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Renal Mass and Flank Pain in a 9-Year-Old with Hypertension

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Abstract

Renal Abscess (RA) is rare in pediatric population and the incidence is unknown. Unrecognized and untreated RA can be life-threatening, leading to sepsis, loss of a kidney, and even death. Initial presentation is often nonspecific which can delay diagnosis. Xanthogranulomatous Pyelonephritis (XP) is a sequela of chronic suppurative infections, seen in 0.6% to 1.0% of patients with chronic pyelonephritis, where part of the kidney (focal, most common in children) or the entire kidney becomes a suppurative inflammatory and necrotic mass.

This case is atypical: A longstanding subclinical urinary tract infection (given the history of dysuria and low-grade fever) eventually led to the formation of an abscess in the spectrum of XP, triggering a systemic inflammatory response syndrome that closely resembled the B symptoms of malignancy.

Keywords: Xanthogranulomatous pyelonephritis; Renal abscess; Renal mass; Multifocal; Urinary tract infection

Case Presentation

A 9-year-old African American female with a history of hypertension presented with 4 days of worsening subjective fever, nausea, and left flank pain. Review of symptoms revealed weight loss, fatigue, and early satiety for a month, on-and-off low-grade subjective fever, as well as dysuria for 9 months.

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Copyright © 2024 Shamim J. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. Past medical history was significant for non-febrile *E. coli* urinary tract infection treated with antibiotics (cefdinir) at 5 years of age. Subsequent urinalysis results were normal after completing the antibiotic course. Then, hypertension was diagnosed 5 months before admission (at 9 years of age) which was well controlled with daily amlodipine 2.5 mg. A cyst on L kidney measuring 3.4 cm \times 2.7 cm \times 3.8 cm was found on abdominal ultrasound during the workup for hypertension. She had a family history of a maternal aunt with a renal cyst in childhood and was treated with surgery.

In the Emergency Department (ED), her vitals included a pulse of 135 beats/min, respiratory rate of 20/min, temperature of 37.8°C (oral), and blood pressure of 111/76 mm of Hg. Anthropometric measures include height of 140 cm, weight of 39.6 kg, and BMI of 20.20 kg/m² down from 45.6 Kg and BMI of 24.22 kg/m² 3 months ago from a follow-up visit with the nephrologist. She appeared mildly ill and uncomfortable on examination due to moderate tenderness on the left flank.

CBC demonstrated a normal white cell count of $11.87 \times 10^{9}/L$ (0.5- $1.5 \times 10^{9}/L$), mild anemia with hemoglobin 9.4 g/dL (11.5-14.5 g/dL), hematocrit level 29.1% (35-43%), and elevated platelet count, $590 \times 10^{9}/L$ (150-400,000 $\times 10^{9}/L$). The basic metabolic panel was within normal limits. Urinalysis was negative for proteinuria, glucosuria, pyuria, bacteriuria, hematuria, nitrites, and ketones but leukocyte esterase was elevated at 25 L/uL. Urine culture was negative. On admission, further labs showed borderline lactate dehydrogenase 4.17 µkat/L (2.0-4.11 µkat/L) and elevated Adrenocorticotropic Hormone (ACTH) 93.5 pmol/L (1.58-13.93 pmol/L).

Retroperitoneal ultrasound demonstrated an interval increase in the size of the interpolar cyst on L kidney, now measuring 8.6 cm \times 6.4 cm \times 8.5 cm (from 3.4 \times 2.7 \times 3.8 cm) with increasing echogenicity and internal color Doppler flow (Figure 1).

Computed Tomography (CT) showed a large, complex, cystic septate mass within the left kidney. There was no active bleeding, abscess, free air, or mechanical obstruction. Adjacent left periaortic adenopathy was present (Figure 2).

Magnetic Resonance Imaging (MRI) demonstrated a large, complex/septate cystic left renal





Figure 1: Retroperitoneal ultrasound of L kidney.



Figure 2: Computed Tomography (CT) of abdomen and pelvis with contrast.



Figure 3: Magnetic Resonance Imaging (MRI) of abdomen and pelvis with and without contrast.

mass. Left periaortic retroperitoneal lymphadenopathy was at the level of the renal veins (Figure 3).

Pediatric Surgery and Hematology/Oncology were consulted. Uric acid and erythropoietin were within normal limits. The clinical pathway of pediatric Kidney Tumors was followed. Due to the solid/cystic appearance of the mass, an exploratory laparotomy was planned. Intraoperatively, the mass involved more than 3/4 of the volume of the kidney, thus complete nephrectomy with lymph node dissection was performed. The specimen was sent for histopathology (Figure 4).

The histopathology of the specimen obtained after surgical removal of the kidney showed liquefactive necrosis, and interstitial edema with acute and chronic inflammation. There were no granulomas and/or multinucleated giant cells. A perinephric abscess was also identified. Uninvolved parenchyma showed no pathologic changes and there was no involvement of the renal artery, vein, or ureter. There were reactive peri-aortic lymph nodes which were



Figure 4: Gross image of left kidney after nephrectomy. Black arrow highlights the peri-abscess fibrous capsule. The red star shows the central cavity with destruction of the normal renal parenchyma and yellowish-green purulent material.



Figure 5: Histopathologic image of biopsy specimen taken 10x. Hematoxylineosin-stained slides showing a central area of liquefactive necrosis (black circle, the normal renal parenchyma is destroyed and replaced by neutrophils and debris), at the periphery there is an area of epithelioid macrophages (red circle) with red to clear and foamy cytoplasm in a fibrotic stroma.

negative for malignancy as well as acid-fast bacilli. Based on these findings, renal abscess was our final diagnosis in the spectrum of Xanthogranulomatous Pyelonephritis, consistent with clinical presentation, but without histologic evidence.

Our patient tolerated the procedure, recovered well, and was discharged from the hospital on amlodipine 2.5 mg for hypertension. Postoperatively, pain was managed with acetaminophen and ibuprofen. She received ibuprofen for shorter duration (<5 days). Upon outpatient follow up, her incision healed without complications and activity restrictions were removed. Fortunately, her hypertension resolved a few months after nephrectomy, so amlodipine was discontinued. An informed written consent was obtained from parents before writing this case report. Figures 1-5 taken from patient's chart with parental consent.

Discussion

The differential diagnosis for flank pain, low-grade fever, early satiety, and weight loss in conjunction with renal mass and periaortic lymphadenopathy include malignancy (namely nephroblastoma, renal cell carcinoma, rhabdoid tumor of the kidney, clear cell sarcoma of the kidney, congenital mesoblastic nephroma, primary renal myoepithelial carcinoma, cystic partially differentiated nephroblastoma and Ewing sarcoma of the kidney) as well as hemorrhagic transformation of a renal cyst, renal tuberculosis, pyelonephritis or renal abscess. Xanthogranulomatous Pyelonephritis (XPN), although uncommon in children but difficult to diagnose due to its nonspecific symptoms and findings on imaging [1,2].

Renal Abscess (RA) is a rare disease in pediatrics and the incidence is unknown [3,4]. They have been increasingly reported with time due to advancements in imaging modalities [5,6]. Unrecognized and untreated RA can be life-threatening and lead to sepsis, loss of a kidney, and even death [4]. Initial presentation is often nonspecific and can lead to a delay in diagnosis. In children, urologic abnormalities such as urolithiasis, urinary tract defects, or hematogenous spread can predispose to frequent urinary tract infections. Infection can extend to the kidney and cause pyelonephritis. When left untreated, abscesses can form due to necrosis and destruction of normal renal parenchyma. Abscesses that occur in a setting of acute pyelonephritis are characterized by liquefactive necrosis, neutrophilic infiltrate, and a dense fibrous capsule [5]. These abscesses may have a protracted progression when partially treated and show infiltration by foamy macrophages. Fluid drainage into adjacent nodes causes reactive lymphadenopathy. With enlargement of the abscess, it can outgrow the blood supply needed for healthy renal parenchyma, leaving behind non-viable renal parenchyma [5]. This was seen in our patient. Although she had normal urinary tract anatomy, but history of recurrent subclinical urinary tract infection was the predisposing factor.

The causative organism of renal abscesses is similar to urinary tract infections. A study conducted in Germany suggested *E. Coli* as the most prevalent organism [6]. However, in our patient, urine culture showed endo microbial contamination and no isolated organism grew. This can be explained by its thick fibrous capsule which limits communication to the pelvicalyceal system, therefore bacteria are not seen in the urine. This was also in accordance with a study in Greece, where renal abscess was reported while in a patient with sterile urine culture [5].

Treatment of renal abscesses is based on their size on imaging. If the size is <3 cm, then the patient may benefit from conservative management with antimicrobials for 4 to 6 weeks. If the patient does not improve with antimicrobials or if the size is >3 cm, then percutaneous abscess puncture is the treatment of choice. Surgical management is considered if the abscess is >4 cm. The primary surgical modality is ultrasound-guided percutaneous drainage. However, partial or complete nephrectomy can be considered based on the viability of renal parenchyma on intraoperative examination [3,6,7].

It is worth mentioning in this case that XP is a sequela of chronic suppurative infections, seen in 0.6% to 1.0% of patients with chronic pyelonephritis, where part of the kidney (focal, most common in children) or the entire kidney becomes a suppurative inflammatory and necrotic mass [6,7]. The focal form lacks communication with the pelvis and thus does not cause pyelitis or urinary tract obstruction. The preoperative diagnosis of focal XP may be challenging sometimes due to the infiltrative and destructive nature of the process mimicking the appearance of a malignant renal neoplasm clinically, radiologically, and even at pathology level [1]. While XP was strongly considered in this case, and may likely be the underlying process, histologic evidence was not seen. Despite having a history of Urinary Tract Infection (UTI) and a renal cyst, there is no documented evidence of nephrolithiasis or other urinary tract abnormalities, which are often associated with Xanthogranulomatous Pyelonephritis (XP). A delay in the diagnosis can lead to increased morbidity and mortality. Ultrasound is first-line imaging, but computed tomography scan is more sensitive. Magnetic resonance imaging is preferred [8-10].

Renal masses are known to cause hypertension and hypertension resolves after partial or complete nephrectomy. This was supported by a study that revealed that nephrectomy completely cured hypertension [11]. Our patient's hypertension resolved a few months after nephrectomy, so amlodipine was discontinued. Along with renal mass, ACTH was high in our patient, which could have been attributed to hypertension. This was also discussed in a study that stated that stress causes ACTH release, leading to hypertension [7,12]. We hypothesize that both the renal mass and stress played a role in contributing to her hypertension. Ibuprofen was used for postoperative pain management. While long-term use of Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) is generally discouraged in patients who have undergone nephrectomy, it is not an absolute contraindication. In our patient, the medication was used for a shorter duration (less than 5 days).

Conclusion

It's essential to recognize that not all masses presenting with these B symptoms—such as low-grade fever, weight loss, early satiety, and loss of appetite are necessarily malignant. Additionally, renal abscesses don't always manifest acutely. Interestingly, a renal abscess can mimic malignant masses on various imaging modalities. Histopathology plays a crucial role in distinguishing between renal abscesses, Xanthogranulomatous Pyelonephritis (XP), and true malignancies. Furthermore, it's worth noting that a renal abscess can occur even without a positive urine culture.

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