

Emphysematous pyelonephritis: Nephrectomy is still standard of treatment? 15 years 'experience

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Abstract

Original Research Article

Emphysematous pyelonephritis (EPN) is a severe form of urinary tract infection with a high mortality unless treated rapidly and effectively. Our objective is to review our experience over 15 years (from 2005 to 2020) on conservative treatment according to clinical, bacteriological, radiological, therapeutic and evolutionary aspects of EPN. We analyzed the medical record of patients treated for EPN at the Urology service of Mohammed the VIth University Hospital of Marrakesh. There were 18 patients with an average age of 54 years. They were all diabetics. Lithiasis obstruction of the upper excretory tract was found in 15 patients (83%). The germs involved were Gram-negative bacilli, especially *E. coli* (61% in our series) followed by *Staphylococci* (22.2%), *Klebsiella* (11.1%), and *proteus mirabilis* in 5.5% of cases. Resuscitation measures, including antibiotic and insulin therapy, were introduced as a matter of urgency for patients if needed. In 77.8% of cases, treatment was conservative: 11 patients (61.1%) underwent endoscopic drainage with a JJ stents and 3 patients (16.6%) underwent open drainage of peri-renal collections with a nephrostomy tube placement). Only 4 patients (22.2%) patients underwent nephrectomy. No deaths were observed during the course.

Keywords: Emphysematous pyelonephritis, *E. coli*, diabetes.

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1. INTRODUCTION

Emphysematous pyelonephritis (EPN) is a severe and necrotizing form of acute bacterial pyelonephritis, characterized by the presence of gas in the renal parenchyma, excretory cavities and/or perirenal spaces. Clinically, its initial presentation can be misleading and the CT-scan is the key examination for diagnosis, prognosis and follow-up [1]. It often occurs in immunocompromised patients and is fraught with a high mortality rate without prompt medical and surgical management [2].

OBJECTIVE

Our main objective is to review our experience over 15 years (from 2005 to 2020) and point out the main predilection factors for conservative treatment.

METHOD

We retrospectively collected epidemiological, clinical, biological, radiological, therapeutic and evolutionary data from the medical records of patients treated for emphysematous pyelonephritis at service of

Urology, Mohamed the VIth Hospital University between 2005 and 2020. For each file, we specified the clinical, paraclinical and therapeutic characteristics as well as the evolution after treatment.

RESULTS

We identified 18 cases of emphysematous pyelonephritis. The mean age was 54 years (21-87 years). All patients had one or more comorbidities: all our patients were diabetics, three patients had high blood pressure (16%), fifteen had an obstruction in the upper excretory tract (83%), eight had renal insufficiency (44.4%). However, fever and low back pain with alteration of the general condition was the main reason for consultation in all our patients. On the biological level, the blood count showed hyperleukocytosis in all patients, with microcytic hypochromic anemia in 14 cases. CRP levels ranged from 56 to 352 mg/l in our patients. Hyperglycemia was noted in 16 patients. Eight patients had renal insufficiency, five had functional kidney failure due to the sepsis, which had regressed after resuscitation measures.

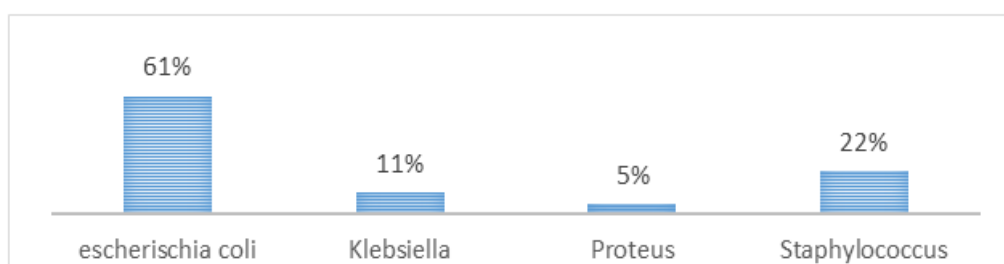
Table 1: Clinical, biological, imaging and therapeutic profiles of patients

CASES	FEVER	GIORDANO	GLUCOSE	HbA1c	CREATININE	UREA	C-RP (C-Reactiv Protein)	K (meq/L)	LEUKOCYTES (10 ³ /μL)	NEUTROPHILS (G/L 10 ³)	STONES	IMAGING*	TREATMENT**	ATB***
1	Yes	Yes	2	13	53	1.2	138	5.5	12	8.4	Yes	1	C	Yes
2	Yes	Yes	7	12	31	1.2	63	4.7	14	11.2	Yes	2	B	Yes
3	Yes	Yes	2.53	12	92	1.89	259	4.7	38	34.2	Yes	3A	A	Yes
4	Yes	Yes	4.07	11	14	0.5	100	6.1	12	9.6	Yes	3B	A	Yes
5	Yes	No	1.09	12	7	0.30	88	4	14	11.2	No	2	B	Yes
6	Yes	No	2.5	13	8.56	0.43	352	4.6	12	8.4	Yes	2	B	Yes
7	Yes	Yes	1.31	12	5.2	0.1	252	2.7	13	11.7	Yes	3B	A	Yes
8	Yes	Yes	3	11	112	3.52	211	8.9	15	12	Yes	3B	B	Yes
9	Yes	Yes	3	12	57	1.44	217	4.5	28	25.2	Yes	1	B	Yes
10	Yes	Yes	2.2	10	42	1	300	5	15	12	Yes	2	B	Yes
11	Yes	Yes	1.9	12	33	1.9	234	4.2	13	9.1	Yes	2	B	Yes
12	Yes	Yes	3	11	12	0.45	167	4	16	12.8	Yes	2	B	Yes
13	Yes	Yes	1.8	13	7	0.5	56	3.9	20	15	No	1	A	Yes
14	Yes	Yes	2	11	31	1	321	5	13	9.1	Yes	2	B	Yes
15	Yes	Yes	1.9	13	22	2	201	4	16	14.4	Yes	2	B	Yes
16	Yes	Yes	1.9	10	12	0.5	94	3.9	14	9.8	Yes	2	B	Yes
17	Yes	Yes	3.4	12	56	2.1	224	4.1	21	19.8	Yes	2	C	Yes
18	Yes	Yes	4	13	14	2	169	3.9	17	13.6	Yes	1	C	Yes

*Imaging aspects of kidney basis on imaging classification of Huang and Tseng **Treatment: A=nephrectomy B=double J stent C=nephrostomy D= double J stent & nephrostomy
***ATB: antibiotics

The cytobacteriological examination (Figure) of the urine was positive in all cases, with Escherichia Coli isolated in 11 cases (61.1%), Staphylococci in 4 cases (22.2%), Klepsiella in 2 cases (11.1%), and a proteus mirabilis in one case (5.5%). The diagnosis was

made by CT- scan in all cases. It showed the presence of gas in the renal parenchyma and excretory tracts in 4 cases (22.2%), air diffusion in the peri-renal space in 11 cases (61.1%), and para-renal space in 3 cases (16.6%).

**Table 2: Bacteriological profile of patients**

It also diagnosed renal and ureteral stone in the fifteen patients who had an obstruction of the urinary excretory tracts. Five patients (27.7%), benefited resuscitation measures to restore the hydrolytic balance, eleven patients (61.1%), had received insulin in addition to the previous measures and antibiotics comprising a third generation cephalosporin and an

aminoside. Four (22.2%) patients underwent nephrectomy, eleven (61.1%) underwent surgical drainage with a JJ tube and three (16.6%) underwent drainage of peri-renal collections. The evolution depended on the stage of the kidney at the time of diagnosis and the associated defects in all our patients.

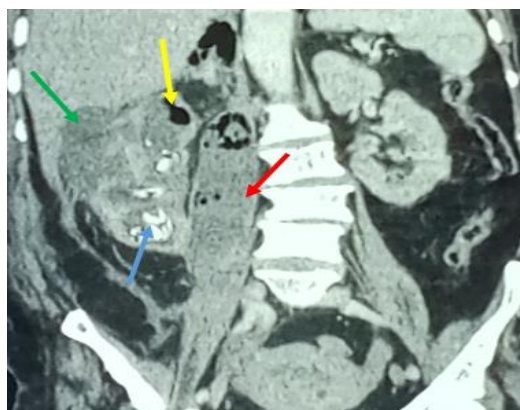


Figure 3: Abdominal CT scan, coronal section after injection: emphysematous pyelonephritis (yellow arrow) on stones kidney (blue arrow), complicated by perirenal collections (green arrow) and psoas muscle abscess (red arrow)

DISCUSSION

A necrotic infection of the kidney, emphysematous pyelonephritis is characterized by the presence of gas within the renal parenchyma, excretory cavities, or perirenal spaces [3].

In our study, the middle age was 54 years, which corresponds to the data in the literature [4].

Diabetes, a fortiori poorly balanced, is the predictive factors (100%) because chronic hyperglycemia favors micro angiopathy, anatomical and functional abnormalities of the urinary tract, and abnormalities of antibacterial immunity. The occurrence of severe forms is explained by diabetic neuropathy that reduces the painful symptomatology [5]. The existence of an obstacle on the urinary tract (83% of cases) constitutes the second favouring factor [6].

Clinically, there are signs of severe pyelonephritis, with fever and chills, associated with sepsis or decompensation of diabetes. Biologically, there are signs of sepsis or decompensated diabetes. Severity factors in the form of visceral dysfunction (renal failure, hepatic failure) or consumption coagulopathy (thrombocytopenia, increased activated

partial thromboplastin time and decreased prothrombin level) are also sought. Cytobacteriological examination of the urine reveals leukocyturia and hematuria, the extent of which reflects the degree of necrosis or destruction of the kidney by the infectious process. The positivity is found one time out of two and the identified microorganisms are represented essentially by Gram-negative bacilli, especially *E. coli* (61% in our series) and followed by *Staphylococci* (22.2%), *Klebsiella* (11.1%), and a *proteus mirabilis* in one case (5.5%). No patient benefited from blood cultures because they are only of value if they are positive and if they isolate the same germ as that found in the urine [7].

Imaging exploration by abdominal and pelvic CT-scan is the key to the positive diagnosis and follow-up of emphysematous pyelonephritis. Its sensitivity is 100% to detect the presence of a gas effusion in the form of a strongly negative density and to assess the parenchymal destruction. In addition, it allows to study the perirenal spaces and to specify the extension of the lesions. According to the risk of acute renal failure in these patients, the injection of contrast medium is not essential. The scannographic classification of Huang and Tseng has a therapeutic impact and allows to classify the EPN in 4 stages [8].

STAGES	CARACTERICTICS
Stage 1:	Gas in the excretory tract only
Stage 2:	Gas in the renal parenchyma without extension in the extrarenal space
Stage 3:	3A: extension of the gas or abscesses in the renal pelvis; 3B: extension of the gas or abscesses beyond the fascia of Gerota;
Stage 4:	Emphysematous pyelonephritis bilaterally or on a single kidney

In our study, it showed the presence of gas in the renal parenchyma and excretory tracts in four cases (22.2%), and air diffusion in the peri-renal space in eleven cases (61.1%), and para-renal space in three cases (16.6%). The prognosis of renal function depends on the degree of parenchymal destruction and the existence of associated nephropathy [9].

Emphysematous pyelonephritis is a medical and surgical emergency and relies on the combination of vigorous resuscitation, antibiotic, and a percutaneous and/or endo urological surgical drainage procedure. The initial probabilistic treatment combines a third generation cephalosporin with a fluoroquinolone or an aminoglycoside. The advantage of fluoroquinolones is related to their excellent tissue diffusion and low toxicity [11].

The correction of hemodynamic and hydroelectrolytic disorders and organ dysfunctions, as well as the control of hyperglycemia, are non-specific but essential measures that must be carried out in the intensive care unit. Drainage of the excretory cavities with a percutaneous nephrostomy tube or a single or double J ureteral stent is the surgical means for emphysematous pyelonephritis: this type of drainage is indicated in forms localized to the excretory tract [10].

In our study, five patients (27.7%), benefited resuscitation measures to restore the hydrolytic balance, eleven patients (61.1%), received insulin in addition to the previous measures and antibiotics comprising a third generation cephalosporin and an aminoside. Four (22.2%) patients underwent nephrectomy, 11 (61.1%) underwent surgical drainage with a JJ tube and 3 (16.6%) underwent drainage of peri-renal collections or in cases of obstruction [9].

In fact, in the presence of poor prognostic factors, percutaneous drainage should be the first step of a graduated therapeutic approach that may go as far as nephrectomy afterwards (22.2% of cases in our series) [12].

A scannographic check-up will be carried out between the fourth and seventh day to look for any new collections which should be drained by other catheters. Considered in the past by most teams as the reference treatment for emphysematous pyelonephritis, nephrectomy should currently be indicated as a second-line treatment after failure of conservative treatment or exceptionally as a first-line salvage treatment in the case of extensive forms with several organ dysfunctions [13].

CONCLUSION

Emphysematous pyelonephritis is a serious renal infection, particularly in diabetics. The reference examination for positive diagnosis and follow-up is the CT-scan. Nephrectomy should be reserved for severe extensive forms such as organ dysfunction (liver, kidney); forms with non-functioning kidney destroyed by the infectious process. Conservative treatment should always be preferred.

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