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Clinical Communications: Adult

A Rare Case of Page Kidney in a Young Man with Flank Pain

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□ **Abstract—Background: Page kidney is a rare condition in which an external compression of the kidney as a result of a hematoma or mass causes renal ischemia and hypertension. In a patient with flank pain, elevated blood pressure, and recent trauma, this condition should be considered. Since this condition was first described in 1939, more than 100 case reports have surfaced. Case Report: We describe the case of a 26-year-old man who presented to the Emergency Department with flank pain, vomiting, and elevated blood pressure. A computed tomography scan of the abdomen and pelvis confirmed the presence of a perinephric hematoma, and the interventional radiology team was consulted to resolve the Page kidney. Why Should an Emergency Physician Be Aware of This?: Symptoms seen in Page kidney may be similar to other more common diagnoses encountered in the emergency department. It is important to maintain a high suspicion and order imaging studies as needed, especially in the setting of trauma, or a recent procedure in the vicinity of the renal parenchyma. © 2023 Elsevier Inc. All rights reserved.**

□ **Keywords—flank pain; Page kidney; perinephric hematoma; renal artery pseudoaneurysm**

Introduction

Flank pain is a common diagnosis encountered in the emergency department (ED). Differentials are broad and can range from pyelonephritis, to ruptured abdominal aortic aneurysm, to shingles. Another rare, but important, diagnosis to consider is Page kidney. Page kidney or Page phenomena is the result of an external compression of the renal parenchyma, thereby causing renal ischemia and a resultant systemic hypertension (1,2). Without prompt management, this can further lead to renal infarction and acute kidney injury. As this is a reversible condition and can often be acute in nature, it is crucial for the emergency physician to keep a high clinical suspicion for this diagnosis. There is no documented incidence for the Page kidney as it is, in itself, a rare condition. However, since the condition was first described in 1939, more than 100 case reports have surfaced (3). We present a surprising case of a young man who presented with acute flank pain and mild hypertension and was found to have Page kidney, requiring emergent intervention by interventional radiology (IR).

Case Report

A 26-year-old man presented to a busy urban community ED with right-sided flank and abdominal pain. The pain started acutely, waking him up from his afternoon nap earlier that day. It was described as intermittent and colicky, with radiation to the right lower quadrant. He also endorsed nausea, with two episodes of nonbloody, nonbilious emesis. He denied any alleviating factors and had never experienced similar symptoms before. When asked about any prior trauma or activity, he stated that he played basketball for approximately 3 h the day prior, but did not remember sustaining any acute injury. This was not an activity unusual for him. He had no fever, chills, chest pain, shortness of breath, diarrhea, hematuria, dysuria,

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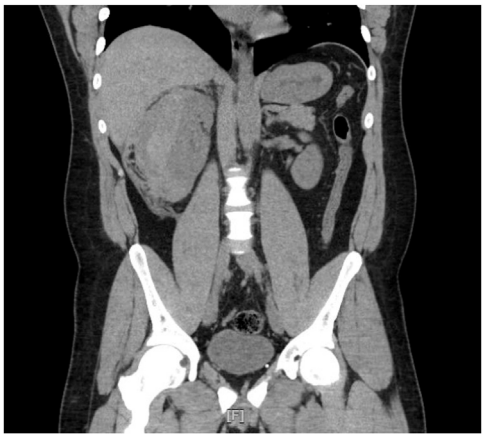

Figure 1. Noncontrast computed tomography of the abdomen/pelvis showing a large hematoma around the right kidney.

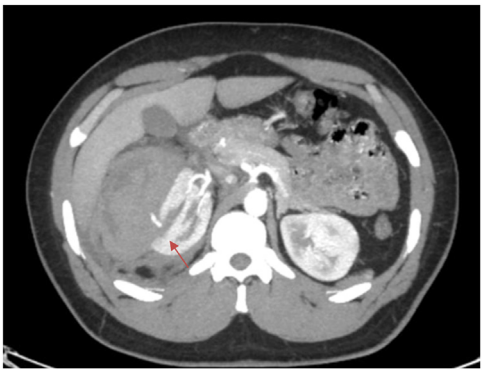

Figure 2. Computed tomography angiogram demonstrating right perinephric hematoma and active extravasation (arrow).

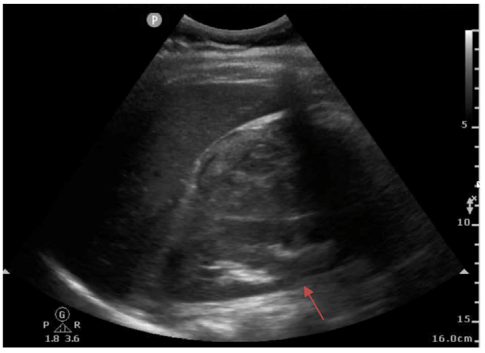

Figure 3. Point-of-care ultrasound demonstrating subcapsular right renal hematoma (arrow) on a standard Morrison's pouch view.

urinary frequency, or bloody stool. His only medical history included asthma and a tibial fracture. Otherwise, he endorsed smoking marijuana since the age of 13. He denied any alcohol, nicotine, or other recreational drug use. His medications included albuterol as needed, as well as Percocet every 6 h as needed for his extremity pain.

On presentation to the ED, initial vitals at triage included a temperature of 36.6°C, heart rate of 75 beats/min, blood pressure of 142/83 mm Hg (mean arterial pressure 102 mm Hg), respiratory rate of 18 breaths/min, and an O_2 saturation of 99% on room air. Upon approaching the patient, he was lying against the recliner chair, intermittently fidgeting around to achieve a more comfortable position. Upon physical examination, he had a benign abdominal examination with a costovertebral angle that was tender to percussion on the right side. There were no skin findings.

The differential diagnosis at this time included, but was not limited to, renal colic, pyelonephritis, appendicitis, and lumbosacral strain. An intravenous line was inserted, bloodwork and urine were obtained, 1 liter of lactated Ringer's solution was ordered, and a noncontrast computed tomography (CT) scan of the abdomen and pelvis was performed.

Laboratory studies were significant for a leukocytosis (13.0 K/ccm) with a neutrophil predominance (84.2%) and trace blood in the urine. Creatinine level was 1.3. Noncontrast CT of the abdomen and pelvis was significant for a large right-sided perinephric hematoma measuring 12 cm × 5.3 cm, causing compression of the right kidney, and otherwise showed no evidence of renal or ureteral calculi (Figure 1). The radiologist noted in writing to consider an acute Page kidney. This case was discussed with the on-call urology resident who recommended following up these results with a CT angiogram of the abdomen and pelvis to evaluate for acute extravasation that may be worsening the current hematoma. The findings for the angiogram study included evidence of a hematoma similar in size to the one described in the noncontrast study with the addition of a pseudoaneurysm that was discovered along the lateral margin of the kidney within the hematoma. Delayed pooling of blood in the venous phase was also noted, consistent with an active extravasation (Figure 2). Point-of-care ultrasound (POCUS) was performed after viewing the CT results to further evaluate the kidney (Figures 3 and 4).

The on-call IR attending was consulted and urged for the preparation of the patient for an embolization in the IR suite, with an admission to the intensive care unit for close monitoring of blood pressure and hemoglobin/hematocrit. Increasing blood pressure would indicate worsening Page kidney, whereas a sudden decrease in blood pressure may indicate rupture of hematoma in the setting of an active extravasation. The repeat blood pressure at this time was 149/96 mm Hg.

That morning, a right transfemoral renal artery angiogram and pseudoaneurysm coil embolization were performed, with resolution of hemorrhage (Figures 5 and 6). The patient remained in the hospital for a total of 5

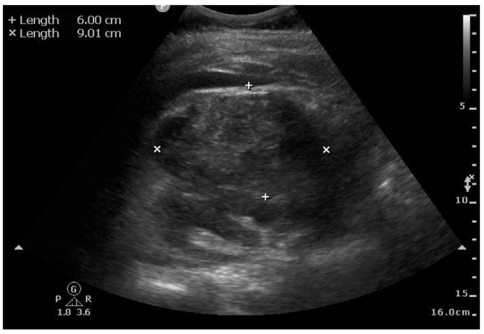

Figure 4. Point-of-care ultrasound demonstrating subcapsular hematoma measuring 6 cm × 9 cm and compression of the right kidney in coronal view.

Figure 5. Right renal angiogram showing contrast extravasation (arrow) from the interpolar region of the right kidney consistent with active hemorrhage.

Figure 6. Right renal angiogram, post coil embolization, showing resolution of contrast extravasation and sparing of the majority of the renal parenchyma.

days for monitoring. One day postprocedure, a repeat noncontrast CT of the abdomen and pelvis was performed, showing a slightly larger hematoma, for which the IR service recommended continued monitoring of vitals and the hemoglobin/hematocrit status. After an otherwise uneventful hospital stay, he was discharged with urology and IR follow-up for a repeat visceral CT angiogram of the abdomen and pelvis.

Discussion

Page kidney occurs when there is an external compression of the renal parenchyma, resulting in renal tissue ischemia and systemic hypertension (1). This phenomenon was first described by Dr. Irvine Page in 1939, who discovered that wrapping one or both kidneys in dogs in cellophane caused the dogs to develop hypertension due to compression of intrarenal vasculature and subsequent activation of the renal-angiotensin-aldosterone system. The compression was due to an inflammatory reaction, causing tissue around the renal parenchyma to form a fibrocollagenous hull. The hypertension was resolved after a nephrectomy or removal of the hull (4).

Causes

Page kidney can occur due to any structure that may cause a mass effect, including subcapsular or perinephric hematoma and tumors, and can be sustained after blunt trauma (due to sports, motor vehicle accidents, or falls) and procedures (shockwave lithotripsy, kidney biopsy, ureteral surgery, sympathetic nerve block) (5). It has even been seen to occur after a Chinese massage and a chiropractic adjustment (6,7). It is a rare diagnosis that is seen preferentially in young males. In fact, the first case ever described in a human, in 1955, was of a young football player who was tackled multiple times during a match (8). It is our hypothesis that our patient sustained blunt trauma during a basketball game that led to renal artery injury and extravasating pseudoaneurysm. Alternatively, our patient could have had a congenital pseudoaneurysm that ruptured after unnoticed injury during the game or without a cause. Renal aneurysm and pseudoaneurysm are rare conditions, with overall incidence of 0.01% and 1% that can go up to 39% in the evaluation of a patient with hypertension unresponsive to medical therapy (9).

Signs/Symptoms

Patients with Page kidney could present with no symptoms other than elevated blood pressure. In one literature review study, the average blood pressure was 177/105 mm Hg (mean arterial pressure 129 mm Hg) (10). In our

patient, the highest recorded blood pressure during the ED stay was 149/96 mm Hg. As this value is significantly lower than the average pressure of 177/105 mm Hg noted in the above study, it is difficult to establish whether the elevated blood pressure in our patient was due to the subcapsular hematoma, pain, or a combination of the two. However, past case reports have shown a wide array of blood pressures in patients with subcapsular or perinephric hematomas, from 110/80 mm Hg to a systolic blood pressure of over 200 mm Hg (11). The Page kidney could be found incidentally during hypertension workup. Alternatively, it can present with severe flank pain and mimic symptoms of renal colic. In cases of trauma, ecchymosis was a common examination finding in patients that suffered from Page kidney (10).

Workup

Generally, patients with Page kidney have normal renal function, as the process is unilateral. The kidney function is reduced in patients who have only one functioning kidney (e.g., history of nephrectomy) (12). Urinalysis is not a reliable test for the diagnosis of Page kidney, as it is frequently normal, but sometimes it may show hematuria or proteinuria. Similarly, other laboratory tests such as complete blood count or lactate hold low clinical value in diagnosis of Page kidney (10). Page kidney is diagnosed via ultrasound or CT. In this case, ultrasound was performed after viewing the CT, as shown in Figures 3 and 4. In retrospect, we wish we performed POCUS upon patient arrival, as is usually the practice in our ED for young patients with possible renal colic. If POCUS were performed earlier, the care of the patient would have been expedited and CT angiogram would have been ordered as the imaging of choice.

Treatment

There are several modalities of treatment, depending on the cause, severity, and chronicity of the patient's condition. However, the general objective is the removal of the compressing agent. In the case of a stable hematoma, renal-angiotensin-aldosterone system inhibitors such as angiotensin-converting enzyme inhibitors and angiotensin receptor blockers may be used to control blood pressure while monitoring the hematoma for spontaneous resolution (13,14). Antihypertensive agents were not administered to our patient, as his blood pressures were only mildly elevated, and he was taken emergently to the IR suite. Throughout the rest of the hospital stay, the patient did not require antihypertensives, and his blood pressure dropped to 134/81 mm Hg upon discharge. Persistent hypertension due to nonresolving hematoma is an indication to perform removal of the external compression. Options include a capsulectomy, hematoma evacuation, and, in the worst-case scenario, a nephrectomy. Percutaneous drainage is often successful, but may cause recurrence (15). Laparoscopic renal decortication and hematoma evacuation have also been successful (11). For an emergency physician, it is paramount to get IR involved early in the case, monitor blood pressure closely, and most likely, disposition the patient to the intensive care unit.

Why Should an Emergency Physician Be Aware of This?

Page kidney is an uncommon diagnosis in the ED. Symptoms seen in Page kidney may be similar to other more common diagnoses encountered in the Department, such as renal colic, pyelonephritis, and appendicitis. However, it is important to maintain a high suspicion and order imaging studies as needed, especially in the setting of trauma, exertion, or a recent procedure in the vicinity of the renal parenchyma. We advocate for liberal use of POCUS in patients presenting with flank pain to evaluate for hydronephrosis, aortic aneurysm, and subcapsular collection. POCUS could have expedited our patient's diagnosis and management and led to decreased radiation exposure overall.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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