



## Case Summary

### Chief Complaint

“Right-sided lower back pain and hyperglycemia”

### HPI

A 58-year-old male with a past medical history of hypertension and diabetes presented to the ED with hyperglycemia and right-sided lower back pain. There was no preceding trauma. The patient also complained of months of malaise, generalized weakness, abdominal pain with episodes of non-bloody non-bilious emesis, decreased oral intake, and polyuria. The patient had unintentional weight loss over the past several months. He denied fevers, chills, rigors, cough, chest pain, shortness of breath, diarrhea, dysuria, or hematuria. The patient was not adherent to his home insulin regimen.

### Physical Exam

VS: BP 157/85 HR 95 T 99 RR 18 SpO2 98%

HENT: mucous membranes dry  
Eyes: mild conjunctival pallor  
Pulmonary: rales bilaterally  
Abdomen: generalized abdominal tenderness, soft, no rebound or guarding  
MSK: spastic muscles R lower back

### Pertinent Laboratory Data

<b>WBC 22.71</b>	Cl 89	<b>BHB 1.70</b>
<b>N 83.8%</b>	Co2 27	pH 7.43
Hgb 9.6/Hct 29.4	<b>BUN 36</b>	Pco2 46
Na 130	<b>Cr 2.42</b>	Po2 39
K 5.0	<b>Glu 335</b>	Lactate 1.3
		Hco3 30

## Diagnostic Radiology



**Image 1.** Ultrasound of the right kidney with "dirty air" shadowing. This is demonstrated by a hyperechoic stripe with underlying anechoic shadowing, concerning for the presence of air.  
**Image 2.** Ultrasound of the left kidney, which appears normal.

## Case Discussion

The patient's renal POCUS was consistent with emphysematous pyelonephritis. POCUS of the right kidney demonstrated a finding referred to as "dirty air shadowing," which was highly concerning for gas or air in the renal capsule. Shadowing on ultrasound is an artifact that can be referred to as "clean" or "dirty". Clean shadowing refers to the production of anechoic shadows, which is the case with calcifications like gallstones and kidney stones, as these stones attenuate ultrasound waves. Dirty shadowing refers to the production of hypoechoic shadows, which occurs with gas such as that in bowel, or subcutaneous air. This is due to the highly reflective gas bubble interface. Dirty air shadowing can also be seen with necrotizing fasciitis, and if seen in an area with cellulitis or an abscess should prompt treatment or further diagnostic testing for necrotizing fasciitis.

Based on the concern for gas in the renal capsule on POCUS, the patient emergently had a CT abdomen/pelvis done which showed a large right kidney subcapsular abscess with multiple air fluid levels, with involvement of the adjacent abdominal wall musculature and intramuscular abscess formation. The patient was started on meropenem and underwent subcapsular abscess drainage of the right kidney by IR with catheter placement. He was ultimately transitioned to oral antibiotics and was discharged with the drain in place, in stable condition.

Emphysematous pyelonephritis is a diagnosis with a considerably high mortality rate, between 20-40%, almost always occurring in diabetic patients. The prevalence of diabetes in emphysematous pyelonephritis is 53-90%. Early suspicion for emphysematous pyelonephritis should prompt the clinician to rapid initiation of appropriate antibiotics and consultation with Urology. POCUS may expedite diagnosis if CT is delayed or not readily available.

## References

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## Clinical Questions

- 1) What is the name of the finding in this ultrasound?
- 2) What does this finding represent? What does this raise concern for in this patient?

## Answers

- 1) Dirty air shadowing.
- 2) Dirty shadowing indicates the presence of air, which in this case, is concerning for emphysematous pyelonephritis.

## Clinical Pearls

Emphysematous pyelonephritis has a significantly high mortality rate and is seen more in patients with diabetes. Always consider this diagnosis in your diabetic patients with undifferentiated sepsis.

Ultrasonographic shadowing is considered artifact, but if identified, should be characterized as clean or dirty, in order to distinguish benign etiologies from more devastating, necrotizing infections.

