



## Case Report

## The Cephalad Malposition of a Kidney as a Thoracic Abnormality on Tc-99m MDP Bone Scintigraphy

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### Abstract

Thoracic location of an aberrant kidney is the least encountered renal malposition. We present a 62-year-old female patient with ovarian malignant mixed epithelial tumor complicated with massive ascites and right hemidiaphragmatic eventration. The cephalad malpositioned right kidney was found incidentally as an intrathoracic mass on Tc-99m MDP bone scintigraphy. (*Tzu Chi Med J* 2008;20(4):314–317)

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## 1. Introduction

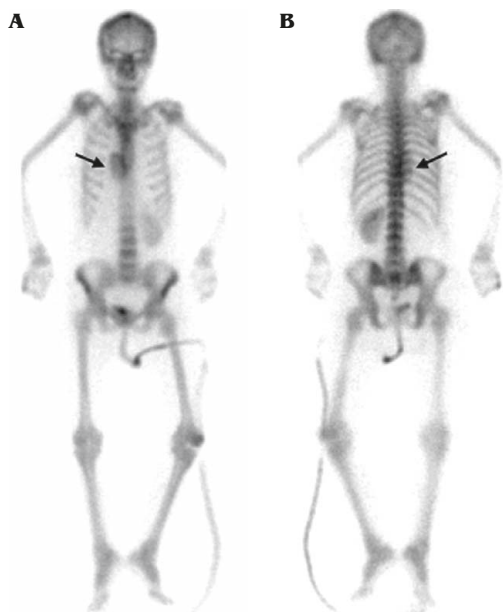
The cephalad location of an aberrant kidney is a rarely encountered situation, accounting for less than 5% of renal ectopies (1). It is more commonly seen in male patients on the left side. The exact mechanism of cephalad malposition of the kidney is not apparent; nevertheless, this entity has been associated with some complications and born or acquired abnormalities (1,2). Bearing in mind the possibility of a thoracic kidney obviates unnecessary intervention and harm.

We present a patient with ovarian cancer whose Tc-99m methylene diphosphonate (MDP) bone scan for a survey of possible bone metastasis revealed an unusual thoracic mass with increased radioactivity, corresponding to a high malpositioned right kidney.

## 2. Case report

A 62-year-old female patient had hypertension and depression, and was under medical treatment for more than 10 years. She had been experiencing intermittent attacks of shortness of breath since 2 years before this presentation. This kind of discomfort subsided after rest and she did not pay much attention to it. However, the situation had progressively worsened during the 6 months prior to this presentation, and she complained of poor appetite and body weight loss.

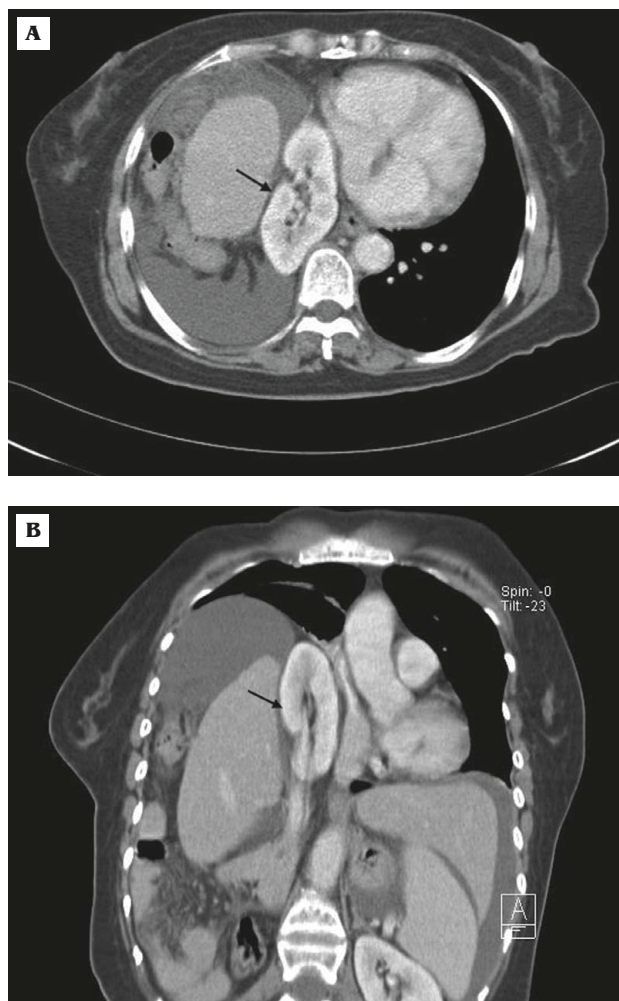
Physical examination revealed abdominal distention with mild tenderness. No pitting edema or cardiac murmur was found. Chest X-ray revealed right hemidiaphragm elevation. Due to body weight loss,



**Fig. 1 — (A) Anterior and (B) posterior plain images of Tc-99m MDP bone scintigraphy. Bone metastasis was not identified. However, an ovoid “mass” with increased uptake was observed in the lower medial aspect of the right hemithorax (arrows). Note that the right kidney is absent in the usual position despite lack of relevant surgical history in this patient.**

tumor markers were checked and revealed elevated serum levels of carcinoembryonic antigen (235 ng/mL) and CA125 (250 U/mL). Upper gastrointestinal panendoscopy and colon barium enema study results were negative. Gynecologic evaluation and sonography disclosed an adnexal mass and massive ascites. Finally, the patient underwent debulking surgery (abdominal total hysterectomy+bilateral salpingo-oophorectomy+pelvic and para-aortic lymph node sampling+appendectomy+partial omentectomy) and adjuvant chemotherapy. The results of surgical pathology proved malignant mixed epithelial tumor (squamous cell carcinoma and mucinous adenocarcinoma). She tolerated the treatment procedures well and was discharged in fair general condition.

Tc-99m MDP bone scintigraphy was performed during the tumor staging work-up. Bone metastasis was not identified. However, a mass showing increased uptake was observed in the lower medial aspect of the right hemithorax (Fig. 1). Correlation with computed tomography images with contrast enhancement (Fig. 2) clarified that the “mass” with increased radioactivity was a cephalad malpositioned right kidney. It was carefully inspected concomitantly during the debulking operation. Hiatal hernia and diaphragmatic trauma holes were excluded, confirming right diaphragm eventration with fixed right kidney over the subphrenic space.



**Fig. 2 — (A) Transaxial and (B) coronal sections of computed tomography images with contrast enhancement show massive ascites and eventration of the right hemidiaphragm. The right kidney is upwardly displaced (arrows), compressing the right atrium and right lung. Upward displacement of the right lobe of the liver and bowel loops are also illustrated. A huge adnexal mass was discovered on pelvic computed tomography (not shown here). Surgical pathology proved ovarian malignant mixed epithelial tumor. Diaphragmatic eventration improved slightly after debulking surgery, ascites drainage and chemotherapy.**

### 3. Discussion

Cephalad malposition of the kidney is a rare condition. Most cases have no symptoms referable to the malposition and it may only be discovered incidentally on routine chest radiography or during thoracotomy (1,2). The exact mechanism for the formation remains unclear, although some researchers have proposed explanations. Cranial migration of the embryonic metanephrons occurs from the 6<sup>th</sup> to 9<sup>th</sup> week of gestation (3). Normally, the kidneys ascend to lumbar sites just below the adrenal glands, and one may become arrested at any site in the pelvis above its

origin. In contrast, the ascending developing kidneys rarely "overshoot" their intended location and ascend to a higher location than usual. Failed or delayed closure of the pleuroperitoneal membrane may allow excessive renal ascent, which may be another cause of high ectopic kidneys (2,3). In addition, diaphragm traumatic holes, acquired or congenital Bochdalek foramen hernia, and eventration of the diaphragm may account for the aberrance. It is a rational speculation that, in our patient, the high malpositioned kidney, which was originally asymptomatic, was aggravated by the progressive pelvic tumor, massive ascites and diaphragmatic eventration which resolved partially after debulking surgery and neoadjuvant chemotherapy.

The associated anomalies of cephalad malposition of the kidney are rare and not consistent. Most patients with unilateral cephalad malposition have no additional anomalies described in their other organ systems with their adrenal gland in the normal position (4), which was the case in our patient. Nevertheless, concurrent high ectopic adrenal glands and spleens have been reported (4). Other concomitant anomalies reported include renal calculi (5), ureteropelvic junction obstruction (6), ureteral duplication (7), diaphragmatic hernia (8), dextrocardia (9), and patent ductus arteriosus (7). Renal cell carcinoma in a thoracic kidney (10) and associated multiple congenital defects have also been reported (9,11). These cases remind us that it is important to look for possible associated complications or anomalies, albeit infrequent, when evaluating a patient with a high malpositioned kidney.

From the perspective of nuclear medicine physicians, extraosseous soft tissue uptake may be intriguing, particularly in cases of thoracic uptake. Such uptake at times leads to disclosure of otherwise latent disease. After reviewing the literature, the list of differential diagnoses includes lung cancer (squamous cell carcinoma, adenocarcinoma, large cell carcinoma, bronchoalveolar cell carcinoma) (12), primary or metastatic osteogenic sarcoma (13), hamartoma (14), amyloidosis (15), Wegener's vasculitis (16), Waldenström's macroglobulinemia (17), sarcoidosis (18), infection (18), radiation therapy (18), fibrothorax (18), myocardial infarction (19), and idiopathic pulmonary ossification (20). Careful inspection of the MDP uptake pattern and correlation with clinical, laboratory and other imaging findings make accurate diagnosis possible. For instance, the notion of a malpositioned kidney may be even more straightforward if complications such as urolithiasis, hydronephrosis and/or hydroureter as mentioned in the text above are present on the bone scan and make more distinct the contour of the kidney and related urinary tract. Though not the case in our patient, such findings may serve as important clues in image interpretation to characterize the nature of radiotracer accumulation and to support the assumption of an ectopic kidney.

An ectopic kidney can be confirmed using the results of functional assessment with intravenous pyelography or Tc-99m DMSA (dimercaptosuccinic acid) scintigraphy (21). Although these studies were not performed in our patient, the cephalad malpositioned kidney can be identified using typical findings on contrast-enhanced computed tomography and by direct inspection during surgical exploration.

In summary, cephalad malposition of the kidney should be kept in mind in the differential diagnosis of thoracic tumors. Most of the patients have no symptoms owing to this anomaly, and they are discovered incidentally using imaging findings and require no medical or surgical intervention (1,2,22). Recognition of this possibility obviates incorrect interpretation in imaging studies (23,24), avoids unnecessary aggressive interventions, and prompts accurate patient management.

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