Q: Localised renal cancer

Case 1

A 56-year-old lady is referred to the urology clinic after the GP conducted an ultrasound abdomen for deranged liver function tests and found a renal lesion. She is otherwise fit and well.

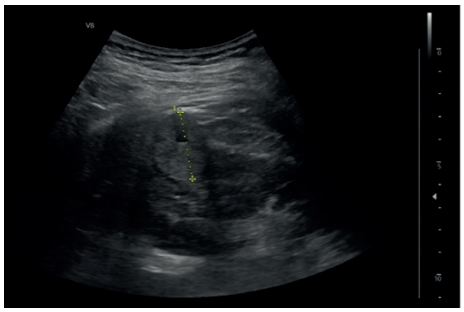

Figure 1.

1. What is the sensitivity and specificity of ultrasound (US) for detecting renal tumours? Do you know of any US adjuncts that can improve this?
2. What is the best imaging modality for investigating renal cell carcinoma?
3. On CT, what change in Hounsfield units may alert you to malignant pathology?
4. What are the main limitations of CT / MRI in detecting renal masses with tumour potential?

Case 2

A 65-year-old gentleman presented with visible haematuria and underwent the below CT scan. He has hypertension and hyperthyroidism.

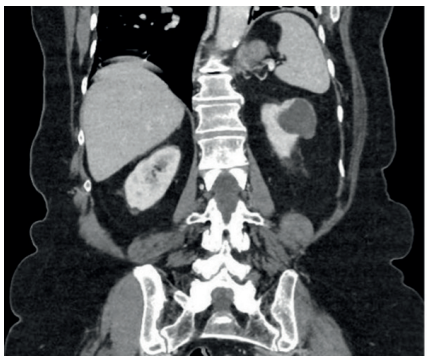

Figure 2.

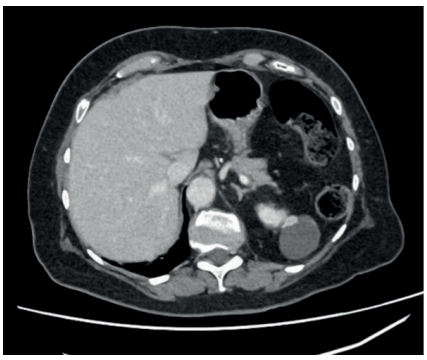

Figure 3.

1. What are the different phases of a CT renal?
2. What do Figures 2 and 3 demonstrate? What is the stage of this lesion?
3. What are the treatment options for this patient?

Case 3

A 77-year-old gentleman was diagnosed with the below 3cm renal lesion confirmed to be a renal cell carcinoma. Management options were discussed, and he opted for the below intervention.

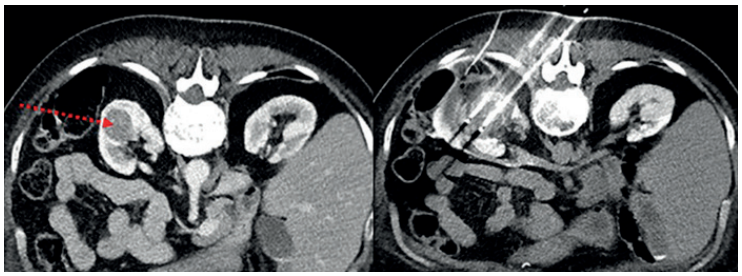

Figure 4.

1. Can you describe the intervention shown in Figure 4?
2. Please outline the risks involved with this procedure.

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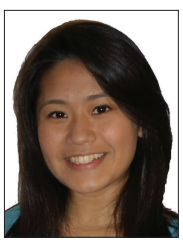

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A: Localised renal cancer

Case 1

1. Sensitivity of US in detecting renal masses depends on the size of the lesion. Sensitivity for tumours >3cm and smaller tumours (2–3cm) is reported to be 85–100% and 67–82% respectively [1]. Plain US typically looks for distortion of architecture. Doppler US identifies increased vascularity to an area relative to the surrounding tissue, which is particularly useful for endophytic tumours and in differentiating between RCC and small angiomyolipomas (AML).
Another modality is contrast-enhanced US (CEUS), which identifies areas of renal parenchyma brightness and can assess for microcirculations. CEUS has a suggested sensitivity up to 95% and specificity around 55% [2]. They can help demonstrate hypovascular lesions such as papillary RCC, but may not differentiate RCC from oncocytoma / AML [3].
2. According to the European Association of Urology (EAU) guidelines contrast enhanced multi-phasic CT has high sensitivity (95–100%) and specificity (88–95%) for characterisation and detection of RCC, invasion, tumour thrombus and mRCC [4,5].
3. An increase in 15 Hounsfield units or more in the solid part of a tumour represents enhancement. One systematic analysis reported a median sensitivity and specificity of 88% in identifying renal tumours [6].
4. Limitations of CT include exposure to ionising radiation and nephrotoxic contrast agents, whilst MRI may be contraindicated in patients with metallic prostheses or pacemakers. Historically, it was thought that both CT and MRI were not completely reliable when distinguishing oncocytomas or fat-poor AMLs from renal cell carcinoma. However, a meta-analysis from 2022 concluded that CT had a pooled 83% sensitivity and 92% specificity when differentiating between oncocytomas and RCC [7].

Case 2

1. CT renal consists of multiple phases as outlined below [8]:
Non-contrast phase – This is conducted prior to intravenous (IV) contrast administration, with the purpose of detecting calcifications (e.g., renal or ureteric stones) and identifying fat content in mass lesions (e.g., AML). It is also useful in having a baseline attenuation with which to compare the contrast images.
Corticomedullary phase – This is conducted approximately 25–40 seconds after contrast injection. Its purpose is to highlight renal arteries, cortex and medulla (the renal cortex enhances preferentially). It is useful in assessing vascular anatomy which can aid surgical planning, and in demonstrating renal artery stenosis / arteriovenous malformations and other abnormalities. It can identify early enhancement in hypervascular tumours.
Nephrogenic phase – This is conducted approximately 80–120 seconds after contrast injection. It allows both enhancement of the cortex and medulla and is the best phase for detecting renal masses.
2. This is a 5cm, exophytic, cystic, superior pole tumour of the left kidney, stage T1b N0 Mx.
3. A full summary of treatment of these lesions is outlined in the table below [4,9,10].

Treatment option	Indications	Considerations
Partial nephrectomy (Open, laparoscopic, or robotic-assisted.)	T1a tumours (first-line treatment). T1b tumours, where technically feasible; patients with solitary kidney, bilateral tumours, or chronic kidney disease (CKD).	Equivalent oncologic outcomes to radical nephrectomy for small tumours. Better renal function preservation.
Radical nephrectomy (Laparoscopic or robotic-assisted preferred over open surgery due to faster recovery.)	Large T1b tumours not amenable to partial nephrectomy; central tumours or those with complex vascular involvement, when partial nephrectomy would lead to poor functional outcomes.	
Radiofrequency ablation (RFA) (Uses heat generated by high-frequency electrical currents.)	Tumours <3 cm (T1a); peripherally located.	Higher local recurrence rates than surgery; requires close follow-up.
Cryoablation (Freezes tumour tissue using argon gas, causing cellular necrosis.)	Indications are similar to RFA.	Lower recurrence than RFA; can be done percutaneously under imaging guidance.
Active surveillance	Appropriate for: elderly patients with limited life expectancy; patients with significant comorbidities where intervention risks outweigh benefits; small, slow-growing T1a tumours.	Monitoring required: regular imaging (CT / MRI / US) and clinical evaluation.
Systemic treatment	NOT typically indicated for T1 RCC.	Considered only if: part of a clinical trial; occult metastases are discovered (rare in T1); patient progresses to advanced stages during follow-up.

Case 3

1. This is cryoablation of a small renal tumour.
2. The complications involved with this procedure are listed below, along with their respective risks.

Complication	Estimated risk
Minor bleeding / haematoma	5–10%
Major bleeding requiring intervention	<2%
Local recurrence	5–15%
Urinary leak / fistula	<3%
Adjacent organ injury	<1%
Infection (UTI, abscess)	<5%
Cryoshock	<1% (extremely rare)

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