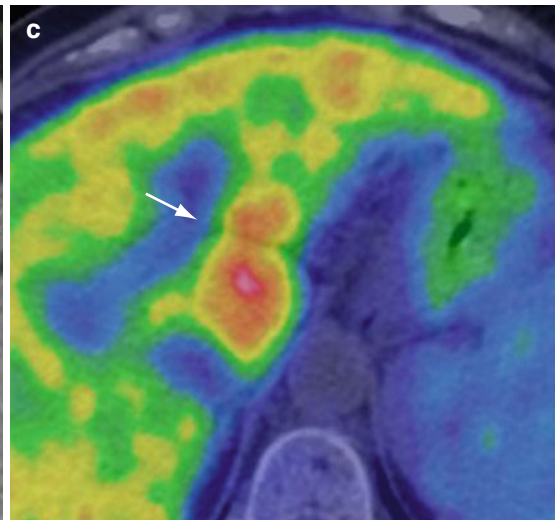
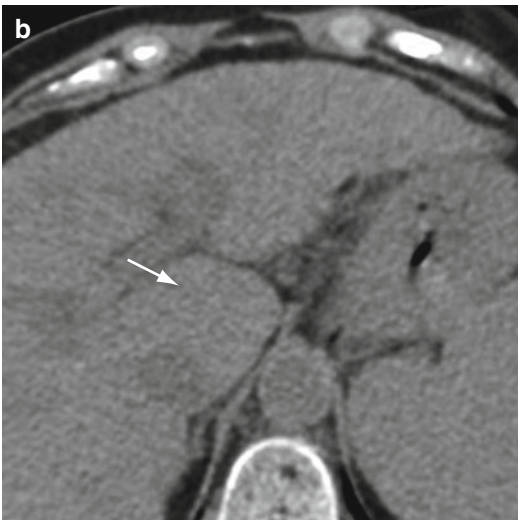


Case 62	Clinical Diagnosis: Hepatocellular Carcinoma	126
Case 63	Clinical Diagnosis: Multiple Myeloma.....	128
Case 64	Clinical Diagnosis: Paget's Disease	130
Case 65	Clinical Diagnosis: Sarcoidosis	132
Case 66	Clinical Diagnosis: Renal Cell Carcinoma	134
	Suggested Reading.....	136



■ Fig. 62.1 11C-Choline PET/CT (**a**: MIP image) showed increased tracer uptake in the first segment of the liver (*white arrow* on **b** and **c**) (**b**: CT scan; **c**: fused images), consistent with disease persistence

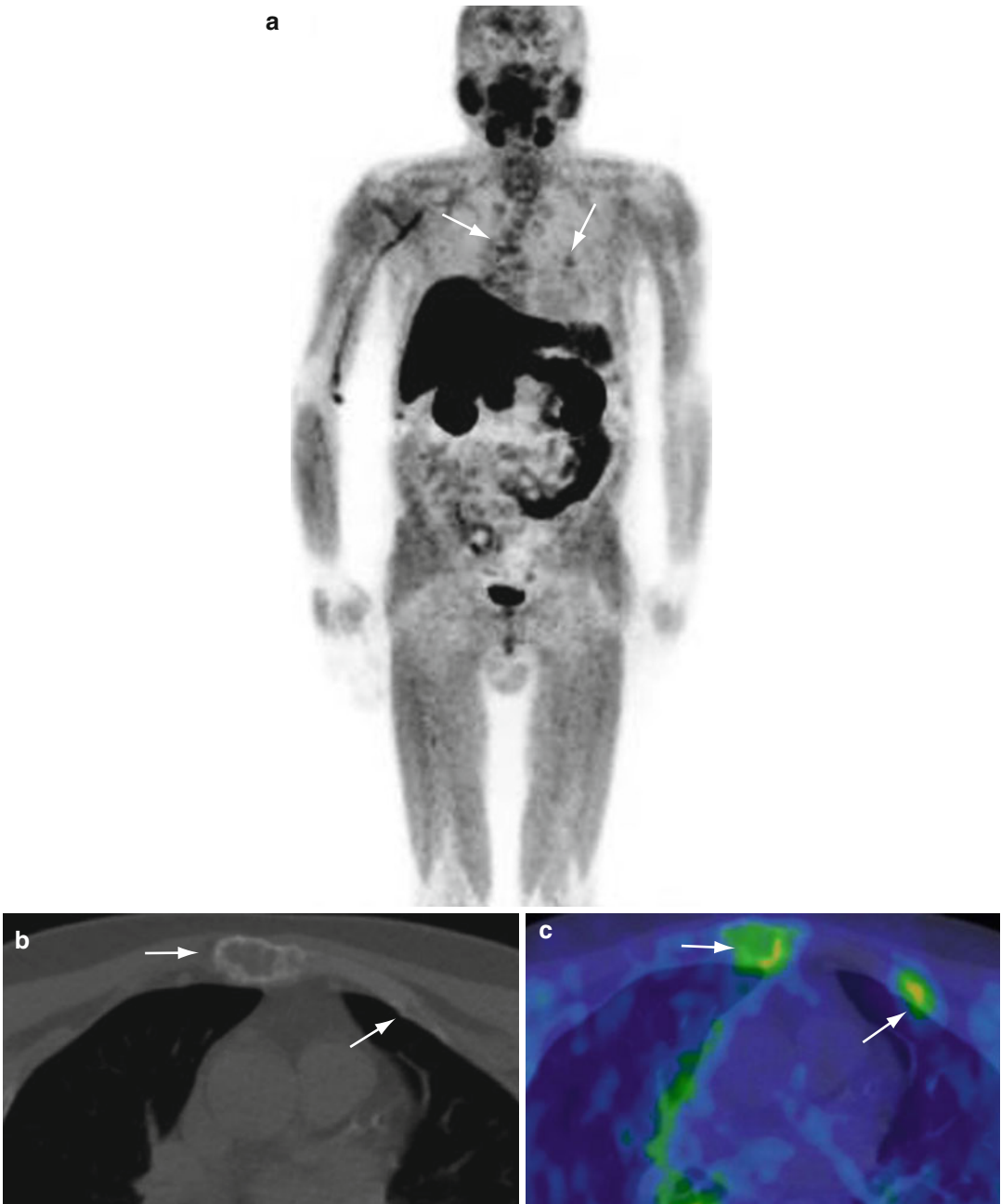
▣ Hepatocellular Carcinoma

Hepatocellular carcinoma (HCC, also called malignant hepatoma) is the most common type of liver cancer. Most cases of HCC are secondary to either a viral hepatitis infection or cirrhosis. Treatment options for HCC and prognosis are dependent on many factors, but especially on tumor size and staging. Tumor grade is also important. High-grade tumors will have a poor prognosis, while low-grade tumors may go unnoticed for many years, as is the case in many other organs, such as the breast, where a ductal carcinoma in situ (or a lobular carcinoma in situ) may be present without any clinical signs and without correlate on routine imaging tests.

Clinical Case

A 55-year-old female patient was affected by hepatocellular carcinoma. She was treated with thermoablation. After therapy the CT scan was equivocal for disease persistence. The patient was referred for an 11C-choline PET/CT scan to characterize the CT findings.

The scan demonstrated increased uptake in the suspect lesion (Fig. 62.1). This was consistent with incomplete response to therapy.



■ Fig. 63.1 ^{11}C -Choline PET/CT (**a**: MIP image) showed increased tracer uptake in the sternum and in the fourth left rib (*white arrows* on MIP, **b** and **c**) (**b**: CT scan; **c**: fused images), consistent with myelomatous bone lesions

Multiple Myeloma

Multiple myeloma (MM) is a neoplastic disease caused by the uncontrolled proliferation of plasma cells within the bone marrow, causing bone marrow dysfunction, bone damages (lytic lesions), release of monoclonal protein in the blood stream (linked to organ damage) and immune system suppression. The incidence of MM is relatively low (3–4 new cases/100,000 in the USA), representing 1% of all malignant tumors, but increases to 9.5 new cases/100,000 among African Americans. Males are more frequently affected by MM compared to females (M:F=3:2), with a peak of incidence at over 55 years. In more than 40% of patients, MM affects bones by producing interleukins activating osteoclasts. This process results in bone damage that can be diffuse (osteoporotic pattern) or focal (single or multiple lytic bone lesions), causing bone pain, pathological fractures, hypercalcemia, and hypercalciuria.

Clinical Case

A 59-year-old male patient was affected by multiple myeloma. He was referred for an ¹¹C-choline PET/CT scan to assess the extension of bone involvement.

The scan demonstrated two focal areas of increased tracer uptake in the sternum and in the fourth left rib (Fig. 63.1), consistent with myelomatous lesions. No other areas of pathological increased uptake were detected.

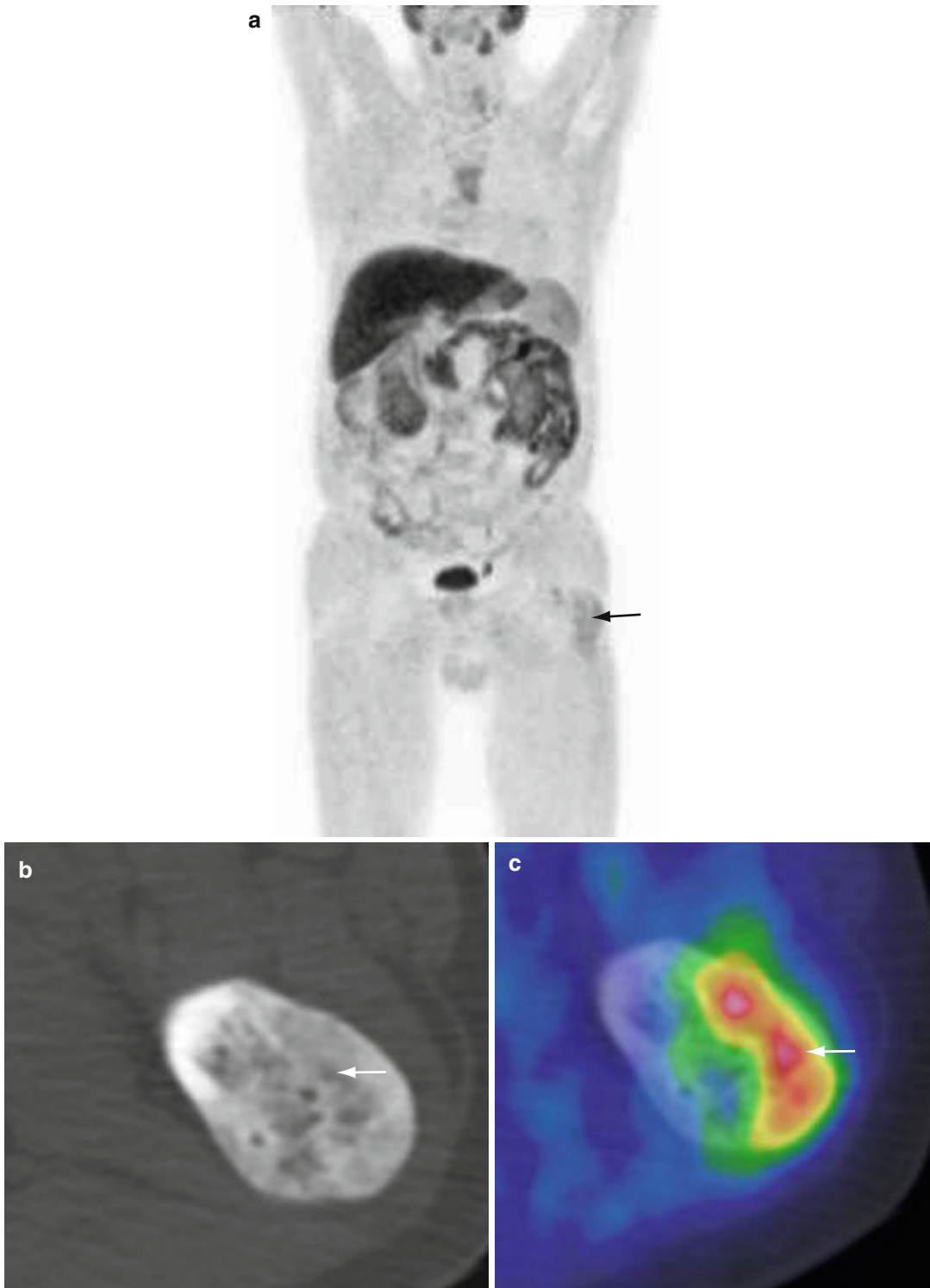


Fig. 64.1 11C-Choline PET/CT (**a**: MIP image) showed diffuse increased tracer uptake in the proximal femur (*black arrow on a, white arrows on b and c*), corresponding to increased density at CT scan (**b**: CT scan; **c**: fused images), consistent with Paget's disease

■ Paget's Disease

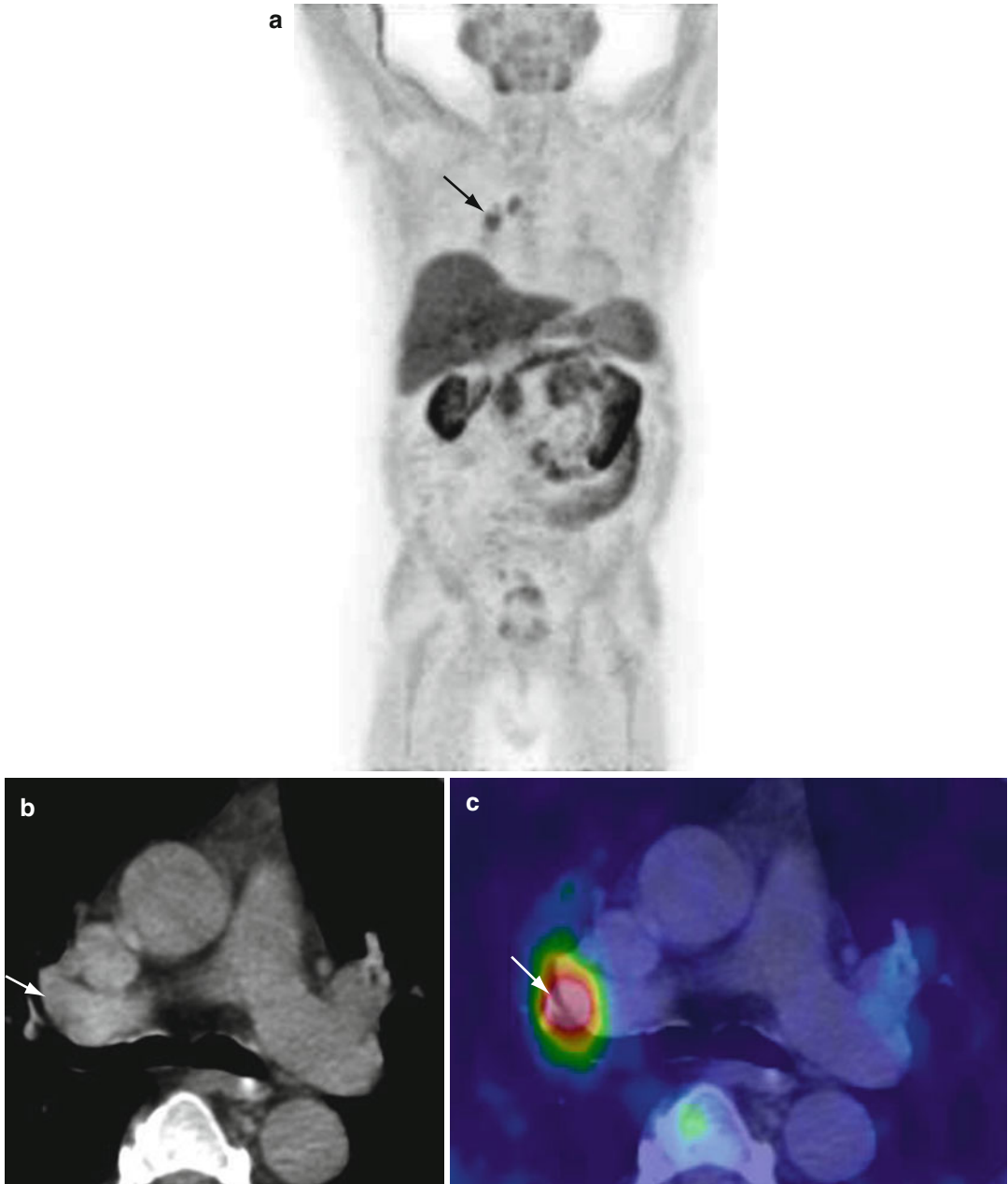
Paget's disease is a disorder that affects the normal remodeling process of bone. In the remodeling process, old bone is removed and new bone is formed. In patients with Paget's disease, this process is altered. These patients have an excessive amount of bone removal followed by an even more excessive amount of new bone formation. Unfortunately, this increased rate of bone remodeling leads to new bone that is weaker, has more blood vessels, and is larger in size than normal bone. While most cases do not cause symptoms, some patients may develop pain, fractures, or even malignant transformation into sarcoma (bone tumor), although this is rare.

Men are affected by Paget's disease slightly more often than women (3:2). Paget's disease is more common in patients of Northern European ancestry, most commonly in those from Great Britain. It is rare in the Asian and African populations. It is more common with increasing age, typically diagnosed in people in their 50s.

Clinical Case

A 78-year-old male patient was affected by prostate cancer that was treated radically. He was referred for an ¹¹C-choline PET/CT scan during the follow-up.

The scan demonstrated an area of diffuse increased tracer uptake in the proximal femur, corresponding to increased density at CT scan (Fig. 64.1). This was subsequently proved to be Paget's disease.



■ Fig. 65.1 ^{11}C -Choline PET/CT (**a**: MIP image) showed diffuse increased tracer uptake in the right pulmonary hilum (*black arrow on a*, *white arrows on b and c*) (**b**: CT scan; **c**: fused images), consistent with sarcoidosis

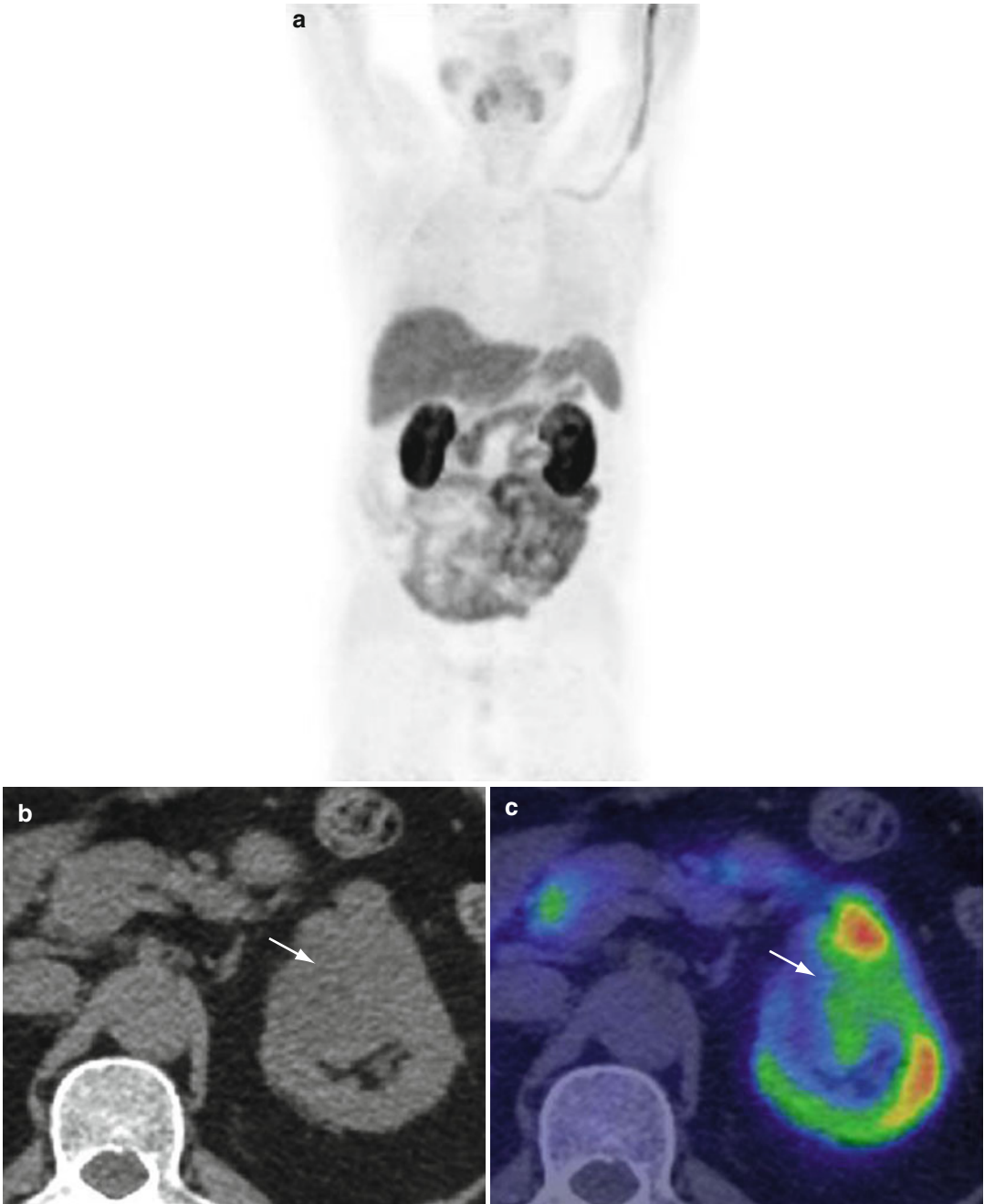
▣ Sarcoidosis

Sarcoidosis is a disease in which abnormal collections of chronic inflammatory cells (granulomas) form as nodules in multiple organs. The cause of sarcoidosis is unknown. Granulomas most often appear in the lungs or the lymph nodes, but virtually any organ can be affected. Normally the onset is gradual. Sarcoidosis may be asymptomatic or chronic. It commonly improves or clears up spontaneously. More than two-thirds of people with lung sarcoidosis have no symptoms after 9 years. About 50% have relapses. About 10% develop serious disability. Lung scarring or infection may lead to respiratory failure and death.

Clinical Case

A 62-year-old male patient was affected by prostate cancer that was treated radically. He was referred for an ^{11}C -choline PET/CT scan during the follow-up.

The scan demonstrated an area of increased tracer uptake in the right pulmonary hilum (Fig. 65.1). This was subsequently biopsied, and the final diagnosis was sarcoidosis.



■ Fig. 66.1 11C-Choline PET/CT (**a**: MIP image) showed increased tracer uptake in the cortical left kidney (*white arrows on b and c*) (**b**: CT scan; **c**: fused images), consistent with clear cell renal cancer

Renal Cell Carcinoma

Renal cell carcinoma (RCC) accounts for approximately 3% of adult malignancies and 90–95% of neoplasms arising from the kidney. This disease is characterized by a lack of early warning signs, diverse clinical manifestations, and resistance to radiation and chemotherapy.

Increasingly, renal cell cancers are diagnosed at an earlier stage, and nephron-sparing surgery and thermal ablation are gaining acceptance as a treatment of choice for smaller tumors. Radical nephrectomy is the standard for larger and central tumors.

Clinical Case

A 55-year-old male patient was referred for an ¹¹C-choline PET/CT scan for characterizing a left kidney mass detected at ultrasound. The scan demonstrated an area of increased tracer uptake in the left cortical kidney (Fig. 66.1). He underwent nephrectomy, and the final diagnosis was clear cell cancer.

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