Case Report

When stones deceive: A case report of renal calculus mimicking upper tract malignancy

Vignesh Vivekanandam[1], Umesh Sharma[2], Abhishek Saini[1]

From [1]Senior Resident, [2]Professor, Department of Urology, ABVIMS and Dr. R.M.L Hospital, New Delhi, India

ABSTRACT

Renal cell carcinoma often presents with hematuria and flank pain, symptoms that overlap with benign urological conditions like nephrolithiasis. In this case report, we describe a 35-year-old male with flank pain and a suspicious renal mass identified on imaging, initially raising concerns for malignancy. A detailed evaluation, including retrograde pyelography and flexible ureteroscopy, ultimately revealed a staghorn calculus rather than malignancy with inflammatory changes, which was successfully treated with percutaneous nephrolithotomy. This case underscores the importance of comprehensive evaluation to avoid misdiagnosis and overtreatment in patients with renal stones mimicking malignancy.

Key words: Renal calculi, Renal cell carcinoma, Staghorn calculus, Ureteroscopy

Renal cell carcinoma (RCC) typically presents with painless hematuria, flank pain, or a palpable mass. RCC is often diagnosed through imaging modalities such as contrast-enhanced computed tomography (CECT), which can reveal mass lesions or filling defects [1]. However, several benign conditions may mimic malignancy radiologically, leading to potential diagnostic pitfalls. Chronic inflammation due to renal calculi, xanthogranulomatous pyelonephritis (XGP), and inflammatory pseudotumors can all simulate neoplastic lesions [2-4]. The radiologic features of staghorn stones, in particular, may present as ill-defined, hypoenhancing lesions with surrounding fat stranding, mimicking an infiltrative tumor. Prevalence of renal pseudotumors is low but may be higher in populations with underlying nephrolithiasis or chronic infections. Renal pseudotumors arise from various causes, including developmental anomalies, vascular malformations, inflammatory lesions, and infectious processes such as XGP [5]. Radiological features of staghorn calculi can sometimes mimic infiltrative tumors by causing irregular parenchymal changes due to chronic inflammation and fibrosis [6,7].

Failure to recognize these mimics can lead to overtreatment, including unnecessary nephrectomy or nephroureterectomy. This case highlights the importance of a structured diagnostic approach, integrating radiology with endoscopic and cytological evaluation [8] to arrive at an accurate diagnosis and avoid unnecessary radical interventions.

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CASE PRESENTATION

A 35-year-old male presented with left flank pain for 3 months, which was gradual, dull aching, intermittent, not radiating, not associated with fever, with no aggravating factors, and relieved by oral analgesics. The pain intensity was moderate (6/10 on the visual analog pain scale). His medical history was notable for a previous episode of painless gross hematuria 10 months prior, which resolved spontaneously within 1 week. He did not have any other urinary complaints and did not have systemic symptoms such as loss of weight or appetite, jaundice, or bone pain. The patient also had a history of left ureteroscopic lithotripsy for ureteric calculus 10 years ago, although the details were unavailable. He was a chronic tobacco chewer. He did not have any significant family history or occupational exposure to chemicals. He was well built and nourished.

On examination, vital signs were within normal limits: blood pressure was 120/70 mmHg and pulse rate was 80 beats/min. Abdominal examination was unremarkable.

Laboratory investigations, including complete blood count, renal function tests, and inflammatory markers, were unremarkable, with no signs of paraneoplastic syndrome.

Initial imaging was done. X-ray kidneys, ureters, and bladder (KUB) was suggestive of multiple renal calculi

Correspondence to: Dr. Vignesh Vivekanandam, B-604, New Doctor's Hostel, Dr. R.M.L Hospital, New Delhi – 110001, India. E-mail: valiantvignesh@gmail.com

in the left renal region. Ultrasound examination revealed a suspected mass of the left kidney (5.5 × 5 cm) and multiple renal calculi. CECT KUB revealed a solitary, ill-defined, heterogeneous, hypodense infiltrative mass (5.2 × 5.8 × 6.7 cm) in the lower and interpolar region of the left kidney. Hypoenhancing in all contrast phases. The mass appears to infiltrate into the pelvicalyceal system, associated periureteric fat stranding and mild hydronephrosis were noted (Fig. 1).

These findings raised suspicion of upper tract malignancy.

Given the suspicious imaging findings and the patient's age, an aggressive approach was initially considered. However, a more conservative and detailed diagnostic workup was pursued. Subsequent diagnostic evaluation included: left retrograde pyelography (RGP) demonstrated a smooth, regular contour of the renal mass without the typical infiltration seen in malignancy (Fig. 2). Flexible ureteroscopy revealed no evidence of an infiltrative mass and showed multiple stones in the renal pelvis. Cytology from the renal pelvic washings was negative for malignancy.

Based on the comprehensive diagnostic evaluation, the decision was made to proceed with percutaneous nephrolithotomy for the management of the renal stones. Intraoperatively, a staghorn calculus was identified in the renal pelvis, extending into both the lower and upper calyces. The stone was fragmented and completely removed. The patient had an uneventful recovery and was discharged on postoperative day 2.

On follow-up, the patient was maintaining well with no complaints. Double J Stent removal was done on postoperative day 14, and the patient is advised to undergo CECT KUB after 6 months as part of the follow-up plan.

DISCUSSION

Infiltrative renal lesions with hypodense appearance and peri-pelvic stranding on contrast imaging are often concerning for malignancy. However, renal calculi, particularly staghorn stones, can incite intense local inflammation, causing architectural distortion and a mass-like appearance. Such features can mimic RCC or upper tract urothelial cancer radiologically.

This case emphasizes the importance of endoscopic evaluation and cytology to differentiate malignancy from benign causes. Misdiagnosis may lead to unnecessary nephroureterectomy, especially when relying solely on imaging. A high index of suspicion and thorough evaluation, including RGP, flexible ureteroscopy, and wash cytology, can prevent overtreatment.

The radiological overlap between benign and malignant upper tract lesions is a well-recognized clinical dilemma. While CT urography remains the cornerstone in diagnosing upper tract malignancies, it is not infallible in distinguishing inflammatory from malignant lesions [9,10]. In this case, the ill-defined, hypodense, infiltrative lesion raised a high suspicion of urothelial carcinoma, supported by the lesion's size and surrounding fat stranding. Thus, a high index of suspicion and thorough diagnostic evaluation are paramount in preventing overtreatment.

However, endoscopic findings provided crucial clarification. Flexible ureteroscopy with negative cytology and absence of a visible tumor ruled out malignancy. Inflammatory conditions such as XGP, chronic pyelonephritis, and stone-associated fibrosis can often cause radiologic findings identical to those of neoplasms [11]. Biopsy or histologic confirmation is vital but may be challenging due to the inaccessibility or inconclusiveness of ureteroscopic biopsies.

XGP is a rare, chronic granulomatous infection often associated with obstructing calculi, which can mimic malignant neoplasms clinically and radiologically. Sensitivities and specificities of imaging modalities in distinguishing XGP from RCC are variable: CT has a reported sensitivity of 87–94% and specificity of 70–80% in identifying features suggestive of XGP [12-14]. However, overlap with malignant features

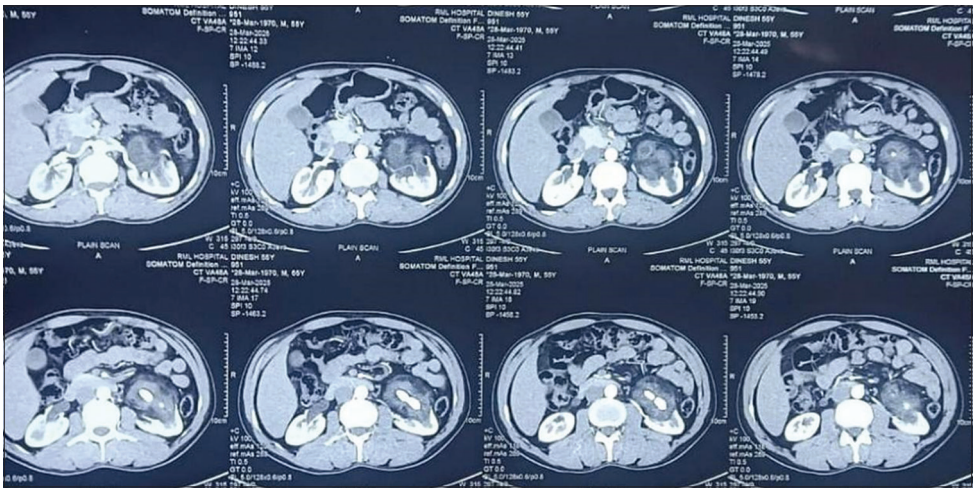

Figure 1: Contrast-enhanced computed tomography kidneys, ureters, and bladder showing solitary, ill-defined, heterogeneous, hypodense infiltrative mass in the lower and interpolar region of the left kidney infiltrating into pelvicalyceal system with associated periureteric fat stranding

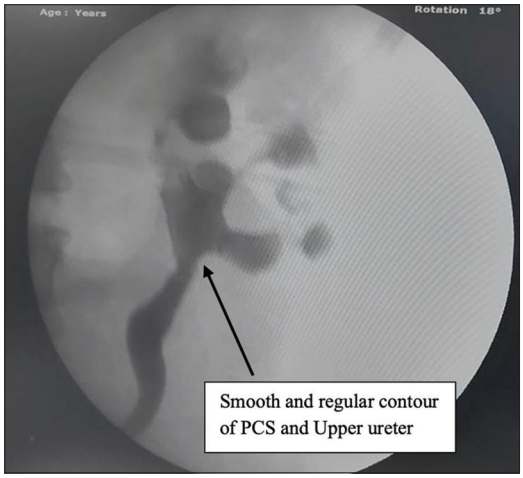

Figure 2: Left retrograde pyelography showing regular and smooth contour of pelvicalyceal system and upper ureter

often necessitates tissue diagnosis. Differential diagnoses in such presentations include RCC, transitional cell carcinoma, lymphoma, renal abscess, and other inflammatory pseudotumors. RCC typically presents as a solid, enhancing renal mass, whereas XGP often exhibits renal enlargement with hypodense areas, calculus, and perinephric stranding [15-17].

Previous case reports have highlighted similar diagnostic dilemmas. For example, Singh *et al*. [18] described two cases of XGP with staghorn calculi initially suspected as renal carcinoma but ultimately confirmed as XGP postnephrectomy.

This case underscores the need for a high index of suspicion, particularly in patients with known stone disease. Clinicians must carefully weigh the risks of radical surgery versus conservative management when faced with equivocal findings.

CONCLUSION

Renal calculi with associated inflammation can radiologically simulate renal or upper tract malignancy. A systematic approach with multimodal imaging and endoscopic correlation is critical to avoid misdiagnosis.

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