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**Dr. Abhilasha Singh**  
2<sup>nd</sup> year DNB Resident,  
Department of Radio-  
diagnosis Ramkrishna Care  
Hospital, Pachpedi Naka,  
Raipur, Chhattisgarh, India

**Dr. Sharad Chandak**  
Head of Department,  
Department of Radio-  
diagnosis, Ramkrishna Care  
Hospital, Pachpedi Naka,  
Raipur, Chhattisgarh, India

## Role of radiological evaluation in post-renal transplant patients: Case series

**Dr. Abhilasha Singh and Dr. Sharad Chandak**

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### Abstract

Continued improvements in graft survival have led to widespread acceptance of renal transplantation as the preferred treatment for the majority of patients with end-stage renal disease. The long-term care of these patients is often provided away from transplantation centre. This article presents clinical and imaging features of few cases with renal transplantation complications. Ultrasound can accurately depict and characterize many of the potential complications of renal transplant and increasingly CT & magnetic resonance imaging also facilitates this role. In addition, interventional radiologic techniques allow nonsurgical treatment.

**Keywords:** Renal transplantation, ultrasonography, pyelonephritis, chronic graft dysfunction

### Introduction

The first successful renal transplantation (RT) was performed in 1954. Since then, RT has found widespread use worldwide and has become the treatment of choice for end-stage renal disease. With improved transplantation technology and new immunosuppressive agents, 1-year survival rates for grafts are reported to be between 80% and 95%, depending on the type of the graft used. The half-life of grafts from living related donors varies between 13 and 24 years, depending on the match.<sup>[1]</sup> However, despite all these improvements, postoperative complications still do occur in approximately 12%-20% of patients.<sup>[2]</sup>

These complications can be divided into 3 categories: vascular, urologic, and nephrogenic. A delay in detection and treatment of any of these complications may lead to loss of renal graft function, morbidity, or even the patient's death.

**Imaging Modalities:** Ultrasonography (US) is often the first imaging method of choice for transplantation evaluation in the early post-operative period and also is used for long-term follow-up. US can also be used to guide diagnostic and therapeutic interventions, such as biopsy, fluid aspiration, or drainage.<sup>[3]</sup> It helps to detect parenchymal abnormalities, but its role in differentiating different parenchymal disease processes, such as graft rejection, acute tubular necrosis, or drug toxicity, is limited.

Computed tomography (CT) is useful to demonstrate parenchymal, hilar, perirenal, pyeloureteral, and vascular complications. CT can show fluid collections or hematoma and their anatomic relationship to adjacent structures better than US can, particularly in patients with obesity.<sup>[4, 5]</sup> CT angiography is very useful in depicting vascular abnormalities in the graft artery and in the recipient iliac arterial system without the need for catheter angiography in most cases. CT with coronal and sagittal (and, if needed, oblique) reformatted images can also allow accurate imaging of the entire course of the ureter to look for ureteral and periureteral diseases.<sup>[4]</sup> However, the administration of considerable volumes of potentially nephrotoxic iodine-based contrast agents may limit its use in patients with RTs, especially for those with renal insufficiency.<sup>[5]</sup>

In more recent years, magnetic resonance imaging (MRI) has evolved into an excellent alternative tool for evaluation of RT and the diagnosis of most complications. Magnetic resonance angiography (MRA) is increasingly used to screen for vascular abnormalities in RTs. Phased-array surface coils provide excellent signal-to-noise information, which permits rapid acquisition of high-quality images.<sup>[5, 6]</sup> The contrast agents used for MRI are safer for the transplanted kidney. However, MRI is expensive and may be contraindicated in certain

**Corresponding Author:**  
**Dr. Abhilasha Singh**  
2<sup>nd</sup> year DNB Resident,  
Department of Radio-  
diagnosis Ramkrishna Care  
Hospital, Pachpedi Naka,  
Raipur, Chhattisgarh, India

patients who have a heart pacemaker, a metallic foreign body (metal sliver) in their eye, or an aneurysm clip in their brain, and so forth. Nephrogenic systemic fibrosis is a rare condition, which has been associated with exposure to gadolinium-based contrast agents and recognized as a severely disabling systemic fibrosis that resulted in morbidity and mortality. Although it is extremely rare, its incidence is substantially higher, ranging from 2.9%-4.0%, in patients with markedly reduced kidney function and RT. [7]

Catheter angiography has been considered as the criterion standard imaging method to evaluate vascular complications of transplanted kidney. [8] Catheter angiography provides luminal data with high spatial and temporal resolution and allows interventions, such as balloon dilation or stent placement. Catheter angiography can also provide physiological data by measuring gradients across stenosis but does not allow any direct visualization of vessel wall and adjacent organs. Currently, catheter angiography is not typically used as the first-line imaging tool and is mostly reserved for therapy.

### Case Series

**Case 1:** A 41 year old male patient came to us with fever and right lower abdominal pain 1 month after transplant. Sonography was done but no significant findings noted. CT Abdomen with CT angiography was performed.

On CT transplanted kidney showed normal size, shape, attenuation and enhancement. Air pockets noted within the collecting system of the transplanted kidney. Normal excretion of contrast seen in collecting system so diagnosis of Emphysematous pyelonephritis of transplant kidney was made.

**Case 2:** A 56 year old female Patient came for follow with complaints fever and pain. Patient referred to our department for sonography, there is mildly increased echotexture of kidney. Patient remain symptomatic.

Triphasic CECT whole abdomen was performed in which transplanted kidney showed heterogeneous post contrast enhancement, hypo-enhancing & non-enhancing areas seen in lower pole with perinephric fat stranding and non opacification of Renal vein.

Feature s/o Pyelonephritis involving transplanted kidney

with Renal vein thrombosis

**Case 3:** A 26 yr old male patient admitted in our hospital for post renal transplant care on day 8. Underwent routine renal doppler study in which findings were increased resistance in transplanted renal artery and its branches.

Two months later patient presented with deranged RFT's. On USG findings were- Raised parenchymal echogenicity, moderate hydronephrosis and hydro-ureter of transplant kidney with few calculi secondary to vesico-ureteric stricture.

Findings were confirmed on MRI of lower abdomen and pelvis.

**Case 4:** A 29 yr old female patient admitted in our hospital for post renal transplant care. Underwent routine USG abdomen in which finding was collection in right iliac fossa adjacent to urinary bladder. On USG guided aspiration, diagnosis of lymphocele was made.

**Case 5:** A 27 yr old male patient admitted in our hospital 3 months after renal transplant with complaints of mild discomfort in right iliac fossa. We performed sonography in which mild perinephric collection seen. Patient admitted in our hospital and his symptoms resolved with medications in few days without any need of intervention.

**Case 6:** A 44 yr old male came to our hospital with chief complaints of fever with chills since 2 days with evening rise of temperature. Patient had renal transplant in July 2018. On blood investigation there was rise in creatinine level. Then patient referred to our department for renal Doppler, there was increase in resistive index of intrarenal arteries noted in upper(0.80),mid(0.85) and lower(0.82) pole.

Patient was admitted in ICU and his condition was deteriorating. Patient blood and urine sample was send to laboratory for culture sensitivity but reports were inconclusive.

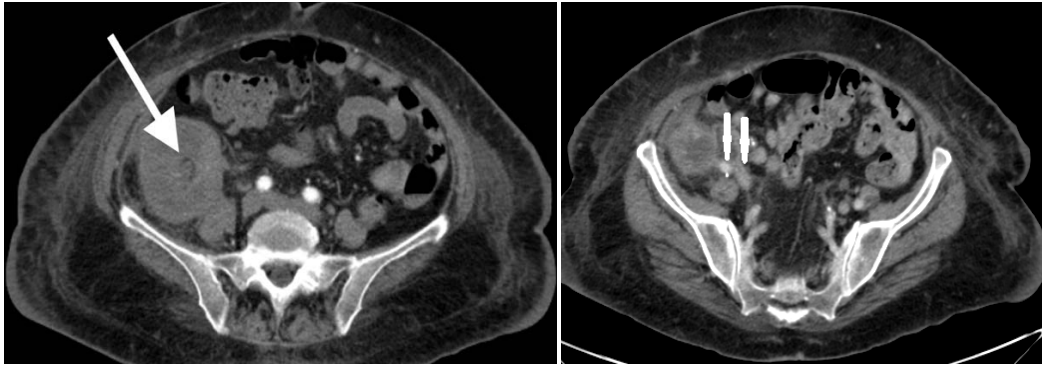
Clinician advised USG guided renal biopsy of transplanted kidney and sample came positive for BK virus induced interstitial nephritis. Hence diagnosis of Chronic graft dysfunction with BK virus nephropathy was made.

### Image Gallery:

**Case 1:** Emphysematous pyelonephritis of transplant kidney.



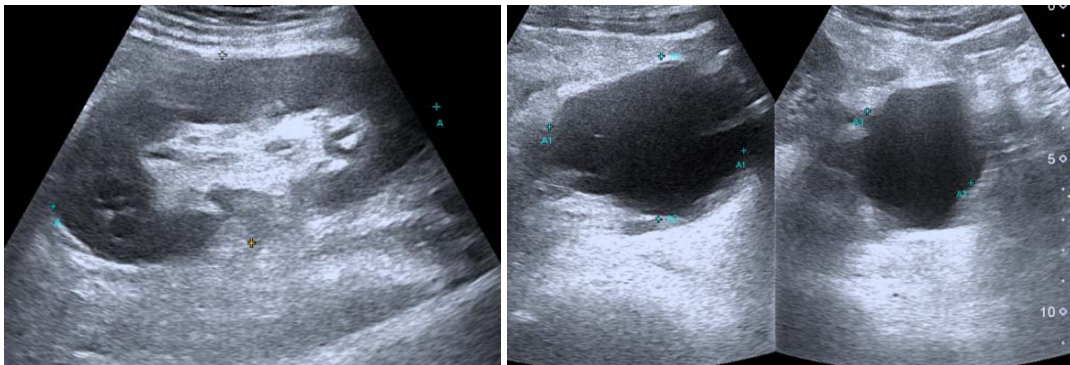
**Case 2:** Pyelonephritis involving transplanted kidney with Renal vein thrombosis



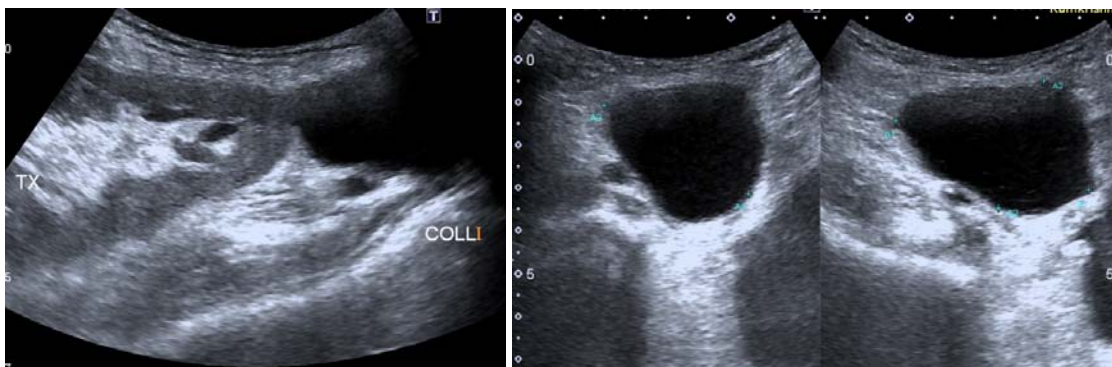
**Case 3:** Vesico-ureteric stricture with moderate hydronephrosis and hydro-ureter of transplant kidney with few calculi



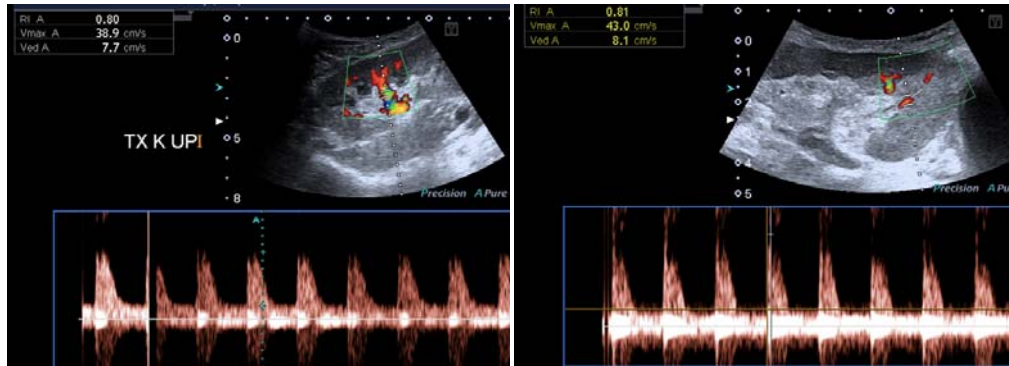
**Case 4:** Lymphocele adjacent to transplant kidney.



**Case 5:** Mild perinephric collection.





**Case 6:** Chronic graft rejection with BK virus nephropathy.**Discussion**

The treatment of choice for patients with end-stage renal disease is renal transplantation. Despite improvements in peritoneal dialysis and hemodialysis, these patients survive much longer after receiving a kidney transplant. Survival rates have improved because of refined surgical techniques, more effective immunosuppression with medications such as cyclosporine and OKT3, improved availability of human leukocyte antigen typing for donor-recipient matching, and establishment of a nationwide coordinating network. These advances have enabled a better quality of life for these patients.

The imaging appearances and postoperative complications encountered vary depending on the surgical procedures used, and radiologists must become familiar with the techniques employed in their institutions. <sup>[9]</sup>

**Vascular Complications:** Vascular complications are an important cause of graft dysfunction and are seen in fewer than 10% of recipients. It includes renal artery stenosis, renal vein stenosis, graft thrombosis, intrarenal arteriovenous fistula and pseudoaneurysm. In contrast to other causes of transplantation dysfunction, vascular complications have a high associated morbidity and mortality. Although catheter angiography remains the criterion standard for diagnosis of vascular complications, US with duplex- and colour-Doppler modes is an excellent noninvasive modality for evaluating the affected vessels.

**Urologic Complications:** Urologic complications are 2.6%-13% in prevalence, often affect the distal third of the ureter, and result in graft loss in 10%-15% of cases. They are commonly secondary to the alterations in ureteral vascularization during graft manipulation, which causes vascular impairment and subsequent necrosis. It includes urinary obstruction, urinary leak, peritransplantation fluid collection like hematomas, urinomas, lymphocele and abscesses. Most are apparent in the first month after transplantation.

**Nephrogenic Complications:** Acute rejection, acute tubular necrosis, and drug toxicity are the most common causes of early graft failure after transplantation. Differentiating these conditions is difficult with radiologic methods only and usually are made by ultrasound guided biopsy of a transplanted kidney.

Chronic rejection occurs months to years after transplantation and is due to sclerosing vasculitis and extensive interstitial fibrosis. Renal biopsy is the criterion

standard in the diagnosis of rejection. Prolonged immunosuppression after renal transplant places the recipient at increased risk for developing cancer. <sup>[10]</sup>

**Conclusion**

Imaging like Ultrasonography, Computed tomography and Magnetic resonance imaging has a critical role in the evaluation of post renal transplant complications in immediate postoperative period & later, and interventional radiologic techniques are often successfully applied to their treatment.

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