



- Renal failure immediately following allograft transplantation is called 'Delayed Graft Function' (DGF). This refers to oliguria or the requirement of dialysis in the immediate post-operative period.
- The major causes of DGF are;
 - Acute Tubular Necrosis (ATN)
 - Acute Antibody Mediated Rejection
 - Rejection superimposed on ischemic ATN
 - Urinary tract obstruction
 - Vascular occlusion
 - Atheroemboli
 - Segmental Cortical Infarction
- The role of imaging modalities is to help in the differentiation between these causes of DGF. Doppler ultrasound and nuclear medicine scintigraphy are useful initial investigations.

DOPPLER ULTRASOUND

- Indicated in almost all patients with allograft dysfunction or urinary tract abnormalities. [1,2](#)
- Sensitivity approaching 100% in diagnosing urinary tract obstruction, a common cause of acute allograft failure. [3](#)



- US findings in acute renal transplant dysfunction include swelling, enlarged pyramids, decreased cortico-medullary differentiation and Doppler changes such as increased resistive index. However these findings are non-specific and can be seen in acute tubular necrosis and cyclosporin toxicity. [2,4](#)
- In the immediate postoperative period, sonography is useful in diagnosing surgical causes of DGF such as thrombosis of the renal artery or vein, extrinsic or intrinsic causes of urinary tract obstruction and urine leaks. [1,3](#)
- Colour and power Doppler provide useful information regarding blood flow to the kidney and vascular complications in renal allografts. [5,9](#)
- In occlusion of the main renal artery by thrombus, Doppler US demonstrates a lack of arterial flow distal to the occlusion and absence of venous flow. [1,2,7,8](#)
- Renal vein thrombosis presents with marked elevated resistive index and reversal of arterial flow in diastole together with absent venous signals. [1,2](#)
- Useful for: [1](#)
 - Guiding percutaneous biopsy.
 - Diagnosing fluid collections in patients with graft pain or ipsilateral leg oedema.
 - Measurement of residual bladder volume.
 - Identification of ureteral stents.
- Limitations: lacks specificity (false positives for urinary tract obstruction may result if collecting system of kidney is not examined when bladder is empty, since full bladder may cause dilatation of transplant collecting system). [4](#)

RENAL SCINTIGRAPHY

- Allows assessment of graft perfusion, function and excretion. The most common finding is normal perfusion with increased retention and little excretion indicating acute tubular necrosis. [10](#) The grade of ATN on nuclear scintigraphy is correlated with graft survival. [11](#)
 - Class I ATN - Delayed transit time but with excretion
 - Class II ATN - No excretion phase
 - Class III - Low uptake and flat curve of tracer
- In acute antibody mediated rejection there is absent perfusion and function. [10](#)
- Useful in the diagnosis of obstruction and cortical scar formation in the renal transplant but its contribution to the diagnosis of parenchymal dysfunction remains unproven. [10](#)

RENAL ANGIOGRAPHY

- Useful in confirming and possibly treating stenoses in patients with positive US or those with inadequate or equivocal US when clinical suspicion is strong. [1,7,8](#)

RENAL BIOPSY

- "Gold Standard" in the diagnosis of acute renal transplant rejection. [1,4,9](#)
- Disadvantages: invasive procedure with a risk of complications. [12](#)





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12. Wilczek HE. **Percutaneous needle biopsy of the renal allograft.** Transplantation 1990;50:790-7. (Level III evidence)

FURTHER READING

1. Baxter GM. **Ultrasound of renal transplantation.** Clinical Radiology 2001;56:802-18. (Pictorial Review)

Website

For more information go to www.imagingpathways.health.wa.gov.au

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