1 Normal Anatomy on US

Hepatic US in children should be focused on hepatic vascularization. Real-time US makes such a study much easier. Five scans are mandatory: a longitudinal scan through the long axis of aorta, a longitudinal scan through the inferior vena cava (IVC), a subcostal oblique scan through the confluence of the hepatic veins, a subcostal oblique scan through the portal vein bifurcation, and a longitudinal oblique scan through the long axis of the portal trunk.

1.1 Longitudinal Scan Through the Aorta

On such a scan (Fig. 1), one must look for the abdominal esophagus, the crus of the diaphragm, the aorta, the celiac trunk, and the superior mesenteric artery (SMA). The splenic vein is seen anterior to the SMA. The anatomic space between the aorta and the posterior end of the left lobe of the liver at the level of the celiac trunk is the lesser omentum. Its normal thickness in a control group of patients is inferior to one diameter of the aorta.

The examination can be impeded by a medially located stomach in cases of huge splenomegaly or hepatic atrophy. The left lateral decubitus or the right lateral decubitus, using the spleen as an acoustic window, allows good visualization of the abdominal aorta.

It is mandatory to measure the diameter of the aorta above and below the celiac trunk, which is generally nearly identical; the diameters of the celiac trunk and the SMA are also identical.

It is sometimes possible to demonstrate a right hepatic artery branching off the SMA. This hepatic artery is located posterior to the portal trunk, while a normal hepatic artery is anterior to the portal trunk (Fig. 2a, b).

1.2 Longitudinal Scan Through the IVC

The patency of the IVC is a very important diagnostic and prognostic factor in the evaluation of portal hypertension in children (Fig. 3). The
diameter of the IVC should be measured in younger children during crying or, in older children, at the beginning of expiration after a Valsalva maneuver. Indeed, during the Valsalva maneuver, the IVC is compressed anteriorly by the liver. The maximum diameter of the IVC is then observed at the beginning of expiration. The diameter of the IVC should be measured at the level of the portal trunk on a longitudinal scan. When the IVC is not seen, one must look for a vascular structure behind the crus of diaphragm on the left or right of the aorta, which is an azygos continuation of the IVC.

1.3 Subcostal Oblique Scan Through the Confluence of the Hepatic Vein

The diameter, direction, and ostia of the hepatic veins (HV) should be examined (Fig. 4). The wall of the HV is usually not echogenic except that of the right HV which is perpendicular to the ultrasonic beam. The HV converge toward the IVC. The left and medial HV often have a common trunk. Their diameter increases from the periphery to the right auricle and their diameter presents variations during the respiratory cycles, synchronized to those of the IVC. Their ostia are well analyzed only by real-time US.

1.4 Subcostal Oblique Scan Through the Portal Bifurcation

The orientation of the portal bifurcation is variable, from a horizontal to a vertical plane (Fig. 5). Its walls are normally slightly echogenic. It is possible to follow the portal vein to the subsegmental branches.

The right portal vein has two branches: the anterior branch is horizontal, the posterior branch is vertical. The left portal branch has a characteristic posteroanterior course and ends in the umbilical recess in a branch of the quadrate