

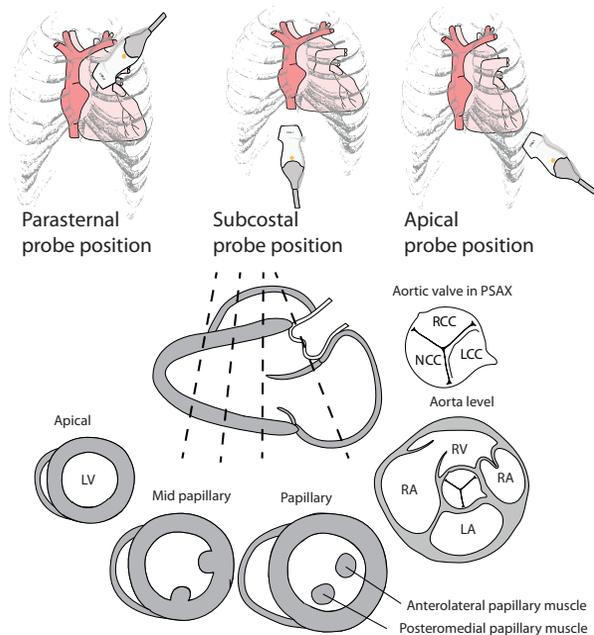
BEFORE YOU START AN ECHOCARDIOGRAPHIC EXAMINATION:

First insert patient ID.
Make sure you have a stable ECG recording with positive QRS.
Ask the patient to turn to the left side.
Make sure you set the total gain and depth for optimal visualisation of the endocardium.

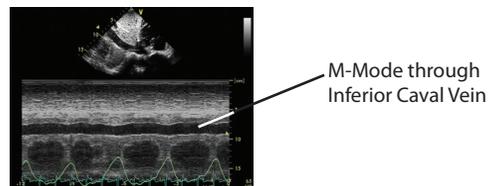
STANDARD EXAMINATION

1. Start with the parasternal long axis (PLAX) showing the mitral valve(MV) and the aortic valve(AV). The aorta should be open.
2. Record the MV and AV with color. When using color decrease the total gain.
3. Record MMode, perpundicular to the ventricular septum just below the tips of the MV leaflets for dimensions or measure 2D.
4. Rotate the probe 90 ° clockwise for the short axis (PSAX) and record on aortic level, tilting the probe cranially for the MV, papillary muscle and apical levels. Record color in the pulmonic palve (PV), AV and tricuspid valve(TV).
5. Record the apical 4 chamber (A4C).
6. Tilt the probe for the 5 chamber view with the aorta(A5C).
7. Rotate the probe to the 2 chamber view (A2C).
8. Rotate the probe to the 3 chamber view (A3C) (same structures visible as PLAX).
9. Record color in the MV and AV in the A3C, the MV in the A2C and the MV, AV, TV in A4C and A5C.
10. Record a pulsed wave(PW) doppler just at the tips of the MV leaflets for E/A ratio and record an PW tissue velocity imaging signal(TVI) of the interventricular septum.
11. Record a continuous wave(CW) in the AV.
12. Record a tricuspid annular plane systolic excursion (TAPSE) for right ventricular function.
13. Record a subcostal view.
14. Record the Inferior Caval Vein and ask the patient to sniff.
15. Record more on indication.

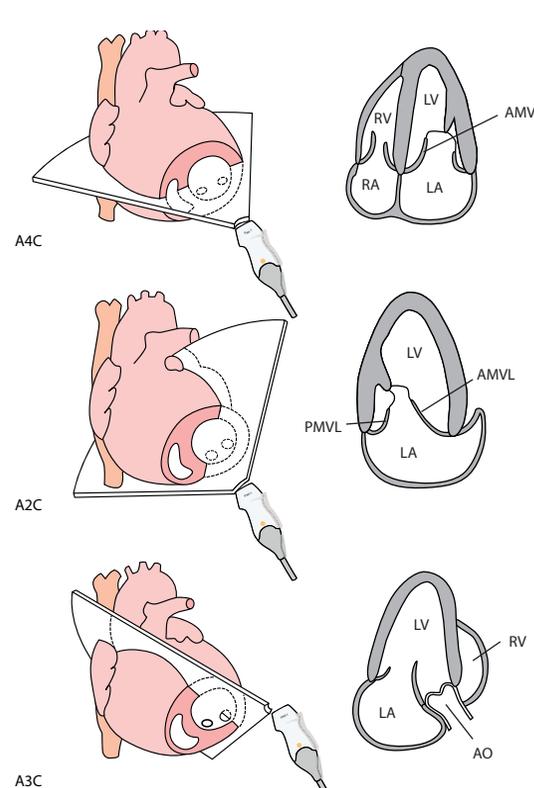
STANDARD PARASTERNAL TTE VIEWS



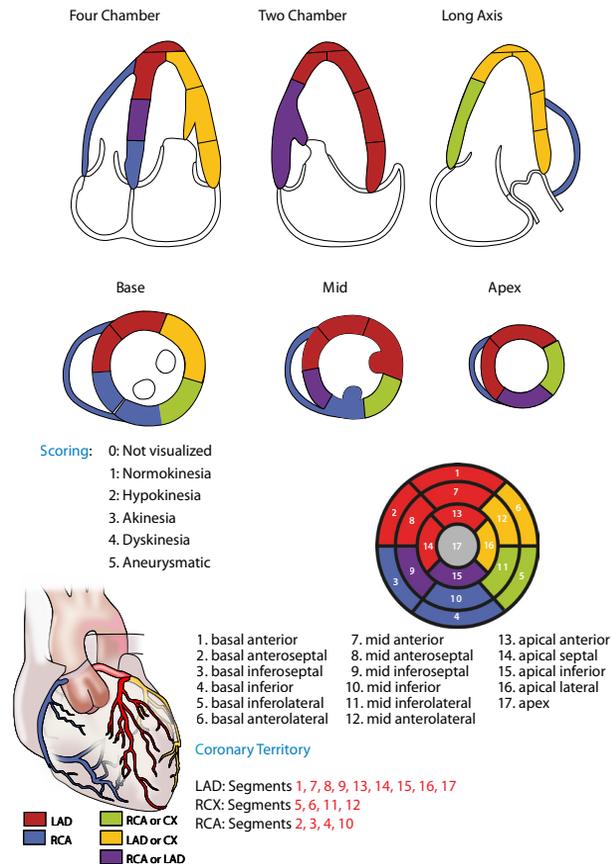
SUBCOSTAL VIEW



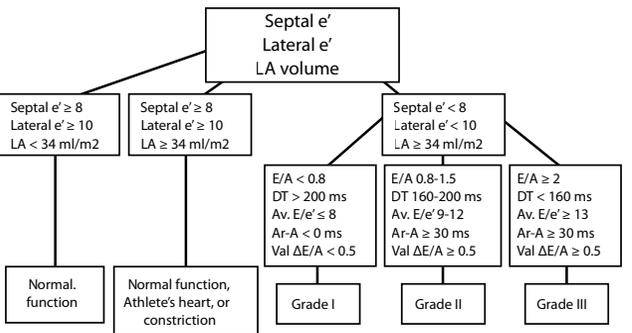
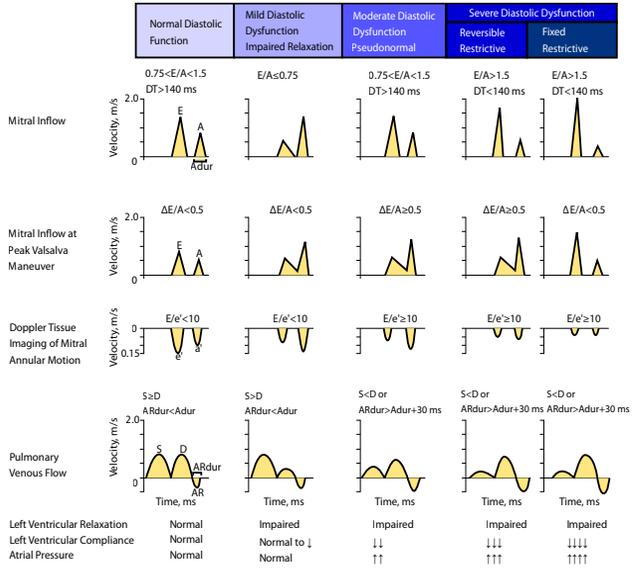
STANDARD APICAL TTE VIEWS



ASSESSMENT OF SYSTOLIC FUNCTION



ASSESSMENT OF DIASTOLIC FUNCTION



AORTIC VALVE STENOSIS SEVERITY

	Sclerosis	Mild	Moderate	Severe
Aortic jet velocity(m/s)	≤2.5	2.6-2.9	3.0-4.0	>4
Mean gradient (mmHg)	-	>20	20-40	>40
AVA(cm ²)	-	>1.5	1.0-1.5	<1
AVI=AVA/BSA(cm ² /m ²)	-	>0.85	0.6-0.85	<0.6

AORTIC VALVE REGURGITATION SEVERITY

	Mild	Moderate	Severe
Specific	Central Jet, width>25% LVOT ² Vena contracta <0.3 cm ² No/brief early diastolic flow reversal in descending aorta	Signs of AR>mild present but no criteria for severe AR	Central Jet, width ≥ 65% of LVOT ² Vena contracta > 0.6cm ²
Supportive	Pressure half time > 500 ms Normal LV size ¹	Intermediate values	Pressure half-time < 200 ms Holodiastolic aortic flow reversal in descending aorta Moderate or greater LV enlargement ³
Quantitative⁵	EROA ³ <0.10 RF (%) <30 R vol (ml/beat) <30	0.10-0.19 30-39/40-49 30-44/45-59	≥0.30 ≥50 ≥60

REFERENCE VALUES

	Normal	Normal
Ejection Fraction(%)	>55	
LV mass/BSA(g/m ²)	43-95	LVOT(cm) 1.8-2.4
Septal thickness(mm)	<12	RVOT(above AV)(cm) 2.5-2.9
Posterior wall thickness(mm)	0.6-1.0	TAPSE(cm) 1.5-2.0
LV diast. vol/BSA(ml/m ²)	35-86	LA volume/BSA(ml/m ²) 22 ±6
LV syst. vol/BSA(ml/m ²)	12-30	LA diameter/BSA(cm/m ²) 1.5-2.3
LVEDD(cm)	3.9-5.9	RA diameter/BSA(cm/m ²) 1.7-2.5
LV diast. volume/BSA(ml/m ²)	35-75	Aorta diameter (normal/Marfan) (mm)
LV syst. volume/BSA(ml/m ²)	12-30	<50/<45

MITRAL VALVE REGURGITATION SEVERITY

	Mild	Moderate	Severe
Specific	Small central jet <4 cm ² or <20% of LA area ² Vena contracta width <0.3 cm No or minimal flow convergence	Signs of MR>mild present but no criteria for severe MR	V. contracta ≥ 0.7cm, central MR jet(area < 40% of LA) or with a wall-impinging jet, swirling in LA ² . Large flow convergence ⁵ Syst. pulm. vein reversal
Supportive	Systolic dominant flow in pulmonary veins A-wave dominant mitral inflow ⁴ Soft density, parabolic CW Doppler MR signal Normal LV size ¹	Intermediate signs/findings	Dense, triangular CW Doppler MR jet E-wave dominant mitral inflow (E >1.2m/s) ⁴ . Dilated LV/LA ³ .
Quantitative⁶	EROA(cm ²) <0.20 RF (%) <30 R vol (ml/beat) <30	0.2-0.29/0.3-0.4 30-39/40-49 30-44/45-59	≥0.40 ≥50 ≥60

MITRAL VALVE STENOSIS SEVERITY

	Mild	Moderate	Severe
Specific	Valve area(cm ²) >1.5	1.0-1.5	<1.0
Supportive	Mean gradient(mmHg) <5 Pulmonary artery pressure(mmHg) <30	5-10 30-50	>10 >50

MITRAL VALVE STENOSIS WILKINS SCORE

Grade	Mobility	Leaflet Thickening	Calcification	Subvalvular thickening
1	Mobile valve, only leaflet tip restricted	4-5 mm	Single aea	minimal
2	Leaflet mid and basal normal	5-8 mm, middleleaflet normal	Scattered areas	Extending 1/3 of chordal length
3	Valve continues to move forward in diastole, mainly from the base	5-8 mm, extending through entire leaflet	Calcium extending into mid portion of leaflet	Extending to distal third of chords
4	No or minimal forward movement of the leaflets in diastole	>8-10 mm	Extensive throughout most of the leaflet	Extensive, extending to papillary muscle

LEFT VENTRICULAR FUNCTION

LV dysfunction	Normal	Mild	Moderate	Severe
Ejection Fraction(%)	>54	45-54	30-44	<30
Fractional Shortening				
Endocardial(%)	25-45	20-26	15-21	≤14
Midwall(%)	12-23	12-14	10-12	≤10

AVA, Aortic valve area; AR, Aortic regurgitation; EROA, effective regurgitant orifice area; LV, left ventricle; L(R)VOT, left(right) ventricular outflow tract; R Vol, regurgitant volume; RF, regurgitant fraction; LVEDD, LV end diastolic diameter; TAPSE, tricuspid annular plane systolic excursion; LA, left atrium; RA Right atrium; BSA, Body Surface Area. CW, Continuous wave.

¹LV size applied only to chronic lesions.

²At a Nyquist limit of 50-60 cm/s.

³In the absence of other etiologies of LV dilatation.

⁴Usually above 50 years of age or in conditions of impaired relaxation, without elevated LA pressure(MS).

⁵Minimal and large flow convergence defined as a flow convergence radius < 0.4 cm and ≤ 0.9 cm for central jets, respectively, with a baseline shift at a Nyquist of 40 cm/s; Cut-offs for eccentric jets are higher, and should be angle corrected (see text).

⁶Quantitative parameters can help sub-classify the moderate regurgitation group into mild-to-moderate and moderate-to-severe as shown.