

Page Kidney: A Secondary Case of Hypertension

Matthew Agnew ^a Anas Renno ^b and Asif Mahmood ^b

Corresponding author(s): Matthew.agnew@utoledo.edu



^aThe University of Toledo School of Medicine 3000 Arlington Ave. Toledo, OH 43614, USA, and ^bThe University of Toledo Medical Center Department of Hospital Medicine, 3000 Arlington Ave. Toledo, OH 43614, USA

Page kidney is a rare cause of secondary hypertension in adults that occurs as a result of extrinsic compression of the kidney due to a subcapsular collection, such as a hematoma or urinoma. Usually, these subcapsular formations are a result of trauma to the kidney from incidents such as a biopsy or motor vehicle accident. Here we present a case of a 61-year-old African American male who presented to the hospital with worsening shortness of breath for 2 days, a blood pressure of 203/156, and a brain natriuretic peptide (BNP) of 206. The patient was admitted and treatment began for diastolic congestive heart failure and hypertensive emergency. Clinically, he showed improvement but his systolic blood pressure continued to be in the 150's despite administering multiple blood pressure medications. Due to difficulty controlling the patient's blood pressure and a negative renal ultrasound, the internal medicine team ordered an abdominal CT scan with contrast which revealed a subcapsular fluid collection indenting the lateral margin of the left kidney measuring approximately 7.1 x 5.4 x 2.3 cm, which lead the radiologist to diagnose the patient with a Page kidney. Upon gathering additional patient history the medical team learned that the patient received extracorporeal shock wave lithotripsy for nephrolithiasis within the past several months, which is a known risk factor for subcapsular hematoma formation. Ultimately, the urology team determined that the patient's subcapsular hematoma would resolve on its own and the patient should be monitored through outpatient follow-up for changes in his condition. We feel this case is noteworthy due to the rarity of a Page kidney, however, this case also highlights the importance of considering a secondary cause to hypertension in patients with difficult to control hypertension.

Page kidney | hypertension | chronic obstructive pulmonary disease | emergency

Case Report

Patient Information

We present a 61-year old African American male with a past medical history of chronic obstructive pulmonary disease, obstructive sleep apnea, hypertension, and nephrolithiasis who presented to the hospital in diastolic congestive heart failure and hypertensive emergency. Upon further evaluation for secondary causes of hypertension we found the patient to have a subcapsular hematoma, suggestive of a Page kidney.

Objective for Case Reporting

Page Kidney is a rare cause of secondary hypertension and we hope to contribute to the literature of this phenomenon. Additionally, this case demonstrates the importance of investigating potential secondary causes of hypertension in patients.

Case

A 61-year old African American male with a past medical history of chronic obstructive pulmonary disease, obstructive sleep apnea, hypertension, and nephrolithiasis was admitted to the hospital due to worsening shortness of breath for 2 days with associated symptoms of bilateral lower extremity edema, coughing, and wheezing. His condition did not improve after the use of his inhaler and nebulizer.

After completing the review of systems the medical team determined there was nothing of note for further consideration. On exam,

Submitted: 07/10/2020, published: 03/03/2021.

Freely available online through the UTJMS open access option

patient presented as an obese male in no acute distress who was alert and oriented. The remainder of the exam was unremarkable except for bilateral ankle edema and scattered wheezing throughout all lung fields. At the time vitals and labs were taken, the patient presented with a blood pressure of 203/156 mm Hg and a brain natriuretic peptide (BNP) level of 207, which is notable. The hospitalist team diagnosed the patient with hypertensive emergency and diastolic congestive heart failure leading the team to treat the patient through diuresis and an anti-hypertensive regimen.

The patients' initial drug regimen included furosemide 40 mg IV, metoprolol 25 mg oral Q12H, nitroglycerin drip, and hydralazine 50 mg Q8H. Over the course of the patients' 6-day admission, his symptoms steadily improved but hypertension persisted despite adding medications and increasing the dosage of existing medications. His final anti-hypertensive regimen was as follows:

40 mg of lisinopril, 5 mg of amlodipine, 100 mg of hydralazine, 25 mg of metoprolol, and 40 mg of furosemide daily. This regimen regulated his systolic blood pressure to a range of 130 to 150 mm Hg.

The medicine team ordered a renal ultrasound on the third day of admission which showed no abnormalities. However, due to the patient's persistent hypertension, the medical team ordered an abdominal CT with contrast to rule out secondary causes of hypertension. Per the radiology report, there was a subcapsular fluid collection indenting the lateral margin of the left kidney measuring approximately 7.1 x 5.4 x 2.3 cm (Figure 1). The fluid collection was most likely a subcapsular hematoma suggestive of a Page kidney, the probable source of his refractory hypertension.



Fig. 1. CT abdomen with contrast showing left renal subcapsular fluid collection (indicated by the blue arrows) measuring approx. 7.1 x 5.4 x 2.3 cm, suggestive of a Page kidney.

Discussion

In 1939, Irvine H. Page identified that parenchymal compression of a kidney via wrapping it in cellophane caused arterial hypertension in animal-model experiments (1). These experiments led to the formation of the Page phenomenon in which systemic hypertension is caused by extrinsic compression of the kidney by a subcapsular collection, such as a urinoma or a hematoma. The underlying mechanism is hypothesized to result from compression of the kidney parenchyma resulting in hypoperfusion and consequent activation of the renin-angiotensin-aldosterone system (RAAS). The majority of hypertension in patients is deemed "essential" and this patient has all the typical risk factors for essential hypertension (i.e., age, race, family history, overweight, etc.). This case demonstrates how a patient with all these risk factors can still have an underlying secondary cause to their hypertension.

Although extracorporeal shock wave lithotripsy is an effective and proven means of managing renal and proximal ureteral calculi,

there is a known risk of peri- and intrarenal hematomas. Risk ranges from 0.1% to 0.6% using ultrasonography and between 20% and 25% using magnetic resonance imaging or CT (2). Due to this patient's history of nephrolithiasis and recent treatment with shock wave lithotripsy, we suggest this is the most likely etiology of his Page kidney. Page kidney has been documented in the past as occurring after extracorporeal shock wave lithotripsy (ESWL) and we feel this case has similar circumstances (2, 3, 4).

Our patient's history and clinical presentation fit well with a diagnosis of Page kidney. His initial blood pressure, history of nephrolithiasis with lithotripsy, and size of hematoma are appropriate according to a literature review of Page Kidneys from 1991 to 2009, in which only 8 of the 28 cases reported renin and aldosterone levels that were abnormal (5).

Although the RAAS studies were in the normal range for this patient, we still suspect that our patient did in fact have a Page kidney. We feel his normal renin and aldosterone are most likely due to his high dose anti-hypertensive regimen that couldn't be held

prior to labs being drawn and the resolving nature of his subcapsular hematoma.

We hope this case study illustrates that in patients who present with resistant hypertension, thorough history taking is of the utmost importance. Page kidney can be suspected in patients with resistant hypertension and whose history reveals recent urologic manipulation. In these patients it may be advantageous to proceed to an abdominal CT with contrast after an inconclusive ultrasound to evaluate for a Page kidney or other cause of secondary hypertension.

Conclusion

In patients with difficult to control hypertension consider secondary causes of hypertension as this can drastically change the

management of the patient. Page kidney is a rare cause of secondary hypertension in patients but can be considered in those with a recent history of nephrolithiasis and extracorporeal shock wave lithotripsy.

Conflict of interest

Authors declare no conflict of interest.

Authors' contributions

MA wrote/edited manuscript and provided the literature review. Both AR and AM edited and reviewed the paper, as well as providing guidance during the writing of the paper. All authors read and approved the final document.

1. Page IH, The Production of persistent arterial hypertension by cellophane perinephritis. *JAMA*. (1939) 113(23):2046{2048.
2. Labanaris AP, Kühn R, Schott GE, Zugor V. Perirenal hematomas induced by extracorporeal shock wave lithotripsy (ESWL). (2007) Therapeutic management. *Scientific World Journal*. 7:1563-1566.
3. Schnabel, M.J., Gierth, M., Chaussy, C.G. et al. (2014) Incidence and risk factors of renal hematoma: a prospective study of 1,300 SWL treatments. *Urolithiasis* 42, 247{253
4. Naranjo Muñoz J, Narváez C, Villanego F, Mazuecos MA, Ceballos M. (2018) Page kidney as a complication after a shock wave lithotripsy: a case report. *CEN Case Rep*. 27(2):330-331.
5. Dopson SJ, Jayakumar S, Velez JC. (2009) Page kidney as a rare cause of hypertension: case report and review of the literature. *Am J Kidney Dis*. Aug;54(2):334-9