Renal and perinephric abscesses

Introduction

- **Gas-forming infections** are rare in renal bacterial infections. They appear as emphysematous pyelonephritis or renal/perinephric abscesses.
- **Emphysematous Pyelonephritis**: a necrotizing infection characterized by the presence of gas bubbles in the parenchyma and perirenal space. Emphysematous pyelitis occurs when the infection only affects the urinary tract and not the parenchyma.
- **Renal abscess**: an infection generally found in diabetic patients with a urinary tract infection, usually caused by *E. coli* (bacteria that form gas from excess glucose) and which is characterized by renal cavities filled with gas and pus. Distinguishing between abscesses and emphysematous pyelonephritis is essential as the former require emergency surgery while the latter, if mild, can be managed with antibiotics and percutaneous drainage.
- **Perinephric abscess**: characterized by the presence of gas and pus in the perinephric space, confined by Gerota’s fascia. This can spread inside the collecting system or to the retroperitoneum, peritoneum, or adjacent pleura.
- **Pyonephrosis**: with enlargement, infection, and obstruction of the upper urinary tract.
- **Focal bacterial nephritis**: a non-suppurative kidney infection that marks the progression of acute pyelonephritis.

Etiology

- **Produced by** the hematogenous spread from an infectious focus or by parenchymal extension of a urinary tract infection.
- **Risk factors**:

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Most frequent species</th>
<th>Less frequent species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal lithiasis</td>
<td><em>Staphylococcus aureus</em></td>
<td><em>Pseudomonas aeruginosa</em></td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td><em>Escherichia coli</em></td>
<td><em>Mycobacterium tuberculosis</em></td>
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<tr>
<td>Renal trauma</td>
<td><em>Proteus</em></td>
<td><em>Candida albicans</em></td>
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<td></td>
<td>Generally polymicrobial infections.</td>
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Clinical symptoms:

- **Emphysematous pyelonephritis**: severely ill patients with *septic shock* in which surgical intervention is imperative; otherwise the mortality rate is 80%.
- **Renal/perirenal abscess**: generally occurs in diabetic patients who are hemodynamically stable and suffering from *abdominal* or *costovertebral pain* and *fever*, with no signs of obstruction in the urinary tract.
- **No symptoms** in the elderly or in patients with autonomic neuropathy (diabetics, alcoholics).
- **These pathologies should be suspected** in patients originally diagnosed with acute pyelonephritis who show no improvement after 5 days of appropriate antimicrobial treatment.

Clinical diagnosis

- **Symptoms**: especially *pain* and signs of *sepsis*.
- **Laboratory tests**:
  - Urine and blood cultures.
  - Urinalysis with *pyuria* and *proteinuria*.
  - *Leukocytosis*, increased *sedimentation rate* and *C-reactive protein*. 
Diagnostic imaging techniques

- **KUB**: renal mass, gas on the renal or perirenal silhouette with disappearance of the psoas contour, signs of pneumonia or empyema, calcium density images of renal outline.
- **IVU**: although not conclusive, this technique shows loss of renal function, as well as renal mass, obstruction, or lithiasis. Only 25% of pyelonephritis cases present urographic abnormalities.
- **Ultrasounds**:
  - Shows the presence of abscesses without clearly defining their extent.
  - Shows the hypoechoic cavity with a hyperechoic rim of thick walls filled with fluid; there is a horizontal separation between an upper level of low echogenicity and a lower, more echogenic level (pus).
  - In other cases, these may be anechoic masses or echogenic intrarenal/perirenal collections.
- **CT scan**: the method of choice.
  - Shows the location and extent of gaseous lesions and their associated pathologies such as subdiaphragmatic abscesses or papillary necrosis.
  - **Abscesses** appear as heterogeneous, hypodense intrarenal or perirenal cavities; contrast is not shown inside these cavities, but rather on their rims (pseudocapsule).
  - **Pyonephrosis** appears as a thickening of the pyelic wall, with dilatation of the urinary tract with purulent content.
  - **Emphysematous pyelonephritis** shows multiple, small, intraparenchymal or perinephritic gas bubbles.
  - **Focal bacterial nephritis** appears as wedge-shaped hypodense areas between the papilla and the renal cortex.

Treatment

- **Basic pillars**: antimicrobial therapy, percutaneous drainage, and removal of the obstruction.
- **Emphysematous pyelonephritis**: requires urgent surgery or percutaneous manipulation.
- **Renal/perirenal abscess**:
  - **Abscesses <5 cm** are treated with Gram-negative antimicrobials plus correction of hyperglycemia and electrolytic alterations. If no improvement occurs within a few hours, a percutaneous approach or surgery are required.
  - **Abscesses >5 cm** or if symptoms persist: drainage is performed. Drainage catheters must remain in place for at least 1 week.
- **Focal bacterial nephritis**: requires only antibiotic treatment and monitoring.
- **Antimicrobial treatment**: to support active measures.

<table>
<thead>
<tr>
<th>Generic name</th>
<th>Brand name ®</th>
<th>Parenteral dose</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefotaxime</td>
<td>CLAFORAN</td>
<td>1 inj of 2 g/8 h</td>
<td>24-48 h</td>
</tr>
<tr>
<td>Piperacillin-Tazobactam</td>
<td>TAZOCIN, TAZOCEL</td>
<td>1 inj of 4/0.5 g/6 h</td>
<td>24-48 h</td>
</tr>
<tr>
<td>Imipenem</td>
<td>TIENAM, PRIMAXIN</td>
<td>1 inj of 1 g/8 h</td>
<td>24-48 h</td>
</tr>
<tr>
<td>Meropenem</td>
<td>MERONEM</td>
<td>1 inj of 1 g/8 h</td>
<td>24-48 h</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>INVANZ</td>
<td>1 inj of 1 g/24 h</td>
<td>24-48 h</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>AZACTAM</td>
<td>1 inj of 1 g/8 h</td>
<td>24-48 h</td>
</tr>
<tr>
<td>Cloxacillin</td>
<td>CLOXACILLIN, EKVACILLIN</td>
<td>1 inj of 1 g/8 h</td>
<td>24-48 h</td>
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