common bile duct measuring more than 2 mm in diameter suggests a pathologic or physiologic obstruction. Congenital hepatic tumors including hemangioblastomas and hepatoblastomas can be imaged sonographically. Benign vascular tumors of the liver including hemangioendotheliomas and mesenchymal hamartomas present as complex hepatic masses associated with dilated abdominal aortic and venous structures.

About 15% of neonatal abdominal masses arise from the gastrointestinal tract. These include omental and mesenteric cysts and gastrointestinal tract duplications. The hypoechoic concentric muscular thickening of pyloric stenosis is easily diagnosed by ultrasonography. Gastrointestinal masses can be distinguished from retroperitoneal masses and free intraperitoneal fluid due to peritonitis or hemorrhage can also be detected.

Many additional applications include the use of ultrasound to define normal neonatal genitalia and imaging pelvic masses in a newborn. One can also use ultrasonography to detect tethering of the neonatal spinal cord and to locate the level of the distal pouch in evaluating cases of imperforate anus. Diagnostic applications of rapid, noninvasive, high-frequency ultrasonography in neonatal abdomens continue to increase.

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Nuclear Magnetic Resonance Imaging of the Whole Body

IN THE PAST YEAR, the clinical evaluation of whole body nuclear magnetic resonance images has started at several centers in the United States. The technique measures the hydrogen density of a tissue and the effects of the molecular environment on the hydrogen. As a result, nuclear magnetic resonance provides cross-sectional images of the body with soft tissue contrast superior to that of x-ray computed tomography (CT). Spatial resolution is rapidly approaching that of CT and, in addition, there are no known hazards. Due to the static and varying magnetic fields and radio fields used, however, people with ferromagnetic or large metallic implants are presently excluded.

Because clinical evaluation has just begun, the actual clinical usefulness of whole body nuclear magnetic resonance imaging is unknown; it is showing good clinical potential in several areas. Because rapidly flowing blood causes blood vessels to be imaged as dark lumina, the vascular anatomy of the neck, mediastinum and abdomen can be seen in great detail without the need for intravenously given contrast agents. This effect of blood flow plus the ability of the nuclear magnetic resonance imager to be gated from a patient's electrocardiogram enables gated images of the heart to be obtained throughout the cardiac cycle.

Nuclear magnetic resonance clearly images all the major intra-abdominal, retroperitoneal and pelvic organs. It is presently comparable but not superior to CT in identifying most of the organs. Only a few pathologic conditions such as hepatic neoplasms have been studied in detail, but nuclear magnetic resonance imaging appears to have the potential to provide at least as much information as is obtained by CT.

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Ultrasonic Evaluation of Neonatal Vascular Catheters

THE ABDOMINAL AORTA and its branches, the inferior vena cava, portal vein and hepatic veins are readily imaged in the abdomen of a neonatal infant using high-frequency ultrasonography. Umbilical catheters are commonly used in neonatal intensive care. Ultrasound location of these catheters is a noninvasive technique that involves no ionizing radiation and has no known detrimental side effects. Sonographic catheter location allows direct visualization of the aortic bifurcation and renal arteries, thereby allowing one to assess the position of the catheter tip relative to the vessels. Coronal and decubitus scans in both transverse and longitudinal projections allow accurate locating of arterial and venous catheters and can detect intravascular thrombus associated with catheter placement. Locating catheters can also be done at crib side, which is particularly valuable in a fragile newborn.

Umbilical vessel anatomy determines the distinctive course of umbilical catheters seen on both plain film radiographs and by ultrasound. The arterial catheter passes through either of the periumbilical arteries, travels inferiorly towards the ipsilateral internal iliac artery, then turns cephalad and passes retrograde into the common iliac artery and from there into the abdominal aorta. In our nursery, optimal arterial catheter tip placement is below the origin of the renal arteries and above the aortic bifurcation; however, in some nurseries the catheter tip is placed in the midthoracic aorta. The umbilical vein catheter travels superiorly in the midline as the umbilical vein courses through the falciform liga-

ment to enter the liver where the umbilical vein joins the left portal vein. The catheter then crosses the portal vein to enter the ductus venosus and ascends through the ductus venosus to enter either the left or middle hepatic vein and from thence to enter the inferior vena cava on its way to the right atrium. Proper positioning of umbilical venous catheters should show the tip in the intrathoracic inferior vena cava or the right atrium.

About 17% of infants studied by the sonographic technique have had clinically evident signs of vascular compromise. Of these infants, ultrasound detected abnormal intravascular echoes or lack of radial pulsation in 10 of 12 or 83%. Abnormal echogenic foci, consistent with both thrombus and intimal dissections, were found. Ultrasonically detected abnormalities can be followed to resolution in infants. Typically the echogenic foci vanish and normal radial pulsation returns. The future evaluation of umbilical catheters within abdominal vessels can be augmented by combining Doppler analysis of flow within these vessels and high-frequency ultrasonic imaging. BARBARA A. CARROLL, MD

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Ultrasonographic Evaluation of Fetuses

BECAUSE OF technical improvements in both gray-scale and real-time ultrasound, prenatal ultrasonography has advanced far beyond its traditional roles of locating the placenta and determining fetal position, number and age. The fetus itself has come under increasing scrutiny. A variety of fetal anomalies can be consistently identified in utero. Recognition of many of these can dramatically alter patient management including the recent option of in utero interventional procedures.

The search for fetal anomalies with ultrasonography is carried out in two distinct patient groups. In the first group, the fetus is examined because of a genetic or familial history of a heritable disorder or an incidentally discovered risk factor such as an elevated amniotic fluid α-fetoprotein level. In these patients the prevalence of abnormality is high and an ultrasonographer knows which abnormalities may be present.

The second group includes those in whom a fetal abnormality is found serendipitously while the patient is being scanned for an obstetric indication, such as a discrepancy of size versus dates. In these patients the prevalence of anomalies is low. There is no genetic history of which abnormalities could conceivably be present. In such instances it is important not only to identify but to accurately characterize the lesion. For example, one should distinguish hydranencephaly from hydrocephaly; the prognostic implication is obvious. Accurately defined anomalies can alter the mode of delivery such as in cases of conjoined twins or a large sacral teratoma. The detection of such abnormalities as bilateral hydronephrosis, immune hydrops fetalis or hydrocephalus often affects the timing of delivery because such fetuses may be cared for more appropriately in a neonatal intensive care nursery than in their mother's womb. In addition, such lesions as posterior urethral valves and hydrocephalus can be diagnosed ultrasonographically and potentially treated in utero.

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Percutaneous Drainage of Abdominal Fluid Collections

A LOCALIZED fluid collection in a critically ill patient who has a clinical diagnosis of abdominal abscess following a surgical procedure or an injury would have required surgical intervention in previous years, both for diagnosis and for drainage. Now in many instances these lesions may be percutaneously aspirated for a diagnosis and percutaneously drained for treatment by an interventional radiologist.

Locating a suspected intra-abdominal abscess is usually done by either sonography or computed tomography. These cross-sectional imaging techniques allow intraorgan, extraorgan and extra-alimentary fluid collections to be imaged both with precision and accuracy and in a rapid and noninvasive manner. Using these techniques, a safe percutaneous access to the fluid collection that avoids bowel, unaffected solid viscera and vessels can be planned. After finding the collection, an 18- or 20-gauge needle is placed in the fluid collection and a diagnostic aspirate is obtained. If the collection is unmistakably pus or infectious as noted by a Gram's stain, then a percutaneous catheter can be inserted to allow for continuous drainage. Appropriate antibiotics can be selected on the basis of results of a Gram's stain while results of cultures are pending. The catheter is connected to a closed-bag drainage system until drainage is completed. Noninfectious collections either may be aspirated through the needle or, if they are very large, a catheter may be inserted to allow for complete drainage over a one- to two-day period.

These drainage procedures are done using local