Nephrolithiasis: Review Questions

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QUESTIONS

Choose the single best answer for each question.

Questions 1 and 2 refer to the following case.

A 30-year-old man presents to his family physician for evaluation of flank pain that radiates towards his groin with associated nausea and vomiting. The pain came on suddenly and is described as intermittent and crampy. Physical examination reveals some diffuse left-sided abdominal pain to palpation but no other significant abnormalities. Laboratory evaluation is performed, including a complete blood count, serum chemistry, and urinalysis. The laboratory evaluation is normal, with the exception of the urinalysis, which reveals microscopic hematuria. Based on this patient's presentation and laboratory results, a diagnosis of nephrolithiasis is suspected.

1. **Which of the following has become the imaging modality of choice to aid in the diagnosis of nephrolithiasis?**
   (A) Abdominal radiography
   (B) Computed tomography (CT)
   (C) Intravenous pyelography
   (D) Magnetic resonance imaging
   (E) Ultrasonography

2. **Urinary calculi are classified based on their composition. What type of urinary calculi does this patient most likely have, given that this is a single episode and no prior evaluation has been performed?**
   (A) Calcium oxalate
   (B) Calcium phosphate
   (C) Cystine
   (D) Struvite
   (E) Uric acid

3. **A 38-year-old man with a past medical history of hypertension and obesity presents with severe, crampy abdominal pain, nausea, an inability to get comfortable, and blood in his urine. His vital signs are stable. His physical examination is significant for left flank pain and left lower quadrant abdominal pain, but no other abnormalities are noted. A complete blood count and serum chemistry are unremarkable. Urinalysis is positive for blood but is otherwise negative. A CT scan with stone protocol is performed and reveals a 4-mm calculus. How should this patient be managed?**
   (A) Extracorporeal shock wave lithotripsy
   (B) Open pyelolithotomy
   (C) Pain control and hydration
   (D) Percutaneous nephrolithotomy
   (E) Ureteroscopic stone extraction

4. **A 42-year-old man presents for further treatment and management of renal stones. He has been trying to increase his fluid intake per the physician's recommendations. Past medical history includes 3 episodes of passing stones over the past 5 years, all requiring visits to the emergency department for pain control. The patient had not presented for follow-up until the third episode occurred, at which time he was given a strainer and instructed to bring any stones to the office for analysis. Stone analysis was performed and revealed that the patient has uric acid stones. Which of the following medications would help treat this patient?**
   (A) Acetohydroxamic acid
   (B) Captopril
   (C) Penicillamine
   (D) Potassium citrate
   (E) Thiazide diuretics

(turn page for answers)

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ANSWERS AND EXPLANATIONS

1. **(B) CT.** Noncontrast helical CT has become the gold standard for the radiologic diagnosis of renal stones. CT can detect almost all stones, evaluate the renal parenchyma, evaluate for urinary tract obstruction, and provide data on surrounding organs.[1] Abdominal radiography can identify radiopaque stones but will miss radiolucent stones (eg, uric acid stones) and may miss small stones. Intravenous pyelography has a higher sensitivity and specificity than abdominal radiography for detecting stones and can detect obstruction, but it requires the use of contrast, which can cause adverse reactions. Ultrasonography can detect stones comprised of uric acid and obstruction and is useful in evaluating pregnant women or patients who should avoid radiation. However, ultrasonography can miss stones in the ureter or small stones. Magnetic resonance imaging is not used to diagnose renal stones.
2. **(A) Calcium oxalate.** Renal stones occur in approximately 1% of the population annually, with men twice as likely as women to develop renal stones.[1] Calcium oxalate stones are the most common type of urinary calculi (70% of all stones), followed by struvite (15%–20%), calcium phosphate (5%–10%), and cystine (1%). Urinary tract infections caused by urease-producing organisms, such as *Proteus* species, can lead to struvite stones. Calcium-containing stones are radiopaque and can be seen on plain radiography, while stones that do not contain calcium are often radiolucent and cannot be visualized on plain radiography. Certain diseases that cause hypercalciuria, hyperuricosuria, and hypocitraturia increase the risk for stone formation.
3. **(C) Pain control and hydration.** Renal stones generally do not cause symptoms until the stone begins to move down the urinary tract. Nausea results from the obstruction of a hollow viscus. Most symptomatic patients with stones are treated conservatively with pain medication and hydration. The likelihood that stones will pass depends on the size and location of the stone; stones smaller than 5 mm will pass spontaneously in about 90% of patients.[1] Patients should be hospitalized if they cannot tolerate oral administration of medication or have severe pain. Patients should strain their urine and bring passed stones to the office for analysis. Patients should consider lowering their sodium and meat intake. Nonsteroidal anti-inflammatory drugs and opioids are typically used in patients with renal colic.[2] Extracorporeal shock wave lithotripsy and other surgical options would not be used in this case because the patient is stable. However, if the patient showed signs and symptoms of obstruction or sepsis, surgical intervention would be needed. Urology consultation is needed for patients with acute renal failure, sepsis, anuria, or intractable pain.
4. **(D) Potassium citrate.** Patients with renal stones should be counseled about the disease process, the need for hydration, and, in some cases, dietary modification. The evaluation should include a thorough history, including the number of previous episodes of renal stones. Serum studies are usually performed, including a parathyroid hormone level. A more extensive evaluation is performed for patients with recurrent episodes and generally includes a 24-hour urine collection. Stone analysis can help identify the cause and help guide treatment and management. Patients with uric acid stones can be treated by alkalinizing the urine with potassium citrate or allopurinol.[1] Patients with calcium stones can be treated with thiazide diuretics for hypercalciuria. Patients with cystine stones can be treated with captopril, penicillamine, or tiopronin. Management of struvite stones is more difficult, but antibiotics and acetohydroxamic acid can be used.

REFERENCES

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2. Teichman JM. Clinical practice. Acute renal colic from ureteral calculus. N Engl J Med 2004;350:684–93.

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