CASE REPORT

Emphysematous pyelonephritis in decompensated diabetes: A case report and review of the literature.

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Emphysematous pyelonephritis is a rare and severe renal parenchyma necrotizing infection visible just in diabetic patients which results in gas presence – probably produced through the glucose fermentation process – in the collecting system, renal parenchyma and perirenal tissue (1-3). We present a case of a not known diabetic female patient with emphysematous pyelonephritis of the left kidney and emphysematous pyelitis of the contralateral kidney.

KEY WORDS: Pyelonephritis; Genito-urinary infection; Decompensated diabetes; Lactose fermenting bacteria.

Summary

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CASE REPORT

A 59 years old woman with a pathologic anamnesis of blood hypertension and depressive syndrome, presented to our emergency department with a 3-day history of hypotenasia, fatigue and lack of appetite. Furthermore, the day of the admission to our hospital she was clearly confused and disoriented in time and space. At physical examination she had left flank pain, her body temperature was 37.2°C, SpO2 95%, heart rate 100 beats/min and blood pressure 90/60 mmHg.

Laboratory data revealed a white blood cell count of 20770/mm3 and platelet count of 19000/mm3, glucose 953 mg/dl and creatinine of 2.0 mg/dl. Urinalysis showed a severe pyuria. A plain abdominal radiograph revealed no pathological findings (Figure 1). Antibiotic and antidiabetic therapy were started.

An abdominal ultrasound was performed revealing a normal right kidney with hyperechoic structures within a non-dilated lower calyx with strong acoustic shadowing misinterpreted as a calculus. The left kidney couldn’t be identified because totally obscured by gas. Therefore the patient underwent a contrast enhanced computed tomography (CT) of abdomen in the suspect of a renal abscess. CT revealed a left kidney totally replaced by abundant gas bubbles within the collecting systems and the renal parenchyma extended to the perinephric and retroperitoneal space (Figure 2). The images interpreted as a calculus at the ultrasound were shown to be a limited air collection within the lower calyx of the right kidney.

The CT findings gave evidence of a clear case of emphysematous pyelonephritis. Given the high risk of disease progression a CT-guided percutaneous 16 Ch catheter drainage of the left kidney was immediately performed.

The CT control done 12 hours later (Figure 3) didn’t anyway show significant clinical or radiological improvement therefore the patient underwent immediate nephrectomy. The antibiotic therapy (imipenem+cilastatin) solved instead the gas collection within the right calyx.

Urine, blood and aspirated pus cultures showed that the responsible bacteria was Klebsiella Pneumoniae. The patient received parenteral antibiotic for 25 days and was sent home 30 days after admission with an optimized therapy for the diabetes, platelet amount of 191000/mm3, white blood cells 7970/mm3 and a creatinine of 0.9 mg/dl.
Emphysematous pyelonephritis (EPN) is a rare life threatening necrotising renal infection that needs quick diagnosis and early treatment. Most patients are women (2:1) and diabetic (90%) with a mean age of presentation of 55 year. Michaeli and co-workers reviewed 55 cases and found the left kidney to be most often involved (53% cases), whereas 35% cases involved the right kidney and 7% had bilateral involvement. At presentation patients are usually significantly ill and complain of fever, flank pain, hyperglycaemia and electrolyte and acid-base disturbances.

The postulated mechanism of gas formation is infection by Gram-negative facultative anaerobic organisms causing fermentation of glucose which is present in high concentrations in kidney, producing carbon dioxide. *E. Coli* is the most common causative organism (62-70% of cases), less common are *Klebsiella Pneumoniae* and *Proteus*.

Factors that may be involved in the pathogenesis of EPN include: gas-forming bacteria, high tissue glucose level, impaired tissue perfusion, obstruction of the urinary tract and a defective immune response (5, 6).

A plain film of the abdomen may show mottled gas within the renal outline and extension into perinephric space or retroperitoneum through Gerota’s fascia. Michaeli and co-workers proposed a classification on plain film findings:

**Stage 1**: Gas in either the renal parenchyma or the perinephric tissues;

**Stage 2**: Gas in both the kidney and its surroundings

**Stage 3**: Extension through Gerota’s fascia and/or bilateral EPN.

Plain film also can show the presence of calculi, if any. We think that plain abdominal X-ray is diagnostic only in advanced stages, demonstrating...
streaky and mottled gas in the kidney, a crescent-shaped gas in the renal space and gas collection in the retroperitoneal spaces.

Ultrasound shows echogenic foci in the renal parenchyma or perirenal space. On sonography gas will cause echogenic foci (“comet tail artefacts”) which can be mistaken for calculi (as shown in our case) or bowel gas. For this reason non-visualization of the kidney (gassed out kidney) on ultrasound warrants CT. Ultrasound has advantages over CT; it is cheap, non invasive and easily available. But it is an operator-dependent technique and is not very good at characterization of gas-containing lesions.

CT is the preferred diagnostic technique for EPN because it is well-describing the extent and the quantification of the gas and also gives an idea about the destruction of the renal parenchyma. It also provides better guidance for placement of the catheter when a lot of gas is present in the area of interest, so surely it offers a conservative treatment technique for EPN in the form of percutaneous nephrostomy or drainage.

Despite the different imaging modalities for EPN, urinary tract infections are very common, therefore imaging is usually reserved for patients who don’t respond to therapy and for those with atypical and aggressive clinical presentation.

Treatment of EPN has been controversial: several studies suggested immediate nephrectomy (8-10); other authors claim that percutaneous drainage offers several advantages because it is cost-effective, easy to perform, takes very little time, is performed under local anesthesia and does not require a sterile operation theatre. These authors concluded that percutaneous drainage and antibiotic treatment should always be the initial management strategy because it is associated with a lower mortality (11-16).

Wan et al. (3) defined two types of EPN. Type I includes patients with renal parenchymal destruction with gas formation but without fluid collection. These patients had a mortality rate of 69%. Type II includes patients with renal or perinephric fluid collection that contained bubble of gas and/or gas in collecting system. The mortality rate in this group was 18%. The pathological findings of type I include necrosis, hemorrhagic infarction and a fragile and spongy kidney with “honeycomb like” gas containing spaces. Microscopic pathology reveals vasculitis, extensive necrosis, microscopic abscesses and infarcts.

Pathological type II EPN is characterised by diffuse infiltration of acute and chronic inflammatory cells, exudates, abscess formation and necrosis. The streaky/mottled gas pattern and absence of exudative response in patients with type I EPN may reflect a defective immune reaction in the host, while the presence of exudates in patients with type II suggests a better host immunity and hence a more favourable prognosis.

Besides according to Wan et al. patient with creatinine levels greater than 1.4 mg/dl and platelet 60000/mm c or less are at highest risks of death.

Huang and Tseng (17) described four classes of EPN. Class 1 includes patients with gas limited in the collecting system (emphysematous pyelitis). In class 2 there was evidence of gas in the renal parenchyma. Class 3A was characterised by gas in the perinephric space and class 3B by gas in the pararenal space. Class 4 includes patients with bilateral EPN or patients with disease in a solitary kidney. They also noted that thrombocytopenia, disturbance of consciousness, shock, severe proteinuria and acute renal function impairment at the moment of hospital admission seemed to be a risk factor for poor outcome.

Class 1 and 2 patients had the best prognosis and were successfully treated with percutaneous drainage combined with antibiotic treatment. In class 3 and 4 patients with less than two risk factors, percutaneous drainage combined with antibiotic treatment could be attempted; however nephrectomy should be immediately performed in patients with a fulminant course and in class 3 and 4 with more than two risk factors.

The extension of the disease to almost all the left renal parenchyma and perinephric space, the abundant gas in the retroperitoneal space and the presence of gas in the right lower calyx classified our case as class 4 of Huang and Tseng and as a type 1 of Wan et al. The aggressive course of EPN and the presence of risk factors such as disturbance of consciousness, thrombocytopenia, hypotension, high creatinine level and severe proteinuria, indicated that our patient had a high mortality risk. Despite a poor prognosis the patient was discharged fully recovered 30 days after admission in subjective well-being.

CONCLUSION

Although plain abdominal X-ray and US are useful, CT is the most important imaging modality in EPN, not just as a guide for percutaneous drainage positioning, but even because it provides specific findings and accurate assessment of the extrarenal extent of infection, clarifying the “class of risk” which is essential for surgical planning. The gold standard therapy is still today controversial: while some authors suggest immediate nephrectomy, other authors describe as “mandatory” initial treatment strategy percutaneous drainage associated to antibiotic treatment.

What we suggest is that, in accord with our experience, the conservative approach doesn’t guarantee valid clinical results in absence of adequate fluid collection.

BIBLIOGRAPHY


