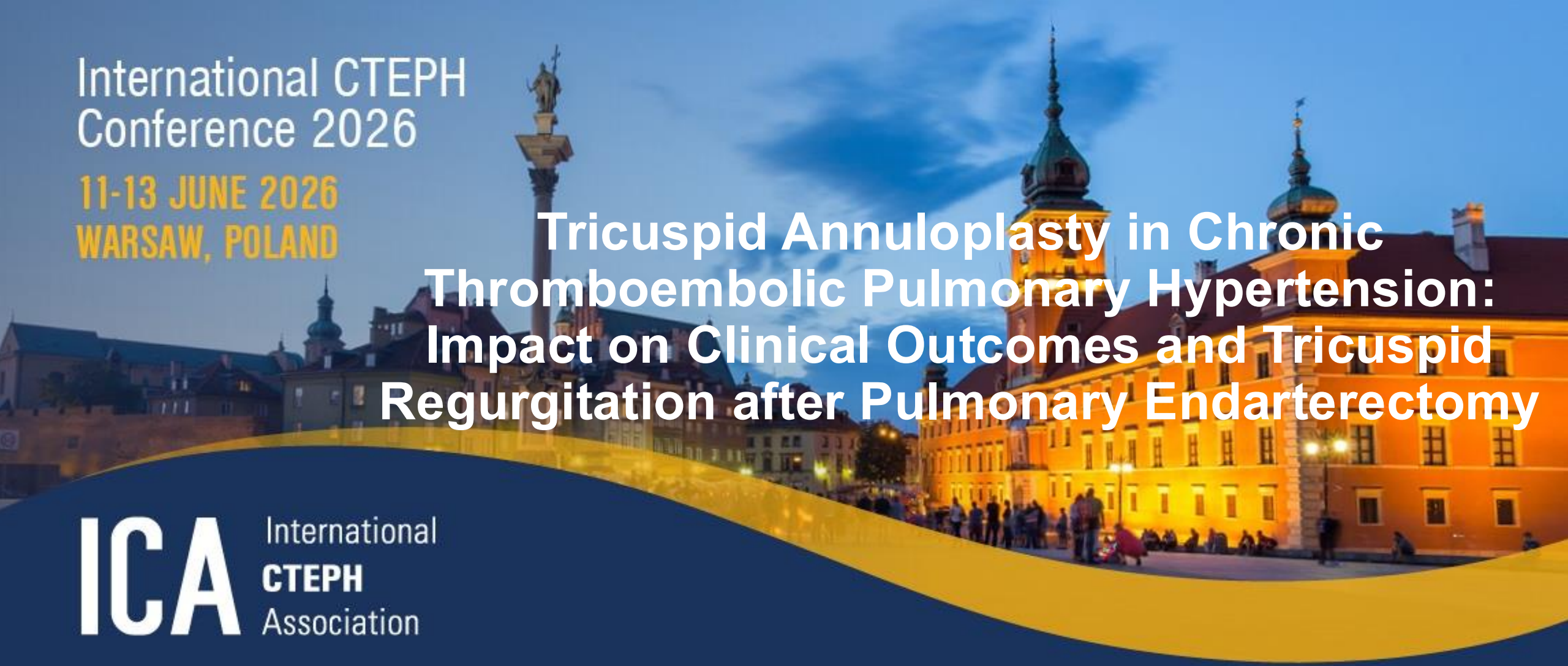


Tricuspid Annuloplasty in Chronic Thromboembolic Pulmonary Hypertension: Impact on Clinical Outcomes and Tricuspid Regurgitation after Pulmonary Endarterectomy

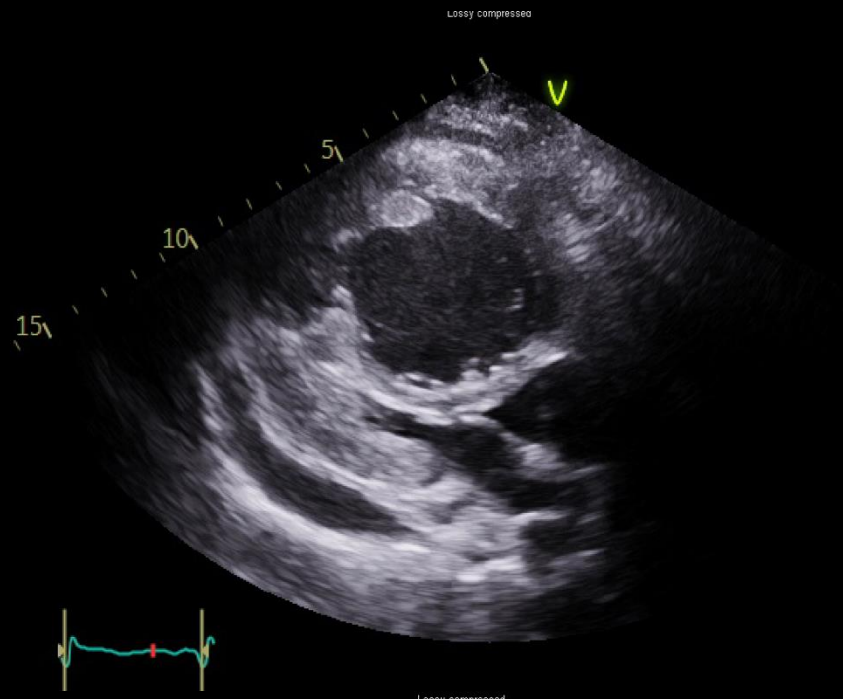
ICA International CTEPH Association

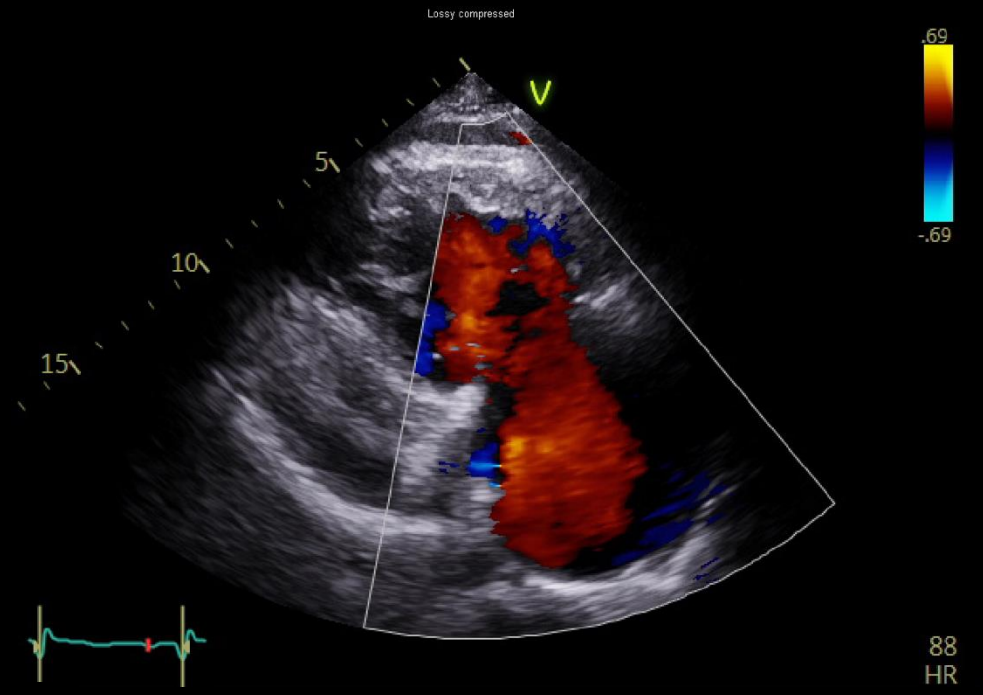
ICC 2026

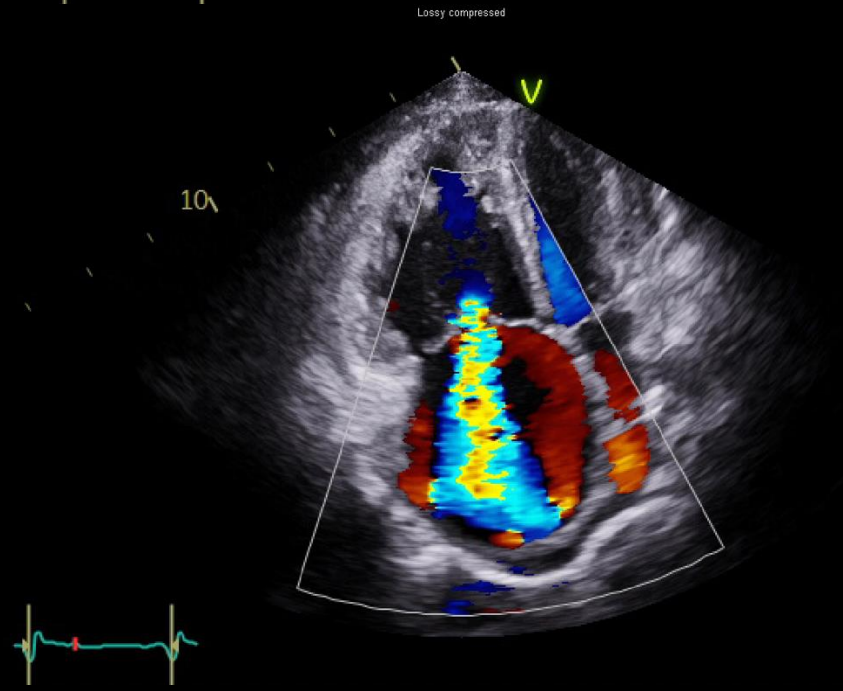
Tricuspid Annuloplasty in Chronic Thromboembolic Pulmonary Hypertension

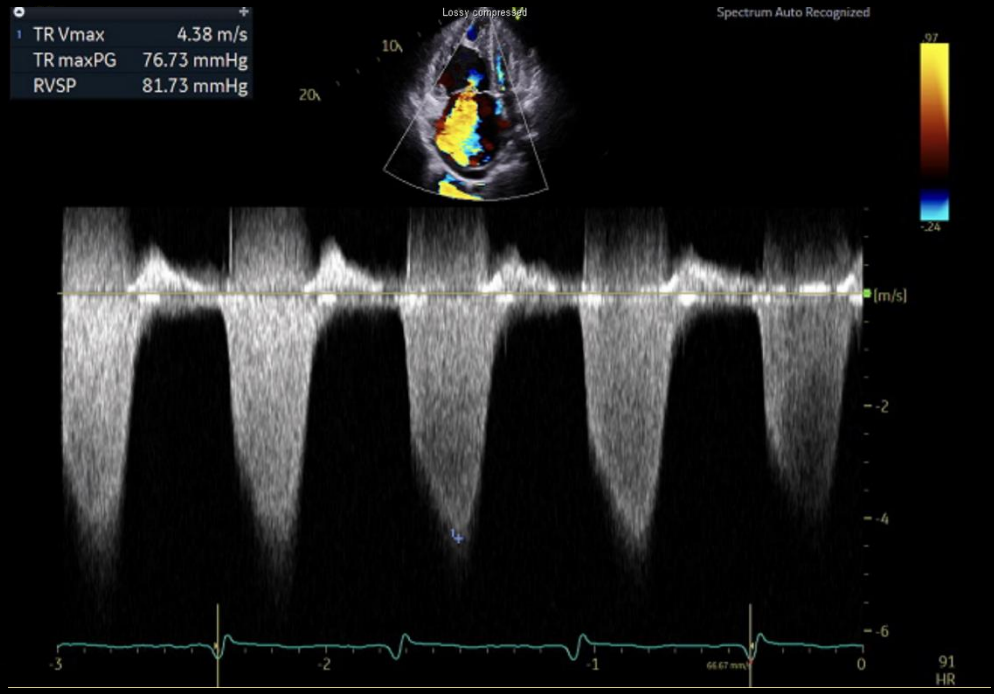
- Ye Chan Kim, MD, Division of Cardiology, Department of Internal Medicine, Heart Vascular Stroke Institute, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea
- Sung-A Chang, MD, PhD, Division of Cardiology, Department of Internal Medicine, Heart Vascular Stroke Institute, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea
- Dong Seop Jeong, MD, PhD, Department of Thoracic and Cardiovascular Surgery, Cardiac and Vascular Center, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

M/38, CTEPH
Severe pulmonary HTN (PASP 91.7mmHg)
Severe TR
RV dilatation
Decreased RV function (TAPSE 7.5mm, TV s` 3.9cm/s)









M/38, CTEPH
Severe pulmonary HTN (PASP 91.7mmHg)
Severe TR
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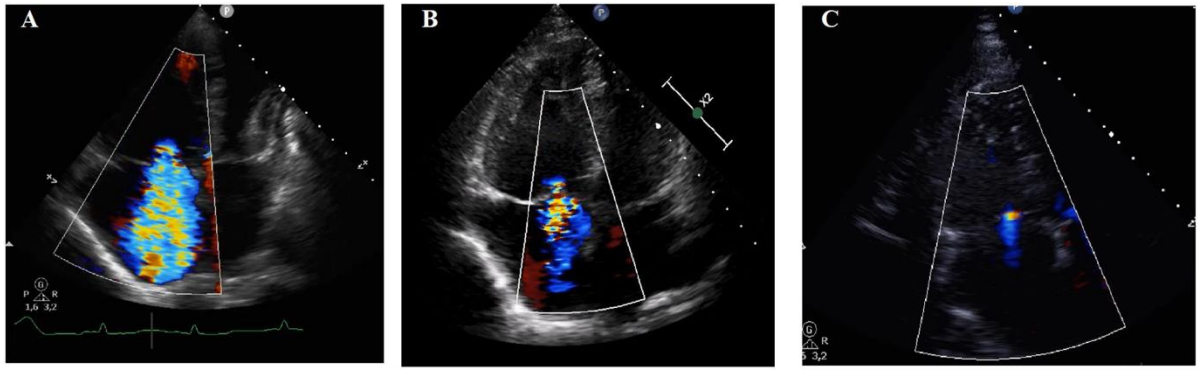
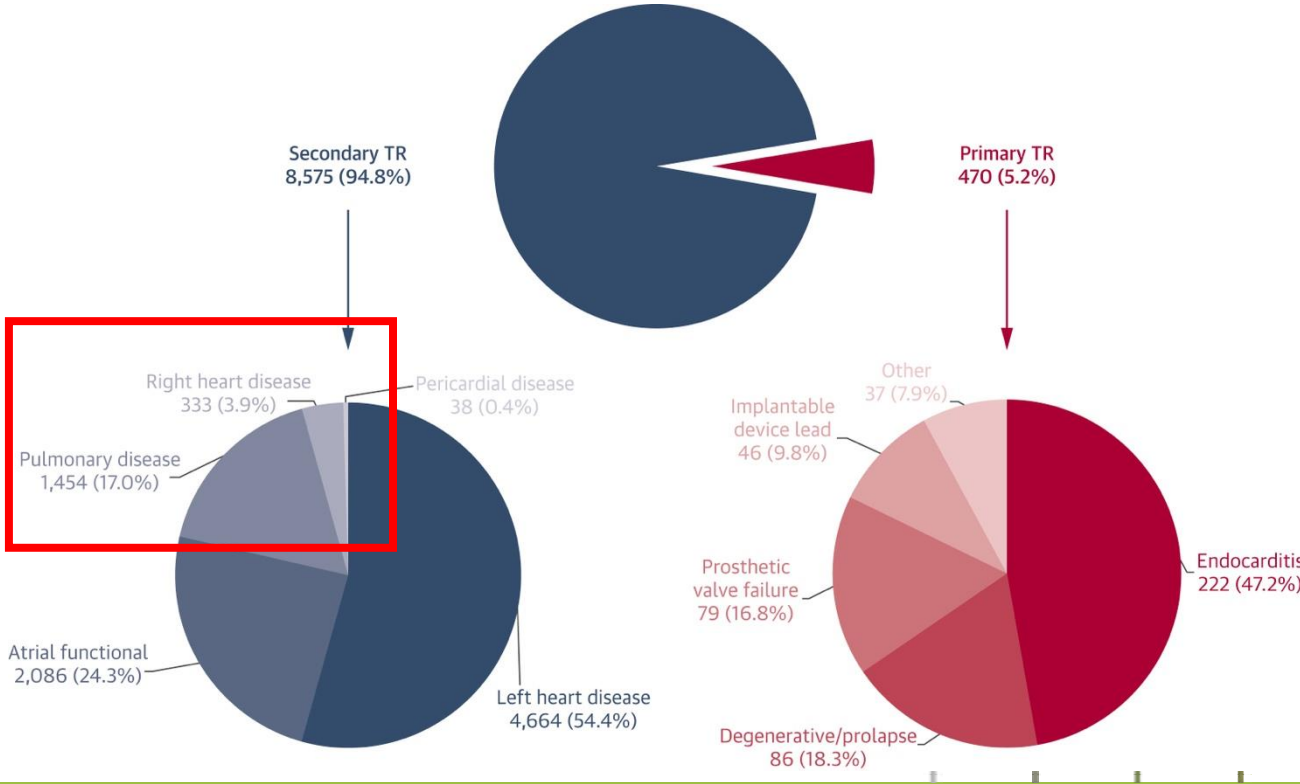
Decreased RV function (TAPSE 7.5mm, TV s` 3.9cm/s)

Is concomitant TAP needed for this patient?

Introduction

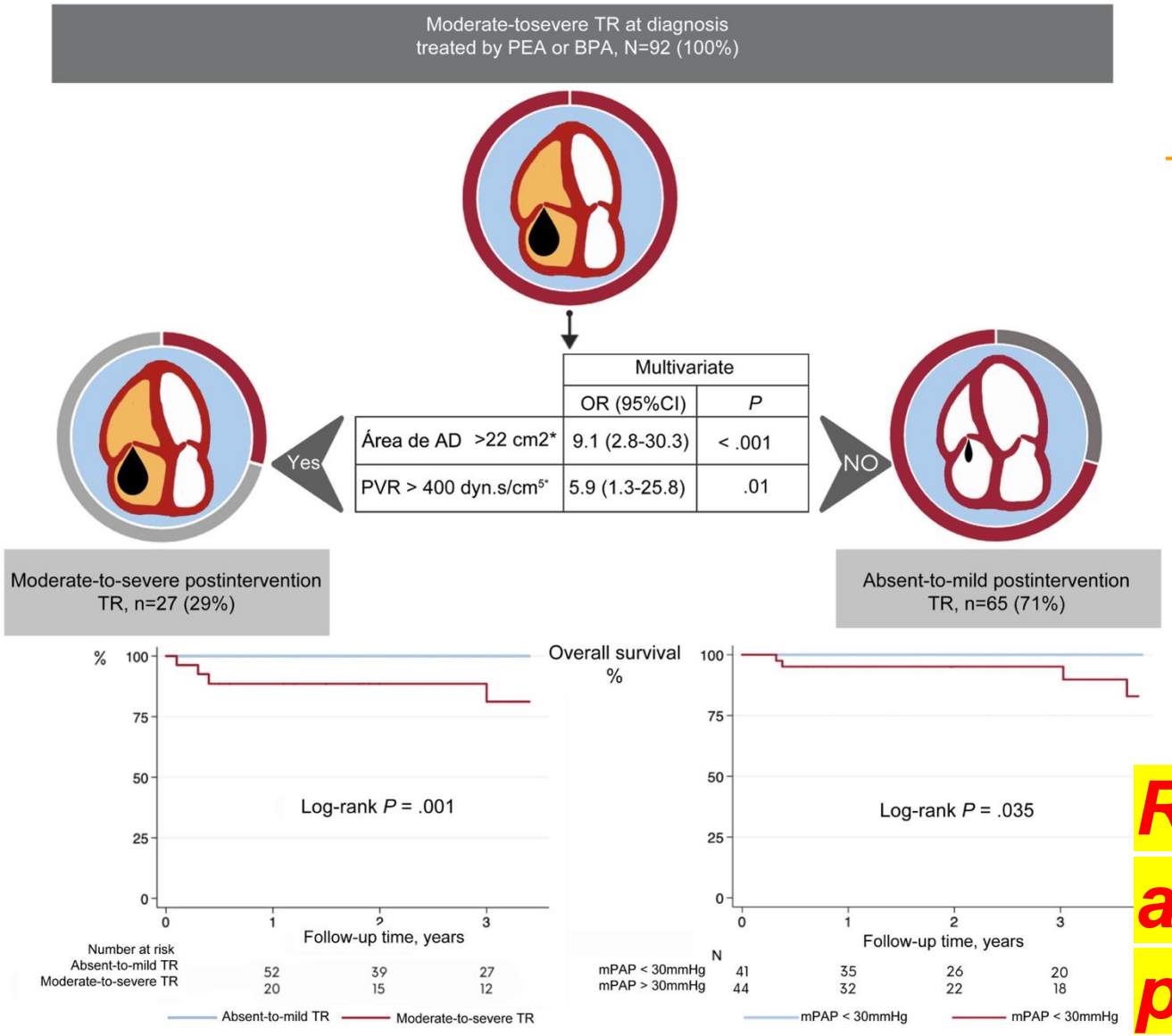
- CTEPH is a rare but serious condition resulting from unresolved pulmonary emboli sm and arteriopathy.
- TR is frequently observed in relation to RV remodeling and tricuspid annular dilata tion.





JACC. Cardiovascular imaging vol. 15,5 (2022): 731-744.

Introduction



Residual TR is associated with poor outcomes

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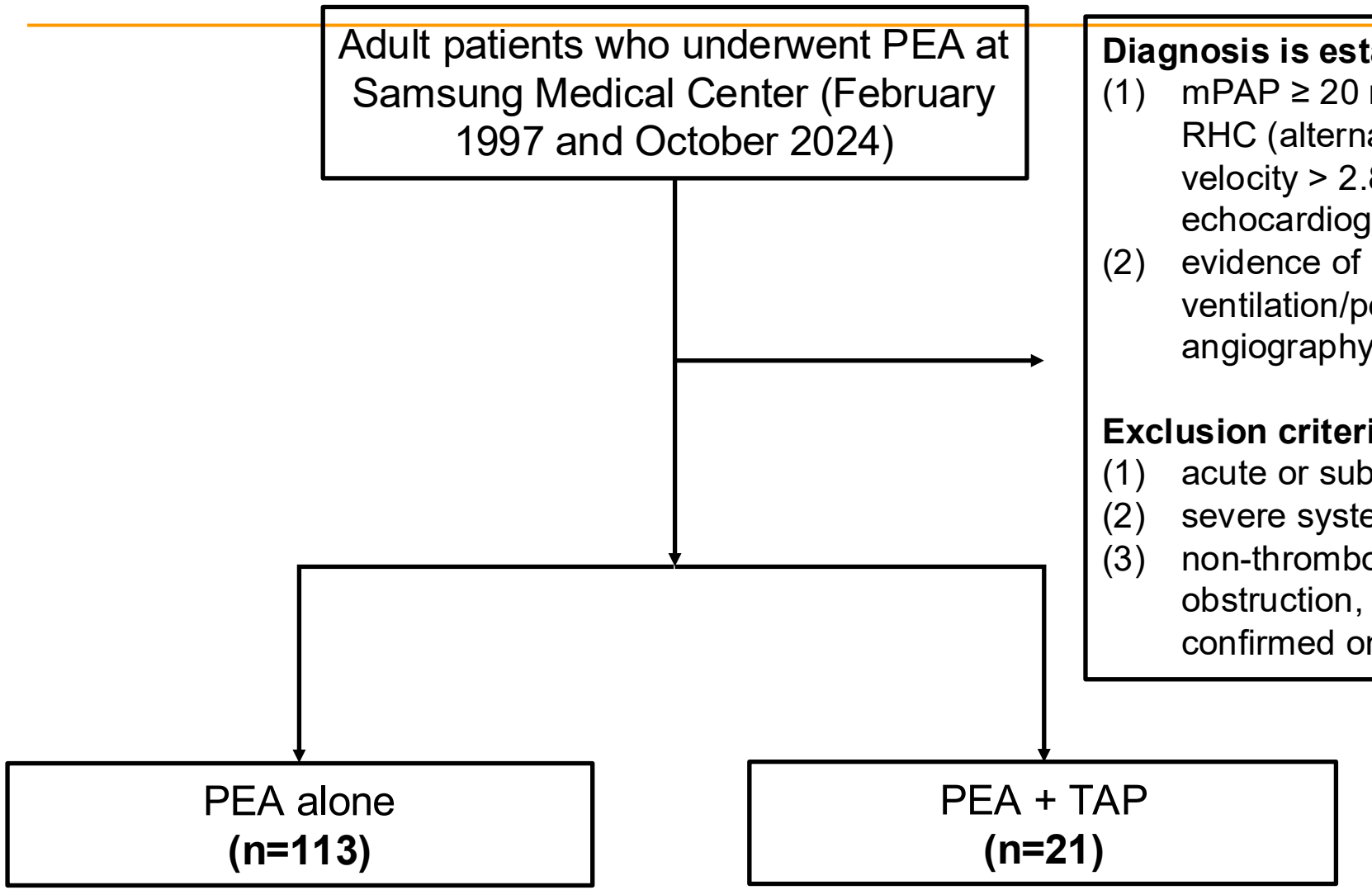
Introduction

- Despite the clinical significance of TR in patients with CTEPH, the role of concomit ant TR repair during PEA remains uncertain.
- Therefore, this study aimed to evaluate the impact of concomitant TAP on clinical outcomes and residual TR after PEA in patients with CTEPH.

Methods



Diagnosis is established by international guidelines

(1) mPAP ≥ 20 mmHg and PCWP ≤ 15 mmHg on RHC (alternatively confirmed by a maximal TR velocity > 2.8 m/s on transthoracic echocardiography).

(2) evidence of chronic thromboembolic occlusion on ventilation/perfusion scintigraphy or pulmonary angiography.

Exclusion criteria

(1) acute or subacute pulmonary embolism

(2) severe systemic comorbidities

(3) non-thromboembolic causes of pulmonary artery obstruction, such as pulmonary angiosarcoma confirmed on pathological evaluation

Methods

- The primary outcome was all-cause mortality at 5 years
- Secondary outcomes included in-hospital mortality, ECMO insertion, postoperative adverse events, and residual TR.
- Residual TR was defined as TR of mild or greater severity at least 3 months after t he index operation.

Results (Changes in Tricuspid Regurgitation)

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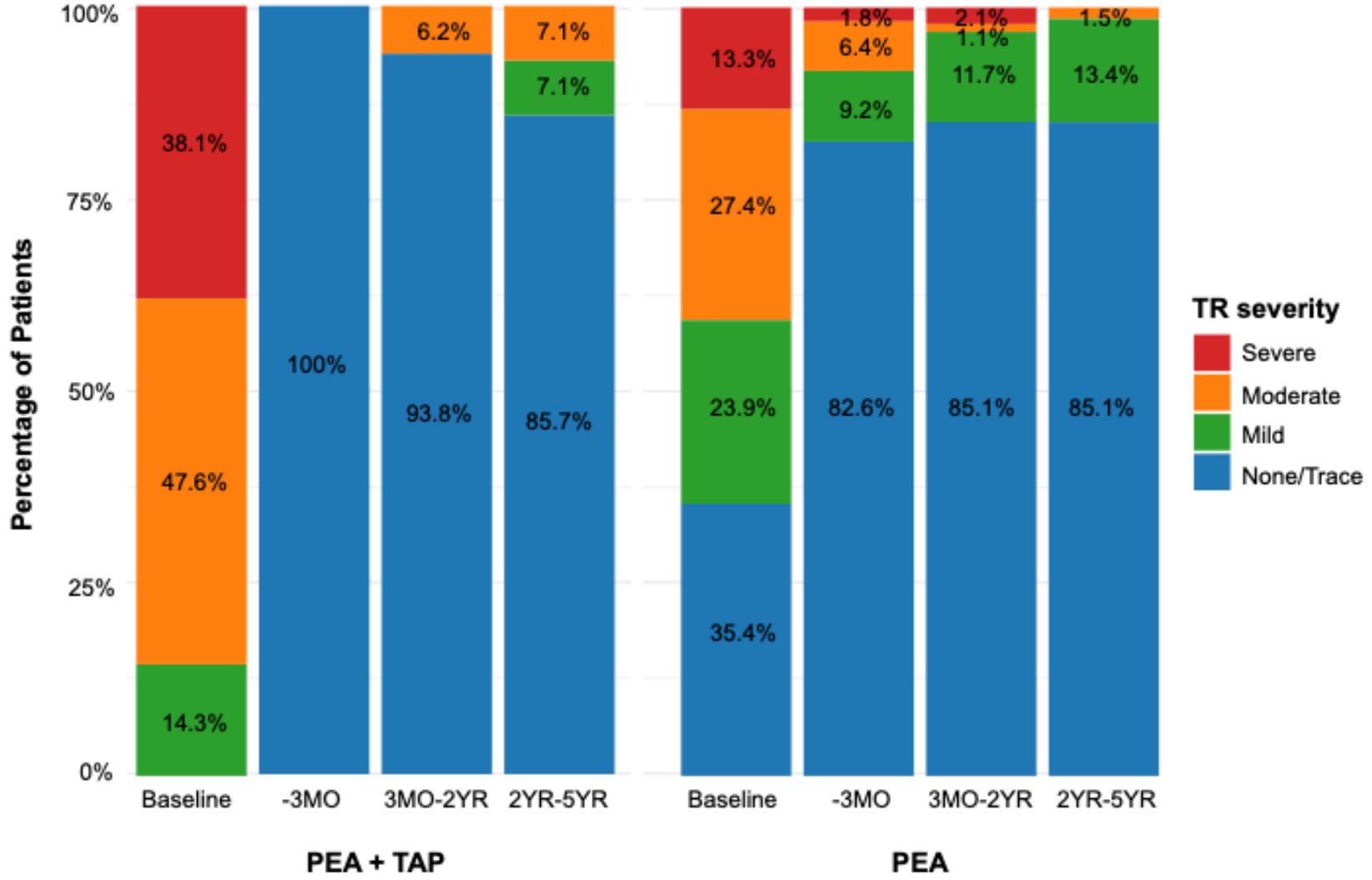
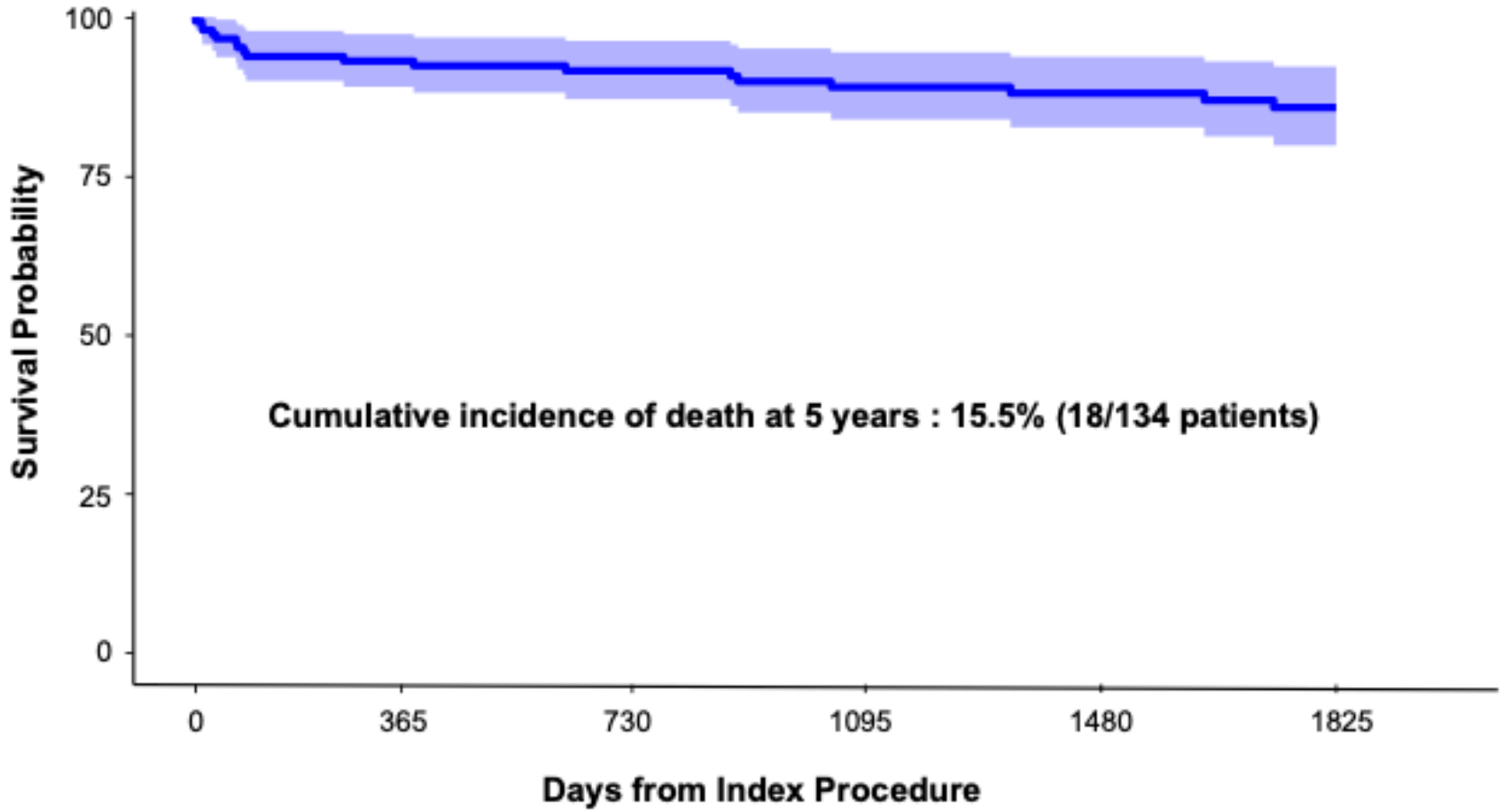
No difference of TR severity in long term f/u TTE



Results (5-Year Mortality in Overall Population)



Results (5-Year Mortality According to Concomitant TAP)

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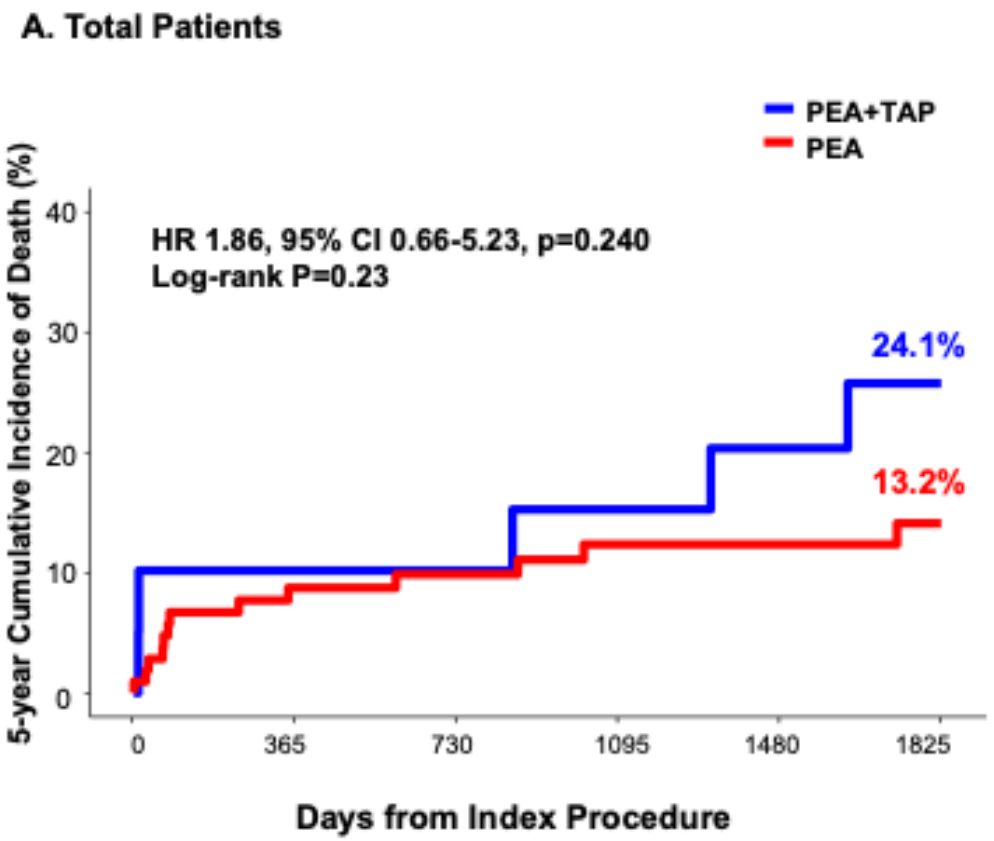
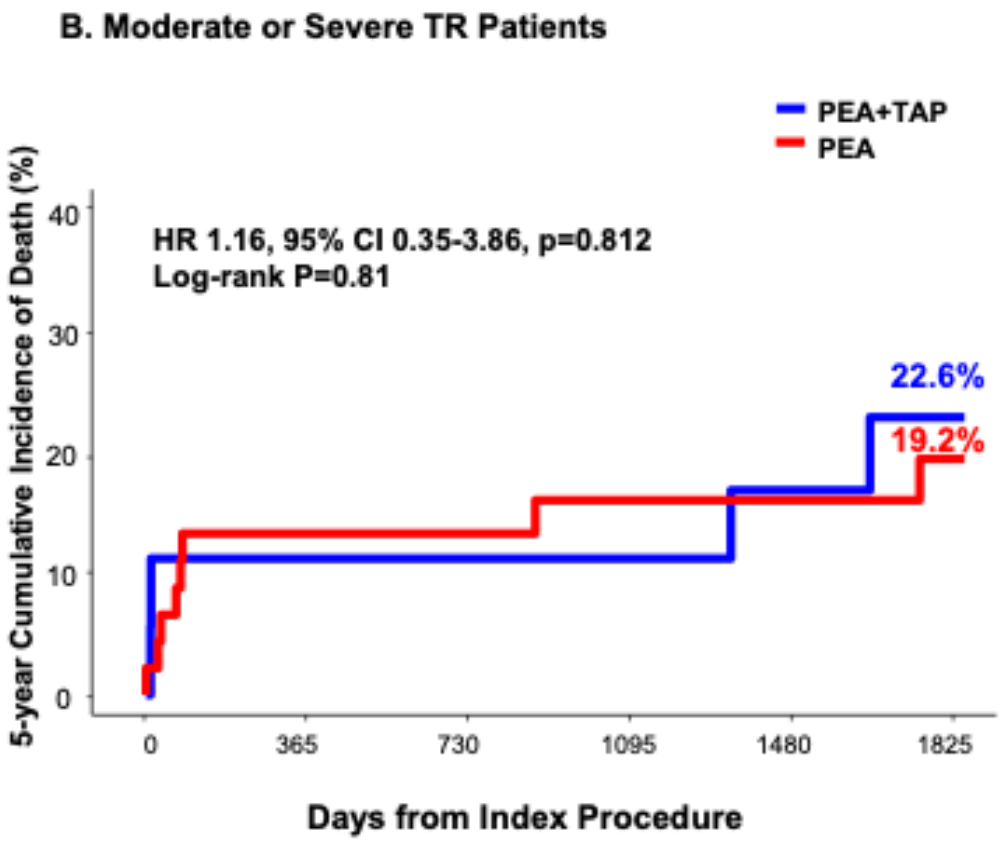
No difference in 5-year mortality





Results (Comparison of Secondary Clinical Outcomes)

Variables	PEA+TAP (n=21)	PEA (n=113)	Risk Ratio (95% CI)	Difference (95% CI)	P value
In-hospital Clinical Outcomes					
In-hospital mortality or ECMO insertion	5 (23.8%)	9 (8.0%)	2.99 (1.00-8.92)	0.16 (-0.03 to 0.35)	0.050
In-hospital mortality	2 (9.5%)	4 (3.5%)	2.69 (0.49-14.69)	0.06 (-0.07 to 0.19)	0.253
ECMO insertion	4 (19.0%)	8 (7.1%)	2.69 (0.81-8.93)	0.12 (-0.05 to 0.29)	0.106
Hospitalization period, days	23.1 ± 30.0	15.3 ± 13.7			0.049
Postoperative Adverse Events					
Pneumonia	6 (28.6%)	6 (5.3%)	5.38 (1.74-16.68)	0.23 (0.04 to 0.43)	0.004
Reintubation	3 (14.3%)	11 (9.7%)	1.47 (0.41-5.26)	0.05 (-0.11 to 0.20)	0.556
Duration of mechanical ventilation, days	6.5 ± 7.0	1.9 ± 2.3			0.008
Tracheostomy	3 (14.3%)	4 (3.5%)	4.04 (0.90-18.03)	0.11 (-0.05 to 0.26)	0.068
RRT	3 (14.3%)	6 (5.3%)	2.69 (0.67-10.76)	0.09 (-0.07 to 0.25)	0.162
Pericardial effusion	1 (4.8%)	10 (8.8%)	0.54 (0.07-4.20)	-0.04 (-0.15 to 0.06)	0.554
Atrial fibrillation	3 (14.3%)	19 (16.8%)	0.85 (0.25-2.87)	-0.03 (-0.19 to 0.14)	0.793

Increased risk of postoperative adverse outcomes in PEA + TAP

Results (Predictors of Residual Tricuspid Regurgitation)

Variables	Unadjusted		Adjusted	
	OR (95% CI)	P value	OR (95% CI)	P value
Concomitant TAP	0.52 (0.11-2.42)	0.406		
Age	1.04 (1.01-1.08)	0.016	1.01 (0.97-1.06)	0.524
Male	0.26 (0.09-0.68)	0.009	0.48 (0.13-1.68)	0.253
Body mass index	0.83 (0.71-0.96)	0.014	0.88 (0.73-1.04)	0.152
CKD	1.41 (0.36-4.58)	0.585		
Hemoglobin	0.87 (0.69-1.09	0.236		
LVEDD	0.91 (0.85-0.98)	0.016		
TAPSE	0.93 (0.82-1.05)	0.259		
TR peak velocity†	3.05 (1.35-7.62)	0.011		
TR severity	4.15 (1.44-15.93)	0.015	1.65 (0.94-3.06)	0.094
Follow-up TR peak velocity	7.95 (3.16-24.30)	<0.001	6.16 (2.19-21.32)	0.002

Results (Independent Predictors of Residual TR in Overlap Weighting Population)

Variables	Follow-up TR peak velocity < 3.2m/s	Follow-up TR peak velocity ≥ 3.2m/s	SMD	P value
Concomitant TAP	5.9%	5.9%	<0.001	>0.999
Age	54.5 ± 15.9	54.5 ± 17.4	<0.001	>0.999
Male	46.3%	46.3%	<0.001	>0.999
Body mass index	24.0 ± 3.8	24.0 ± 4.1	<0.001	>0.999
LVEDD	41.1 ± 6.8	41.1 ± 6.7	<0.001	>0.999
TR peak velocity	4.35 ± 0.55	4.35 ± 0.54	<0.001	>0.999
TR severity			<0.001	>0.999
None/Trace/Mild	51.8%	51.8%		
Moderate/Severe	48.2%	48.2%		
Logistic regression			**OR (95% CI)**	
Follow-up TR peak velocity ≥ 3.2m/s			3.69 (1.11-12.29)	0.033

Persistent HTN remained predictors of residual TR after the adjustment

Discussion

- Given that most TR in CTEPH is secondary, prior studies have suggested that TR can be effectively reduced through PEA alone without the need for additional tricu spid valve intervention.
- Therefore, routine concomitant TAP has not been recommended.
- However, this recommendation has been based on **limited evidence**, and **no stu dy** has directly compared clinical outcomes and longitudinal changes in TR severit y by adding TAP to PEA.

Discussion

- A key observation in this study is that **early postoperative outcomes were wors e** among patients who underwent concomitant TAP.
- Although these adverse outcomes may, in part, reflect differences in baseline TR s everity, the observed association **raise concerns regarding the routine use of c oncomitant TAP** in patients with CTEPH undergoing PEA.

- In the patients with moderate or severe baseline TR, **5-year mortality was similar** regardless of whether concomitant TAP was performed.
- These findings indicate that the **incremental survival benefit of concomitant TAP** may be limited in patients with CTEPH underoing PEA.

Discussion

- Our findings suggest that routine application of concomitant TAP **may not provide sustained long-term benefit for TR management** in most patients with CTEPH undergoing PEA.
- A pivotal factor influencing the persistence or recurrence of TR in the present stud y was **persistent pulmonary hypertension.**
- Therefore, controlling persistent pulmonary hypertension by **performing optimal PEA and BPA with medical therapy is important for TR management**
- Future studies are warranted to identify specific subgroups that may benefit from concomitant TAP

Limitation

- Retrospective observational design and single-center nature of the study with sma ll sample size may limit the power of the study.
- Baseline severity of TR might have been the main factor for the decision to perfor m TAP during PEA surgery.
- The assessment of tricuspid regurgitation was not uniformly scheduled, which ma y have introduced variability in the timing of TR evaluation
- Further multicenter studies with larger sample sizes are needed to validate the cur rent findings.

Conclusion

- Significant TR reduction was observed in PEA alone group comparable to PEA+TAP group with no significant difference in 5-year survival.
- Concomitant TAP should be carefully considered in selected patients, with emphasis on controlling persistent pulmonary hypertension.

2YR after PEA
No pulmonary HTN (PASP 32.1mmHg)
Trivial TR
Improved RV function (TAPSE 11.4mm, TV s` 10.4cm/s)