



A RARE CASE OF EMPHYSEMATOUS PYELONEPHRITIS

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ABSTRACT

Emphysematous pyelonephritis (EPN) has been defined as a necrotising infection of the renal parenchyma and its surrounding area that results in the presence of the gas in the renal parenchyma, collecting system, or perinephric tissue.

Historically, EPN has been described by terms such as renal emphysema and pneumonephritis. Schultz and Klorfein recommended the term emphysematous pyelonephritis in 1962.

Emphysematous pyelonephritis is typically caused by glucose fermenting gram negative facultative anaerobes. It is commonly seen in patients with diabetes mellitus.

A high index of suspicion is required to suspect this condition. Hemodialysis or even nephrectomy is warranted if disease progresses to a highly advanced state. In the present case neither nephrectomy nor hemodialysis was required and was managed conservatively with Carbapenems according to culture sensitivity report.

KEYWORDS : Emphysematous Pyelonephritis, Gas Producing Organisms, Management

CASE –

48 year old female, known case of hypertension and diabetes on treatment since 7 years, presented with fever with chills and rigor, nausea, vomiting, bilateral lower limb swelling, facial puffiness and pain in abdomen.

On examination, patient had tachycardia and raised blood pressure with renal angle tenderness and guarding. A differential diagnosis of acute pyelonephritis or renal abscess was made and the patient was investigated further for the same.

Patient's haemogram showed anemia (Hb-8.9 gm/dl), leucocytosis (Total leucocyte count– 21,930/mm³) and urine routine showed presence of abundant pus cells suggestive of urinary tract infection. Urine culture isolated Klebsiella pneumonia and was sensitive to carbapenems and Cotrimoxazole.

Renal function test was deranged suggestive of acute kidney injury.

Table 1 – Renal function tests done on successive days post admission

	Day1	Day 2	Day 5	On discharge
BUN	143	147	94	31
Sr. Creatinine	5.6	5.1	4.14	2.08
Sr. Sodium	129	125	129	143
Sr. Potassium	3.7	4.2	3.3	4.2
Sr. Chloride	96	84	96	114

Ultrasonography of abdomen was done which showed multiple bilateral renal abscesses in both kidneys with increased renal cortical echogenicity and corticomedullary differentiation maintained. Ultrasonography also showed right renal lower pole echogenic shadows suggestive of air pockets.



Figure 1 – Ultrasonography (Abdomen and pelvis)

Computed tomography of abdomen and pelvis confirmed the presence of air in the right renal pole indicative of emphysematous pyelonephritis in a known diabetic elderly lady.

CT grade Class 2 by CT Grading (proposed by Michaeli et al and modified by Huang and Tseng)

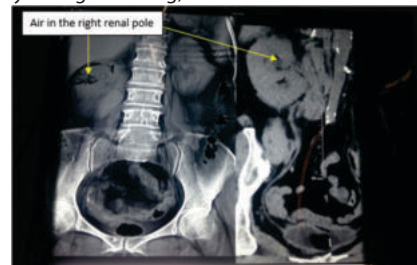


Figure 2 – Computed Tomography (Abdomen and pelvis)

Patient was treated conservatively with Meropenem 500mg TID and Metronidazole 500 mg TID according to the urine culture sensitivity report. Patient recovered completely with complete resolution of air pockets on radiological imaging.

Patient was discharged with repeat ultrasound suggestive of resolution of air pockets.

DISCUSSION AND SUMMARY –

Emphysematous pyelonephritis (EPN) is a rare but severe infection of the renal parenchyma that causes gas accumulation in the tissues

EPN is typically caused by gram negative facultative anaerobes -

- Escherichia coli (66%)
- Klebsiella (26%)
- Proteus, pseudomonas and streptococcus species
- Mixed organisms (10%)
- Rarely fungi (Aspergillus fumigatus, Candida species)
- Protozoa (Entamoeba histolytica)

Although the exact pathogenesis of EPN is unclear, several studies implicate the following factors as important contributors

- High tissue concentration of glucose,
- Impaired tissue perfusion and
- Defective or inadequate immune responses

In addition the hypoxic environment of kidney medulla, especially

in diabetic nephropathy with associated microvascular disease leading to tissue ischemia and necrosis leading to growth of gas forming microbes

The theories implicated in the pathophysiology of EPN are fermentation of glucose with carbon dioxide produced by pathogens has been proposed as the cause of gas in tissues.

Analysis of the gas content in EPN showed:

- Nitrogen (60%)
- Hydrogen (15%)
- Carbon dioxide (5%)
- Oxygen (8%)

Huang et al concluded that mixed acid fermentation is the mechanism of gas production, based on the presence of hydrogen.

Diabetic microangiopathy may also contribute to the slow transport of catabolic products may lead to accumulation of gas.

Staging-

A system proposed by Michaeli et al and modified by Huang and Tseng is as follows⁽⁴⁾:

- Class 1: Gas confined to the collecting system
- Class 2: Gas confined to the renal parenchyma alone
- Class 3A: Perinephric extension of gas or abscess
- Class 3B: Extension of gas beyond the Gerota fascia
- Class 4: Bilateral EPN or EPN in a solitary kidney

Management –

• Indications of Conservative treatment :

1. Patients with compromised renal function
2. Early cases associated with gas in the collecting system alone, and patient is in otherwise stable condition
3. Class 1 and class 2 EPN
4. Class 3 and class 4 EPN: In the presence of fewer than 2 risk factors (eg, thrombocytopenia, elevated serum creatinine levels, altered sensorium, shock)

• Conservative treatment consists of the following:

1. Prompt hydration
2. Fluid resuscitation
3. Systemic antibiotics
4. Relief of obstruction with percutaneous drainage or stent placement
5. Rapid control of diabetes, if present

Initial antibiotic therapy should target gram-negative bacteria and should take into account individual patient characteristics and local patterns of antibiotic resistance. In patients with renal compromise, doses must be adjusted according to creatinine clearance.

• Indications for Nephrectomy:

1. No access to percutaneous drainage or internal stenting (after patient is stabilized)
2. Gas in the renal parenchyma or "dry-type" EPN
3. Possibly bilateral nephrectomy in patients with bilateral EPN
4. Class 3 and class 4 EPN: In the presence of more than 2 risk factors (eg, thrombocytopenia, elevated serum creatinine, altered sensorium, shock)

• Prognosis –

1. Untreated cases of emphysematous pyelonephritis result in death
2. Huang and Tseng reported an overall mortality of 19%
3. Significant success rates of : Percutaneous drainage and antibiotics (66%) Nephrectomy (90%)

REFERENCES-

1. Pontin AR, Barnes RD. Current management of emphysematous pyelonephritis. *Nat Rev Urol*.2009;6:272–9
2. Shigemura K, Yasufuku T, Yamashita M, Arakawa S, Fujisawa M. Bilateral

emphysematous pyelonephritis cured by antibiotics alone: A case and literature review. *Jpn J Infect Dis*.2009;62:2068

3. Falagas ME, Alexiou VG, Giannopoulou KP, Siempos II. Risk factors for mortality in patients with emphysematous pyelonephritis: A meta-analysis. *J Urol*. 2007;178:880–5
4. Wan YL, Lee TU, Bullard MJ, Tsai CC. Acute gas producing bacterial renal infection correlation between imaging findings and clinical outcome. *Radiology* 1996; 198:433-8
5. Schultz EH, Jr Klorfein EH. Emphysematous pyelonephritis. *J Urol*. 1962;87:762-6
6. Huang JJ, Tseng CC. Emphysematous pyelonephritis: clinicoradiological classification, management, prognosis and pathogenesis. *Arch Intern Med*. 2000;160:797-805
7. Kelly HA, Maccullem WG. Pneumatouria. *JAMA* 1898;31:375
8. Shokeir AA, El –Azab M, Mohsen T, El-Diasty T. Emphysematous pyelonephritis: A 15 year old experience with 20 case. *Urology* 1997;49:343-6
9. Subramanyam BR, Lefleur RS, Van Natta FC. Renal emphysema secondary to traumatic renal infarction. *Urol Radiology* 1980;2:53-4
10. Hidlebrand TS, Nibbe L, Frei U, Schindler R. Bilateral emphysematous pyelonephritis caused by candida infection. *Am J Kidney Dis*. 1999;33:E10
11. Kumar VS, Lakshmi AY. Emphysematous pyelonephritis. *Indian J Nephro*.2004;14:192-4
12. Paivansalo M, Hellstrom P, Sinihiroto T, Leinonen A. Emphysematous pyelonephritis Radiologic and clinical findings in six cases. *Acta Radiology*. 1989;30:311-5
13. Ahlering TE, Boyd SD, Hamilton CL, Bragin SD, Chandramma PT, Lieskovsky G et al. Emphysematous pyelonephritis. A 5 year old experience with 13 patients. *J Urology* 1985;134:1086-8
14. Langston CS, Pfister RC. Renal emphysema. A case report and review of the literature. *Am J Roentgenol Radium Ther Nucl Med*. 1970;110:778-86
15. Michaeli J, Mogle P et al. emphysematous pyelonephritis. *J Urol*. 1984; 131:203-8
16. Chen MT, Huang CN, Chou YH, Huang CH, Chiang CP, Liu GC. Percutaneous drainage in the treatment of emphysematous pyelonephritis. *J Urol*. 1997;157:1569-73
17. Godec CJ, Cass AS et al. Emphysematous pyelonephritis in a solitary kidney. *J Urol*. 1980;124:119-21
18. DePauw AP, Ross G, Jr. Emphysematous pyelonephritis in a solitary kidney. *J Urol*
19. Hudson MA, Wyeman PJ, Van der Vliet et al. Emphysematous pyelonephritis successful management by percutaneous drainage. *J Urol*. 1986;136:884-6
20. Zagoria RJ, Dyer RB et al. Percutaneous management of localized emphysematous pyelonephritis. *J Vasc Interv Radiology* 1991;2:156-8
21. Hall JR, Choa RG, Wells IP. Percutaneous drainage in emphysematous pyelonephritis – an alternative to major surgery. *Clinical Radiology* 1988;39:622-4
22. Corr J, Glesson M, Wilson G et al. Percutaneous management of emphysematous pyelonephritis. *Br J Urol*. 1993;71:487-8
23. Koh KB, Lam HS, Lee SH. Emphysematous pyelonephritis: drainage or nephrectomy? *Br J Urol*. 1993;71:609-11