

72. Pediatric Abdominal Disease

MRI of the pediatric abdomen poses many challenges, in particular with younger patients, where it is difficult to minimize voluntary motion. As such, conscious sedation may be necessary. Persistent physiologic motion due to respiration and bowel peristalsis may be minimized by utilization of sequences with short acquisition times, possibly to the detriment of image quality, or employing motion robust imaging techniques such as BLADE and newer compressed sensing approaches. Pediatric abdominal masses most commonly involve the kidney with nephroblastoma (Wilms' tumor) being the most common, often appearing as a large heterogeneously hyperintense and hypointense mass on T2 and T1WI, respectively. Inhomogeneity on T2WI may result from hemorrhagic, cystic, or necrotic foci, the latter identifiable by a lack of contrast enhancement. Figure 72.1A illustrates FS CE T1WI of a large, somewhat homogeneously enhancing nephroblastoma. Since normal retroperitoneal lymph nodes are not commonly visible in children, the presence of such nodes, which often enhance and demonstrate increased SI on T2WI, is suspicious for metastases. Infiltration of the perirenal fat or renal veins is an important determination, the latter manifesting as loss of normal vascular flow voids on FSE imaging or as luminal hypointensity on GRE images. MRV may further delineate such spread if invasion is questioned, as this finding may alter the surgical approach. The true origin of a retroperitoneal mass in a child may be difficult to delineate: a neuroblastoma arising from

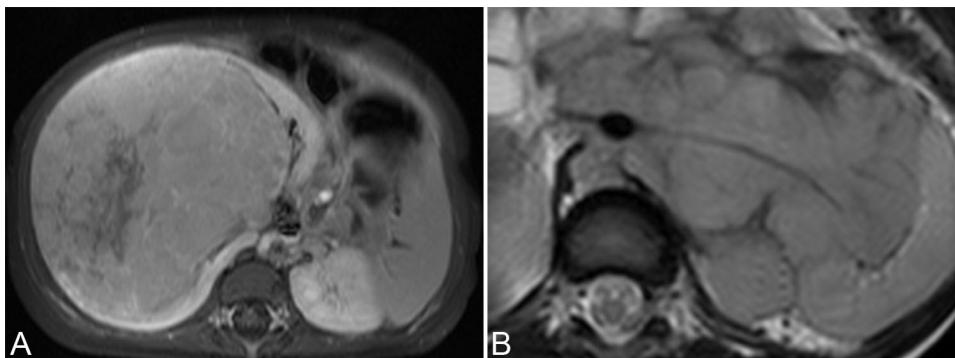


Fig. 72.1

the adrenal medulla or paraspinal sympathetic chain may appear similar. A neuroblastoma is shown on the T2WI of Fig. 72.B. Unlike nephroblastomas, neuroblastomas are less well-defined, typically encase but do not infiltrate the retroperitoneal vascular structures, extend posteriorly to the aorta, and calcify more frequently—the latter finding not well detected on MRI. Localization of lesion origin to the adrenal gland is assisted by the multiplanar capabilities of MR. Extension to the midline is an important staging factor. More than half

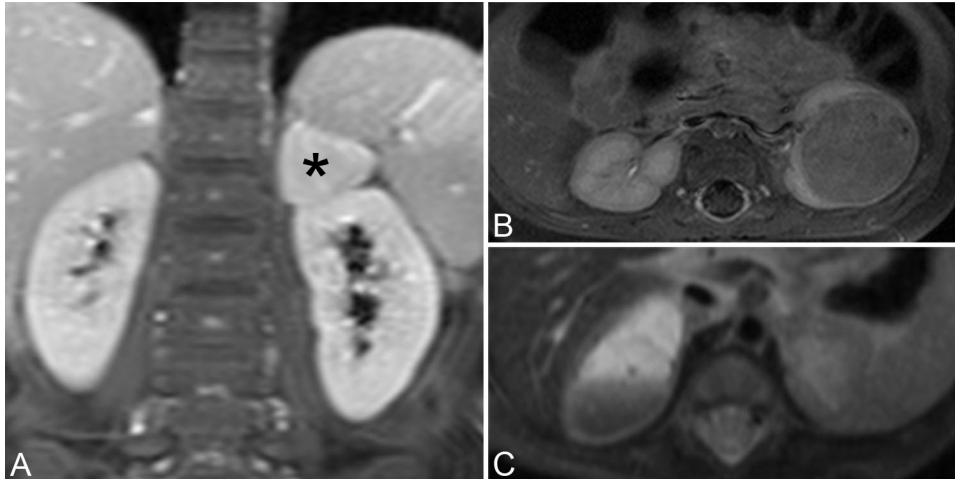


Fig. 72.2

of neuroblastomas metastasize to bone—a more difficult finding to appreciate in infants, as opposed to adults, given the normal low marrow SI on T1WI in the former. In particular whole-body DWI can be a valuable technique for depiction of metastatic disease in this setting. Progressively more benign neurogenic tumors—ganglioneuroblastoma then ganglioneuromas—may be found with increasing age (based on a spontaneous or therapy-dependent differentiation with time), the former lesion illustrated in the coronal FS CE T1WI of Fig. 72.2A (asterisk). Such lesions do not encase the vasculature like a neuroblastoma. The left kidney in Fig. 72.2B (FS CE T1WI) is affected by a mesoblastic nephroma (i.e. fetal renal hamartoma)—the most common solid renal tumor in patients less than 6 months old. This lesion is benign with a MR appearance essentially indistinguishable from that of a nephroblastoma. Such lesions may be hyperintense on T2WI despite their typically fibrous content and enhance variably. Metastases from lymphoma and leukemia may also involve the kidney. Nephroblastomatosis is the rare persistence of the fetal renal blastema that predisposes to nephroblastoma development, a lesion more likely to develop from central rather than peripheral (perilobar) lesions. These lesions often manifest as bilateral, oval-shaped entities with irregular hypointense foci on T1WI and CE T1WI and high SI on T2WI. Hemorrhage into the adrenal glands, often from birth trauma, may occasionally mimic a retroperitoneal neoplasm. In distinction to neoplasia, adrenal hemorrhages often preserve the triangular shape of the gland. The SI characteristics of such hemorrhages vary depending on the stage of their contained blood products: the axial STIR T2WI image in Fig. 72.2C demonstrates hyperintensity consistent with the hemorrhage's subacute timeframe.

Hepatoblastomas and hepatocellular carcinoma, both malignant, constitute the major pediatric liver masses. The former—associated with Beckwith-Wiedemann, fetal alcohol,

and Gardner's syndromes—affects a younger population (1 year of age), while hepatocellular carcinoma typically affects children between 5-15 years old with hepatitis or congenital liver disease. These two entities appear similar on MR, both preferentially involving the right hepatic lobe and occurring commonly as a solitary mass. The hepatoblastoma in the CE T1WI of Fig. 72.3 exhibits this appearance. Early heterogeneous enhancement is typical and reflective of the contained fibrous structures that are more prominent in hepatoblastomas than in hepatocellular carcinoma. Assessment of both involvement of nearby vascular structures and portal lymph nodes should be made. Prominent flow-voids are present in the hepatoblastoma of Fig. 72.3, a feature complicating its distinction from a hemangioma (infantile cavernous hemangioma). Enhancement patterns similar to those of adult hemangiomas typify the latter (see Chapter 65). Pancreatoblastoma is exceedingly rare compared to the aforementioned pathologies yet represents the most frequent solid neoplasm of the pancreas in childhood. It may arise at any location of the pancreas and metastases to the liver and lymph nodes are present in up to 1/3rd of cases.

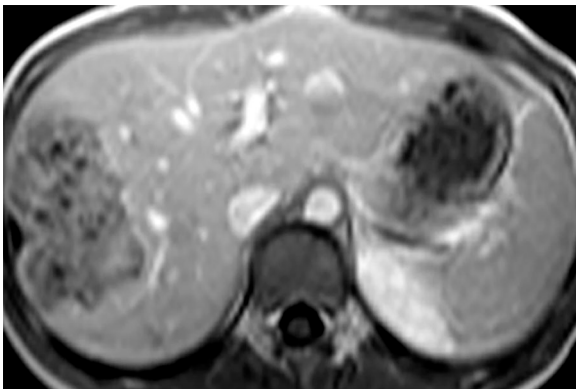


Fig. 72.3

Inflammatory bowel disease may best be assessed by MR enterography acquiring T2WI single-shot sequences in axial, coronal and sagittal orientations and CE FS T1WI after oral application of fluid. In particular Crohn's disease typically affects young adolescents and presents with bowel wall thickening >3 mm of affected loops as well as associated vascular engorgement and fibrofatty proliferation. Inflammatory changes typically show increased SI on T2WI and prominent enhancement after contrast application. Complications includes strictures and stenosis of the affected bowel segment as well as fistulas and abscess formation.