This chapter discusses hepatobiliary scintigraphy, reticuloendothelial system (RES) scintigraphy, and splenic scintigraphy. Hepatobiliary scintigraphy employs intravenously injected radiopharmaceuticals that are rapidly taken up by the parenchymal cells of the liver and eliminated through the biliary system into the intestine. Reticuloendothelial system scintigraphy employs technetium-99m (99mTc)–sulfur colloid, which permits static imaging-planar scintigraphy and single photon emission computed tomography (SPECT) of functional hepatic parenchyma by its localization in cells of the RES. It permits evaluation of size, position, displacement, and replacement of functional hepatic and splenic tissue. At present, hepatobiliary scintigraphy is used in pediatric practice more frequently than static RES scintigraphy.

Ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) have largely replaced RES scintigraphy for the morphologic evaluation of the liver. The spleen can be imaged with 99mTc–sulfur colloid scintigraphy, but the method of choice for splenic scintigraphy is with 99mTc-labeled denatured red blood cells (99mTc–denatured RBC scintigraphy). Indications for hepatic and splenic scintigraphy in pediatrics are listed in Tables 9.1 and 9.2.

Methods

Hepatobiliary Scintigraphy

Radiopharmaceuticals

The knowledge that organic dyes are localized in the liver led to the first successful hepatobiliary imaging agent, iodine-131 (131I)–rose bengal, devised by Taplin et al.1 in 1955. Modern hepatobiliary agents are labeled with 99mTc (Fig. 9.1).

Administered Doses

Technetium-99m disofenin (Hepatolite, CIS-US, Bedford, MA) is given in a dose of 0.05 mCi/kg (1.85 MBq) with a minimum total dose of 0.25 mCi (9.25 MBq) and a maximum total dose of 3.0 mCi (111 MBq).

Imaging Method

The patient should fast for 3 to 4 hours prior to the examination to facilitate visualization of the gallbladder. In infants the principal indication is determination of the patency of the biliary tract and not the visualization of the gallbladder. Therefore, fasting prior to hepatobiliary scintigraphy is not absolutely necessary in most infants.
Patients are studied in the supine position with the gamma camera equipped with high-resolution, parallel-hole collimator viewing the entire abdomen including the liver. Intravenous access is gained using a butterfly-type needle that is securely fastened to the skin with tape and kept patent with normal saline until the time of radiopharmaceutical administration. After the patient is positioned under the gamma camera, the radiopharmaceutical is injected as a bolus and flushed with normal saline. Recording begins simultaneously with the start of the injection.

The hepatobiliary study is recorded with serial 0.5-minute frames for 60 minutes using a $128 \times 128$ matrix (Fig. 9.1). Additional images are obtained at later intervals (i.e., 2, 4, 6, and 24 hours) or until radiotracer appears in the bowel. If the gallbladder fails to empty significantly during the initial 60-minute period, an additional series of images (one frame per minute for 60 minutes) is obtained following the administration of a cholecystokinin analogue or a standard fatty meal. If a biliary leak is suspected, additional images in various projections are obtained in order to identify any abnormal collection of tracer.

**Pharmacologic Interventions**

A cholecystokinin analogue (Kinevac, sin-calide; Bracco Diagnostics, Princeton, NJ) or a...