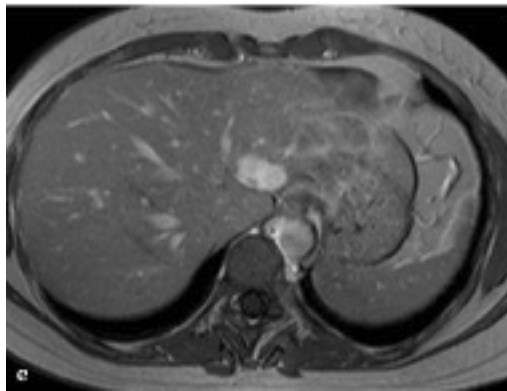
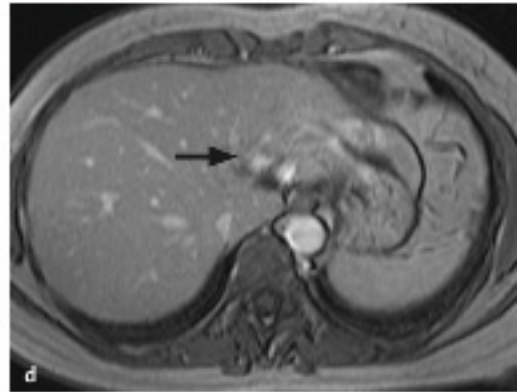
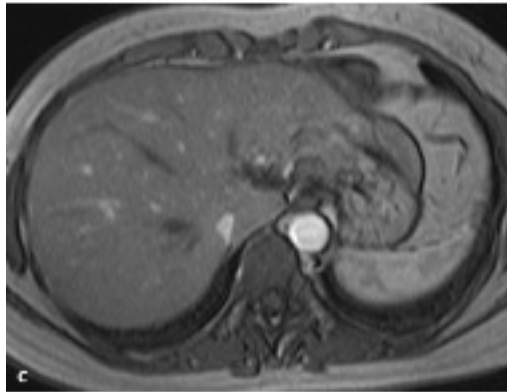
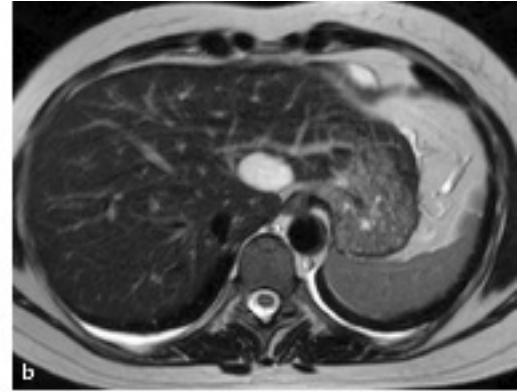
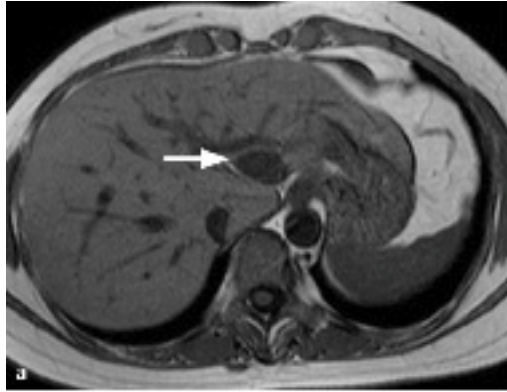


Fig. 5.3a–e Hemangioma.

- a** The T1W GE image demonstrates the hemangioma as a well-circumscribed, hypointense lesion (arrow).
- b** The tumor has very high signal intensity on the heavily T2-weighted image, appearing iso-intense to cerebrospinal fluid (“light-bulb” sign).
- c–e** Appearance after intravenous bolus injection of Gd-DTPA.
- c** On the T1W GE image at approximately 20 s post injection, the lesion is predominantly hypointense and shows slight peripheral, nodular contrast enhancement.
- d** At approximately 40 s post injection, the tumor shows progressive centripetal enhancement (“iris diaphragm” phenomenon).
- e** The lesion is completely enhanced by approximately 120 s post injection.



Given the high index of confidence achieved with MRI, it is rarely necessary to proceed with angiography, which shows lacunar contrast pooling without malignant vascular transformation or arteriovenous

shunts; ultrasound-guided or CT-guided percutaneous biopsy; or a nuclear-medicine blood pool scan.

Focal Nodular Hyperplasia

Focal nodular hyperplasia (FNH) is the second most common benign tumor of the liver, with an autopsy incidence of 8%. It shows a 2:1 predilection for females over males, with a peak incidence between

20 and 50 years of age. An association with oral contraceptive use has been discussed, but is no longer considered relevant. Histopathologically, FNH involves a regional hyperplasia of all hepatic

tissue components. The hyperplasia is permeated by fibrous septa and is most likely initiated by a vascular anomaly at the center of the lesion (the *nidus*), toward which the fibrous septa converge. An association with hemangiomas has been described and supports the theory of a vascular malformation as the underlying cause. FNH is solitary in 80% of cases, is not encapsulated, has smooth margins, and usually ranges from 3–5 cm in diameter (may reach 20 cm).

Multiple sites of focal nodular hyperplasia have also been described in association with vascular malformations in other organs. Rarely, FNH undergoes intralesional hemorrhage or necrosis. Usually, this occurs only in large tumors and may present with nonspecific upper abdominal pain.

MRI Specifics

- Focal nodular hyperplasia is isointense to liver tissue on unenhanced MRI. It is slightly hypointense or often indistinguishable from normal liver tissue on very heavily T1W GE sequences.
- The tumor is frequently isointense or slightly hyperintense on T2W images. This is due to the tissue nature of focal nodular hyperplasia, which consists histologically of normal liver tissue.
- In approximately 50–80% of cases, a central spoke-wheel “scar” (*nidus*) can be seen that contains vessels and bile ducts and appears bright on T2W images (**Fig. 5.4**).
- On *dynamic MRI* using gadolinium-based *extracellular contrast agents* (e.g., Gd-DTPA, Gd-DTPA-BMA, Gd-DOTA, etc.), FNH is characterized by intense, early arterial, centrifugal, sometimes patchy contrast uptake that occurs several seconds after bolus contrast injection and spares a hypointense central area

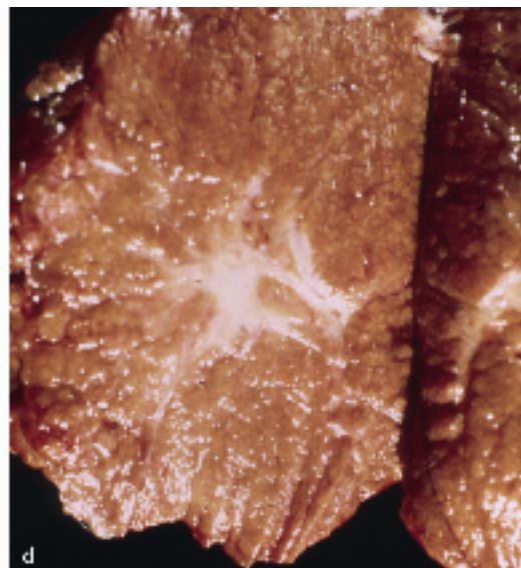
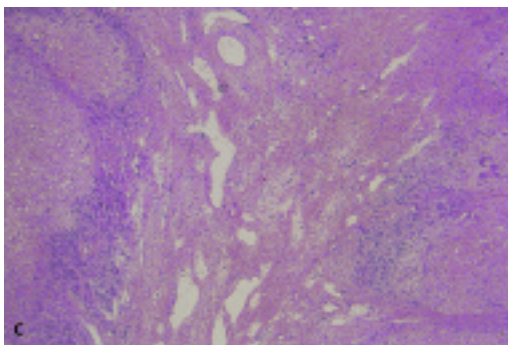
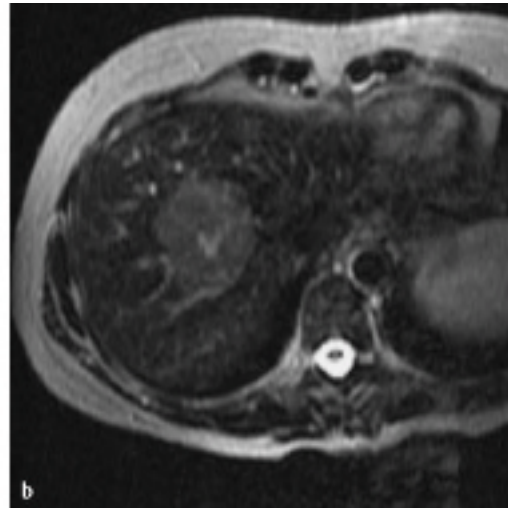
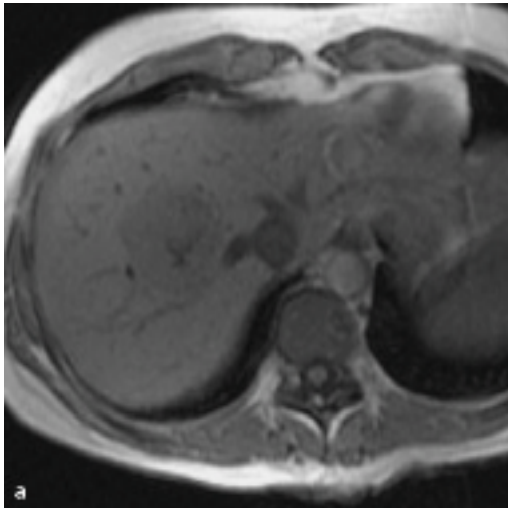


Fig. 5.4a–d Focal nodular hyperplasia (FNH) with a central nidus.

- a** T1W GE image. The lesion appears largely isointense or perhaps slightly hypointense to the surrounding liver tissue. The central scar is markedly hypointense.
- b** The T2W FSE image displays the FNH as a slightly hyperintense lesion with a markedly hyperintense central scar.
- c** Pathologic specimen of FNH with a central scar. (Reproduced with permission from Rummeny et al., *Radiology* 1989;171:323–6).
- d** Histologic specimen of the central scar, demonstrating vascular structures. (Reproduced with permission from Rummeny et al., *Radiology* 1989;171:323–6).