



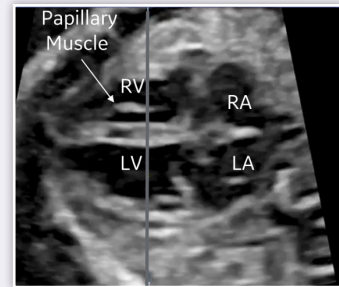
Voluson™ fetalHQ Consensus Guidelines

Conduct an easy and comprehensive evaluation of the size, shape and contractility of the fetal heart from the 4-chamber view using measurements based on 2D imaging and speckle tracking. fetalHQ contains an in-depth report page including z-scores and percentiles for each of the cardiac measurements. These consensus guidelines can provide steps to optimize your fetalHQ exams.

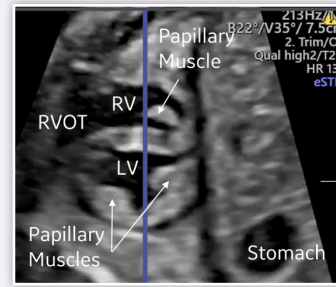
ACQUISITION OF AN IDEAL 4-CHAMBER VIEW FOR fetalHQ

Septal Orientation

- Choose Fetal Cardiac Preset – Harmonic mid or low, narrow angle, low depth
- Frame rate: min. 80 Hz*
- Heart located centrally within the image
- Orientation:
 - Septum horizontal, 3 or 9 o'clock position, up to ±45° from horizontal – orientations marked in green are preferred
 - Scan between the ribs, no rib shadow visible



Optimal 4-chamber view from a 25 week fetus.



B-Plane at the desired level (blue line) should be between the two papillary muscles of the left ventricle, and just off center to the papillary muscle of the right ventricle at the maximum width of the heart.

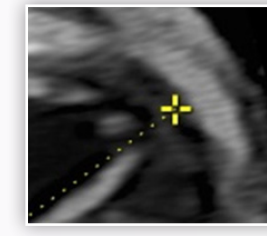
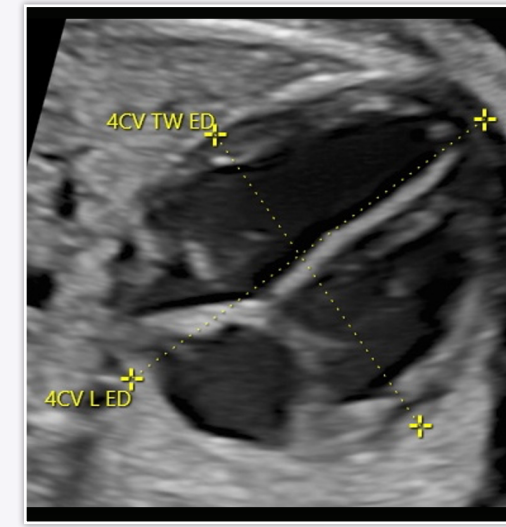
Left ventricle: papillary muscles should not be visible.

Right ventricle: papillary muscle can be visible during systole, moderator band can be visible.

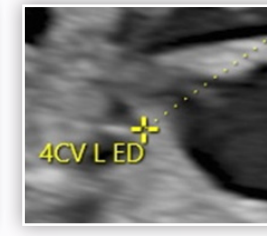
* Goal of fetalHQ is to have a good contour detection to outline the endocardium in ES and ED. Framerates < 100 Hz are considered acceptable because ES and ED tracings are adjusted manually if needed. For Strain Analysis of the entire cardiac cycle, framerates > 100 Hz are recommended.

- Obtain recording in absence of fetal corporal and respiratory movements
- Consider asking mother to hold her breath
- Avoid arrhythmia during the acquisition, repeat if necessary
- Save 2-3 seconds clip (approximately 3-5 cardiac cycles)

OBTAIN GLOBAL SPHERICITY INDEX – SIZE AND SHAPE



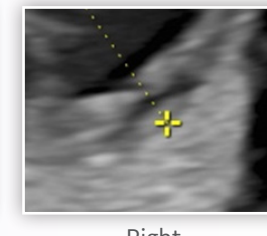
Apex



Base



Left



Right

Go to end diastolic image (1st image where AV valves are closed)

- Set 4CV-Length: Epicardium (apex), parallel to the ventricular septum to epicardium (between right and left atrium, outside the atrial septum)
- Set 4CV-Width: Epicardium to epicardium on the widest diameter, perpendicular to the septum

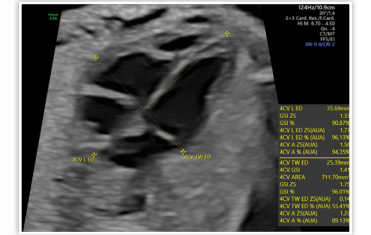


Image of normal size and shape results

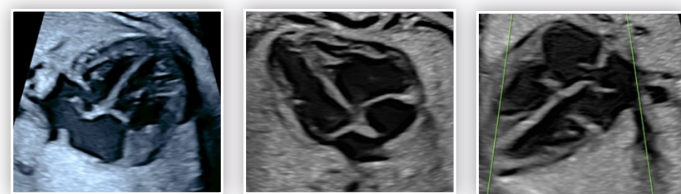
- Size: 4CV-Length, 4CV-Width, Area
- Shape: GSI (Global Sphericity Index)



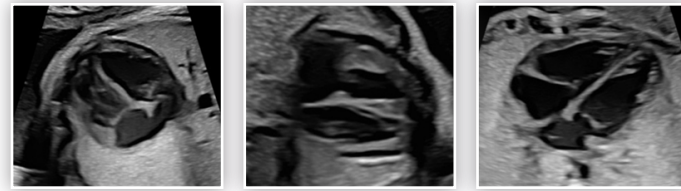
Image highlights abnormal size and shape due to aortic stenosis.

VENTRICULAR ANALYSIS FOR CONTRACTILITY

STEP 1 | DEFINE ORIENTATION



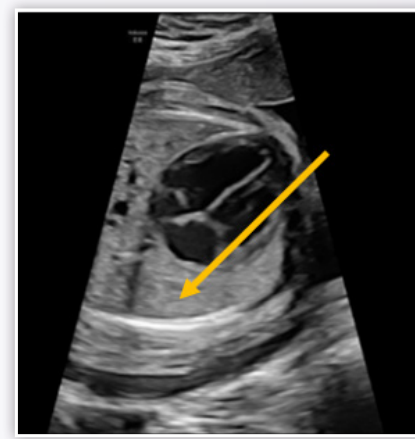
Orientation acceptable



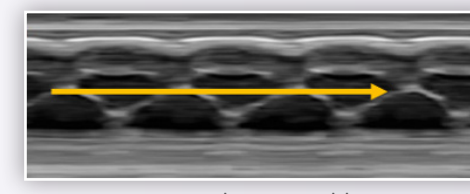
Orientation not acceptable – flip

- Left ventricle should be on the left, if apex is up – Left ventricle should be clockwise before the right ventricle
- If not, flip function on touch panel

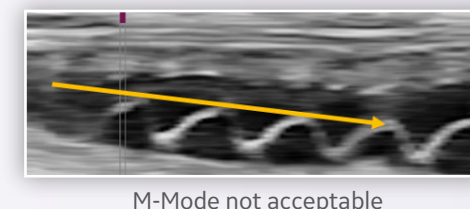
STEP 2 | SELECT ONE CARDIAC CYCLE



Draw M-Mode line from apex through the lateral base of the right ventricle (tricuspid valve lateral anulus).

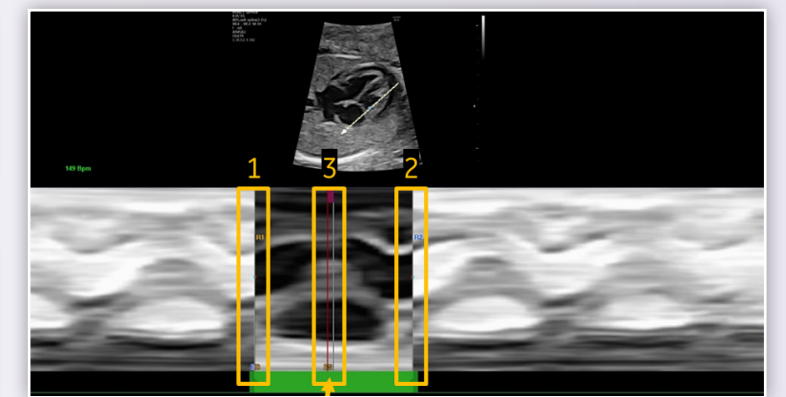


M-Mode acceptable



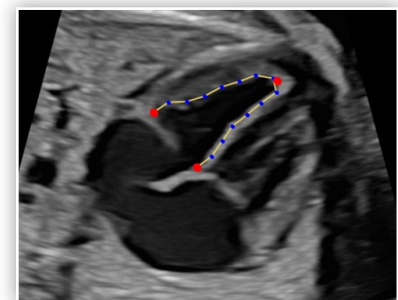
M-Mode not acceptable

On M-Mode tracing, ensure there is no drifting (due to fetal movement or maternal breathing).



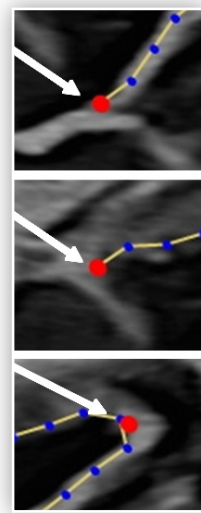
- Select end diastole (mid portion of the lowest anulus position on M-Mode trace); if visible, 1st image after AV-valves closed
- Select end diastole to mark end of selected cycle
- Select end systole between the 2nd diastole markers (highest anulus position on M-Mode trace); if visible, 1st image before AV-valves open

STEP 3 | DEFINE LEFT VENTRICULAR END-SYSTOLIC ENDOCARDIAL TRACING



Tracing should be placed on the endocardial border.

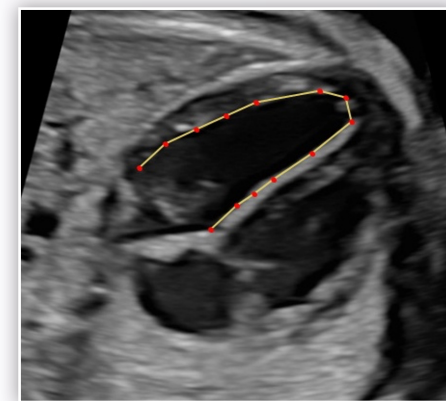
- Septal mitral valve insertion
- Lateral mitral valve insertion
- Apex



Adjust tracing if needed:

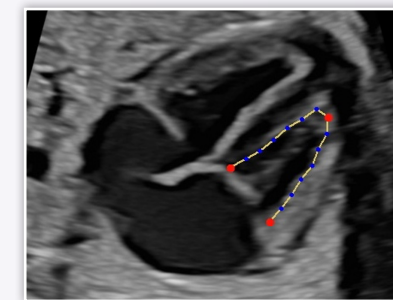
- Adjust red anchor points first
- Fine tune on blue dots

STEP 4 | DEFINE LEFT VENTRICULAR END-DIASTOLIC TRACING



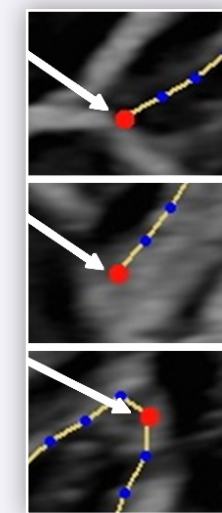
Adjust red dots if needed (contour should follow endocardial border).

STEP 5 | DEFINE RIGHT VENTRICULAR END-SYSTOLIC ENDOCARDIAL TRACING



Tracing should be placed on the endocardial border.

- Septal tricuspid valve insertion
- Lateral tricuspid valve insertion
- Apex

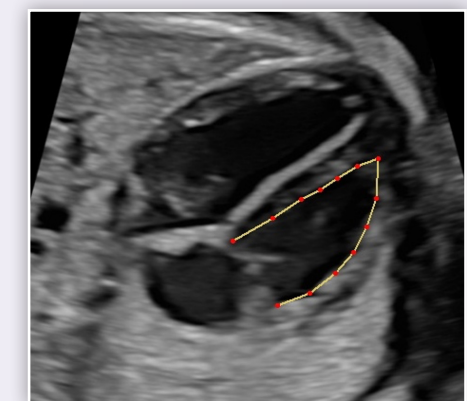


Adjust tracing if needed:

- Adjust red anchor points first
- Fine tune on blue dots

Papillary Muscle should be inside the contour.
Moderator Band (if visible) should be inside contour.

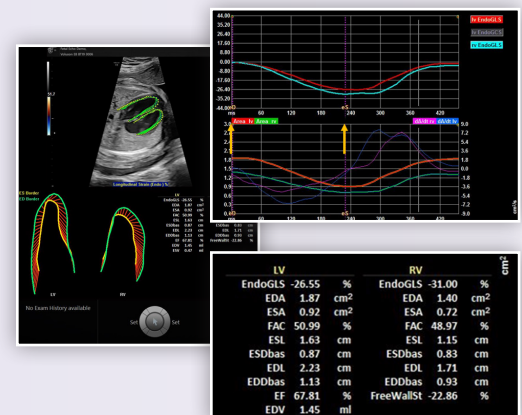
STEP 6 | DEFINE RIGHT VENTRICULAR END-DIASTOLIC TRACING



Adjust red dots if needed (contour should follow endocardial border).

fetalHQ REPORT AND RESULTS

Advanced Report



ES and ED can be adjusted here by moving the lines

Top Graph

- LV Endocardial Global Longitudinal Strain
- RV Endocardial Global Longitudinal Strain

Bottom Graph - Left Side

- LV Area - Area displayed over time
- RV Area - Area displayed over time

Bottom Graph - Right Side

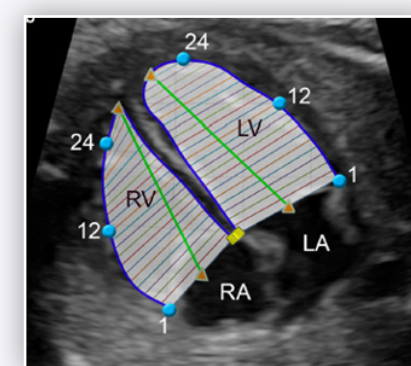
- RV Area - Area displayed over time
- LV Area - Area displayed over time

Parameter	Value	Unit
EndDiGS (%)	25.55	%
EndDiGS - RV (%)	31.00	%
EDA	1.87	cm ²
EDA - RV	1.40	cm ²
ESA	0.92	cm ²
ESA - RV	0.72	cm ²
FAC	50.99	%
FAC - RV	48.37	%
ESDbas	0.82	cm
ESD - RV	0.83	cm
EDL	2.23	cm
EDL - RV	1.71	cm
EDDbas	1.15	cm
EDD - RV	0.83	cm
EF	47.83	%
FreeWallStr	22.86	%
EDV	5.45	ml

Global Analysis



- Size: 4CV-Length, 4CV-Width, Area
- Shape: GSI (4CV-Length/4CV-Width)



Based on 24 segment analysis for right and left ventricle.



- Size – End Diastolic Diameter (ED)
- Shape – Sphericity Index (SI): ventricular length/end diastolic diameters
- Contractility – Fractional Shortening (FS): (end-diastolic diameter-end-systolic diameter)/end-diastolic diameter x 100

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GE would like to thank the following expert contributors for their scientific guidance: Prashant Acharya, Hagai Avnet, Gregory DeVore, Christian Enzensberger, Edgar Hernandez Andrade, Kwang Jun Kim, Wesley Lee, Jose Ochoa, Katsusuke Ozawa, Olga Patey, Luigi Raio, Mette Tind Tindholdt, Renato Ximenes, Simcha Yagel and Satoshi Yasukochi.

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