Original Article

Xanthogranulomatous Pyelonephritis: Analysis of 18 Cases

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OBJECTIVE: To review and evaluate patients with a clinicopathological diagnosis of xanthogranulomatous pyelonephritis (XGP) with emphasis on the diagnostic methods and the effect of socioeconomic status on disease severity.

METHODS: Data compiled from the previous history of the patients, clinical, laboratory, radioimaging findings, preoperative, operative, histopathological diagnosis and postoperative follow-up period were analysed. On the basis of presentation, XGP was classified as complicated and simple.

RESULTS: There were 18 cases of XGP. The clinical characteristics included: calculi or obstruction in the urinary tract, and damage to the kidney, complication of urinary tract infection, anaemia, increased erythrocyte sedimentation rate and liver dysfunction. All patients had diffuse XGP. Associated pathological findings such as psoas abscess, nephrocutaneous fistula, renocolonic fistula and paranephric abscess were found in 33.3% of cases. Eleven of 14 patients (78.6%) who were evaluated by computed tomography (CT) had the correct diagnosis made prior to nephrectomy. Urine culture was positive in 88.9% of patients and *Proteus mirabilis* was the most common organism.

CONCLUSION: Our experience with a small number of patients demonstrates that low socioeconomic status could be a risk factor in the development of complicated cases of XGP. CT is considered to be the best radiological test for correct preoperative diagnosis and evaluation of XGP. Nephrectomy and removal of all surrounding affected tissue proved to be curative for XGP. [*Asian J Surg* 2006;29(4):257–61]

Key Words: abscess, fistula, replacement lipomatosis, xanthogranulomatous pyelonephritis

Introduction

Xanthogranulomatous pyelonephritis (XGP), first described by Schlagenhaufer in 1916, remains a rare disease. Its name is derived from the yellow (xantho) colour on gross pathology and a granulomatous reaction histologically.[1] XGP is a severe inflammation of the renal parenchyma that occurs in the presence of chronic obstruction and suppuration. The symptoms and signs, as well as the laboratory and urographic findings, of XGP are not pathognomonic, and computed tomography (CT) is the most accurate imaging technique for evaluating the disease.[2,3]

The disease often mimics other inflammatory or neoplastic disorders and is frequently misdiagnosed clinically.[4]

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Coexistence of cutaneous fistula, renal replacement lipomatosis, renocolonic fistula, staghorn disease in children, and psoas abscess formation, albeit rare, have been reported.[1,5–8]

We present here our experience with 18 cases of pathologically proven XGP with emphasis on the diagnostic methods, as well as the socioeconomic status as a risk factor for the development of complicated forms of XGP.

Patients and methods

A review of all nephrectomy cases at Princess Basma Teaching Hospital, King Abdullah University Hospital and King Hussein Medical Centre in Jordan from 1995 to 2004 revealed 18 cases with pathological diagnosis of XGP. All the medical records of these patients were reviewed with respect to age, gender, income, insurance, and data concerning clinical presentation, laboratory results, radiological findings and therapy. Socioeconomic status was defined as "poor" if income was below US$400/capita/year (Department of Statistics, Jordan). Preoperatively, all patients underwent ultrasound, renal radioisotope scanning and intravenous urography (IVU). CT was performed in 14 patients only. On the basis of presentation, XGP was classified as complicated and simple.

Fisher's exact test was used to compare gender and income distribution between complicated and simple XGP, while the Mann–Whitney U test was used to compare the median duration of disease between complicated and simple XGP. Statistical significance was defined as $p < 0.05$. Statistical analysis was conducted using SPSS version 11.5 (SPSS Inc., Chicago, IL, USA).

Results

Mean patient age was 50 years (range, 3–65 years), with the peak incidence in the sixth decade of life. There were 13 females and five males. Gender was not statistically significant with regard to the type of presentation of complicated versus simple XGP ($p > 0.05$). All cases were unilateral, with the left kidney involved in 16 of 18 cases. Six patients (33.3%) developed complicated XGP as shown in Table 1. The income of patients with complicated XGP was significantly different compared to patients who presented with simple XGP ($p < 0.01$). The income of patients who developed complicated XGP was low and they did not have health insurance. All patients who developed uncomplicated XGP had either private or general health insurance and their income was good.

Table 1. Complications in 18 cases of xanthogranulomatous pyelonephritis

Complication	Patients, *n*
Psoas abscess	2
Nephrocutaneous fistula	1
Nephrocolonic fistula	1
Paranephric abscess	2
Total	6

Table 2. Symptoms and signs of xanthogranulomatous pyelonephritis in 18 patients

Symptom/sign	Patients, *n* (%)
Flank pain	17 (94.4)
Fever	5 (35.7)
Weight loss	15 (88.3)
Gross haematuria	3 (16.7)
Lower urinary tract symptoms	8 (44.4)
Malaise	11 (61.1)
Palpable mass	4 (22.2)
Draining sinus	2 (11.1)
Pallor	16 (88.9)
Flank tenderness	17 (94.4)

Symptoms and signs are shown in Table 2. The duration of symptoms ranged from 2 months to 6 years (mean, 22 months). In patients with complicated XGP, the duration of symptoms before consultation ranged from 8 months to 6 years (median, 14 months), while in patients with simple XGP, it ranged from 2 to 8 months (median, 4 months). The median duration of disease in patients with complicated XGP compared to simple XGP was statistically significant ($p < 0.001$). The most common complaints were flank pain and weight loss. There were four (22.2%) diabetes patients. One adult female patient who presented with intermittent spontaneous draining flank sinus for 11 months was found to have pyelocutaneous fistula. One 3-year-old boy who was operated on for nonfunctioning left kidney and recurrent urinary tract infections was found to have renocolonic fistula. All patients showed diffuse XGP. Two patients presented with huge paranephric abscess, which was treated with antibiotics and drained percutaneously under ultrasound guidance

Table 3. Abnormal laboratory findings in 18 patients with xanthogranulomatous pyelonephritis

Laboratory test	Patients, *n* (%)
Haemoglobin < 12 g/dL	16 (88.9)
White blood cell count > 10,000/mL	11 (61.1)
Erythrocyte sedimentation rate > 10 mm/hr	17 (94.4)
Raised alkaline phosphatase and SGOT	5 (27.8)
Albumin < 3.2 mg/dL	5 (27.8)
Fasting blood sugar > 120 mg/dL	4 (22.2)

SGOT = serum glutamic oxaloacetic transaminase.

for 2 weeks, and nephrectomy was performed thereafter because radioisotope scan revealed nonfunctioning kidney. Renal stones were found in 14 patients (77.8%) and lower ureteric stone > 1.5 cm in one patient (5.6%). Congenital pelviureteric junction with severe stenosis and nonfunctioning kidneys were found in one patient. All patients had recurrent urinary tract infections.

Abnormal laboratory data are presented in Table 3. Hepatic dysfunction was found in about 22.2% of patients. After 2 months postnephrectomy, liver function had become normal. Anaemia was noted in most of our patients (88.9%). Elevated erythrocyte sedimentation rate was found in 17 cases (94.4%).

Positive culture was seen in 16 cases (88.9%). *Proteus mirabilis* and *Escherichia coli* were the most frequent microorganisms. The radiological investigations of patients in our series included urography, renography, ultrasound and CT scan of the abdomen. On IVU, all patients showed nonfunction or poor function of the involved kidney with normal contralateral kidney function and 14 of them had simple or staghorn stones. CT scan was performed in 14 patients. Typical CT features were seen in most of our patients who underwent CT study; an enlarged kidney with stones, cortical multiple low-density fluid-filled areas arranged in hydronephrotic pattern, perinephric fat stranding, thickening of Gerota's fascia and/or involvement of adjacent structures. The operative notes of all patients showed that all had perirenal fat or adjacent tissue involvement in the inflammatory process. Grossly, the removed kidneys were enlarged and filled with pus.

There was no surgical mortality. Only one diabetes patient developed simple wound infection after nephrectomy and one patient complained of chronic pain at the site of surgery.

Discussion

XGP is an uncommon chronic infection that usually involves the renal parenchyma and its replacement by lipid-laden macrophages. XGP has been named as the "great imitator" because of its close resemblance clinically, radiologically and pathologically to other renal disorders.[9] Similar to previous series,[2] women were affected more often than men and unilateral involvement was found in all cases in this series. The frequent occurrence of XGP in females is most likely related to the higher incidence of chronic pyelonephritis in women. Although some authors[10] thought that there is no predilection for either side, in this series, similar to previously reported series,[11,12] the left kidney was involved more than the right one (16 of 18 cases).

To the best of our knowledge, the effect of socioeconomic status on the severity of XGP has never been published. Reviewing the socioeconomic status of our patients, we found that all complicated cases (6 cases, 33.3%) had low socioeconomic status, and had no health insurance. Complicated cases of XGP are rare and most appear as case reports in the literature.[1,6–8] Most large reported series have no complicated cases,[3,10] while the rate of complicated cases in this series was found to be 33.3%. Although our data are based on a small group of patients, the high rate of complicated cases could be related to low socioeconomic status. Patients with low socioeconomic status usually seek medical advice in the late stages of the disease and are usually inappropriately treated as a result of low income and ignorance. The aetiology of the disease, which usually progress to nonfunctioning renal parenchyma, is still unclear but appears to be multifactorial; it is clearly related to a combination of renal obstruction and chronic bacterial infection. Similar to previous reports,[2,12] XGP was associated with calculi in 14 (77.8%) of our patients. All of these patients had recurrent urinary tract infections with inadequate treatment. Intermittent flank pain, malaise with weight loss, fever and palpable flank mass were common in our patients, and have been described in most patients in reported series.[11,12] Chronic disease, such as diabetes mellitus or liver disease, was not the major predisposing factor. Only four patients in this series had a history of diabetes mellitus. However, if they were infected with gas-forming bacteria, then more serious and fulminating emphysematous pyelonephritis would occur. Anaemia was noted in 88.9% of patients.

It has been reported that anaemia may be due to an iron reutilization effect.[13] In this series, there were no available data for serum iron and total iron binding capacity, but most patients had normochromic type of anaemia. Hepatic dysfunction was found in 22.2% of patients. This is usually reversible postoperatively. Most large series, including our own, have found Gram-negative bacteria, particularly *Proteus* and *E. coli*, to be the most common organisms associated with XGP.[3,10,12] It was reported that more than half of the patients had sterile urine.[3] Sterile urine may be the result of previous antibiotic therapy or spontaneous elimination of infection. In this study, sterile urine was found in less than 15%. The high rate of infected urine in this series could be explained by patients' noncompliance with treatment as a result of low income and no health insurance.

The urine cytology study might contribute to clearing up diagnostic doubts among renal XGP, tuberculosis or renal tumours if foam cells are present in the smear as reported by Ballesteros et al.[14] However, other authors have reported negative urine cytology findings.[12] The final diagnosis is often made with histology, although there is still potential for misdiagnosis, as lipid-laden foam cell macrophages ("xanthoma cells") can resemble the clear cell typical of renal cell adenocarcinoma.[15] In our series, urine cytology was not done due to lack of expert cytologists. Historically, XGP is usually a pathological diagnosis, not a clinical preoperative diagnosis. Preoperative diagnostic imaging is paramount for diagnosis.

Urographic findings as described in previously reported series are an enlarged kidney with poor or absent function, simple or staghorn calculi, tumour-like structures, deformation of the renal calyces and calcified intraparenchymal structures;[3,15] these findings were observed in most of our patients but are not pathognomonic.

The ultrasound pattern of XGP corresponds approximately to that of a solid mass and often has an inhomogeneous echo.[15] Other reported ultrasonographic features include calculi with central echogenicity, enlarged kidney with multifocal areas of varying densities and infiltration into surrounding tissues.[16]

Tiu et al[17] reported that XGP has no specific sonographic features, but is suggested by parenchymal thinning and hydronephrosis, sonographic signs of chronic obstructive uropathy caused by stones, echoes in the dilated collecting system and a perinephric fluid collection. Prior to the advent of CT, the radiologic diagnosis of XGP was difficult. Many authors believe that CT is one of the best preoperative radiological tests for the evaluation and confirmation of XGP.[2,3] The CT characteristics of XGP include a large calculus in the renal collecting system, absence of excretion of contrast medium, spherical areas arranged in a hydronephrotic pattern, with higher attenuation than urine and no enhancement, large lesions with ill-defined borders and extension beyond the expected confines of the kidney, preservation of the reniform outline, and enhancing rims surrounding the spherical low-density areas.[11] Enhancement of the cortical tissue surrounding hydronephrotic spaces was considered the most characteristic feature.[11] These features were observed in most of our patients who had CT scan, and XGP was suspected preoperatively in 11 of 14 (78.6%) patients who underwent a CT scan.

With magnetic resonance imaging (MRI), infiltration of the inflammatory mass into adjacent tissue structures can be demonstrated very well.[18] Although MRI was inferior to CT in demonstrating renal calcifications and ureteric stones in reported series, it better demonstrated the anatomical relationships of the XGP on coronal and sagittal planes, as well as suggested the fat element within the mass and compressed renal parenchyma. MRI is more expensive than CT and does not yield additional valuable information except in patients with allergy to contrast medium. MRI was not used for our patients because it was not available in our hospital until 2001.

The treatment of choice for diffuse XGP, which is the most frequent form, is surgery and consists of nephrectomy with resection of all other involved tissues. The prognosis is good after the affected kidney has been removed, provided that the function of the contralateral kidney is normal.

Conclusion

Urolithiasis and urinary tract obstruction are well-known risk factors for the development of XGP. Our experience with a small number of patients demonstrates that low socioeconomic status could be another risk factor in the development of complicated cases of XGP. CT is one of the best preoperative radiological tests for evaluation and confirmation of XGP. Nephrectomy and removal of all the surrounding affected tissue can be curative for XGP.

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