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Radionuclide Demonstration of Urinary Extravasation with Ureteral Obstruction

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Two cases of urinary extravasation with ureteral obstruction demonstrated by the radionuclide studies are reported. The value of radionuclide studies in patients with renal transplantation has been reported previously, but studies in patients without transplantation have rarely been described in the literature. Ureteral obstruction may cause urinary extravasation, which may be demonstrated by radionuclide studies even when radiologic studies are inconclusive. In one case, urinary extravasation was detected in the sitting position but not in the supine position. Renal imaging should probably be performed not only with multiple projections but also in different positions.


Urinary extravasation may be due to renal injuries, surgical operation, infection, tumor, erosion by calculus, or ureteral obstruction of acute or gradual onset (1-5). The overall incidence of urinary backflow in i.v. pyelography with abdominal compression is about 2.2% (1). The incidence of frank urinary extravasation is lower but not rare. Urinary extravasation may cause retroperitoneal fibrosis, stricture of the upper ureter (2), or perinephric abscess (6).

The value of radionuclide studies in urinary extravasation after renal transplantation has been reported (7-9). Evidence of urinary extravasation may be suggested on the radionuclide studies even though the patient has only minimal symptoms and routine constrast studies are normal (8). Radionuclide studies of urinary extravasation without renal transplantation have rarely been reported in the literature. We describe here two cases of urinary extravasation with ureteral obstruction, demonstrated by the radionuclide studies.

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Case 1. A 55-year-old woman had a colectomy and colostomy for sigmoid cancer 11 days before our study. Postoperatively the patient developed persistent nausea and increased serum amylase. Ultrasound studies revealed an enlarged and sonolucent pancreas, indicating acute pancreatitis. Incidentally, a left hydroureter with a perirenal sonolucent lesion was found. A radionuclide renal angiogram with 5 mCi of Tc-99m DTPA showed decreased perfusion of the left kidney generally (Fig. 1A). The immediate postperfusion static renal image showed decreased uptake in the left kidney (Fig. 1B). These findings are indicative of decreased renal function on the left. A 2-hr postinjection renal image showed left hydroureter and definite urinary extravasation (Fig. 2). Intravenous pyelography (IVP) confirmed a left ureteral obstruction and hydroureterosis. The urinary extravasation was not detected at the initial IVP interpretation but was subsequently recognized after correlation with the radionuclide study. Surgical operation disclosed a large amount of urine around the left kidney. No rupture of the urinary tract was identified. Postoperatively, serum amylase gradually returned to normal level.

Case 2. A 31-year-old woman had a left ureterolithotomy 1 mo before our study. About 1 wk before our study, the patient developed left chest pain and pleural effusion. Lung scans were normal. Ultrasound study of the abdomen showed left hydroureter and a large sonolucent lesion displacing the kidney anteriorly. Renal images with 5 mCi of Tc-99m DTPA, per-

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FIG. 1. Case 1. Radionuclide renal angiogram (A) and immediate postperfusion static renal image (B). Perfusion and early uptake in left kidney are decreased.
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FIG. 2. Case 1. Renal image performed 2 hr after injection of Tc-99m DTPA. Left hydronephrosis is seen (H), with dilated renal pelvis and calyces. Urinary extravasation (U) is seen superiorly and laterally around left kidney.

formed in the supine position showed left hydronephrosis and, delayed appearance of left renal uptake (Fig. 3). Increasing abnormal uptake was seen in the left renal pelvis area (Figs. 3 and 4A), but no definite urinary extravasation could be seen. The renal image performed in the sitting position showed inferior displacement of the kidneys. The abnormal uptake around the left renal pelvis appeared superior to the left kidney because of inferior displacement of that kidney (Fig. 4B). A lateral view of the left kidney definitely indicated that the abnormal uptake was extrarenal, representing urinary extravasation. It was located posterior to the left kidney (Fig. 4C). At retrograde pyelography, performed within 24 hr after the renal imaging, the ureteral catheter encountered a membranous obstruction at the site of the previous left ureterolithotomy. Hydronephrosis was demonstrated, but no urinary extravasation was seen. Exploration of the left retroperitoneal space disclosed fat degeneration posterior to the left kidney. About 80 cc of fluid were evacuated. No perforation of the urinary tract could be found. Eight days postoperatively, a retrograde pyelogram showed a small amount of urinary extravasation. Intravenous pyelography was not performed because of allergy to the contrast medium.

DISCUSSION

When the urinary tract is acutely obstructed by a pathologic process or abdominal compression, or both, the resultant increase in the intraluminal pressure, augmented by a sudden diuretic load of the urographic contrast medium, may lead to rupture at the weakest point (3,5). In an otherwise healthy upper urinary tract, this point is usually at the calyceal fornices, and the extravasated urine penetrates the loose connective tissue of the sinus renalis and is absorbed by the lymphatics. This form of urinary extravasation is transient and relatively innocuous. On the other hand, extravasation of urine from a tear in the collecting system caused by chronic obstruction, infection, erosion by calculus, or tumor is usually of grave significance and requires prompt surgical intervention (1). In renal radionuclide imaging, no abdominal compression is applied and the imaging agent does not have significant diuretic action. These factors, in addition to the relatively poor resolution of the scintillation camera, may be the reasons why fornical back-flow has not been described in the nuclear medicine literature. Perhaps the urinary extravasations demonstrated by the radionuclide studies have grave rather than innocuous significance. In both of our cases, surgical intervention was necessary.

In Case 1, the urinary extravasation is better demonstrated on the radionuclide studies than by radiography. In Case 2, retrograde pyelography performed after the radionuclide studies failed to show the extravasation. The same failures to demonstrate extravasation by retrograde pyelography have been reported in the literature (1,2). Accordingly, a normal radiologic study does not rule out urinary extravasation and a radionuclide study may then be useful.

Even sterile urine may cause a foreign-body reaction in the retroperitoneal space (1) and renal liposclerosis (6). The perirenal fat necrosis found in Case 2 may be secondary to the urinary extravasation. Whether the large amount of retroperitoneal urine plays any role in causing the acute pancreatitis in Case 1 is unknown.

Urinary extravasation at the distal ureter may be missed on the radionuclide study because the urinary activity may not be separated from the urinary bladder if the bladder is distended. The extravasation may be clearly shown, however, on the post-voiding image (7). In Case 2, the peripelvic urinary extravasation was not well demonstrated in the supine position but showed well in the sitting position when the kidneys moved downward. The observation emphasizes the importance of imaging the kidneys not only with multiple views but also in different body positions.

Most of the reported radionuclide studies of urinary extrava-
sation have been performed on the patients with renal transplantation (7–9). One article reported the incidental detection of Ga-67 in a urinoma following pyeloplasty (10). Any abnormal gallium uptakes in an image are more likely due to inflammation or malignancy than to urinoma. Unfortunately, renal imaging with Tc-99m DTPA was not performed to confirm the diagnosis of urinoma in this reported case. There was another article describing surgically related extravasation of urine detected on a bone scintigram (11).

Our cases demonstrate the value of Tc-99m DTPA imaging, not only in the patient with renal transplantation but in other patients, especially when ureteral obstruction is present and even if radiography is inconclusive.

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Positive Ga-67 Citrate Scan in Retroperitoneal Fibrosis

Rollin K. McCombs, Vinod Singhi, and William H. Olson

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A patient with retroperitoneal fibrosis was evaluated by Ga-67 citrate imaging. The radionuclide study accurately demonstrated the location and extent of the disease.


Retroperitoneal fibrosis, though not a common disease, occurs frequently enough so that it must be included in the differential diagnosis of diseases of the retroperitoneal space. Although sonography (1) and radiography (2) have been used in the diagnosis of retroperitoneal fibrosis, review of the literature of radionuclide imaging has not disclosed a report of Ga-67 citrate soft-tissue scanning in this disease. We present a case here.
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