

ECHOCARDIOGRAPHY  
*...From a Sonographer's Perspective*

THE NOTEBOOK 8

Chapter IVa: Transthoracic Echocardiogram

Susan King DeWitt, BS, RDCS, RCS

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# IVa. TRANSTHORACIC ECHO (TTE)

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## OBJECTIVES

Upon completion of this section, the reader will be able to:

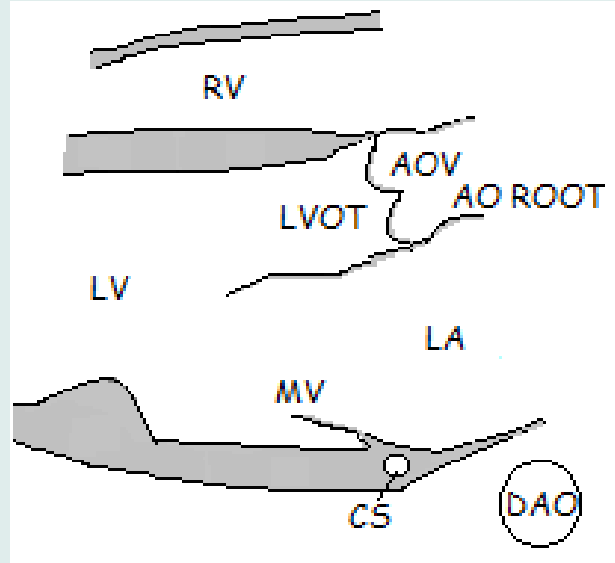
1. Discuss the TTE order, patient verification, EKG placement, patient positioning, and scanning options.
2. Recognize when a limited TTE is advised and some common indications.
3. Define different methods of calculating the LVEF.
4. Stay up-to-date and integrate the latest TTE guidelines, required dimensions, and routine calculations.
5. Identify and interpret normal cardiac anatomy.
6. Suggest what needs to be ruled out during TTE.

PARASTERNAL  
LAX & SAX

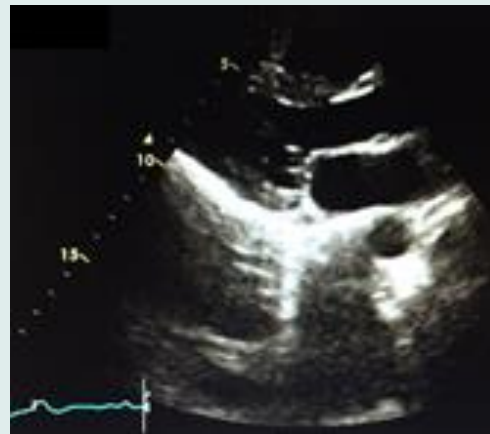
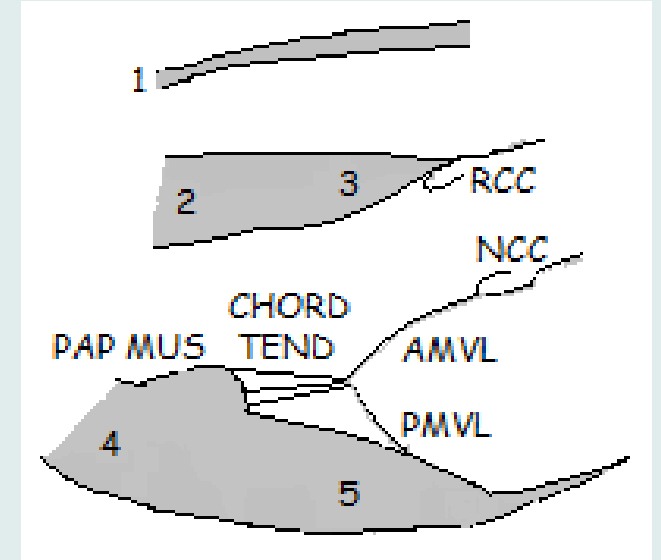
# PARASTERNAL WINDOW

VIEW	PROTOCOL
LAX LV	<p>1) Increase depth</p> <ul style="list-style-type: none"><li>entire cardiac structure &amp; surroundings</li></ul> <p>2) Decrease depth</p> <ul style="list-style-type: none"><li>chamber size</li><li>wall thickness</li><li>global function</li><li>valvular function</li></ul>

## IMAGES

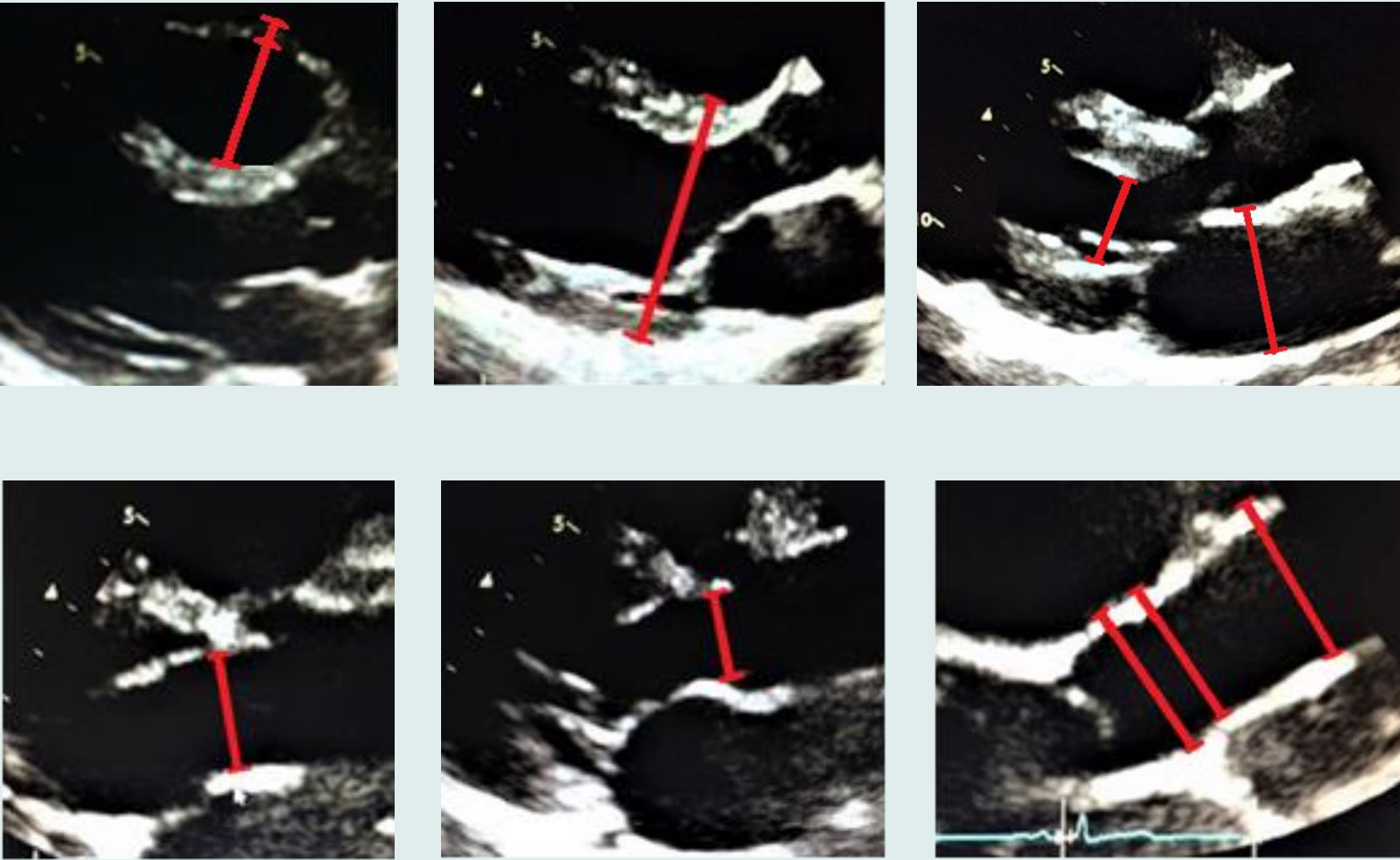


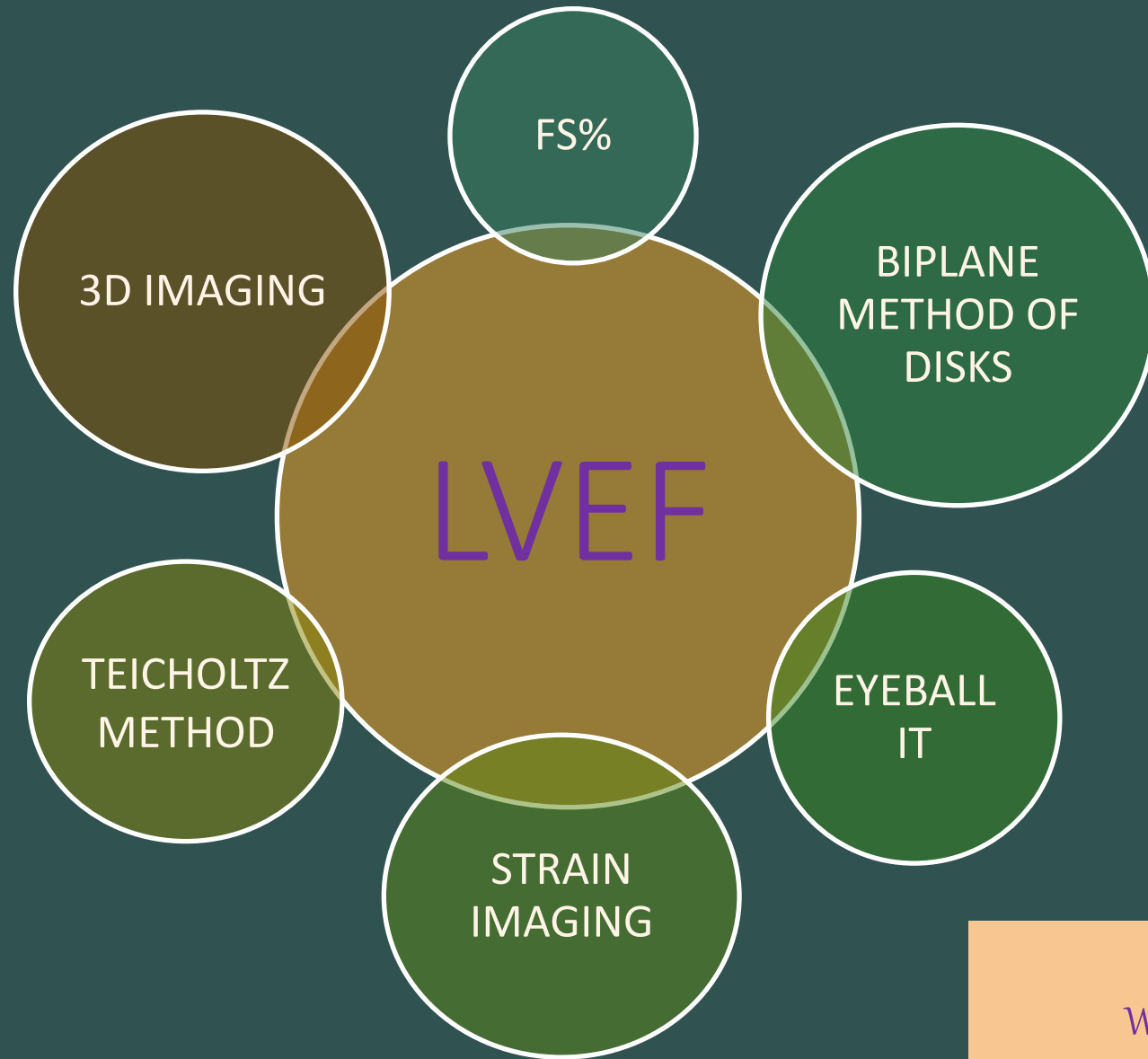
POP QUIZ!  
Label the wall  
segments #1 - 5.



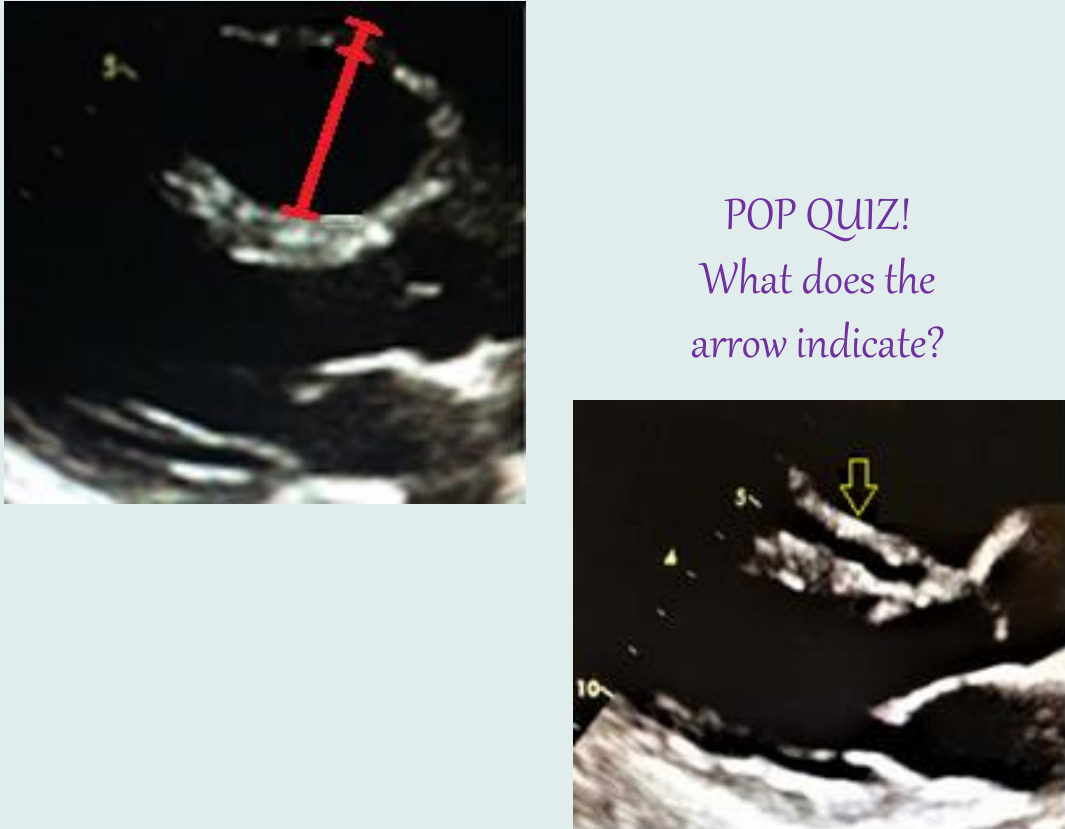
## POP QUIZ!

What phase of the cardiac cycle are the dimensions acquired?

VIEW	PROTOCOL	IMAGES
LAX LV & LAX AO	<p data-bbox="262 304 774 354">3) 2D linear dimensions</p> <ul data-bbox="313 432 830 1239" style="list-style-type: none"><li data-bbox="313 432 555 475">• RV wall</li><li data-bbox="313 496 606 539">• RVOTprox</li><li data-bbox="313 561 466 604">• IVS</li><li data-bbox="313 625 517 668">• LVIDd</li><li data-bbox="313 689 491 732">• PWT</li><li data-bbox="313 753 517 796">• LVIDs</li><li data-bbox="313 818 440 861">• LA</li> <li data-bbox="313 939 504 982">• LVOT</li><li data-bbox="313 1003 670 1046">• AOV annulus</li><li data-bbox="313 1068 797 1110">• sinuses of Valsalva</li><li data-bbox="313 1132 823 1175">• sinotubular junction</li><li data-bbox="313 1196 695 1239">• proximal AAO</li></ul>	 <p>The images show six different echocardiographic views with red dimension lines. The top row shows: 1) RV wall measurement, 2) RVOTprox measurement, and 3) IVS measurement. The bottom row shows: 4) LVIDd measurement, 5) PWT measurement, 6) LVIDs measurement, 7) LVOT measurement, 8) AOV annulus measurement, 9) sinuses of Valsalva measurement, 10) sinotubular junction measurement, and 11) proximal AAO measurement.</p>



POP QUIZ!  
What does LVEF measure &  
what methods are discouraged?

VIEW	PROTOCOL	IMAGES
LAX LV	<p>4) Anterior wall of RV</p> <ul style="list-style-type: none"><li>• thin</li><li>• squeezes concentrically</li><li>• end-diastolic RV wall thickness (1 - 5 mm)</li></ul> <p>5) RV</p> <ul style="list-style-type: none"><li>• most anterior chamber</li><li>• smaller &amp; more trabeculated than LV</li><li>• complex crescent shape—tricky to measure</li><li>• moderator band</li><li>• end-diastolic RVOTprox diameter (20 - 30 mm)</li></ul>	 <p>POP QUIZ! What does the arrow indicate?</p>





*According to the ASE Guidelines,*

- acquire LV dimensions perpendicular to the structures,*
- in a straight line,*
- at or immediately below the tips of the MV leaflets,*
- with calipers placed at myocardial wall/cavity interface & wall/pericardium interface.*

VIEW	PROTOCOL	IMAGES
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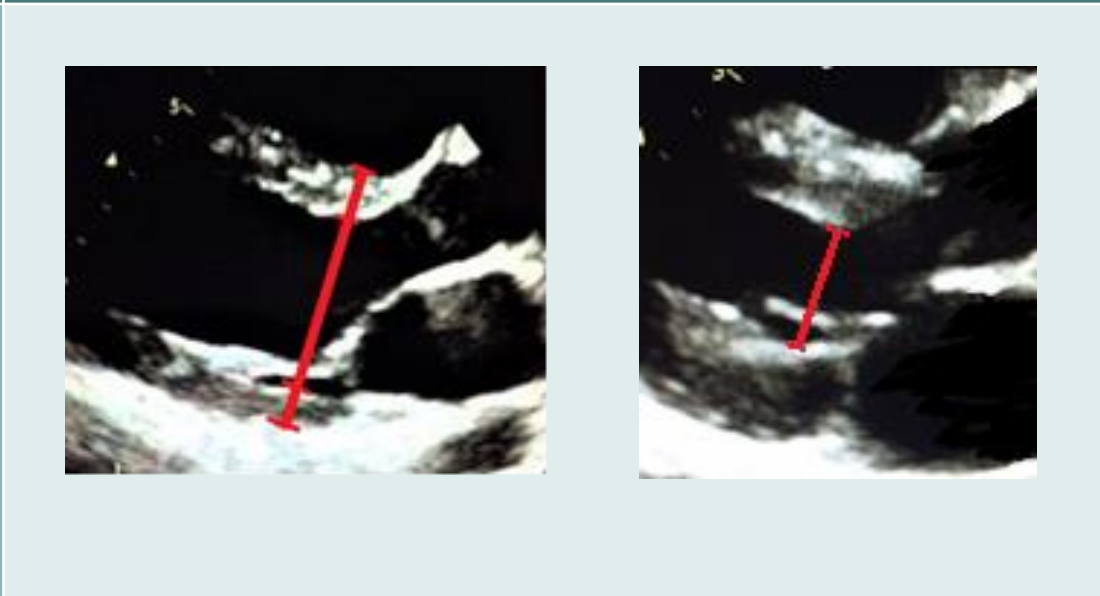
LAX LV

6) IVS & LVPW

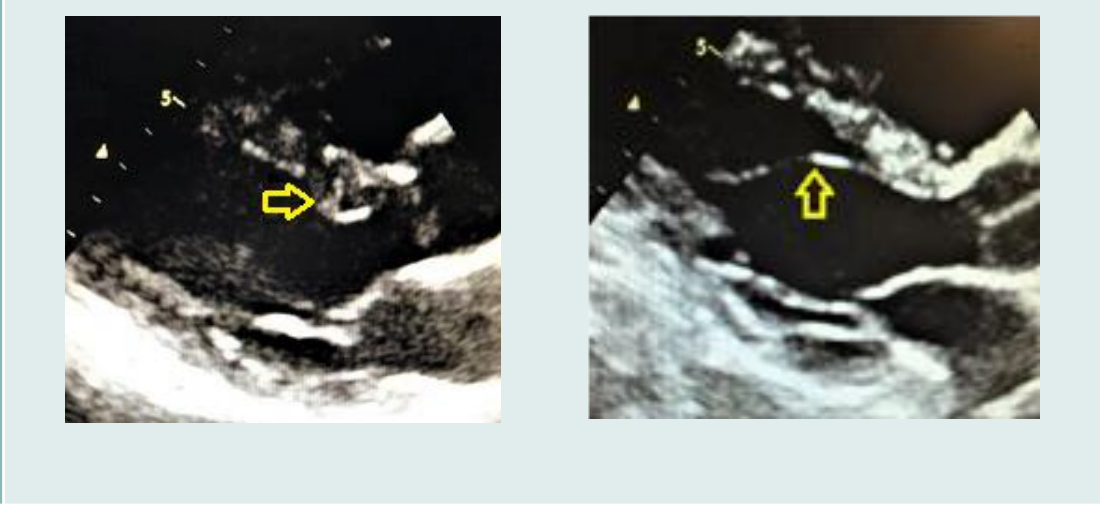
- 1:1 ratio
- thicker than RV walls
- squeeze concentrically
- sigmoid-shaped septum
- end-diastolic IVS & PWT dimensions (female 6 - 9 mm, male 6 - 10 mm)

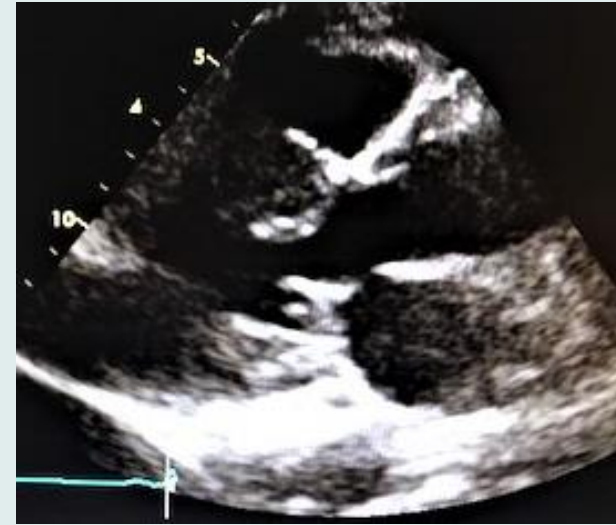
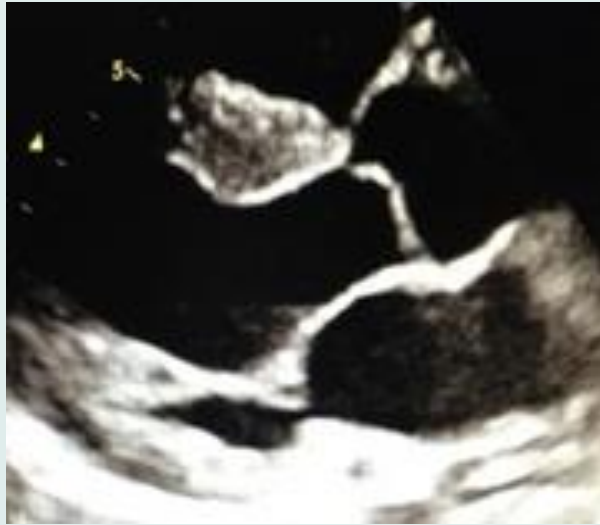
7) LV

- largest chamber
- posterior & lateral to RV
- ellipsoid shape
- larger, more conical & less trabeculated than RV
- false tendon
- LVIDd (female 38 - 52 mm, male 42 - 58 mm)
- LVIDs (female 22 - 35 mm, male 25 - 40 mm)



POP QUIZ!  
What do the arrows indicate?



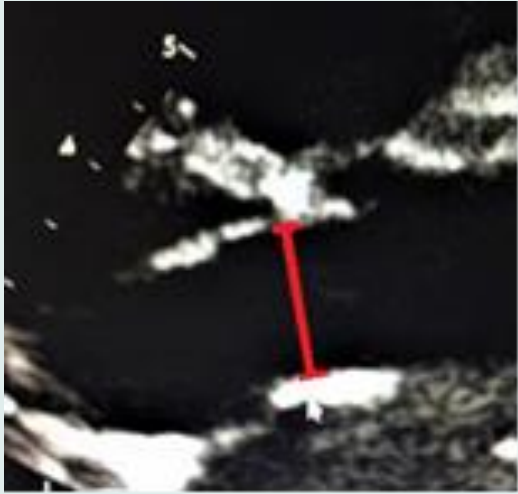


## LVH SEVERITY SCALE

	NORMAL (mm)	MILD LVH (mm)	MOD LVH (mm)	SEVERE LVH (mm)
MALE	6 - 10	11 - 13	14 - 16	≥ 17
FEMALE	6 - 9	10 - 12	13 - 15	≥ 16

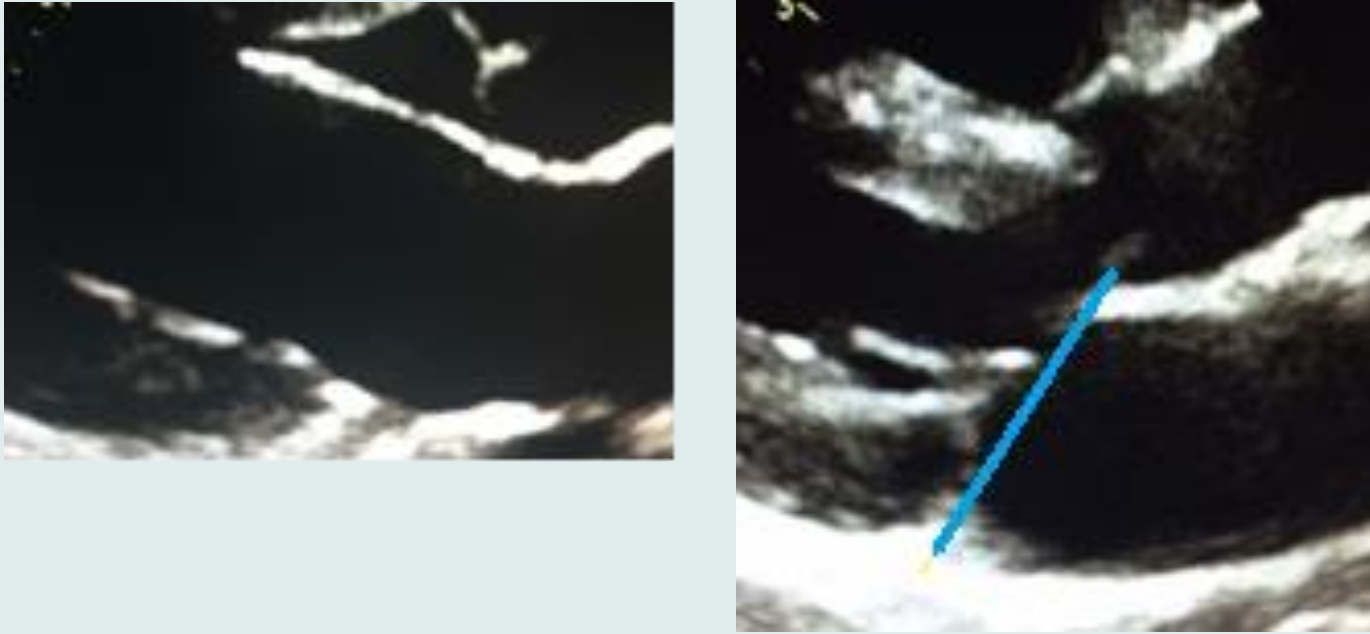
POP QUIZ!

If the IVS & PWT measure 15 mm, what is the degree of LVH?

VIEW	PROTOCOL	IMAGES
LAX LV	<p data-bbox="519 386 690 436">8) LVOT</p> <ul data-bbox="558 515 1493 753" style="list-style-type: none"><li data-bbox="558 515 912 565">• unobstructed</li><li data-bbox="558 579 894 629">• laminar flow</li><li data-bbox="558 644 1054 694">• zoom &amp; adjust gains</li><li data-bbox="558 708 1493 758">• mid-systolic LVOT diameter (18 - 22 mm)</li></ul>	 An echocardiogram image showing a cross-section of the left ventricular outflow tract (LVOT). A red vertical line is drawn across the narrowest part of the LVOT to indicate the measurement site. The surrounding myocardial walls and the aortic valve are visible in grayscale.

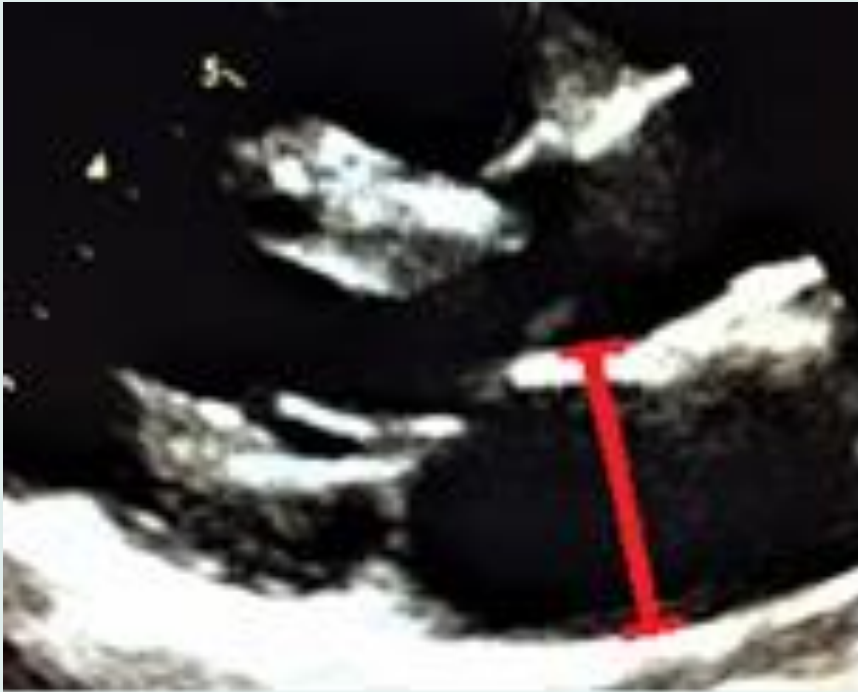
POP QUIZ!

Where exactly is the  
LVOT diameter acquired?

VIEW	PROTOCOL	IMAGES
LAX LV	<p data-bbox="242 307 624 364">9) AMVL &amp; PMVL</p> <ul data-bbox="267 435 1006 806" style="list-style-type: none"><li data-bbox="267 435 637 492">• thin &amp; pliable</li><li data-bbox="267 499 802 556">• unrestricted opening</li><li data-bbox="267 564 1006 678">• continuous with posterior wall of AO</li><li data-bbox="267 685 764 742">• AMVL more mobile</li><li data-bbox="267 749 649 806">• no MVP/MAC</li></ul>	 <p>The left image shows a long-axis view of the aortic valve. The right image shows the same view with a blue line drawn across the aortic root, indicating the diameter of the aorta.</p>

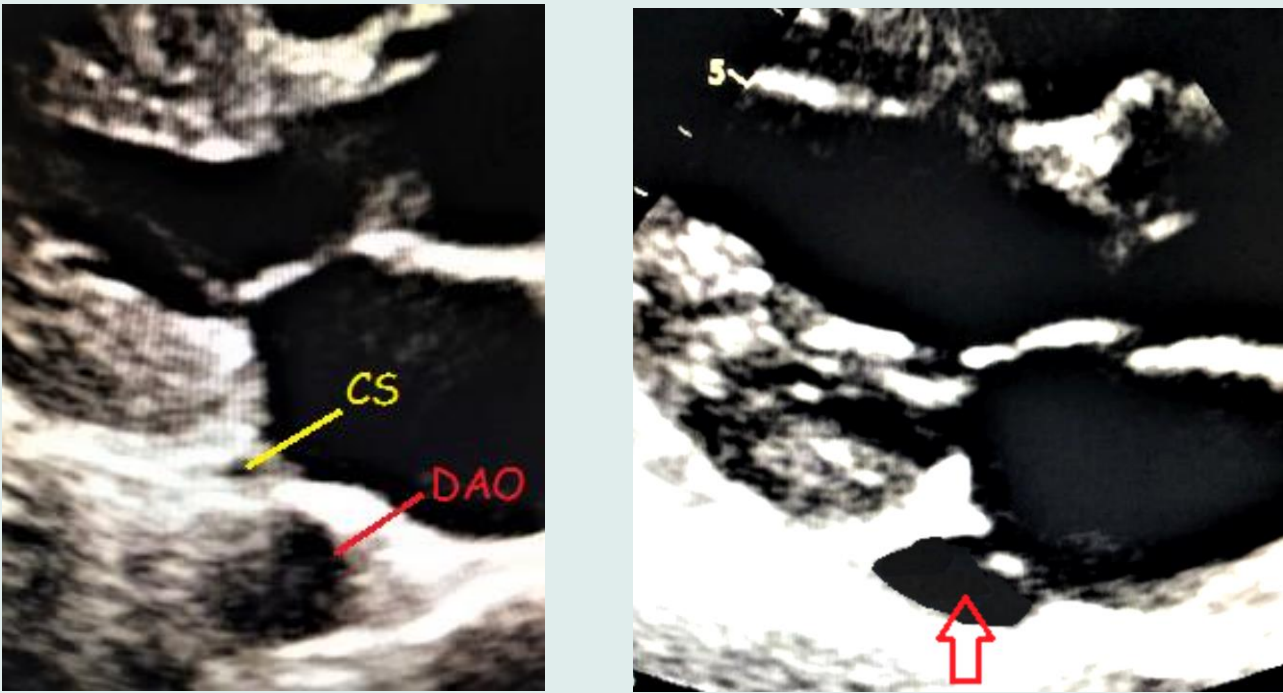
POP QUIZ!

What does the blue line indicate?

VIEW	PROTOCOL	IMAGES
LAX LV	<p>10) LA</p> <ul style="list-style-type: none"><li>• most posterior chamber</li><li>• reservoir that receives PV4 return</li><li>• passageway to LV</li><li>• contractile pump (atrial systole/kick)</li><li>• size is gender dependent &amp; indexed to BSA</li><li>• smaller than LV</li><li>• end-systolic anteroposterior LA linear dimension (female 27 - 38 mm, male 30 - 40 mm)</li><li>• LA linear dimension vs LAVi</li></ul>	 An echocardiogram image showing a cross-section of the heart. A red vertical line is drawn across the left atrium (LA) to measure its anteroposterior linear dimension at the end of systole. The LA is the dark, anechoic region in the center-right of the image.

POP QUIZ!

What percentage of LV filling is provided by the atrial kick?

VIEW	PROTOCOL	IMAGES
LAX LV	<p>11) SAX of CS</p> <ul style="list-style-type: none"> <li>• 4 - 10 mm</li> <li>• within myocardium</li> <li>• posterior to LA-LV junction</li> <li>• narrows during atrial contraction</li> </ul> <p>12) SAX of DAO</p> <ul style="list-style-type: none"> <li>• separate structure</li> <li>• posterior to LA</li> </ul>	

POP QUIZ!  
 What does the arrow indicate?