

HEMATURIA IN CHILDHOOD

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Complete case examples: reach a tentative diagnosis by (♣) or ♣ in each case (answers below).

- 1) A 12 year-old boy had had two episodes of faintly gross hematuria 2.5 and 1 month prior to evaluation. The first episode occurred a few days after the onset of a URI. Physical examination at that time, including BP, was normal. His urine was brown, and contained 1-2+ protein and RBCs too numerous to count. Serum creatinine and C'3 complement were normal, and an ASO titer was negative. The second episode occurred without an apparent inciting event. Microscopic hematuria, without proteinuria, persisted between these episodes and after the second one.
Additional history revealed that the boy's father had had gross hematuria and had passed urinary calculi on two occasions. (♣) The boy's physical examination remained benign. Urinalysis showed many uniformly shaped RBCs, but no protein or casts. ♣ A urine calcium-to-creatinine ratio (Ca/Cr, mg/mg) was 0.28.
Elimination of dairy products from his diet for one day, followed by an overnight fast, produced a urine Ca/Cr of 0.08; a 1 gm calcium load increased the ratio to 0.25 (normal → 0.22), and a day of high (but not unprecedented) milk intake resulted in a ratio of 0.32. The following serum chemistries were found on a day of typical calcium intake: bicarbonate 25 mEq/l, calcium 9.9 mg/dl, inorganic phosphate 4.6 mg/dl, intact parathyroid hormone < 10 pg/ml (normal 10-65).
- 2) A 9 year-old boy was referred for evaluation of chronic glomerulonephritis. He had had three episodes of gross hematuria, with 2-3+ proteinuria, over the past 2 years. An ASO titer was elevated after the first episode, but blood pressure and serum creatinine were normal on all three occasions. His health history was otherwise unremarkable, and his family history was negative for renal and stone disease.
Further discussion of his nephritic episodes revealed that two had accompanied respiratory infections and one had occurred during a gastroenteritis. ♣ Physical examination, including BP, was within normal limits. Urinalysis showed no protein, 30-50 RBC/HDF, and two RBC casts. UAs from his mother and sister were benign. A serum creatinine was 0.7, CBC and ESR were normal, ANA and C'3 complement levels were normal. A G-U ultrasound showed no abnormality. A urine Ca/Cr ratio was 0.17. A later UA from his father was also normal.
- 3) A 7 year-old boy seen for evaluation of symptomless microscopic hematuria first detected several months earlier. His past history indicated no apparent cause of the problem; his parents were divorced, but his mother indicated that she and his father had no history of kidney or urinary tract disease. Prior laboratory testing showed a serum creatinine of 0.5, a normal CBC and ESR, a negative ANA and normal C'3 complement level. A G-U ultrasound showed no pathology.
His mother's UA was negative, but his 6 year-old sister had 5-10 RBC/HDF. Further inquiry about the father's health revealed a "life-long" history of microscopic hematuria, without proteinuria, hypertension, or other health problems. The father was 38 years old. (♣) There were no known relatives with hearing loss or hypertension at a young age, and no cases of renal failure, gross hematuria, or urinary calculi. ♣ Urine Ca/Cr ratios were 0.06-0.14 on the two children.

- 4) A 13 year-old girl presented to her pediatrician with gross, brownish hematuria and 3+ proteinuria. Two weeks earlier she had had a sore throat. Physical examination was benign, with a normal BP, clear lungs and no edema. She was hospitalized and started on oral penicillin after a throat culture was taken. The next day her urine showed a trace of protein, 5-7 RBC, 10-20 WBC and no casts; the following day her urine showed no abnormality. (♣) Her throat culture grew no β -Strep, and her serum creatinine, ASO titer and C'3 complement were all normal. ♣

Further history revealed that she had become sexually active in recent months and that she had had mild dysuria on the day of admission. A urine culture taken on day 3 was negative, but the history was strongly suggestive of a UTI.

- 5) A 2 year-old boy was hospitalized with a fever to 38.5°C and a petechial rash. He had undergone surgery one week earlier for a testicular torsion. Physical examination showed a normally healing surgical incision and number of petechial lesions on his lower extremities. His WBC count was 9.4K (44% segs, 5% bands). Urinalysis showed 30-50 RBC, but no protein. (♣) He was started on intravenous antibiotics after a blood culture was drawn.

Over the next 36 hours he remained alert, but became progressively more irritable and refused to eat or walk. His temperature was normal, but his rash spread to the lower trunk and buttocks. ♣ The blood culture showed no growth at 48 hours.

- 6) A 4 year-old boy was seen in the emergency department with a one-day history of vomiting and a fever of 39.5°C. The mother was a poor historian and revealed only that several people in the household were similarly ill. Physical examination showed mild dehydration and coarse breath sounds at both lung bases. A urinalysis revealed 2+ protein, with 25-40 WBC and 10-20 RBC/HDF. BUN and serum creatinine were 27 and 0.8, respectively; electrolytes were normal; his WBC count was 14.7K (44% segs, 11% bands). A chest X-ray showed a questionable lower lobe infiltrate.

Based on the concern about the reliability of his home care and a possible diagnosis of acute pyelonephritis, the boy was hospitalized and started on a regimen of intravenous cefotaxime and fluid replacement. Over the next 24-48 hours he developed intermittent hypertension (135-140/85-95). His urine culture grew no pathogens. A renal consult was requested.

Further history was obtained from his grandmother, who was visiting at the time. She reported that he had had the measles three weeks earlier, with a high fever that lasted 2 or 3 days. She believed that he had been fully immunized, and asked why the measles had caused his palms and the soles of his feet to peel. (♣) On PEx he was an alert, well-hydrated, and comfortable child; his BP was 124/78; he had slight persistent peeling around his toenails; his lungs were clear to auscultation.

His urine now showed a trace of protein, 5-10 WBC, 10-20 RBC, and rare RBC casts. ♣ An ASO titer was 680 (normal 0-100); C'3 complement 21 (normal 50-100); serum creatinine 0.7. Over the next several days his weight decreased from 19 to 18 kg, his serum creatinine fell to 0.6, and his hypertension resolved.

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Answers: These cases were selected because they illustrate important causes of hematuria in children who presented with initially confusing information. Clues to the actual or likely diagnoses are emphasized.

- 1) Familial hypercalciuria. This boy presented in a manner suggestive of "recurring" nephritis, raising the question of IgA or Berger's nephropathy. However, his family history was suggestive of hypercalciuria. Our urinalysis showed no protein, and contained "epithelial" RBCs without casts, ruling against a glomerulopathy. The urine calcium/creatinine ratio showed hypercalciuria, albeit mild; dietary calcium restriction both reduced his calciuria and eliminated his hematuria, confirming the diagnosis.
- 2) Berger's (IgA) nephritis. Again, we have a recurrent nephritic picture, but not an obviously progressive one (normal BPs and serum creatinine). The history of gross hematuria simultaneous with mucosal infections, and the finding of a nephritic sediment with no proteinuria between his acute episodes, were typical for IgA nephropathy. Renal biopsy is not routinely done where there is no persistent proteinuria, hypertension, or elevation of serum creatinine, so the diagnosis is presumptive. We would recommend a biopsy in a similar patient who had proteinuria in a yellow urine, or an elevated BP or serum creatinine.
- 3) Benign familial hematuria. For various reasons, family histories are often misleading on initial inquiry. This case illustrates the problem in a physician's family. The boy's work-up was negative, and his sister and father also had microhematuria. The father's good health at age 38, with no proteinuria or hypertension, made it very likely that this was a case of benign familial hematuria.
- 4) Hemorrhagic cystitis. This girl was so upset by her bloody urine that she did not report her mild dysuria. Her urine was so bloody that it tested 3+ for protein. She was admitted with a diagnosis of AGN. However, her urinalysis cleared much too rapidly for this diagnosis, and her serologies were negative. The social history and the disappearance of all abnormalities on penicillin supported the diagnosis of a bacterial cystitis.
- 5) Anaphylactoid (Henoch-Schönlein) purpura. H-S purpura typically involves skin, joints, the gastrointestinal tract, and the kidneys. Two points are illustrated by this case. 1) The testis is the fifth organ affected by this multi-organ small vessel vasculitis. The boy's age was wrong for a torsion; it was later confirmed that he had infarcted a testicular appendage. 2) Only one or two systems may be involved in the early days (or weeks) of the illness.
- 6) Post-Streptococcal AGN. This was a confusing presentation. A flu-like illness had affected several members of the extended household. Because the patient had no clear focus of infection, acute pyelonephritis was a reasonable initial concern. The negative urine culture, elevated blood pressure without pyelonephritic scarring on ultrasound, and later information about his scarlatiniform rash led to the diagnosis. Pyuria may be more apparent than hematuria in AGN. The high ASO, low C₃, and prompt clinical resolution confirmed the diagnosis.