Infections and Inflammation

Case report

A near-fatal case of emphysematous pyelonephritis: Embracing the new management ‘gold standard’ – Saving the life while saving the kidney!

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Received 31 July 2016; accepted 23 August 2016
Available online 17 January 2017

Abstract

Introduction: Emphysematous pyelonephritis (EPN) is a rare, acute, severe infection of the renal parenchyma and its surrounding tissues and is associated with a significant morbidity and mortality. Underlying diabetes is the most commonly associated risk factor.

Observation: We report on the presence of EPN (Grade 3a) in a patient with poorly controlled diabetes, who presented in septic shock due to EPN. Although previous older treatment algorithms would proceed with an immediate nephrectomy, based on her grade, she was successfully managed by incorporating the new treatment ‘gold standard’: medical management with percutaneous drainage. A high index of suspicion is required to detect and manage this life-threatening condition associated with diabetes, since the presenting symptoms may be non-specific. The diagnosis, risk factors, and current management options of EPN are expanded further.

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A near-fatal case of emphysematous pyelonephritis

Case report

A 44-year-old woman presented to the emergency department with a 3-day history of right-sided flank pain. Examination revealed signs of septic shock. A background history of insulin dependent diabetes, with poor compliance was noted. A leukocytosis (20.60 x 109/L), elevated C-Reactive Protein (231 mg/L) and hyperglycaemia was present. Plain abdominal X-ray (erect) films revealed an air fluid level in the right upper quadrant (Fig. 1A, white arrows). A diagnosis of emphysematous pyelonephritis (grade 3A) was made on the contrasted abdominal CT scan (Fig. 1B).

This was managed by ultrasound-guided percutaneous drainage (PCD). During insertion of the pig-tail catheter (14 Fr), pus and gas bubbles (Fig. 1C, white arrow) could be seen around the dilating guide-wire (Fig. 1C, blue arrow). Blood, pus and urine cultures revealed Escherichia coli sensitive to Cefuroxime/Ampicillin/ Ceftriaxone. Follow-up scan (3 days post-intervention) showed a significant reduction in the collection (Fig. 1D).

The glycaemic control was optimised. She responded well to antibiotics and was discharged 12 days after her initial admission. At her one year follow-up she still remains asymptomatic.

Discussion

EPN may occur in both, insulin-dependent or non-insulin-dependent patients with diabetes, even in the absence of ureteric obstruction. Patients without diabetes may also develop EPN, but the extent of disease is more limited [4]. Females are at particular risk due to their propensity to developing urinary tract infections [1]. E. coli or Klebsiella pneumoniae infection in patients with diabetes mellitus and/or urinary tract obstruction are two key aetiological factors in the development of EPN [5].

Factors within the pathogenesis of EPN include; elevated glucose tissue levels, impaired vascular supply, the presence of gas-forming organisms, reduced immunity and urinary tract obstruction [1].

With the glucose and lactate fermentation from gas producing Gram-negative organisms, an elevated local tissue carbon dioxide and hydrogen production results [1].

In confirming the diagnosis, there are no distinct pathognomonic features, however; costovertebral angle tenderness, abdominal distraction and tenderness, leukocytosis, hyperglycaemia, electrolyte and acid-base imbalance may be present [6].

Radiological features on abdominal X-rays include; effacement of ipsilateral psoas muscle image and ‘gas bubbles’ within the renal parenchyma [6]. Details of the ultra-sound acoustic shadow may help discern EPN from an underlying calculus, since the posterior acoustic shadowing is ‘dirty’ in cases of EPN, and ‘clean’ in cases of calculus [2].

Based on the extension and location of the gas formation, on contrasted CT scan, Huang and Tseng developed a classification...
grading from 1 to 4 [5]. Since renal dysfunction may be present in diabetes, intravenous contrast must be administered with caution [6].

Management of EPN consists mostly of resuscitation, and treatment of shock, correction of electrolyte imbalance, glycemic regulation, and relief of any obstruction. Urine and blood cultures should be obtained and parenteral empiric broad-spectrum antibiotics should be initiated. Specific antibiotic therapy should be tailored to culture sensitivity results [6]. Since Gram-negative bacteria are commonly isolated in EPN, the initial antibiotics considered include, Aminoglycosides, ß-lactamase inhibitors, cephalosporins and quinolones [1].

PCD is minimally invasive and allows for nephron-sparing (as observed in our index case) and simple pressure relief of the underlying gaseous collection. It also may result in an acceptable success rate even within severe grades of EPN [5].

The PCD also relieves pressure on the underlying renal parenchymal tissue and may be flushed with anti-biotic solution if needed. The PCD stays in situ until imaging evidence has confirmed resolution of the collection [1].

Urteral stenting may not be used as sole therapy as they may obstruct, or produce an anterograde cystitis and they do not adequately access or drain the peri-nephric space [1,7].

CT guided PCD insertion has a better success rate than ultra-sound guided insertion, furthermore PCD has even proved successful in the presence of loculations [1]. Chen et al., recommend the use of at least a 14 Fr Malecot catheter, based on their experience of 25 patients reviewed over a decade [8].

Poor prognostic factors in EPN associated with mortality, include; thrombocytopenia, disturbance of consciousness, and signs of shock (as observed in our index case) [5].

PCD failure is defined as progressive or persistent lesions post percutaneous drainage, that is also accompanied by an adverse clinical picture [5].

Recent systematic reviews, have recognised the role of delayed nephrectomy in EPN, however the evidence supports antibiotics with PCD as the new ‘gold standard’ in initial EPN management [9,10]. Furthermore, PCD with medical management showed a lower mortality compared to emergency nephrectomy [9,10].

In conclusion, rather than emergency nephrectomy (depending on the clinico pathological grade), PCD and medical management has now become first line therapy in EPN [5,10]. As illustrated here, this new ‘gold standard’ should be advocated, where possible, as it may result in ‘saving the kidney’ while ‘saving the life’!

Authors’ contributions
AA – contributed to the inception, concept, design, drafting, reviewing intellectual content, image selection.

KS – contributed to the design and drafting of the manuscript.

Ethical committee approval
Ethics Clearance Certificate Number: M160396, Date: 18/04/16, Chairman: Professor Peter Cleaton-Jones, Institution: Human Research Ethics Committee (Medical), University of the Witwatersrand.

Conflict of interest
Authors have none to declare.

Source of funding
Authors have none to declare.

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