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Original Research Article

MORBIDITY OF EMPHYSEMATOUS PYELONEPHRITIS; IS IT MORE THAN OBSERVATION?

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Abstract

Background: Emphysematous pyelonephritis (EPN) is one of the uncommon reported acute necrotizing renal and/or perirenal tissues infection, with characteristic presence of gas. Its morbidity is critical and its treatment outcome is usually not predictable. **Material & Methods:** We did a retrospective observational study from september 2016 and august 2022 with description of clinical, laboratory and imaging features of EPN patients in our hospital. Morbidities and different treatment modalities with outcome were observed and noted. **Results:** Total 46 patients were noted with higher numbers of females and diabetics. Chronic kidney disease and urolithiasis were notable association. Fever, flank pain, and painful micturation were in almost all patients. Urinary culture report had most commonly Escherichia coli. Most of the patients had been managed medically but surgery was also required in notable cases. **Conclusion:** EPN were observed with higher frequency due to increasing wide available imaging studies and morbidities are more than usual thinking.

INTRODUCTION

Emphysematous pyelonephritis (EPN) is one of the rare & acute manifestation of renal necrotising infection which affecting the its parenchyma, pelvic-calyceal system and surrounding structures. Its main characteristic feature is gas accumulation within renal and/ or its surrounding structures.[1,2] It develops most often in persons with diabetes mellitus (DM) especially females. Other risk factors include obstructive uropathy, vesicoureteric reflux(VUR), and immunosuppression, although exact pathogenesis is unclear.[3,4] Usually patients with EPN have nonspecific symptoms of upper urinary tract infection including fever, loin pain, nausea, vomiting, altered mental status, shock, acute kidney injury and disseminated intravascular coagulation. Renal angle tenderness is usually elicited in almost every patients.[5] Various imaging modalities can identify gas in the affected tissues. Abdominal X-ray and ultrasonography have limited role in the diagnosis of EPN.Conventional radiological imaging shows mottled gas within the renal fossa and sometime crescentic accumulation of gas within the Gerota fascia. In ultrasonography, kidney is enlarged and high-amplitude, nondependent echoes are observed within it. Computerised tomograpgy is the most definitive and reliable imaging modality of choice for evaluating these patients.[6] Treatment principle usually tabulated in the form of vital resuscitation, use of antimicrobial agents, control of diabetes, any obstructions relieve , and in some patients nephrectomy Outcomes usually depend on severity of patients , radiological class and treatment quality. Present study, describes the clinical details, management, morbidity and outcome of patients with emphysematous pyelonephritis at our tertiary center.

MATERIALS AND METHODS

This is a retrospective observational study which was carried in top tertiary care medical college which has big impact on mind of people of state. It involved total of 46 patients were managed in the hospital with clinical diagnosis of Emphysematous Pyelonephrits from september 2016 and august 2022. All the patients were studied with respect to the clinical features at presentation, biochemical paremeters in blood, radiological imaging. Risk factors for EPN in the form of diabetes, chronic kidney disease, immunosuppression, and obstruction were noted. Computerized tomography was done in all cases to confirm the diagnosis and for classification. Patients were classified into four classes using the classification system proposed by Huang and Tseng.

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Class I: Gas in collecting system only
Class II: Parenchymal gas only
Class IIIA: Extension of gas into perinephric space
Class IIIB: Extension of gas into pararenal space
Class IV: EPN in solitary kidney, or bilateral disease.

All the patients were thoroughly investigated, and the risk factors (as proposed by Huang and Tseng) were evaluated. Diagnostic workup and therapy were indivisualised. Nephrologist and Endocrinologist consultation taken whenever necessary for optimisation of patient general renal condition and blood sugar. Factors like thrombocytopenia, azotemia, hematuria, altered consciousness, shock, severe proteinuria, need for emergency hemodialysis, severe hypoalbuminemia polymicrobial infections, and extension of infection to the perinephric space which causes poor outcome were analyzed. The outcome was reported as clinical improvement with preserved I/L renal function or nephrectomy. Conservative treatment of emphysematous pyelonephritis was either medical treatment only or combination of medical treatment with percutaneous drainage. Clinical improvement and disappearance or reduction in gas on follow-up radiological imaging was parameter for success. Medical treatment included, early adequate fluid resuscitation, glycemic control, close clinical and biochemical monitoring, serum electrolyte management, antibiotics, and percutaneous catheter drainage (if required). The antibiotics used were third-generation cephalosporin and fluoroquinolone group. Vancomycin and imipenem were used in shock patients. Clinical deterioration on medical treatment were led to consideration for surgery i.e. nephrectomy. All patients were followed up for at least 6 months after discharge from the hospital. Results data were collected on Microsoft excel and analyzed by computer software, expressed as mean ± standard deviation.

RESULTS

Total forty-six were analyzed in the study in which eight patients were male and rest all were females. Mean age was forty-seven years. [Table-1].

Most of the patients were having raised temperature with pain in flanks. 38% of the total patients had hematuria. Crepitus were present in the flank in twenty-eight percent of the patients. Two patients also have altered sensorium. Renal angle tenderness was noticed in 42 patients. Diabetes was most common comorbidity and about 50% were diagnosed after admission. They were unaware about their blood sugar status. In non-diabetic patients most common comorbidity was obstructive uropathy. Stones were present in significant number of the patients. CKD was present in only 28% of the patients. Routine blood and urine tests were done in all patients. Ultrasonography of the abdomen and computerized tomography of abdomen was done in all patients. Total white blood cell count was increased in forty-five patients. [Table 2]

Total platelet were decreased in forty four patients.CRP was increased in thirty eight patients. At presentation time thirty-seven patients had altered renal parameters. In Urine culture and sensitivity E coli was most common bacteria isolated. Klebsiella and pseudomonas were found in lesser number of patients. All patients were admitted and oxygen, fluid therapy started immediately. Aggressive blood sugar control was initiated.

Broad spectrum antibiotics started which was modified after culture report. Most of the patients were recovered with percutaneous drainage but four patients were required nephrectomy.

Table 1: Showing demographic and risk factors parameters

Parameters	N=46	Parameters	N=46
Age(Mean)	47 (32-75)	Diabetes	82%
Female: Male	38:8	Obstructive uropathy	76%
Fever	86%	Urolithiasis	68%
Flank pain	74%	Hypertension	45%
Hematuria	38%	CKD	28%
Crepitus	28%		

Table 2: Showing laboratory parameters and Management

Laboratory Parameters(n=46)		Management	
Leucocytosis	45	Diabetic Control	46
Thrombocytopenia	44	Fluid Management	46
Increased CRP	38	Electrolyte correction	46
Pyuria	45	Antibiotics	46
E.COLI	36	Percutaneous drainage	42
Klebsiella	7	Nephrectomy	4
Pseudomonas	2		

DISCUSSION

Emphysematous pyelonephritis (EPN) is one of the rare & acute manifestation of renal necrotising infection which affecting the its parenchyma, pelvic-calyceal system and surrounding structures. Kelly and Mac Cullem were given first credit for describing this necrotising infection. Schultz and klorfein named term emphysematous pyelonephritis.[7]

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Gas presence in kidney is unique and characteristics which occurs mainly due to infection by microorganisms and fast tissue catabolism. In inflamed kidney there is decrease vascular efficiency and gas transport hampered and trapping of gas occurs. According to Huang and Tseng, increased blood sugar in the tissue, gas forming bacterial infection, reduced tissue perfusion, altered response by immune system and white blood cell malfunction are causing emphysematous pyelonephritis pathogenesis.[8] It is most common in diabetic patients. Left sided renal tract gets effected more than right side. Misgar RA et al in his publications showed that 38.5% patients had EPN in left side whereas right side affected in 30.8%. Bilateral EPN was noted in 30.8%. On average bilateral side get infected in about 10%.[9] Aboumarzouk OM et al. in their publication of meta-analysis, noted left side renal infection in 52% of patients, 37.7% in right side, & bilateral in 10.2%.[10] In the present study also left sided emphysematous pylonephritis predominant.

Thirty-eight patients in this observational study were females which one is similar finding to others many publications. Many literatures reported 3:1 ratio for female to male. Cause of more female susceptibility is probably due to more incidence of urinary tract infections.[10,11] Usually emphysematous pyelonephritis have clinical features which are not specific but three features pyrexia, loin pain and nausea represent most noticeable symptoms and assumed as clinical triad. Pain may be colicky and can be accompanied with hematuria. Altered mental status, dysuria may be present and it is very difficult to differentiate clinically from other type of pyelonephritis. The important clue which reached towards EPN diagnosis is presence of crepitus but it is rare finding.[12] In our studies crepitus is found in 28% of the patients. Sometime interesting rare first clinical presentation of emphysematous pyelonephritis in the form of pneumomediastinum & emphysematous cutanae, or septic embolus to the liver, lungs, and brain.[13] In our study routine examination of urine shows pus cell and hematuria. In blood test, most of the time blood sugar and white blood cells were increased. Total platelet counts were decreased. C Reactive protein value may increased. There may be alteration in renal profile. E.coli was found in thirty six patients which was similar to findings published in literature .It was commonest etiological organisms which isolated in 47–90% cases. Proteus, klebsiella and pseudomonas were other microbial agents isolated from emphysematous pyelonephritis patientsThese are actually gas forming organisms.[14] Sometime fungus like condida were also isolated as etiological agents.[15]

Radiological studies routinely done in EPN. In Ultrasonography kidney size, features of gas bubble and abscess in the form of echogenic and hypoechoic area can be known. Abnormal gas can also be seen on plain abdominal x-ray. Most important radiological imaging is ct scan which gives clear picture of renal anatomy, identifies gas in kidney, delineate extent of infection. It also identifies stones, any urinary obstruction.[16] Huang-Tseng also classified EPN based on ct scan.

Management of emphysematous pyelonephritis is always challenging and debatable. Conservative management is nowadays first treatment approach. With advancement of imaging technique conservative approach taking place of old early surgical approach. In our study only four patients underwent nephrectomy rest all were recovered well with conservative approach. Kapoor et al. in their study noticed that initial surgical approach of nephrectomy have high date rate.[17] Somani BK et al noticed that, with increase in conservative management approach ,there are reduction in mortality rate upto 21%. After diagnosis immediately resuscitation is necessary. Correction of fluid and electrolyte is required. Blood sugar urgently controlled. Antibiotics and renal drainage helps in fast improvement of emphysematous pyelonephritis. Wan YL et al. studied that low platelet count, hematuria, altered renal function were associated with negative result in treatment of emphysematous pyelonephritis.

CONCLUSION

Emphysematous pyelonephritis (EPN) is one of the rare & acute manifestation of renal necrotising infection. It was observed with higher frequency due to increasing wide available imaging studies and morbidities are more than usual thinking. Management of emphysematous pyelonephritis is always challenging and debatable. Conservative management is nowadays first treatment approach.

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