

Maternal heart imaging

A guide to understanding normal cardiac anatomy and basic cardiac assessment

Coral García González
Hospital Universitario de Torrejón

Paula Prieto Pérez
Hospital Universitario de Torrejón

María Cristina Casanova Pedraz
Hospital Universitario de Torrejón

María del Mar Gil Mira
Hospital Universitario de Torrejón

The basics

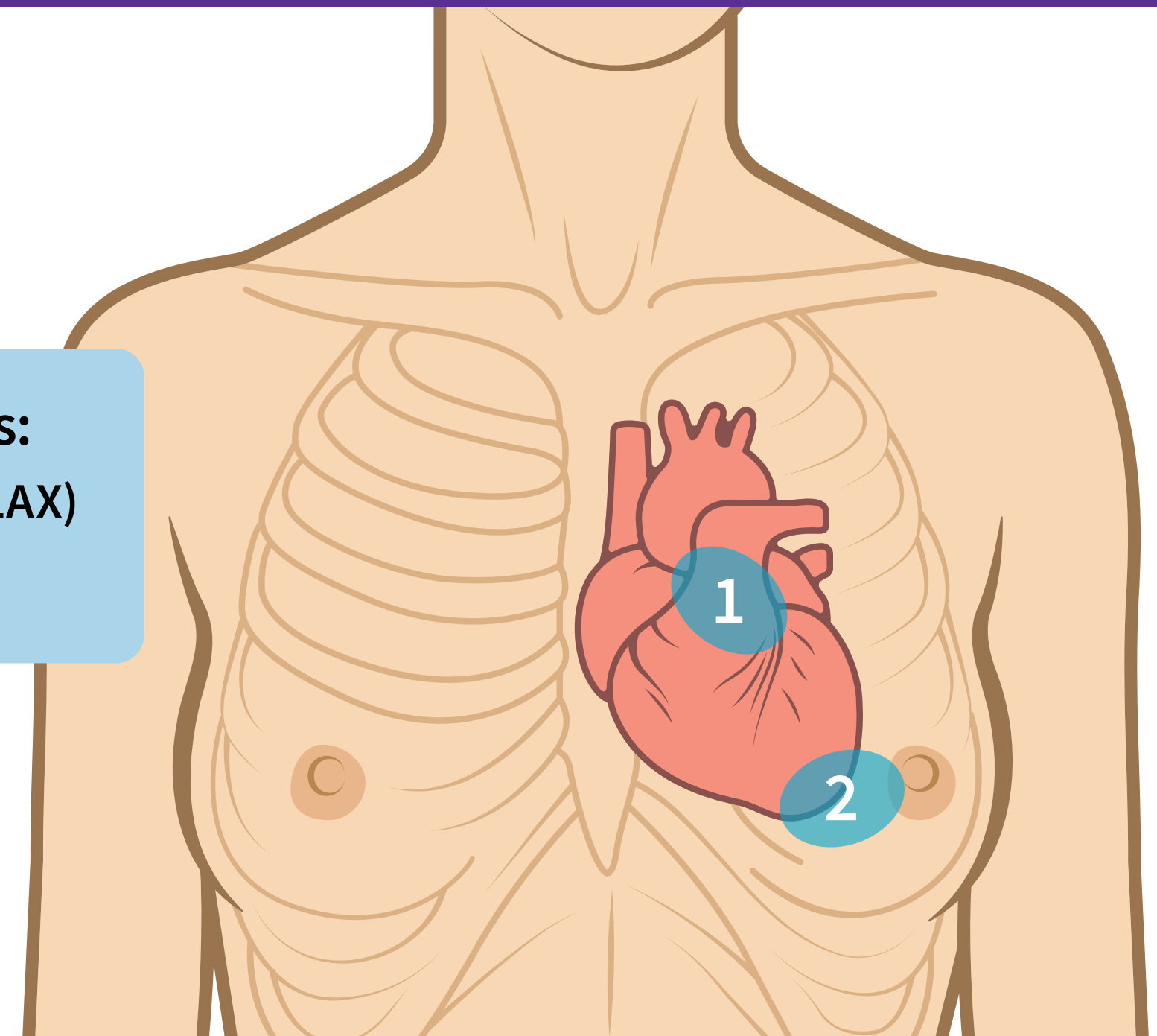
Ergonomics and set-up

- Stand at the level of the patient's shoulders, facing the ultrasound system.
- Adjust the height of the patient's bed and ultrasound system so you are in a comfortable position while scanning.
- It is recommended to scan with your left hand.

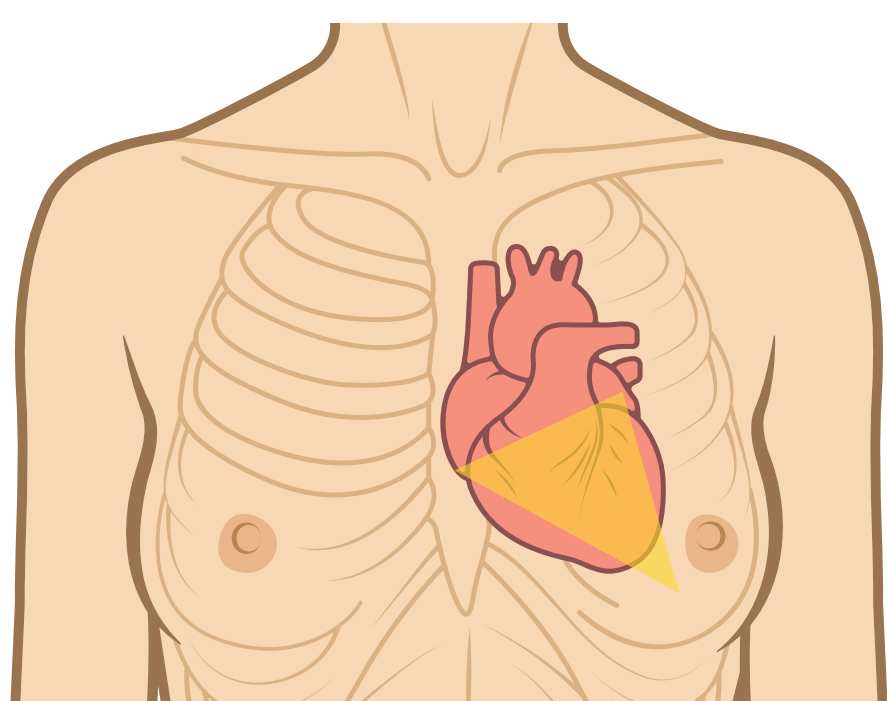
The patient

- The patient should be lying on her left side – this will bring the heart closer to the chest wall.
- Abduct the patient's left arm – this will open the intercostal spaces.

Main transthoracic windows:
1. Parasternal long-axis view (PLAX)
2. Apical 4-chamber view (A4C)



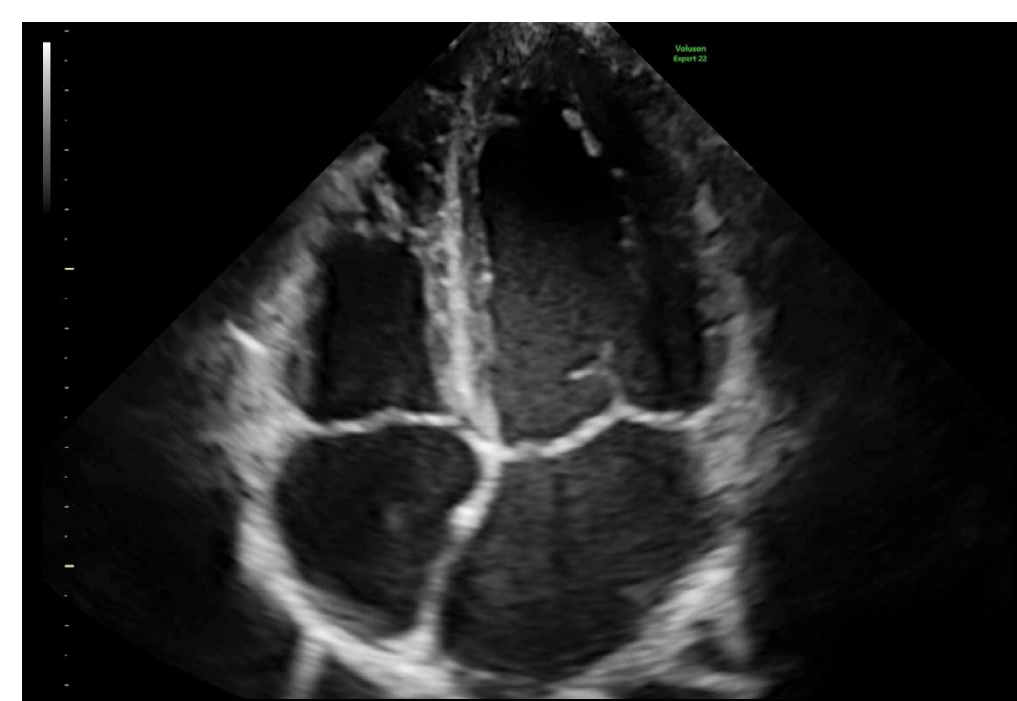
Apical Four-Chamber View (A4C)



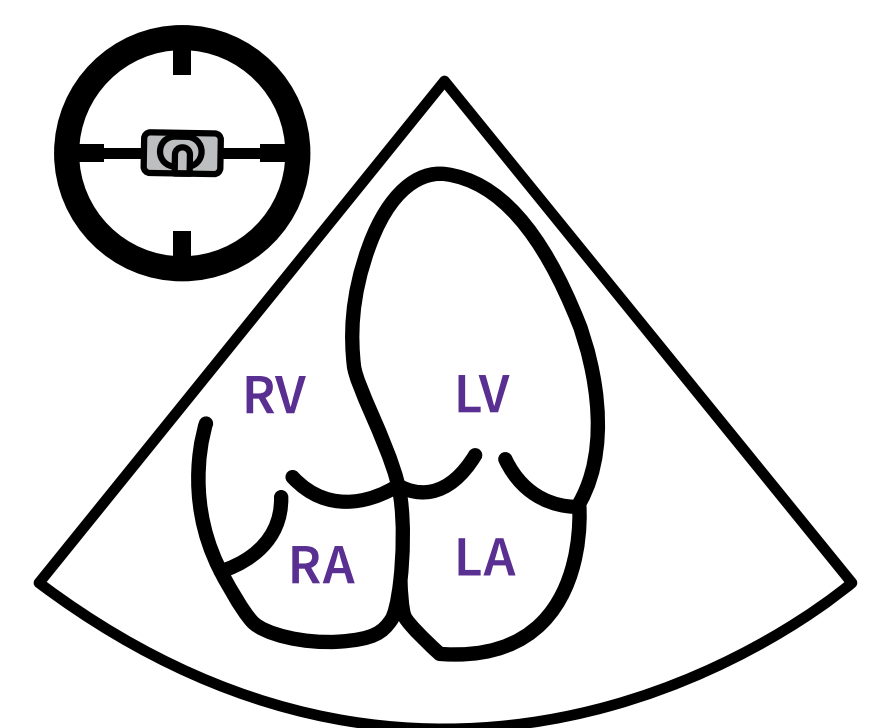
Transducer orientation marker is at ~3 o'clock.



The transducer is placed on the apical impulse, below the left breast tissue (5th intercostal space).



Identify full excursion of the two mitral leaflets and two of the tricuspid leaflets.

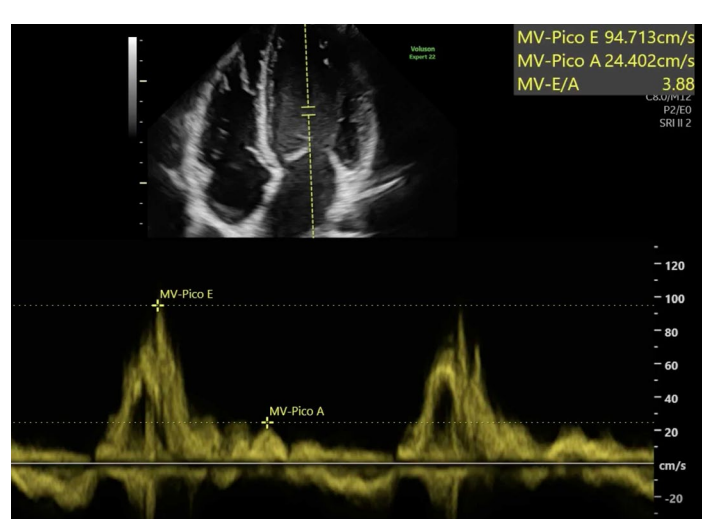


Optimize image so that all four chambers are seen, with left-sided structures appearing on the right, right-sided structures on the left, and the apex of the LV at the top.

Basic measurements

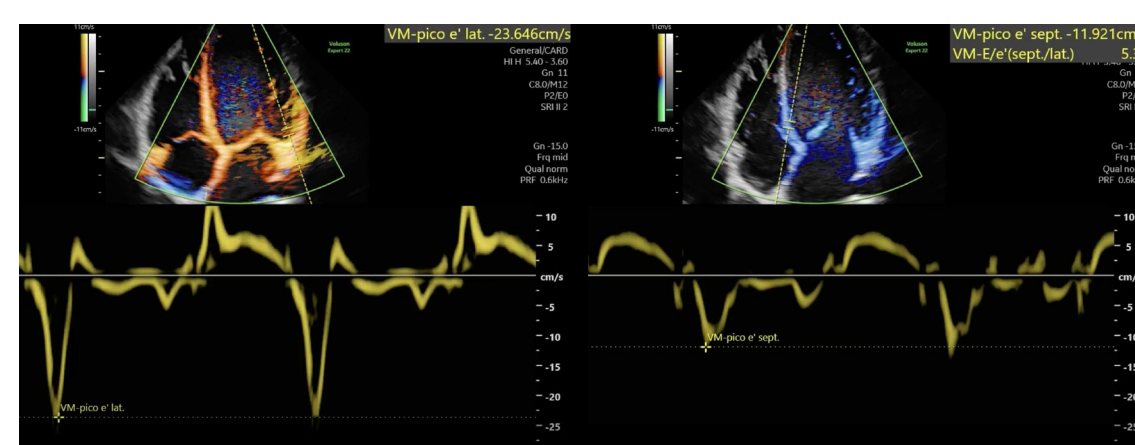
1. Mitral valve (MV)

PW Doppler



- Sample volume: 1-3-mm
- At the tips of the open MV leaflets
- **Measure peak velocities:**
 - E wave (early diastole)
 - A wave (atrial contraction)

Tissular Doppler Imaging (TDI)



- Measure velocities of the longitudinal movement of the lateral and medial MV annulus
- Sample volume 5-10 mm and scale ~ 25 cm/sec

- **Measure peak velocities:**
 - E' lateral (lateral MV annulus movement in early diastole)
 - E' septal (septal MV annulus movement at early LV filling)

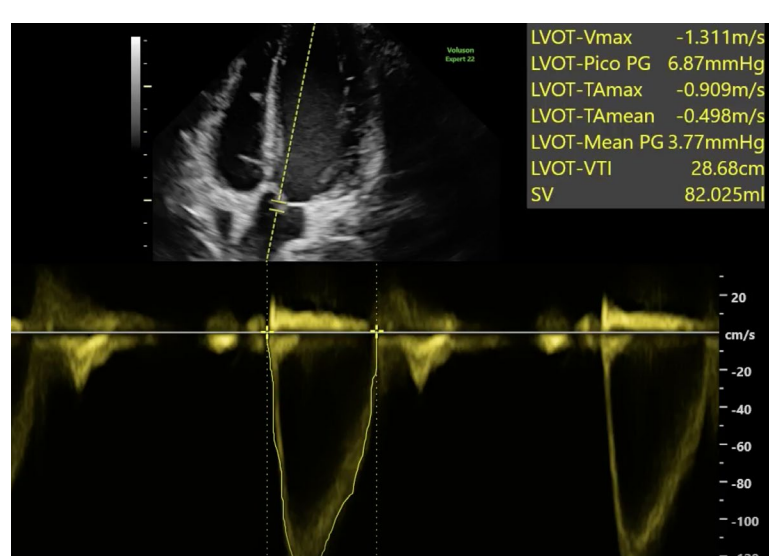
Calculated parameters:

1. E/A
2. E/E' (average lateral and septal E')

2. Left ventricular outflow tract (LVOT)

PW Doppler

Tilting the probe anteriorly from the A4C view shows the LVOT in the Apical Five-Chamber View

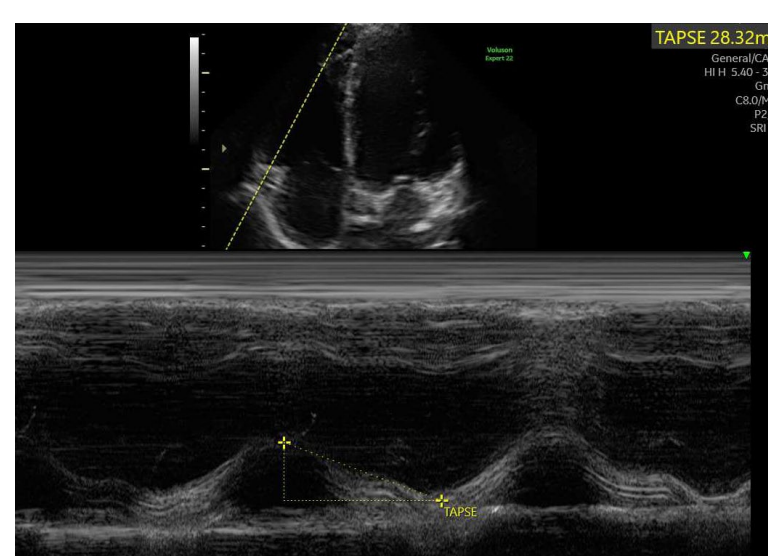


- Sample volume: 1-3-mm
- 5 mm proximal to the AV

- **Measure:**
 - LVOT peak velocity
 - **Velocity-time integral (VTI):** area under the LVOT curve, manual trace
 - Heart rate (HR)

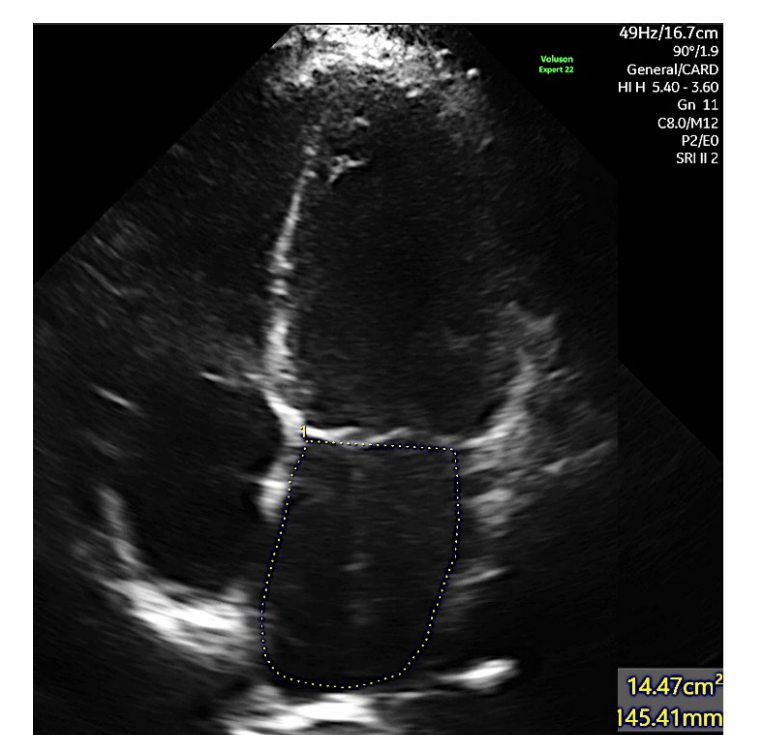
3. Tricuspid valve (TV)

Use M-mode parallel to motion of lateral TV annulus to assess tricuspid annular systolic excursion (TAPSE) and measure the distance from minimum to maximum excursion



4. Left atrium (LA)

Trace the endocardial borders in the A4C view and complete by drawing a line from one aspect of the annulus to the opposite side. The atrial appendage and pulmonary veins should not be included.



Recommended literature

- Mitchell C, Rahko PS, Blauwet LA, Canaday B, Finstuen JA, Foster MC, Horton K, Ogunyankin KO, Palma RA, Velazquez EJ. Guidelines for Performing a Comprehensive Transthoracic Echocardiographic Examination in Adults: Recommendations from the American Society of Echocardiography. *J Am Soc Echocardiogr.* 2019 Jan;32(1):1-64. doi: 10.1016/j.echo.2018.06.004.
- Lang RM, Badano LP, Mor-Avi V, Afilalo J, Armstrong A, Ernande L, Flachskampf FA, Foster E, Goldstein SA, Kuznetsova T, Lancellotti P, Muraru D, Picard MH, Rietzschel ER, Rudski L, Spencer KT, Tsang W, Voigt JU. Recommendations for cardiac chamber quantification by echocardiography in adults: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *J Am Soc Echocardiogr.* 2015 Jan;28(1):1-39.e14. doi: 10.1016/j.echo.2014.10.003.
- Nagueh SF, Smiseth OA, Appleton CP, Byrd BF 3rd, Dokainish H, Edvardsen T, Flachskampf FA, Gillebert TC, Klein AL, Lancellotti P, Marino P, Oh JK, Popescu BA, Waggoner AD. Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *J Am Soc Echocardiogr.* 2016 Apr;29(4):277-314. doi: 10.1016/j.echo.2016.01.011.