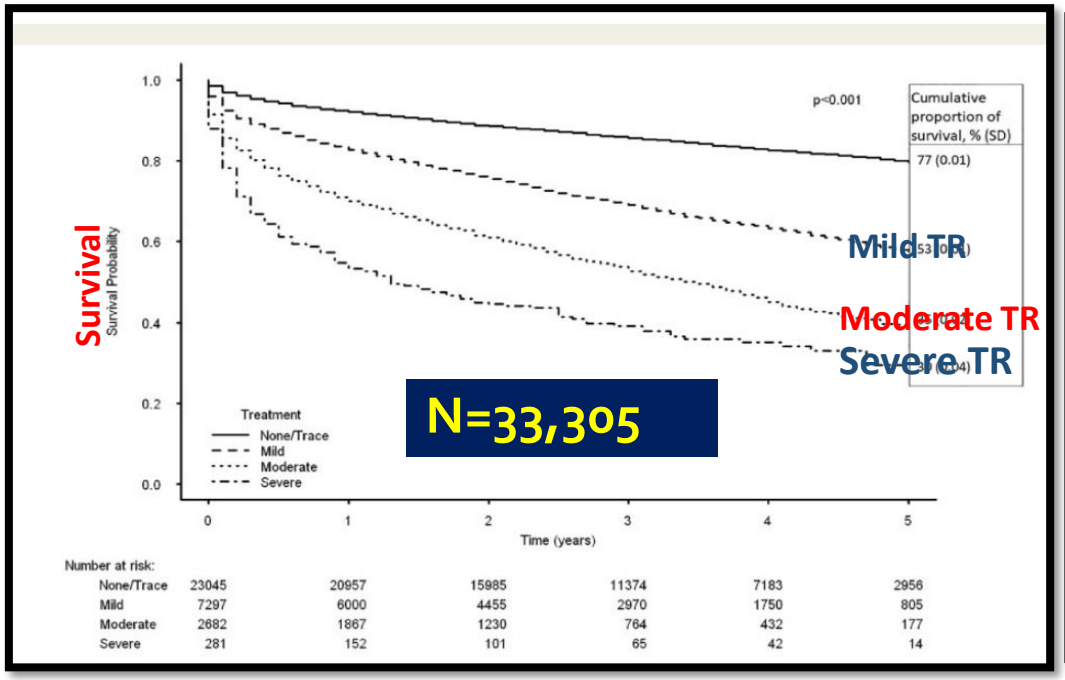
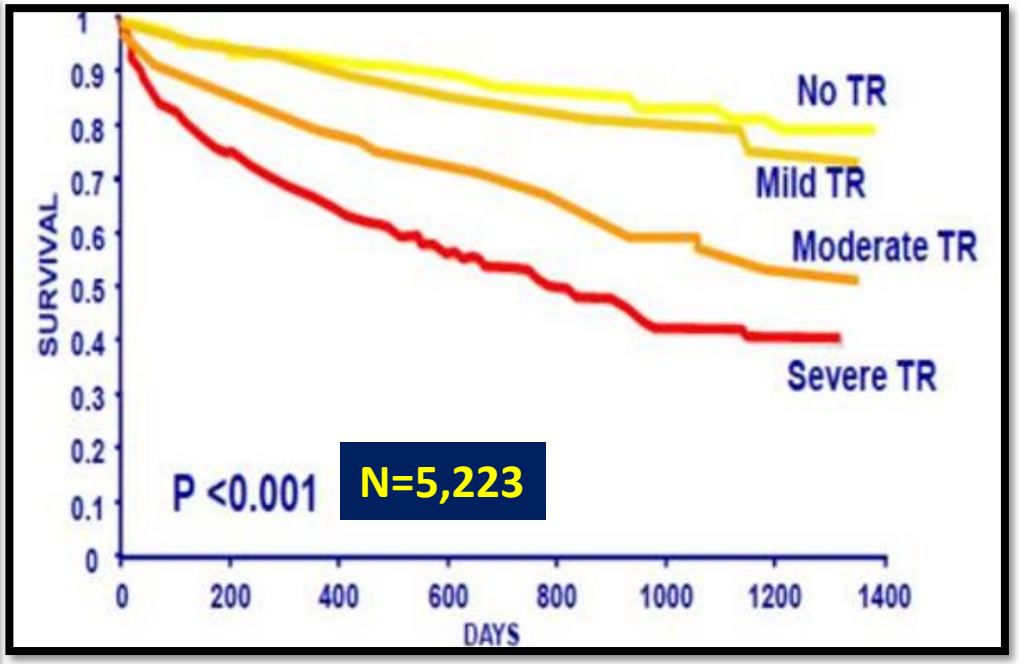
Moderate TR has a "life of its own"

Unpublished data (Courtesy of Ori Ben-Yehuda)

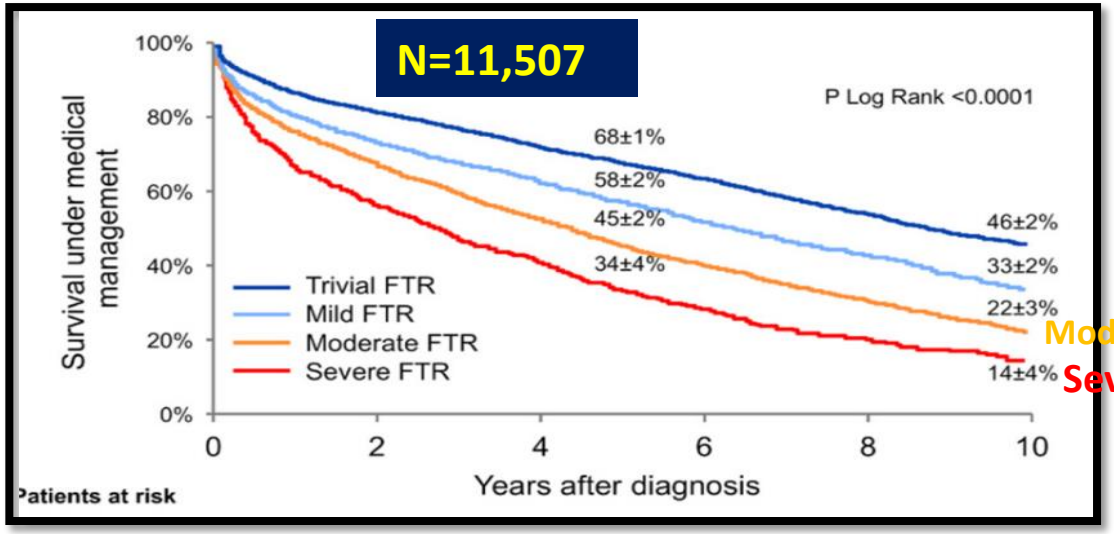
Moderate TR



Chorin E. EHJ CVI 2020



Nath J, JACC 2004



Moderate TR

Severe TR

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Tricuspid VARC Definitions

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 82, NO. 17, 2023

THE PRESENT AND FUTURE

JACC STATE-OF-THE-ART REVIEW

Tricuspid Valve Academic Research Consortium Definitions for Tricuspid Regurgitation and Trial Endpoints

Rebecca T. Hahn, MD,[a,b] Matthew K. Lawlor, MD, MS,[a] Charles J. Davidson
Anna Sannino, MD, PhD,[e,f] Ernest Spitzer, MD,[g,h] Philipp Lurz, MD, PhD,[i] B
Yan Topilsky, MD,[k] Suzanne J. Baron, MD, MSc,[l,m] Scott Chadderdon, MD,
Gilbert H.L. Tang, MD, MSc, MBA,[p] Maurizio Taramasso, MD, PhD,[q,r] Paul A
Luigi Badano, MD, PhD,[t,u] Jonathon Leipsic, MD,[v] JoAnn Lindenfeld, MD,[w]
Sreekanth Vemulapalli, MD,[y,z] Bjorn Redfors, MD, PhD,[b,aa] Maria C. Alu, MS
Josep Rodés-Cabau, MD, PhD,[bb] Gorav Ailawadi, MD, MBA,[cc] Michael Mack
Martin B. Leon, MD,[a,b] Jörg Hausleiter, MD,[ff,gg] on behalf of the TVARC Ste

ABSTRACT

Interest in the pathophysiology, etiology, management, and outcomes of patien
grown in the wake of multiple natural history studies showing progressively wo
TR severity, even after adjusting for multiple comorbidities. Historically, isolate
associated with high in-hospital mortality rates, leading to the development of t
of this first Tricuspid Valve Academic Research Consortium document is to standardize definitions of disease etiology and
severity, as well as endpoints for trials that aim to address the gaps in our kn
management of patients with TR. Standardizing endpoints for trials should pro
ingful comparisons between clinical trials. A second Tricuspid Valve Academic
focus on further defining trial endpoints and will discuss trial design options. (
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Thoracic Surgeons and by Oxford University Press on behalf of the European S
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I. Intraprocedural success

All of the following must be present:

1. Absence of intraprocedural mortality or stroke; and
2. Successful access, delivery, and retrieval of the device delivery system; and
3. Successful deployment and correct positioning of the intended device(s) without requiring implantation of unplanned additional devices; and
4. Adequate performance of the transcatheter device. Performance of devices whose purpose is a reduction in TR, should include the absence of tricuspid stenosis (TVA ≥1.5 cm^2 or TVAi ≥0.9 cm^2/m^2 [≥0.75 if BMI >30 kg/m^2], DVI <2.2, mean gradient <5 mm Hg); reduction of total tricuspid regurgitation to optimal (≤ mild [1+]) or acceptable (≤ moderate [2+]).
5. Absence of device-related obstruction of forward flow
6. Absence of device-related pulmonary embolism
7. Freedom from emergency surgery or reintervention during the first 24 h related to the device or access procedure.

quantitative measures of severity.[94] Nonetheless, moderate or more (≥2+) residual TR following device therapy is associated with adverse outcomes.[39,95]

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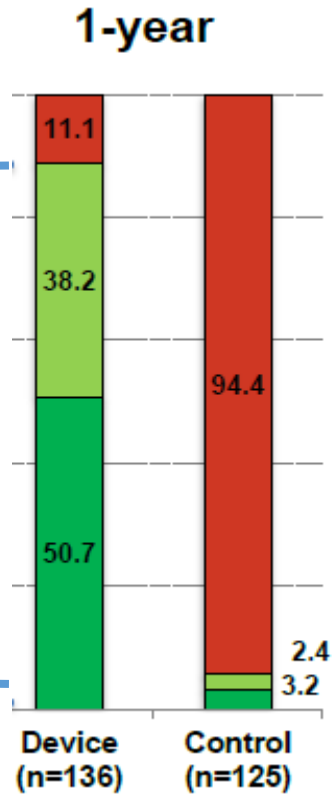
Hahn R. et al. JACC, Oct 2023

What is Procedural Success in T-TEER?

89.5% Moderate or less TR



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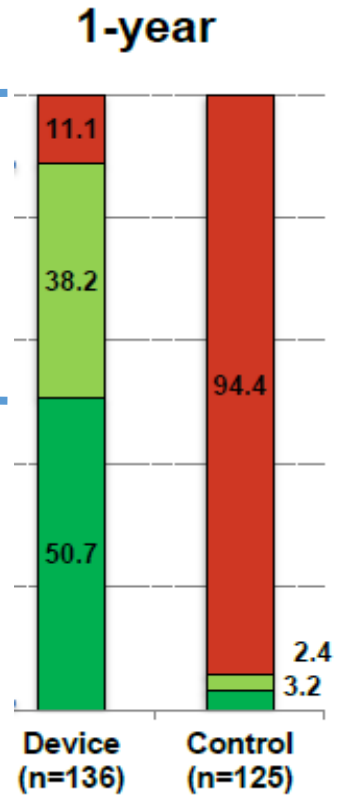
What is Procedural Success in T-TEER?

49.3% Moderate or more TR



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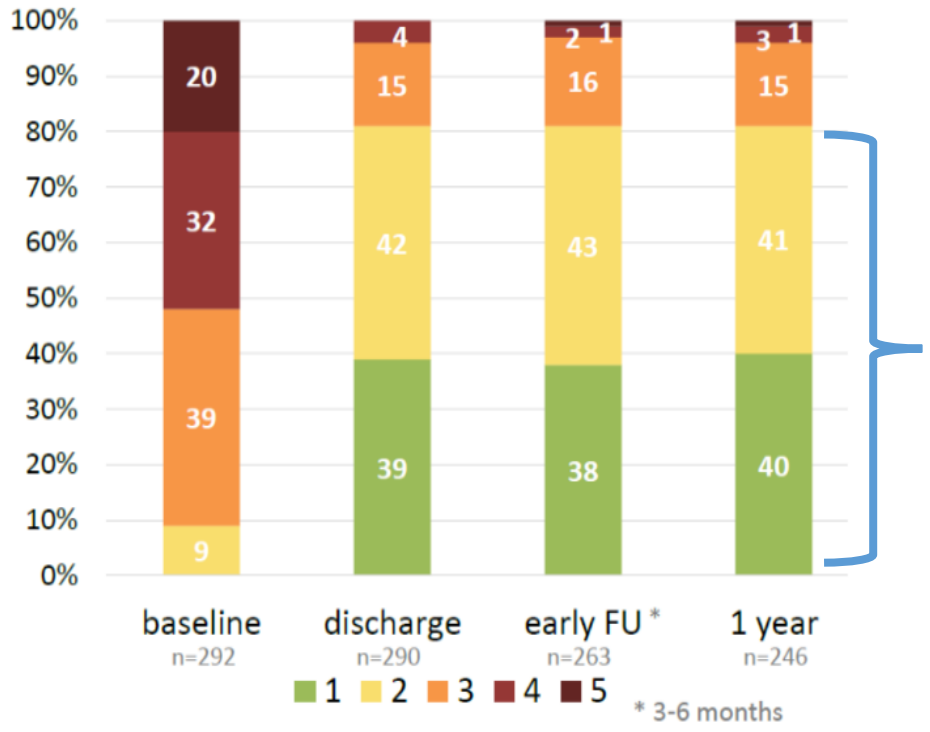
PASTE: PASCAL for Tricuspid Regurgitation, a European registry

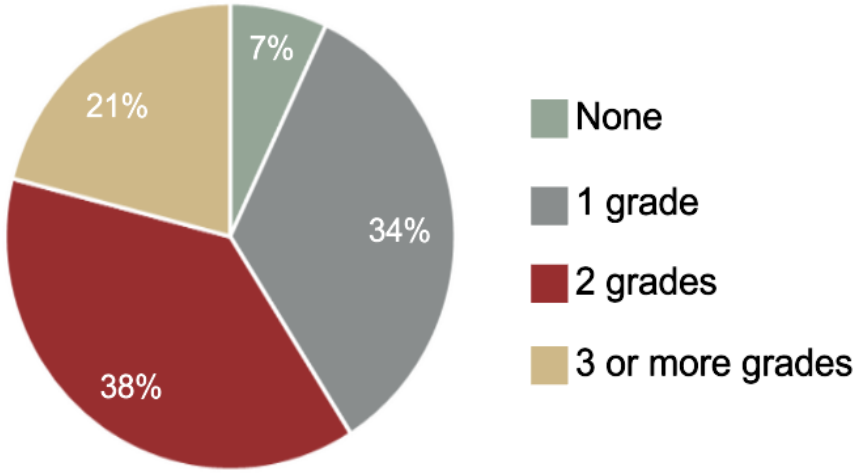
Reduction of TR at 1-year

TR severity grade



81% TR Moderate or less

TR reduction



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Wild MG. et al. JACC CVI; 2022;15

PASTE: PASCAL for Tricuspid Regurgitation, a European registry

Reduction of TR at 1-year

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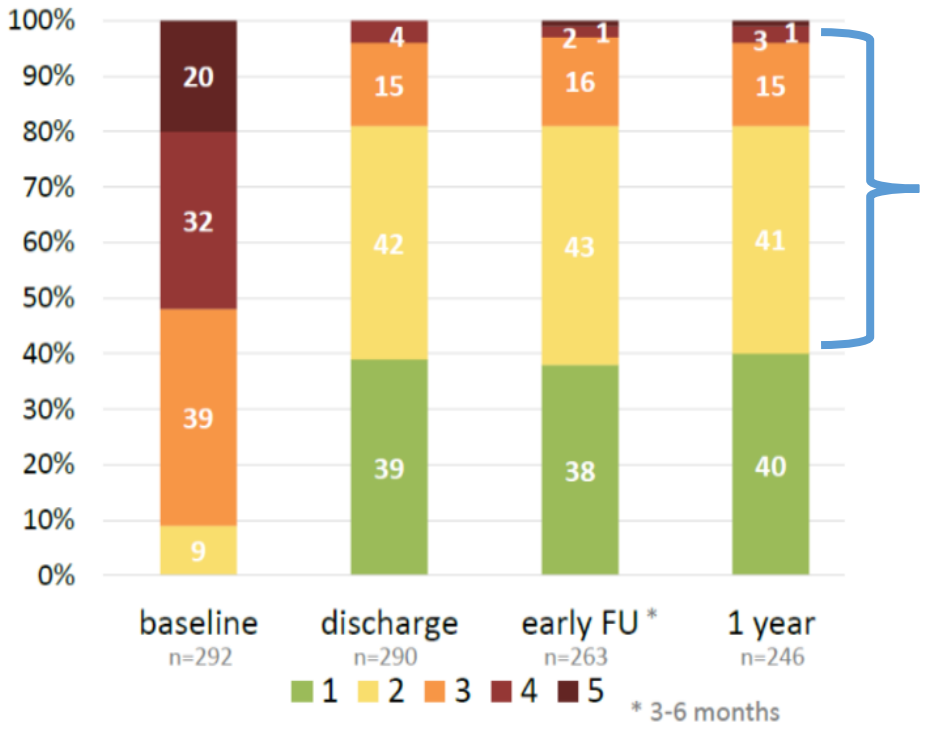
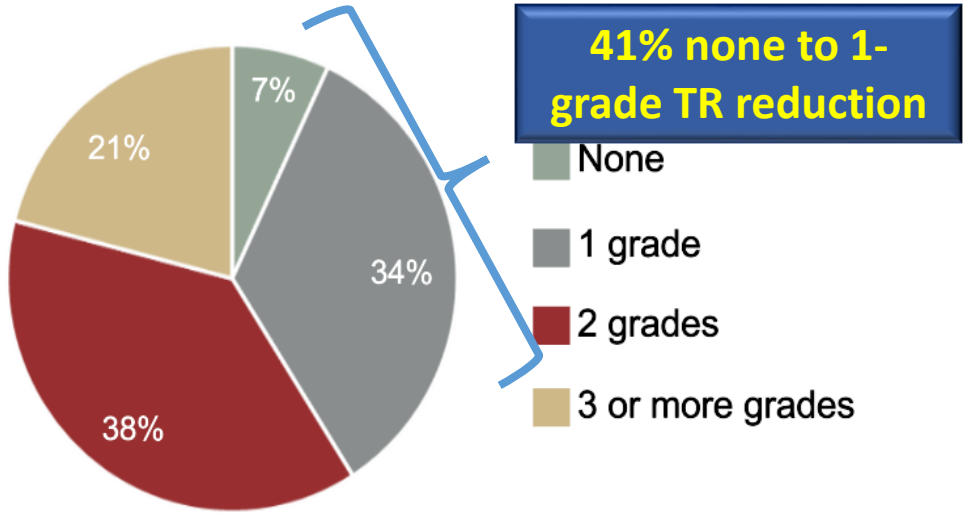


60% Moderate or more TR

TR reduction



41% none to 1-grade TR reduction

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Wild MG. et al. JACC CVI; 2022;15

T-TEER and Residual TR

Study	Moderate or more residual TR at 1-year
TRILUMINATE Pivotal	49.3%
bRIGHT	49%*
PASTE	60%
TRICLASP	41%

* 30-day F/U

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Methods: The prospective, single-arm, multicentre TRISCEND study enrolled 176 patients to evaluate the safety and performance of transcatheter TV replacement in patients with ≥moderate, symptomatic TR despite medical therapy. Major adverse events, reduction in TR grade and

T-TEER and Residual TR

Study	Moderate or more residual TR at 1-year
TRILUMINATE Pivotal	49.3%
bRIGHT	49%*
PASTE	60%
TRICLASP	41%
TRISCEND Single arm	**2.4% (0.0% severe)**
TRISCEND II Pivotal	**4.9%****

* 30-day F/U

** First 150 patients @ 6-month F/U

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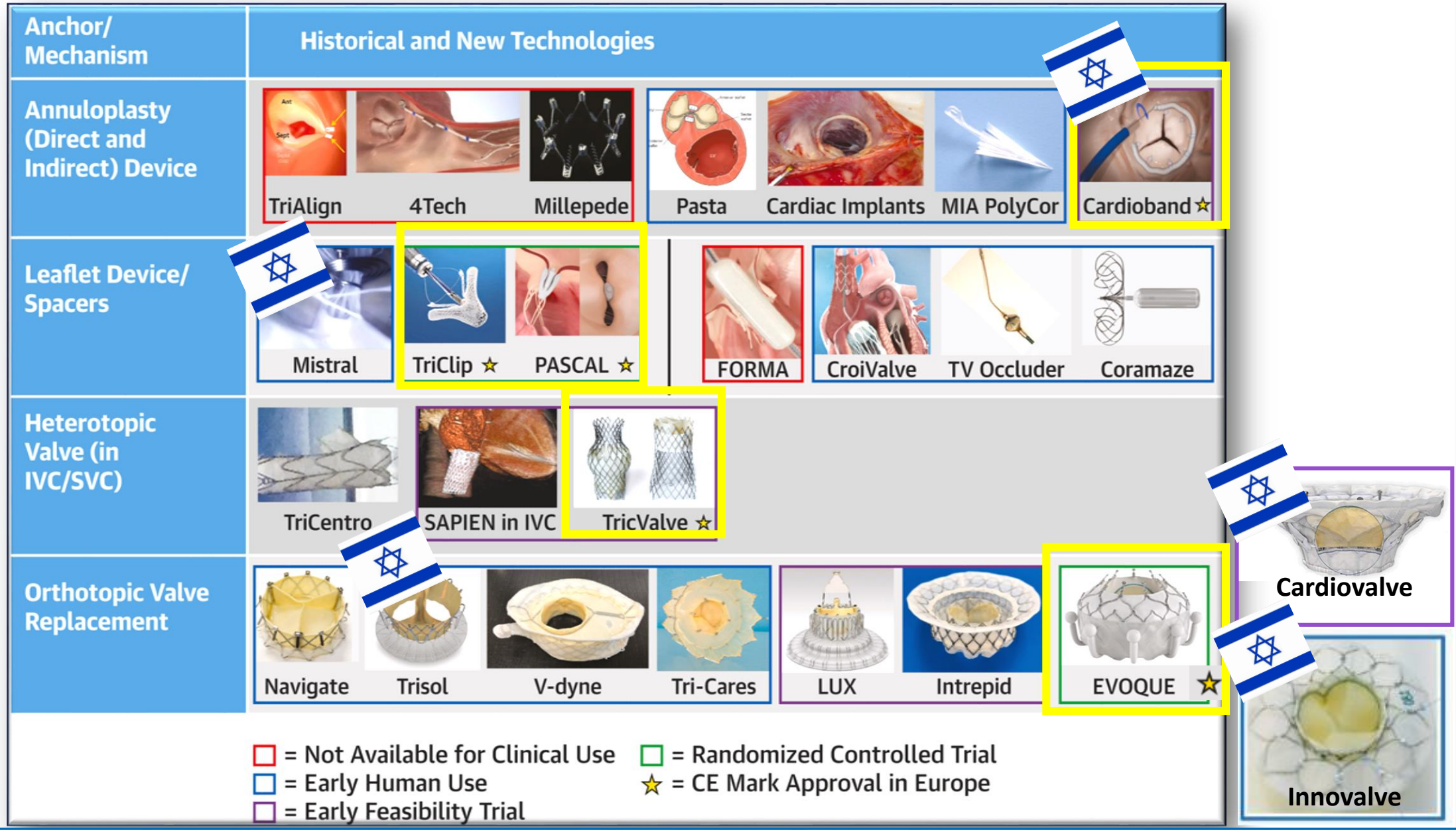
Transcatheter Tricuspid Valve Technologies



Hahn R. et al. JACC, Oct 2023

ESC European Society of Cardiology

European Heart Journal (2024) **45**, 876–894
https://doi.org/10.1093/eurheartj/ehae082

STATE OF THE ART REVIEW
Valvular heart disease

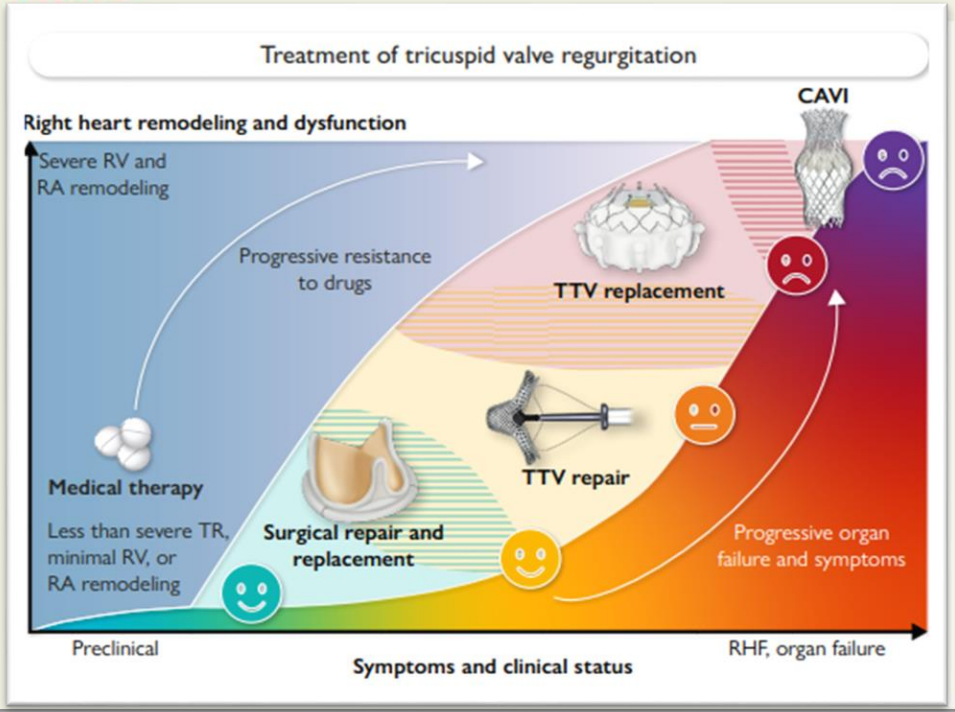
Transcatheter treatment of the tricuspid valve: current status and perspectives

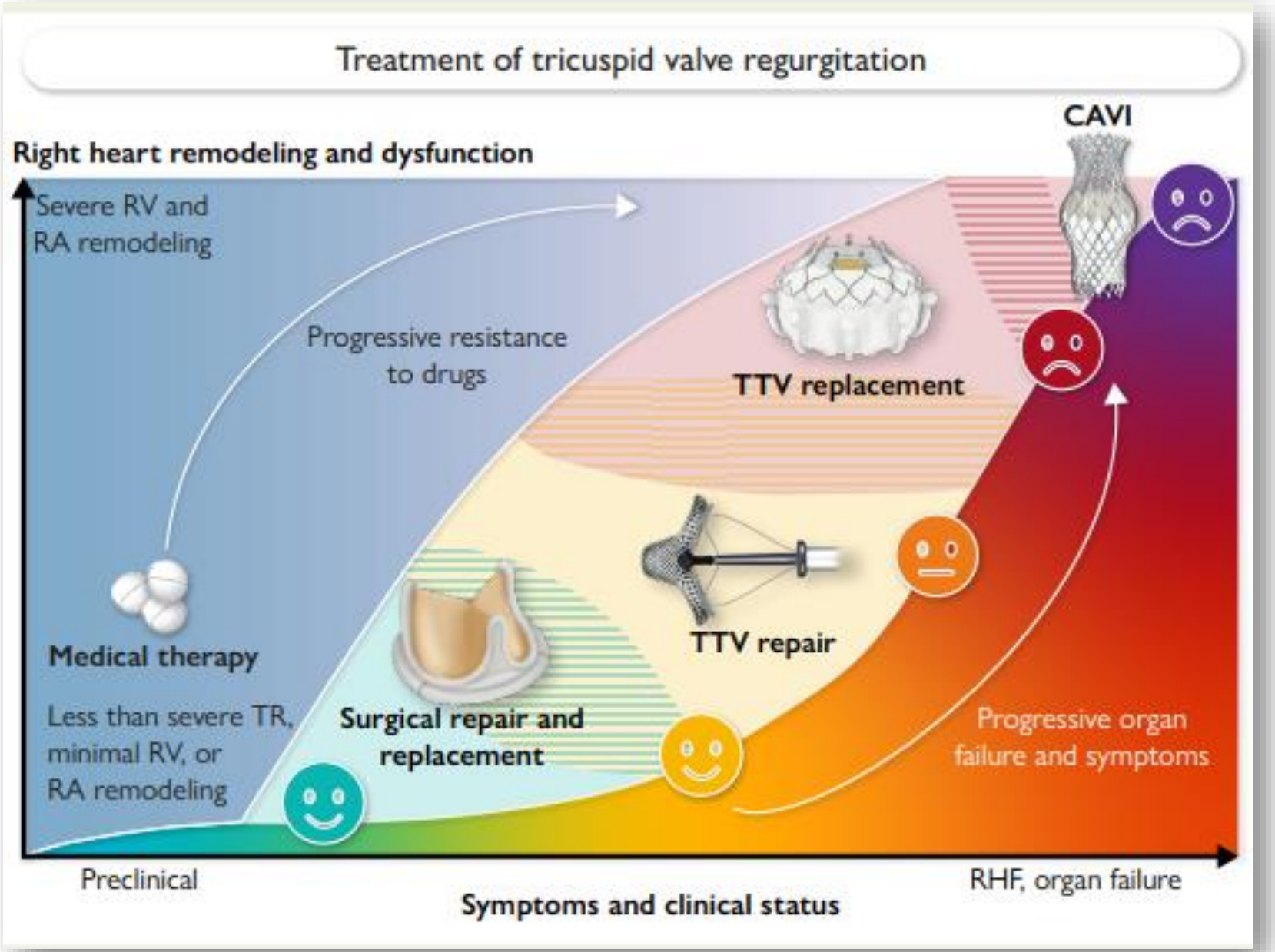
Francesco Maisano [1]*, Rebecca Hahn [2], Paul Sorajja[3], Fabien Praz [4], and Philipp Lurz[5]

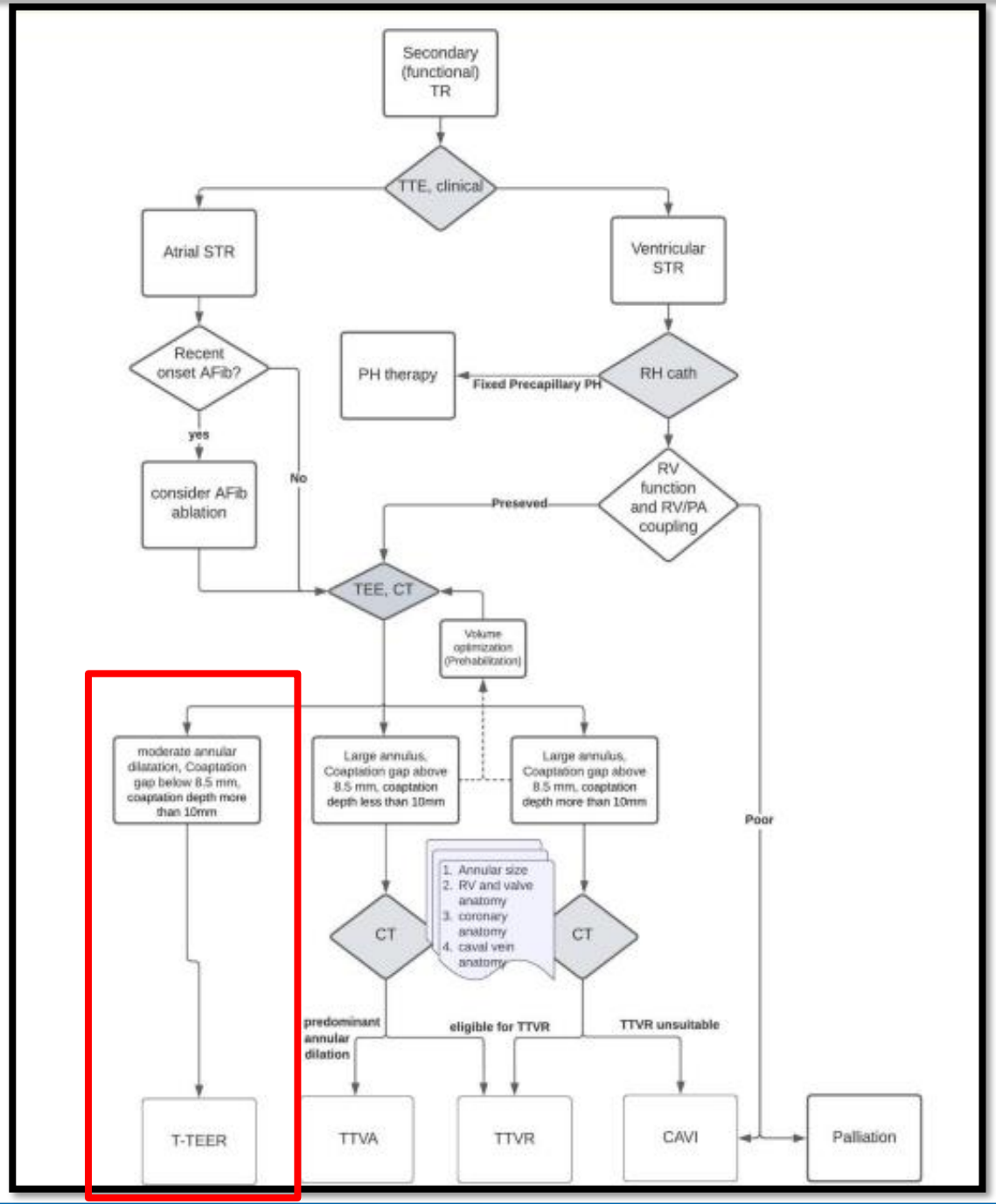
[1]Division of Cardiac Surgery and Valve Center, IRCCS Ospedale San Raffaele, Università Vita Salute, Via Olgettina 60, 20132 Milano, Italy; [2]Department of Medicine, Columbia University Irving Medical Center, New York, 161 Fort Washington Avenue, 10032 New York, NY, USA; [3]Minneapolis Heart Institute at Abbott Northwestern Hospital, 920 East 28th Street, Suite 100, 55407 Minneapolis, MN, USA; [4]Bern University Hospital, University of Bern, Anna-Seiler-Haus Freiburgstrasse 20, 3010 Bern, Switzerland; and [5]Department of Cardiology, Universitätsmedizin Johannes Gutenberg-University, Langenbeckstraße 1, 55131 Mainz, Germany

Received 2 August 2023; revised 13 January 2024; accepted 29 January 2024; online publish-ahead-of-print 1 March 2024

Graphical Abstract




Treatment of tricuspid valve regurgitation
CAVI
Right heart remodeling and dysfunction
Severe RV and
RA remodeling
Progressive resistance
to drugs
TTV replacement
TTV repair
Medical therapy
Less than severe TR,
minimal RV, or
RA remodeling
Surgical repair and
replacement
Progressive organ
failure and symptoms
Preclinical
RHF, organ failure
Symptoms and clinical status


Secondary (functional) TR
TTE, clinical
Atrial STR
Ventricular STR
Recent onset AFib?
PH therapy
Fixed Precapillary PH
RH cath
yes
No
consider AFib ablation
RV function and RV/PA coupling
Preseved
Poor
TEE, CT
Volume optimization (Prehabilitation)
moderate annular dilatation, Coaptation gap below 8.5 mm, coaptation depth more than 10mm
Large annulus, Coaptation gap above 8.5 mm, coaptation depth less than 10mm
Large annulus, Coaptation gap above 8.5 mm, coaptation depth more than 10mm
1. Annular size
2. RV and valve anatomy
3. coronary anatomy
4. caval vein anatomy
CT
CT
predominant annular dilation
eligible for TTVR
TTVR unsuitable
T-TEER
TTVA
TTVR
CAVI
Palliation

Summary

- Decision to proceed with T-TEER, wait for replacement technologies or continue with medical therapy is challenging.

- For most patients, **T-TEER is the first and last Tricuspid Intervention.**

- T-TEER should be pursued early in low and intermediate risk patients with **high likelihood of procedural success – preferably mild or less TR, as moderate TR has prognostic implications.**

- Assessing **feasibility for T-TEER** is important:
  - **Good Imaging is imperative.**
  - **Anatomy**: Coaptation gap, # of leaflets, leaflet tethering, TR severity, pacemaker.
  - **Experienced institutions, operators and imagers.**

- **We need more studies** on patient & device selection, and effects of T-TEER on outcomes (awaiting CLASP-TR, TRI-FR, TRISCEND II).

Thank You

nirf@tlvmc.gov.il