Sudden Gross Hematuria in a Hemodialysis Patient

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Clinical Presentation

A 40-year-old male patient on maintenance hemodialysis for 2 years presented to the hospital with sudden-onset left flank pain and gross hematuria. Two years previously he had been admitted to the hospital with hypertensive emergency and acute kidney injury. A kidney biopsy at the time showed thrombotic microangiopathy. Kidney function did not improve, and hemodialysis was initiated. On the present admission his hemoglobin was 6.4 g/dL (down from 10.5 g/dL 2 weeks prior) and he received a transfusion. A urinary catheter was placed, which demonstrated gross hematuria with clots.

What is the differential diagnosis of gross hematuria in a hemodialysis patient?

What should be the initial diagnostic imaging study?

What is the diagnosis based on the imaging findings?

How should this patient be treated?

Discussion

What is the differential diagnosis of gross hematuria in a hemodialysis patient?

The presence of blood clots indicates a nonglomerular source of the bleeding and requires an evaluation of the urethra, prostate, bladder, ureters, and kidneys. Risk factors specific for the kidney failure population would be bleeding diathesis from uremic platelet dysfunction, use of anticoagulation, and structural kidney disease (ie, polycystic or acquired cystic kidney disease). Renal cell carcinoma is probably the most common cause of spontaneous gross hematuria among patients on hemodialysis, but this has not been well studied in the modern era. History and physical examination will be helpful in differentiating between malignancy, nephrolithiasis, and infection. A rare condition called spontaneous kidney hemorrhage associated with renal cell carcinoma, angiomyolipoma, or vascular disease such as pseudoaneurysms of kidney vessels or polycystic kidney disease has been described in patients receiving hemodialysis; bleeding is usually confined to the retroperitoneum but communication with the renal pelvis can occur.

What should be the initial diagnostic imaging study?

According to the American College of Radiology appropriateness criteria, the initial study to pursue in this setting should be computed tomography (CT) urography, which uses a specific imaging protocol of the abdomen and pelvis without and with intravenous contrast. Ultrasound or magnetic resonance urography can be considered when iodinated contrast or radiation is contraindicated. If an intrarenal source of bleeding is noted the patient should undergo arteriography, which may allow for treatment of a bleeding source. If no obvious source of bleeding is discovered, cystoscopy may be indicated. After CT without contrast that did not demonstrate a clear bleeding site, computed tomography angiography (CTA) was performed in our patient (Fig 1).

What is the diagnosis based on the imaging findings?

As is evidenced in Fig 1, the CTA showed a left lower renal pole arteriovenous fistula (AVF) and renal artery pseudoaneurysm (RAP; arrow) arising from a left lower pole interlobar artery and communicating with the urinary collecting system. It was thought that the pseudoaneurysm was a complication of his prior kidney biopsy. Development of a significant complication years after a kidney biopsy is extremely rare. One patient is reported to have presented 10 years after a biopsy with microscopic hematuria and was found to have an AVF and RAP; another patient with Alport syndrome on

Figure 1. Computed tomography angiography of the abdomen and pelvis.
maintenance hemodialysis presented 10 years after a kidney biopsy with flank pain and was found to have spontaneous rupture of an RAP.³

The incidence of AVF or RAP after kidney biopsy is difficult to define. One study, in which routine Doppler ultrasound was performed the day after biopsy, found AVF in 14.37% of patients, with almost all closing spontaneously within 90 days. The incidence of RAP following percutaneous kidney biopsy is even lower and has been reported to occur after 0.1%-5% of biopsies.⁴ RAP generally appears within 2 weeks after biopsy but may be discovered many years later.⁴ Both AVF and RAP can present with gross hematuria, flank mass, flank pain, and hypertension.

How should this patient be treated?
Transarterial embolization (TAE) is effective for management of hemodynamically unstable patients with RAP or AVF.⁵ Although concerns for devascularization of a portion of the kidney parenchyma with loss of kidney function and renin-dependent hypertension caused by kidney ischemia have been hypothesized, use of TAE has not been associated with substantial deterioration of kidney function or worsening hypertension. Our patient underwent successful coil embolization of the segmental left inferior renal artery (Fig 2) with resolution of the hematuria.

Final Diagnosis
Renal artery pseudoaneurysm and arteriovenous fistula due to prior kidney biopsy with spontaneous communication with the renal pelvis and gross hematuria.

Figure 2. Coil embolization of left renal arteriovenous fistula.
FELLOWSHIP PROGRAM HIGHLIGHT

Note from editors: To recognize fellowship programs’ educational mission, AJKD is using its popular Quiz feature to highlight Nephrology Fellowship programs when an author is a Nephrology Fellow. To participate, Fellowship Program Directors mentor fellows in submitting prospective Quizzes; those that are selected for publication include a brief description of the fellowship program from the Director. For “Sudden Gross Hematuria in a Hemodialysis Patient,” the first author is Jesse Diaz, a Nephrology Fellow at Baylor University Medical Center.

Program: Baylor University Medical Center (www.bumckidney.com)

Program Director: Akinwande Akifolarin, MD

Program Description from Dr Akifolarin: The Nephrology Program at the Baylor University Medical Center in Dallas is a 2-year fellowship that provides excellent clinical training in nephrology. Our program relies on a 1:1 faculty-to-fellow ratio to provide a very hands-on experience in a 1,000-bed quaternary care hospital treating patients with diverse kidney pathology. Fellows are trained in the care of critically ill patients with state-of-the-art diagnostic and management techniques including CRRT and ECMO. The medical center has a nationally recognized transplant program. Fellows can choose a variety of elective experiences, such as critical care, renal pathology, renal ultrasound, and interventional nephrology. Baylor Fellows gain experience in placement of temporary dialysis catheters and both native and transplant kidney biopsies. In addition, fellows are exposed to the outpatient care of peritoneal and hemodialysis patients. The program prides itself in emphasizing education over service; our approach to graduate medical training is to facilitate the educational experience of trainees by providing an environment where they can meet their career goals. Because of this experience our fellows have had a 100% board pass rate over the last 10 years.

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