

Renal Tuberculosis Presented as Emphysematous Pyelonephritis: A Case Report

N Mahmood¹, MR Hassan², MMR Siddiqui³, SI Shumi⁴

ABSTRACT

Emphysematous pyelonephritis (EPN) is an acute necrotic infection of the kidney which is characterized by presence of gas in the renal parenchyma. Uncontrolled diabetes mellitus and obstruction of the urinary tract are the main predisposing factors and *Mycobacterium tuberculosis* is a rare causative pathogen. One of the major health problems faced particularly by the developing world since ages is that of tuberculosis (TB). Genitourinary tuberculosis (GUTB) is the second most common extra-pulmonary TB, with kidney being the most frequent site of infection. We herein report a case of a patient with uncontrolled diabetes mellitus who was admitted through the emergency department with symptoms of pyelonephritis. Imaging revealed the gas in the renal parenchyma establishing the diagnosis and as we found sterile pyuria we searched for *Mycobacterium tuberculosis*. GUTB was diagnosed and was treated successfully with anti-TB drugs. EPN is a medical emergency and once diagnosed, attention must be paid to avoid high mortality rates.

Key Words: Emphysematous pyelonephritis, Renal tuberculosis, CT scan, X-Ray KUB.

Introduction

Emphysematous pyelonephritis (EPN) is a severe, acute necrotizing infection with formation of gas in the collecting system, renal parenchyma and perirenal tissues. It is a life-threatening condition with a high mortality rate. It predominantly affects female diabetics and can occur in patients with Type I and Type II diabetes. Rare cases have been reported in non-diabetics who have other contributing factors such as immunosuppression, urinary tract obstruction secondary to stones, tumor or sloughed papilla.¹ Rarely it has been seen in patients with autosomal dominant polycystic kidney disease.^{2,3} The factors that predispose to EPN in diabetics may include uncontrolled diabetes mellitus, high level of glycosylated haemoglobin and impaired host immune mechanism. The majority of cases reported are unilateral, occur in patients with diabetes mellitus or

urinary tract obstruction, and more commonly affect the left kidney.^{4,5} One of the major health problems faced particularly by the developing world since ages is that of tuberculosis (TB).⁶ Genitourinary tuberculosis (GUTB) is the second most common extra-pulmonary TB, with kidney being the most frequent site of infection.⁶ We report a case of Emphysematous pyelonephritis (EPN) with uncontrolled diabetes mellitus later diagnosed as a case of renal tuberculosis.

Case Report

A 85-year-old Bangladeshi male patient hailing from Islambag, Dhaka got admitted to Anwer Khan Modern Medical College Hospital through the Emergency Department on 13.6.19 at 8.30 pm with the complaints of fever and cough for 15 days and

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difficulty in micturition, frequency, urgency, high colour urine and loin pain for 4 days. He had no previous significant history. He is known a case of Diabetes mellitus for 5 years. On clinical examination temperature was raised and renal angle tenderness was present on left side. He had H/O partial gastrectomy with gastrojejunostomy 30 years back. After all lab investigations (Table 1) he was diagnosed as a case of Renal tuberculosis leading to Emphysematous pyelonephritis with Pulmonary tuberculosis with Diabetes mellitus with mild renal impairment. Anti TB drugs were started and Insulin was added to control diabetes. Patient started recovering clinically and follow up X-ray after 1 and half months showed, no gas in the renal area and in Gene X-pert of urine and sputum, MTB not detected. The patient was discharged from the hospital with anti TB drugs for 8 months and Insulin and advised to come for follow up in the Out Patient Department.

Table - I: The Patient's laboratory results

1.	CBC (Complete Blood Count)	
	Haemoglobin	9.5 gm/dl
	Erythrocyte Sedimentation Rate	56 mm in 1 st hour
	TC of White Blood Cell	10.00 X 10 ⁹ /L
	Neutrophils	78%
	Lymphocytes	13%
	Monocytes	9%
	Eosinophils	1%
	Basophils	0%
	Red Blood Cells (RBC)	3.79 X 10 ¹² /L
	Platelets	526.00 X 10 ⁹ /L
	Packed Cell Volume	30.20%
	Mean Corpuscular Haemoglobin	25.00 pg/ml
2.	Blood C/S	No growth
3.	Urine R/E	
	Albumin	Trace
	Sugar	+++
	Push Cell	Plenty/HPF (High Power Field)
	RBC	2-3/HPF
4.	Urine C/S	No growth
5.	Serum Creatinine	1.84 mg/dl
6.	Blood Urea	38 mg/dl

7.	Serum Electrolytes	
	Sodium (Na ⁺)	126 mmol/L
	Potassium (K ⁺)	2.8 mmol/L
	Chloride (Cl ⁻)	96 mmol/L
	Bicarbonate (HCO ₃ ⁺)	26 mmol/L
8.	SGPT	69 U/L
9.	Serum Bilirubin	0.40 mg/dl
10.	Serum Alkaline Phosphatase	103 U/L
11.	GGT	61 U/L
12.	Serum Total Protein	60 gm/L
13.	Serum Albumin	24 gm/L
14.	Serum Globulin	36 gm/L
15.	Serum Magnesium	2.03 mmol/L
16.	Serum Uric Acid	2.2 mg/dl
17.	HbA _{1c}	9.1%
18.	Serum Vitamin D3	10.3 ng/ml
19.	Parathyroid Hormone	136.90 pg/ml
20.	Plain X-ray KUB	Gas filled left renal region consistent with left Emphysematous Pyelonephritis (Fig: 1)
21.	Ultra-sonogram of whole abdomen	Ill defined mixed echogenic left kidney with evidence of multiple air pockets near the lower pole (Emphysematous Pyelonephritis should be excluded), Chronic Cystitis (UTI) evidence by thick and irregular bladder wall (Fig: 2, 3)
22.	CT Scan of Renal Urogram	Non excretory left kidney with Emphysematous Pyelonephritis and chronic prostatitis (Fig: 4, 5)
23.	HRCT Chest	Suggestive of bilateral interstitial lung disease, intra-pulmonary fibrosis. Bilateral pulmonary emphysematous change. Left-sided pleural effusion. Sub centimetric mediastinal lymph nodes. (Fig: 6, 7)

24. Fibre optic bronchoscopy	Cytology
25. Bronchoalveolar lavage	Cytospin smears show mostly RBCs along with polymorphs, lymphocytes and histiocytes including carbon laden histiocytes. No malignant cell is seen. C/S-No Growth Fungus (Yeast/mould)-Not found Negative
26. Mantoux Test	MTB Detected
27. Urine for Gene X-pert test	MTB Detected
28. Sputum for Gene X-pert test	15U/L
29. Pleural Fluid	28 gm/L
ADA (Adenosine deaminase)	230 mg/dl
Biochemical-Protein	
Sugar	

Table - II: Types of emphysematous pyelonephritis

Type-I: Characterized by parenchymal destruction with either absence of fluid collection or presence of streaky or mottled gas.

Type-II: Characterized as either renal or perirenal fluid collections with bubbly or loculated gas or gas in the collecting system.

Table-III: Classification of emphysematous pyelonephritis

- 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.

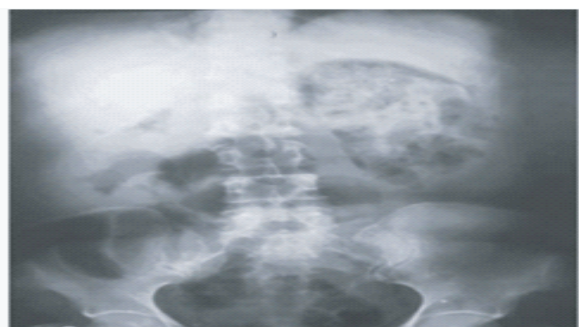


Fig: 1

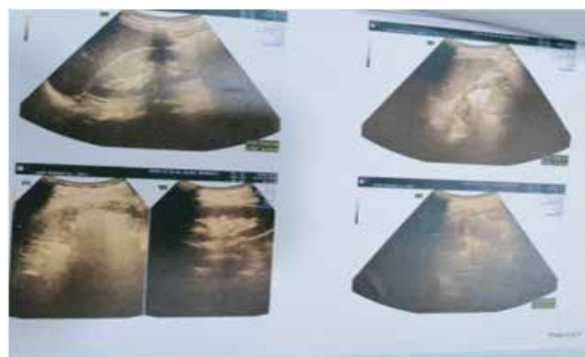


Fig: 2



Fig: 3

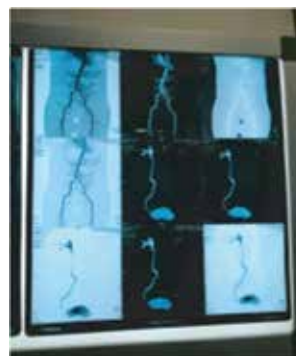


Fig: 4



Fig: 5

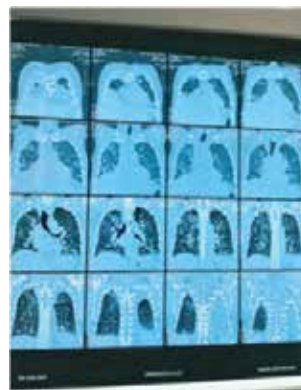


Fig: 6

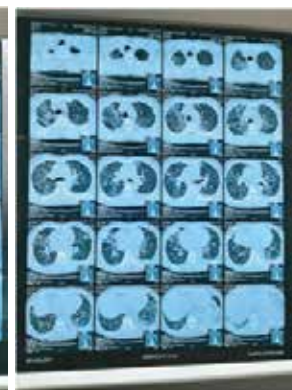


Fig: 7

Discussion

EPN was first described in 1898, in association with pneumaturia as a result of gas forming pathogens.⁷ EPN occurs more than 90% of cases in diabetics with poor glycemic control. Other predisposing factors include urinary tract obstruction, polycystic kidneys, end stage renal disease and immunosuppression.^{4,5} Pathogenesis of EPN remains unclear, however four factors have been implicated, including gas forming bacteria, high tissue glucose level (favoring rapid bacterial growth), impaired tissue perfusion (Diabetic nephropathy) leading to further compromise of regional oxygen delivery in the kidney resulting in tissue ischemia and a defective immune response due to impaired vascular supply. Intra-renal thrombi and renal infarctions have been claimed to be the predisposing factors in non-diabetic patients.^{4,5}

The main bacteria causing emphysematous pyelonephritis are the classical organism of urinary tract infection. The most common is *Escherichia coli*. Other bacteria include *Klebsiella pneumoniae*, *Proteus mirabilis* and *Pseudomonas aeruginosa*.^{8,9} The mean patient age is 55 years old and women outnumber men probably due to their increase susceptibility to urinary tract infections. The left kidney is more frequently involved than the right one.⁴ All the cases reported so far were female patients. But we reported a male patient which was similar to the report of Rafailidis V *et al.*¹⁰ In most of the case reported patients age were around 60 years. But our patient was 85 years old which was similar to that reported by Ali M and Barlas NB11. *E. coli*, *Klebsiella* and *Pseudomonas* were the common organisms.^{10,11} But we found a case of EPN due to invasion of *Mycobacterium tuberculosis* which was different from other studies.

Clinical manifestation of EPN appear to be similar to those encountered in classical cases of upper urinary tract infections. According to Huang and Tseng fever was encountered in 79% of the patients, abdominal and back pain in 71%, nausea and vomiting in 17%, lethargy and confusion in 19%, dyspnea in 13% and shock in 29%.⁴ However, anaerobic infection is extremely uncommon and data appears to be compatible with those generally reported in the literature.¹²⁻¹⁶

Various imaging techniques can be used to detect gas within the genitourinary system. Ultrasound is

insensitive for the diagnosis of renal gas, but useful in diagnosing urinary tract obstruction. It is also a readily available, noninvasive method that is quite useful in the hands of experienced practitioners.¹⁴ Non-contrast CT scan remains the diagnostic method of choice. In addition to showing the presence of gas, it defines the extent of the infection and can diagnose any obstruction.^{4,5} Two staging systems based on CT findings, have been proposed for prognostic and therapeutic reasons. Wan *et al.* described two types where type-I had a mortality rate of 69% and that of type-II was 18% (Table-2).¹⁷ Huang and Tseng defined four classes (Table-3).⁴

The treatment of EPN remains controversial. According to some investigators vigorous resuscitation, administration of antimicrobial agents and control of blood glucose and electrolytes should be followed by immediate nephrectomy.^{5,8} Huang and Tseng proposed certain therapeutic modalities based upon their radiological classification system.⁴ For extensive EPN (Classes 3 and 4) without signs of organ dysfunction antibiotic therapy combined with percutaneous catheter placement should be attempted.⁴ But nephrectomy should be promptly attempted in patients with extensive EPN and signs of organ dysfunction. Risk factors indicating poor prognosis include thrombocytopenia, acute renal failure, disturbance of consciousness and shock.^{4,18} Flagas *et al.* suggested that increased serum creatinine level, disturbance of consciousness and hypotension may need further research to confirm their potential use as risk factors for fetal outcome.¹⁹ Furthermore, their meta-analysis suggest that conservative treatment alone is a risk factor for advance outcome, although one must take into consideration the different scheme, used by the authors of the studies included, when defining terms such as conservative treatment.

Conclusion

In high risk groups, such, as diabetics, presenting with persistent upper urinary tract infection semiology that does not resolve with proper antibiotic treatment, the presence of a severe renal infection should be considered. CT guided percutaneous drainage or open drainage, along with antibiotic treatment, may be a reasonable alternative to nephrectomy. Suspecting genitourinary tuberculosis is very important in a case of emphysematous pyelonephritis. In such cases,

particularly in a high endemic area for tuberculosis, therapeutic trial of anti-tubercular drugs may also be considered to avoid unnecessary surgical intervention and end stage renal disease.

Conflict of interest: none

References

1. Craig WD, Wagner BJ, Travis MD. Pyelonephritis: radiologic-pathologic review. *Radiographics* 2008; **28**(1): 255-76.
2. Vadachia Y, Strachan M, Przybojewski SJ, Kathan DL. Emphysematous pyelonephritis in a patient with polycystic kidney disease. *SA J Radiol* 2006; **10**(3): 30-2.
3. Azzini AM, Sette P, Castellano G, Dorizzi RM. A rare association of emphysematous pyelonephritis with unrecognized diabetes and polycystic kidney. *Indian J Nephrol* 2009; **19**: 20-2.
4. Huang JJ, Tseng CC. Emphysematous pyelonephritis: Clinicoradiological classification, management, prognosis and pathogenesis. *Arch Intern Med* 2000; **160**: 797-805.
5. Shokeir AA, El-Azab M, Mohsen T, El-Diasty T. Emphysematous pyelonephritis: a 15 year experience with 20 cases. *Urology* 1997; **49**: 343-6.
6. Renal tuberculosis presenting as acute pyelonephritis- A rarity. Verma AK, Mishra AK, Kumar M, Kant S, Singh A, Singh A. *IJTB* 2016; **63**(3): 210-213.
7. Kelly HA, Mac Callum WG. Pneumaturia. *JAMA* 1898; **31**: 375-81.
8. 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**(6): 1086-88.
9. Wang JM, Lim HK, Pang KK. Emphysematous pyelonephritis. *Scand J Urol Nephrol* 2007; **41**(3): 223-29.
10. Rafailidis V, Karadimou V, Liouliakis C, Kougioumtzoglou D. Emphysematous pyelonephritis: a case report. *Hippokratia* 2013; **17**(4): 373-375.
11. Ali M, Barlas NB. Emphysematous pyelonephritis: A case report. *IJDM* 2010; **2**: 130-132.
12. Tseng CC, Wu JJ, Wang MC, Hor LI, Ko YH, Huang JJ. Host and bacterial virulence factors predisposing to emphysematous pyelonephritis. *Am J Kidney Dis* 2005; **46**(3): 432-39.
13. Christensen J, Bistrup C. Case report: Emphysematous pyelonephritis caused by clostridium septicum and complicated by a mycoticaneurism. *Br J Radiol* 1993; **66**(789): 842-43.
14. Mallet M, Knockkaert DC, Oyen RH, Van Poppel HP. Emphysematous pyelonephritis: no longer a surgical disease? *Eur J Emerg Med* 2002; **9**(3): 266-69.
15. Stone SC, Mallon WK, Childs JM, Docherty SD. Emphysematous pyelonephritis: clues to rapid diagnosis in the Emergency Department. *J Emerg Med* 2005; **28**(3): 315-19.
16. Vetere NS, Monti J, Gutman D. A case report of emphysematous pyelonephritis secondary to ureteral obstruction in a non-diabetic patient. *Am J Emerg Med* 2006; **24**(6): 749-50.
17. Wan YL, Lee TY, Bullard MJ, Tsai CC. Acute gas-producing bacterial renal infection: correlation between imaging findings and clinical outcome. *Radiology* 1996; **198**(2): 433-38.
18. Wan YL, Lo SK, Bullard MJ, Chang PL, Lee TY. Predictors of outcome in emphysematous pyelonephritis. *J Urol* 1998; **159**(2): 369-73.
19. Falagas ME, Alexiou VG, Giannopoulou KP, Siempos II. Risk factors for mortality in patients with emphysematous pyelonephritis. *J Urol* 1968; **98**: 742-46.