Renal Cysts and Lesions:

Simple renal cysts are very common (up to 50% of 50 yr olds). They are characterised by well defined margins, thin walls and are filled with fluid which has the same density of water (shows up black on USS).

This ultrasound scan shows a small simple renal cyst.
The same characteristics are seen on CT. The two CT scans below show the same cyst, in a coronal and axial view.
Cysts are classified as ‘complex’ if they have solid areas, calcification or septations.

This cyst (circled in white) has a solid component (yellow circle). The degree of ‘complexity’ of the cyst is graded using the Bosniak classification. The more complex the cyst the higher the malignant potential and the classification aids clinicians in their decision to monitor the cyst or remove them.
The same cyst is shown on this CT with contrast. The yellow area has enhanced with intravenous contrast, confirming that it is solid. This is suspicious of a cancer.
Polycystic Kidney disease:

This autosomal dominant disease results in bilateral multiple cysts. In this severe example you can see why the patients develop renal impairment – the cysts compress the parenchymal tissue. Cysts can also develop in the liver as seen in the second CT.
Complications affecting polycystic kidneys include bleeding – the CT at the top of the page shows the left polycystic kidney (white arrow) and the right kidney which has bled (the red arrow points to a large haematoma).

The second CT shows a patient with polycystic kidney disease who has had a renal transplant. The kidney is in the right iliac fossa and the presence of the bladder (yellow), rectum (green) and sacrum (white arrow) demonstrate the pelvic organs that can be seen.
Medullary sponge kidney:

This is an uncommon, congenital disorder. There is dilatation of the collecting tubules causing a characteristic ‘bunch of grapes’ appearance on IVU.

Patients can have complications of renal calculi, infections, haematuria or renal tubular acidosis but rarely develop renal impairment.
Angiomyolipoma

These are a benign growth of smooth muscle, blood vessels and fat. They tend to affect women, are mostly sporadic but are strongly associated with the genetic condition tuberous sclerosis.

On scans they have a very typical appearance. The dark areas (top arrow) is the same density as the perinephric fat (lower arrow). On an ultrasound this appears as a white area.

They do not have malignant potential but once they are larger than 4cm they have an increased chance of bleeding and an elective embolisation performed by the interventional radiologists is the treatment of choice.
Ultrasound is very good at identifying renal masses. Many are found incidentally when patients are investigated by other specialities.

This solid mass is marked with the dashed lines and crosses and is very suspicious of a cancer.
This ultrasound also demonstrates a suspicious-looking mass. A CT with contrast not only helps characterise the mass but also stage the tumour. (size, blood vessel or lymph node involvement).
These CT’s show a large enhancing mass. The darker areas in the middle of the mass are suggestive of necrosis. The normal kidney is arrowed.
This CT is a sagittal view of a lower pole tumour.
Below are two more examples of large tumours, again they have areas suspicious of necrosis. The CT allows for examination of the contralateral kidney – you can see if there are bilateral tumours and look at the degree of enhancement and width of cortex which give an approximation of the function of the kidney (important if you are going to remove the kidney with the tumour!).
This tumour has extension into the renal vein.
There is also involvement of the blood vessels in this CT – see if you can identify it....
The Tumour is in the vena cava both above, and below the renal vein but is confined to below the diaphragm (important for staging).

The patient is at high risk of pulmonary embolus of thrombus or tumour. The venous return from the lower limbs will also be reduced.
This is a CT of the same patient, the axial view demonstrating how the tumour fills the vena cava and leaves little space for venous return.
TCC can also cause masses in the kidney. As this is a cancer of urothelial cells, the tumour arises from the renal pelvis. Patients with visible haematuria and no positive findings on USS, KUB and cystoscopy (performed at the one stop haematuria clinic) have either an IVU or CT urogram (images taken later than for other contrast CTs so that the contrast is in the renal pelvis and ureter.

This IVU (tomogram) shows a filling defect on the left (circled). The left kidney’s upper pole calyx is obvious but on the left it is missing (yellow arrow).
A similar thing is seen on this CT scan. The mass (white arrow) is filling the renal pelvis so that only a small amount of contrast is seen surrounding it (yellow arrow).