Contents

Indications for a detailed cardiac scan

Factors known to increase the risk for heart disease are indications to offer a detailed cardiac scan and are summarized in Table 5.1.

Table 5.1 Indications for a fetal cardiac scan

Indication	Risk to fetus for CHD
Structural abnormality suspected at the anomaly scan	High
Previous child (or fetus) with CHD	2–3% 10% if 2 previously affected
Parent with CHD:	
maternal	6% (higher for left-sided lesions)
paternal	2–3%
Maternal diabetes:	
type 1	3–5%
type 2	Less well defined, depends on HbA1c in 1st trimester
gestational	Probably not increased
Increased nuchal translucency	5–10% (➔ Chapter 21) Increases with increased measurement
Abnormal cardiac axis	High
Other structural anomaly with cardiac associations (Table 5.2)	Variable
At risk of syndrome with cardiac associations (➔ Chapter 2)	Variable
Monochorionic twins (mono- and diamniotic)	4–11% (for at least 1 of set) for MCDA, higher for MCMA
Exposure to teratogen: some anticonvulsants alcohol lithium retinoic acid	Variable
Hydrops (and isolated pleural + pericardial effusions)	Variable
Abnormal cardiac rhythm Fast/slow/persistently irregular	Variable
Maternal anti-Ro/anti-La antibodies	2–3% for complete heart block Small risk of myocarditis
Use of maternal NSAIDs	Variable, gestation dependent (ductal constriction)

Table 5.1 (*Contd*)

Indication	Risk to fetus for CHD
Abnormal fetal karyotype (➔ Chapter 2)	Variable but high
Maternal phenylketonuria	Up to 8–10% Depending on control
Parent with autosomal dominant cardiac condition	Most not detectable in the fetus
Some maternal infections (including parvovirus)	Evidence of myocarditis or fetal anaemia
Absence of the ductus venosus	High association with cardiac anomalies—structural and functional
Hyperdynamic situations including: arteriovenous anomalies vascular tumours	May develop heart failure

Note

- A 1st-degree relative of the fetus is:
  - A parent, or
  - A sibling
- Relatives of the fetus more distant than 1st-degree with CHD are not considered to increase the risk to the fetus.
- Some cardiomyopathies have an unclear familial pattern and more distant relatives may be relevant:
  - Fetal diagnosis is uncommon and a normal study does not exclude the diagnosis.
  - In many cases fetal cardiac assessment is not indicated.
  - Discussion with the parent's cardiologist may help guide pre- and postnatal management.
- Using fetal echocardiography to avoid invasive testing is unreliable:
  - Only 50% of fetuses with Down syndrome will have a detectable cardiac lesion.
- The highest yield for structural CHD is in the apparently 'low-risk' population where an abnormality is suspected:
  - Thus the importance of screening.

Non-cardiac structural anomalies associated with increased risk of CHD

- Some non-cardiac structural lesions are associated with increased risk for CHD (see Table 5.2):
  - Even if the karyotype is normal.
  - Some will have syndromic associations.
- Microarray and other genetic advances now provide more information; this is discussed in detail in ➔ Chapters 2 and 8.

- Is useful for adding to information obtained from 2D imaging to demonstrate:
  - direction of blood flow
  - speed of flow
  - patency of valves
  - regurgitation through valves
  - abnormal flow, e.g. across the ventricular septum.
- Power Doppler signal reflects wave amplitude not velocity and is thus less influenced by angle of insonation.
- When power Doppler is combined with high-density colour Doppler, the displayed signal incorporates direction of flow and is good for demonstrating low-velocity flow in small vessels.

Continuous wave Doppler

- See Fig. 6.3.
- CW Doppler can accurately measure and quantify high velocities.
- It continuously emits and receives information from all moving targets and, unlike PW Doppler, cannot determine exactly where the accelerated jet arises and so this needs to be established first, by using a combination of 2D imaging, colour Doppler, and PW Doppler.

M-mode

- See Fig. 6.4.
- Is useful in the assessment of fetal arrhythmias by giving a visual demonstration of the relationship between atrial and ventricular contraction.
- It can also be used to measure ventricular and myocardial dimensions and function.

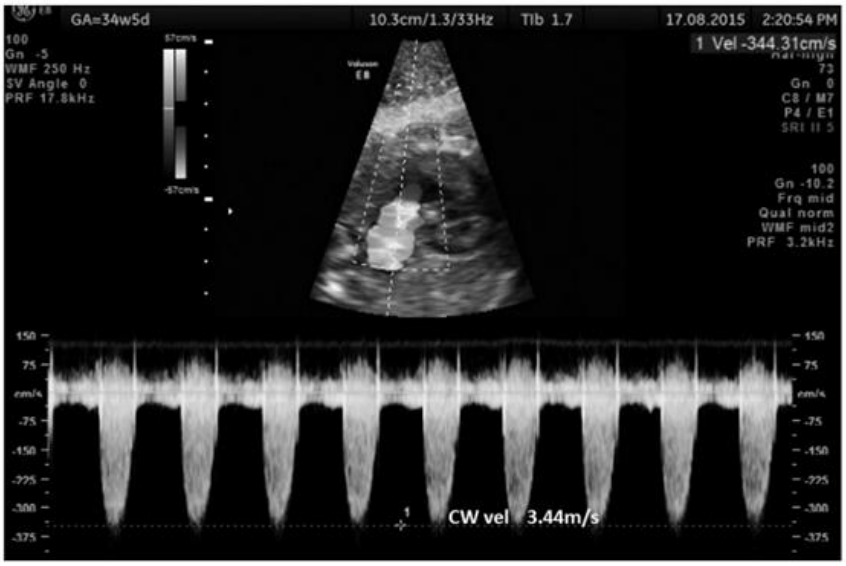

Fig. 6.3 Outlet view of LV with colour flow Doppler highlighting high velocity in right ventricular outflow tract (LVOT). CW confirms velocity of 3.44 m/sec with good angle of insonation indicating severe AS (peak instantaneous gradient from modified Bernoulli equation 47 mmHg).

Helpful observations

- The most posterior chamber of the heart is the left atrium.
- The descending aorta lies between spine and left atrium.
- The right ventricle is bigger than left, especially in 3rd trimester.
- IVC and SVC should be seen draining into the RA.
- A normal 4-chamber view will exclude most uncorrectable cardiac lesions and up to ⅓ of significant cardiac anomalies (Box 6.1).
- Outlet views increase the range of abnormalities detected (Box 6.2).
- By the end of the examination, 'normal cardiac connections' should have been defined see ➔ Chapter 4.

Alternative approach to screening assessment

- 5 transverse views are obtained having established laterality.
- 5 views are obtained as follows:
  - V1: transverse view of the fetal abdomen to demonstrate situs.
  - V2: 4-chamber view of heart.
  - V3: 5-chamber view demonstrating aortic root arising from left ventricle (extended 4-chamber view).
  - V4: to demonstrate bifurcation of pulmonary artery.
  - V5: 3VT view with trachea at level of main PA joining the ductus arteriosus.

Box 6.1 Cardiac lesions resulting in an abnormal 4-chamber view

- Ebstein's anomaly/dysplastic tricuspid valve
- Tricuspid/mitral atresia
- AVSD—complete and partial
- Hypoplastic left heart syndrome
- Pulmonary atresia with intact septum
- Double inlet left ventricle
- Congenitally corrected transposition
- Large ventricular septal defect (inlet/muscular)
- Cardiac tumours
- Laterality defects
- Severe aortic/pulmonary stenosis or atresia.

Box 6.2 Cardiac lesions detected using great artery views

- Tetralogy of Fallot
- Pulmonary atresia with VSD
- DORV
- Transposition of great arteries
- Common arterial trunk
- Some cases of coarctation
- Pulmonary/aortic stenosis.