

# Incidental bone metastases identified by renal dynamic scintigraphy

## A case report

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### Abstract

**Introduction:** The Technetium-99m diethylene triamine pentaacetic acid (Tc-99m DTPA) renal dynamic scintigraphy is widely used to evaluate the split renal function and continuously demonstrate the whole urinary collecting system. Furthermore, the extrarenal uptake of technetium-99m DTPA can provide useful information for the patients.

**Case presentation:** We described a 72-year-old male with a history of flank pain for 8 months and gross hematuria for 3 days. The technetium-99m diethylenetriaminepenta-acetic acid (DTPA) renal dynamic scintigraphy was performed to evaluate the split renal function. Unexpectedly, there were 2 foci of abnormal increased tracer uptake in the midline of the abdomen. The diagnosis of renal cancer was made on the basis of the imaging characteristics on the ultrasonography. The 2 foci with elevated DTPA activity were consistent with bone metastases on the images of computed tomography and magnetic resonance.

**Conclusion:** The bone metastasis is one of the etiologies of the extrarenal uptake of technetium-99m DTPA, especially for the patients with several foci.

**Abbreviation:** DTPA = diethylenetriaminepenta-acetic acid.

**Keywords:** bone metastases, case report, renal dynamic scintigraphy

## 1. Introduction

Tc-99m diethylenetriaminepenta-acetic acid (DTPA) renal dynamic scintigraphy, a routine nuclear medicine technique, is a noninvasive, widely available procedure, which can evaluate the split renal function and continuously demonstrate the whole urinary collecting system in a single procedure. Furthermore, glomerular filtration rate can be calculated accurately with gates method when the renal dynamic scintigraphy is performed.<sup>[1]</sup> Normally, the radiotracer is mainly accumulated in the kidney. However, the extrarenal radiotracer uptake can also be detected incidentally due to various etiologies.<sup>[2–10]</sup> Here, we present a case of the extrarenal DTPA uptake due to bone metastases and provide a consideration to the probable etiologies.

## 2. Case presentation

A 72-year-old male with a history of flank pain for 8 months and gross hematuria for 3 days was referred to our hospital. The past history taking did not reveal pre-existing disease. Blood biochemistry was within normal limits. Physical examination disclosed the percussion pain in the area of left kidney. An ultrasonography (Fig. 1) was performed to detect the likely cause of his presentation, which revealed a large mass in the left kidney with the imaging characteristics of the renal cancer. The technetium-99m DTPA renal dynamic scintigraphy (Fig. 2) was performed for the preoperative evaluation of renal function. The images were acquired with the camera in the posterior position, with a 15% window centered at 140 keV using a 128 × 128 matrix. The blood flow phase (Fig. 2A) was determined with every 2 seconds per image after bolus injection of 10 mCi Technetium-99 DTPA through the right antecubital vein. The function phase images (Fig. 2B) were obtained with every 1 minute per image. In both of the blood flow phase and the function phase, there were 2 foci of abnormal increased activity in the midline of the abdomen with unknown etiology (arrows) in addition to the pathology of left kidney. The subsequent CT and MR were performed to detect the probable reason. The CT images (Fig. 3) showed lytic lesions in the spinous process of L1 (Fig. 3A, dotted arrow) and the vertebral body and the spinous process of L4 (Fig. 3B, solid arrow), which corresponded well to the abnormal increased DTPA activity on renal dynamic scintigraphy. The lytic lesions on CT images were well visualized on the MR images (Fig. 4, dotted arrow: spinous process of L1; solid arrow: the vertebral body and the spinous process of L4) as a focal low signal intensity on the T1-weighted image (Fig. 4A) and as a focal mixed signal intensity on the T2-weighted image (Fig. 4B), which was consistent with bone metastasis. On the basis of all of the

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The authors declare that they have no conflicts of interest to disclose.

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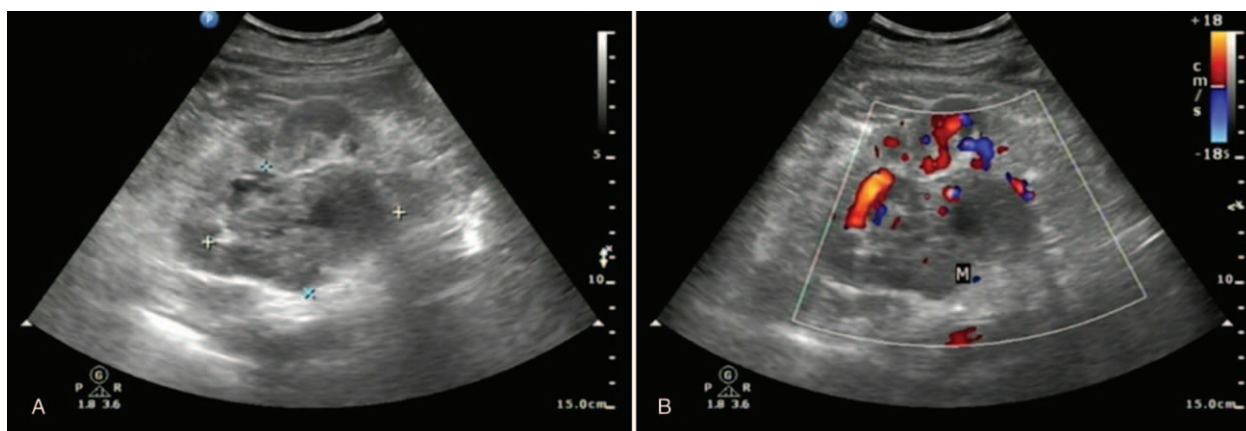
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**Figure 1.** Ultrasonography showed a heterogeneous hypoechoic mass in the left kidney with irregular shape (A). Multiple flow signals were observed inside and around the mass (B).

findings of images, the diagnosis of bone metastases was confirmed. After presenting an informed consent, the patient received nonoperative treatment immediately.

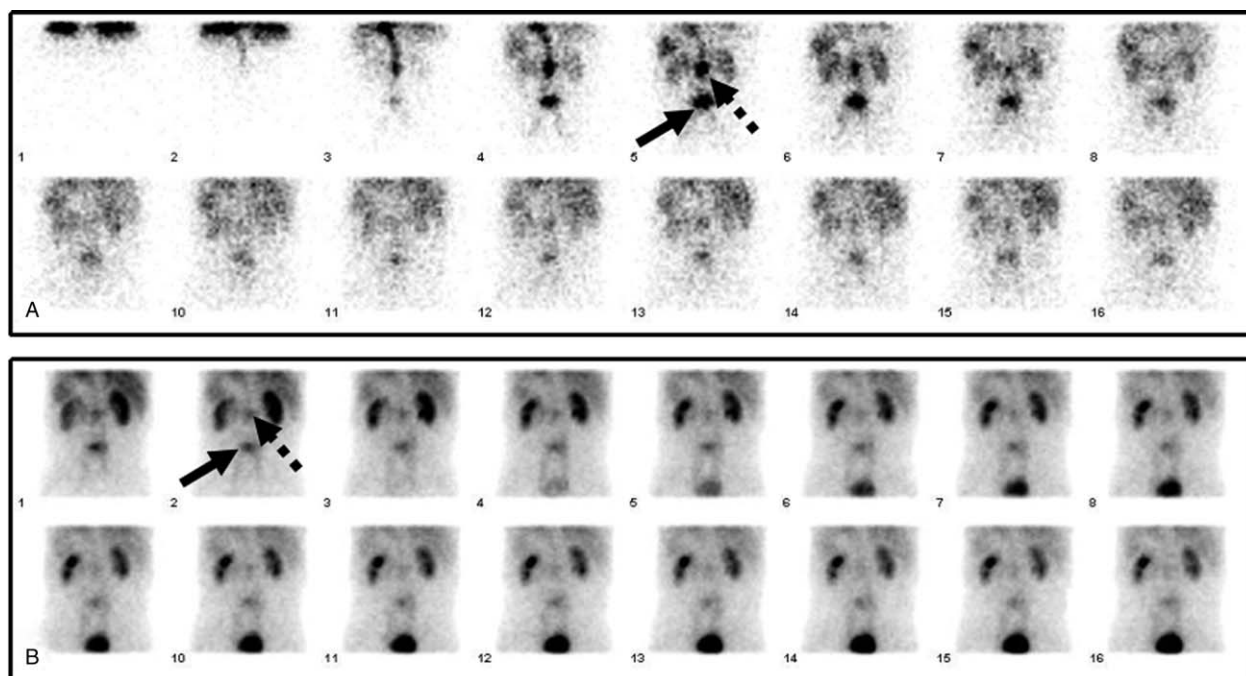
The patient written informed consent was waived due to the retrospective nature of the presented case. Patient information was anonymized and deidentified.

### 3. Discussion

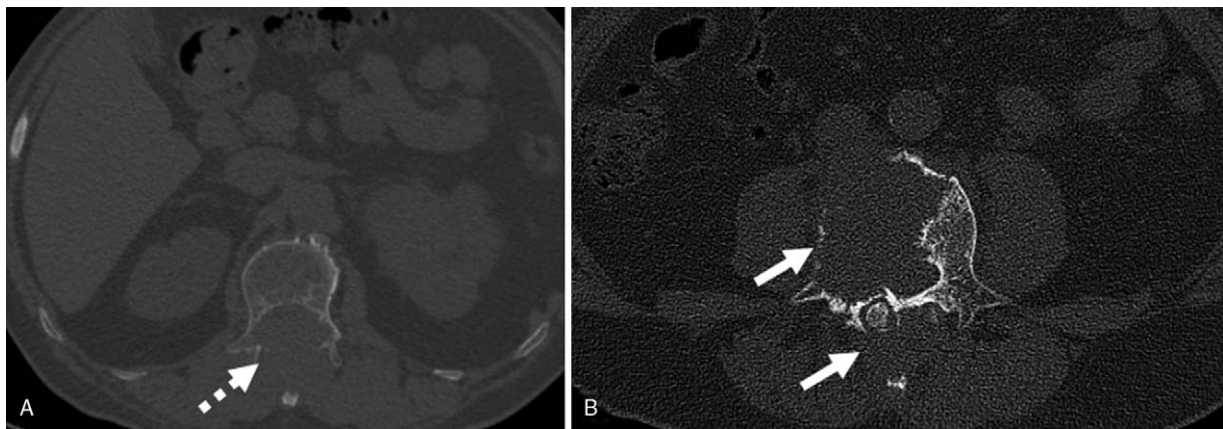
Renal cell carcinoma is the most common type of kidney cancer in adults, responsible for approximately 90% to 95% of cases. Because the renal cell carcinoma lacks characterization in the early stage, it has metastasized before showing clinical signs in

some patients. In our case, there had been bone metastases when the renal mass was detected.

Tc-99m DTPA renal dynamic scintigraphy is a routine procedure for preoperative evaluation of the split renal function for the patients with renal cell carcinoma. Generally, the bilateral kidneys, the bilateral ureters, and the bladder can be visualized in the study process. However, a few of publications indicated that abnormal increased activity could be observed in extrarenal regions due to both benign and malignant disorders. Bihl et al<sup>[2]</sup> reported that 3 cases of tumors (angiomyolipoma in tuberous sclerosis, plasmacytoma, and metastasis of renal carcinoma) were detected during the course of Tc-99m DTPA renography. The Ewing sarcoma, para-axial neurofibromatosis, retroperitoneal



**Figure 2.** The renal dynamic scintigraphy revealed mildly impaired perfusion of bilateral kidneys and partial obstruction of the left kidney. Unexpectedly, there were 2 foci of abnormal increased activity in the midline of the abdomen (dotted and solid arrows) both in the blood flow phase (A) and the function phase (B).



**Figure 3.** The CT images (Fig. 3) showed lytic osseous destructions (arrows) in the spinous process of L1 (A, dotted arrow) and the vertebral body and the spinous process of L4 (B, solid arrows), which corresponded well to the abnormal increased DTPA activity on renal dynamic scintigraphy.



**Figure 4.** The MR images demonstrated focal low T1 signal intensity (A) and a focal mixed T2 signal intensity on the MRI T2-weighted image (B) in the spinous process of L1 (dotted arrows) and the vertebral body and the spinous process of L4 (solid arrows), which was consistent with bone metastasis.

liposarcoma, retroperitoneal paraganglioma, hemangioma, Paget disease, bone metastasis, and abscess could be the pathologies of extrarenal uptake of  $^{99m}\text{Tc}$ -DTPA.<sup>[3–10]</sup> The exact mechanism of uptake of DTPA is not known. We consider one probable reason is the hypervascular character of the disorder in the field of view.

Although it is difficult to distinguish the exact cause only by interpreting the images of renal dynamic scintigraphy, the site of the uptake may be helpful to analyze the possible malignancy. Roman et al<sup>[11]</sup> reported that the increased DTPA uptake in the left iliac fossa usually represented physiological activity or benign conditions. In our case, there were 2 foci of abnormal increased uptake in the lumbar vertebra due to bone metastases. Therefore, the radiopharmaceuticals accumulation in the bone is likely due to malignancy. Especially, multiple foci in the bone are more valuable in differentiating between benign and malignant disorders.

#### 4. Conclusion

Our case indicates that the bone metastasis is one of the reasons of the extrarenal uptake of technetium-99m DTPA, especially for the patients with several foci.

#### Author contributions

**Methodology:** Peng Xie.

**Writing – original draft:** Peng Xie.

**Writing – review & editing:** Peng Xie.

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**Data curation:** Ling-Ge Wei.

**Resources:** Jian-Min Huang.

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