

SNS COLLEGE OF ALLIED HEALTH SCIENCE
Affiliated to The Tamil Nadu Dr MGR Medical University, Chennai



DEPARTMENT OF CARDIAC TECHNOLOGY

COURSE NAME : Echocardiography

UNIT : Basics of Echocardiography and Doppler study

TOPIC : Doppler echocardiography

FACULTY NAME: Kavipriya S

Case Study: Doppler Echocardiography in Evaluation of Mitral Regurgitation and Cardiac Dimensions

Case Overview

Patient: 48-year-old female

Symptoms: Exertional dyspnea, fatigue, occasional palpitations

Clinical Findings: Systolic murmur at apex radiating to axilla, mild ankle oedema

Suspected Diagnosis: Mitral regurgitation with possible left atrial enlargement

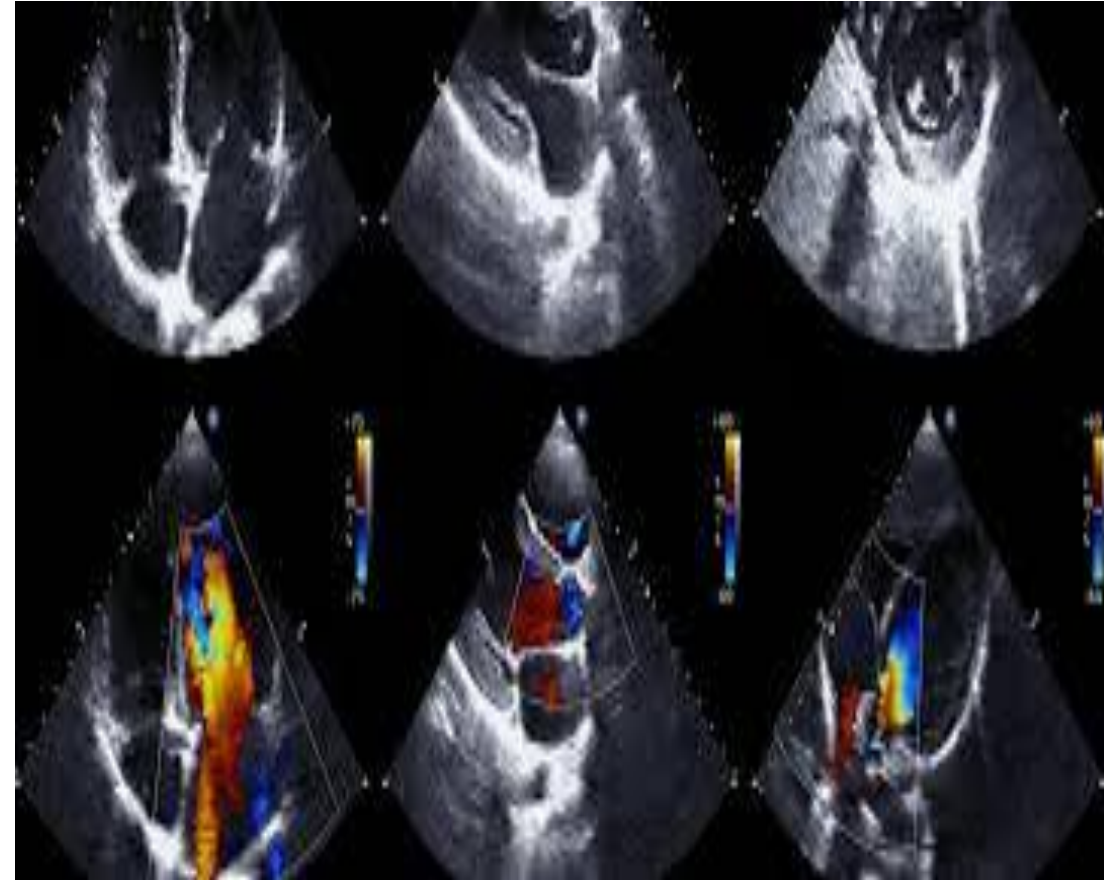
EMPATHIZE – Understanding the Patient and Clinical Need

Objective:

Identify how Doppler echocardiography assists in evaluating valvular flow and cardiac chamber dimensions in a symptomatic patient.

Key Questions:

1. What cardiac dysfunction could explain the murmur and dyspnea?
2. How can Doppler modalities help confirm regurgitation and quantify its severity?
3. Why is accurate measurement of chamber dimensions clinically important?



Empathize

Clinical Observation:

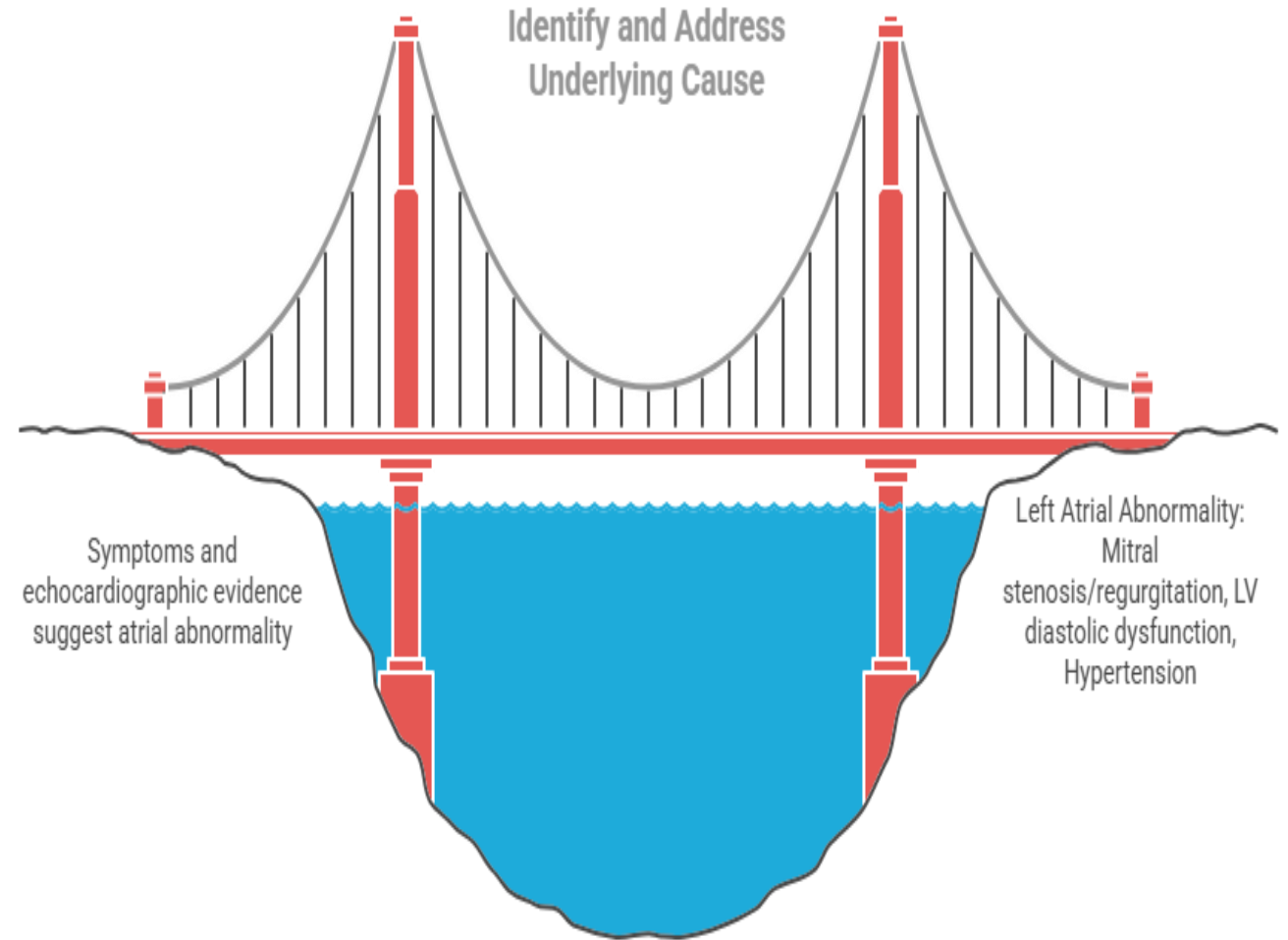
- ✓ MR causes volume overload → left atrial (LA) and left ventricular (LV) dilation.
- ✓ Doppler echocardiography offers **hemodynamic and functional assessment**, complementing structural imaging.



DEFINE – Establishing the Diagnostic Problem

Problem Statement:

How might we use Doppler echocardiography to confirm and quantify mitral regurgitation, and assess its impact on cardiac chamber dimensions?



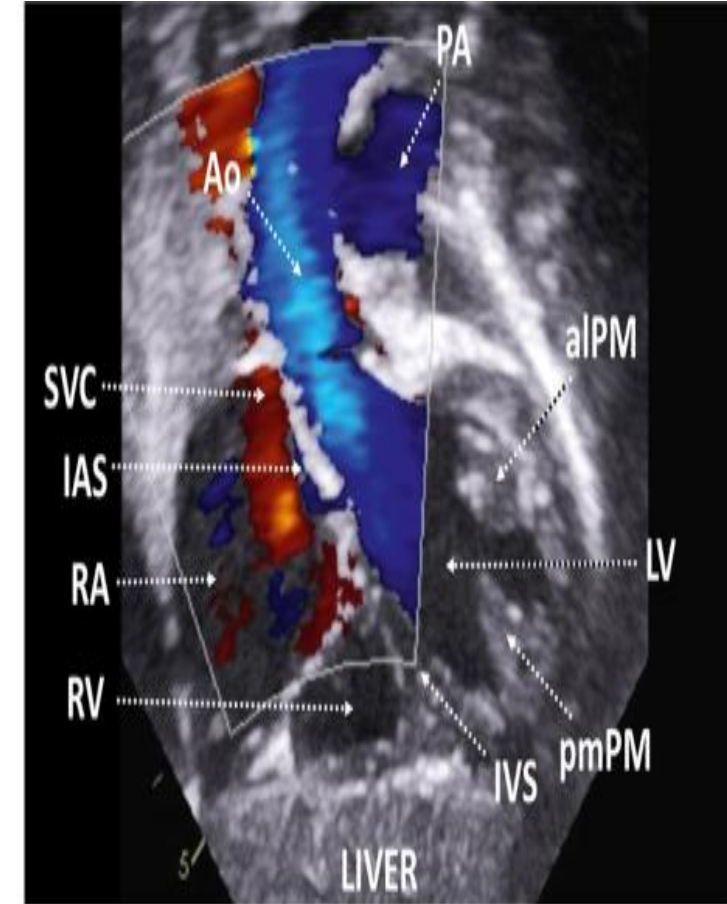
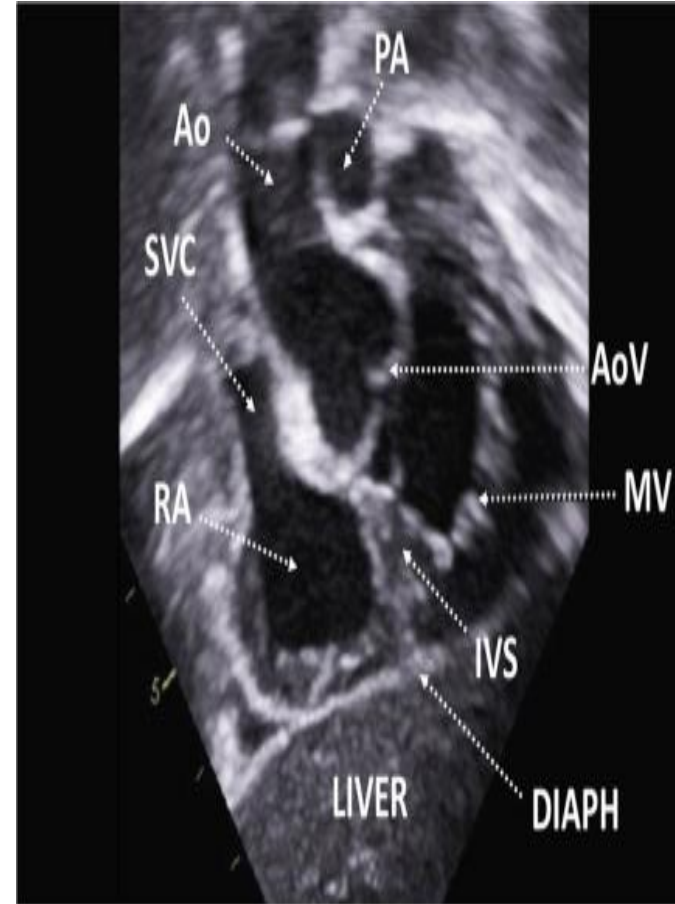
Define

Diagnostic Goals:

- Detect abnormal blood flow direction and velocity.
- Quantify regurgitant volume and pressure gradients.
- Measure LA and LV size and function accurately.

Key Diagnostic Needs:

- Pulsed, continuous, and color Doppler data.
- Standardized chamber dimension measurements (ASE guidelines).
- Reliable correlation between Doppler and 2D data.



Ideate Planning the Echocardiographic Strategy

Doppler Type	Key Feature	Application in Case
Pulsed Wave (PW)	Measures velocity at a specific location	Mitral inflow (E & A waves)
Continuous Wave (CW)	Measures high velocities along full cursor line	Detect MR jet peak velocity
Color Doppler	Displays flow direction & turbulence	Localize MR jet and regurgitant area

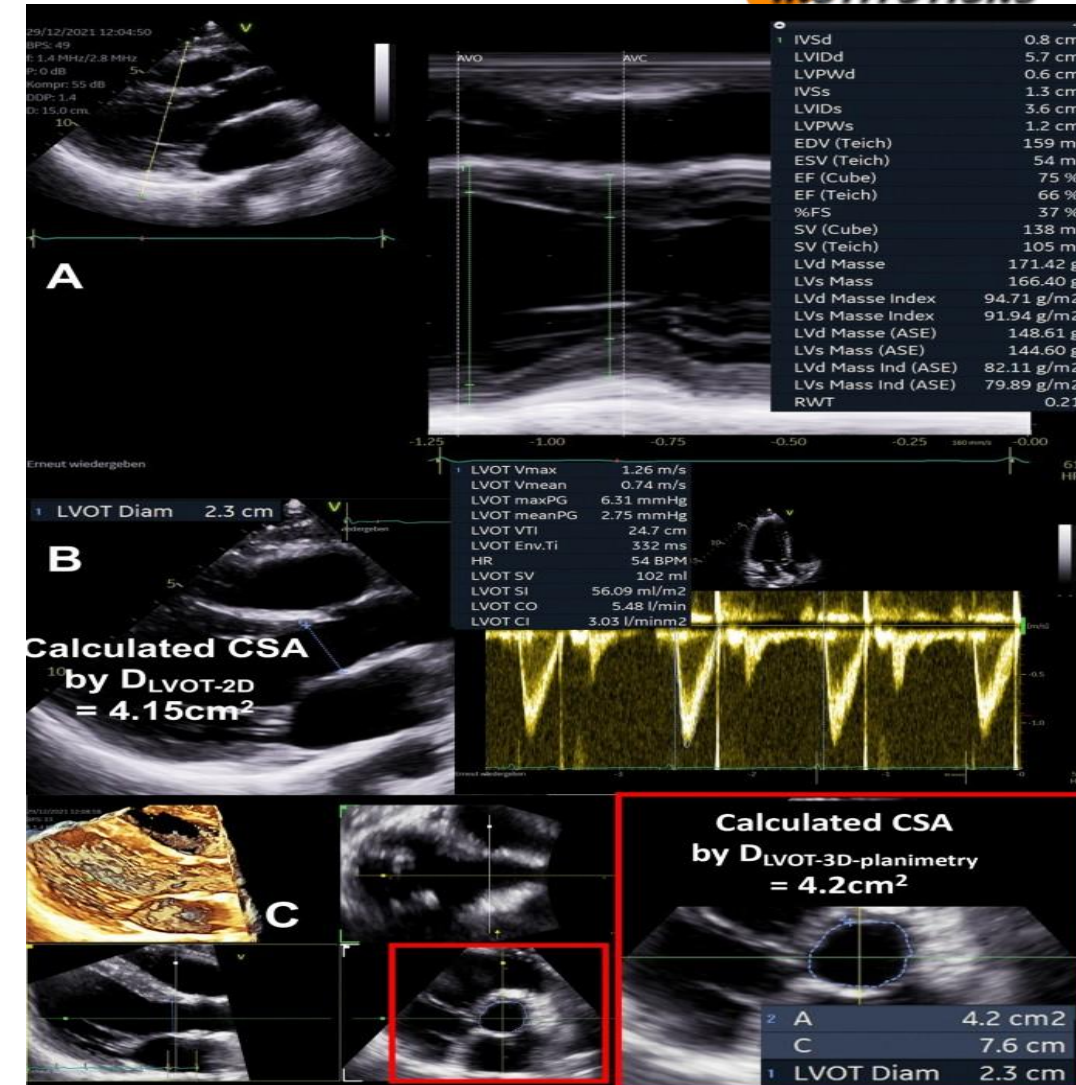
Ideate Planning the Echocardiographic Strategy

Additional Measurements (2D & M-mode):

- LV dimensions (LVIDd, LVIDs)
- LA diameter and volume
- LV ejection fraction (Teichholz / Simpson method)

Brainstorm Possible Tools:

- Parasternal long-axis (PLAX) and apical four-chamber (A4C) views
- Doppler sample placement at mitral valve tips and regurgitant jet
- Quantification using PISA or vena contracta (for MR severity)



PROTOTYPE – Performing the Doppler Echocardiographic Study

Step 1: Patient Preparation

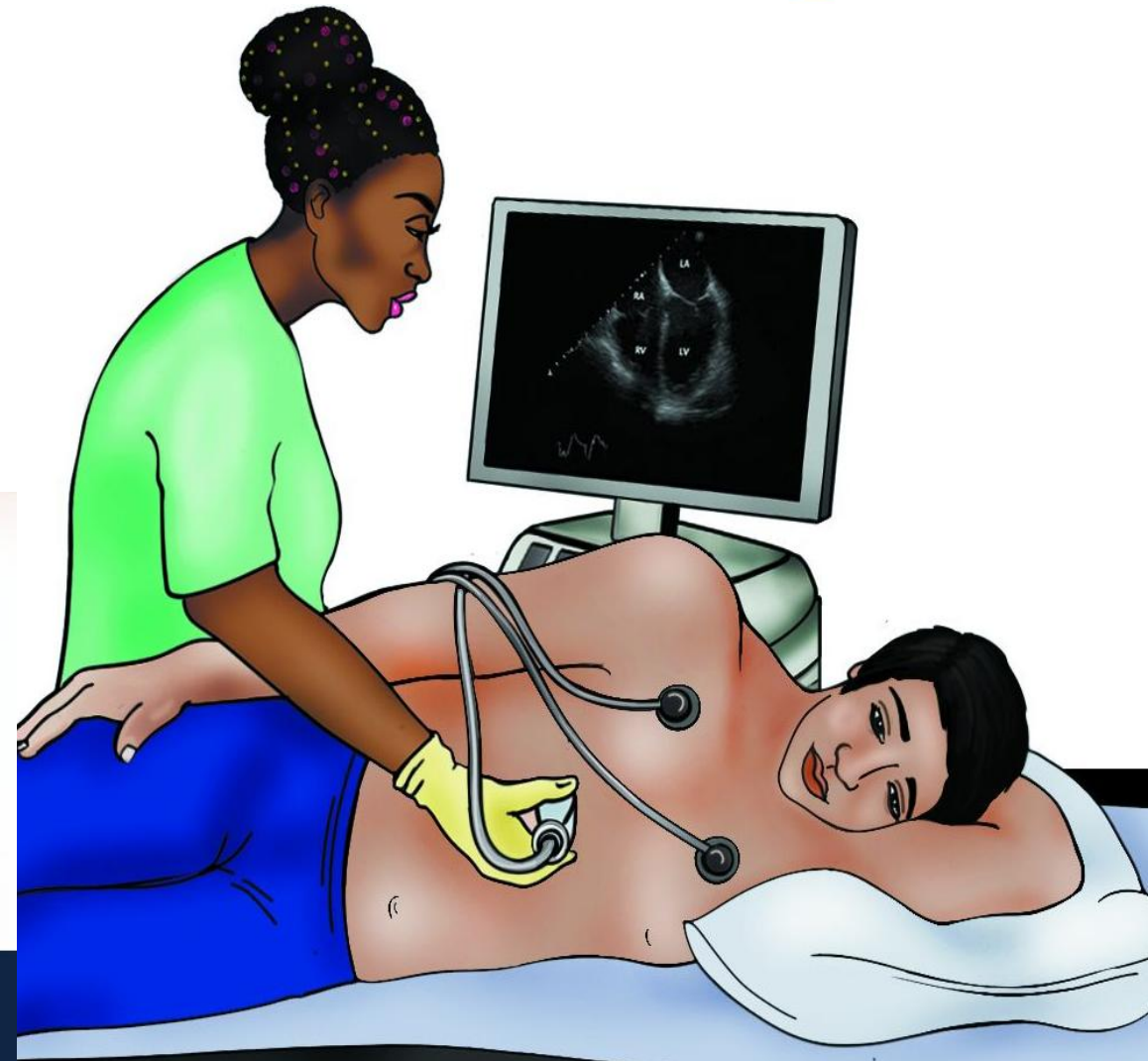
- Supine or left lateral position
- ECG lead attached for timing reference
- Use of 2.5–3.5 MHz transducer



Canon - PLT-1005BT
Linear Probe



Samsung - LA4-18B
Linear Probe



- **Step 2: 2D and M-Mode Baseline Imaging**

Measure:

- IVSd: 10 mm
- LVIDd: 54 mm (↑)
- LVIDs: 36 mm
- LVPWd: 10 mm
- LA diameter: 44 mm (↑)

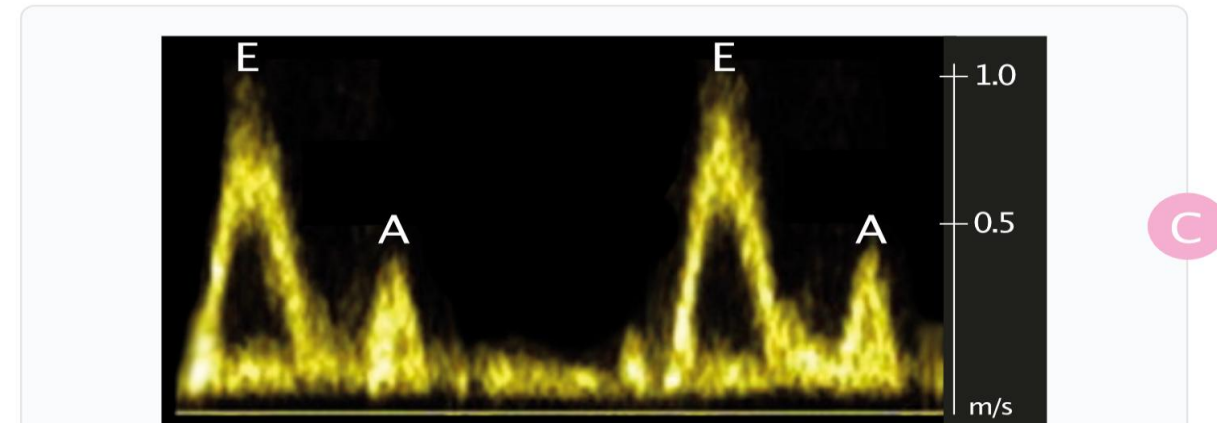
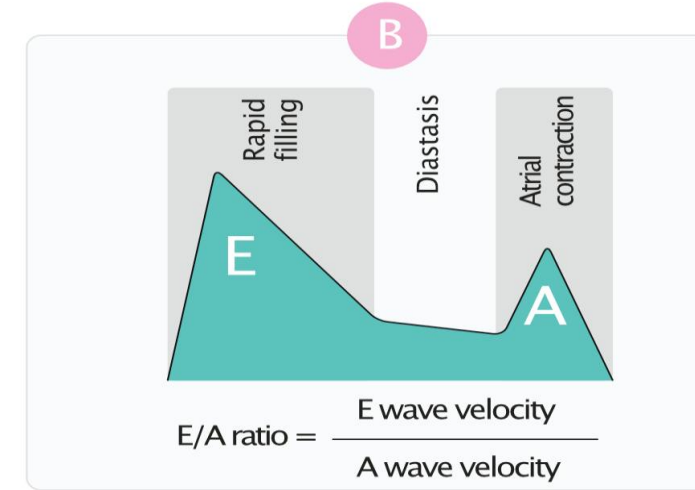
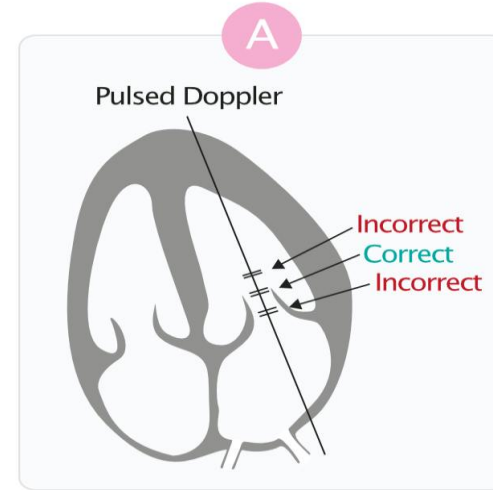
Interpretation: Mild LV dilation and LA enlargement



Step 3: Doppler Assessment

- **Pulsed Wave Doppler (Apical 4-Chamber view):**
 - Mitral inflow pattern: E/A ratio = 1.2
 - Deceleration time = 180 ms
- **Continuous Wave Doppler:**
 - MR jet with peak velocity = 5.2 m/s
 - Estimated pressure gradient = 108 mmHg
- **Color Doppler:**
 - MR jet area covers 30% of LA → *moderate MR*
 - No turbulence across aortic or tricuspid valves

Mitral inflow – E/A ratio



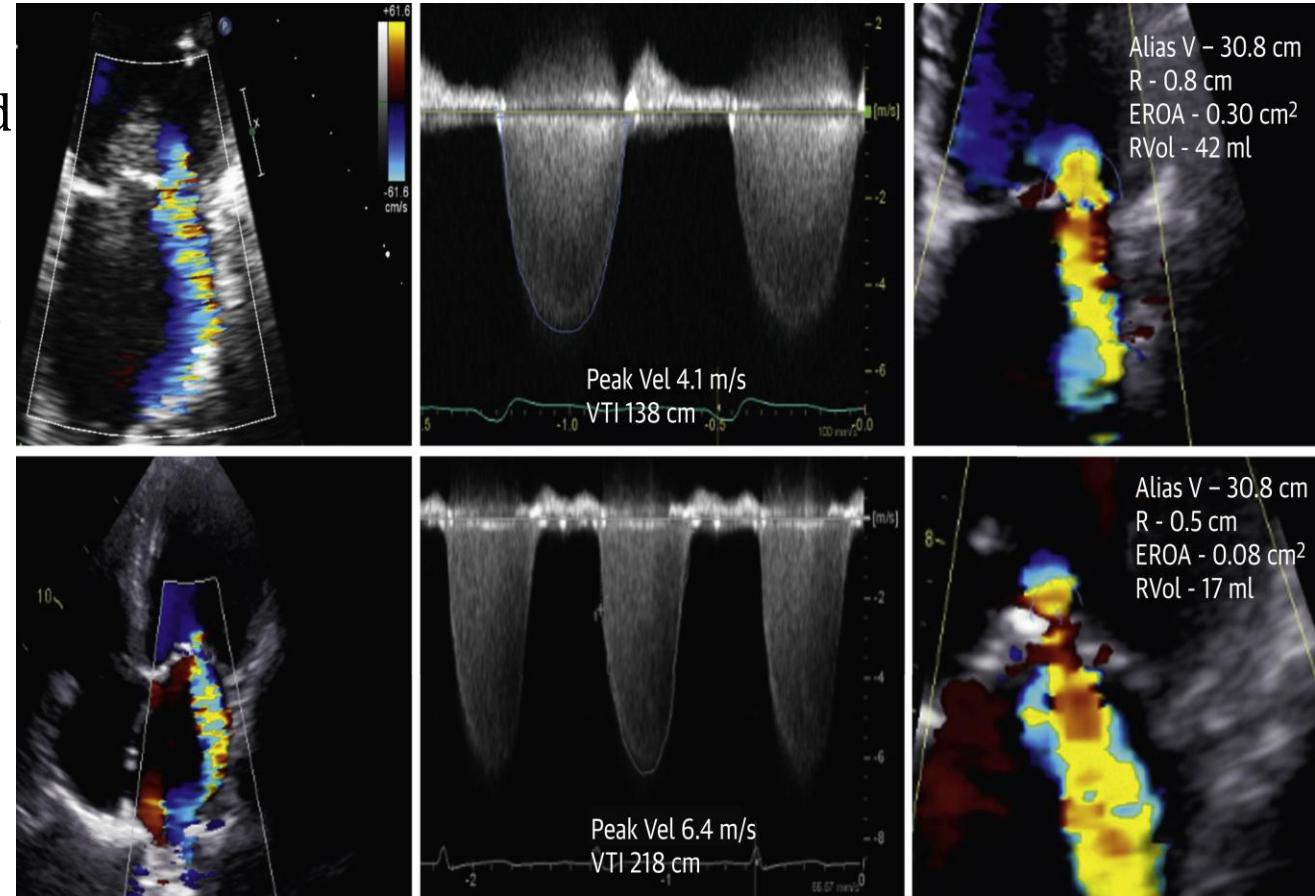
TEST – Clinical Interpretation and Refinement

Findings Summary:

- Moderate mitral regurgitation confirmed by CW and colour Doppler.
- PW Doppler shows normal LV filling pattern → mild diastolic dysfunction.
- LV and LA enlargement measured on 2D echo.

Echocardiographic Conclusion:

- Moderate MR with secondary LA enlargement and mild LV dilation; preserved LV systolic function (EF = 58%).

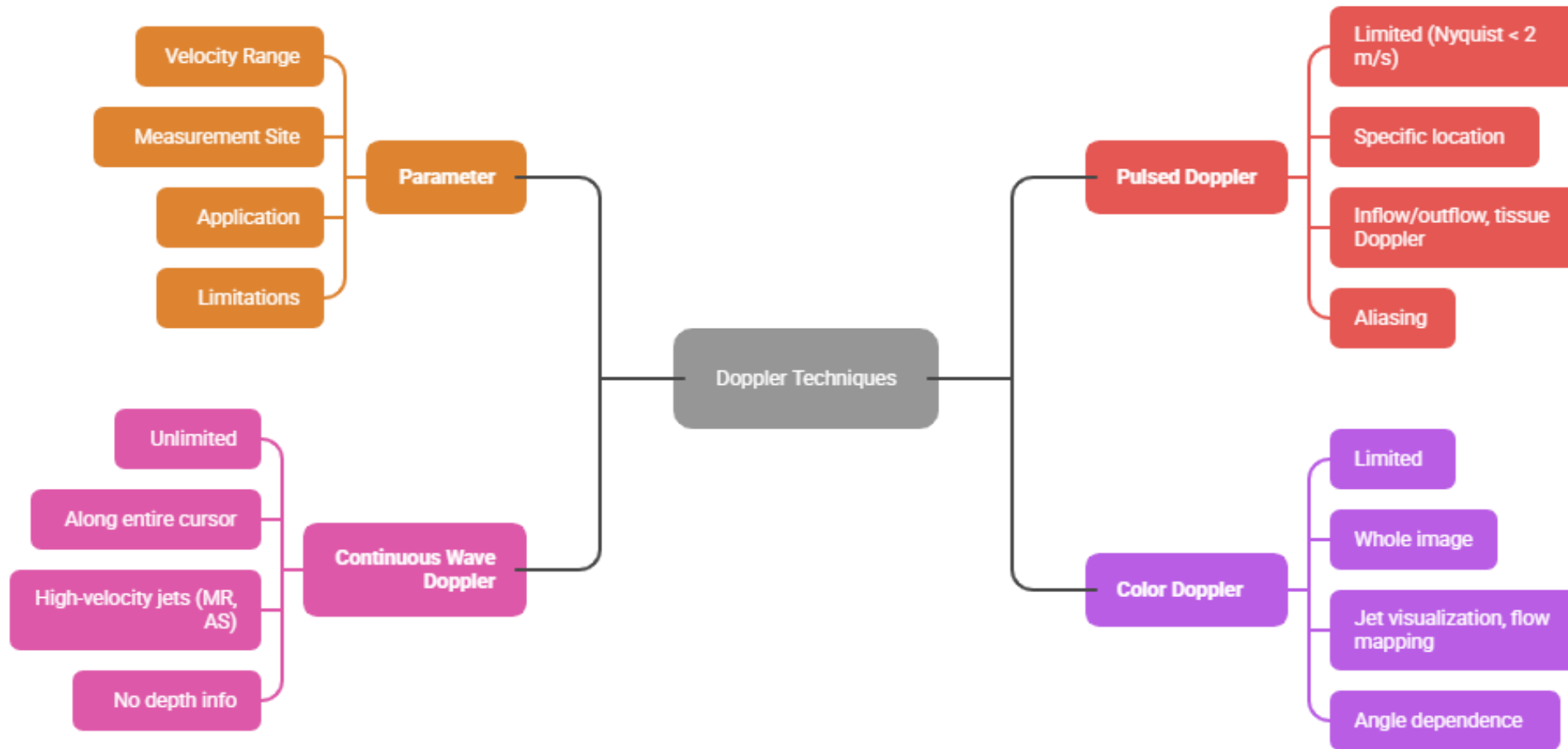


V 4.1 m/s = gradient 67 mmHg; BP 100/64; LAP 100-67= 33 mmHg
V 6.4 m/s = gradient 164 mmHg, BP 176/95; LAP 176-164= 12 mmHg

Measurement of Cardiac Dimensions (ASE Guidelines)

Parameter	Normal Range (mm)	Case Value (mm)	Interpretation
IVSd	6–10	10	Normal
LVIDd	35–52	54	Mildly ↑
LVIDs	20–38	36	Normal
LVPWd	6–10	10	Normal
LA Diameter	<40	44	Enlarged

Summary : Doppler Modalities in Echocardiography



References

- Otto CM, *Textbook of Clinical Echocardiography*, 6th Ed., Elsevier, 2022.
- Feigenbaum H., *Echocardiography*, 8th Ed., Lippincott Williams & Wilkins, 2018.
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- Oh JK et al., *The Echo Manual*, 4th Ed., Lippincott, 2018.
- Nagueh SF et al., “ASE Recommendations for the Evaluation of Valvular Regurgitation,” *JASE*, 2017.