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Primary and Secondary Tricuspid Regurgitation

Athena Poppas, MD, FACC

Incoming Vice-President ACC

Chief, Cardiology Division

Director, Lifespan Cardiovascular Institute

Rhode Island, Miriam and Newport Hospitals

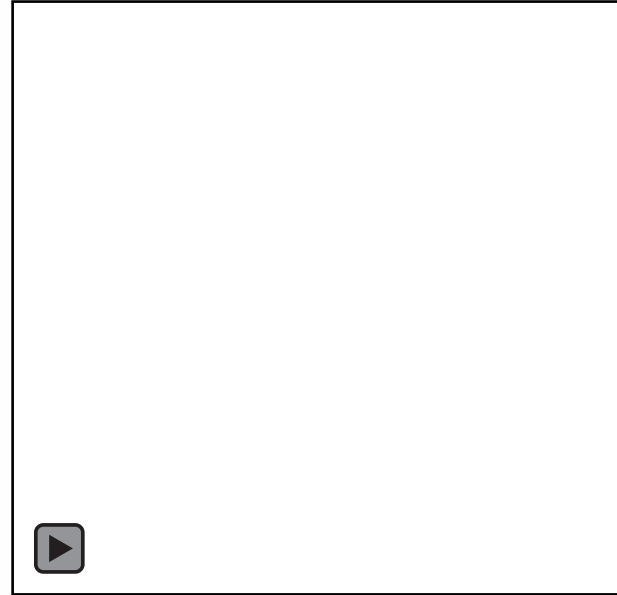
Professor of Medicine, Brown University



TV: normal and abnormal



Normal TV, RV, RA



Dilated RV, RA, Annulus with 3+ TR



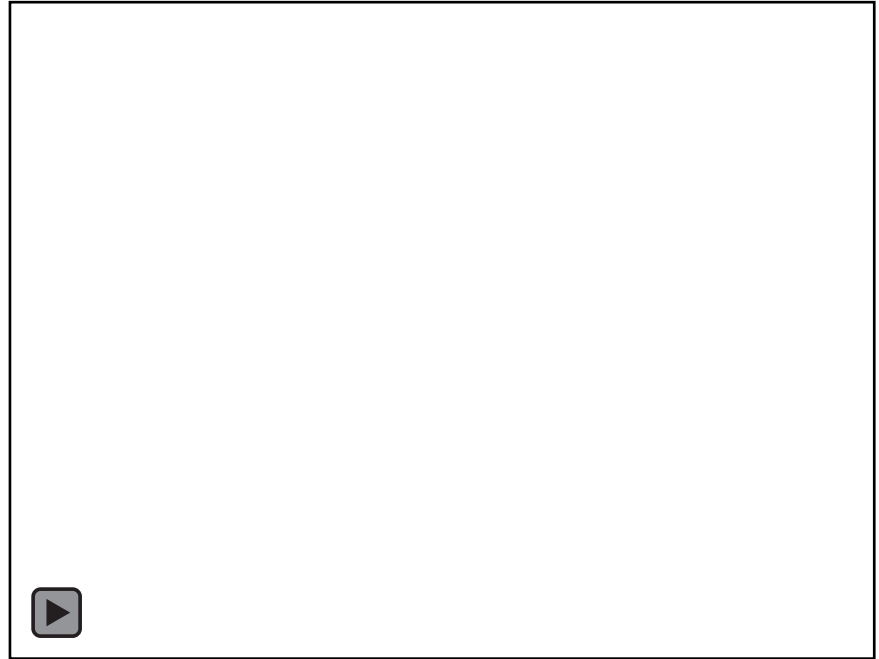
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Understanding the Tricuspid Valve

- Anatomy
- Assessment
- Prognosis

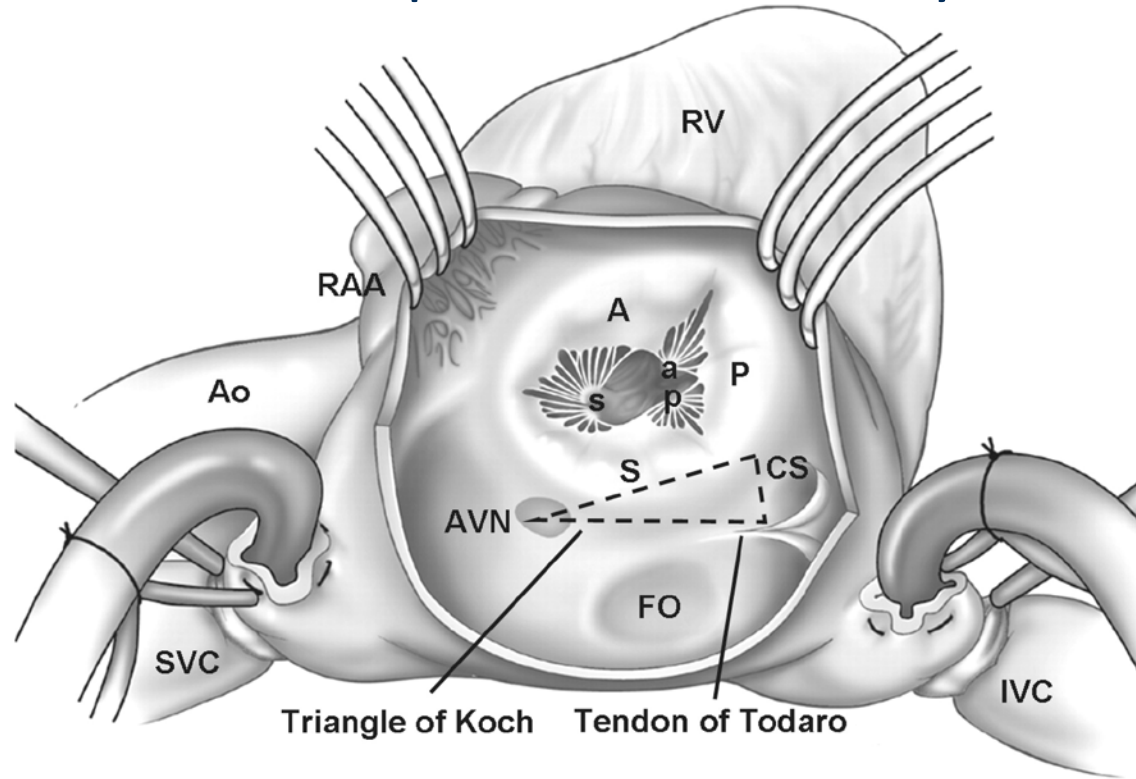


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Tricuspid Valve: anatomy



**Rogers & Bolling. Circ
2009;119:2718**



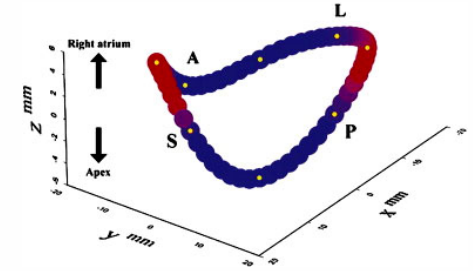
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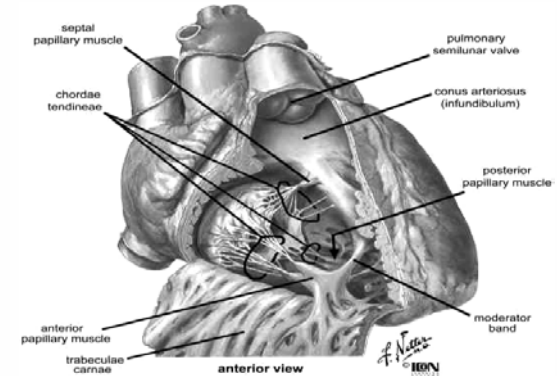
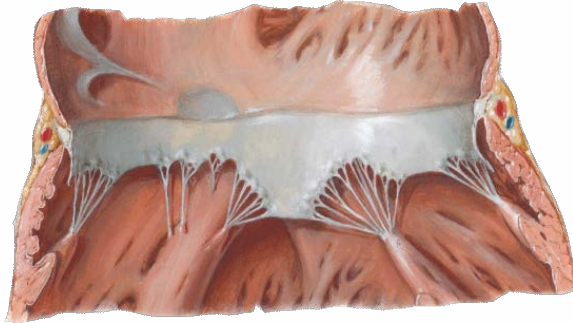


Leaflets, Papillary Muscles and Chordae

- Leaflet structure:
Variations include 2-6 leaflets
- Annulus: Dynamic, D shaped
- Papillary muscles
Variations, supplying chordae to at least two leaflets



Fukada. Circ 2006;114:s



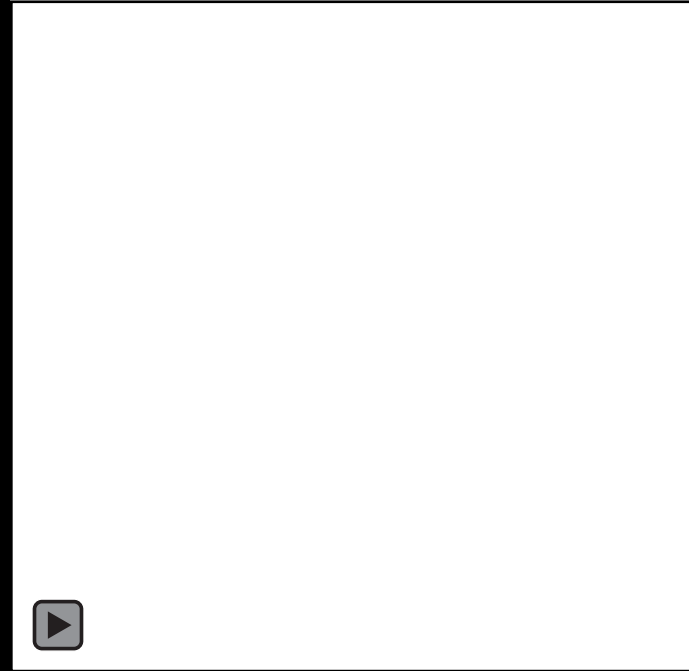
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Right ventricular contribution

- 3 distinct sections
 - Inflow TV
- Contraction
 - Peristaltic in- to outflow
 - Longitudinal > radial
 - Bellows effect & Ventricular interdependence



Understanding the Tricuspid Valve

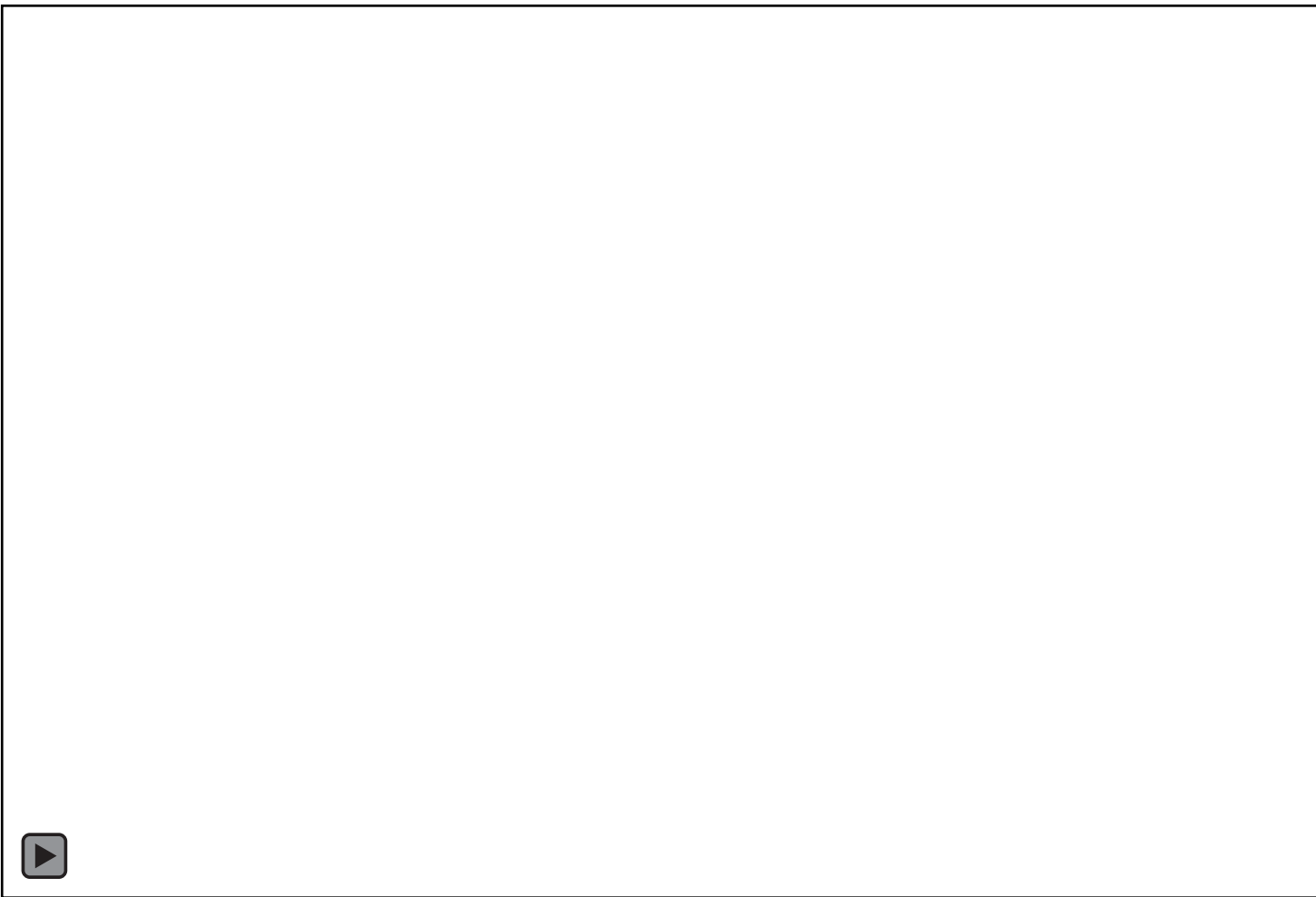
- Anatomy
- Assessment: structure and function
- Prognosis



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Secondary/Functional

Annular Dilation

Ventricular Dilation

Ventricular Remodeling

Pulmonary Hypertension

Reduced Coaptation Force

Primary/Organic

Rheumatic

Myxomatous

Trauma

Congenital

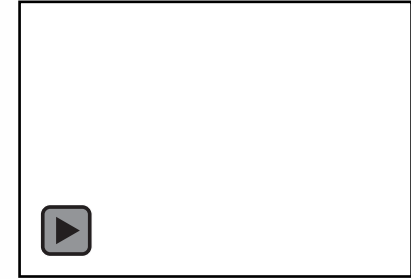
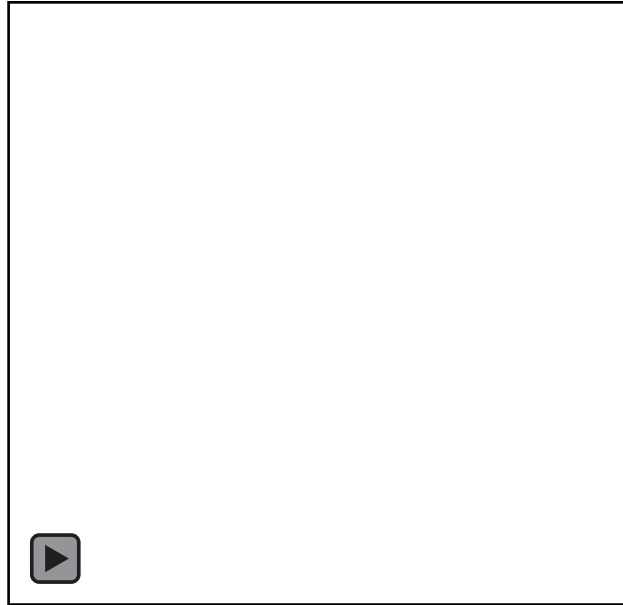


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Primary TR: Ebsteins structure and function



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Primary TR:

Trauma



Endocarditis



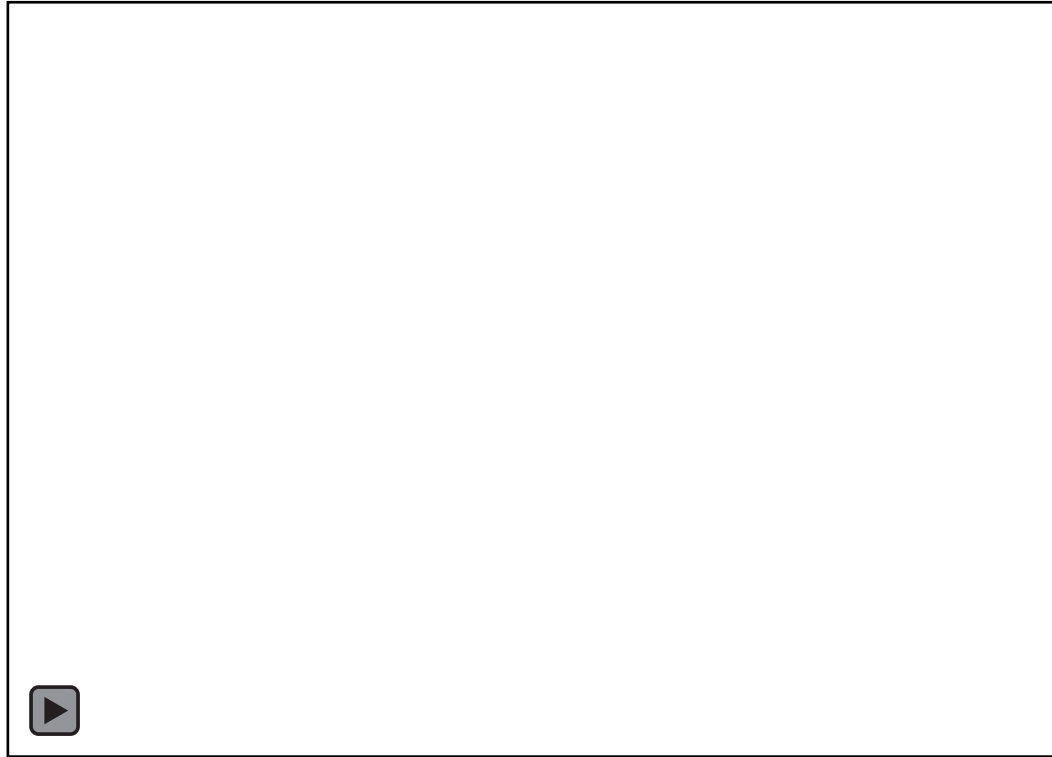
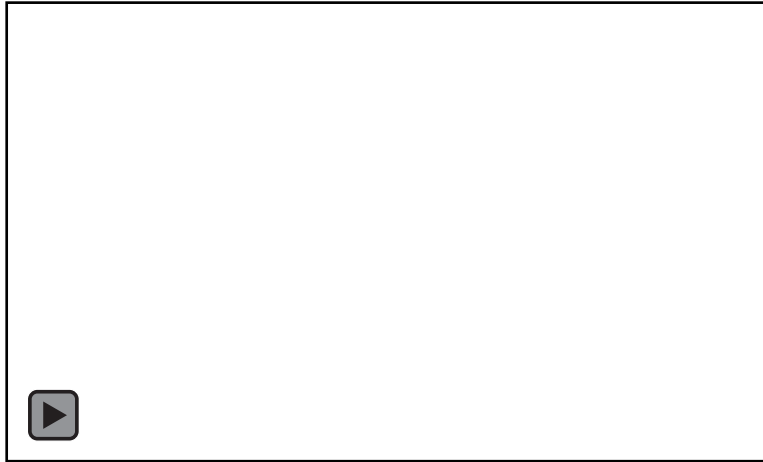
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Primary: Myxomatous

Secondary, functional TR



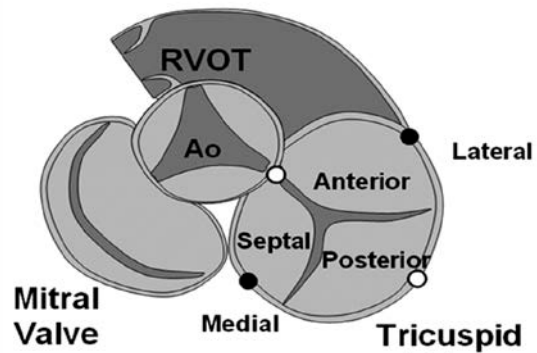
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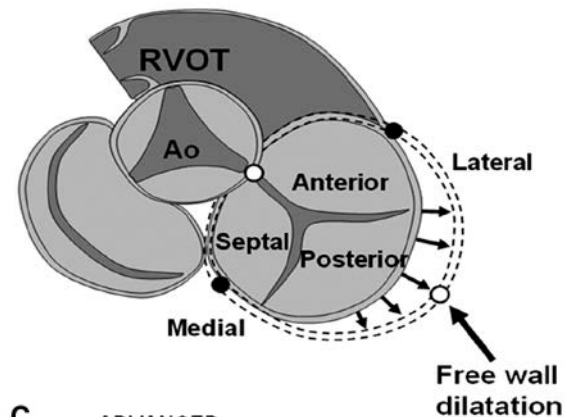
A

○ High Points
● Low Points



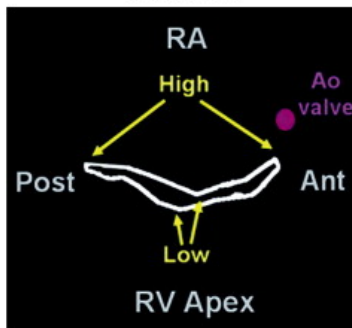
B

○ High Points
● Low Points



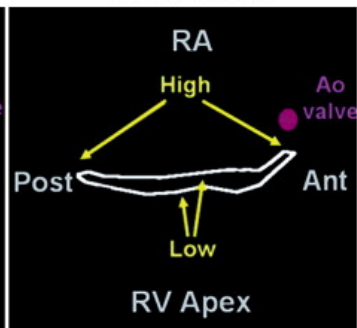
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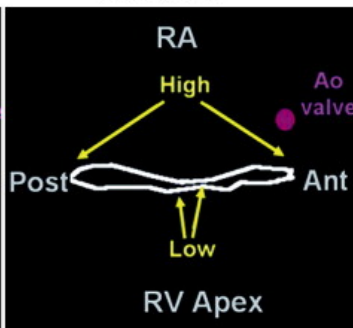
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INTERMEDIATE



C

ADVANCED



Geometric Determinants of Functional
TR: 3D echo insights. Ton-Nu
Circ.2006;114:143-149



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Secondary TR: annular measurements

- Normal = 28 ± 5 mm: A4C
*2D underestimates
- Sign >40mm, >21mm/M2,
*Correlates with TR severity
- Normal contraction = 25%
- Tethering Area > 1.63cm^2
and Heights > 0.76 cm --
*Recurrence

*Fukuda. Circ 2005;111: 975

*Abbas ACC'18



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Understanding the Tricuspid Valve

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- Assessment: structure and function
- Prognosis

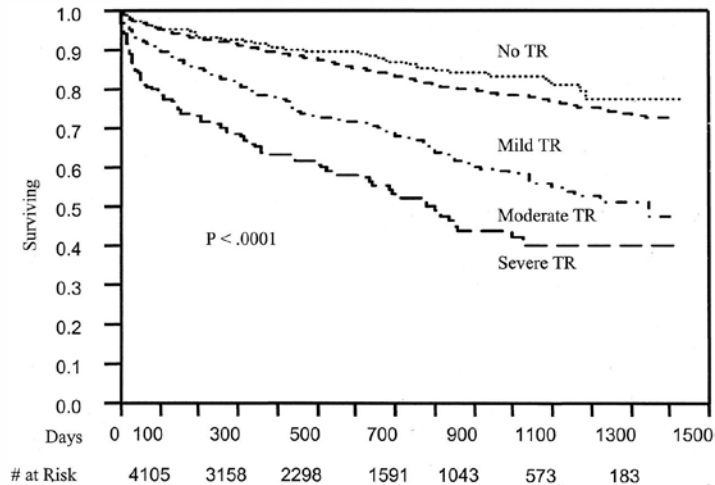


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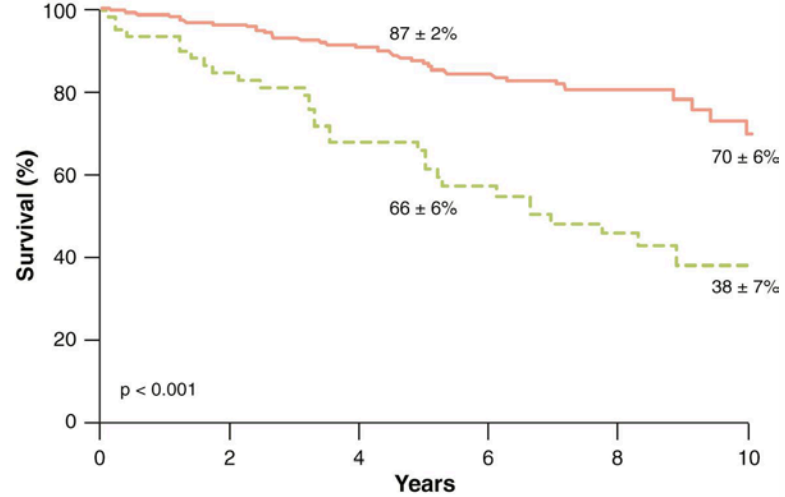
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TR and Prognosis



Increased mortality independent of age, EF, RVE,
Jayant Nath et al. JACC 2004;43:405-409



353 isolated TR
ERO independent predictor of mortality
-RV size/function, PASP
Topilsky. JACCi 2014;12:1185



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ACC-AHA Guidelines: TR Stages

Stage	Definition	Valve Anatomy	Valve Hemodynamics	Hemodynamic Consequences	Symptoms
A	At risk of TR	Primary • Mild rheumatic change • Mild prolapse • Other (vegetation, carcinoid, radiation) • RV pacemaker/ ICD lead • Postcardiac transplant (biopsy-related) Functional • Normal • Early annular dilation	• No or trace TR	• None	• None or in relation to other left heart or pulmonary/ pulmonary vascular disease



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	Definition	Valve Anatomy	Valve Hemodynamics	Hemodynamic Consequences	Symptoms
C	Asymptomatic, severe TR	Primary - Flail or grossly distorted leaflets Functional - Severe annular dilation (>40 mm or 21 mm/m²) - Marked leaflet tethering	- Central jet area >10 cm² - Vena contracta width >0.7 cm - CW jet density and contour: dense, triangular with early peak - Hepatic vein flow: systolic reversal	- RV/RA/IVC dilated with decreased IVC respirophasic variation - Elevation RA pressure with “c-V” wave - Diastolic interventricular septal flattening may be present	None, or in relation to other left heart or pulmonary/pulmonary vascular disease
D	Symptomatic severe TR	Primary - Flail or grossly distorted leaflets Functional - Severe annular dilation (>40 mm or >21 mm/m²) - Marked leaflet tethering	- Central jet area >10 cm² - Vena contracta width >0.70 cm - CW jet density and contour: dense, triangular with early peak - Hepatic vein flow: systolic reversal	- RV/RA/IVC dilated with decreased IVC respirophasic variation - Elevation RA pressure with “c-V” wave - Diastolic interventricular septal flattening - Reduced RV systolic function in late phase	Fatigue, palpitations, dyspnea, abdominal bloating, anorexia, edema

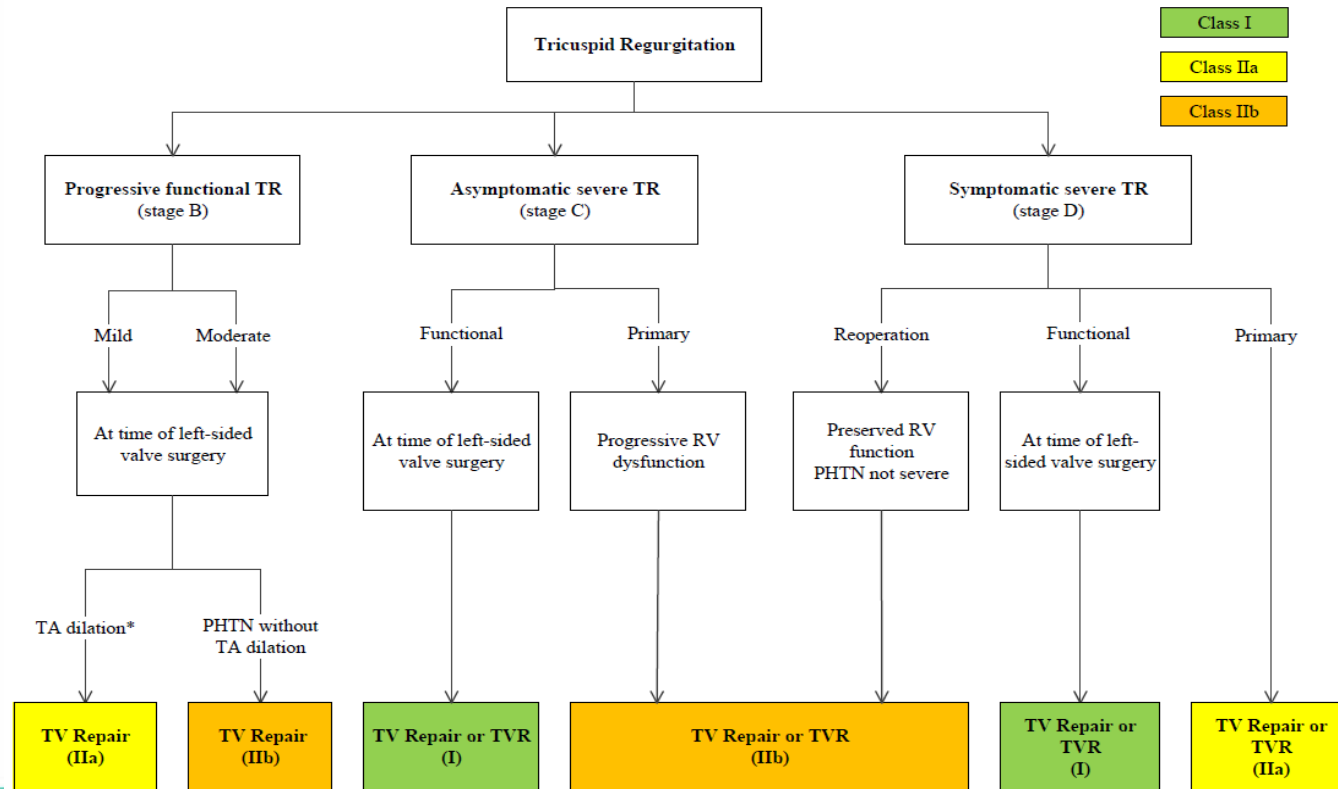


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Indications for Surgery for Tricuspid Regurgitation

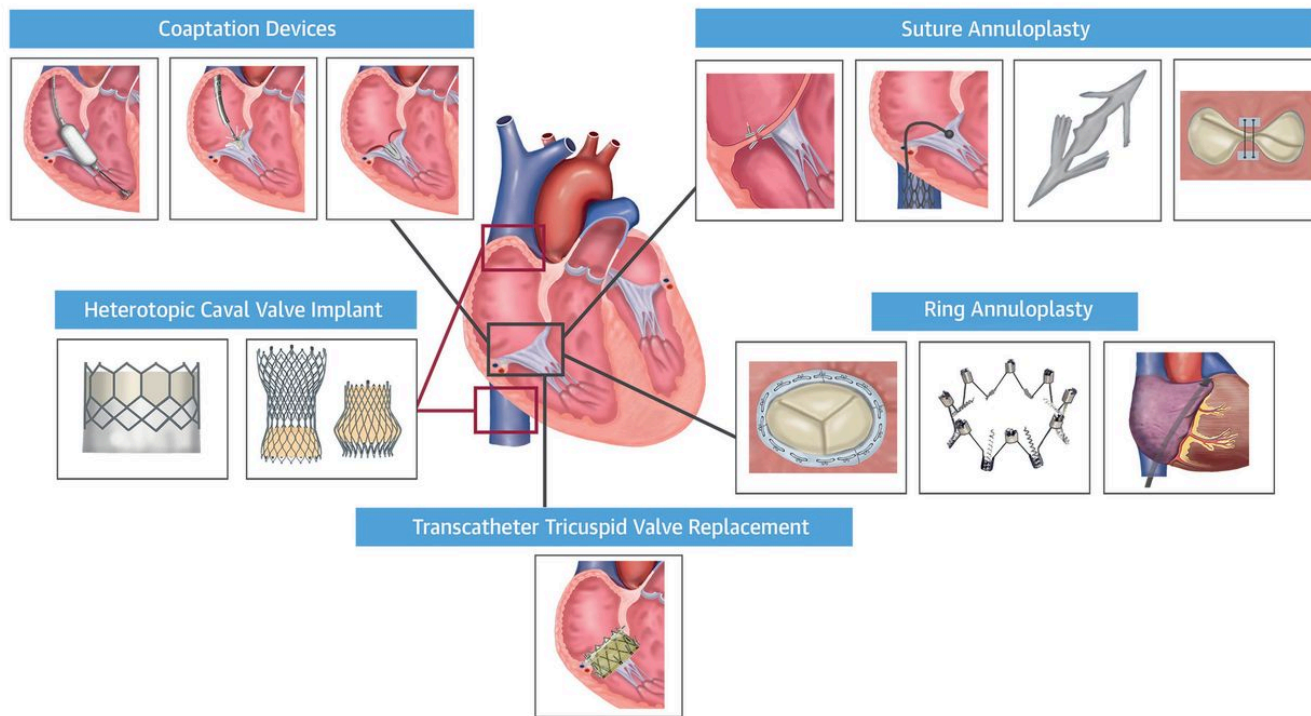


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CENTRAL ILLUSTRATION: Transcatheter Tricuspid Landscape



Asmarats, L. et al. J Am Coll Cardiol. 2018;71(25):2935-56.



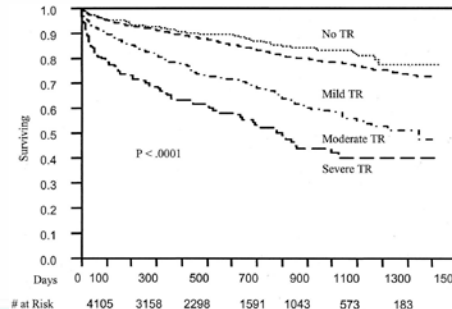
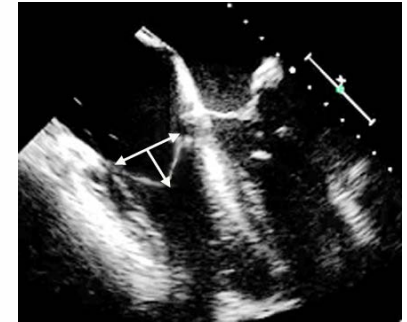
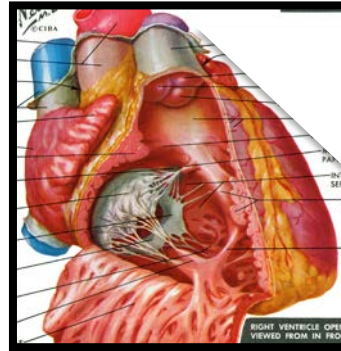
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Summary: Tricuspid Valve

- Anatomy
 - Entire apparatus
- Assessment
 - 2D, 3D, Doppler
- Prognosis
 - Graded



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Muchas Gracias



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- Persistent or Progressive TR
 - Significant TR Prior to Left Heart Surgery
 - Tricuspid Valve Annular Diameter (TVAD)
 - Change in TVAD (Diastole to Systole)
Matsuyama Ann Thorac Surg 2003;75:1826
- Right Heart Failure and Mortality With TR
 - Right Heart Enlargement Messika-Zeitoun JTCVS 2004;1128:296
 - IVC Diameter and Respiratory Variation
 - Reduced or 'exhausted' capacitance Vaturi J Heart Valve Dis 2003;12:197



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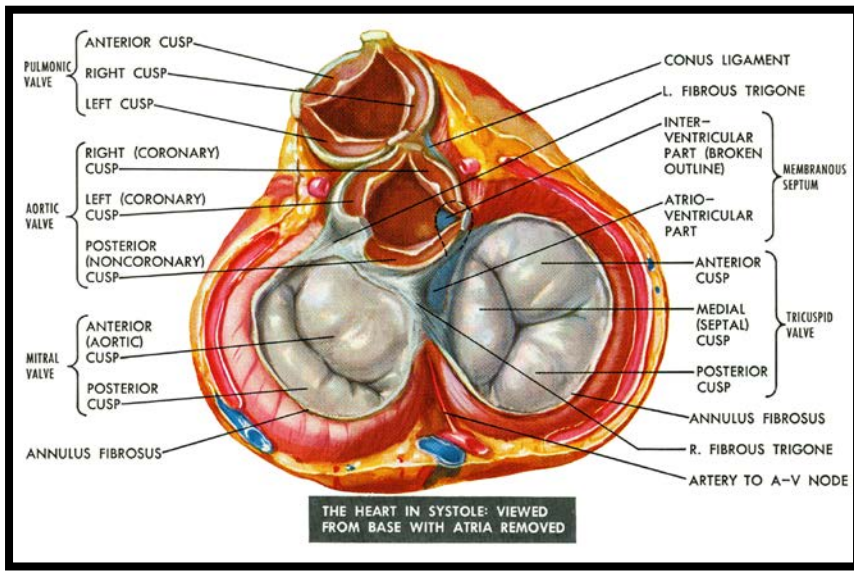




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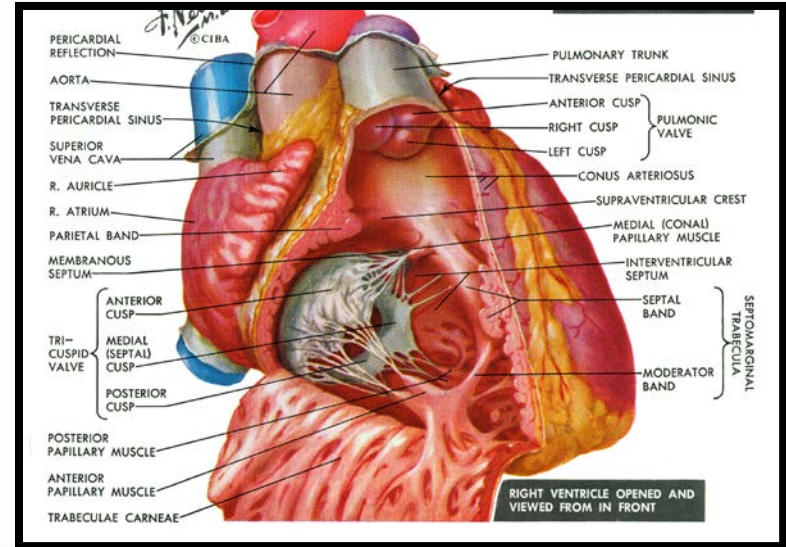
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Right Ventricle

Tricuspid Valve



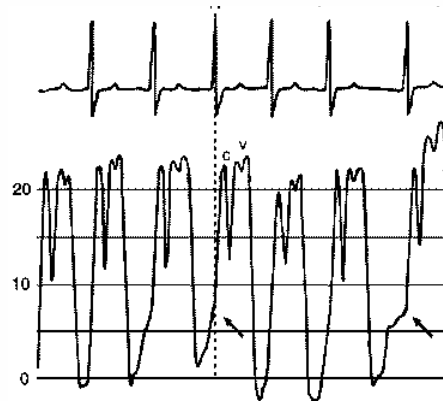
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Tricuspid Valve: forgotten? Misunderstood?

- Often asymptomatic
 - Right heart failure
- Not easily audible
 - Echo diagnosis
- Right heart
 - Less well studied

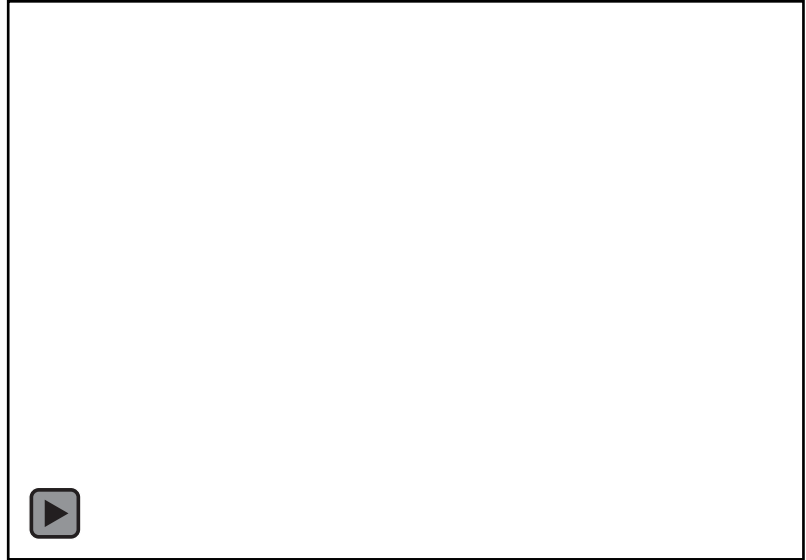
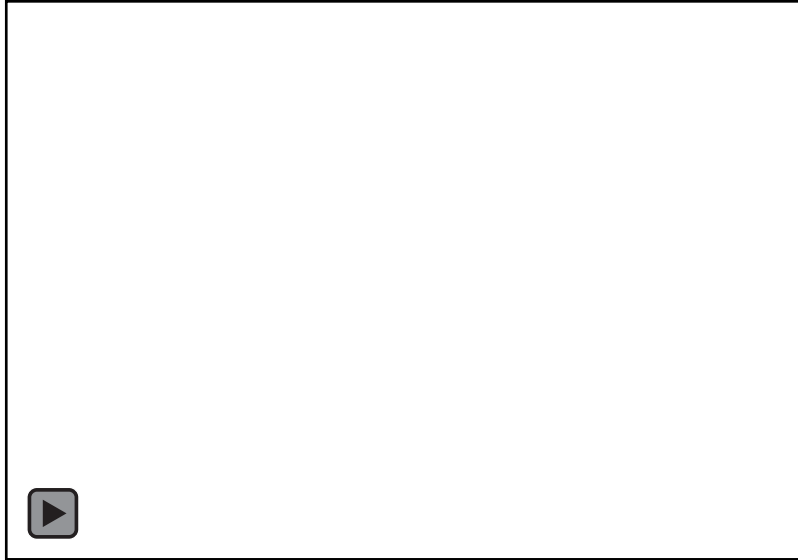


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Primary TR: Endocarditis



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