

## Hematuria: Review Questions

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### QUESTIONS

Choose the single best answer for each question.

1. A 36-year-old Asian man with a history of asthma presents with a complaint of red urine. He describes 5 days of nasal congestion and dry cough. He notes no sore throat, fever, chills, myalgias, arthralgias, or flank pain. He has no family history of renal disease. A urine study indicates 1+ protein, and no bacteria, leukocyte esterase, or nitrates. Thirty to 50 erythrocytes are observed, but no leukocytes are present. His serum creatinine level is normal. Which one of the following is the most likely diagnosis?

  - (A) IgA nephropathy
  - (B) Nephrolithiasis
  - (C) Transitional cell carcinoma of the bladder
  - (D) Wegener's granulomatosis
  - (E) Postinfectious glomerulonephritis
2. A 64-year-old Caucasian man with a history of hypertension, hyperlipidemia, and nephrolithiasis presents with a complaint of dark-colored urine. He felt well until 2 days ago when he noted increasing fatigue and muscle weakness. Dipstick urinalysis shows a specific gravity of 1.020, no protein, and large blood. Neither leukocyte esterase nor nitrates are identified in the urine. The sediment reveals no erythrocytes or leukocytes. Which of the following diagnostic procedures is appropriate at this point?

  - (A) Cystoscopy to evaluate for urologic cancer
  - (B) Flank computed tomography (CT) to evaluate for recurrent nephrolithiasis
  - (C) Kidney biopsy to delineate the disease process
  - (D) Serum analysis to evaluate the level of creatine phosphokinase (CPK)
3. A 27-year-old African American woman presents with left-sided flank pain and pink-tinged urine. She has recently moved to the Denver, CO, area and is an avid runner. She denies any family history of renal disease or hematuria. She is in good health. She takes an oral contraceptive and occasional acetaminophen for headaches. Urine examination demonstrates 30 to 50 erythrocytes, few leukocytes, 1+ protein, and no cellular casts. Blood count and renal function parameters are normal. Which of the following is the most likely diagnosis for this woman?

  - (A) Nephrolithiasis
  - (B) Pyelonephritis
  - (C) Rhabdomyolysis
  - (D) Sickle cell trait
4. A 55-year-old Caucasian man with hypertension presents to the emergency department with excruciating back pain. The pain develops suddenly, comes in waves of colicky sharp pain for approximately 45 minutes, then stops spontaneously. He describes obvious blood in his urine. Urine examination shows blood but no protein present on the dipstick. Many erythrocytes are seen under the microscope, and no leukocytes are observed. A flat plate radiograph of the abdomen reveals 3 stones in the right renal pelvis, the largest of which is 10 mm. A 4-mm radiopaque density is seen in the bladder. What is the most appropriate management for this patient?

  - (A) Extracorporeal shock wave lithotripsy (ESWL) to break apart larger stones in the renal pelvis
  - (B) Flank CT to further characterize the location and number of stones
  - (C) Oral hydration alone to achieve an average daily urine output of 2 L
  - (D) Uteroscopy with basket retrieval of the stone in the bladder

*(turn page for answers)*

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## EXPLANATION OF ANSWERS

- 1. (A) IgA nephropathy.** Isolated hematuria without other manifestations of glomerular disease (eg, proteinuria and systemic symptoms) after an upper respiratory infection is most consistent with IgA nephropathy. Disease states with similar clinical presentations include thin basement membrane disease and Alport's syndrome. IgA nephropathy may be diagnosed with renal biopsy, but this test is not often needed. Light microscopy shows focal or diffuse mesangial proliferation and immunofluorescence microscopy demonstrates mesangial deposits of IgA. Electron microscopy reveals electron dense deposits in the mesangium but also may show deposition in the subendothelial and subepithelial spaces. The clinical course of IgA nephropathy is often benign in patients with isolated hematuria, but a small percentage of patients with proteinuria and hypertension can progress to end-stage renal disease. Nephrolithiasis typically manifests with flank pain and a stone on urologic imaging. Bladder cancer often occurs in older individuals with a history of carcinogen exposure. Wegener's granulomatosis is a more fulminant disease, presenting with renal failure, hemoptysis, and sinus symptoms. Post-infectious glomerulonephritis is most commonly associated with streptococcal throat or skin infection. The patient had neither of these problems.
- 2. (D) Serum analysis to evaluate the level of creatine phosphokinase.** A urinalysis that demonstrates large blood on dipstick but no erythrocytes in the sediment represents heme pigment in the urine, typically myoglobin. This finding is most commonly a manifestation of muscle necrosis, or rhabdomyolysis. Statin therapy for hyperlipidemia may be complicated by rhabdomyolysis. Laboratory results in the case of rhabdomyolysis include elevations in serum CPK and urinary myoglobin. Other associated laboratory findings include hyperkalemia and hyperphosphatemia from the release of potassium and phosphorus resulting from damaged myocytes. Hypocalcemia also may develop owing to deposition of the complex of calcium and phosphorus into damaged muscle tissue. An increased serum creatinine concentration signals acute renal failure. In the absence of erythrocytes in the urine, it is unlikely that recurrent stones are present or that a kidney biopsy or cystoscopy would be required to facilitate the correct diagnosis.
- 3. (D) Sick cell trait.** This 27-year-old woman has sickle cell trait disease. The absence of previous clinical manifestations of sickle cell disease makes it highly

unlikely that she is homozygous for this condition. The combination of high altitude (lower oxygen content) and volume depletion from running in this heterozygotic woman promoted the development of erythrocyte sickling in the kidney, ultimately leading to hematuria. Erythrocyte sickling predominantly occurs in the vasa recta in the renal medulla. Focal areas of hemorrhage and papillary infarction occur, and they can cause either microscopic or gross hematuria and can be associated with flank pain. Therapy consists largely of maintaining adequate hydration. Pyelonephritis is not likely without associated pyuria or fever. Although nephrolithiasis is a possibility, the diagnosis of hematuria from sickle cell trait is more likely. Rhabdomyolysis is not supported by the clinical presentation.

- 4. (A) Extracorporeal shock wave lithotripsy to break apart larger stones in the renal pelvis.** The patient has a classic presentation for nephrolithiasis. Small stones will pass on their own, but stones larger than 8 mm often require urologic intervention. ESWL is useful for large stones in the renal pelvis or ureter. An abdominal flat plate radiograph demonstrates radiopaque stones, such as calcium oxalate and struvite. It is essential to identify the composition of the stones because therapy will be guided by this information. Patients with recurrent nephrolithiasis should undergo 24-hour urine collection for sodium, calcium, phosphate, oxalate, citrate, and uric acid. Serum electrolytes, calcium, phosphate, uric acid, parathyroid hormone, and serum creatinine also should be measured. Evidence of obstruction on renal imaging warrants urgent urologic consultation for nephrostomy tube placement and stone retrieval. Flank CT would not add any further information because the patient has large stones identified on the abdominal radiograph. Oral hydration alone may help prevent stones but would not permit large stones to be passed without a procedure to reduce their size. Ureteroscopy with retrieval of the bladder stone is not necessary and would only be required if ESWL failed to eliminate the stones in the renal pelvis.

## SUGGESTED READINGS

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- Sutton JM. Evaluation of hematuria in adults. *JAMA* 1990; 263:2475–80.
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