



New Zealand
Maternal
Fetal
Medicine
Network



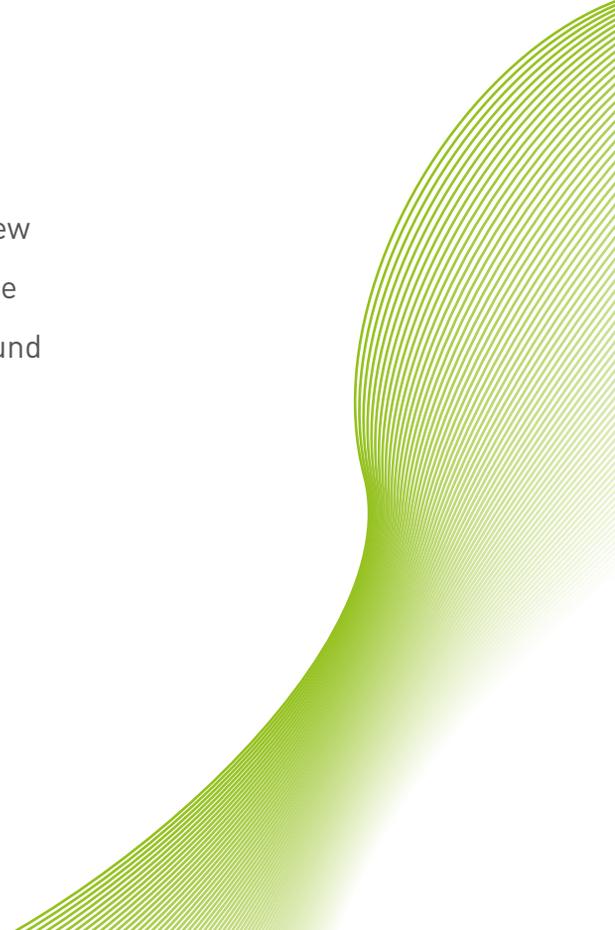
Australasian
Society for
Ultrasound in
Medicine
New Zealand
Branch

FETAL HEART ASSESSMENT DURING THE 18-20 WEEK ANATOMY SCAN

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BACKGROUND

Screening for fetal cardiac malformations is an important component of the 18-20 week anatomy scan. This document summarizes the recommended techniques for fetal heart assessment. These guidelines have been endorsed by the New Zealand Fetal Maternal Medicine Network (NZMFMN) and the New Zealand Branch of the Australasian Society for Ultrasound in Medicine (ASUM).



INSTRUMENTATION

Transducer selection should be guided by the acoustic characteristics of the mother and fetus according to the principle of “highest frequency for adequate penetration”. Routine use of low frequency transducers (such as 5-1MHz curvilinear) for the assessment of the fetal heart is discouraged. System settings in 2D and color Doppler should be optimized to obtain high-resolution, artifact-free images at high frame rates. In particular, sonographers should consider the optimal settings for the following system controls: dynamic transmit focus (at structure of interest), sector width (narrow), high definition (write) zoom (preferred over read zoom), dynamic range (conservative), spatial compounding (low level or off), tissue harmonic imaging, color Doppler scale (high) and color Doppler gain (low).

PATIENT MANAGEMENT STRATEGIES

The purpose of the cardiac assessment at 18-20 weeks is to screen for structural malformations. It is a screening test only, not a diagnostic test. Immediate referral to the nearest fetal medicine centre should be initiated if:

1. A cardiac abnormality is detected.
2. A cardiac abnormality is suspected.
3. Heart normality cannot be confirmed.
4. The sonographer is unsure whether the heart is normal or abnormal for any reason including the inability to obtain the expected views.

If the heart assessment is suboptimal for reasons of unfavorable fetal lie, a repeat ultrasound should be attempted on the same day if possible or no later than 3 business days. If normality still cannot be established, the patient should be referred to a fetal medicine centre.



GENERAL EXAMINATION STRATEGIES

Recommendation 1

It is generally not possible to obtain diagnostically adequate views of all cardiac anatomy from a single angle of approach due to a) the complexity of fetal cardiac anatomy, b) the non-uniform dimensions of the ultrasound beam and c) the angle-dependence of color Doppler. It is recommended that the heart be assessed from a range of angles.

Recommendation 2

Representative still images should be supplemented by videoclips whenever possible. At minimum, a four chamber (4CH) sweep, an outflow tract sweep, and a 3 vessel sweep should be recorded.

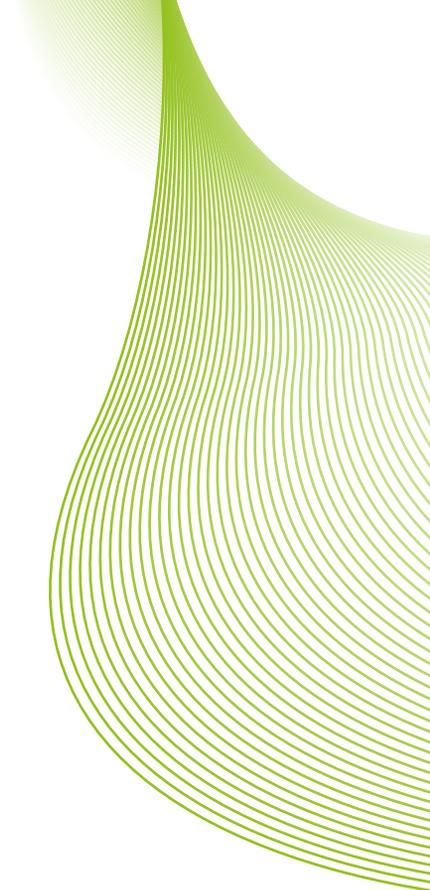
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Videoclips bring three main benefits: Firstly, it is often more efficient to record real-time videoclips rather than spending valuable examination time attempting to obtain perfect still images. Secondly, recording of videoclips is believed to improve the sonographer's surveying technique. Thirdly, videoclips provide more diagnostic information for second opinion review.

Recommendation 3

Real-time 2D assessment should always be supplemented by color Doppler examination of (at minimum) the 4 heart chambers, outflow tracts and the arrow view.

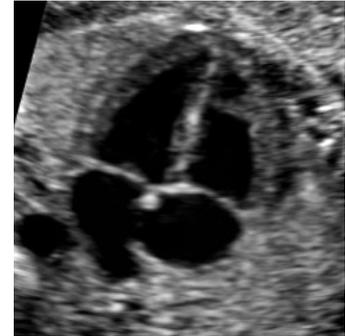


ASSESSMENT OF THE 4 CHAMBERS (4CH)

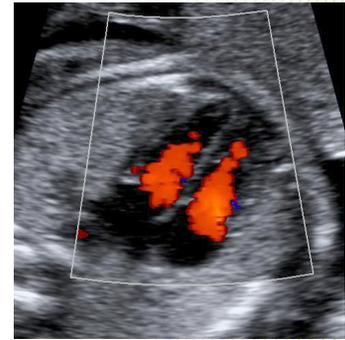
The checklist for assessing the 4CH views may seem exhaustive, but all items can normally be assessed within a few seconds, many of them simultaneously. Examination of a normal fetal heart should demonstrate all of the following:

- Realtime sweep of 4 chamber plane from stomach to outflow tracts
- Overall heart size approximately 1/3 of chest size
- Normal cardiac and abdominal situs with reference to fetal position, not the location of fetal stomach
- Cardiac axis with apex at 45 degree angle to the left
- Relatively comparable ventricular and atrial sizes
- Interrogation of the interventricular septum (IVS) from top to bottom and from different angles of approach

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- Relative symmetry of atrioventricular valve size and movement
- Normal tricuspid valve offset
- Moderator band in the right ventricle (RV)
- Septum primum flap projecting into the left atrium (LA)
- Normal rate and rhythm (120-180bpm)
- Normal contractility of ventricular myocardium
- No flow across the IVS on color Doppler
- Antegrade, laminar flow through the atrioventricular valves, with no regurgitation



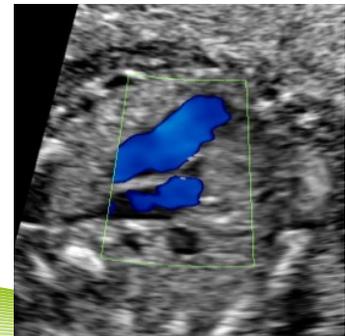
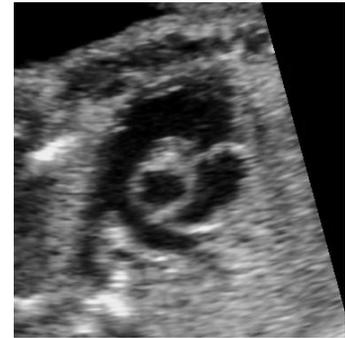
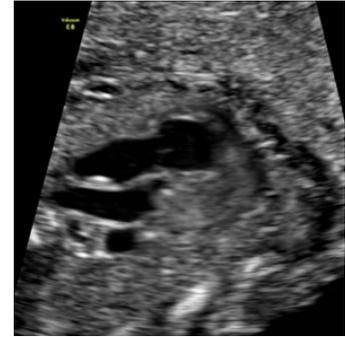
ASSESSMENT OF THE LVOT

- LVOT originates in the left ventricle (LV)
- Initially courses towards the right fetal shoulder
- The anterior wall is continuous with the IVS
- The posterior wall is continuous with the mitral valve



ASSESSMENT OF THE RVOT

- RVOT originates in the right ventricle (RV)
- Initially anterior to the aorta
- Courses directly from anterior to posterior
- Crosses the aorta at the conus at 90 degrees
- Approximately 10% larger than the LVOT



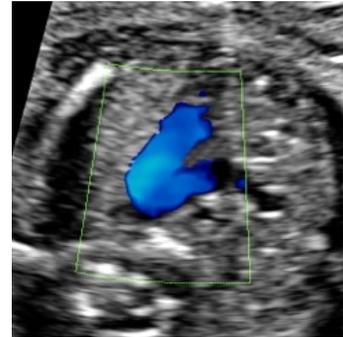
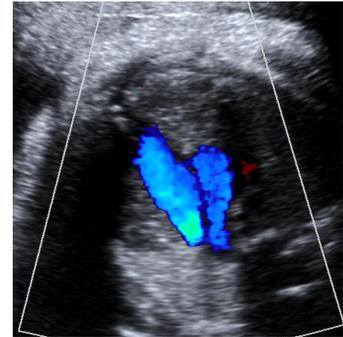
ASSESSMENT OF THE 3-VESSEL AND TRACHEA VIEW (3VT)

- Requires a transverse view of the chest above the level of the outflow tract origins
- The three vessels in descending order of size are: the main pulmonary artery (MPA), ascending thoracic aorta (AO), and superior vena cava (SVC)
- If this view is unobtainable with the fetus in a favorable position, there is likely an outflow tract abnormality



ASSESSMENT OF THE ARROW VIEW

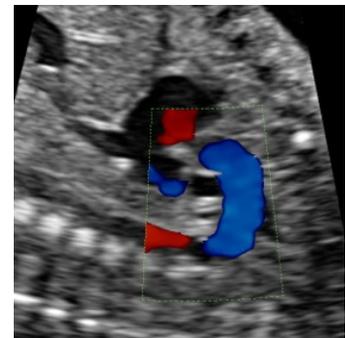
- Demonstrates transverse aortic arch and ductus arteriosus
- The vessels form a “V” configuration and appear comparable in size
- Flow in the vessels should be in the same direction
- The aorta is to the left of the trachea



ASSESSMENT OF THE AORTIC ARCH

- Arises centrally from the heart midway between the anterior and posterior chest walls
- Forms a tight curve (“shepherd’s crook”)
- Gives off head and neck vessels

Note: This is a complimentary view which is not as helpful in screening for cardiac abnormalities as the previously described views.



ASSESSMENT OF THE DUCTAL ARCH

- Arises from the anterior chamber (RV)
- Has a broader curve (“hockey stick”)
- In a longitudinal view the MPA-Ductus Arteriosus (DA) wraps around the root of the aorta which is seen as a circle (transverse section) confirming crossover of the MPA and AO
- DA provides a continuous bridge between MPA and AO
- Colour flow within the ductal and aortic arches should be in the same direction.

Note: This is a complimentary view which is not as helpful in screening for cardiac abnormalities as the previously described views.



CONCLUDING REMARKS

Assessment of the fetal heart is difficult, but it need not be arduous. Sometimes ideal views of the anatomy cannot be obtained due to adverse fetal lie or unfavorable maternal acoustic characteristics. In most of these cases, it is still possible to carry out a thorough investigation of all components of the heart as described in this document. It is important to keep in mind that a diagnostically adequate examination is not necessarily a technically perfect examination. In the end, it is up to each individual practitioner to determine his or her level of diagnostic confidence when assessing the fetal heart. If there is any doubt about the normality of the fetal heart, the patient should be reassessed by a senior ultrasound practitioner in the first instance and then referred to the nearest fetal medicine centre for a screening fetal echocardiogram.

