EMPHYSEMATOUS PYELITIS : epidemiological, therapeutic and evolutive features

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LA PYÉLITE EMPHYSÉMATEUSE : aspects épidémiologiques, thérapeutiques et évolutifs

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RÉSUMÉ

But : La pyélite emphysémateuse est une forme rare de pyélonéphrite aigue. Elle est rapportée dans la littérature sous forme de cas sporadiques. Notre objectif est d'étudier les caractéristiques épidémiologiques, cliniques et thérapeutiques de la pyélite emphysémateuse.

Méthodes : Les dossiers de six patients traités pour pyélite emphysémateuse ont été rétrospectivement analysés.

Résultats : L'âge moyen était de 55 ans. La lithiase urinaire et le diabète étaient les co-morbidités les plus fréquentes. Les lombalgies fébriles avec altération de l'état général ont été le motif de consultation dans cinq cas. Un choc septique a été noté dans un autre cas. L'examen cytobactériologique des urines et les hémocultures ont isolé un E. Coli dans 4 et 3 cas respectivement. La TDM abdominale a posé le diagnostic en montrant de l'air dans les cavités excrétrices. Le traitement a consisté au drainage des voies excrétrices associé à des antibiotiques, évitant ainsi la néphrectomie en urgence dans tous les cas. Le traitement des calculs était fait à distance de l'épisode infectieux. Une patiente a eu une néphrectomie pour rein détruit sur lithiase pyélique. Les suites ont été simples.

Conclusions : La pyélite emphysémateuse est une infection rare caractérisée par la présence de gaz exclusivement dans les voies excrétrices rénales. Le diabète et l'obstruction sont ses principaux facteurs de risque. Le diagnostic est scanographique. Le traitement est basé sur une antibiothérapie efficace associée à un drainage des cavités excrétrices. Le pronostic est favorable.

MOTS-CLÉS

Emphysémateuse, Pyélite, Lithiase urinaire, Antibiotiques, Drainage.

SUMMARY

Aim : Emphsematous pyelitis is an uncommon form of acute pyelonephritis. It has been reported sporadically in the literature. Our objective is to study the epidemiological, clinical and therapeutic characteristics of emphysematous pyelitis.

Methods : The data of six patients managed for emphysematous pyelitis were collected and analyzed.

Results : The mean age was 55 years. Urinary lithiasis and diabetes were the most common co-morbidities. Febrile lumbar pain and general health impairment were the presenting symptoms in five patients; the remaining case presented with septic shock. Urine and blood culture grew E. Coli in 4 and 3 cases respectively. Computed tomography of the abdomen led to diagnosis by showing gas images in the collecting system. Treatment consisted of antibiotics associated with collecting system drainage. It avoided emergent nephrectomy in all cases. The treatment of the calculi was held at distance from the infection. Nephrectomy was done in one patient presenting a thinned – dedifferentiated – renal parenchyma. Outcome was good.

Conclusion : Emphysematous pyelonephritis is a rare upper urinary tract infection. Risk factors include diabetes and urinary obstruction. The diagnosis is made by computed tomography. Efficient antibiotics administration associated with collecting system drainage allow soon recovery and avoid nephrectomy.

KEY-WORDS

Emphysematous, pyelitis, urinary lithiasis, antibiotics, drainage.

إلتهاب الحويضة النفاخي المظاهر الوبائية والعلاجية والتطورية

الباحثون : درويش . أ . العطاط . ر . حنتاتي . ح . بلاح . م.

الهدف من هذه الدراسة هو إستعرض المظاهر الوبائية والعلاجية والتطورية لإلتهاب الحويضة النفاخي.

تشتمل دراستنا على 6 حالات التحصي وداء السكري كان السببين الأكثر تواترا . وقع تشخيص الإصابة بواسطة المفراس البطني الذي أظهر وجود الهواء في الأجواف الإفراغية . تمثل العلاج في نزع السبل الإفراغية مع المضادات الحيوية متضادين عملية إستئصال الكلية في كل الحالات . الإنذار إيجابي بصفة عامة.

الكلمات الأساسية : إلتهاب الحويضة - النفاخي - تحصي مضادات حيوية - نزح.

Emphysematous pyelitis (EP) is a rare form of acute pyelonephritis. It is characterized by the presence of gas produced by gas-forming organisms in the collecting system. This entity is included in urinary tract gas infections (1-3). By reporting a series of six cases and reviewing the literature, we evaluate the epidemiological, clinical and therapeutic features of this entity.

PATIENTS AND METHODS

This retrospective study evaluated epidemiological, clinical, therapeutic and evolutive data in six patients treated for EP in our department between 1995 and 2005. These cases were collected among 27 cases of urinary tract gas infections (pyelitis, pyelonephritis and cystitis) managed during the same period, which gives a rate of 22%. Annual incidence was 0.6 case/year.

RESULTS

Five women and one man were included in our series. The mean age was 55 years with extremes of 47 and 63 years. Urinary lithiasis was found in all patients and was the most common co-morbidity. Five patients were diabetic (Table 1).

The mean duration of symptoms and signs before presentation was six days (range: 4 – 12 days). Presenting signs were lumbar pain, fever and sick appearance in five patients. Septic shock was noted in the other case. All patients presented lumbar tenderness on physical examination.

Laboratory tests revealed elevated white blood cell count (12,000 – 18,000/mm3) and C reactive protein (CRP) levels (150 – 296mg/L ; normal < 6 mg/L) in all patients. Urinalysis showed high leukocyturia in all cases but urine culture was positive in four cases only and grew Escherichia coli (E. coli). This bacterium was also isolated in blood culture in three patients.

Radiological investigation was performed for all our patients. It included abdominal X-ray, renal ultrasonography (US) and computed tomography (CT) of the abdomen and pelvis.

Abdominal X-ray showed renal calculi in 2 cases and distal ureteral stones in 4 cases. US suspected the diagnosis of EP in one case by revealing echoic reverberation in the renal pelvis. Besides, it noticed obstructive stones of the renal pelvis in two patients. Theses calculi measured 1.5 and 3cm respectively. Destruction of the renal parenchyma was noticed in one patient. In the four other patients, ureteropelvocalyceal dilatation was noticed; the distal ureter was also dilated but no obstacle was visualized. Echoic reverberation was found in the collecting system in two cases, thus suspecting the presence of gas.

CT allowed gas detection in all cases by showing highly negative density areas strictly limited to the collecting system (Figure 1, 2). The two renal pelvis calculi were found, and distal ureteral stones were visualized in the four cases in which no

Table 1 : Epidemiological, therapeutic and evolutive characteristics of Emphysematous pyelitis.

Patient	Age / Sex	Comorbidity / History	Clinical findings	Antibiotics	Drainage	Outcome	Obstacle treatment
1	55/F	Diabetes DUS	Febrile left lumbar pain	Quinolone + aminoside	Double-J ureteral stent	Favorable	spontaneous elimination of a ureteral stone
2	59/F	Chronic renal failure RPS	Febrile left lumbar pain	Quinolone + cephalosporin	Double-J ureteral stent	Favorable	extracorporal shock wave lithotripsy
3	53/F	Diabetes DUP	Septic shock	Quinolone + aminoside	Double-J ureteral stent	Favorable	ureteroscopy
4	63/ F	Diabetes RPS	Febrile right lumbar pain	Quinolone + aminoside	Percutaneous nephrostomy	Favorable	Nephrectomy
5	47/M	Diabetes DUS	Febrile right lumbar pain	Quinolone + aminoside	_____	Favorable	Spontaneous elimination of a ureteral stone
6	50/F	Diabetes DUS	Febrile left lumbar pain	Quinolone + aminoside	Double-J ureteral stent	Favorable	Ureteroscopy

RPS = Renal pelvis stone, DUS = Distal ureter stone.

obstacle was found by US. Renal parenchyma was dedifferenciated in one case and destroyed by renal pelvis stones in another case.

Figure 1 : Emphsematous pyelitis of the left kidney: note the presence of gas in the collecting system. a: without contrast material administration. b: after contrast material administration.

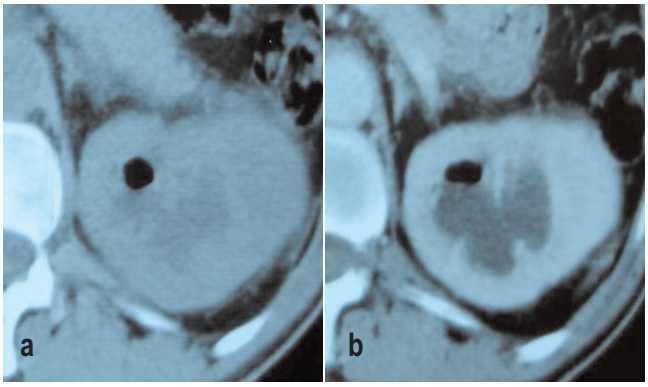
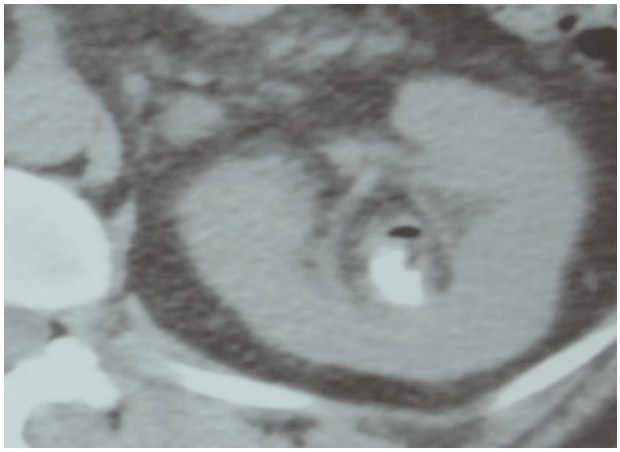


Figure 2 : Abdominal computed tomography without contrast material administration: Emphysematous pyelitis of the left kidney with a renal pelvic calculus and gas within the renal pelvis.



All our patients were treated by double antibiotics, associating fluoroquinolone with aminoside in 5 patients and with 3rd generation cephalosporin in one patient, during five days. Fluoroquinolone was then administrated alone to totalize 4 weeks. Collecting system drainage was performed using a double-J stent in 4 cases and a percutaneous nephrostomy catheter on a thinned renal parenchyma in another patient. In the remaining case, a ureteral stone was spontaneously eliminated upon admission, before drainage.

Clinical and biological courses were rapidly favorable in all cases. The mean delay of amelioration of general state was 24 hours; it was 48 hours for white blood cell count and 72 hours for C reactive protein serum level. Control CT was done on day 7 and day 15 after drainage, and then depending on the outcome. Gas images in the collecting system completely disappeared in a mean delay of 10 days (7-60 days).

The obstacle was treated 3 weeks after antibiotherapy was started, using extracorporeal shock wave lithotripsy for a renal pelvis stone in one case, ureteroscopy associated with ballistic lithotripsy in two cases for ureteral stones, and nephrectomy for a destroyed kidney in one case. One patient spontaneously eliminated a calculus 5 days after double-J stent placement (Table 1).

DISCUSSION

Emphysematous pyelitis is an uncommon pathology. It is defined by the presence of gas produced by gas-forming organisms in the collecting system; the renal parenchyma and perinephric spaces are spared (1-3). Few series in the literature have been devoted to EP; we found only a few cases included in global studies of gas infections of the upper urinary tract. This could be explained not only by the rarity of this entity but also by the fact that it shares the ethiopathogenic and epidemiological characteristics with emphysematous pyelonephritis and that it clearly differs from it only by its treatment and prognosis. In fact, Huang and Tseng4 established a scanographic classification having a prognostic value and an impact on the therapeutic decision of emphysematous pyelonephritis where EP appears to be the Stage I.

The mean patients' age presenting EP is situated in the sixth decade of life (5,6). The female predominance of the disease is undeniable (3,5,7). In our series, the mean age was 55 years with a sex ratio of 5 female to one male.

The most consensual risk factors implicated in the development of emphysematous infection of the upper urinary tract consist in diabetes – found in 87% of the cases (8) – and urinary tract obstruction – found in 20 to 40% of the cases (9). These two factors were associated in five of our patients.

The main hypothesis explaining gas formation in the urinary tract is the intra renal glucose fermentation10. Four factors are thought to be implicated: anaerobic organisms, elevated intra tissular glucose level, defectuous tissular perfusion and altered immune response (4,7). Bacteria infecting the collecting system locally produce a certain number of mediators, particularly the lipopolysaccharide of the Gram negative bacilli external membrane (endotoxin), which passes in the blood circulation. These mediators lead to high vascular production of nitrogen monoxide (NO), a strong vasodilating factor, which results in general and visceral circulation disorders and organ aggression, thus making a severe sepsis (7).

Micro-organisms identified during EP are quite similar to those found in the other urinary tract infections. Gram negative bacilli are the most incriminated bacteria. E. coli is the most frequently isolated organism, with a frequency ranging between 50 to 75%, followed by Klebsiella Pneumoniae and Proteus11. In our series, bacteriological tests grew E Coli in 2/3 of the patients.

Clinical findings are not specific; symptoms and signs are those observed in any acute pyelonephritis and are dominated by lumbar pain associated to fever (7). Physical examination finds lumbar tenderness or guarding . Urinalysis often notes manifest pyuria. A delay in diagnosis of 7 to 21 days is common in diabetic patients due to symptoms attenuation. In such patients presenting with recent impairment of the general state associated with diabetes decompensation, the etiologic – mainly

infectious – investigation is compulsory, even in the absence of urinary signs.

Laboratory serum analysis confirm the sepsis by showing elevated white blood cell count over 10,000/mm3 or leucopenia less than 4,000/mm3, with elevated erythrocyte sedimentation rate and other inflammation markers. Despite their late results, bacteriological analysis must be systematically performed in order to adjust initial probabilistic antibiotherapy. Urine culture is positive in 50% of the cases, blood culture in 42% and pus drainage in 68% (7).

Diagnosis of EP is only made by imaging procedures. Revealing gas bubbles in the upper urinary tract is very specific but not pathognomonic. This situation can be observed during urodigestive fistulas or following endo urologic procedures7. Abdominal X-ray can show gas images in the renal shadow9. The low sensibility of this exam makes it useless for diagnosis and follow-up11. US usefulness is differently appreciated by the authors. It can evoque the diagnosis by showing gas images in the urinary tract. These appear to be as dense echos followed by echoic reverberation with posterior attenuation. It still has an interest in the positive and etiologic diagnosis of urinary tract obstruction (1-3).

CT is the main exam for diagnosis and follow-up of EP. It demonstrates – with an excellent sensibility – the presence of gas which is strictly confined to the collecting system, appearing as very negative densities, and sparing the renal parenchyma and the perinephric spaces. Contrast material administration is not necessary for diagnosis, especially since most of the patients are diabetic (1-3,8).

Treatment of EP is urgent. It is based on antibiotic administration, collecting system drainage, treatment of the cause of obstruction and diabetes equilibration. Synergic antibiotics should be associated and administrated intravenously. They have to be active against Gram negative bacilli. Initial probabilistic antibiotherapy associates a 3rd generation cephalosporin or imipenem to a fluoroquinolone or aminoside. Fluoroquinolones have the advantage of excellent tissular diffusion and a low toxicity (7). This initial antibiotherapy is to be adapted according to the bacteriological test results and the clinical and biological efficiency.

Collecting system drainage can be done by placement of ureteral stent or percutaneous nephrostomy under CT or US guidance. Some authors indicate drainage only in case of urinary tract obstruction3, but the current tendency reported in the literature is systematic drainage independently of the state of the renal cavities (6,7,11). In our series, a double-J stent was placed in four patients while a patient with laminated renal parenchyma had a percutaneous drainage of the collecting system, which allowed evaluation of the separated renal function. The remaining patient spontaneously eliminated a ureteral stone on admission; we considered that the urinary tract would be drained naturally.

The outcome of EP is usually favorable using antibiotics and collecting system drainage, with a soon resolution of the sepsis. Huang4 reported a success as high as 100% in such conditions. Secondary nephrectomy is exceptional. It is reserved to non-functional kidneys or to alteration of a life-threatening sepsis.

The obstacle – usually a urinary stone – is treated at distance from the acute infection, under antibiotic therapy. In our practice, we always respected a minimal delay of 21 days of efficient antibiotics before proper treatment of the obstacle.

EP should be considered as a potentially severe infection. Its prognosis is good when promptly and correctly treated. Mortality is often related to false diagnosis (8).

CONCLUSION

EP is a rare infection characterized by the presence of gas in the renal collecting system exclusively. Diabetes and obstruction are the most important risk factors. CT makes the diagnosis. Treatment is based on efficient antibiotics associated with drainage of the collecting system. Its prognosis remains favorable.

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