





# Advanced Echocardiographic Assessment of Right Ventricle Mechanics

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# **Learning objectives**

• Discuss the components of right ventricular (RV) performance. (i.e. morphology, afterload, contractility, preload)

• Evaluate echocardiographic approaches to RV performance. (conventional and advanced techniques)

• Identify emerging methods to characterize RV performance. (*i.e. Apical 3-chamber view, RV-PA coupling*)

• Take Home Tips. (don't forget the LV, validation studies)

# **Qualitative assessment of RV function** *The "eyeball" test*

	All (n=60)	Healthy "Controls" (n=30)	Pulmonary hypertension (n=30)
<b>RV dilation</b>			
Expert	0.15 (0.06), p=.003	0.13 (0.02), p<.001	0.17 (0.07), p=.009
Novice	0.13 (0.05), p=.003	0.22 (0.07), p=.002	0.02 (0.06), p=.38
<u>Septal curvatur</u>	<u>'e</u>		
Expert	0.23 (0.05), p<.001	0.09 (0.08), p=.13	0.23 (0.08), p=.001
Novice	0.21 (0.05), p<.001	0.06 (0.07), p=.18	0.29 (0.07), p<.0001
<b>RV dysfunction</b>			
Expert	0.31 (0.06), p<.001	0.13 (0.01), p=.1	0.32 (0.08), p<.0001
Novice	0.35 (0.06), p<.001	0.06 (0.1), p=.3	0.4 (0.08), p<.0001

Purna J, McNamara PJ. PAS 2017.

#### **Determinants of right ventricle performance**



### **Measures of right ventricle performance**

Afterload • Resistance • Compliance • Impedance	<ul> <li>Preload</li> <li>Diastolic function</li> <li>Hydration / Shunts</li> <li>Pericardial effusion</li> </ul>	Contractility • Acidosis / sepsis • Ischemia / asphyxia • Inotropes	Morphology • Macroscopic • Ultrastructure • Cellular
γ	γ	γ	γ
<ol> <li>Pressure-dependent         <ul> <li>TR velocity jet</li> <li>Septal wall motion</li> <li>LV eccentricity index</li> <li>Shunts / directions</li> </ul> </li> <li>PA acceleration time         <ul> <li>PAAT / RVET</li> </ul> </li> </ol>	1. IVC (?) 2. Volumes (?)	<ol> <li>RV contractility         <ul> <li>dp/dt</li> <li>Strain rate</li> </ul> </li> <li>RV systolic function         <ul> <li>Global</li> <li>Regional</li> </ul> </li> <li>RV diastolic function         <ul> <li>Global</li> <li>Regional</li> </ul> </li> </ol>	<ol> <li>RV Areas         <ul> <li>Systolic</li> <li>Diastolic</li> <li>4-ch / 3-ch</li> </ul> </li> <li>Dimensions         <ul> <li>RV inflow</li> <li>RV outflow</li> </ul> </li> </ol>

# **Morphology** *Complex tripartite structure*



Netter FH, Atlas of Human Anatomy

#### **Imaging the right ventricle** *Apical 4-chamber*





The probe is placed on the apex, at an angle pointing towards the right shoulder. www.tnecho.com (Images)

#### **Imaging the right ventricle** *RV focused apical 3 – chamber view*



Rotate the probe counterclockwise from the apical 4-chamber view

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Animations, Malcom and Evans