A Case of Emphysematous Pyelonephritis

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Introduction

Emphysematous pyelonephritis (EPN) is an acute necrotising infection of the renal system caused by anaerobic uro-pathogens. The majority of patients have diabetes mellitus.

- Clinical presentation is very similar to that of pyelonephritis and includes fever, abdominal or flank pain, acute kidney injury, dysuria, nausea and vomiting.
- Organisms associated with EPN are Klebsiella species, Proteus, Pseudomonas, Streptococcus and most commonly as in this case Escherichia Coli.
- Traditional management has been surgical, however there is increasing evidence basis for good outcomes following medical management.

Case Report

A 34-year-old lady with a background of very poorly controlled diabetes presented to the Emergency Department in Diabetic Ketoacidosis (DKA). She had been known to the diabetic team but had repeatedly missed appointments over the previous 8 years.

As well as evidence of DKA her bloods revealed an acute kidney injury with urea 24.1, creatinine 181 and eGFR 28, a CRP of 357 and platelets 51. Blood gas showed a pH 7.30 glucose of 34 lactate 2.5, base excess -8.6.

She was managed with aggressive IV fluids, insulin infusion, stat dose of IV Gentamicin, IV Co-Amoxiclav and careful monitoring of electrolytes. Over the next 14 hours her DKA had resolved and renal function improved to urea 21.2, creatinine 105 and eGFR 52.

Unfortunately around 20 hours into her admission her clinical condition started to deteriorate. She was drowsy, tachycardic, tachypnoeic, pyrexial and producing only a small amount of concentrated frothy urine.

On review she had a diffusely tender abdomen with focal areas on her left flank. A CT abdomen revealed a diagnosis of severe emphysematous pyelonephritis, which unfortunately had destroyed the majority of her left renal cortex.

Gentamicin was continued regularly on advice from Microbiology. The Urology team reviewed urgently and arranged to undertake percutaneous stenting the next morning. The procedure went successfully and she had post-operative care in ITU.

Recovery was complicated with cholestatic jaundice caused by Co-Amoxiclav and persisting raised temperatures. Conversion to Metronidazole and Ciprofloxacin resolved this issue and her renal function returned to normal. After completing a 14 day course she was discharged with prophylactic Nitrofurantoin.

Her HbA1c was found to be 122 and intensive educational input was provided by the Diabetic team.

Follow up DMSA revealed only 11% function in left kidney and nephrectomy is planned. See Figure 2.

Discussion

Emphysematous pyelonephritis (EPN) is a rare, severe gas-forming infection of the renal parenchyma and peri-renal tissues.

Type 2 diabetes is comorbid in up to 95% of patients (6), generally this is poorly controlled with high blood sugar levels or glycosylated haemoglobin (>72%) (0.5, 6).

In EPN without diabetes, 22% of patients have renal calculi, 4% have polycystic kidneys and 4% have end-stage renal failure (0.5, 6).

Organisms most commonly associated with EPN are Escherichia coli (66%) and Klebsiella species. Ideally positive blood culture results and urine culture results occur in approximately 50% of patients (0).

Bacterial replication and fermentation is facilitated by a hyperglycaemic milieu caused by impaired tissue perfusion or urinary obstruction (6).

Necrotic tissue then acts as a substrate to augment gas production (6,10). Also, tissue ischaemia inhibits the dispersion of locally produced gas and prevents effective delivery of antibiotics to the site of infection (6).

Clinical presentation is very similar to that of pyelonephritis with fever, abdominal or flank pain, acute kidney injury, dysuria and nausea and vomiting. Subcutaneous emphysema and crepitus on the flank area may occur in very severe cases.

A plain radiograph may show a characteristic gas shadow in the renal bed and ultrasound may also visualize large gas locules (1). CT is gold standard imaging and will confirm the presence of intra-renal gas.

Surgical treatment such as ureteric stenting or nephrectomy should be considered in those who fail to respond to conservative management and have ongoing septic shock despite resuscitation efforts. This is itself a hazardous intervention in a septic patient with high rates of complications including haemorrhage, local trauma, perinephric abscess and postoperative wound infection due to compromised wound healing. Increasing evidence has emerged demonstrating improved survival rates following aggressive medical management compared to surgical outcomes (4).

In conclusion patients with severe EPN often present in extremis and require intensive medical treatment. The diagnosis must be entertained in diabetic women presenting with flank pain and septicaemia. The function of the affected kidney is often very poor.

Learning Points

- Control of diabetes, resuscitative management and minimally invasive treatment have improved outcomes in EPN.
- Where nephrectomy has traditionally been performed, a trial of medical management with drainage should be employed.
- There is ongoing need for classification of severity of EPN in order to guide management decisions.
- Whilst CT scanning is the Gold standard imaging modality, the role of bedside US scanning early in admission has yet to be explored.
- Given the increasing evidence supporting equally successful outcomes in medically managed EPN compared to surgical intervention, randomized controlled studies are greatly needed to guide future practice.

References: