Incidentally Discovered Hepatic Lesions

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Historically, unsuspected incidental solid tumors of the liver were encountered only at the time of laparotomy when biopsy and definitive histologic diagnosis were obtainable. However, as cross-sectional imaging studies have become widely available and increasingly applied, the identification of unsuspected liver lesions has become common, and the appropriate means to address these lesions is a growing clinical problem.

Although the majority of incidental liver lesions are benign and need no specific therapy, unsuspected primary hepatocellular carcinoma or metastatic tumors from a previously undiagnosed primary occur with a defined and significant frequency. It is important to recognize, however, that the range of diagnoses encountered will be related to the population under study. For example, patients subjected to imaging studies to investigate benign conditions such as cholecystitis or renal colic are likely to have findings that mirror those of the general population. By contrast, the likelihood of encountering malignant hepatic lesions will probably be greater in patients diagnosed with cancer and undergoing extent of disease assessment or in chronic hepatitis patients undergoing screening evaluation. Thus, the radiographic findings and the clinical context must always be considered together to formulate an appropriate differential diagnosis.

In many cases, a precise diagnosis of an incidental liver lesion can be made on the basis of the lesion’s radiographic appearance. Often, however, the radiographic findings are inconclusive, prompting additional investigations. Thoughtful application of noninvasive imaging studies will provide the correct diagnosis, however, and needle biopsy is often unnecessary.

The best approach to evaluating patients with incidental hepatic lesions continues to evolve in step with advances in imaging technology. At MSKCC, high-quality magnetic resonance imaging (MRI) and experienced radiologists are readily available, and we have come to rely heavily on this imaging modality. The value of MRI in assessing hepatic lesions, distinguishing benign from malignant tumors, and distinguishing among the various benign lesions has been shown in several previous reports and supports its use in these settings. However, dynamic computed tomography (CT) scanning and duplex ultrasonography (US) may also supply valuable diagnostic information. It must be emphasized, however, that high-quality imaging studies and radiologists experienced in evaluating hepatic lesions are absolutely essential.

This chapter discusses the problem of incidentally discovered liver tumors and provides a framework for the clinician to use in pursuing further diagnostic studies. We also present some commonly encountered clinical situations and show the value of MRI in assessing problematic lesions. Detailed discussions of specific benign or malignant hepatic tumors appear in later chapters.
RELATIVE FREQUENCY OF DIFFERENT HISTOLOGIES IN INCIDENTALLY DISCOVERED LIVER TUMORS

Advances in hepatic imaging have made incidentally identified hepatic lesions commonplace. Moreover, the sensitivity of current generation MRI and helical CT scanners have improved greatly, and lesions less than 1 cm in diameter are frequently reported. Although radiographic characterization may be readily available for some of these lesions, many cannot be characterized completely. The clinician is thus faced with an unexpected hepatic lesion and an extremely anxious patient expecting a cogent plan for establishing the diagnosis, which in turn may affect treatment recommendations. The relative frequency of possible diagnoses that comprise incidental liver lesions is uncertain and may vary significantly on the basis of the clinical situation in which they are encountered. Although sparse, data from previous studies on different patient populations will help the clinician in discussing the findings with the patient and in formulating a rational diagnosis and treatment plan.

Incidentally Discovered Liver Lesions in Well Patients

In otherwise well patients without a known primary malignancy, incidental solid liver lesions occur with great regularity. Benign hepatic lesions have been reported in up to 50 percent of the general population and consist mostly of simple cysts, hemangiomas, and focal nodular hyperplasia (FNH); it is likely that benign lesions occur with the same frequency in cancer patients. Precise information relating to the relative frequency of various benign and malignant tumors of the liver is limited, and the published data may not reflect the true incidence in the general population. Much of the information on incidental liver lesions is from autopsy or surgical series; as such, it is likely to be biased by the referral patterns of the clinicians and institutions from which they originate. Nevertheless, certain lesions occur more commonly than others, and at least some knowledge of the relative frequency of various diagnoses for hepatic tumors is useful in evaluating a patient with an incidental liver tumor. Little and colleagues published a report of 36 patients with incidental solid tumors evaluated over a period of 36 months. Twenty-nine (81%) of these incidental tumors represented benign conditions while the remaining 7 (19%) were malignant: 5 metastatic tumors and 2 primary liver tumors. In this small series, patients with physical evidence of hepatomegaly were more likely to harbor a malignancy. An elevated serum alkaline phosphatase level was associated with malignancy in 60 percent of patients over the age of 55 years and in 22 percent of patients under the age of 55 years. Hepatic hemangioma was identified in 20 patients (52%), making it the single most common histologic diagnosis.

A more recent study from the same authors analyzed 64 patients with solid hepatic lesions encountered unexpectedly in otherwise well patients (Table 2–1). Fifty-three patients (83%) had either benign neoplasms or non-neoplastic conditions, and hemangiomas were again the single most common finding (52%). Additional benign tumors included FNH, focal fatty infiltration, and hepatic adenomas. Eleven patients (17%) were diagnosed with malignant lesions, of which hepatocellular carcinoma (HCC) was the most common (11%), followed by metastatic tumors (6%). These authors found no single biochemical or clinical finding that reliably distinguished a benign from a malignant neoplasm. However, age greater than 55 years, clinical hepatomegaly, and an elevated alkaline phosphatase level were associated more frequently with malignant tumors, with the risk increasing in accordance with the number of risk factors demonstrated. One

Table 2–1. FINAL DIAGNOSES OF INCIDENTALLY IDENTIFIED HEPATIC LESIONS IN OTHERWISE WELL PATIENTS

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Incidence (%)</th>
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<tbody>
<tr>
<td>Benign</td>
<td></td>
</tr>
<tr>
<td>Hemangioma</td>
<td>52</td>
</tr>
<tr>
<td>FNH</td>
<td>11</td>
</tr>
<tr>
<td>Adenoma</td>
<td>8</td>
</tr>
<tr>
<td>Fatty infiltrate</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
</tr>
<tr>
<td>Malignant</td>
<td></td>
</tr>
<tr>
<td>HCC</td>
<td>11</td>
</tr>
<tr>
<td>Metastasis</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
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</table>

FNH = focal nodular hyperplasia; HCC = hepatocellular carcinoma.
hundred percent of patients with all three risk factors had a malignant tumor (Fig. 2–1).

The results of a study from Jones and colleagues appear to contradict these results, however. In this study, the authors reviewed 1,454 contrast-enhanced CT scans over a 1-year period, selecting those 254 patients (17%) with small (< 1.5 cm) lesions for further analysis. The study population consisted of patients with known primary malignancies undergoing routine evaluation as well as patients with no known cancer diagnosis. Using the results of biopsies, additional radiographic studies, or serial imaging studies, the authors found that 51 percent of all patients had benign lesions while 22 and 27 percent, respectively, had malignant or indeterminate lesions. However, in 45 patients with no cancer diagnosis, none of the small hepatic lesions were malignant.

Rarely, pseudotumors of the liver—nonhepatic conditions apparently involving the liver but arising from adjacent organs—may cause confusion. Such conditions (which may include tumors of the right adrenal gland, right kidney, or lesser curvature of the stomach, or subhepatic abscess from a perforated peptic ulcer) are uncommon causes of diagnostic uncertainty but should be considered as possibilities in some situations.

**Incidentally Discovered Liver Lesions in Patients at Risk for 1° or 2° Hepatic Malignancies**

Are incidental liver tumors in patients with known primary malignancies more likely to be malignant? It would appear that this is true although the precise incidence is difficult to determine and will vary with the patient population and the stage of disease. In the study described above, Jones and colleagues found that small incidental hepatic lesions were equally likely to be benign in patients with (51%) or without (49%) a cancer diagnosis. However, of the 209 patients with known primary cancer, incidental liver lesions were malignant in 26 percent. The most common underlying cancer diagnoses were breast (22%), colorectal (19%), and renal cell (10%) can-

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**Figure 2–1.** The probability of malignancy in an incidentally discovered solid lesion. In this series, a tagged red cell scan was used to exclude hemangioma. Magnetic resonance imaging (MRI) is now the test of choice for this purpose. (Alk phos = alkaline phosphatase.) Reprinted with permission from Little JM. Benign tumors of the liver. In: Terblanche J (ed). Hepatobiliary malignancies: its multidisciplinary management. Edward Arnold; 1994.
cancers; melanoma (10%); lung cancer (9%); other gastrointestinal cancers (9%); and lymphoma (8%). The majority of patients (82%) with small (< 1.5 cm in diameter) hepatic lesions were known to have a primary malignant tumor, and multiple small lesions were found to represent malignant disease more often than solitary lesions.

In a more recent study from MSKCC, Schwartz and colleagues reviewed reports of 2,978 CT scans from patients with cancer over a 24-month period. In contrast to the study by Jones and colleagues, lymphoma was the most common underlying diagnosis (22%), followed by genitourinary cancers (18%), colorectal cancer (14%), and breast cancer (12%). Small hepatic lesions (defined as tumors < 1 cm in diameter or deemed too small to characterize) noted on the initial scans were assessed with follow-up CT scans, and the number and presence of any additional lesions were recorded. Among the 2,978 patients, small hepatic lesions were reported in 378 patients (13%). Fifteen (4%) of these patients also had larger hepatic lesions that were interpreted as metastases. In 44 patients (11.6%), small hepatic lesions demonstrated interval growth and were considered metastatic. In the majority (80.2%) of patients, however, no interval growth was observed over a mean follow-up of 25.6 months, and the lesions were presumed to be benign. Small hepatic lesions in 31 patients (8.2%) were stable at follow-up after at least 6 months and were considered indeterminate. Also, this study confirmed the observation by Jones and colleagues that multiple small lesions were more likely to represent metastatic disease than were solitary lesions.

These two large series show clearly that the underlying diagnosis predicts the likelihood that small hepatic lesions will represent metastatic disease. In the report from Schwartz and colleagues, the incidence of malignancy varied considerably when the patients were stratified by diagnosis, ranging from 4 percent in those with lymphoma and genitourinary cancers to 14 and 22 percent in patients with colorectal cancer and breast cancer, respectively (Table 2–2). Small, incidental liver lesions were more likely to be malignant in patients with primary cancers of the small bowel, skin, pancreas, liver/biliary tract, or uterus. Furthermore, the incidence of malignancy in this study (11.6%) was much lower than that observed in the study by Jones and colleagues (26%), which probably reflects differences in the underlying diagnoses. For example, unlike the latter report, patients with lymphoma represented 20 percent of the study population in the series from Schwartz and colleagues; yet, small hepatic lesions in these patients were among the least likely to be malignant. On the other hand, colorectal cancer and breast cancer (tumors more likely to give rise to metastatic liver disease) represented a smaller proportion.

The level of suspicion that malignant liver disease exists, based on factors such as stage of the primary tumor, laboratory values, coexisting risk factors, or results of other imaging studies, is itself an important factor that influences the results of such studies. For example, Noone and colleagues used MRI to further investigate suspicious hepatic lesions seen on CT or US in 34 patients with breast cancer. Twenty-one (62%) of these patients had malignant hepatic disease, 19 of whom had metastatic breast cancer; 1 patient had metastatic carcinoid, and 1 had primary HCC. A study by Tanaka and colleagues further demonstrates this point in cirrhosis or chronic hepatitis patients with small hepatic lesions (≤ 3.5 cm) identified on US. These patients are at high risk for HCC but may also harbor dysplastic or regenerating nodules, which are typically small and which may be difficult to distinguish from cancer. Of the 31 nodules identified, 17 (55%) were histologically proven to be HCC. The likelihood of malignancy increased with size, from 30 percent of those < 1 cm being malignant to 86 percent of those > 1.5 cm.

**CLINICAL EVALUATION**

It is clear that the clinical context in which an incidental liver lesion is discovered is an important aspect of the diagnostic process. In assessing such cases, there is no single algorithm that must be followed to arrive at the correct diagnosis. Often, part of the patient’s evaluation will have been performed by the referring physician, which may influence the subsequent course of events. Often, the initial study is a CT scan performed for symptoms of vague abdominal pain, trauma, or some other unrelated
A history of recent symptoms may be revealing and should also be elicited. Pain may be caused by benign or malignant tumors but is usually associated with large lesions, whereas anorexia, weight loss, jaundice, and abdominal distention are more indicative of malignancy. Patients with colorectal cancer may relate a history of anemia, a change in bowel habits, or constipation, whereas patients with metastatic neuroendocrine tumors may have symptoms consistent with hormone overproduction as the initial manifestation of their disease.

A complete physical examination, including a rectal examination and breast and pelvic examinations in women, is important and occasionally yields findings that may help in diagnosis. Patients with chronic liver disease may exhibit physical manifestations such as splenomegaly, ascites, palmar erythema, testicular atrophy, spider angiomas, or (rarely) asterixis. Patients with colorectal cancer may have blood in the stool or a palpable mass on digital rectal examination. Findings of diffuse lymphadenopathy or cachexia are obviously important and are suggestive of advanced malignant disease while some patients with large hepatic hemangiomas may have an audible bruit in the right upper quadrant. Although such physical findings are helpful, physical examination is unrevealing in the majority of patients.

Liver function tests, hepatitis B and C serology, and α-fetoprotein and carcinoembryonic antigen (CEA) levels can provide valuable information in the initial evaluation of patients with incidental tumors. In the appropriate clinical setting, α-fetoprotein levels above 500 ng/mL are diagnostic of primary HCC. Elevated CEA levels, although not diagnostic of a particular histology, suggest metastatic liver disease and should prompt an investigation for a primary lesion; at minimum, a colonoscopy followed by an upper endoscopy is required. Serum CEA levels may also be elevated in patients with peripheral cholangiocarcinoma and (occasionally) primary hepatobiliary malignancies, as well as in patients with primary HCC. Evidence of chronic hepatitis B viral infection or exposure to hepatitis C virus is clearly important since these patients are at risk for HCC. The number of patients with hepatitis C has reached nearly epidemic proportions in the

### Table 2–2. INCIDENCE OF METASTATIC LIVER DISEASE IN PATIENTS WITH SMALL HEPATIC LESIONS

<table>
<thead>
<tr>
<th>Primary Tumor</th>
<th>No. of Patients with Small Hepatic Lesions</th>
<th>No. (%) of Patients with Metastatic Liver Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymphoma</td>
<td>76</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Breast</td>
<td>63</td>
<td>14 (22)</td>
</tr>
<tr>
<td>Colorectum</td>
<td>57</td>
<td>8 (14)</td>
</tr>
<tr>
<td>Ovary</td>
<td>23</td>
<td>5 (22)</td>
</tr>
<tr>
<td>Stomach</td>
<td>17</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Prostate</td>
<td>15</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Kidney</td>
<td>14</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Bladder</td>
<td>12</td>
<td>1 (8)</td>
</tr>
<tr>
<td>Sarcoma</td>
<td>11</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Unknown</td>
<td>11</td>
<td>2 (18)</td>
</tr>
</tbody>
</table>

*According to primary tumor type.

United States, and this has resulted in an increased incidence of HCC. In our experience, many patients remain asymptomatic for many years, and hepatitis C is diagnosed during evaluation of an incidentally discovered hepatic mass. While most patients with hepatitis C develop HCC in the setting of hepatic cirrhosis, this is not necessarily true of patients with chronic hepatitis B, and in fact, a small number of patients may develop HCC in the absence of any obvious risk factors and with a normal liver.

In some reports, patient age has been identified as an independent predictor of the malignancy of a solid tumor of the liver. However, even in patients over 50 years of age, the relative frequency of benign lesions far surpasses that of malignant lesions. Little and colleagues have put considerable emphasis on the importance of alkaline phosphatase level as a reliable predictor of malignancy. As discussed above, these authors have noted that a patient over the age of 55 years with an elevated alkaline phosphatase level and an incidental liver lesion has a malignancy in 75 percent of instances. The incidence of malignancy rose to nearly 100 percent if a red cell scan was negative, essentially excluding the possibility that the lesion was a hemangioma. It is important to emphasize, however, that these findings have not been validated in a large series of patients.

**RADIOLOGIC EVALUATION**

In the majority of patients, clinical history, physical examination, and initial screening radiographic studies are insufficient to make the diagnosis, and additional imaging is required to further define the nature of the hepatic lesion. In some cases, studies are selected in order to answer very focused questions regarding the nature of a lesion; usually, however, broader information is required. In addition to defining the nature of the hepatic lesion, additional radiographic studies should also address the following questions:

1. Is the liver parenchyma normal, or is there evidence of underlying liver disease?
2. Are there additional liver lesions?
3. Can the individual lesions be characterized completely?
4. What is the relationship of the lesion(s) to the major vascular and biliary structures?
5. If clinically indicated, is the lesion resectable?

While the unique sensitivity and specificity of a particular imaging technique may provide an accurate diagnosis, multiple studies providing complementary information are sometimes necessary. Imaging techniques can be divided into three broad categories: (1) those used for screening, (2) those used for staging, and (3) those used in special situations. Ultrasonography is the standard imaging technique for screening, generally because it is noninvasive and can be quickly performed. In competent hands, US can provide important diagnostic information for even very small tumors and may be able to distinguish benign from malignant lesions. Ultrasonography is particularly useful for distinguishing solid from cystic lesions, a distinction that may not be obvious on CT scan, especially with small lesions. Ultrasonography is highly operator dependent, however, and requires a radiologist experienced in evaluating hepatic lesions. While both CT and MRI can be used as screening techniques, their expense and the need for the administration of intravenous contrast material reduce their use for routine screening. Both CT and MRI are most useful for staging, particularly when administered with dynamic incremental bolus techniques. With MRI, both T1- and T2-weighted sequences are required to increase the detection rate and provide accurate tissue characterization. Although motion artifact can occur, motion suppression for both CT and MRI can be used as screening techniques, their expense and the need for the administration of intravenous contrast material reduce their use for routine screening. Both CT and MRI are most useful for staging, particularly when administered with dynamic incremental bolus techniques. With MRI, both T1- and T2-weighted sequences are required to increase the detection rate and provide accurate tissue characterization. Although motion artifact can occur, motion suppression for both CT and MRI are available with fast techniques, and satisfactory results can be obtained in most instances. Imaging the liver for purposes of precise staging and possible operative planning demands detailed delineation of tumor location with regard to the segmental anatomy of the liver. Critical anatomic structures that must be identified include the portal and hepatic veins, inferior vena cava, and major bile ducts. This degree of anatomic detail is generally not available with standard noncontrast CT and may not be discernible even with routine contrast-enhanced CT. On the other hand, contemporary helical CT and CT arterial portography are capable of providing superior detail. Similarly, gadolinium-enhanced MRI is more than
sufficient to provide the specific information necessary for management decisions while permitting the evaluation of additional pathology within the abdomen at the same time. Radionucleotide scintigraphy and hepatic angiography, historically “gold standard” techniques for evaluating liver lesions, now have only limited roles in specialized situations. Nuclear medicine scans are occasionally used to differentiate problematic lesions such as hemangiomas (technetium $[\text{Tc}]^{-99m}$-labeled red blood cell scintigraphy), FNH, and hepatic adenomas ($\text{Tc}-99m$ with fast techniques, labeled sulfur colloid scintigraphy), but MRI has now supplanted these techniques in the vast majority of cases. Hepatic angiography is generally reserved for specific problems, such as differentiating FNH from hepatic adenoma by differences in their patterns of arterial supply. However, distinguishing these lesions arteriographically is not always straightforward, and high-quality MRI is often more helpful.

Improved accuracy in the differential diagnosis is a dominant theme in the development of clinical liver tumor imaging. Although contrast-enhanced CT has a valuable role and is generally the initial test performed to evaluate hepatic lesions, MRI has contributed more by virtue of its inherently superior contrast resolution. We use MRI for most cases in which diagnostic uncertainty remains, and we find that it usually clinches the diagnosis without the need for needle biopsy. Needle biopsy still has a role in some situations, however, usually in patients with an apparent malignancy of uncertain origin and in whom resection is contraindicated on clinical grounds or is not possible. On the other hand, in the appropriate clinical setting, if imaging studies are highly suspicious for cancer and resection is indicated and technically feasible, biopsy is unnecessary. It must be emphasized that the possibility of a hemangioma must be excluded before proceeding with needle biopsy, given the risk of severe hemorrhage. In some cases, diagnostic uncertainty remains even after extensive evaluation. In such cases (particularly when the lesion is small and probably benign in nature and when needle biopsy would pose some risk), repeat imaging studies in 2 to 3 months are a reasonable course of action, with continued follow-up if there is no change.

**COMMON CLINICAL PROBLEMS**

Identification of hepatic lesions that cannot be further characterized on imaging is frustrating not only for the patient and the referring clinician but also for the radiologist. As discussed above, these lesions are often discovered on screening CT or by US performed for unrelated reasons, and the finding is unexpected. It is important for the clinician to provide the radiologist with details of the patient’s medical history and with any prior imaging studies for review. In our practice, we find that direct communication with the radiologists provides them with a clearer understanding of the problem and thus a better opportunity to provide helpful information. Direct discussions with the radiologist also will often guide the clinician to the imaging study most likely to benefit the patient. At MSKCC, a weekly multidisciplinary conference that includes surgeons, radiologists, oncologists, and gastroenterologists is an invaluable forum in which to discuss such problematic cases.

In most cancer patients, the finding of liver metastases will significantly impact on treatment recommendations, whether discovered upon evaluation of the initial extent of disease or during follow-up after completion of initial therapy. In general, a new and previously unseen hepatic lesion is likely to represent metastatic disease and must be considered as such until proven otherwise. Focal hepatic accumulation of fat (focal fatty infiltration), which may be induced by systemic chemotherapy, is occasionally seen and may appear as a new lesion on CT (Fig. 2–2, A). In some patients, the entire liver may have an excess accumulation of fat except for focally spared areas of normal liver that may also be mistaken for a metastatic lesion. Fatty infiltration and focal sparing, while problematic on CT and US, are easily diagnosed with MRI (see Fig. 2–2, B to E). The finding of normal-appearing vessels coursing through a hypodense area on CT is suggestive of fatty infiltration and should prompt an MRI for confirmation.

Small hepatic cysts are relatively common and may present a diagnostic dilemma on initial contrast CT. When small, simple cysts typically do not generate CT values consistent with fluid, the result of volume averaging with adjacent tissue (Fig. 2–3, A).
However, cysts are easily diagnosed with US, provided they have no internal echoes, an increased through transmission of sound, and an imperceptible wall (see Fig. 2–3, B). Magnetic resonance imaging can also diagnose cysts on the basis of their intrinsic properties. Simple cysts are typically hyperintense on both T2-weighted images and more heavily T2-weighted images (see Fig. 2–3, C and D), and they do not enhance after administration of intravenous contrast (see Fig. 2–3, E).

Most hemangiomas are readily diagnosed, even on many single-phase CT scans. The classic finding of peripheral nodular enhancement is diagnostic of these lesions. The MRI characteristics of hemangiomas are also quite typical and include increased signal on T2- and heavily T2-weighted images and peripheral nodular enhancement after gadolinium administration (see also Chapter 1). Small hemangiomas may be difficult to characterize precisely on CT but are often easily diagnosed.

Figure 2–2. Focal fatty infiltration in a patient with breast cancer. A, Noncontrast computed tomography (CT) examination of the liver demonstrates two small lesions (arrows) in hepatic segment II not seen on a prior CT scan performed 6 months earlier. B, Fat-suppressed T2-weighted image, though the same level fails to demonstrate any lesions. C, Non-fat-suppressed heavily T2-weighted image demonstrates the lesions (arrows). D and E, Opposed- and in-phase images using chemical shift technique demonstrate the lesions to be present only on the opposed-phase image (D, arrows), diagnostic of focal fatty infiltration.
on MRI. Improvements in imaging hardware and software have dramatically reduced scanning times, allowing complete coverage of the liver during a held breath. This has also led to the incidental discovery of small hypervascular lesions that had not been seen on prior scans. Focal nodular hyperplasia is a lesion frequently encountered during clinical practice. These lesions are typically best seen on arterial dominant-phase images and mimic normal parenchyma on more delayed scans (Fig. 2-4).

Unfortunately, some lesions that are found incidentally are malignant. The liver is the second most common site of metastasis after the lungs. Hepatic metastases on MRI tend to be mildly hyperintense on T2-weighted images (Fig. 2-5, A) and show thick irregular rim enhancement after administration of gadolinium chelates (Fig. 2-5, B and C).

Figure 2–3. Hepatic cysts. A, Contrast-enhanced computed tomography demonstrates a small lesion (arrow) that could not be characterized on this examination. B, Ultrasonography of the same lesion demonstrates a cluster of small cysts. C, Fat-suppressed T2-weighted image demonstrates the lesions (arrow) to be hyperintense. D, The lesions (arrow) remain hyperintense on the heavily T2-weighted images. E, Images after administration of gadolinium fail to demonstrate enhancement of the cysts (arrow).
Figure 2-4. Hemangioma and focal nodular hyperplasia (FNH) in the same patient. A, T2-weighted image of the liver demonstrates a lesion (white arrow), which is hyperintense to hepatic parenchyma. A second lesion (black arrows) is almost isointense to background liver. B, Arterial-dominant T1-weighted gradient-echo image demonstrates peripheral nodular enhancement in the lesion in segments VII/VIII (white arrow). The lesion in segment IVA shows rapid homogeneous enhancement (black arrows). C, Delayed images after contrast demonstrate continued nodular filling of the lesion in the right lobe, defining it as a hemangioma (white arrow). The lesion in the left lobe is approaching the same signal intensity as that of hepatic parenchyma (black arrows), characteristic of FNH.
Figure 2-5. Hepatic metastasis. A, Fat-suppressed T2-weighted image demonstrates a lesion in the caudate lobe, hyperintense to background parenchyma. Note that this lesion contains a rim of intermediate signal intensity (arrow). B, T1-weighted gradient-echo (GRE) image before gadolinium administration, demonstrating the lesion to be hypointense (arrow). C, Postcontrast T1-weighted GRE image also demonstrates enhancement of the rim (arrow) seen in A.
Metastases can have a variety of enhancement patterns. In conjunction with the other characteristics provided by MRI, however, the correct diagnosis can usually be made.

REFERENCES