Renal Transplants: A pictorial review of ultrasound cases

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ABSTRACT

Ultrasound is an important tool for monitoring structure and function of kidney transplants. The advantages of ultrasound specific to kidney transplants are; non-invasive, easily accessible and non-nephrotoxic. The use of ultrasound in the evaluation of renal transplants is crucial, especially in the immediate post-operative period, in order to, identify any complications which require urgent intervention, to protect the function of the transplant [1]. This poster is a pictorial review of interesting ultrasound cases involving transplant kidneys, aiming to discuss and analyse image interpretation of related pathologies.

PATHOLOGY

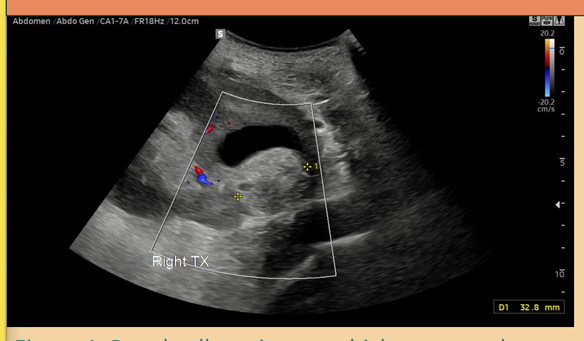


Figure 1 Renal cell carcinoma which presented as a hyperechoic partially cystic mass.

Patients who are transplant recipients are at a higher risk of cancer due to chronic immunosuppression [2]. Renal cell carcinoma (RCC) has a higher occurrence in the native kidneys, but can also develop in the kidney transplant. RCC is the most common renal malignancy; ultrasound appearances are; a solid or partially cystic complex mass, disruption of the renal parenchyma, increased vascularity and can range in echogenicity. Ultrasound sensitivity for RCC can vary greatly, effected by size of lesion and operator dependency [3]. Therefore, it is important ultrasound practitioners are aware of multiple sonographic appearances.

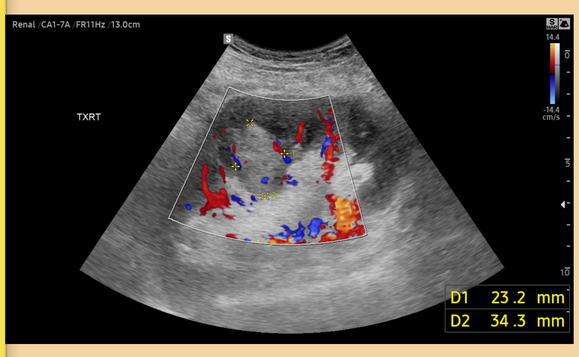


Figure 2 Pyelonephritis presenting as an echogenic area within the renal parenchyma.

Pyelonephritis is one of the most common forms of bacterial infection in kidney transplant recipients and can be associated with negative long-term effects on function[4]. Ultrasound has a low sensitivity for detecting pyelonephritis, but can identify associated factors such as obstruction. Ultrasound appearances include hyperechoic appearance (including wedge or rounded areas with a mass like appearance), hypoechoic areas, hypovascularity, debris in the collecting system, gas bubbles and diffuse or focal enlargement of the kidney.

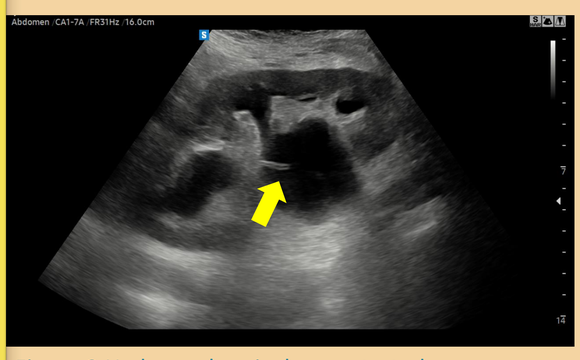


Figure 3 Hydronephrosis demonstrated as an avascular anechoic area within the renal pelvis extending to the calyces. Yellow arrow shows stent in situ.

Ultrasound appearances of hydronephrosis include the "bear paw" sign, with avascular anechoic connecting areas within the renal pelvis. Pelviectasis can be common post-surgery, however cortical involvement differentiates moderate from severe hydronephrosis, where the calyces merge into a single anechoic area, also differentiating from cortical or sinus cysts[5].
Ultrasound can aid in diagnosis of obstructive or non-obstructive hydronephrosis, which can determine treatment. In the initial post operative period a stent is inserted to help keep the ureter open while the connection to the bladder heals.

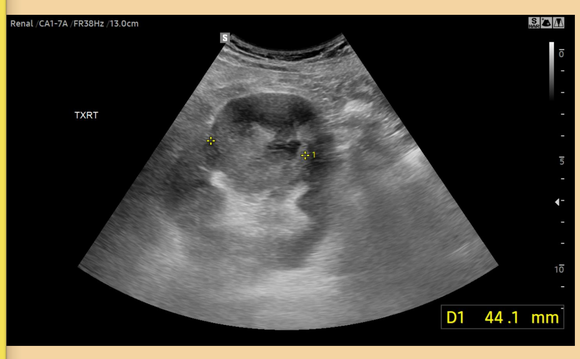


Figure 4 Abscess represented as a complex mass disrupting the renal capsule.

Abscess on a renal transplant is an uncommon infectious occurrence but can lead to higher morbidity and mortality[6]. Ultrasound appearances include a hypoechoic or mixed echogenicity thick walled mass, with internal debris or septa. Use of Doppler is important as increased peripheral vascularity may be visualised, but absent vascularity should be noted centrally.

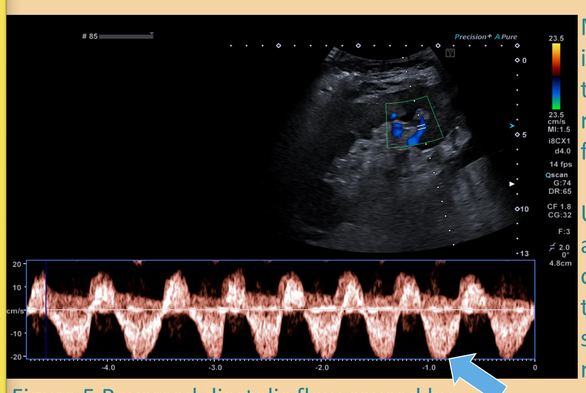


Figure 5 Reversed diastolic flow caused by thrombus. Retrograde flow (blue arrow) is on the negative axis, below the line, representing backflow of blood.

Measuring the resistive index (RI) using Doppler can inform clinicians about the vascular function of the transplant. Renal vein thrombosis is an emergency, requiring immediate intervention as it is associated with failure in 33-55% of cases[7].

Ultrasound technique is important as it can be difficult to achieve an optimal trace due to small vessels and position of the transplant kidney in the pelvis. To optimise techniquea practitioner should; adjust scale, reduce sector width, reduce sampling Doppler box size and reduce gate size. The practitioner should be aware not to apply too much probe pressure transabdominally, as this can affect the trace.

UROTHELIAL THICKENING

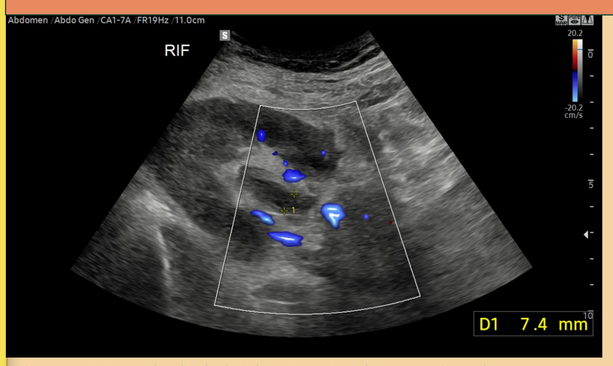


Figure 6 Urothelial thickening in the proximal ureter (yellow callipers).

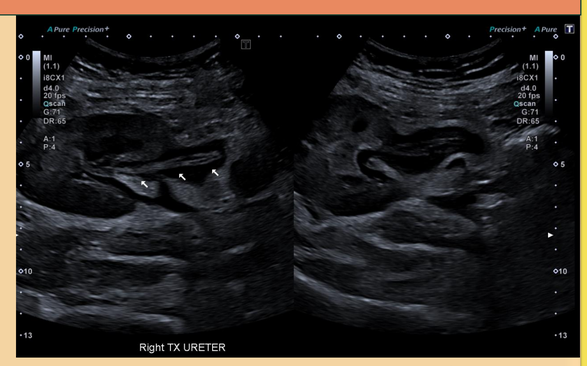


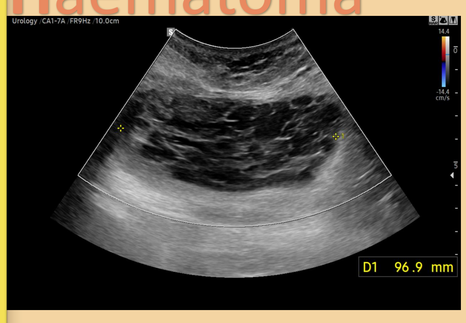
Figure 7 Transplant kidney case to learn from; showing a longitudinal oblique section (left image) and transverse section (right image) demonstrating linear echogenic urothelial thickening (white arrows) misinterpreted as potential remnant stent.

Urothelial thickening is an abnormal thickening of the lining of the urinary tract. Ultrasound findings of urothelial thickening are non-specific with many causes in a transplant kidney, ranging from urinary tract infection to transplant rejection. Figure 7 is a case to learn from, as urothelial thickening was mistaken by two experienced sonographers, as a remnant stent due to the echogenic linear appearance, previous imaging showed no stent in situ. Learning point: A subsequent scan showed the thickening did not continue along the entirety of the ureter, differentiating this from a remnant stent.

COLLECTIONS

Perirenal transplant fluid collections are non-specific with overlapping ultrasound appearances, asymptomatic presentation and variation in size and location. Ultrasound can assess the size, position and echotexture of the collection, but does not give a definitive diagnosis, often requiring aspiration with fluid analysis. Generally, the incidence of a collection can be differentiated based upon the time frame after surgery, however, it is important to note, that collections can occur any stage post surgery: HEAL mnemonic can be a useful tool for remembering the time line[8].

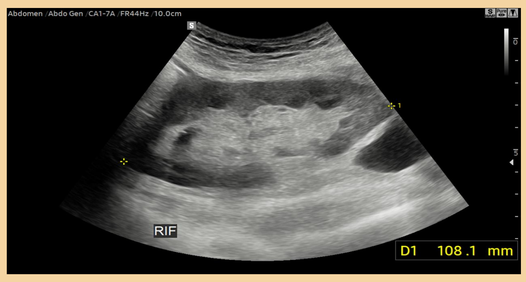
Haematoma



Time period: Immediate. Haematomas contain blood, are avascular and can vary in ultrasound appearances. Generally, in the early stages haematomas appear heterogeneous and echogenic, later presenting as anechoic collections containing septations.

Encapsulated Collections

Seroma is a collection of serous fluid. Time period 1-2 weeks. Ultrasound appearances are, avascular, anechoic collection usually anterior to the graft.



Urinomas consist of urine and are secondary to anastomotic leak or ureteric ischaemia. Time period: 1-2 weeks. Ultrasound appearances are an avascular anechoic collection in the perirenal space. Symptoms can include; pain, swelling, elevated creatinine and wound discharge.

Abscess can develop if the collection becomes infected at a later time period. Symptomatic; fever, pain, elevated infection markers.

Lymphocele

Lymphoceles contain lymphatic fluid, caused by damage of the lymphatic channels around the iliac vessels. Lymphoceles are the most common fluid collection and occur later in the weeks and months post surgery. Ultrasound appearances are an avascular anechoic collection around the renal transplant.

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