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Community-associated methicillin-resistant *Staphylococcus aureus* causing diffuse xanthogranulomatous pyelonephritis in a neonate

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ABSTRACT

Xanthogranulomatous pyelonephritis (XGP) is an uncommon variant of chronic pyelonephritis; often associated with ipsilateral urological obstructive pathology and infection. It occurs rarely in the pediatric population and is caused usually by gram-negative bacteria. We herein present a case of a 6-week old male patient who presented with fever, gross hematuria and left flank tenderness. Urine and blood cultures were negative. Radiological investigations suggested an infiltrating malignant neoplasm of the kidney. There was no evidence of nephrolithiasis or obstructive pathology. A left radical nephrectomy was performed and histopathological examination revealed diffuse XGP. Microbiological culture of the perinephric purulent discharge proved positive for methicillin-resistant *Staphylococcus aureus* (MRSA). To the best of our knowledge, this is the first reported case of MRSA-induced XGP in a neonate emphasizing the expanding spectrum of disease secondary to community-associated MRSA.

Xanthogranulomatous pyelonephritis is a rare, severe, chronic form of pyelonephritis characterized by an exuberant, destructive infiltration of foamy macrophages with mixed inflammatory cells, multinucleated giant cell formation, and a granulomatous reaction. It is often associated with ipsilateral synchronous obstruction of the kidney with concomitant or superimposed infection by gram-negative bacteria; *Proteus mirabilis* and *Escherichia coli* being the most commonly implicated micro-organisms [1]. Xanthogranulomatous pyelonephritis is most often seen in middle-aged women, and typically found in patients with risk factors such as long standing nephrolithiasis or other urological obstructive conditions such as untreated urinary tract infections, diabetes, hyperlipidemia and immunosuppression [1,2]. It is uncommon in children and extremely rare in neonates and infants [3]. No single radiological feature has proven pathognomonic of XGP [4], and preoperative differentiation of XGP from other mass-forming renal pathologies, particularly malignant neoplasms, is either problematic or unachievable in most cases.

Methicillin-resistant *Staphylococcus aureus* is an important causative bacterium of nosocomial infections. However, *S. aureus* has rarely been reported as being an etiological micro-organism of XGP [5]; and more rarely, cases of MRSA-associated XGP [2,6,7]. We herein report a case of an XGP in a 6-week old male patient caused by community-associated MRSA (CA-MRSA), which is possibly the first reported case of CA-MRSA in this age group. We also reviewed pertinent cases in the literature.

1. Case report

A 6-week old boy was referred to our hospital for evaluation and management of a left renal mass. He was born normally at term following an uneventful pregnancy with normal antenatal ultrasound. He remained only a few hours in the nursery before discharged for home as a well-baby. The patient started to manifest occasional episodes of vomiting and tactile fever in his second week of life. At 20 days old, his mother noted gross blood in his urine, as he cried when pressure was applied to the left side of his abdomen. Physical examination revealed no fever, normal blood pressure for

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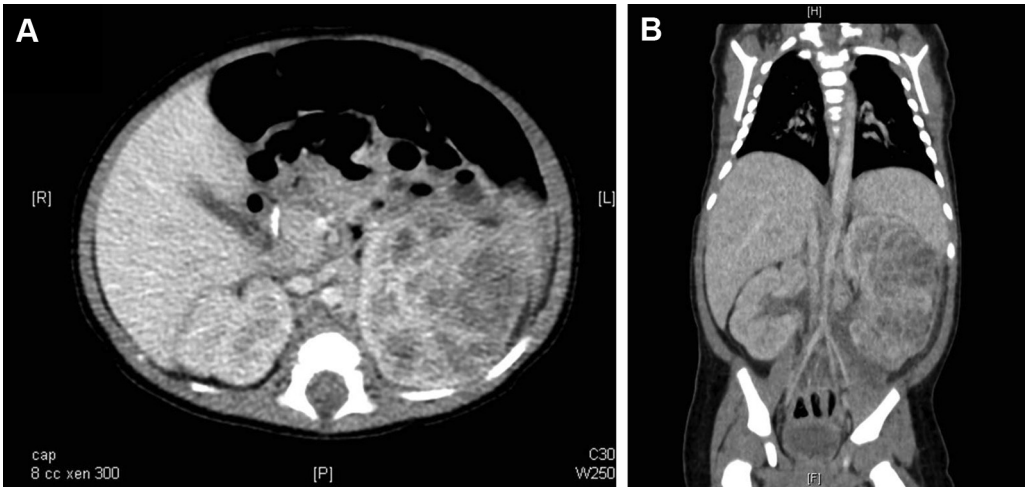

Fig. 1. (A and B) Computed tomography scan showing a large heterogeneous complex mass, involving most of the kidney parenchyma, and extending to the perinephric fat.

patient's age, but left flank fullness and tenderness. The remainder physical examination was normal. Blood tests showed a hemoglobin measurement of 96 gm/L and a leukocyte count of 20,000/mm^3. Serum electrolytes and renal function tests were normal. Urine and blood cultures were negative. Ultrasonographic and computer tomographic (CT) scans of the abdomen showed a large, heterogeneous complex mass involving most of the left kidney with extension into the perinephric fat radiographically (Fig. 1A and B). The radiological findings were highly suspicious of a malignant renal neoplasm. Accordingly, the patient underwent a nephrectomy procedure. Intra-operatively, the left kidney was adhered to the lateral abdominal wall and left colon. A purulent discharge, noted focally on the external surface of the kidney, was sampled and forwarded for microbiological analysis (Fig. 2A). Grossly, and after fixation in 10% buffered formalin, the kidney measured $9 \times 4 \times 3.5$ cm and weighted 100 g. Its external surface was grey and slightly nodular. The cut surfaces of the kidney revealed a cavitating lesion involving most of the renal cortex, medulla and renal pelvis measuring $7 \times 4 \times 3$ cm with nodular expansive boundaries, and containing a yellow-tan soft cheesy material (Fig. 2B). The lesion did not have a solid component. The renal pelvis was markedly distorted anatomically. Light microscopic examination revealed severe xanthogranulomatous pyelonephritis with a prominent focus of acute suppurative inflammation with numerous, variably-sized abscesses. The xanthogranulomatous inflammation was composed of sheets of foamy macrophages admixed with numerous lymphocytes, plasma cells, neutrophils and scattered eosinophils (Fig. 3A). The foamy macrophages expressed strong but diffuse immunostaining for CD68 (clone KP1, Dako, Carpinteria, California). Occasional multinucleated giant cells were noted (Fig. 3B). Foci of renal tubular neutrophilic microabscesses were seen; most evidently in the distal renal tubules. No well-defined epithelioid granulomas were seen. The inflammatory process extended into the perinephric adipose tissue, and renal pelvis. Special staining for acid fast bacilli (i.e., Ziehl-Neelsen stain) did not reveal mycobacteria. Periodic acid Schiff and Gomori's methenamine silver special stains were also negative for fungal elements. There was no evidence of malignancy.

The cultures from the perinephric purulent discharge grew MRSA, in accordance with the Center for Disease Control and Prevention criteria of CA-MRSA, and demonstrated a susceptibility to vancomycin, clindamycin, erythromycin and trimethoprim-sulfamethoxazole. The same organism was cultured from nares and nasopharyngeal aspirates of the patient. The patient's post-operative course was uneventful, and he was placed on parenteral vancomycin (60 mg/kg) for three weeks. A follow-up voiding cystourethrogram, to assess urine reflux was normal. The patient had shown no evidence of disease in the contralateral kidney three years post-surgery.

2. Discussion

Xanthogranulomatous pyelonephritis is a rare, severe form of chronic pyelonephritis, which is typically associated with chronic

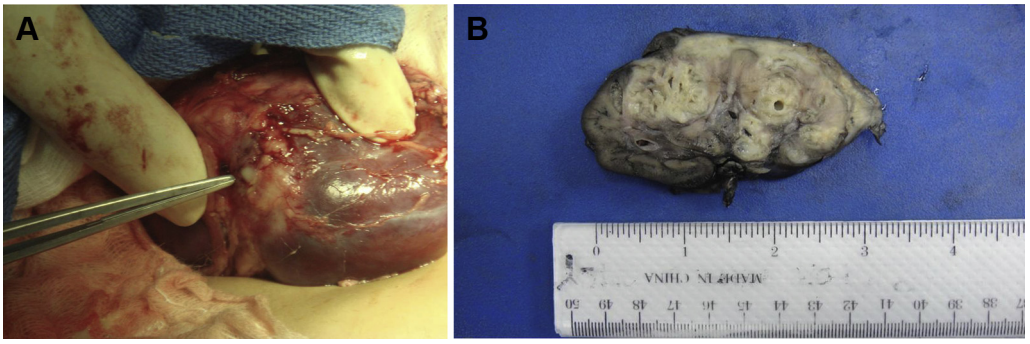

Fig. 2. A) Focal purulent discharge from the kidney was seen intraoperatively. B) Cut surface of the nephrectomy specimen demonstrating a vague tan-yellow nodular appearance of the lesion. The lesion significantly distorted the kidney and replaced most of its parenchyma.