

## **EFSUMB Course Book, 2nd Edition**

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### **Ultrasound after kidney transplantations**

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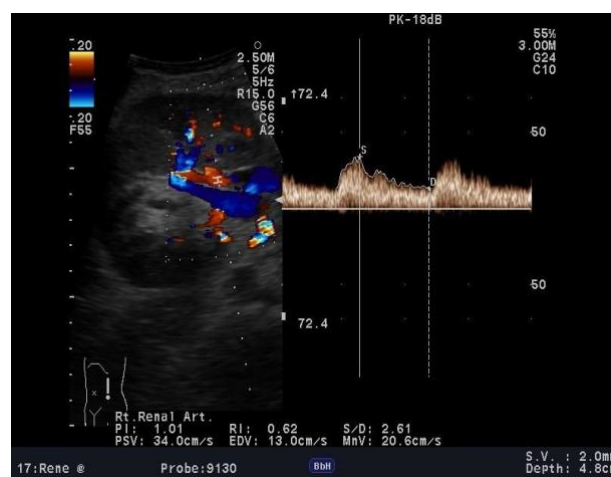
## Introduction

Renal transplantation is an established cost-effective treatment in patients with end-stage renal disease [(1)]. However, after the first year, graft survival curves show an exponential decline in the number of functioning grafts. Many causes of renal graft dysfunction are treatable, which makes prompt detection and diagnosis of complications mandatory. Acute tubular necrosis (ATN) [(2)] may cause immediate oliguria and follow an initial short period of graft function as well as acute rejection. Finally, there is a possibility of cyclosporine or tacrolimus toxicity [(3)].

## Evaluation of kidney transplants using greyscale sonography and colour Doppler imaging

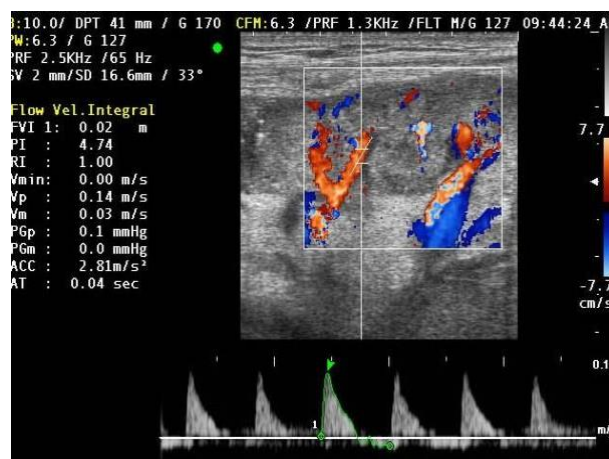
Renal graft measurements (length and width) and anatomical characteristics (corticomedullary differentiation, the existence of hydronephrosis affecting the graft, perinephric fluid collections or masses) [Video 1] as well as vascular flow [(4)] [Video 2, Figure 1] can be defined using greyscale sonography and colour Doppler imaging.

**Figure 1** Colour Doppler imaging in a normal patient shows blood flow and vascular morphology (renal artery and renal vein are both visible)



During the first 24h after surgery the graft must be examined using greyscale and colour Doppler imaging as the first technique according to the protocol or clinical indication. Absence of perfusion in the graft is a sign of renal artery occlusion. Reverse diastolic flow in the arteries due to retrograde blood flow during diastole [Figure 2] is a sign of complete allograft vein thrombosis or acute rejection. Incomplete vein thrombosis is more difficult to identify. When colour Doppler imaging cannot completely rule out arterial occlusion, stenosis or vein thrombosis, a CT scan or even arteriography is required [(5)].

**Figure 2 Acute rejection. Typical colour Doppler aspect. The flow under the baseline indicates the retrograde arterial blood flow during diastole.**



Infarctions can be diagnosed on Doppler ultrasound or power Doppler examination by demonstrating a lack of blood flow to the infarcted region of the parenchyma. Exploration using ultrasound contrast agent is the best option in these cases. Sonographic exploration cannot differentiate between ATN and acute rejection and therefore, ultrasound-guided allograft biopsy is required.

Renal artery stenosis usually occurs at the site of the surgical anastomosis, at a rate of 1–10%. Diagnosis is made by demonstrating a focal and segmental region of flow abnormality characterised by elevated peak systolic velocity (PSV) (normal value 250cm/s) with associated turbulence at an adequate insonation angle. The ratio of renal artery PSV compared with that of the iliac artery can be useful because PSV may be variable in the allograft artery. In addition to this, tardus parvus waveform abnormalities can be observed

in the renal parenchyma. After sonographic diagnosis of possible renal artery stenosis, MRI or CT angiography may be indicated to confirm the diagnosis before percutaneous transluminal angioplasty is performed.

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