Emphysematous pyelonephritis: a case report
Published on 16.07.2009

DOI: 10.1594/EURORAD/CASE.7673
ISSN: 1563-4086
Section: Uroradiology & genital male imaging
Case Type: Clinical Cases
Authors: Pavone S., Oreste D.
Patient: 74 years, female

Clinical History:
A 74 year old woman with a history of diabetes presented with diffuse abdominal pain, anuria, fever and worsening of general state. For her septic state with peritoneum suffering, a CT evaluation was required.

Imaging Findings:
CT examination was made with single detector row equipment, before and after intravenous injection of iodinated contrast medium. The axial scans showed enlargement of the left kidney with frontally dislocated, even if the corticomedullary phase showed normal enhancement of the kidney cortex (Fig 1). An obstructing stone was present in the pyelo-ureteral joint, determining severe ectasis of the upper urinary tract (Fig 2). A great amount of gas was found in the kidney medulla and in pyelo-caliceal cavities and in their contiguity a fluid containing sac with small gas bubbles was found (Fig 2-4). There was also imbibitions of the peri-nepheric areas as a retroperitoneal extension of the process (Fig 5). The final diagnosis was emphysematous pyelonephritis of the left kidney (Type II according Wan classification). The treatment was based on antibiotic therapy and urine drainage by a double J stent. The evolution was favourable.

Discussion:
Emphysematous pyelonephritis (EPN) is a rare severe form of necrotizing acute pyelonephritis, generally affecting female diabetic patients (up to 90% patients), defined as the presence of gas-producing bacteria in the kidney (generally unilaterally) and in peri-nepheric areas. Urinary collecting system obstruction from pathologic conditions such as stone disease is commonly found. E. coli is the causative bacterial source in approximately 70% of cases, while Klebsiella, Candida, and Pseudomonas species are less frequently isolated. The clinical diagnosis of EPN may be difficult as the symptoms are usually non-specific including fever, nausea, general malaise, flank pain and dysuria. In the absence of a rapid and effective treatment it is associated with a high mortality, as rapid progression to septic shock may be seen. CT scan is mandatory to confirm diagnosis, even if conventional radiography may demonstrate gas bubbles overlying the renal fossa or may show a diffusely mottled kidney with radially oriented gas corresponding to the renal pyramids. However these findings are frequently misinterpreted as bowel gas. CT scans confirm the presence and extent of parenchymal gas and allow the identification of obstruction cause when present. The use of intravenous contrast material often reveals asymmetric renal enhancement or delayed excretion, and, during the nephrographic phase, will help identify areas of focal tissue necrosis or abscess formation.

A CT classification scheme proposed by Wan et al divides EPN into two types with different prognostic significance. Type I is characterized by parenchymal destruction with streaky or mottled gas collections but no fluid collections. Type II is characterized by bubbly or loculated gas within the parenchyma or collecting system with associated renal or perirenal fluid collections, that are thought to represent a favourable immune response. Our case showed normal enhancement of the kidney cortex during corticomedullary phase so it was classified as Type II. Type I EPN has a 69% mortality rate versus 18% for type II, although transformation from type I to type II has been observed following
conservative treatment. With minimal functional impairment and localized disease (discrete abscess or focal pyelonephritis), percutaneous drainage or partial nephrectomy may be attempted, whereas poor renal function would be an indication for total nephrectomy. Generally in non-diabetic patients, successful removal of an obstruction, surgical or percutaneous drainage, and aggressive antimicrobial management may be sufficient.

**Differential Diagnosis List:** Emphysematous pyelonephritis

**Final Diagnosis:** Emphysematous pyelonephritis
Description: Enlargement of the left kidney, frontly dislocated. The arterial phase shows normal enhancement of the kidney cortex. Origin:
Description: An obstructing stone (arrow) is present in the pyelo-ureteral joint, determining severe ectasis of the upper urinary tract. A great amount of gas (stars) was found in the kidney medulla and in pyelo-caliceal cavities. Origin:
Description: Arterial phase: besides the features showed in Fig. 2 a small cortical abscess (arrowhead) is present. Origin:
Figure 4

Description: Nephrographic phase: a fluid containing sac with small gas bubbles (arrowhead) abscess-like. Origin:
Figure 5

Description: Extension of the process in the peri-nephretic areas (arrows). This feature is characteristic of Type II EPNs. 

Origin: