

DIAGNOSIS OF URINARY LEAKAGE IN RENAL TRANSPLANT PATIENTS: ULTRASONOGRAPHIC, CLINICAL AND SCINTIGRAPHIC FINDINGS

RENAL TRANSPANTLI OLGULARDA İDRAR KAÇAĞI TANISI: ULTRASONOGRAFİ, KLİNİK VE SİNTİGRAFİ BULGULARI

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SUMMARY

Urinary leakage is a well-recognized complication of renal transplant surgery, which may lead to increased morbidity. In order to define clinical efficacy of renal scintigraphy in urinary leakages, we retrospectively reviewed 82 renal transplant patients with early scintigraphic exams in the current study. The clinical, scintigraphic and ultrasonographic findings were comparatively evaluated. Seven sequential radionuclide studies in five patients showed urinary leakage, however; ultrasonography could be detected this pathology in only one patient. Scintigraphic evaluation was found to be false positive due to abdominal ascites in one patient. Our results show that, Tc99m DTPA dynamic renal scintigraphy seems to be an easy and safe method to detect urinary leakage in renal transplantation patients.

Key Words: Tc99m DTPA, urinary leakage, renal transplantation

INTRODUCTION

Currently, renal allograft transplantation has become the best treatment for the patients with end stage renal failure. In recent years, 1-year graft and recipient survival rates increased up to 92% and 96% respectively with development of more effective immunosuppressive agents, improvements of surgical techniques and histocompatibility matching (1). However, early post-operative surgical complications may constitute high risk for developing serious life-threatening complications. These surgical complications include perinephric fluid collection, urinary obstruction and vascular insufficiency. Perinephric fluid collection due to urinary extravasation is a relatively rare complication. However, unless it is detected, it leads increased morbidity and mortality rates because of septicemia and graft infection in the late period (2,3,4).

ÖZET

İdrar kaçağı, renal transplant cerrahisinde artan morbiditeye yol açan, bilinen bir komplikasyondur. İdrar kaçağında renal sintigrafmin klinik etkinliğini belirlemek amacıyla, bu çalışmada 82 renal transplant olgunun erken dönem sintigrafilerini retrospektif olarak değerlendirdik. Sadece bir hastada ultrasonografi kullanılarak patoloji tespit edildi. Beş hastanın yedi sintigrafisinde idrar kaçağı saptandı. Abdominal asiti olan bir hastada sintigrafisi ile yanlış pozitif olarak idrar kaçağı tanısı konuldu. Bulgularımız, renal transplantlı olgularda Tc99m DTPA dinamik renal sintigrafisinin idrar kaçağı tanısında kolay ve güvenilir yöntem olduğunu gösterdi.

Anahtar kelimeler: Tc99m DTPA, idrar kaçağı, renal transplantasyon

Although many reports have documented the use of various imaging techniques in the evaluation of post-operative complications, there are few studies focusing the detection of urinary leakage with ultrasonography and renal scintigraphy (2,3). The current study reviews our experience with scintigraphy for detection of urinary leakage after renal transplantation surgery in comparison with ultrasonographic and clinical findings.

MATERIAL AND METHOD

A total of 119 early post-operative renal scintigraphies obtained in 82 transplant recipients in a period of two years (1997-1999) were reviewed. The patient was considered to have urinary leakage if a) increased activity out of urinary tract was noted on dynamic renal scintigraphy and/or b) delayed static images

showed extravasated accumulation. Scintigraphic diagnosis was confirmed with a combination of clinical, surgical and ultrasonographic findings.

Radionuclide studies were performed at the supine position and camera was placed over the abdomen anteriorly. Toshiba GCA 602 gamma interfaced with a computer system and equipped with low energy collimation was used.

After bolus intravenous injection of 10-15 mCi (370-555 MBq) Tc99m diethylenetriamine pentaacetic acid (Tc99m DTPA), the images were acquired in 0.5 second/frame (64x64 matrix) for the first minute and subsequent images were obtained every 30 seconds for 30 minutes duration. Thus, the data acquisition protocol consisted of two groups of frames covering perfusion, parenchymal and excretion phases. Two to four hours after completion of dynamic study, a delayed image was recorded over the anterior abdomen for 1 minute in the early post-operative period.

Consequently, a sonographic evaluation performed with Toshiba SSA-270A color Doppler US. A 3.75 MHz convex and sector transducer was used. Bladder, ureter, perinephric area as well as the renal graft were investigated by an experienced radiologist.

RESULTS

According to the defined by above scintigraphic criteria, seven scintigraphic studies in five patients found to show urinary leakage. Patient 4 had triple scintigraphic studies. However, combined clinical and surgical findings were confirmed the final pathology of urinary leakage in four out of these patients. Analysis of the scintigraphic images demonstrated that urinary leakage was observed during thirty minute dynamic studies in five of seven patients. On the remaining two scans increased activity was noted only on the delayed images (**Figure 1**).

Full clinical data including imaging and surgical findings of the patients are documented in the **Table 1**. All patients had high levels of creatinine except patient-3 during the period urinary leakage. When the scans were evaluated, parenchymal and/or excretion phases were found to be prolonged. One patient (Pt no: 3) who had false-positive scintigraphic findings of urinary leakage was finally diagnosed to have intraperitoneal ascites by fluid analysis.

In-patient 3, Tc99m DTPA activity was noted in the abdominal cavity on the first day postoperatively.

Renogram analysis showed no abnormality. Analysis of the fluid revealed same creatinine level of serum, indicating that urine was not present in the fluid. The intraperitoneal ascites was discovered on the sonographic evaluation due to hypervolemia, which developed before renal transplantation. When the diuresis increased, abdominal ascites disappeared on the following sonographic evaluation and the renal scintigraphic study was found to be normal (**Figure 2 a, b**).

Four cases with urinary leakage underwent the surgical reconstruction: ureteroneocystostomy was applied to three of them (Pt. no: 1, 2, 4) and ureteropyeloplasty to one of them (Pt no: 5). After surgical-correction of the urinary leakage, follow-up imaging studies of all patients except patient no: 4 showed no evidence of leakage. But in the patient no: 4 scintigraphic images obtained after ureteroneocystostomy revealed an increased activity adjacent to the lower pole of the transplanted kidney and this findings was also supported with ultrasonographic collection (**Figure 3**). This activity was presumed to be due to caliceal urinary leakage. The lower pole was resected because of the necrosis discovered during the operation. When the urinary leakage findings were observed persistently on the following scan, partial nephrectomy was performed. During the post-operative period and clinical follow-up, renal functions and scintigraphic findings were normalized.

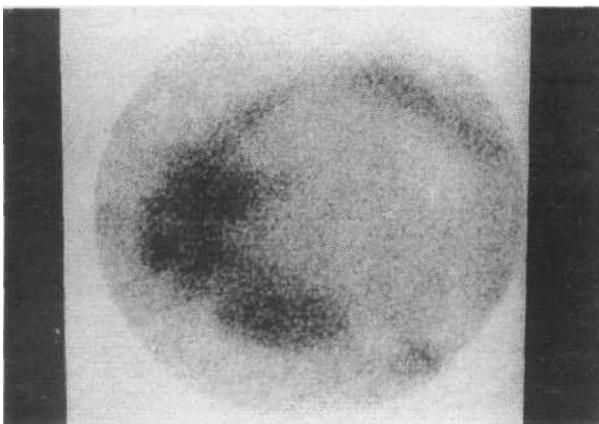


Figure 1: The activity accumulation out of the urinary tract in the abdominal cavity is considered as urinary leakage on the delayed image (Patient 1)

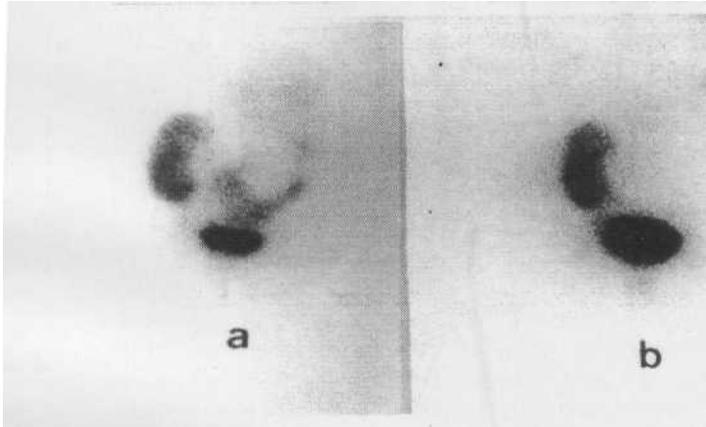


Figure 2a: In patient no: 3, Tc99m DTPA activity was revealed on the delayed image. However, clinical findings did not confirm the urinary leakage and intraperitoneal ascites was shown on the sonographic evaluation.

Figure 2b: There was no evidence of urinary leakage on the delayed image that was performed one week later.

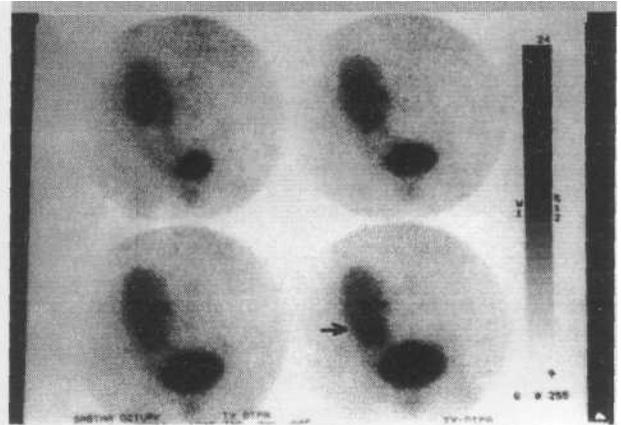


Figure 3: On the 25th and 30th images, the increased activity accumulation is observed adjacent to the lower pole of the transplanted kidney (Patient -4).

Table 1:Data of the patients with suspected urinary leakage

	Age	Graft function	Scintigraphic findings	Urinary leakage findings with Tc99m DTPA	USG	Reoperation	Follow-up scintigraphies
Patient 1	42	Creatinine: 3 mg/dl Abdominal pain, disuria, DUO	Perf: N P. phase:! Exc. phase: T	Urinary leakage on the delayed image (+)	Perirenal fluid collection	Ureteroneocystomy	Urinary leakage (-)
Patient 2	34	Creatinine: 2,8 mg/dl Abdominal pain	Perf: T P. phase:T Exc. phase: Î	Urinary leakage on the 25 th image (+)	Perirenal fluid collection	Ureteroneocystomy	Urinary leakage (-)
Patient 3	19	Creatinine: 0,87 mg/dl No abnormal clinical findings	Perf:N P. phase: N Exc. phase: N	Urinary leakage on the delayed image (+)	Intraperitoneal free fluid	(-)	Urinary leakage (-)
Patient 4	30	Creatinine: 4,95 mg/dl Abdominal pain	Perf: T P. phase:T Exc. phase: T	Urinary leakage on the 10 th image (+)	Perirenal fluid collection	Ureteroneocystomy	Urinary leakage (+)
Patient 4	30	Creatinine: 2,67 mg/dl Swallowing and pain at the site of the operation	Perf: N P. phase:? Exc. phase: T	Urinary leakage on the 25 th image (+)	Perirenal fluid collection	Resection of necrotic lower pole	Urinary leakage (+)
Patient 4	30	Creatinine: 1,53 mg/dl DUO	Perf:N P. phase:N Exc. phase: T	Urinary leakage on the 25 th image (+)	Urinoma	Partial heminephrectomy	Urinary leakage (-)
Patient 5	37	Creatinine: 2,35 mg/dl	Perf:N P. phase:! Exc. phase: T	Urinary leakage on the 25 th image (+)	Perirenal fluid collection	Ureteropyeloplasty	Urinary leakage (-)

DISCUSSION

The early diagnosis and treatment of urinary leakage are very important to prevent any damage to the allograft kidney. After renal transplantation, fluid collection is revealed about the rates up to 50 % (7). Although most of peritransplant fluids are diagnosed by sonographic evaluation, ultrasound is nonspecific in diagnosis of urinary leakage. However; scintigraphy, CT and i.v. contrast enhancement and possibly MRI may be valuable in characterizing perinephric fluid collections (8). The confirmation diagnosis can be made by direct percutaneous aspiration of the fluid or antegrade pyelography, which are quite invasive methods (9, 10, 11). In a study with 9 cases with urinary leakage, where a combination of sonography, scintigraphy, excretory urography and cystography could be applied in only three of them, the authors concluded that all imaging modalities mentioned above were identical in the detection of urinoma (3). However, in our series, ultrasonography could aid diagnosing urinoma in one out of four cases whose scintigraphic findings also supported urinary leakage.

Interestingly, in patient no: 3, increased activity in the abdominal cavity on the delayed image was confirmed to be ascites. In the literature, Pralash and Shih reported photon defective areas on the Tc99m DTPA renal scintigraphy due to abdominal ascites (12,13). However, in these case reports two authors regarded only early phase images and no delayed imaging was performed. Itoh and et al. reported a case with chilosus ascites that visualized as increased activity on delayed Tc99m DTPA renal scintigraphy that was also confirmed parasynthesis (14). In agreement with our observation, Praskash et al reported that a patient with uremia had progressive accumulation of Tc99m DTPA in ascites fluid on the 4.5-hour delayed image (15). As Tc99m DTPA is a lipophilic and an extracellular agent, it can be held by the intraperitoneal ascites as the time passes leading to increased tracer accumulation in ascites. For this reason, a renal transplant patient with abdominal ascites may be falsely diagnosed as urinary leakage on the delayed image. However, the presence of ultrasonographic findings of intraperitoneal ascites without co-existing clinical or biochemical evidence may be key finding.

The most common clinical symptoms of urinary leakage are impaired renal functions associated with decreased urine output, anuria or urinary leakage from surgical incision (3). In a study consisting of 25 patients who had urinary leakage, abdominal pain (50%), increased creatinine level (71%) and decreased urine output (43%) were reported to be most frequent clinical findings (9). Although the total number of the patients with urinary leakage was limited in the current study, coexistence of high serum creatinine levels and abnormal renographic

parameters was remarkable. Rosenberg et al reported 5 patients with ureteral leakage after renal transplantation and showed that the sensitivity and specificity of the scintigraphy for detecting ureteral escape of urine might be high. In each of their cases, clinical findings suggesting urinary leakage were also noted. The authors concluded that the use of long imaging times might be required for detecting small urinary leakages (16). In the current study population, urinary leakage in one patient was visualized as delayed activity accumulation, thus we think that the diagnostic accuracy of scintigraphy could be improved by the inclusion of delayed imaging as a diagnostic criteria.

In conclusion, renal scintigraphy and ultrasonography are complementary in the evaluation of urinary leakage complications following renal transplantation. Tc99m DTPA dynamic renal scintigraphy is a simple, sensitive and reliable method in diagnosis and in the follow-up of patients after surgical correction of urinary leakage.

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