© Pediatr Med Rodz 2018, 14 (3), p. 319–323
DOI: 10.15557/PiMR.2018.0038

Katarzyna Królikowska[1], Błażej Benka[1], Joanna Samotyjek[2], Marianna Lichosik[1], Katarzyna Jobs[1]

Received: 20.03.2018
Accepted: 16.04.2018
Published: 31.10.2018

Xanthogranulomatous pyelonephritis in a child – a case report

Żółtakowe zapalenie nerki u dziecka – opis przypadku

[1] Department of Paediatrics, Paediatric Nephrology and Allergology, Military Institute of Medicine, Warsaw, Poland. Head of the Department: Associate Professor Bolesław Kalicki, MD, PhD
[2] Department of Paediatric Surgery and Urology, Medical Centre for Postgraduate Education, Warsaw, Poland. Head of the Department: Associate Professor Beata Jurkiewicz, MD, PhD
Correspondence: Katarzyna Królikowska, Department of Paediatrics, Paediatric Nephrology and Allergology, Military Institute of Medicine, Szaserów 128, 04-141 Warsaw, Poland, tel.: 261 817 236, fax: +48 22 515 05 85, e-mail: kwisniewska1@wim.mil.pl

Abstract

Xanthogranulomatous pyelonephritis is a chronic inflammatory condition that involves the kidney and occurs mainly in middle-aged women, but rarely in children. Its aetiology has not been elucidated completely. It is believed that the following factors may play a role in its development: an obstruction for urine flow, urolithiasis, inadequately treated urinary tract infection as well as venous and lymphatic drainage disorders. Poorly specific signs and symptoms delay the correct diagnosis by even several months. Kidney enlargement with nonspecific cysts and calcifications, and concomitant adjacent tissue reaction may be suggestive of a cancerous lesion. Computed tomography plays a vital role in imaging. It helps establish an initial diagnosis to be verified intraoperatively. The final diagnosis is made in a histopathological examination of the removed organ. The case presented herein illustrates the need to consider xanthogranulomatous pyelonephritis in the differential diagnosis of abdominal masses.

Keywords: xanthogranulomatous pyelonephritis, renal pseudotumour, kidney US, nephrectomy, children

Streszczenie

Xanthogranulomatous pyelonephritis to przewlekły stan zapalny nerki występujący głównie u kobiet w średnim wieku, rzadko u dzieci. Etiologia choroby nie została do końca poznana. Uważa się, że powstaniu tego stanu sprzyjają: obecność przeszkody w odpływie moczu, kamica układu moczowego, nieprawidłowo leczone zakażenie układu moczowego, a także zaburzenia drenażu żylnego oraz chłonnego. Mało charakterystyczny obraz kliniczny opóźnia właściwe rozpoznanie choroby nawet o kilka miesięcy. Występujące w przebiegu procesu zapalnego powiększenie zajętego narządu z obecnością niespecyficznych torbieli i zwapnień oraz towarzyszącym zajęciem okolicznych tkanek może sugerować zmianę nowotworową. Kluczową rolę odgrywa badanie obrazowe metodą tomografii komputerowej, pozwalające na wstępne postawienie diagnozy, weryfikowanej śródoperacyjnie. Ostateczne rozpoznanie jest wynikiem badania histopatologicznego usuniętego narządu. Prezentowany przypadek ilustruje konieczność uwzględnienia *xanthogranulomatous pyelonephritis* w diagnostyce różnicowej guzów jamy brzusznej.

Słowa kluczowe: żółtakowe zapalenie nerki, guz rzekomy nerki, USG nerek, nefrektomia, dzieci

INTRODUCTION

Xanthogranulomatous pyelonephritis (XGP) is a relatively rare kidney disease characterised by the presence of chronic kidney inflammation. It was first described by Schlagenhaufer in 1916[1]. To date, a few hundred XGP cases have been reported in the literature (the first paediatric case in 1963), but the exact aetiology of this condition remains unknown. In the Polish literature, the first report appeared in 1964. The disease may occur at any age, but concerns mainly females in the 5th–6th decade of life, who develop it 4 times more often than males. The disease usually involves one kidney and accounts for approximately 1% of all inflammatory kidney diseases. By contrast with adults, the disease tends to develop in boys, mainly older than 8 years of age, with the left kidney being involved more often[2].

This paper presents a 2-year-old girl hospitalised in the Department of Paediatrics, Paediatric Nephrology and Allergology, Military Institute of Medicine, due to a suspicion of urolithiasis, with the final diagnosis established several months after the onset.

CASE REPORT

A 2-year-old girl was first brought to the Department of Paediatrics, Paediatric Nephrology and Allergology in July 2017 with a suspicion of urolithiasis.

The child reported pain during voiding approximately 12 months before admission. Moreover, redness of the external urethral orifice was observed. At that time urinary tract infection was diagnosed and treated with amoxicillin. Furazidin prophylaxis followed for approximately 12 months. Due to persisting symptoms, 2 abdominal ultrasound (US) scans were performed; both reported left kidney deposits in the lower calyx. The remaining calyces of this kidney were filled with hyperechoic urine with slight reflections coming from their interior. The next abdominal US scan, conducted 6 months later, revealed heterogeneous left renal cortex with nonhomogeneous focal lesions, measuring approximately 18 mm in diameter which were difficult to differentiate. The walls of the lesions were hyperechoic and calcific; this image was not present in the previous examinations. Moreover, radiopaque structures of a total size of approximately 16 mm were still present, probably corresponding to radiopaque stones, each measuring 8 mm in diameter. Due to unclear image of the left kidney, computed tomography with urographic phase was ordered. Additionally, from September 2016, the parents observed lower appetite: enterobiasis and ascariasis were identified. Moreover, microcytic anaemia was diagnosed. This delayed the renal diagnosis.

During the first hospitalisation at the Department of Paediatrics, Paediatric Nephrology and Allergology, lower respiratory tract infection was diagnosed and increased inflammatory markers detected. In chest X-ray, pulmonary lesions were identified, and amoxicillin with clavulonic acid was started. Abdominal US revealed a large left duplex kidney with the length of 108 mm and parenchymal thickness of 20 mm. The AP size of the upper moiety pelvis was 7 mm. In the lower moiety pelvis and in the lower calyx, there were 2 calculi measuring 19 mm and 9 mm. Additionally, the lower calyx was dilated to 13 mm. In the AP presentation, the renal cortical layer was nonhomogeneous and hypertrophied with blurred cortical-medullary differentiation. Due to diagnosed pneumonia, computed tomography was postponed until after the infection regressed.

Two months later, the child was brought to the Department again. No signs of upper respiratory tract infection were noted on physical examination. In additional tests, increased levels of inflammatory markers and signs of microcytic anaemia [iron concentration below optimal values: 14 μg/dL (reference range: 60–180 μg/dL), elevated ferritin level: 270 ng/mL (range: 13–150 ng/mL), decreased total iron binding capacity: 201 μg/dL (range: 228–428 μg/dL)] persisted. Elevated levels of D-dimers: 2.39 μg/mL (range: <0.5 μg/mL) and fibrinogen: 771 mg/dL (range: 200–400 mg/dL) were observed. Chest X-ray showed bilateral perihilar interstitial radiodensities. Considering the global clinical picture and auxiliary test results, the child was diagnosed with pneumonia again, and empirical antibiotic therapy (ceftriaxone) was started. A slight improvement in inflammatory markers was noted. Since an atypical aetiology of infection was suspected, clarithromycin was added. A control examination revealed increasing inflammatory markers, and consequently the previous antibiotic therapy was changed to ceftazidime and amikacin. An abdominal US scan demonstrated hepatomegaly (113 mm), with slightly heterogeneous echogenicity of the liver, with no focal lesions. The kidneys were at their typical location, moving on respiration; the right kidney measuring 89 mm and the left 108 mm. The cortical layer of the left kidney was nonhomogeneous and hypertrophied with blurred cortical-medullary differentiation. The renal pelvis contained a calculus or a group of calculi with the total length of 17 mm, and one smaller stone measuring 8 mm in diameter. The pelvicalyceal system of the right kidney and the ureters were not dilated. The examination showed increasing size of the left kidney. At the lower pole, beyond the renal capsule, there was a heterogeneous and hypoechoic lesion measuring 43 × 22 mm. The global clinical and radiological picture suggested left xanthogranulomatous pyelonephritis. A computed tomography scan with a urographic phase showed a significantly enlarged left kidney, mainly in the axial plane. Also, signs of duplex pelvicalyceal system were seen. The thickness of the parenchyma and cortical-medullary differentiation in the upper part of the kidney were normal, and the renal calyces were slightly dilated. The lower pelvis was surrounded by enhancing inflammatory/fibrotic tissue that restricted patency; there was

DOI: 10.15557/PiMR.2018.0038

a calcific staghorn deposition in the lumen, measuring approximately 17 × 8 mm. Significantly dilated renal calyces contained homogeneous hypodense material with the density of approximately 45–48 Hounsfield units, which corresponded with dense fluid. In the perinephric space of the left kidney, along the posterior lamina of the renal fascia, there were polycyclic encapsulated fluid collections with the maximum size of 30 × 20 mm (most probably abscesses) and fluid. The image could correspond with complicated xanthogranulomatous pyelonephritis of the left kidney. The left ureter was narrowed in the subpelvic segment. Moreover, multiple retroperitoneal lymph nodes at the level of the renal vessels were enlarged, and there was free fluid in the pouch of Douglas.

Due to progressive anaemia, 200 mL of packed red blood cells (PRBCs) were transfused.

Following a urological consultation, the patient was deemed eligible for urgent nephrectomy, and transferred to the Department of Paediatric Surgery and Urology of the Medical Centre for Postgraduate Education in Dziekanów Leśny, Poland. The surgery was performed under general anaesthesia on the second day of hospitalisation. The perinephric space was reached through the left lumbo-subcostal incision. The tumour extended to the midline, left iliac fossa and left subphrenic region. Massive inflammation and numerous adhesions in the surrounding tissues were observed. In stages, the peritoneum, inflamed and with adhesions, was taken out of the tumour. Next, consecutive perinephric abscesses were opened and evacuated; the material was sent for culture. The kidney was separated from the surrounding tissues. Using argon coagulation, the renal parenchyma was incised and the pelvicalyceal system was reached. A large amount of purulent material was evacuated from the kidney. The renal hilum was secured, and the vessels ligated. The kidney was removed entirely with the proximal part of the ureter (Figs. 1 and 2). The kidney bed was washed with gentamycin, and a drain was inserted (Fig. 3). Due to intensive bleeding from the inflamed tissues, 260 mL of PRBCs were transfused. After the procedure, the patient was monitored in the recovery room. Subsequently, she was transferred to the Department of Paediatric Surgery in a good overall state, cardiovascularly and respiratorily stable.

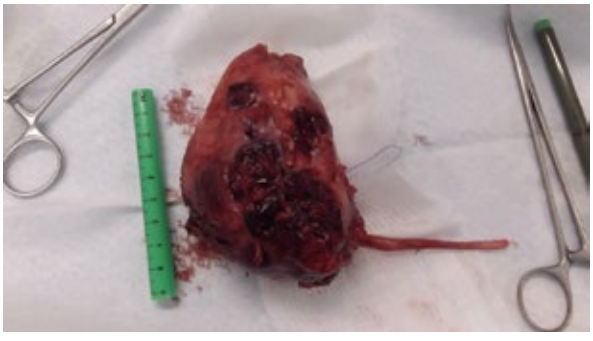

Fig. 1. The removed kidney with the proximal part of the ureter

The patient received amikacin, cilastatin with imipenem, and vancomycin. When the culture results arrived (*Proteus mirabilis*), vancomycin was discontinued and ceftriaxone started. The girl was also administered nystatin and a *Lactobacillus rhamnosus* probiotic for protection.

On the second day after the surgery, paralytic ileus was noted. Inflammatory markers were elevated [CRP 494.6 mg/L (reference range: to 5 mg/L), procalcitonin 5.74 ng/mL (reference: to 0.5 ng/mL), WBC 24.32 × 10^9/L, NEUT 83.3%, PLT 851 × 10^9/L], and there were transient diuresis disorders. Diuresis was forced for 2 days with furosemide and dopamine with a good effect. The patient received an albumin, amino acid and human immunoglobulin infusion. The general condition was gradually improving, and inflammatory markers normalised. Hepatic and renal function markers as well as urinalysis results were normal for the entire hospitalisation. Follow-up imaging (abdominal US) presented no pathological collections or abnormal structures. The postoperative wound healed normally by first intention. Histopathology confirmed the diagnosis of left xanthogranulomatous pyelonephritis.

The girl was discharged in a good overall and local state on the 20th day of hospitalisation. She remains under outpatient care.

During follow-up hospitalisation in the Department of Paediatrics, Paediatric Nephrology and Allergology 2 months after nephrectomy, the child was in a good overall state, had normal blood pressure and renal function, and there were no signs of anaemia or elevated inflammatory markers. There was no albuminuria. In the metabolic diagnosis of potential causes of urolithiasis, there were no disorders that could result in this condition. Abdominal US revealed a kidney bed filled with intestinal loops, with no signs of fluid.

DISCUSSION

In the international classification of diseases, xanthogranulomatous pyelonephritis (XGP) is classed as tubulointerstitial nephritis.

The disease is thought to be caused by urinary obstruction (e.g. posterior urethral valve) or urolithiasis, which might

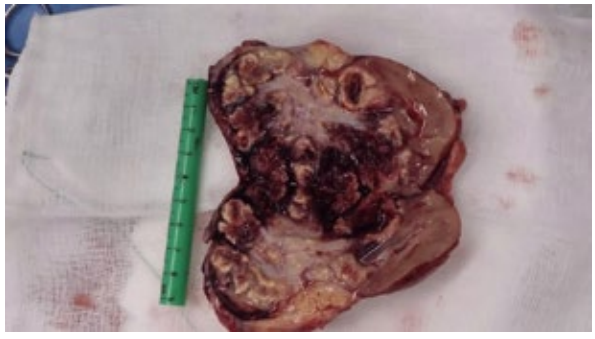

Fig. 2. The removed kidney with the proximal part of the ureter – cross-section

 DOI: 10.15557/PiMR.2018.0038

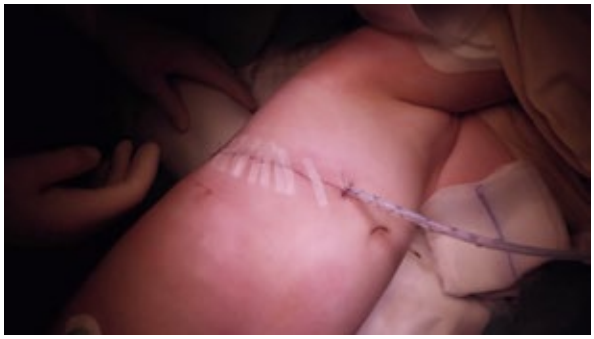

Fig. 3. Postoperative scar with a drain

concern over 70% of patients. Moreover, the disease may develop in response to inadequately treated urinary tract infection, recurrent infections or postinflammatory renal scars. Infection that leads to XGP is relatively frequently associated with *Escherichia coli* or *Proteus mirabilis*, and rarely with *Pseudomonas* spp. According to another theory, XGP may develop secondary to a venous drainage disorder in venous embolism, bleeding or renal infarction, or abnormal lymphatic drainage that results in stasis in the involved region. Moreover, lipid metabolism disorders, immunodeficiency and diabetes also seem to play a role[3].

XGP presents with poorly specific signs and symptoms. The following are noted: malaise, pain in the region of the affected kidney (80% of patients), elevated body temperature (70%), weight loss (50%), and a palpable tumour (50%)[1]. Patients with this disease are initially diagnosed with urinary tract infection (95%), urolithiasis (70%) and hypertension (45%)[2].

Laboratory findings in XGP patients are as follows: blood tests: leucocytosis and anaemia (75%), urinalysis: haematuria (50%), pyuria (95%), and albuminuria (80%). Function tests reveal the absence of excretory function of the affected kidney in 80% of cases. It is worth noting that creatinine and urea values are normal in unilateral kidney involvement. The classical triad of XGP signs include: unilateral kidney enlargement, limited or absent function of the kidney, and presence of calculi in the renal pelvis[2].

Common imaging investigations are helpful in the diagnostic workup. Abdominal US scan, characterised by a 44% sensitivity, reveals heterogeneous changes with urolithiasis and urinary stasis. It shows an enlarged kidney with a dilated pelvicalyceal system and foci of parenchymal destruction, observed as diffuse destruction of typical intrarenal architecture, and numerous structures filled with hypoechoic fluid. A colour Doppler scan reveals faint flow in residual renal vessels, and the absence of flow in the pathological tissue[1]. When isolated inflammatory changes are suspected, US is supplemented with fine-needle aspiration biopsy[4]. Computed tomography is the main imaging method for 2 reasons: first, most changes present typical features enabling the diagnosis to be confirmed, and second, it helps plan surgery. Nuclear magnetic resonance imaging, which is the most sensitive examination, may present typical signs in lipid-rich tissue, which enhances the signal[5]. Another helpful examination is renal arteriography. It is useful for planning partial nephrectomy, which is an option in certain cases.

Radiological tests carry a risk of false positive results indicative of cancerous lesions, such as Wilms' tumour or renal carcinoma[3]. Xanthogranulomatous pyelonephritis mimics cancer since lesions extend into the neighbouring structures, such as the psoas muscle, pancreas, spleen and duodenum.

The current classification distinguishes between 3 stadia of XGP: I: confined to the affected kidney, II: involving the renal fascia (Gerota's fascia), and III: extending into the perinephric space[6].

The final diagnosis almost always requires surgical inspection and histopathological examination. Macroscopically, the disease may present as a diffuse, tumorous and yellowish tissue mass with local necrosis and focal bleeding. Microscopically, however, the following can be observed: atrophic changes leading to the release of lipids, which are absorbed by histiocytes, and the formation of granulomas composed of lymphocytes, plasma cells and fibroblasts, which is accompanied by diffuse stromal fibrosis. In 85–90% of cases, the process is extensive, involving the entire kidney. Histologically, the lesions must be distinguished from renal cell carcinoma (World Health Organization classification from 2004), i.e. clear cell renal cell carcinoma, papillary renal cell carcinoma, sarcomatoid renal cell carcinoma and leiomyosarcoma that belongs to mesenchymal tumours as well as from inflammatory processes, such as malacoplakia and interstitial nephritis[7].

Antibiotic therapy in XGP is used in the period before and after nephrectomy. Empirical therapies include first- and third-generation cephalosporins, aminoglycosides, and fluoroquinolones. Treatment should be verified upon arrival of urine culture results.

Surgery is the basic and the only treatment of XGP. Radical nephrectomy, with removal of surrounding inflamed tissues, is usually required. In certain cases, a kidney-sparing procedure can be considered. This concerns mainly patients with bilateral renal involvement and focal lesions. Due to technical difficulty and potential complications, laparoscopy is not recommended. There are only several reports regarding laparoscopic procedures, and long-term outcomes have not been studied[6].

CONCLUSION

In the presented case, the affected kidney was resected. This management helped control extensive inflammation and resulted in the regression of all signs and symptoms, including anaemia.

A diagnosis of xanthogranulomatous pyelonephritis should be considered in cases of urolithiasis and inflammation. The sooner the correct diagnosis is established the less dangerous and debilitating the disease.

DOI: 10.15557/PiMR.2018.0038 PEDIATR MED RODZ Vol. 14 No. 3, p. 319–323

Conflict of interest

Authors do not report any financial or personal connections with other persons or organisations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.

References

1. Eckoldt F, Riebel T, Wolke S: Xanthogranulomatous pyelonephritis in children: diagnostic and therapeutic aspects. J Med Ultrason (2001) 2009; 36: 33–37.
2. Osadzin B: Pyelonephritis xanthogranulomatosa. Urol Pol 1979; 32 (4).
3. Iumanne S, Shoo A, Akoko L et al.: Case report: Xanthogranulomutous pyelonephritis presenting as "Wilms' tumor." BMC Urol 2016; 16: 36.
4. Nandedkar S, Malukani K, Sakhi P: Xanthogranulomatous pyelonephritis masquerading as a tumor in an infant. Indian J Urol 2014; 30: 354–356.
5. Craig WD, Wagner BJ, Travis MD: Pyelonephritis: radiologic-pathologic review. Radiographics 2008; 28: 255–277.
6. Devrim T, Atasoy P, Tuğlu D: Xanthogranulomatous pyelonephritis: a case with rare adhesion to pancreas. CEN Case Rep 2018; 7: 44–47.
7. Li L, Parwani AV: Xanthogranulomatous pyelonephritis. Arch Pathol Lab Med 2011; 135: 671–674.