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Original Research Article

Emphysematous pyelonephritis treated with CSE-1034: case report and review of the literature.

Abstract

Background & aim:

Emphysematous pyelonephritis (EPN) is an acute necrotizing infection of upper urinary tract characterized by the presence of gas in renal parenchyma and peri-renal tissue. We report a case of diabetes mellitus with renal calculi who was diagnosed with EPN due to *E. coli*. Early recognition of the infection prompted the management of patients with aggressive medical management.

Results:

The patient was successfully treated with intravenous antibiotic CSE-1034 (Ceftriaxone/Sulbactam/EDTA) in combination with DJ stenting.

Conclusion:

Conclusively, this case report emphasizes that early diagnosis and appropriate therapeutical management which includes CSE-1034 in this case is a key to good prognosis in EPN.

Key words: Diabetes, emphysematous pyelonephritis, Ceftriaxone/Sulbactam/EDTA

Introduction

Emphysematous pyelonephritis (EPN) is a rare acute necrotizing infection of kidney resulting in gas formation in renal parenchyma, collecting system and peri-renal tissues (1). EPN is mostly unilateral and 90% of the cases are reported in patients with diabetes mellitus (DM) or obstructive uropathy (1). The clinical symptoms associated with EPN can range from mild abdominal pain to severe septic shock (2). EPN can turn out a life-threatening condition if the disease is not recognized and treated promptly. As the clinical condition is reported very rarely with only 300 case of EPN reported since its first description in 1898, most of the available literature is in the form of case reports. We report a rare case of renal

UNDER PEER REVIEW

calculi in a type 2 DM patient leading to unilateral EPN and successfully treated with monotherapy, CSE-1034 along with other supportive medicines.

Case presentation

A 77 year female presented to our department with chief complaint of abdominal pain along with fever, nausea, mild cough and weakness. The patient had reported one episode of vomiting and increased frequency of urine but did not complain of dysuria. Past medial history included presence of renal calculi and DM diagnosed one month ago. On admission, the patient was conscious and oriented, Cardio-vascular system examination revealed normal S1 and S2, respiratory system was clear and per-abdomen was soft. Vitals on admission were pulse=88/min, BP=110/78mm Hg, Temperature=101.7°F. Immediate hematology test reports showed raised WBC count (13100/cu-mm) whereas other parameters including Hb-11.7g/dL and platelet count (373,000/cu-mm) were normal. No abnormalities were reported in kidney function test (KFT) and Liver function test (LFT). Urine examination revealed presence of pus cells (2-5/HFU) whereas all other laboratory parameters including creatinine value were within the range. Urine sample was sent for culture and susceptibility testing and the patient was put empirically on IV CSE-1034 3g/12h along with anti-pyretics and other supportive care.

Ultra-sonography (USG) of kidney/ureter/bladder (KUB) indicated left PUJ calculus with mild to moderate hydronephrosis and right renal non-obstructive calculi. Air pockets were noted in left pelvicalyceal system. Left peri-nephric fat stranding, mild thickening of anterior peri-renal fascia and lateral conal fascia were noted. The opinion of urologist was sought on renal calculi. Left cytoscopy followed by percutaneous nephrostomy (PCN) with left DJ stenting was done. Urine culture grew *E. coli* with sensitivity to CSE-1034, meropenem and colistin. The patient was continued with conservative management with IV CSE-1034 post-operatively for 14 days and was continuously monitored. After the treatment period, she was afebrile and all her vitals were stable. On 15th day after admission, the patient was discharged with medications and was advised to follow up with urologist after two weeks for left side Percutaneous nephrolithotomy.

Discussion

EPN, a necrotizing infection of upper urinary tract is mostly encountered in patients with DM or ureteral obstruction like calculi, and is characterized by the production of intra-renal and peri-nephric gas (1). Various risk factors that predispose diabetic patients to EPN

UNDER PEER REVIEW

include high level of glycosylated hemoglobin, impaired immune system and high blood glucose levels. The most common pathogens involved are *E. coli* followed by *K. pneumoniae* and *Proteus*. Some studies have also reported *Clostridium, Candida, Aspergillus, Cryptococcus*, and *Amoeba* as the causative agents (3). Huang and Tseng have proposed that the high sugar level in diabetic patients could be fermented by these gas forming pathogens leading to gas production and entrapment in upper urinary tract, however mere bacterial gas production cannot explain the etiology of this disease completely (4). EPN is unilateral in 90% cases whereas in 10% cases, both kidneys may be involved (1). Bilateral EPN has usually poor prognosis because of associated increased risk of sepsis, multi-organ dysfunction and long-term hemodialysis.

As patients with EPN usually present with symptoms that are typical of pyelonephritis, imaging is necessary for the diagnosis of EPN. CT scan is reportedly 100% sensitive to confirm the presence of EPN whereas 80% cases are confirmed by USG (3). Wan *et al*. (5) proposed that EPN can be classified into two types depending on CT findings. Type 1 is characterized by renal parenchymal necrosis with absence of fluid content or presence of a streaky/mottled gas pattern. Type 2 is characterized by presence of renal or peri-renal fluid accompanied by bubbly gas pattern or gas in the collecting system. Depending on the positioning of gas in CT findings and involvement of kidneys, Huang *et al.* (4) have further proposed the 4-tier classification of EPN. Class 1: gas confined to collecting system; class 2: gas confined to renal parenchyma alone; Class 3a: perinephric extension of gas or abscess in peri-nephric area, Class 3b: extension of gas beyond Gerota fascia or into pararenal space Class 4: solitary kidney with bilateral or unilateral EPN with no organ dysfunction. On the basis of this classification, the prognosis and therapeutic modalities of the patient can be determined. Based on USG findings, our patient was diagnosed with class 2 EPN and was presumptively put on CSE-1034 IV infusion with other supportive medications initially.

Treatment options for EPN have evolved from aggressive surgical intervention to conservative approaches including management with parenteral antibiotics along with percutaneous catheter drainage or D-J stenting (6)(7)(1). The initial antibiotic therapy recommended for EPN can be tailored as per CT findings and risk factors for resistance. As Gram-Negatives are primarily the causative pathogens, any empiric antimicrobial regimen is primarily targeted at it (8). Normally, a third generation cephalosporins with or without amikacin is recommended in patients with Class 1, 2, 3 and 4 without risk factors. Whereas carbapenems with or without vancomycin is recommended in patients with Class 2, 3, and 4

UNDER PEER REVIEW

with risk factors (8). Given the global rise in antimicrobial resistance, carbapenems are also recommended in patients with a history of prior hospitalization and antibiotic use. As the patient had a past history of renal calculi and was elderly, so the patient falls in 2nd category for antimicrobial use. This includes mostly healthcare associated infection where risk of multi-drug resistant infections is high. If we look at sensitivity pattern towards various antibiotics at our hospital, CSE-1034 is reported to be equally sensitive as meropenem and is normally preferred to minimize pressure on penem family. That was the reason we chose to start the patient empirically with CSE-1034. Based on culture and sensitivity reports and good clinical response by day 3, same treatment regimen was continued. The patient was successfully treated with IV antibiotic CSE-1034 in combination with percutaneous DJ stenting (9). The Polyurethane-covered Diamond stent (PCD) or stent placement is done in case of any kind of obstruction observed on imaging studies. Here in our case, the presence of renal calculi in the left side had led to obstruction which was relieved with DJ stenting. The implementation of PCD techniques helps in maximum nephron preserving and facilitates the restoration of renal function (10).

In an analysis of 48 EPN patients by Huang and Tseng, it was reported that the localized EPN which includes Class 1 and 2 types can be dealt with antibiotic treatment along with CT-guided percutaneous drainage (4). For extensive EPN, antibiotic therapy in combination with percutaneous catheter placement can be used only in case of presence of fewer than two risk factors including thrombocytopenia, elevated serum creatinine level, altered sensorium or shock (4). However, if 2 or more risk factors are present or in patients with organ dysfunction, nephrectomy is a preferred option. Riyaz *et al.* (11) have reported a success rate of 88.5% with conservative treatment in retrospective case series of 26 patients despite the presence of two or more bad prognostic factors and extensive EPN (class 3 or 4) in majority patients. Sharma *et al.* (12) have also reported good success rate with conservative management, but early diagnosis was critical. Moreover, the presence of fewer than two risk factors including normal mental status, normal serum creatinine level, normal platelet count, unilateral form, and no associated septic shock definitely favored a better prognosis in our patient.

The mortality rate associated with EPN is very high and increases in case of inappropriate antibiotic therapy. If not treated promptly, the EPN can complicate further leading to its spread and aggressiveness. Thus, this case report suggests that CSE-1034 can

UNDER PEER REVIEW

be empiric therapy for EPN cases. A prompt and appropriate anti-microbial therapy for EPN could play a vital role in improving the disease prognosis.

Research involving human participant

It is a retrospective case report.

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UNDER PEER REVIEW

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