

# Leave no stone unturned

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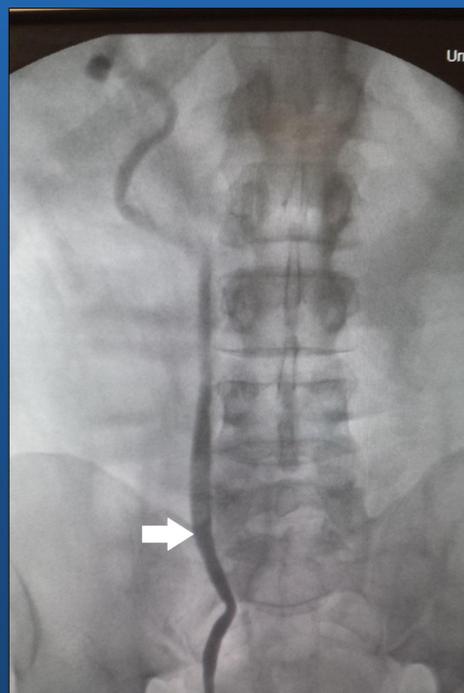
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**Case:** A 37-year-old man presented with 10 days of right flank pain. It was constant with variable intensity. He had episodic nausea, vomiting and blood tinged urine. He had been seen at an outside facility several days prior and undergone renal ultrasound, non-contrast CT and MRI, all reportedly negative except for mild right hydronephrosis.

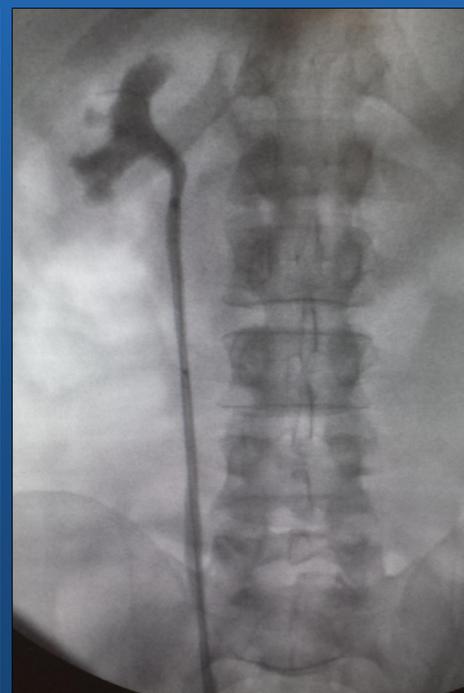
He had a history of mild chronic renal disease and HIV. Medications included ritonavir-boosted atazanavir, emtricitabine and tenofovir.

Temperature was 36.9. He appeared uncomfortable. He had mild right costovertebral angle tenderness.

**Labs:** WBC 6.1. Cr 2.3 (baseline 1.6). UA +1 blood and 3 RBCs/hpf.



Initial pyelogram with hydronephrosis



Follow up pyelogram with resolved hydronephrosis

**Course:** Cystoscopy showed brown debris in right ureteral orifice. Debris was removed and ureteral stent was placed. Symptoms rapidly improved. Repeat cystoscopy was performed 5 weeks later. Stent was removed and pyelogram showed right ureteral filling defect. Ureteroscopy revealed a 5-6 mm yellow stone, which was successfully retrieved.

**Stone analysis showed pure atazanavir.**

Table 1<sup>4,5</sup>

Modality	Advantages	Disadvantages	Difficult Stones to Visualize
Plain film	Widely available Low cost Minimal radiation Rapid	Low sensitivity Cannot assess obstruction Limited by habitus, bowel gas, calcifications	Uric acid, matrix, protease inhibitor, triamterene, xanthine, pseudoephedrine/guaifenesin
Ultrasound	Widely available Low cost May detect hydronephrosis	Variable sensitivity Poor at ureteral and small (<5 mm) stones	Ureteral stones Small (<5 mm) renal stones
Non-contrast CT	Highest sensitivity and specificity Good availability Rapid Can assess anatomy/obstruction	High radiation High cost Incidental findings	Protease inhibitor
MR Urography	No radiation Can assess anatomy/obstruction	Limited experience/availability High cost Slow Stones not directly detected	Small (<5 mm) stones Cannot differentiate stones from tumor or clot

**Discussion:** Nephrolithiasis is a common problem encountered by general internists. Diagnosis generally involves radiologic imaging. Several imaging modalities are available, with different strengths and weakness. (Table 1) Non-contrasted helical CT has become the most common initial imaging test due to its high sensitivity, though this modality also has limitations.

Protease inhibitor (PI) stones are a well-reported cause of nephrolithiasis in patients receiving anti-retroviral therapy and pose a particular diagnostic challenge, as they are difficult to visualize using all imaging modalities. Indinavir is the protease inhibitor most widely associated with stone disease,<sup>1</sup> but atazanavir has recently been appreciated as highly associated as well.<sup>2,3</sup>

**Conclusions:**

- General internists should be aware that all radiologic imaging may miss certain types of urinary stones, including PI stones.
- Ritonavir-boosted atazanavir appears to confer significantly increased risk of stone formation and should thus cause increased index of suspicion for stone disease in patients with urologic complaints while taking those medications.
- Good knowledge of radiologic study qualities and the PI association with stones will facilitate timely diagnosis and treatment.

**References:**

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