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CASE REPORT

Clear cell renal cell carcinoma: atypical imaging presentation of Wunderlich syndrome

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Renal cell carcinomas (RCC) are primary malignant adenocarcinomas derived from the tubular epithelium. These encompass several distinct histological varieties, including clear cell, papillary, clear cell papillary, chromophobe renal cell, and other rare ones. The incidence of RCC is rising, largely attributable to the increased use of cross-sectional imaging and advances in imaging techniques. This case report describes an atypical imaging manifestation of RCC, histologically confirmed as a clear cell subtype, presenting atypically with Wunderlich syndrome.

Keywords: renal cell carcinomas, atypical, diagnostic, haemorrhage

Introduction

Kidney cancer is the 14th most common cancer worldwide.[1] RCCs are thought to be the eighth most common malignancy in adults, accounting for 2% of all cancers and 80–90% of primary malignant adult renal neoplasms.[4] Its incidence has been increasing until recently, primarily due to the increased incidental diagnosis of small renal lesions found during abdominal examinations for a variety of indications.[3] Clear cell renal cell carcinoma (ccRCC) is almost two-fold more common in males than females, with a peak incidence in the sixth and seventh decades.[7] It is the most common subtype, with potentially aggressive behaviours, and has a notable tendency to cause spontaneous bleeding resulting in Wunderlich syndrome.[2,11] Wunderlich syndrome is characterised by Lenk's triad of flank pain, flank mass, and hypovolaemic shock.[11] CcRCC accounts for 65–70% of cases, followed by papillary RCC (10–15%) and chromophobe RCC (~ 5%).[1] Other rare malignant subtypes, including collecting duct carcinoma, micropthalmia-associated transcriptional factor (MiT) family translocation RCC, tubulocystic carcinoma, etc., are extremely rare.[1]

Computed tomography (CT) is the preferred initial modality for characterising and staging renal masses due to its widespread availability, cost-effectiveness, and high diagnostic accuracy.[1] Magnetic resonance imaging (MRI) may also be indicated, as it provides the added advantages of avoiding ionising radiation and offers superior characterisation of complex cystic lesions and certain histological subtypes of RCC.[1] However, compared with CT, MRI is more expensive and time-consuming.[5] Ultrasonography is rarely used alone in evaluating a solid renal mass.[6] This case report highlights an unusual presentation of ccRCC manifesting as Wunderlich syndrome, emphasising the diagnostic challenges posed by atypical imaging findings and the importance of correlating clinical, radiological, and histopathological data.

Patient presentation

The case study discusses a 74-year-old male patient with benign prostatic hypertrophy and established coronary artery disease. The patient is currently admitted for a STEMI (ST-elevation myocardial infarction) and was on anticoagulant therapy (enoxaparin) and dual antiplatelet therapy, with clopidogrel and aspirin since admission (1 May 2025). While in the ward, the patient developed an acute onset of excruciating right flank pain accompanied by frank haematuria. The medications were immediately discontinued following the onset of haematuria.

A CT scan of the abdomen was requested to evaluate the cause of the patient's new symptoms. A large right retroperitoneal mass with heterogeneous contents was noted on the scan, with haematoma considered as a differential diagnosis. The inability to clearly identify the right adrenal gland raised concern for a possible adrenal origin. The scan also demonstrated a subtle area of contrast blush off the segmental right renal artery, concerning for an active bleed (Figure 3). There were also suspected haemorrhagic contents noted within the bladder cavity and an incidental left adrenal gland solid lesion.

Management and outcome

While in the ward, the patient's haemoglobin dropped to a level requiring blood transfusion, raising concern for repeated, ongoing bleeding. This prompted repeat imaging to exclude active haemorrhage. However, the patient remained clinically stable with a blood pressure of 117/72 mmHg, pulse of 80 bpm, and saturating at 96% on room air. The CT angiogram of the abdomen performed

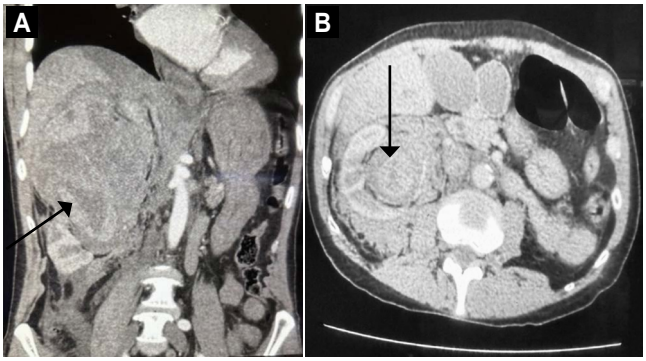

Figure 1: Coronal (A) and axial (B) post-contrast images show a large, heterogeneous, mass-like collection in the right flank (black arrows)

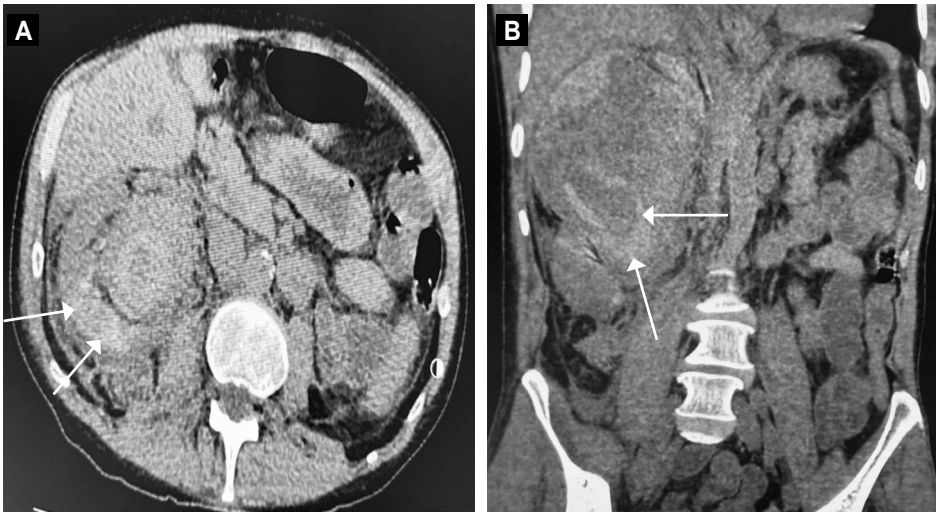

Figure 2: Axial (A) and coronal (B) unenhanced computed tomography slices of the abdomen show hyperdense foci within the mass (white arrows), suggestive of ongoing haemorrhage

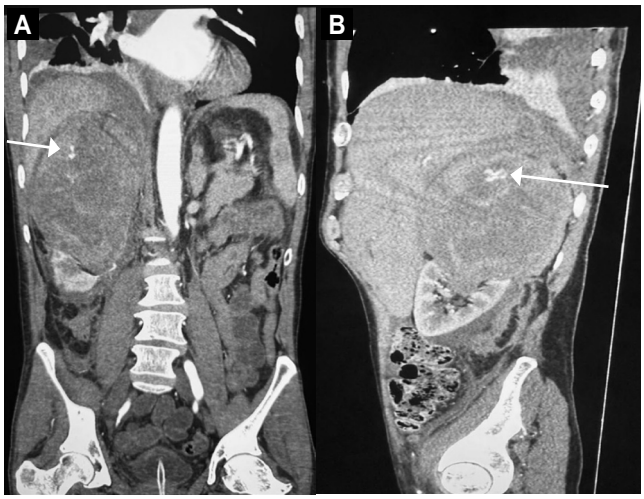

Figure 3: Coronal (A) and sagittal (B) post-contrast arterial phase images show areas of contrast blush in the regions supplied by the branch of the superior segmental renal artery (white arrows)

two days after the initial scan demonstrated progressive contrast blush within the mass in the region supplied by the branch of the superior segmental renal artery. This was concerning for active haemorrhage. All other previously documented imaging findings remained unchanged.

Following this, an ultrasound-guided biopsy and renal artery embolisation were planned. The pre-procedural laboratory results were normal, with international normalised ratio (INR) of 1.37, haemoglobin of 12.1 g/dl, platelet count of 356 × 10^9/L, and normal renal function (creatinine of 105). The biopsy was successful with no acute complications. Embolisation for treating the spontaneous retroperitoneal haemorrhage, suspected to arise from a renal/suprarenal tumour, was performed. Evaluation of the main renal artery and the superior segmental artery revealed a large upper-pole renal mass with prominent neovascularity. The superior segmental artery, originating from the main renal artery, was identified as the primary feeder and successfully embolised without acute complications.

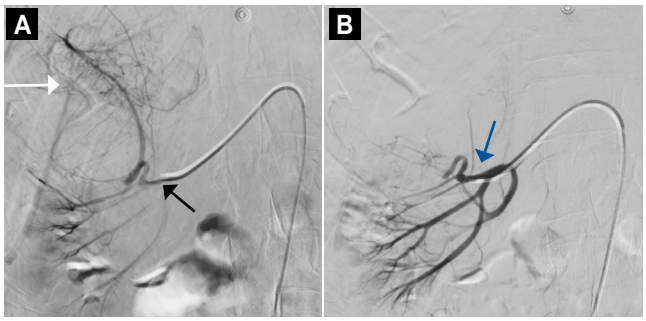

Figure 4: Digital subtraction angiography coronal images (A and B)
The mass is predominantly supplied by the superior segmental branch of the main renal artery. Image A demonstrates a pre-embolisation angiogram with the catheter positioned in the right renal artery (black arrow). Note the neovascularisation of the mass (white arrow). Image B demonstrates a post-embolisation angiogram, with the catheter positioned in the proximal upper pole segmental artery (blue arrow). Note the absence of neovascularisation of the upper pole mass in image B.

Histology confirmed ccRCC. Multidisciplinary teams, including urologists and oncologists, were involved in the patient's care. A staging CT scan was performed two months after the initial study, which showed an interval decrease in the mass size, with no evidence of active haemorrhage or distant metastasis. The patient is planned for nephrectomy and remains clinically stable.

Discussion

CcRCC is the most common histological subtype of RCC, typically presenting as a solid, enhancing renal mass with clear margins and characteristic vascularity on contrast-enhanced imaging.[3] However, this case highlights an atypical presentation, underscoring the variability in imaging features that can lead to diagnostic uncertainty. In this patient, imaging demonstrated a suspected right suprarenal or apico-renal mass-like collection with heterogeneous contents, most consistent with a haematoma (Figure 1). A neoplastic process, such as primary renal or metastasis, was considered as a differential.

Atypical imaging features in ccRCC have been increasingly recognised, particularly in lesions with cystic degeneration, necrosis, and haemorrhage, as demonstrated in this case. These atypical findings may also arise in systemic conditions, like anticoagulation

therapy, recent trauma, or concurrent inflammatory processes. Such features can obscure typical ccRCC enhancement patterns, potentially causing diagnostic delay or misinterpretation. This case also illustrates the importance of integrating the clinical context, such as the patient's age, history, and symptoms, with imaging findings. For example, the patient was taking anticoagulation therapy; therefore, haemorrhage was initially considered.

Recognising atypical imaging manifestations is essential to avoid misleading or delayed management.[1] Imaging of ccRCC demonstrates hypervascularity compared with papillary RCC, which is frequently hypovascular.[8] In this case, hyperdense foci were observed within the mass on pre-contrast images (Figure 2), along with areas of contrast blush on post-contrast arterial images (Figure 3). These imaging features were concerning for active haemorrhage. The main arterial supply to the neovascular mass was identified as the superior segmental artery arising from the main renal artery (Figure 4B). Successful embolisation of these feeding vessels was performed.

Options for managing RCC include radical nephrectomy, partial nephrectomy, thermal ablation, and active surveillance.[5] For larger and complex renal tumours, radical nephrectomy is still the preferred surgical approach in cases where oncological considerations supersede the advantages of nephron-sparing techniques.[9,10] Although imaging characterisation of renal masses has improved significantly, management decisions often still rely on histological diagnoses and an assessment of biological behaviour – both of which are best achieved with renal mass biopsy.[10]

The above case demonstrates a spontaneous, non-traumatic, renal haemorrhage involving the subcapsular and perirenal spaces, in keeping with Wunderlich syndrome. Although not all features of Lenk's triad (acute flank pain, flank mass, and hypovolaemic shock) were present, the first two were observed in this case, supporting the diagnosis of Wunderlich syndrome.

Conclusion

The atypical presentation of ccRCC manifesting as haemorrhage consistent with Wunderlich syndrome, though uncommon, poses significant diagnostic challenges. Such variations can obscure classical imaging hallmarks and complicate the diagnosis. Awareness of these variants and correlation with clinical findings is key in guiding further investigations and timely treatment. Radiologists play a pivotal role in the diagnosis, characterisation, and staging of RCC, providing essential guidance for clinical decision-making and therapeutic planning.

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Ethical approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the Institutional Research Committee and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants involved in the study, which included the use of all images and clinical data.

Conflict of interest

The authors declare no conflict of interest.

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