

Conservative management of severe bilateral emphysematous pyelonephritis: Case series and review of literature

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ABSTRACT

Emphysematous pyelonephritis (EPN) is a life-threatening condition most commonly observed in diabetes, with nephrectomy believed to be the treatment of choice. However, nephrectomy in EPN is associated with increased risk of complications secondary to associated hemodynamic instability and may result in lifelong hemodialysis in case of bilateral EPN. We present three patients of severe bilateral EPN and one patient of unilateral EPN with diabetic ketoacidosis (DKA) successfully managed conservatively. Patient 1 (severe bilateral EPN) and patient 4 (unilateral EPN with DKA) responded to aggressive broad spectrum antibiotics, whereas patients 2 and 3 (severe bilateral EPN) responded to broad spectrum antibiotics along with percutaneous catheter drainage (PCD). PCD resulted in initial drainage of 300 and 200 ml of pus, respectively. All patients had associated uncontrolled hyperglycemia, poor glycemic control (HbA1c >8.5%), prerenal and intrinsic renal failure, leukocytosis, and dyselectrolytemia which responded to aggressive supportive management and insulin. There are several reports of successful medical management of severe bilateral EPN. Nephrectomy might no longer be the preferred treatment of severe bilateral EPN and may be reserved for patients' refractory to antibiotics and PCD. Urgent randomized controlled trials are warranted in EPN to optimize the treatment protocols.

Key words: Computerized tomography, emphysematous pyelonephritis, percutaneous catheter drainage

INTRODUCTION

Emphysematous pyelonephritis (EPN) is an acute necrotizing renal and perirenal infection caused by gas forming organisms most commonly *Escherichia coli* followed by *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Aerobacter aerogenes*, *Citrobacter*, and rarely yeast.^[1,2] Seventy to 90% cases are observed in diabetes, associated with

a high mortality rate (75%) along with need for urgent nephrectomy.^[3] Bilateral EPN (10%) is rarer and is associated with increased risk of sepsis, multiorgan dysfunction, long-term hemodialysis, and hence worse outcomes.^[4]

Traditionally nephrectomy has been considered to be the treatment of choice in EPN with few reports suggesting increased mortality with medical therapy as compared to surgery.^[5,6] However, surgery is often poorly tolerated in EPN due to poor hemodynamic status secondary to associated sepsis. It has been suggested that aggressive antibiotics, percutaneous catheter drainage (PCD), and supportive therapy may be an effective alternative to nephrectomy in EPN.^[7-9] We present three patients of severe bilateral EPN and one patient of unilateral EPN with diabetic ketoacidosis (DKA) successfully managed conservatively.

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CASE SERIES

Patient 1

A 38-year-old lady with 10 years type 2 diabetes mellitus (T2DM) presented with pain abdomen, fever, nausea, and vomiting for 2 weeks and decreased urine output for 2 days. Investigations revealed pyuria, renal failure, and leukocytosis [Table 1]. Piperacillin-tazobactam plus linezolid was started empirically. Computerized tomography (CT) abdomen following initially suggestive ultrasonography (USG) revealed severe bilateral EPN (left > right) [Figure 1] with gas in bilateral renal parenchyma extending into left perinephric and paranephric areas. Urine culture was positive for *Klebsiella* sensitive to piperacillin. She became afebrile after 3 days. General well-being improved with increase in urine output,

Table 1: Initial biochemical status of patients of emphysematous pyelonephritis

Parameter	Patient 1	Patient 2	Patient 3	Patient 4
FBG (mg/dl)	326	232	288	>600 mg/dl
PPBG (mg/dl)	452	341	362	-
HbA1c (%)	8.8	8.2	8.9	10.3
Urea (mg/dl)	126	76	143	112
Creatinine (mg/dl)	3.8	3.6	7.8	1.6
Hb (g/dl) (11-15)	8.6	9.1	8.8	9.6
TLC (per mm ³)	23900	24600	22400	19200
Neutrophils (%)	81	91	92	88
Lymphocytes (%)	16	9	7	12
ESR (mm) (<20)	78	38	66	49
BHB (mmol/L) (<0.4)	0.2	0.1	0.3	1.8
Sodium (mmol/L)	146	151	155	144
Potassium (mmol/L)	4.2	5.3	5.7	3.5

FBG: Fasting blood glucose, PPBG: 2 h Postprandial blood glucose, Hb: Hemoglobin, TLC: Total leukocyte count, ESR: Erythrocyte sedimentation rate, BHB: Beta-hydroxybutyrate, BHB (normal: <0.4 mmol/L, mild ketosis: 0.4-1.5 mmol/L, moderate ketosis: 1.5-3.0 mmol/L, severe ketosis: >3 mmol/L)



Figure 1: Computerized tomography abdomen showing presence of gas in the renal parenchyma and collecting system of both kidneys (hollow white arrows) along with bilateral nephromegaly. In addition, extension of gas into perinephric and paranephric tissue is seen bilaterally (solid white arrow) (left >> right)

reduction in serum urea, and creatinine. Repeat USG done weekly showed improvement in EPN. She was discharged after 5 weeks. Last evaluated, she was doing well 8 months after diagnosis.

Patient 2

A 36-year-old lady with 8 years of poorly controlled T2DM and three episodes of urinary tract infection in last 18 months presented with high grade fever, vomiting, burning micturition, and prostration for 1 week. Investigations revealed pyuria, renal failure, and leukocytosis [Table 1]. CT abdomen revealed bilateral EPN (left >> right) with extension of gas into bilateral perinephric and paranephric tissues [Figure 2]. Piperacillin-tazobactam plus linezolid was started, later changed to imipenem-cilastatin as per the culture (*E. coli*) and antibiogram report. PCD with drain *in situ* of left kidney was done on day-3 admission leading to drainage of 300 ml pus. She showed rapid clinical improvement. Improvement in EPN was documented by repeated USG. The drain was removed after 6 weeks and patient discharged a week later.

Patient 3

A 52-year-old lady with 14 years T2DM presented to emergency with fever, nausea, vomiting, decreased urine output, and left flank pain and swelling for 2 weeks. Examination was significant for anasarca, hypotension, and palpable swelling in the left lumbar region. X-ray abdomen was suggestive of EPN of left kidney [Figure 3a]. CT abdomen revealed enlarged left kidney with irregular margins, presence of gas, and necrotic tissue which extended into the paranephric areas. Few foci of gas in the collecting system of right kidney

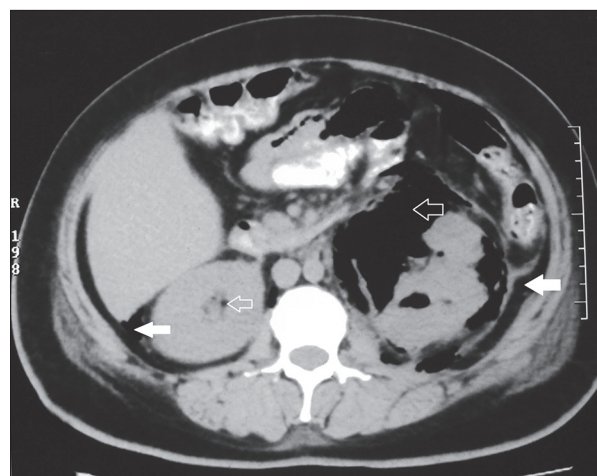


Figure 2: CT abdomen showing enlargement, distortion of architecture, and loss of corticomedullary differentiation of left kidney along with presence of extensive gas and necrotic tissue (hollow white arrow). Few areas of gas are also seen in the collecting system of right kidney (hollow white arrow). There is evidence of extension of gas into bilateral perinephric and paranephric tissue (solid white arrows)

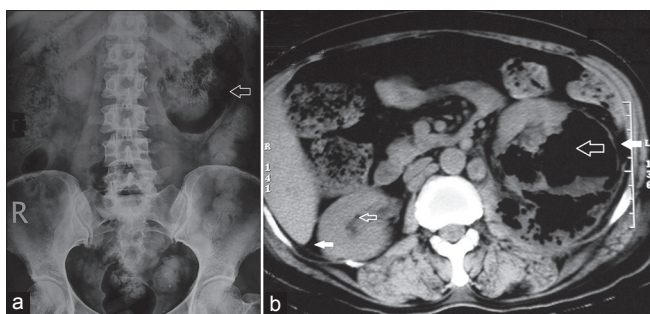


Figure 3: (a) X-ray abdomen showing presence of gas in left kidney suggestive of emphysematous pyelonephritis and (b) CT abdomen showing enlargement, distortion of architecture, loss of corticomedullary differentiation of left kidney along with presence of extensive gas and necrotic tissue (hollow white arrow). Few areas of gas are also seen in the collecting system of right kidney (hollow white arrow). There is evidence of extension of gas into bilateral perinephric and paranephric tissue (solid white arrows)

were noted [Figure 3b]. Fluid resuscitation, inotropic support, and piperacillin-tazobactam plus linezolid were administered. Investigations [Table 1] revealed pyuria, culture from which revealed *Klebsiella*. She received two sittings of hemodialysis on day-2 and 7. PCD with drain *in situ* of left kidney was done on day-2 leading to drainage of 200 ml of pus, culture from which revealed *E. coli*. Both the organisms were sensitive to piperacillin and aminoglycosides. Amikacin was added on day-12 once renal function improved (creatinine: 1.2 mg/dl). The drain was subsequently removed after 8 weeks and patient discharged a week later.

Patient 4

EPN with DKA was diagnosed in a 38 year man with 21 years of type-1 diabetes presenting with 2 weeks history of fever, chills, and rigor. Investigations were significant for ketosis, acidosis, uncontrolled hyperglycemia, and pyuria [Table 1]. CT abdomen revealed enlargement of bilateral kidneys with presence of gas in the collecting system of left kidney [Figure 4]. After initial resuscitation with fluids, potassium supplementation and insulin infusion, he received piperacillin-tazobactam, amikacin, and linezolid. Urine and blood cultures revealed *E. coli*, sensitive to the antibiotic regimen. He showed rapid improvement and was discharged 4 weeks later.

DISCUSSION

Mean age of presentation of EPN is 55 years, and is six times more common in diabetes and females.^[10] Increased tissue glucose, impaired tissue perfusion, and impaired immune response may explain the increased occurrence of EPN in diabetes.^[11] CT has played an important role in improving EPN outcomes, as a result of earlier diagnosis. CT scan is highly sensitive and specific for detecting air in the renal tract (diagnostic hallmark of EPN), clear



Figure 4: CT abdomen showing bilateral nephromegaly with presence of gas in the collecting system of left kidney (hollow white arrow)

depiction of renal and perirenal anatomy, and early detection of spread of infection.^[12] Plain radiographs in contrast are sensitive but not specific for detecting air in the renal collecting system due to superimposition of bowel gas.^[13] USG is also useful but is less sensitive, specific, and is operator dependent.^[13] Based on CT, EPN can be classified into; Class-1: Gas in the collecting system only; Class-2: Gas in the renal parenchyma without extension into the extrarenal space; Class-3a: Extension of gas/abscess to perinephric space; Class-3b: Extension of gas/abscess into pararenal space; and Class-4: Bilateral EPN or solitary kidney with EPN.^[10] Class-1 and 2 constitute mild EPN and are usually managed with antibiotics with or without PCD. Class-3 and 4 in contrast are usually managed surgically.^[10]

In our series, patients 1, 2, and 3 had Class-4 EPN; whereas patient-4 had Class-1 EPN along with DKA. Our series shows that even patients with advanced EPN (Class-4) can be managed with aggressive broad spectrum antibiotics with or without PCD with good clinical outcomes. There are several reports of successful medical management of bilateral EPN,^[7,13-15] thus obviating the need for long-term hemodialysis, should the patient were treated with bilateral nephrectomies. Nephrectomy might no longer be the preferred treatment of bilateral EPN and may be reserved for patients' refractory to antibiotics and PCD. Urgent randomized controlled trials are warranted in EPN to optimize the treatment protocols.

REFERENCES

- Ouellet LM, Brook MP. Emphysematous pyelonephritis: An emergency indication for the plain abdominal radiograph. *Ann Emerg Med* 1988;17:722-4.
- Cook DJ, Achong MR, Dobranowski J. Emphysematous

- pyelonephritis. Complicated urinary tract infection in diabetes. *Diabetes Care* 1989;12:229-32.
3. Ahlering TE, Boyd SD, Hamilton CL, Bragin SD, Chandrasoma PT, Lieskovsky G, *et al.* Emphysematous pyelonephritis: A 5-year experience with 13 patients. *J Urol* 1985;134:1086-8.
 4. Zabbo A, Montie JL, Popowniak KL, Weinstein AJ. Bilateral emphysematous pyelonephritis. *Urology* 1985;25:293-6.
 5. Cook DJ, Achong MR, Dobranowski J. Emphysematous pyelonephritis. Complicated urinary tract infection in diabetes. *Diabetes Care* 1989;12:229-32.
 6. Joris L, van Daele G, Timmermans U, Rutsaert RJ. Emphysematous pyelonephritis. *Intensive Care Med* 1989;15:206-8.
 7. Shimizu H, Hariu K, Kamiyama Y, Tomomasa H, Iizumi T, Yazaki T, *et al.* Bilateral emphysematous pyelonephritis with autosomal-dominant polycystic kidney disease successfully treated by conservative method. *Urol Int* 1999;63:252-4.
 8. Chen KW, Huang JJ, Wu MH, Lin XZ, Chen CY, Ruaan MK. Gas in hepatic veins: A rare and critical presentation of emphysematous pyelonephritis. *J Urol* 1994;151:125-6.
 9. Chen MT, Huang CN, Chou YH, Huang CH, Chiang CP, Liu GC. Percutaneous drainage in the treatment of emphysematous pyelonephritis: 10-year experience. *J Urol* 1997;157:1569-73.
 10. Huang JJ, Tseng CC. Emphysematous pyelonephritis: Clinoradiological classification, management, prognosis, and pathogenesis. *Arch Intern Med* 2000;160:797-805.
 11. Shokeir AA, El-Azab M, Mohsen T, El-Diasty T. Emphysematous pyelonephritis: A 15-year experience with 20 cases. *Urology* 1997;49:343-6.
 12. Craig WD, Wagner BJ, Travis MD. Pyelonephritis: Radiologic-pathologic review. *Radiographics* 2008;28:255-77.
 13. Grozel F, Berthezene Y, Guerin C, Tran-Minh VA, Croisille M. Bilateral emphysematous pyelonephritis resolving to medical therapy: Demonstration by US and CT. *Eur Radiol* 1997;7:844-6.
 14. Angulo JC, Dehaini A, Escibano J, Sanchez-Chapado M. Successful conservative management of emphysematous pyelonephritis, bilateral or in a solitary kidney. *Scand J Urol Nephrol* 1997;31:193-7.
 15. Tahir H, Thomas G, Sheerin N, Bettington H, Pattison JM, Goldsmith DJ. Successful medical treatment of acute bilateral emphysematous pyelonephritis. *Am J Kidney Dis* 2000;36:1267-70.

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