

SONO case series: 35-year-old male patient with flank pain

CASE PRESENTATION

A 35-year-old male patient presents with acute onset right-sided flank pain. He localises the pain to his right lower abdomen, and says it radiates to his right groin. The pain started a few hours ago, and has been 10/10. The pain was initially in his right flank. He denies fever, chills, vomiting, dysuria, penile discharge and haematuria. He has not taken any medications at home for pain. No history of similar pain.

No previous medical history. Previous surgical history—cholecystectomy; home medications—none. No allergies.

Triage vital signs: BP: 136/79 mm Hg, HR: 64, temp: 36.2°C, RR: 24, SpO₂: 98%

PHYSICAL EXAMINATION

Middle aged man grimacing and rolling around in bed unable to get comfortable. He is clutching his abdomen. His complete physical examination was normal, including his testicular examination, except that he has tenderness to palpation of his abdomen in the right lower quadrant and suprapubic area.

LABORATORY DATA

The patient's complete blood count and basic metabolic panel are normal. His urinalysis is normal except for 3+ blood.

QUESTIONS

1. What are the sonographic abnormalities seen in the right kidney (figure 1)?

The most striking finding is hydronephrosis, which is dilation of the urinary collecting system. When there is an obstruction of the ureter from a kidney stone, the urine backs up leading to dilation first of the ureter (hydroureter), then the renal pelvis (pelviectasis), and finally the major and minor calyces (caliectasis). As pressure rapidly builds up, the collecting system may self-decompress by rupturing through the calyceal fornix renalis leading to a collection

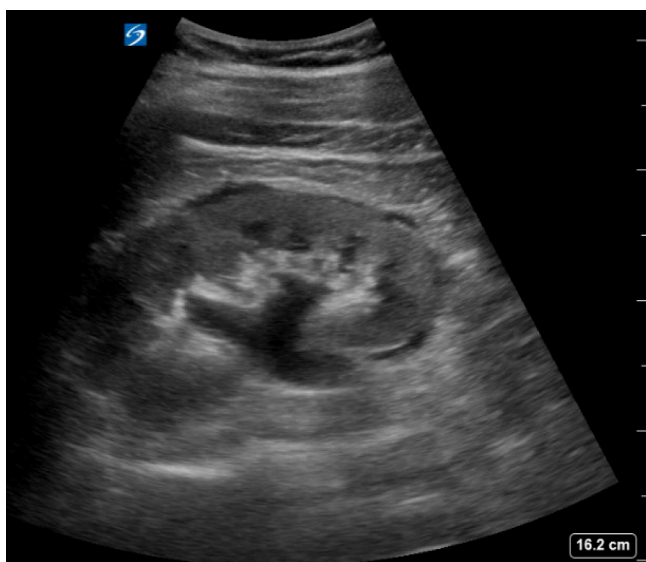


Figure 1 Patient's right kidney ultrasound.



Figure 2 Patient's left kidney ultrasound.

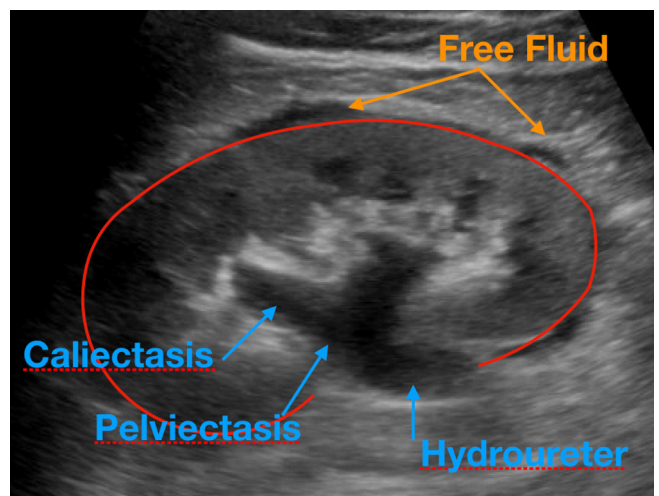


Figure 3 Patient's right kidney ultrasound with annotations.

of free fluid around the kidney, an urinoma. As long as the urine is not infected, an urinoma is a benign finding. Figure 2 demonstrates the patient's normal left kidney without hydronephrosis. Figure 3 is annotated to point out the abnormal findings of hydroureter, pelviectasis, caliectasis and free fluid.

2. What are the grades of hydronephrosis (figure 4)?
Mild hydronephrosis is just dilation of the ureter and renal pelvis. Moderate hydronephrosis is seen when the major and minor calyces are dilated and blunted. Severe hydronephrosis is characterised by severe dilation and loss of architecture of the entire urinary collecting system and cortical thinning of the renal parenchyma. Acute obstruction can lead to mild-moderation hydronephrosis, but severe hydronephrosis is usually seen in cases of chronic obstruction, such as benign prostatic hypertrophy, ureteral strictures and congenital defects. For the emergency physician, the degree of hydronephrosis does not affect the patient's management in the ED; however, appropriate description of the hydronephrosis will help the outpatient care provided by the urologist. Mild-moderate hydronephrosis can often simply be management with a ureteral stent. For severe hydronephrosis, urologists may order additional outpatient imaging tests, such as a CT with delayed renal and

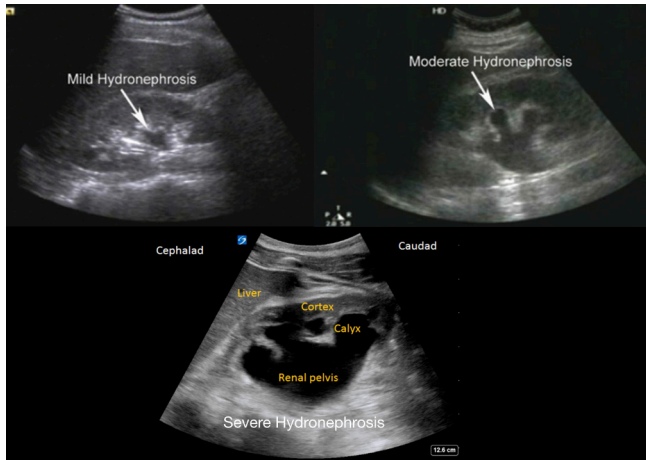


Figure 4 Three ultrasound examples of mild, moderate and severe hydronephrosis.⁵

ureteral imaging or a nuclear medicine study to quantify the function of the affected kidney.

3. What is the most likely diagnosis?
The combination of the clinical history with the presence of hydronephrosis makes urolithiasis the most likely diagnosis.
4. What is the diagnostic study of choice for suspected urolithiasis?

The historical diagnostic study of choice has been a CT stone protocol. Several studies have recently shown that while utilisation of CT scans has increased 3–10 fold, depending on the study, there has been no associated improvement in patient outcomes.^{1 2} The Study of Tomography of Nephrolithiasis Evaluation (STONE) trial showed that utilisation of point-of-care ultrasound for suspected nephrolithiasis was associated with no significant differences in high-risk diagnoses with complications, serious adverse events, pain scores, return ED visits or hospitalisations compared with a CT-first approach.³ Based on the latest evidence, ultrasonography is now the preferred initial study of choice in the USA. The current National Institute for Health and Care Excellence (NICE) guideline recommends low-dose non-contrast CT as the initial diagnostic study for renal colic, except for pregnant patients and patients under 16 years old who should receive an ultrasound first.⁴

We recommend the basic algorithm in figure 5. Patients with moderate pretest probability may receive either a renal ultrasound or CT abdomen depending on the clinical history

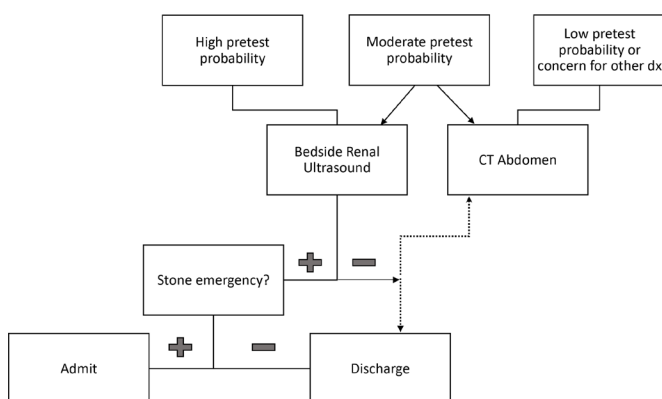


Figure 5 Diagnostic imaging algorithm for flank pain.

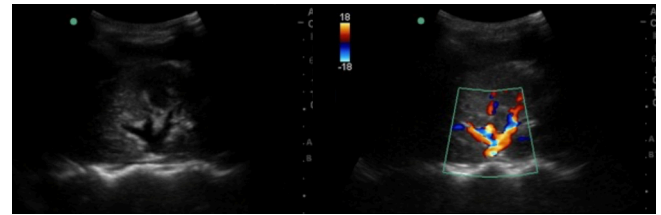


Figure 6 Renal ultrasound with anechoic area in pelvis confirmed to be vasculature by colour Doppler.

and clinician preference; there is inadequate evidence recommending one study over the other in that setting. If the renal ultrasound does not show hydronephrosis, then the clinician may either discharge home or proceed to a CT abdomen depending on clinician risk tolerance and clinical gestalt.

5. What are some pitfalls of performing ultrasound to evaluate for urolithiasis?

The basic views required for an adequate sonographic evaluation of the kidney are not challenging to obtain, but there are a few pitfalls. First, the renal vasculature is anechoic and can mimic mild pelviectasis. To avoid a misdiagnosis, we recommend you place the colour Doppler field over the anechoic area; absence of colour flow indicates hydronephrosis (figure 6). Second, remember an ultrasound-first approach to flank pain should be followed only if the clinician has a high pretest probability that urolithiasis is the diagnosis since a normal renal ultrasound does not rule out other emergent diagnoses. Third, some patients may have hydronephrosis not due to urolithiasis, such as benign prostatic hypertrophy (BPH) or other anatomic abnormalities, so we recommend evaluating the asymptomatic kidney for hydronephrosis as well. Bilateral hydronephrosis raises concern for other diagnoses besides unilateral urolithiasis. It is very important to remember the ‘can’t miss diagnosis’ of an abdominal aortic aneurysm can lead to hydronephrosis by external compression of the ureter and present clinically as flank pain. If a patient with the appropriate risk factors for an abdominal aortic aneurysm, such as hypertension and smoking, presents with unilateral flank pain, we recommend performing an ultrasound of both kidneys in addition to a survey of the entire abdominal aorta.

CONCLUSION

The patient was discharged home with hydrocodone for pain, ondansetron for nausea and an alpha-blocker. He had an uncomplicated, spontaneous passage of his kidney stone.

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