# The Abnormal Fetal Heart

Lindsey Allan

The four-chamber view is the most useful section of the heart to image in fetal cardiology, as normality of this view will exclude about 60% of major structural heart malformations. It must however be correctly obtained and analysed. Analysis includes evaluation of heart size, position, structure and function.

**Abnormalities of size**: A larger-than-normal heart can be global, or affecting predominantly one side or chamber. A globally enlarged heart may indicate a primary cardiomyopathy or alternatively may point to extracardiac pathology, which is causing an increase in cardiac volume, such as can occur in anaemia or in AV fistula. If one chamber is enlarged, obstruction or regurgitation at the down-stream valve on that side is usually the cause. A smaller-than-normal heart is usually due to extracardiac compression such as occurs in a large pleural effusion or in tracheal obstruction.

**Abnormalities of position**: the heart can lie in the right chest in mirror image arrangement or can be shifted to the right or left, usually by a space-occupying lesion on one side of the chest or other. An abnormal septal axis can be a feature of some complex cardiac anomalies especially of the great arteries.

**Abnormalities of structure**: there are a limited number of possible connection anomalies detectable on the four-chamber view at the crux of the heart. Where only one atrioventricular (AV) valve is seen the possibilities are mitral or tricuspid atresia or a common AV junction. Where two AV valves are seen, abnormalities of connection include double inlet ventricle and a discordant AV connection. Additional abnormalities of structure include disproportion of the ventricles, which usually indicates coarctation of the aorta, Ebstein's anomaly of the tricuspid valve or tricuspid dysplasia, and ventricular septal defects.

**Abnormalities of function**: a discrepancy of ventricular function will usually indicate obstruction at the related arterial valve or intrinsic dysfunction of the myocardium in cardiomyopathies.

Analysis of the great artery views, in addition to the four-chamber view, will add a further 30% detection of major structural heart disease, if they are correctly obtained and

interpreted. They should be evaluated in the same way as the four-chamber view in terms of size, position, structure and function.

**Abnormalities of size**: If the aorta is smaller than normal, it suggests obstruction to aortic flow, due to aortic atresia, stenosis or coarctation. Similarly, if the pulmonary artery is smaller than normal, it indicates pulmonary stenosis or atresia. The aorta is larger than normal if the pulmonary artery is obstructed as in tetralogy of Fallot. The pulmonary artery can be larger than normal in the absent pulmonary valve syndrome.

**Abnormalities of position**: Normally the aortic valve lies posterior and to the right of the pulmonary valve but this normal arrangement will not be seen if the great arteries are transposed or if both arise from the right ventricle.

**Abnormalities of structure:** The aorta normally arises wholly from the left ventricle but if it arises from both ventricles astride a ventricular septal defect, this can indicate tetralogy of Fallot or a common arterial trunk.

**Abnormalities of function:** The arterial valves should open freely and show forward flow within them. In valvar stenosis, the valve is restricted and the velocity of flow is increased, whereas in valvar atresia there is no forward flow across the arterial valve. Systematic evaluation of the four-chamber view and great arteries allows the identification of major structural cardiac malformations. Many cardiac defects are associated with a high mortality during childhood or a high morbidity and the need for repeated surgical intervention. On the other hand, some can be successfully surgically repaired. Detailed knowledge of the extent of a cardiac malformation prenatally can allow the parents and their carers to make the best plans for the management of the pregnancy.