Given the improved SNR compared with 1.5 T, 3 T MR imaging holds particular promise for pediatric brain imaging. High-resolution 3D imaging is feasible, with realistic acquisition times (<5 min) for voxel sizes of 1 mm³ and under, with both T1- and T2-weighted scans possible (as well as FLAIR). Three-dimensional scans of the brain are typically acquired in either the sagittal or the axial orientation, with images subsequently reformatted in any additional desired plane. Complex anomalies are in particular well studied by high-resolution 3D imaging. The MR image of a 7-year-old patient with intractable seizures due to lissencephaly, a neuronal migration abnormality, is illustrated in Fig. 48–1 with axial (A) T2- and (B) T1-weighted scans. The slice thicknesses for these 3D acquisitions, acquired in an axial orientation, were 1.5 and 0.9 mm, respectively.
T2- and T1-weighted axial images, in a patient with neurofibromatosis type 1 (NF1) and bilateral optic nerve gliomas, are illustrated in Figs. 48–2A and 48–2B. There is fusiform enlargement of the optic nerves bilaterally. The T2-weighted scan was acquired using 3D technique, with a slice thickness of 0.8 mm, and the postcontrast T1-weighted scan was acquired with 2D technique, and a slice thickness of 2 mm.

Axial T2-and T1-weighted images are illustrated in Figs. 48–3A and 48–3B from the exam of a 28-week premature, 2-week-old infant. Parenchymal hemorrhages are noted bilaterally. Both scans were 3D in type, with the images illustrated 1.5 and 0.9 mm in thickness, respectively, and the T1-weighted scan reconstructed from a sagittal primary acquisition.

The improved depiction of intracranial vessels at 3 T, using 3D TOF MRA, offers a further important advance for pediatric neuroimaging. Illustrated in Figs. 48–4A and 48–4B are 3D TOF MRA studies at 1.5 and 3 T in an 8-year-old sickle cell patient, with multiple prior strokes now presenting with transient ischemic attacks. The left internal carotid artery is not visualized on the 1.5 T study, other than the carotid terminus. The small thread of the residual patent vessel is well seen on the 3 T exam (arrows, B).