

A 17-year-old African American boy comes to the physician after an episode of gross hematuria that resolved spontaneously. He has no other complaints. He has no other medical conditions and takes no medications. The boy smokes occasionally but does not use illicit drugs or alcohol. His temperature is 36.7 C (98 F), blood pressure is 120/70 mm Hg, pulse is 70/min, and respirations are 14/min. Physical examination shows no abnormalities. Laboratory studies show a creatinine level of 0.9 mg/dL. Dipstick urinalysis results in the office are as follows:

#### Urinalysis

Specific gravity	1.010
pH	6.2
Protein	None
Blood	Moderate
Glucose	Negative
Ketones	Negative
Leukocyte esterase	Negative
Nitrite	Negative
Bacteria	None
Red blood cells	Many/hpf
Crystals	None

Urine microscopic examination shows numerous intact red blood cells with no other abnormal findings. Which of the following is the most likely cause of this patient's hematuria?

- ☐ A. Acute cystitis
- ☐ B. Acute glomerulonephritis
- ☐ C. Acute interstitial nephritis
- ☐ D. Acute tubular necrosis
- ☐ E. Renal papillary necrosis



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- ☐ A. Acute cystitis [20%]
- ☐ B. Acute glomerulonephritis [19%]
- ☐ C. Acute interstitial nephritis [7%]
- ☐ D. Acute tubular necrosis [7%]
- ☒ E. Renal papillary necrosis [47%]



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Explanation:

User Id: 

Sickle cell trait	
Clinical features	<ul style="list-style-type: none"><li>• Usually no symptoms of sickle cell anemia</li><li>• More prevalent in African, Middle-Eastern &amp; Mediterranean countries; African American &amp; Hispanic individuals</li><li>• No change in overall life expectancy</li></ul>
Diagnosis	<ul style="list-style-type: none"><li>• Normal hemoglobin, reticulocyte count, RBC indices &amp; morphology</li><li>• Hemoglobin electrophoresis shows both Hb A &amp; Hb S, with the amount of Hb A greater than Hb S</li></ul>
Complications	<ul style="list-style-type: none"><li>• <b>Renal:</b> Hematuria, urinary tract infection, renal medullary carcinoma</li><li>• <b>Thrombosis:</b> Splenic infarction (especially at higher altitudes), venous thromboembolism, priapism</li></ul>

Hb A = hemoglobin A; Hb S = hemoglobin S; RBC = red blood cells.

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Gross hematuria can be from bladder (eg, cystitis, cancer), renal (eg, glomerulonephritis), ureteral (eg, nephrolithiasis), or prostate (eg, benign prostatic hyperplasia) pathology. This patient's gross hematuria and urinalysis with normal-appearing red blood cells (RBCs) suggest an extra-glomerular etiology. Sickle cell trait is a benign condition associated with hemoglobin AS that is more common in Africa, the Middle East, and Mediterranean countries, and in African American and Hispanic individuals. Patients with sickle cell trait have no clinical symptoms of sickle cell disease and no change in overall life expectancy. The diagnosis is confirmed by hemoglobin electrophoresis showing hemoglobin AS. However, patients have normal hemoglobin concentration, reticulocyte count, and RBC indices and morphology.

Renal complications of **sickle cell trait** include hematuria, renal medullary carcinoma, and urinary tract infections. Painless hematuria is likely due to renal papillary ischemia or necrosis. The relatively low local partial pressure of oxygen in the vasa rectae



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Renal complications of **sickle cell trait** include hematuria, renal medullary carcinoma, and urinary tract infections. Painless hematuria is likely due to renal papillary ischemia or necrosis. The relatively low local partial pressure of oxygen in the vasa rectae predisposes the affected red blood cells to sickling. **Papillary necrosis** can occur with massive **hematuria**, but the episodes are usually mild and resolve spontaneously. The urinalysis usually shows normal-appearing RBCs. Other renal complications include **inability to concentrate the urine** (vasa rectae damage with inability to maintain concentrated medullary gradient) and distal renal tubular acidosis (tubular damage with impaired H<sup>+</sup> secretion).

**(Choice A)** Acute cystitis usually presents with dysuria and increased urinary frequency. Urinalysis usually shows many white blood cells and bacteria with positive nitrite and leukocyte esterase. However, this patient has no urinary symptoms or urinalysis showing bacteria, leukocyte esterase, or nitrite.

**(Choice B)** Acute glomerulonephritis typically presents with hematuria and evidence of glomerular injury (eg, hypertension, proteinuria, dysmorphic RBCs, RBC casts). This patient's urinalysis without dysmorphic RBCs or proteinuria makes this less likely.

**(Choice C)** Acute interstitial nephritis is usually associated with history of medication use, rash, eosinophilia, and increased serum creatinine. Urinalysis usually shows abundant white blood cells, many of which are eosinophils. However, acute interstitial nephritis does not typically cause gross hematuria.

**(Choice D)** Acute tubular necrosis is suspected in patients with acute kidney injury due to ischemic or nephrotoxic insult. Serum creatinine is elevated. Urinalysis usually shows granular casts, hematuria, and renal tubular epithelial cells. However, acute tubular necrosis typically does not cause the isolated hematuria seen in this patient.

Educational objective:

Sickle Cell Trait With Hematuria  
Renal, Urinary Systems & Electrolytes

 Feedback

 End Block



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#### Educational objective:

Sickle cell trait is a benign condition with hemoglobin AS that is more common in Africa, the Middle East, and Mediterranean countries, and in African American and Hispanic individuals. Patients with sickle cell trait have no specific clinical symptoms of sickle cell disease and no change in overall life expectancy. Renal complications include painless hematuria, urinary tract infections, and renal medullary cancer.

#### References:

1. [Complications associated with sickle cell trait: a brief narrative review.](#)