Pulmonary vessels are visible within the thymic shadow much as they are in the retrocardiac space. On the ultrasound scan the thymus presents a characteristic homogeneous echo pattern with multiple interspersed “white dots” that resemble snowflakes.

The thymus is relatively large through 4 years of age (with considerable anatomic variation) and undergoes a steady involution after 9 years. Even if the thymus appears large on radiographs and covers the cardiac border and hila, normally it will never compress or displace mediastinal structures. This serves to distinguish a normal thymus from pathologic thymic dysplasia or a mediastinal tumor, which may become symptomatic if they compress or displace vessels or respiratory passages.

Cardiac size. Measurements for estimating cardiac size, like those performed in adults, are much less useful in children due to variables introduced by the thymus and variations in inspiratory position (a cardiothoracic ratio < 0.65 can serve as a guideline).

Practical Recommendation

In doubtful cases the lateral radiograph can be used to estimate cardiac size: The posterior cardiac border should not extend past a line drawn tangentially to the anterior tracheal border (Swischuk line). Echocardiography can be used for further cardiac evaluation.

During Mechanical Ventilation

The tip of the endotracheal tube should be above the carina at the level of the T2 vertebral body. The chin and head position should be noted during imaging: When the head is flexed, the tip of the tube is about 1 cm above the carina. Extending the head or tilting it to one side raises the tip to approximately the level of T1 or the head of the clavicle.

In infants with normal lung expansion during mechanical ventilation (e.g., high-frequency oscillatory ventilation), the right hemidiaphragm is projected between the posterior portions of the eighth and ninth ribs.

Catheter Position: Normal Findings and Malposition

The anatomy of the fetal circulation is shown schematically in Fig. 6.3. The umbilical artery catheter (UAC) initially descends into the lesser pelvis. It enters the systemic circulation through the internal iliac artery or common iliac artery and runs toward the aorta. Its tip may be positioned above the aortic bifurcation, distal to the origin of the renal arteries (“low position” at the L3/L4 level), or at the level of the midthoracic aorta above the origins of the visceral arteries (“high position” at the T7/T8 level). The catheter tip should not be located between

Fig. 6.3 Anatomy of the fetal circulation.
The umbilical vein arises from the placenta and opens into the inferior vena cava via the ductus venosus. The umbilical artery arises from the internal iliac artery and runs back along the bladder to the placenta. Because of this arrangement, an umbilical arterial catheter (UAC) first descends into the lesser pelvis whereas an umbilical venous catheter (UVC) runs cephalad to the liver.

1 Placenta
2 Bladder
3 Right lobe of liver
4 Left lobe of liver
5 Right lung
6 Left lung
7 Umbilical artery
8 Iliac artery
9 Aorta
10 Umbilical vein
11 Iliac vein
12 Ductus venosus
13 Inferior vena cava
14 Right ventricle
15 Left ventricle
16 Right atrium
17 Left atrium
18 Superior vena cava
The origins of the visceral or renal arteries (“no position” between T 10 and L 3 levels) (Fig. 6.4).

The umbilical vein catheter (UVC) runs directly upward through the ductus venosus and left portal venous system into the inferior vena cava. The tip should be just below the diaphragm, occupying a level that is cranial to the level of the liver veins and caudal to the right atrium (Fig. 6.4). The catheter tip should not be intrahepatic, as it might cause liver injury (Fig. 6.5).

Irrespective of whether the central venous catheter has been introduced through the inferior or superior vena cava, the tip should be just outside the right atrium. The same applies to the very thin peripheral venous catheters (silastic catheters), which are difficult to locate radiographically because of their small diameter. Their tip should also be outside the right atrium.

The tip of the gastric tube should be below the diaphragm.

Fig. 6.4  Normal catheter position in a newborn.
The umbilical artery catheter (UAC, arrowheads) first dips into the lesser pelvis. Its tip is placed at the level of the T8 vertebra (high position). The umbilical vein catheter (UVC, arrows) runs directly cephalad with its tip just below the diaphragm.

Fig. 6.5 a–c  Malpositioned catheters.

a  The UAC is positioned too high (T5 level).
b  The UVC is in the portal vein. The endotracheal tube is in the right main bronchus, causing atelectasis of the left lung. The gastric tube and UAC are correctly positioned.
c  The UVC is in the portal vein, and the UAC is correctly positioned. The gastric tube is looped in the stomach, and the endotracheal tube is correctly positioned.