A Review of Findings in Fetal Cardiac Section Drawings

Part 4: Sagittal and Parasagittal Views

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Objective. The goal of this presentation is to review some of the common and rare fetal heart abnormalities and to provide an easy approach to these findings with schematic drawings. In this presentation, we limit the scope to the sagittal and parasagittal sections. ***Methods.*** Over the past 10 years, we collected cases in which the common views of the heart were abnormal and the differential diagnoses that existed for each. This presentation shows the normal sonographic sections and then variations of these sections and the associated anomalies. We used illustrative drawings to present these findings, enabling us to point out the main sonographic features of abnormalities of the heart. ***Results.*** The work reviews 7 fetal heart abnormalities in schematic drawings. ***Conclusions.*** This short review highlights several of the anomalies that can be recognized on the common sonographic views. The drawings tend to simplify the findings but should serve as a basis for those doing fetal echocardiography when they encounter an unusual finding. ***Key words:*** drawings; fetal echocardiography; prenatal sonography.

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In a previous series, we reviewed the typical findings of several cardiac anomalies in axial sections at the level of the high abdomen, the 4-chamber view of the heart, and finally the level of the 3-vessel-trachea view. In this presentation, we will complement those views with findings that can be recognized in sagittal and parasagittal views of the fetus. As in the previous series, we used only drawings because they allow readers to unquestionably recognize the abnormal from the normal. Drawings also allow a more 3-dimensional view by compressing several planes into a single image.

Materials and Methods

Over the past 10 years, we collected cases in which the common views of the heart were abnormal and the differential diagnoses that existed for each. Some diagnoses are quite uncommon and unlikely to be found in regular practice, but they present such typical images that they are worth knowing.

In this presentation, we show first a normal section and then variations of this section and the associated anomalies. Before reading each diagnosis, the reader is urged to identify the anomaly and then suggest the differential diagnoses.

The colors used in the drawings are conventional medical artist colors, with arteries in red and veins in purple or blue. The colors do not represent flow directions, as in Color Doppler sonography, for instance, and they do not correlate with fetal blood oxygenation. The sections are presented with the fetus viewed in the right lateral position (Figure 1). This conforms to the usual American Institute of Ultrasound in Medicine guidelines.[1]

Results

In the following descriptions and drawings, we review some anomalies visible in the sagittal and parasagittal views. Figure 2 represents a normal sagittal view to serve as a reference image for comparison with the subsequent drawings representing anomalies.

Case 1

This case represents a sagittal section with inversion of the positions of the origins of the pulmonary artery and aorta. This is a case of transposition of the great arteries. In this section, the aorta arises near the anterior chest wall, whereas the origin of the pulmonary artery is more posterior. The curve of the aortic arch appears unusually long, whereas the bifurcation of the pulmonary artery is very short (Figure 3). A differential diagnosis between dextrotransposition and levotransposition is not possible on this section, and a 4-chamber-view needs to be obtained. In the 4-chamber view, an inversion of the ventricle should be sought to iden-

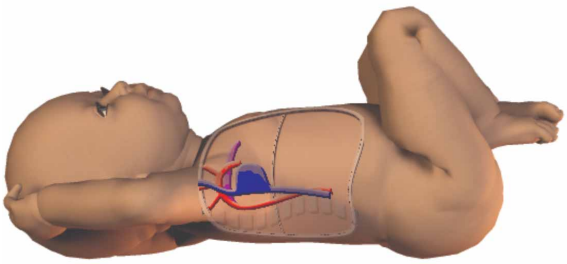


Figure 1. View of the fetus from the right side. The cardiovascular structures are imaged by transparency and are as follows: In the front, rightmost, in blue, are the superior and inferior venae cavae entering the right atrium. Behind these, in red, is the aortic arch with its origin about midway between the sternum and spine. Finally, leftmost, in blue, is the pulmonary trunk continuing into the aortic arch via the ductus arteriosus. The diaphragm is represented as a faint white line below (to the right on the drawing) the heart.

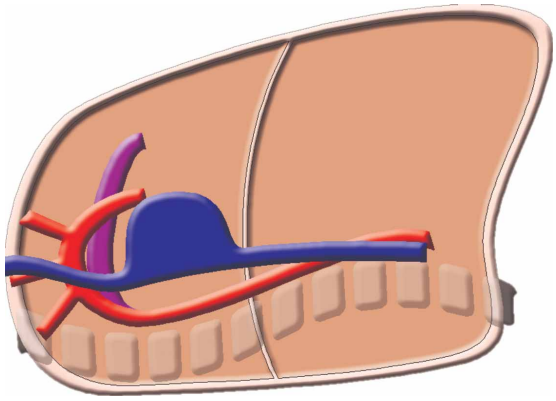
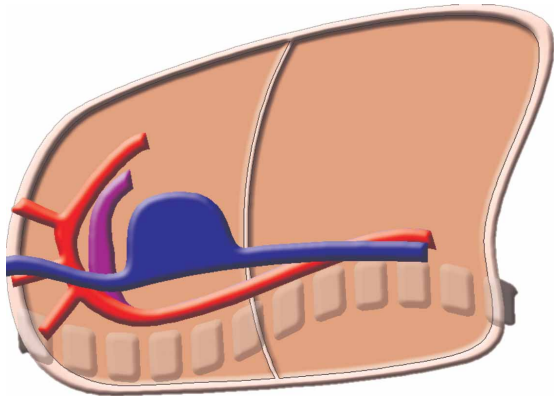


Figure 2. Normal sagittal view to serve as a reference image for comparison with the subsequent drawings representing anomalies. The pulmonary artery and ductus are purple; the ascending aorta, arch, and descending aorta are red. The superior and inferior venae cavae (blue) drain into the right atrium (also blue). Note the relative positions of the 2 arches (ductal and aortic). Also note that in a normal case, the root of the aorta is about midway from the anterior chest wall to the spine, which contrasts with the root of the pulmonary artery. Furthermore, note that as the inferior vena cava progresses cephalad, it becomes a more and more anterior structure in the fetus. The white vertical arciform line represents the diaphragm.

Figure 3. Case 1. Sagittal section with inversion of the positions of the origins of the pulmonary artery and aorta. In this section, the aorta arises from the right ventricle, which is near the anterior chest wall, whereas the origin of the pulmonary artery, from the left ventricle, is more posterior. The curve of the aortic arch appears unusually long, whereas the bifurcation of the pulmonary artery is very short. This is transposition of the great arteries.



tify levotransposition. With a 3-dimensional volume, it is sometimes not possible to reconstruct this view, and that may be an indication that transposition is present.[2]

Case 2

In this case, only 1 arch can be seen, and the complete aortic arch is not visible (Figure 4). In particular, the appearance of a straight vertical aorta extending directly into the neck is characteristic of type B interruption (after the left common carotid artery).[3]

Case 3

In this case, there are 2 vessels coursing side by side next to the spine, with no inferior vena cava connection to the right atrium (Figure 5). The azygos arch and the superior vena cava are wider than usual because of the extra flow. The lack of a connection to the inferior vena cava is probably one of the more visible findings when only a gray scale image is obtained. With color, however, the presence of side-by-side vessels of opposite colors is quite striking. Other findings associated with left isomerism should then be sought. Another adjunctive technique is to use the inversion-rendering mode to show the course of the vessels.[4]

Case 4

There is an extra vessel that arises from the aorta and ends in the lung parenchyma (Figure 6). The usual finding is a cardiac deviation by an echogenic mass. This is most typical of extralobar lung sequestration.[5]

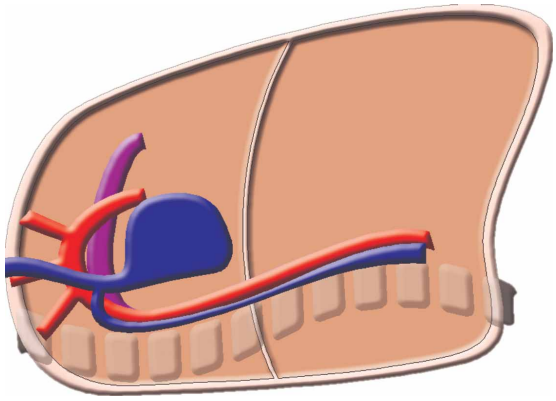


Figure 5. Case 3. Two vessels coursing side by side next to the spine, with no inferior vena cava connection to the right atrium.

Case 5

In this case, the anomaly is an extra vessel behind the 4 chambers or the atria (Figure 7). This vessel courses caudally and has a venous signal on color Doppler imaging and a color signal similar to that of the aorta. This vessel is an aberrant communication between the pulmonary veins and the hepatic circulation. This is total anomalous pulmonary venous drainage of the infracardiac type (subdiaphragmatic). The vein is the confluence vein, collecting all veins from the lung and draining into the hepatic circulation.

Figure 4. Case 2. The complete aortic arch is not visible. This suggests an interrupted aortic arch.

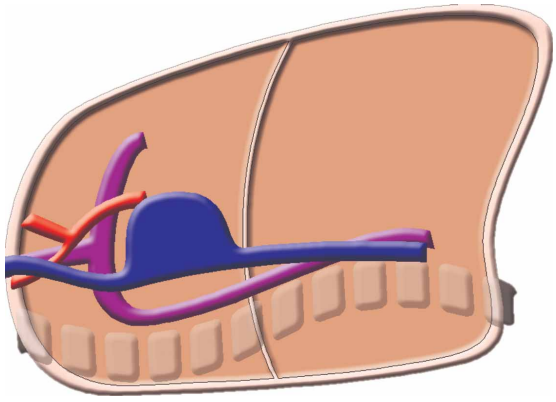
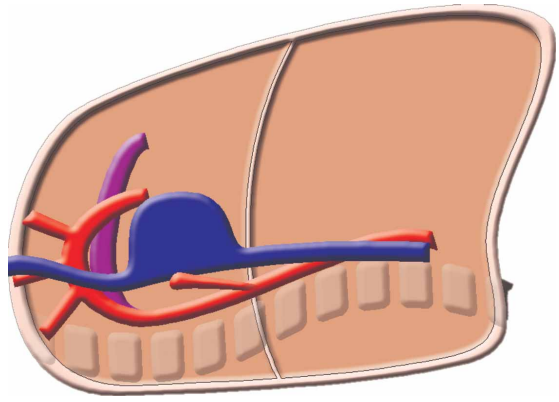


Figure 6. Case 4. As in case 3, a vessel arises from the aorta and enters the lung. The critical finding and usually the one that will call attention is a cardiac deviation by an echogenic mass. This is most typical of extralobar lung sequestration.



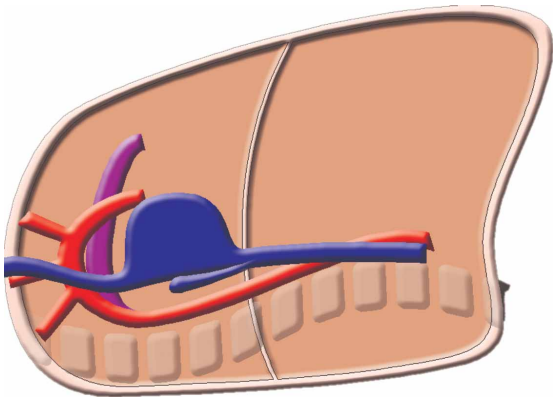


Figure 7. Case 5. In this otherwise normal sagittal section, an extra vessel is seen passing from behind the right atrium and coursing caudally. In the color Doppler mode, this vessel would have the same color as that of the aorta and an opposite color from that of the inferior vena cava. In the pulsed wave Doppler mode, however, the extra vessel has the same type of venous signal as that of the inferior vena cava and not the same as that of the aorta. This vessel is an aberrant communication between the pulmonary veins and the hepatic circulation.

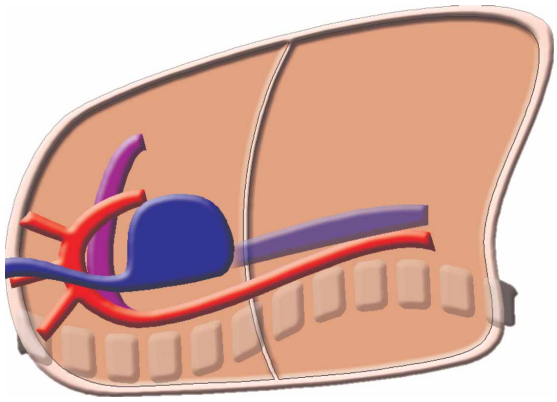
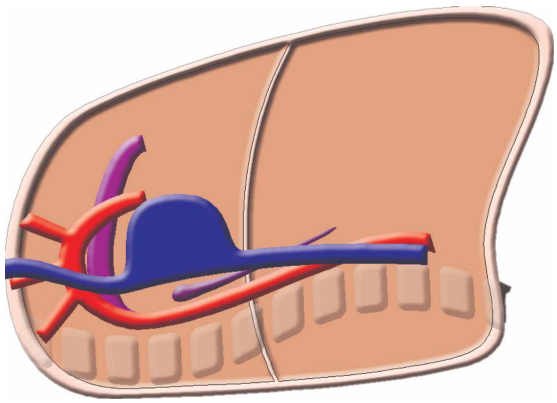


Figure 9. Case 7. The inferior vena cava is anterior and ipsilateral to the aorta. It does not drain into the right atrium. This is typical of right isomerism.

Case 6

In this case, an anomalous pulmonary vein drains the right lung into the inferior vena cava (Figure 8). This is a fairly subtle finding. The presence of major aortopulmonary collateral vessels (of opposite color) helps in the diagnosis of scimitar syndrome.[6] A right-sided overload and cardiac dextroposition with a small right lung should also draw the attention to this condition. A persistent left superior vena cava is another commonly associated finding.

Figure 8. Case 6. A vein returns from the lung (usually the right lower lobe) directly to the inferior vena cava. As in case 4, this represents an anomalous pulmonary venous return. This particular type is called scimitar syndrome.



Case 7

This case shows an inferior vena cava anterior and ipsilateral to the aorta (Figure 9). The inferior vena cava does not drain into the right atrium but to the left side of what is normally a common atrium. This is typical of right isomerism.[7,8]

Conclusions

This short review highlights several of the cardiac anomalies that can be recognized on the sagittal and parasagittal views of the chest. The drawings tend to simplify the findings, but our goal was to create simple and easily rememberable patterns of some anomalies that can serve as a basis for those doing fetal echocardiography when they encounter an unusual finding.

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