74-year-old presents to the ED with fatigue and myalgias

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Patient Presentation

• The patient is a 74-year-old female with atrial fibrillation, currently on Pradaxa, and type 2 diabetes presenting with fatigue, myalgias and urinary frequency for one week. No aggravating or relieving factors reported.

• Denies fever, chills, nausea, vomiting, chest pain, shortness of breath, coughing, abdominal pain, diarrhea, dysuria, hematuria, black/red stools/vomitus
Pertinent Labs

• Comprehensive metabolic panel significant for glucose of 170 mg/dL
• Hemoglobin A1c: 6.8% in March 2021

• Urinalysis
  • Nitrite +
  • Blood 3+
  • Urobilinogen 2.0
  • RBC 10-25
  • Bacteria- moderate
  • Mucus- rare

• Microbiology- >100,000 CFU/ml *Escherichia coli*
What Imaging Should We Order?

CT abdomen pelvis w/ contrast
Select the applicable ACR Appropriateness Criteria

### Variant 2:

**Acute pyelonephritis. Complicated patient (e.g., diabetes or immunocompromised or history of stones or prior renal surgery or not responding to therapy). Initial imaging.**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT abdomen and pelvis with IV contrast</td>
<td>Usually Appropriate</td>
<td>✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>CT abdomen and pelvis without and with IV contrast</td>
<td>Usually Appropriate</td>
<td>✔️ ✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>MRI abdomen without and with IV contrast</td>
<td>May Be Appropriate</td>
<td>O</td>
</tr>
<tr>
<td>CT abdomen and pelvis without IV contrast</td>
<td>May Be Appropriate</td>
<td>✔️ ✔️</td>
</tr>
<tr>
<td>MRI abdomen and pelvis without and with IV contrast</td>
<td>May Be Appropriate (Disagreement)</td>
<td>O</td>
</tr>
<tr>
<td>MRI abdomen and pelvis without IV contrast</td>
<td>May Be Appropriate</td>
<td>O</td>
</tr>
<tr>
<td>US color Doppler kidneys and bladder retroperitoneal</td>
<td>May Be Appropriate</td>
<td>O</td>
</tr>
<tr>
<td>Tc-99m DMSA scan kidney</td>
<td>May Be Appropriate</td>
<td>✔️ ✔️ ✔️</td>
</tr>
<tr>
<td>Fluoroscopy voiding cystourethrography</td>
<td>Usually Not Appropriate</td>
<td>✔️ ✔️</td>
</tr>
<tr>
<td>Radiography abdomen and pelvis (KUB)</td>
<td>Usually Not Appropriate</td>
<td>✔️ ✔️</td>
</tr>
<tr>
<td>Fluoroscopy antegrade pyelography</td>
<td>Usually Not Appropriate</td>
<td>✔️ ✔️</td>
</tr>
<tr>
<td>Radiography intravenous urogramy</td>
<td>Usually Not Appropriate</td>
<td>✔️ ✔️</td>
</tr>
</tbody>
</table>

This imaging modality was ordered by the ER physician.
Findings: unlabeled

Lung window axial

Lung window sagittal
Findings: unlabeled

Soft tissue window axial

Soft tissue window coronal

Soft tissue window sagittal
Findings: (labeled)

- Gas in bladder wall
- Gas in bladder lumen
Findings - labeled gas in bladder wall
Findings: (labeled)

- Decreased bladder capacity
- Bladder wall thickening
Differential Diagnoses

1. Emphysematous cystitis
2. Vesicocolic fistula
3. Vesicovaginal fistula
4. Traumatic
Final Dx:
Emphysematous cystitis
Case Discussion

- Emphysematous UTIs can be of the upper or lower urinary tracts and are associated with gas formation.
- Diabetes mellitus is a risk factor; elevated tissue glucose levels may provide favorable conditions for gas-forming organisms.
- Common microorganisms include *Escherichia coli* or *Klebsiella pneumoniae*.
- Less commonly, *Proteus, Enterococcus, Pseudomonas, Clostridium* and rarely *Candida* can cause these infections.
Case Discussion cont’d

Other conditions that can cause gas in the bladder
- Iatrogenesis- catheter insertion or cystoscopy
- Trauma
- Bladder-bowel fistula
Case Discussion cont’d

• Cobblestoned or “beaded necklace” appearance on abdominal X-ray and CT reflects irregular thickening of the mucosa due to submucosal blebs

• CT helps detect presence of upper UTI and/or other causes of pelvic air
Case Discussion cont’d

Treatment

Emphysematous cystitis - parenteral antibiotics

Emphysematous pyelonephritis - additional management with percutaneous drainage (PCD) or surgery may be necessary, depending on severity

• Emphysematous pyelitis - gas restricted to lumen of collecting system
• Emphysematous pyelonephritis - gas in renal collecting system and/or the renal parenchyma

An example of emphysematous pyelonephritis

Gas within the renal parenchyma
References:


Image: