AMSER Case of the Month
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Obstructive Uropathy

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Patient Presentation

- HPI: Patient is a 65 y/o female who presented to the ED with 2 weeks of intermittent fevers and fatigue. 2 days ago, she had several episodes of nausea and vomiting. Patient was feeling weak with minimal exertion and could not stop her heart racing earlier today when paramedics were called. Vagal maneuvers were unsuccessful. She has not had any heart arrythmia or tachycardia in the past, but her thyroid medication was recently adjusted. Patient is also prescribed Macrobid for chronic urinary tract infections by her PCP. She denies dysuria or hematuria on presentation.
- PMHX: Hypothyroidism and Hypertension
- PSHX: Unilateral salpingectomy/oophorectomy unspecified side.

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Patient Presentation

- Physical Exam
  - Vitals: BP 97/76, HR 161, RR 18, Temp 101.3 F
  - Height 5’1”Weight 240 lb
  - General: Patient appears slightly flushed but surprisingly comfortable.
  - Heart: Irregularly irregular rhythm. No murmurs or gallops.
  - Lungs: Clear to auscultation B/L.
  - Abdomen: Tenderness to palpation over LLQ.
  - GU: There is tenderness to palpation to the left lower back. There is no tenderness over the bladder.

Pertinent Labs

- EKG shows new onset A. fib with RVR
- WBC 18.3
- Na 129, Cl- 91, Alk phos 108, BUN 19, Cre 1.27
- TSH 5.1
- Rapid Flu negative
- Urinalysis showed slightly cloudy urine with positive leukocyte esterase and blood on dipstick, and 5-10 WBC and many squamous epithelial cells microscopically. Urine culture to reveal 50,000 CFU mixed gram positive flora.
- Blood cultures show no growth at 5 days, but body fluid culture grew Proteus mirabilis.
- Patient initially given fluid resuscitation, and put on cefepime, metronidazole, and vancomycin.
- CT scan of the abdomen was ordered.

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Radiographic Findings

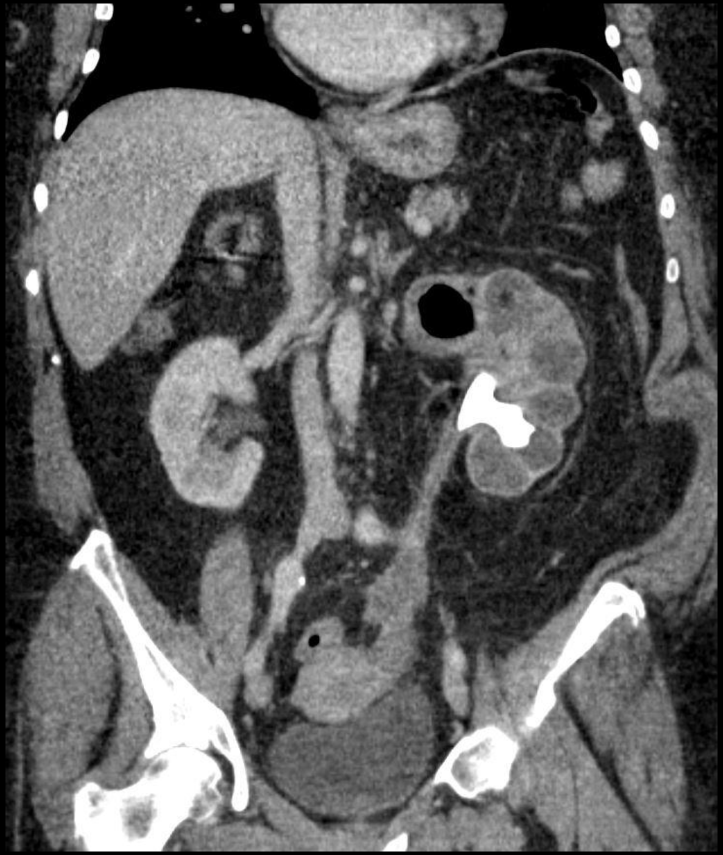

Figure 1. CT abdomen post contrast coronal view

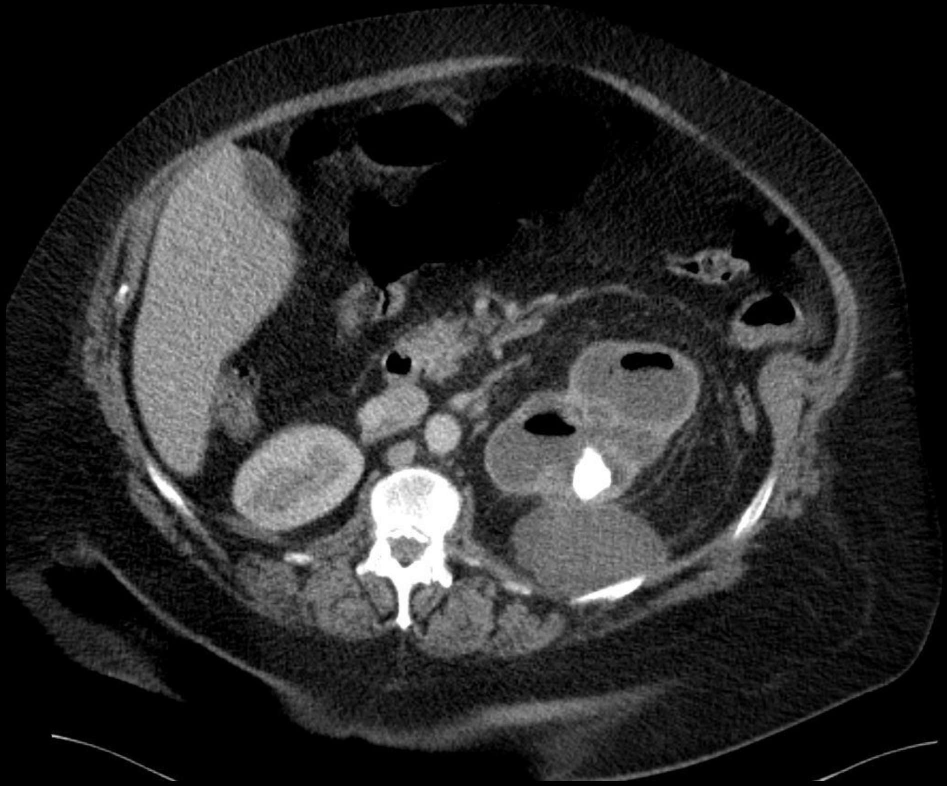

Figure 2. CT abdomen post contrast axial view.

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Radiographic Findings

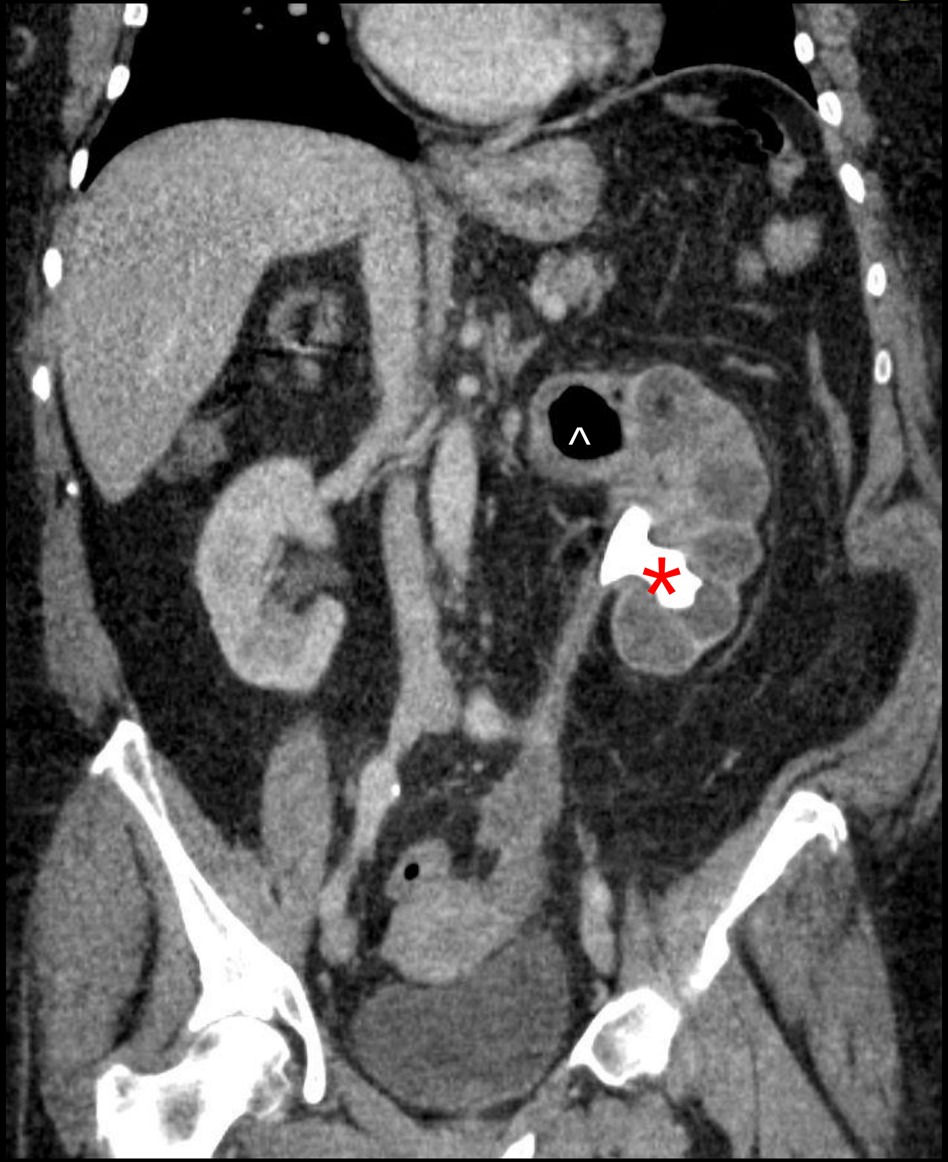

Figure 1 (labeled). CT abdomen post-contrast coronal view labeled.

Left kidney demonstrates staghorn calculus (*) with dilated calyces, and associated air (^) in the superior calyx. The left kidney enhances to a lesser extent than the right kidney.

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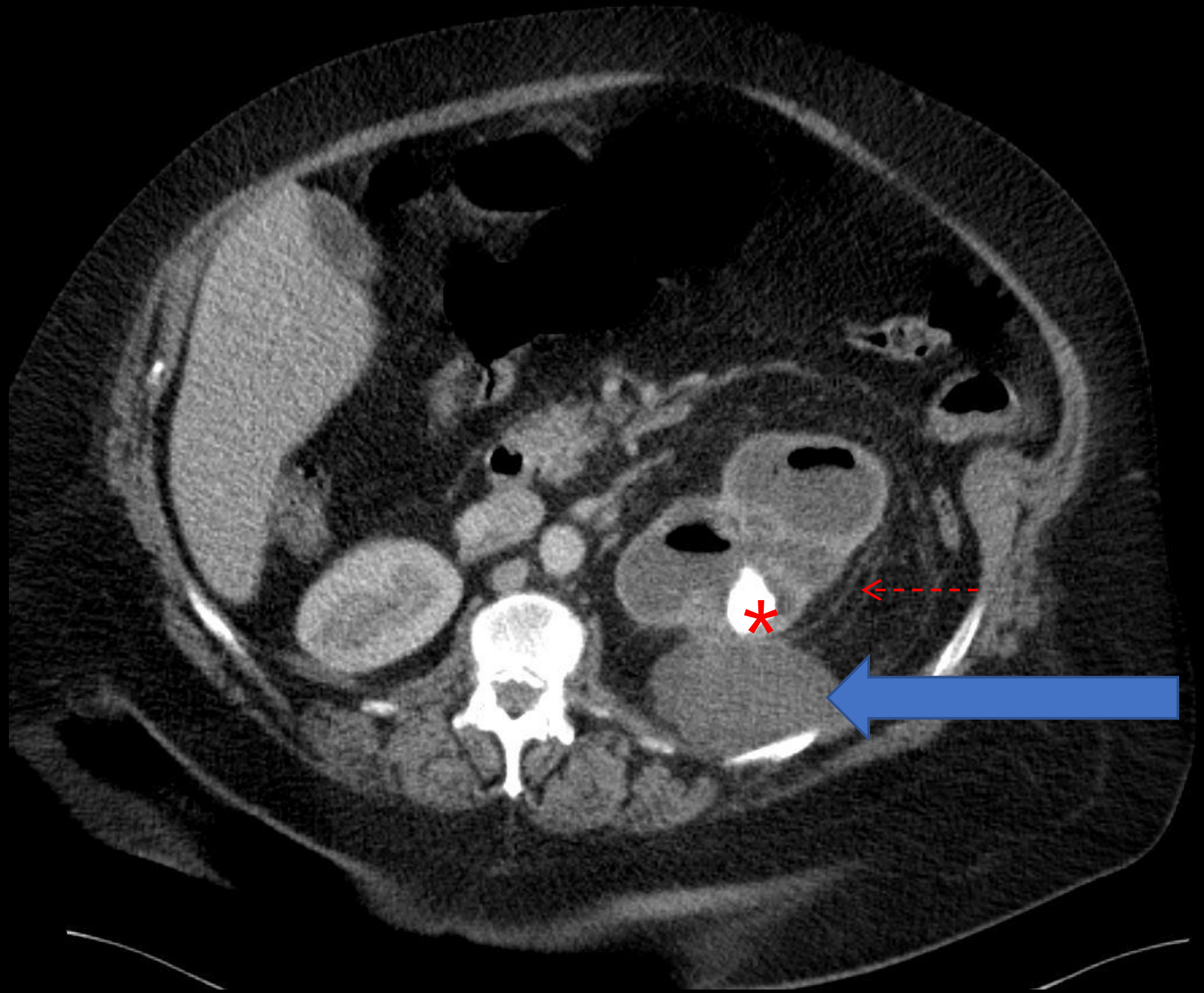
Radiographic Findings



Post contrast axial view showing staghorn calculus (*) in the left kidney. Left kidney demonstrates dilated calyces. Associated air in some calyces.
There is associated fat stranding (red arrow). Associated pararenal abscess (blue arrow)

Figure 2 (labeled). CT abdomen post-contrast axial view labeled.

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Differential Diagnosis

- Emphysematous pyelonephritis or pyelitis
- Acute complicated urinary tract infection
- Xanthogranulomatous pyelonephritis.
- Acute papillary necrosis
- Renal or perinephric abscess
- Fistula formation (entero-renal or cutaneous-renal)
- Retroperitoneal abscess with gas-forming bacteria

Gross specimen

Figure 3. Gross specimen. Initial cut to bivalve the left kidney reveals copious amounts of green to yellow purulent material.

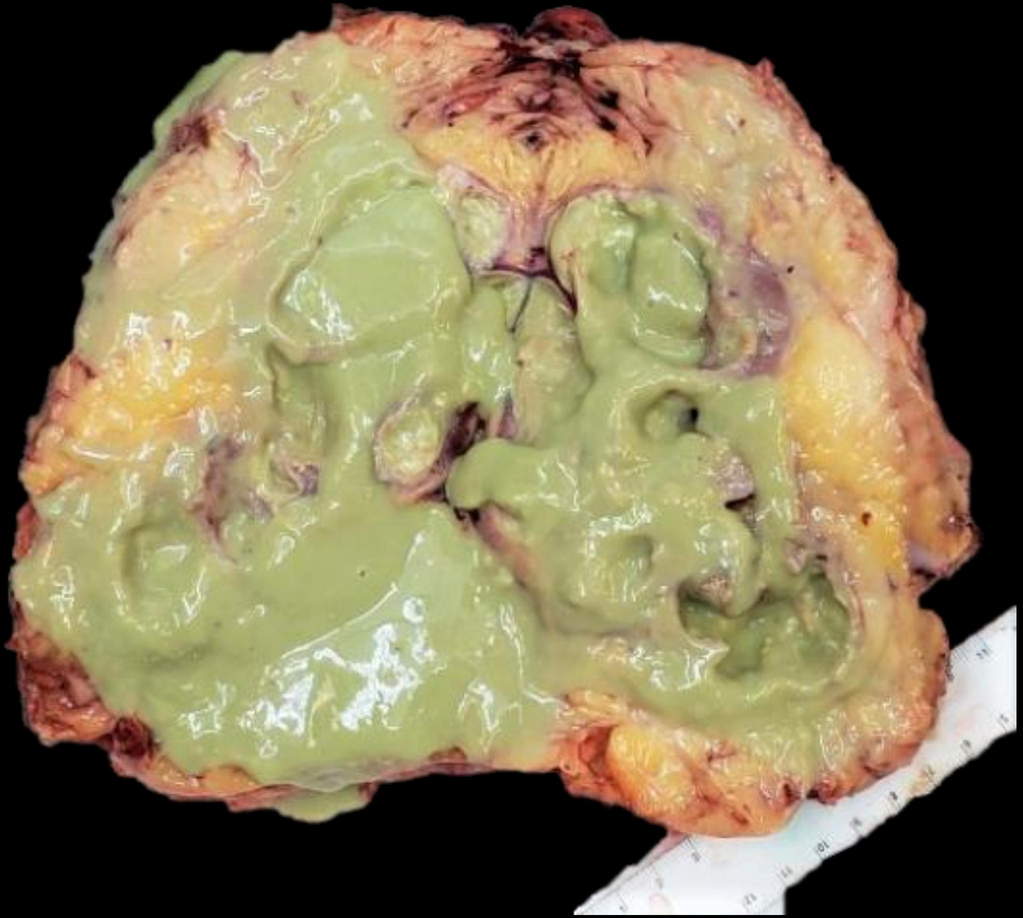

Figure 4. Gross specimen. Bi-valved left kidney.

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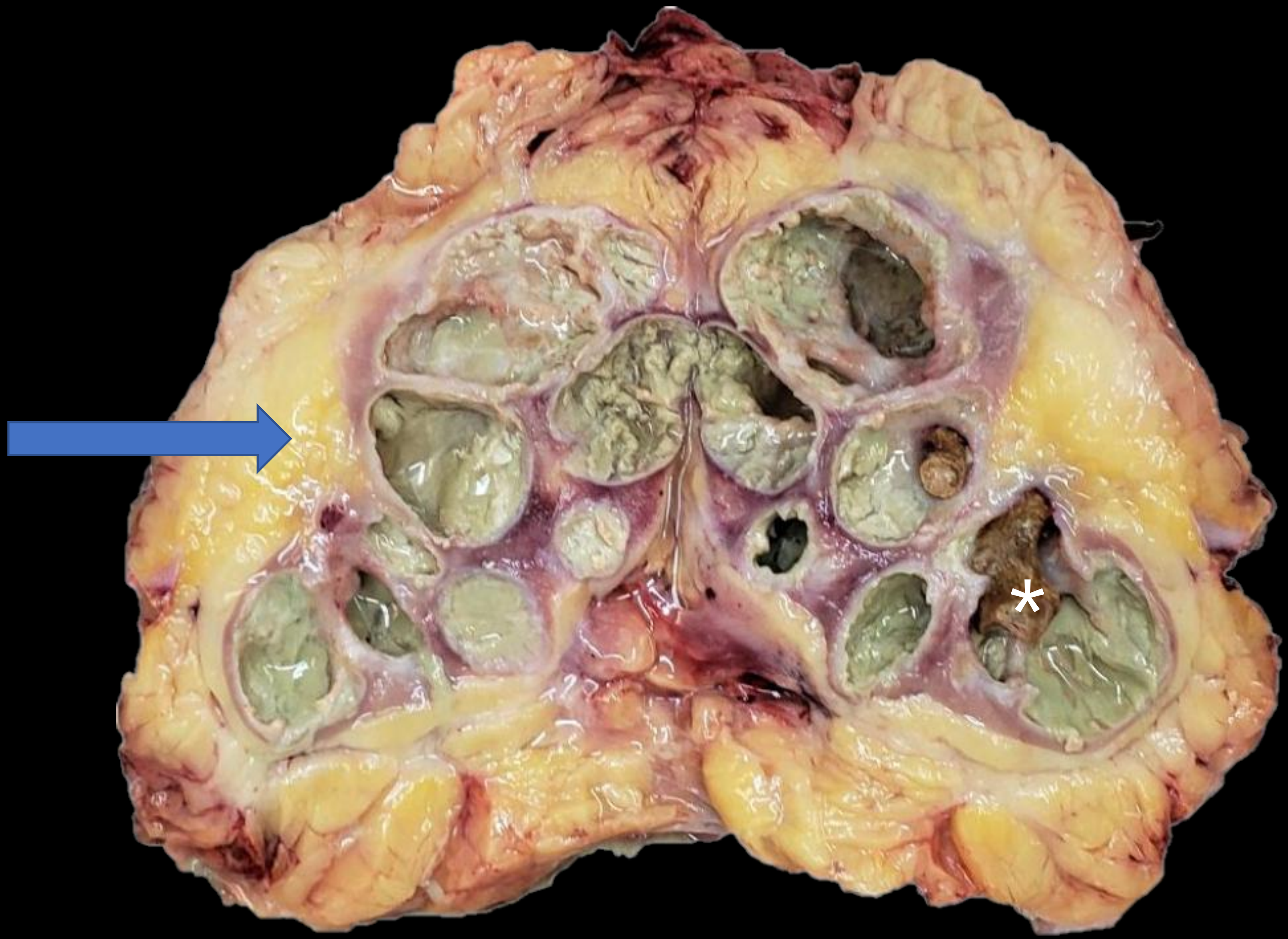

Figure 5. Gross specimen of bi-valved left kidney after rinsing. There is a staghorn calculus in situ (*). There are dilated calyces, and the kidney parenchyma is almost entirely replaced with fatty tissue (arrow). There is also green purulent material within the calyces.

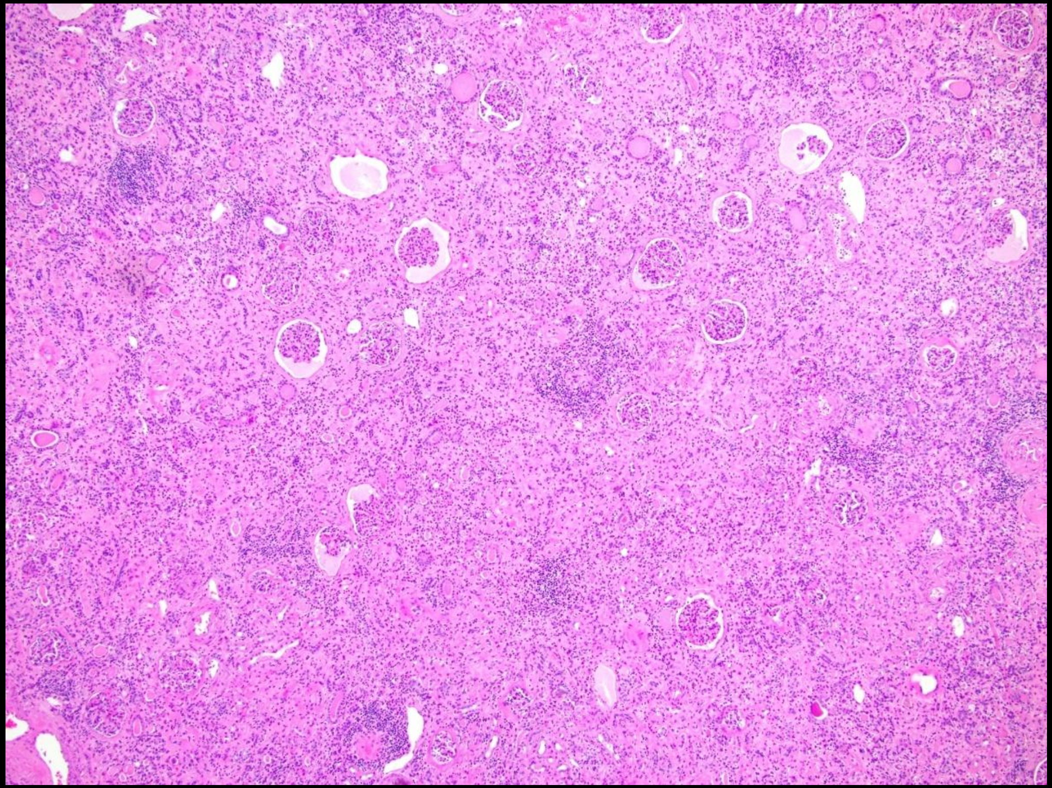

Figure 6. H&E permanent sectioning of left kidney parenchyma. 10x. Diffuse infiltration of lymphocytes suggesting chronic pyelonephritis.

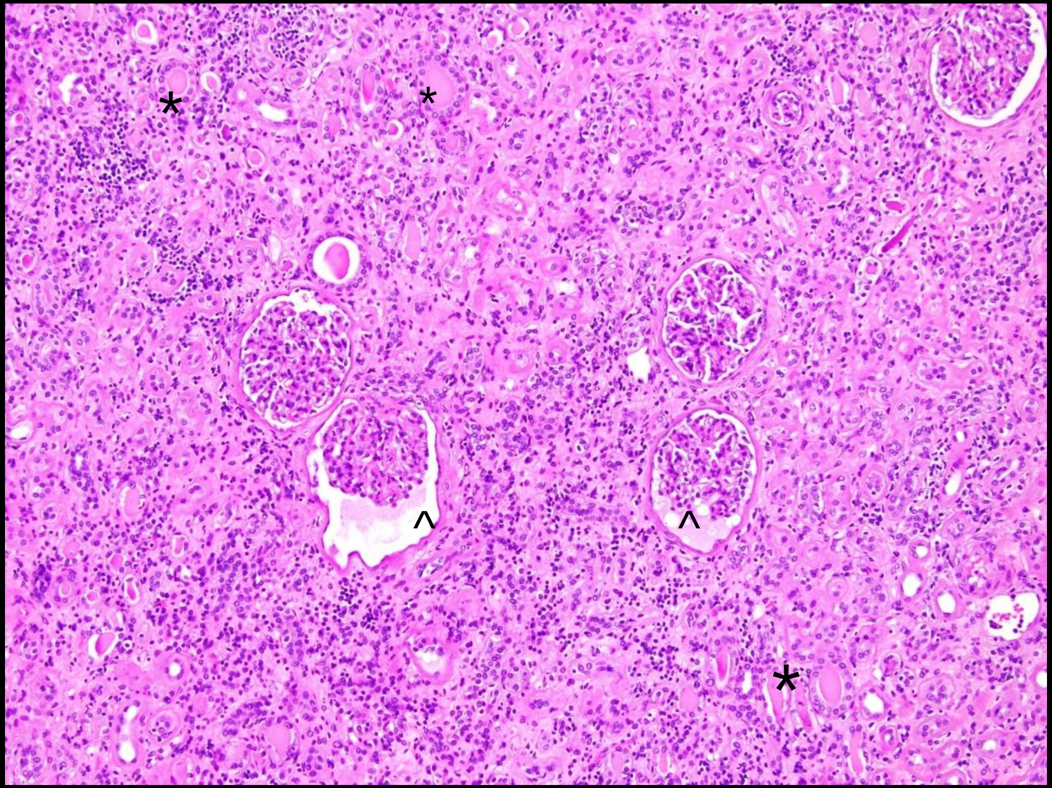

Figure 7. H&E permanent section of left kidney parenchyma. 40x. Diffuse lymphocytes and congested glomeruli (^). There is also congestion in the tubules (*) suggesting obstructive etiology.

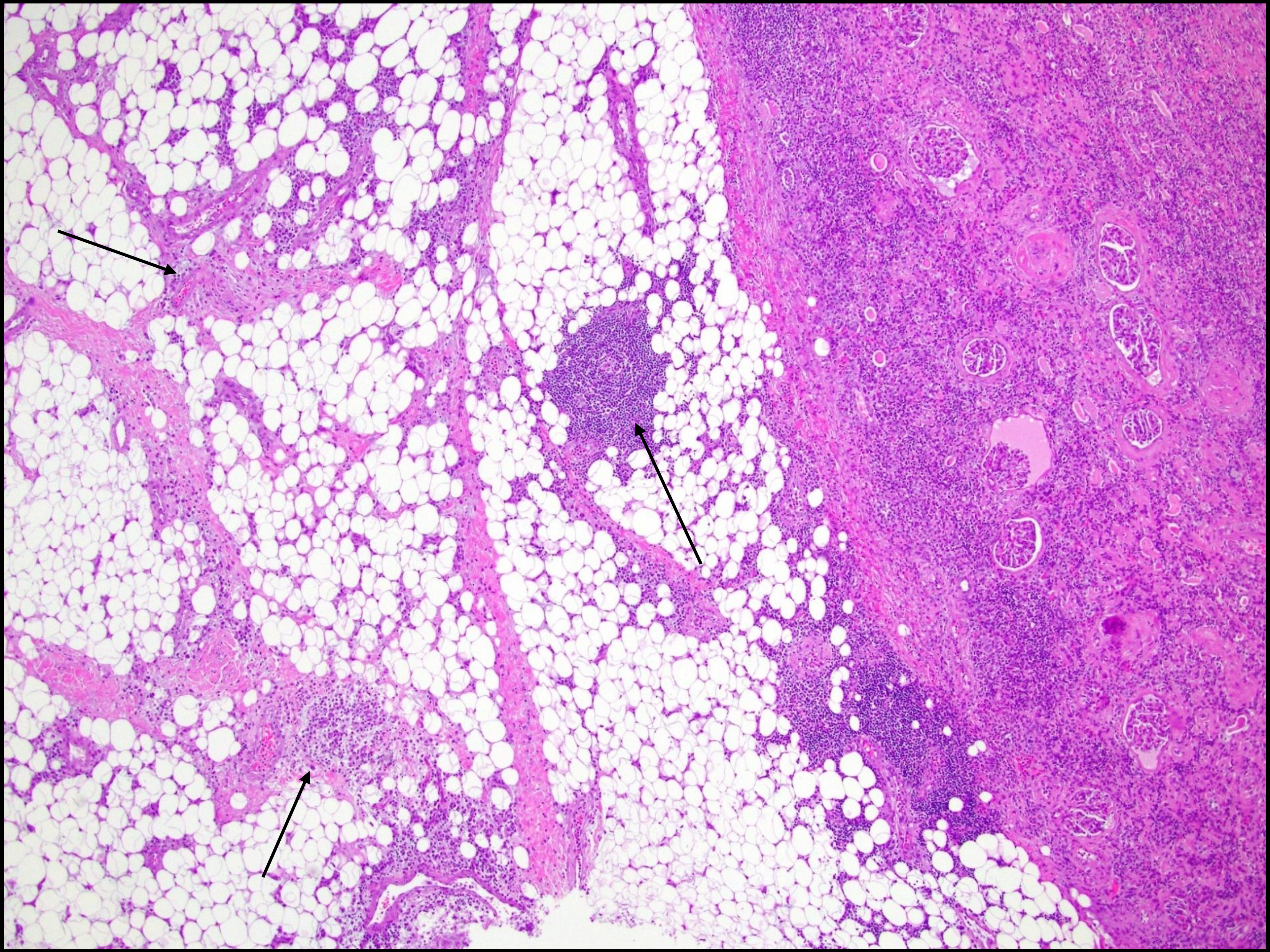

Figure 8. H&E permanent section of left kidney 10x. Extension of inflammation (arrows) in the fibroadipose tissue surrounding the kidney parenchyma

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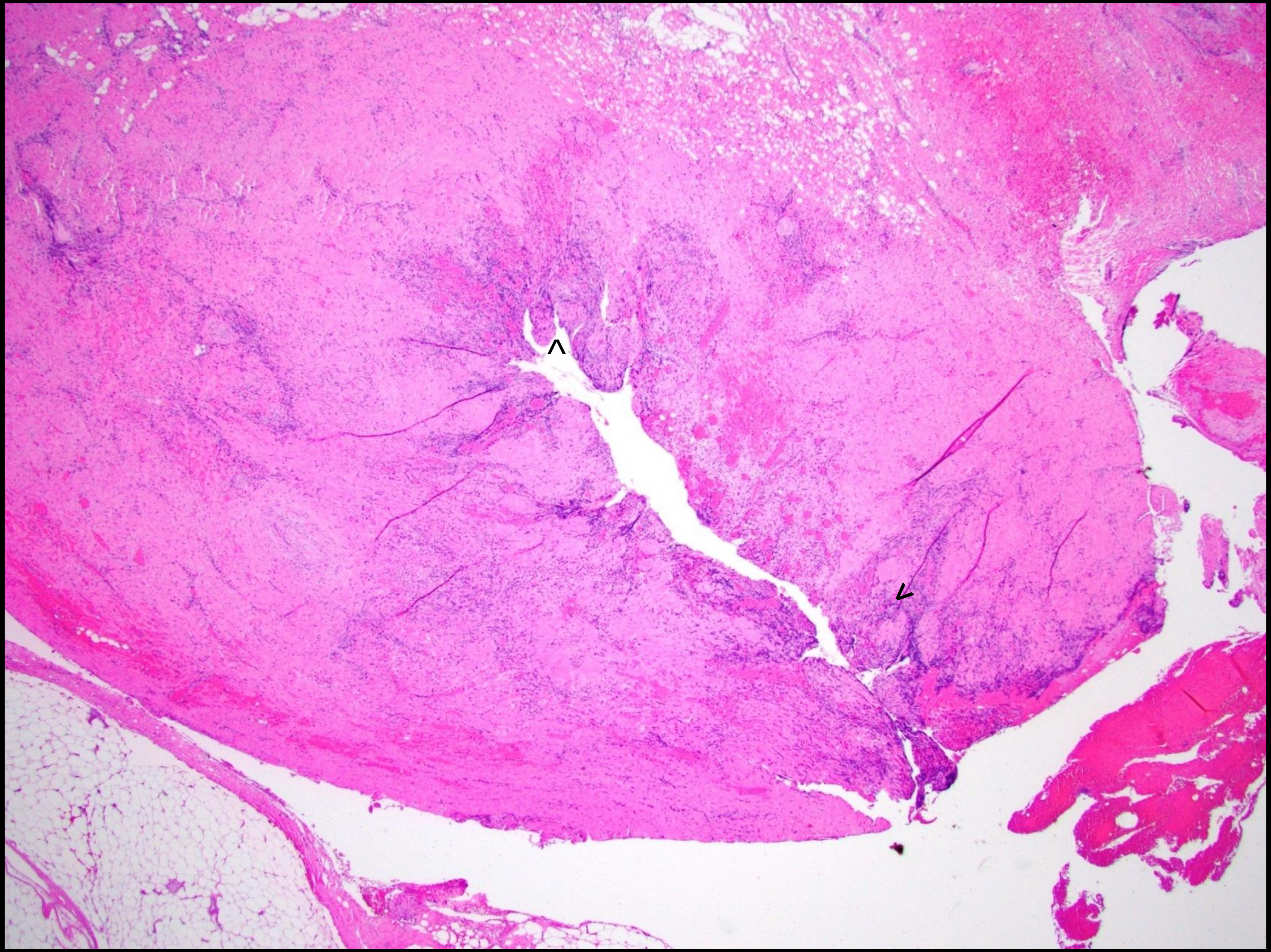

Figure 9. H&E permanent section of the left ureter. There is denuded urothelium and chronic inflammation (^).

Final Dx:

Staghorn Calculi causing Obstructive uropathy

Case Discussion

Patient has extensive history of recurrent UTI's, treated by her PCP.

Development of staghorn calculi prompts obstruction, and acute on chronic pyelonephritis.

Patient presents to the ED in severe sepsis.

Rad/Path Correlation

Radiologically, this patient presented with a triad of findings suggestive of Xanthogranulomatous pyelonephritis.

Unilaterally large kidney

Nonfunctioning or poorly functioning kidney

Renal pelvis stone

Pathologically, this patient had chronic pyelonephritis, and we could not definitely diagnosis XGPN.

Lipid-laden macrophages were not identified; however, there was necrosis and signs of chronic inflammation indicating chronic pyelonephritis.

XGPN is an unusual variant of chronic pyelonephritis.

Staghorn Calculi

- Staghorn calculi are most commonly composed of struvite (magnesium ammonium phosphate) or calcium-carbonate apatite.
- Most commonly caused by urease-producing bacteria like *Proteus or Klebsiella* from an upper urinary tract infection.
- The ammonia production is increased, raising the pH of the urine. Formation usually occurs at pH >8. In an alkaline environment the solubility of phosphate decreases, creating deposits.
- Staghorn calculi develop quickly over weeks to months.
- Women are more likely to get staghorn calculi than men (3:1) because they are more prone to upper urinary tract infections.

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Staghorn Calculi Management

There are several modalities for removal.

- Percutaneous nephrolithotomy (PNL) monotherapy
- Shock wave lithotripsy (SWL)
- Combination of PNL and SWL.
- Open or laparoscopic surgery which may include anatrophic nephrolithotomy, nephrostomy, partial nephrectomy, pelviolithotomy, or total nephrectomy.

Residual fragments left inside may be the source of recurrent urinary tract infections. Complete removal of a stone is preferred to eradicate causative organisms.

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https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria

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