

Postrenal Transplant Allograft “Page Kidney” Identified and Salvaged using ^{99m}Tc-diethylenetriaminepentaacetic acid Renogram and Single-photon Emission-computed Tomography

Abstract

^{99m}Tc diethylenetriaminepentaacetic acid (DTPA) renogram is a commonly performed evaluation postrenal transplant to assess graft function and for early detection of suspected immediate and late transplant-associated complications. Although several modalities can be utilized to detect perinephric collection in posttransplant period, the utility of ^{99m}Tc DTPA single-photon emission-computed tomography (SPECT-CT) is not recognized. Herein, we discuss the incremental role of seldom considered SPECT-CT in early detection, leading to timely appropriate management and graft salvage in a case of posttransplant deteriorating renal allograft as a result of subcapsular hematoma.

Keywords: ^{99m}Tc-diethylenetriaminepentaacetic acid, hematoma, Page kidney, rejection, renal transplant, renogram, single-photon emission-computed tomography

A 48-year-old female with chronic hypertension, diabetic nephropathy, and chronic kidney disease Stage V underwent a complicated live related donor renal transplant. Despite an uneventful surgery, the patient developed decreased graft function 4 h poststabilization with progressive oliguria and a serum creatinine level of 3.4 mg/dl requiring dialysis. Emergency Doppler images [Figure 1] demonstrated a high-resistance flow pattern (resistance index ≥ 1) in transplanted renal artery showing decreased flow and intrarenal arteries showing diastolic reversal of flow with normal venous flow.

A ^{99m}Tc-diethylenetriaminepentaacetic acid (DTPA) diuretic-renogram (F-15 protocol) study [Figure 2] was performed on postsurgery day 2 to rule out possibility of suspected early acute tubular necrosis (ATN). It demonstrated markedly reduced perfusion to the transplant kidney in the right iliac fossa with insignificant cortical tracer uptake in dynamic and prevoid images, respectively, and high background activity suggestive of possible hyperacute/acute rejection.

An immediate single-photon emission-computed tomography

(SPECT-CT) [Figure 3] performed postcompletion of dynamic scanning revealed a large hypodense perigraft collection suggesting a subcapsular hematoma (yellow-arrow), raising the possibility of secondary hypoperfusion. Revisiting surgical notes revealed the use of robotic arm for harvesting donor kidney, suggesting a possible cause for hematoma development.

On open reexploration, SPECT-CT findings were confirmed revealing a large subcapsular hematoma which was deroofed. This resulted in subsequent improved graft function, decline in serum creatinine levels (2.4 mg/dl on day 4 and 1.2 mg/dl on day 5), and good urine output. Poststabilization, follow-up ^{99m}Tc DTPA [Figure 4] was performed on day 5, revealing prompt perfusion to graft in the right iliac fossa with good cortical tracer uptake and drainage and significantly reduced background tracer activity compared to day 2 study.

Follow-up renal Doppler [Figure 5] performed 45 days later revealed the normalization of flow pattern in transplanted renal artery and the intrarenal arteries.

Posttransplant anuria is commonly associated with ATN and is rarely due to

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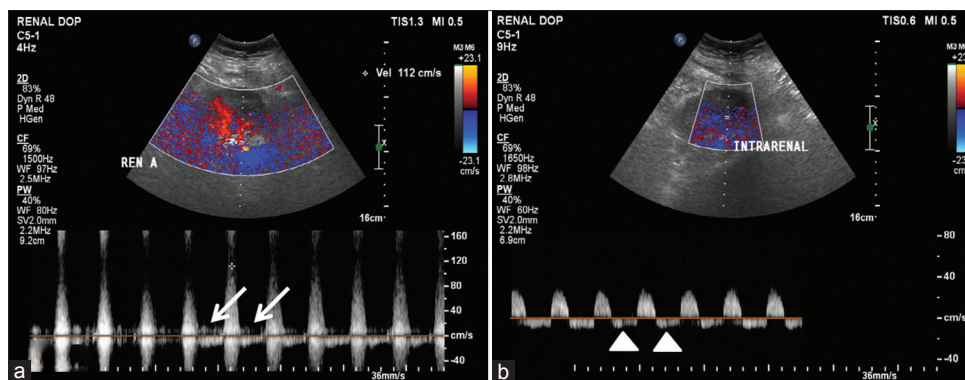


Figure 1: Emergency renal Doppler images demonstrating a high-resistance flow pattern (resistance index ≥ 1) in transplanted renal artery (a, with reduced diastolic flow [arrow]) and intrarenal arteries (b, with diastolic reversal [arrowhead]) with normal venous flow

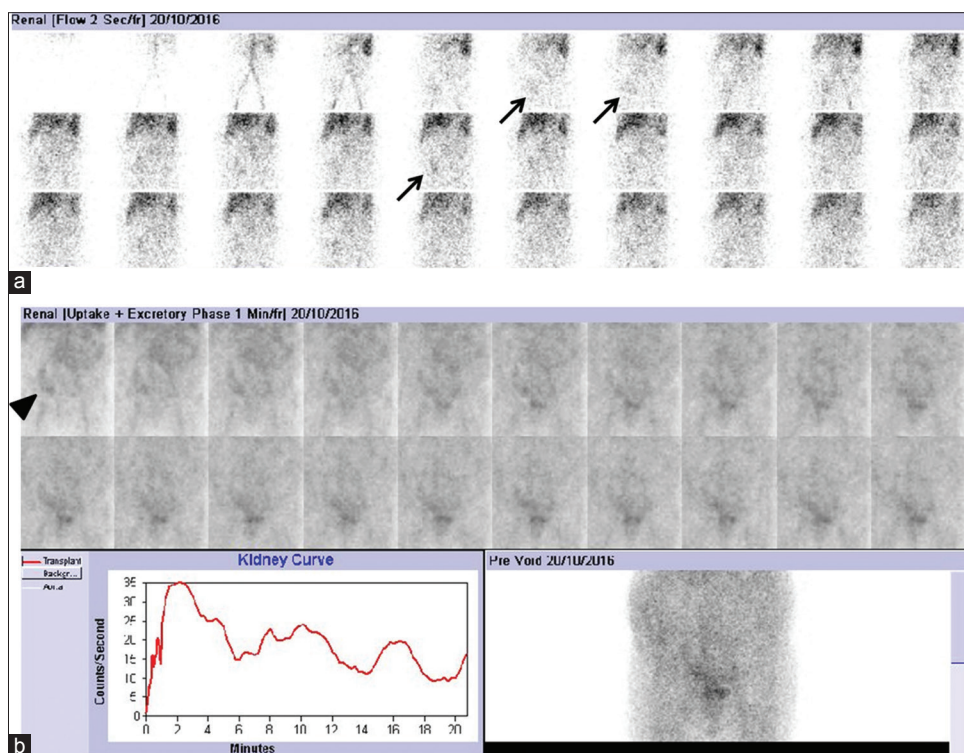


Figure 2: A ^{99m}Tc -diethylenetriaminepentaacetic acid diuretic renogram (F-15 protocol) study was performed on day 2 to rule out suspected early acute tubular necrosis which demonstrated markedly reduced perfusion to the transplant kidney in the right iliac fossa (a, arrow) with insignificant cortical tracer uptake (b, arrowhead) in dynamic and prevoid images, respectively, and high background activity suggestive of possible hyperacute/acute rejection

a subcapsular hematoma causing external compression of the allograft parenchyma and pelvicalyceal system. When associated with hypertension and renal failure, this is commonly referred to as “Page kidney phenomenon” after its first description by Irvine Page in 1939^[1] for cellophane-associated perinephritis and later extended to other perinephric etiologies including hematoma.

Subcapsular hematoma forms a major contributor to complications associated with postrenal allograft biopsy^[2] and may occur due to trauma associated with robotic harvesting of donor kidney as was observed in

our case. Timely recognition is warranted as immediate surgical decompression can salvage allograft as illustrated.^[3]

Among several modalities available, ultrasound guided carries advantage of being available and inexpensive but lacks specificity due to operator dependency. Although CT abdomen is considered the preferred modality for its ability to detect even small hematomas,^[4] the use of fusion imaging modalities such as ^{99m}Tc -DTPA SPECT-CT may serve as a single tool allowing baseline allograft function quantification, differential diagnosis, and following up for the success of reexploratory surgery apart from

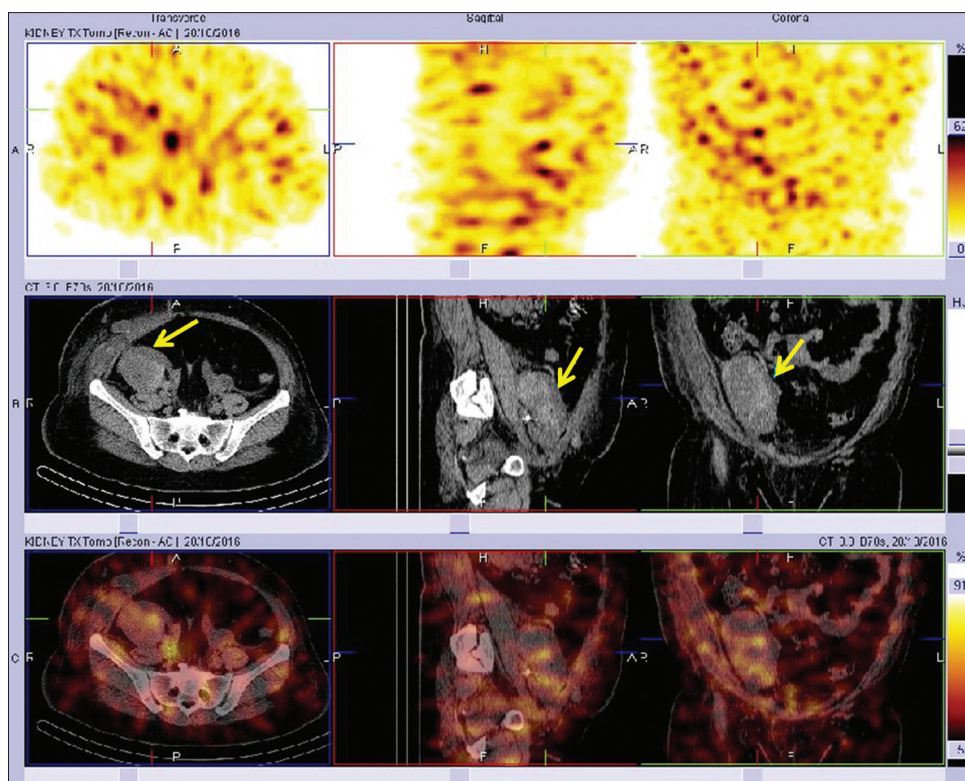


Figure 3: An immediate single-photon emission-computed tomography performed postcompletion of dynamic scanning revealed a large hypodense perigrraft collection suggesting a subcapsular hematoma (yellow arrow) raising the possibility of secondary hypoperfusion. Revisiting surgical notes revealed the use of robotic arm for harvesting donor kidney, suggesting a possible cause for hematoma development

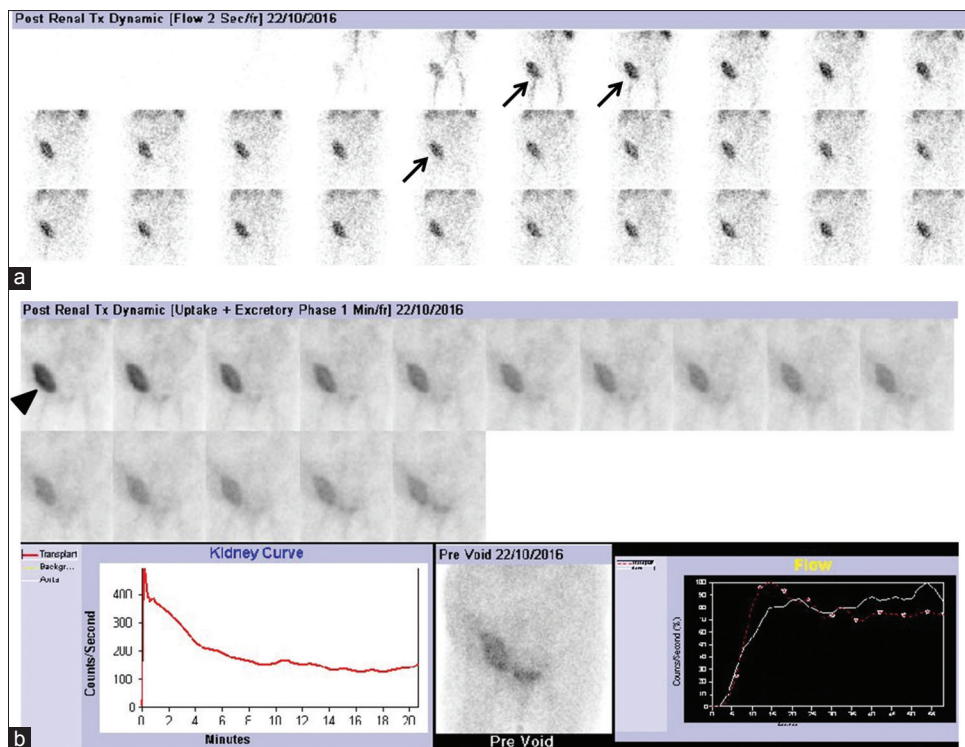


Figure 4: On open reexploration, single-photon emission-computed tomography findings were confirmed, and a large subcapsular hematoma was deroofed and hemostasis achieved resulting in improved graft function, creatinine levels (2.4 mg/dl on day 4 and 1.2 mg/dl on day 5), and good urine output. Poststabilization, ^{99m}Tc diethylenetriaminepentaacetic acid was reperformed on day 5, revealing prompt perfusion to graft in the right iliac fossa (Fig 4a-arrows) with good cortical tracer uptake and drainage (Fig. 4b, arrowhead) and significantly reduced background tracer activity compared to day 2 study

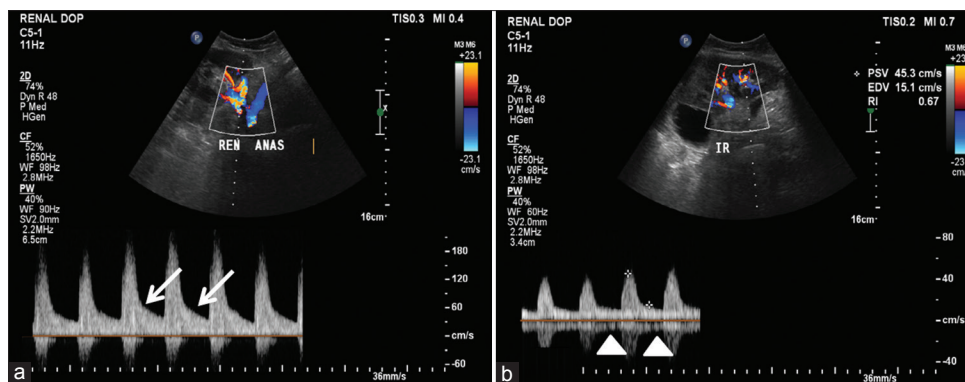


Figure 5: Follow-up renal Doppler performed 45 days later revealed the normalization of flow pattern in transplanted renal artery (a, at site of anastomosis [arrow]) and intrarenal arteries (b, arrow head)

hematoma detection prompting an immediate action as was demonstrated in this case..

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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