Diffuse Renal Retention on Bone Scintigraphy in Localized Clear-Cell Renal Epithelial Neoplasm

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CASE REPORT

A 67-yr-old man was referred for \(^{99m}\)Tc-methylene diphosphonate (MDP) bone scintigraphy to investigate the significance of a small sclerotic rib lesion identified incidentally on a chest radiograph obtained because of chest congestion and symptoms of an upper respiratory tract infection. The patient’s past medical history included diabetes mellitus, peripheral vascular disease, mild chronic renal insufficiency (creatinine: 1.5–2.0 mg/dl) and a small infrarenal aortic aneurysm being followed with serial ultrasound studies. The patient had no known primary malignancy, but had previously had a mildly elevated prostate-specific antigen level (6.1 ng/l) and negative biopsies of the prostate. The bone scinti-
gram showed no abnormal increased uptake in the region of the rib abnormality and no bone findings to suggest the presence of skeletal metastatic disease. There was, however, uniform increased parenchymal retention of the radiopharmaceutical in the left kidney (Fig. 1) without evidence of a filling defect. The patient’s serum creatinine at the time of this study was 1.6 mg/dl. Alkaline phosphatase and serum calcium were both normal.

Because of concern for possible urinary outflow obstruction or renal vascular abnormality (e.g., renal vein thrombosis), the patient was referred for ultrasound with doppler examination of the kidneys. This study showed no evidence of hydronephrosis or vascular compromise, but a 1.8 × 1.5-cm exophytic, ovoid, slightly hyperechoic mass was noted in the inferior pole of the left kidney. This abnormality had not been present on a previous study done 1 yr earlier and was suspicious for a renal neoplasm. A subsequent contrast CT examination identified a 1.5-cm hyper-
vascular mass in the medial posterior portion of the lower pole of the left kidney (Fig. 2) with no involvement of the left renal vein or inferior vena cava and no adenopathy or other definite abnormalities.

The patient underwent left nephrectomy approximately 1 mo after the bone scan. A 1.5-cm irregularly hyperemic mass located largely in the cortical parenchyma along the inferomedial aspect of the left kidney was identified. Histologic examination revealed a clear-cell epithelial neoplasm with uncertain malignant potential on the basis of its overall characteristics. The remainder of the kidney showed no diagnostic alterations. No calcifications were identified in the neoplasm or elsewhere in the left kidney.

The patient had an uneventful postoperative course and was discharged from the hospital 6 days after surgery.

DISCUSSION

In most of the previously reported cases of diffuse, increased renal retention of bone scintigraphy radiopharmaceuticals, findings have been associated with either decreased clearance or increased parenchymal uptake.

Bone scintigraphy performed to assess the significance of an incidental finding of a small sclerotic rib lesion on a chest radiograph of a patient with no known malignancy demonstrated no evidence of metastatic disease, but there was moderate diffuse parenchymal retention in the left kidney. Renal ultrasound revealed an ovoid, slightly hyperechoic mass in the inferior pole of the left kidney, and subsequent contrast CT demonstrated a well-circumscribed hypervascular mass in that location. At nephrectomy, a localized 1.5-cm diameter clear-cell epithelial neoplasms, not definitely malignant, was found. No other abnormalities were noted in the remainder of the left kidney or in the surrounding soft tissues. No calcifications or other parenchymal changes in the kidney were identified to explain the retention of the bone agent, which was possibly related to the hyperemia associated with the neoplasm and undefined parenchymal factors.

Key Words: radionuclide imaging; bone scintigraphy; renal neoplasms


Increased renal retention of radiopharmaceuticals on bone scintigraphy has been observed in association with a variety of processes affecting one or both kidneys. These have included ureteral obstruction (1,2), previous irradiation (3,4), recent exposure to chemotherapeutic or other nephrotoxic drugs (1,5,6), myoglobinuria (7), ischemia (8) and acute tubular necrosis (9). Although there have been reports of malignant renal neoplasms associated with increased retention of bone agents (10–14), the more common appearance is decreased or absent activity in the lesion and, on occasion, the entire kidney, reflecting the nonfunctioning character of such neoplasms and their frequent deleterious impact on surrounding uninvolved parenchyma (2,15–17). The present report describes a localized renal neoplasm associated with diffuse parenchymal retention of bone agent and no scintigraphic evidence of a filling defect. Possible etiologies for this unusual scintigraphic pattern will be suggested.
Urinary tract obstruction is considered the most common cause of decreased renal clearance of bone tracer (1), with vascular impairment such as renal vein thrombosis or arterial stenosis with ischemia also reported to produce this finding (8,18). A variety of causes of renal parenchymal injury have been observed to produce increased cellular retention of phosphate and diphosphonate compounds, including radiation therapy (3,4), nephrotoxic drugs (1,5,6), sickle cell crisis (19,20), acute tubular necrosis (7,9) and acute renal failure with patchy renal vasoconstruction (21). Instances of malignant renal neoplasms demonstrating uptake of bone tracer have also been reported, usually attributed to regional hyperemia and/or renal calcification (10–14).

In this patient, the cause of increased renal retention of 99mTc-MDP remains unclear, given the absence of evidence of ureteral or vascular obstruction, the isolated character of the neoplasm in the lower pole of the left kidney and the absence of a parenchymal defect even though the findings on CT suggested the lesion was nonfunctional. Although regional hyperemia may result in increased tracer deposition in a renal neoplasm, particularly if areas of calcification or necrosis are present, there was no suggestion of such a focal finding in the present case. In addition, there was no histologic evidence of calcification in either the neoplasm or the remainder of the kidney. Although it can be speculated that the increased blood flow to the neoplasm may have resulted in modest generalized hypoperfusion and ischemia in the rest of the kidney, or that an unknown humoral factor was being released into the local milieu which may have contributed to the increased parenchymal retention of MDP throughout the entire kidney, no objective evidence to support either hypothesis can be presented.

Although the cause of diffuse renal retention of 99mTc-MDP in association with a discrete, localized, noninvasive clear-cell epithelial neoplasm of the kidney in this instance remains obscure, this case serves as a reminder of the importance of careful attention to the appearance of the kidneys on bone scans (2,15,22). Noticeable asymmetry in

FIGURE 2. CT images before (A) and after (B) contrast administration show the localized neoplasm in the inferomedial aspect of the left kidney (arrow). No calcification is noted in the lesion, which demonstrates uniform enhancement on the postcontrast image.
renal activity in a patient without known renal parenchymal disease warrants further investigation and possibly additional abdominal imaging with ultrasound or CT. Bone scan observation in this patient led to the identification of a lesion which, although not definitely malignant by histopathologic criteria, warranted resection before further transformation of the neoplasm could occur.

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REFERENCES