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A Rare Cause of Arterial Hypertension in a Young Adult: The Role of a Large Renal Cyst

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Abstract

Introduction: Arterial hypertension is a common and serious medical condition, often contributing to significant cardiovascular morbidity and mortality. While the majority of hypertension cases are classified as primary (essential), secondary hypertension, which results from identifiable causes, is also of clinical importance. Among the causes of secondary hypertension, renal abnormalities—particularly renal artery stenosis, chronic kidney disease, and renal cysts—are significant contributors. Although simple renal cysts are usually asymptomatic and benign, large cysts may cause renal compression, potentially leading to secondary hypertension through activation of the renin-angiotensin-aldosterone system (RAAS). **Case Presentation:** We present the case of a 44-year-old woman with a one-year history of poorly controlled hypertension. Despite initial pharmacological therapy and lifestyle modifications, her blood pressure remained above target levels. Imaging revealed a large, simple renal cyst measuring 14.7 × 12.7 × 9.9 cm in the left kidney, which significantly displaced renal parenchyma. Laboratory workup revealed elevated plasma renin levels, suggesting renin-mediated hypertension caused by the compression of renal tissue. **Management and Outcome:** The patient was started on a combination therapy of Amlodipine 5 mg (a calcium channel blocker) and Candesartan 16 mg (an angiotensin II receptor blocker), achieving partial control of blood pressure. Surgical intervention was not pursued at this stage, as the patient remained stable with no significant increase in cyst size on follow-up imaging. Close monitoring of blood pressure and periodic renal imaging were recommended for reassessment of the need for surgical intervention. **Conclusion:** This case highlights the role of large renal cysts as a rare but important cause of secondary hypertension. It underscores the importance of considering renal cysts in the differential diagnosis of resistant hypertension, especially when conventional pharmacologic therapy is inadequate. Long-term follow-up, including monitoring cyst size and blood pressure,

is essential to optimize patient outcomes and guide further interventions if necessary.

Keywords

Secondary Hypertension, Renal Cyst, Renin, Management, Renal Abnormalities, Resistant Hypertension

1. Introduction

High blood pressure (hypertension) affects millions worldwide and is a leading cause of cardiovascular morbidity and mortality. Arterial hypertension is classified as either primary (essential), accounting for most cases, or secondary, where an identifiable underlying cause exists. Among the causes of secondary hypertension, renal pathologies—including renal artery stenosis, chronic kidney disease, and renal cysts—are well-documented contributors. Although simple renal cysts are generally considered benign and asymptomatic, they can occasionally lead to complications, including hypertension, when they grow large enough to affect renal function. This case report discusses a rare presentation of secondary hypertension in a young adult caused by a large simple renal cyst, emphasizing the diagnostic challenges, management strategies, and the importance of monitoring renal abnormalities in hypertensive patients. To understand the impact of renal cysts on hypertension, it is essential to recognize the role of the renin-angiotensin-aldosterone system (RAAS) in blood pressure regulation. The RAAS, which responds to renal perfusion, can be abnormally activated by large cysts compressing the kidney, leading to increased renin production and subsequent hypertension.

2. Case Presentation

A 44-year-old woman was referred for further evaluation of poorly controlled hypertension, which she had been experiencing for the past year. Despite adhering to lifestyle modifications and initial pharmacological interventions, her blood pressure remained consistently elevated above target levels. The patient had no significant medical history prior to this issue, and there was no known family history of hypertension or renal disease.

Symptoms:

The patient reported experiencing symptoms commonly associated with poorly controlled hypertension, including **persistent headaches**, **dizziness**, and **fatigue**. These symptoms had become more pronounced over the last six months, significantly affecting her quality of life. Although these symptoms are non-specific, they were concerning in the context of the patient's uncontrolled blood pressure.

She didn't report any classic symptoms of renal disease, such as **flank pain**, **hematuria**, or **proteinuria**, which might typically raise suspicion of kidney pathology. However, she did complain of **occasional abdominal discomfort**, which she attributed to bloating and indigestion. The absence of obvious renal symptoms

like those mentioned above can often delay diagnosis, especially in cases where renal cysts are large but not immediately apparent in terms of physical findings.

Initial Examination and Diagnostic Workup:

On physical examination, the patient was found to be **overweight** with a **BMI of 30** and had elevated blood pressure measurements, consistently above 160/100 mmHg, despite being on Amlodipine 5 mg. She had no abdominal tenderness or palpable masses on physical examination.

A comprehensive diagnostic evaluation was initiated, which included **abdominal and pelvic computed tomography (CT)**. Imaging revealed a **large simple renal cyst** in the left kidney, measuring **14.7 × 12.7 × 9.9 cm** (Figure 1 and Figure 2), which was displacing the renal parenchyma and compressing surrounding structures. The large size of the cyst likely contributed to **renal compression**, affecting blood flow and triggering a cascade of events that led to **increased renin production**.

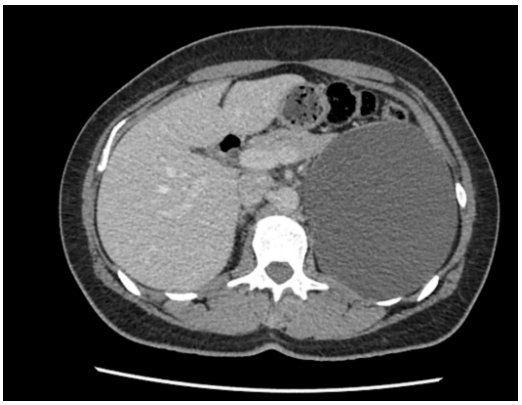

Figure 1. Cross section CT image observation left kidney cyst.

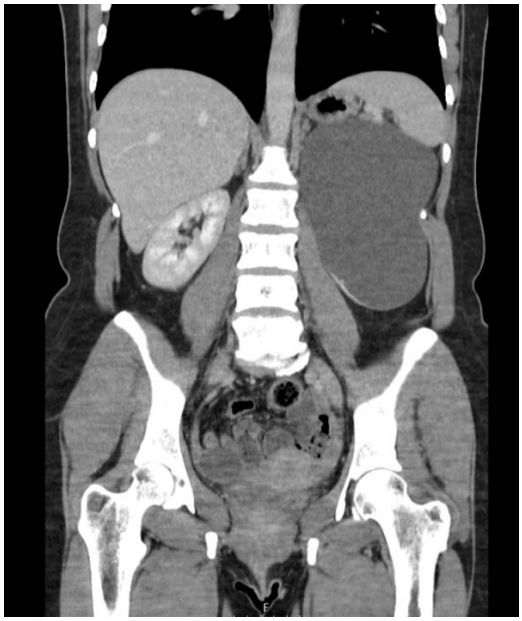

Figure 2. Longitudinal section CT image observation left kidney cyst.

3. Laboratory Results

- **Renal function** was preserved, with normal serum creatinine levels and an **eGFR** within normal limits.
- **Urinalysis** showed no evidence of hematuria or proteinuria, which helped rule out conditions like **glomerulonephritis** or **nephrotic syndrome**.
- **Plasma renin levels** were found to be **significantly elevated**, which pointed to **renin-mediated hypertension** as the likely cause of the patient's blood pressure elevation. This finding, in combination with the large renal cyst compressing renal parenchyma, suggested a clear pathophysiological link between the cyst and the hypertension.

Differential Diagnosis Considerations:

The clinical symptoms and the laboratory results guided the clinical team to consider secondary causes of hypertension, such as **pheochromocytoma** or **hyperaldosteronism**. However, normal levels of **catecholamines**, **metanephrines**, and **aldosterone** made these diagnoses unlikely. Additionally, imaging ruled out **renal artery stenosis**, further confirming that the renal cyst was likely the culprit behind the secondary hypertension.

Management Approach and Follow-up:

The patient was started on a combination of **Amlodipine 5 mg** (a calcium channel blocker) and **Candesartan 16 mg** (an angiotensin II receptor blocker). While this regimen resulted in partial blood pressure control, further reduction was necessary to meet target levels. The decision was made to closely monitor the cyst and blood pressure, with **regular follow-up** imaging and blood pressure measurements. **Surgical intervention**, such as cyst aspiration or partial nephrectomy, was not considered initially since the patient's condition remained stable, and the cyst size did not increase significantly on follow-up imaging.

4. Key Points in Case Presentation

1) Symptomatology: The patient's symptoms were primarily **headaches**, **dizziness**, and **fatigue**, common in cases of poorly controlled hypertension, but there were no classic renal symptoms like pain or hematuria. This highlights how secondary hypertension due to a renal cyst can sometimes present with **non-specific symptoms**, making diagnosis more challenging.

2) Diagnostic Findings: Imaging revealed a **large renal cyst** causing significant **renal compression**, which was likely the underlying cause of the elevated **renin levels** and hypertension.

3) Renal Cyst and Hypertension Connection: The patient's **elevated plasma renin levels** provided critical insight into the pathophysiological link between the cyst and hypertension. The compression of renal parenchyma likely disrupted renal perfusion, leading to abnormal RAAS activation and subsequent blood pressure elevation.

4) Management and Monitoring: Despite initial pharmacological management achieving partial control, **regular monitoring** is essential. The patient will

continue with blood pressure management and imaging follow-ups to monitor for potential cyst growth or complications.

5. Treatment and Follow-Up

The patient was started on Amlodipine 5 mg (a calcium channel blocker) and Candesartan 16 mg (an angiotensin II receptor blocker). This regimen led to partial blood pressure control, although further reduction was needed to reach target levels. Surgery was not pursued at this stage as the patient remained stable and the cyst size did not increase on follow-up imaging. Regular monitoring of blood pressure and renal imaging was recommended for future reassessment.

6. Discussion

This case illustrates the importance of considering large simple renal cysts as a potential cause of secondary hypertension, especially in patients with resistant hypertension. While simple renal cysts are typically asymptomatic, they can grow large enough to compress surrounding renal tissue and blood vessels, disrupting renal perfusion and leading to increased renin production [1]. The elevated plasma renin levels in this case support the hypothesis that the cyst-induced renal compression activated the RAAS, contributing to the development of hypertension.

Renin-mediated hypertension in patients with large renal cysts is often resistant to conventional antihypertensive therapy, as demonstrated by this case. Treatment with RAAS inhibitors such as angiotensin II receptor blockers (ARBs) and calcium channel blockers was partially effective, though further blood pressure control was required. Similar cases in the literature have shown that renal cyst-induced hypertension often requires aggressive pharmacologic management, and surgical interventions such as cyst aspiration or nephrectomy may be considered in cases of uncontrolled hypertension [2].

A review of the literature highlights that approximately 2% - 5% of secondary hypertension cases are attributed to large renal cysts causing significant parenchymal compression [3]. Surgical interventions have been shown to reduce blood pressure in a significant proportion of cases, suggesting that early identification of renal cysts in hypertensive patients may lead to better management outcomes [1].

Given the rarity of this condition, it is essential for clinicians to maintain a high level of suspicion for large renal cysts in patients with resistant hypertension, especially in the absence of other identifiable causes. Monitoring renal function, plasma renin levels, and imaging studies over time is crucial to ensure optimal management and timely intervention if necessary.

7. Conclusions

This case report highlights a rare cause of secondary hypertension in a 44-year-old woman with a large simple renal cyst. Elevated renin levels, in the context of

renal displacement, suggest a mechanistic link between the cyst and the patient's hypertension. While pharmacologic therapy provided partial control, continued monitoring of cyst size and blood pressure is crucial.

This case emphasizes the importance of considering renal abnormalities in the differential diagnosis of resistant hypertension. Early identification and tailored management can significantly improve clinical outcomes in such cases. Surgical options, including cyst aspiration or nephrectomy, may be necessary if hypertension becomes uncontrolled or the cyst continues to enlarge.

8. Recommendations for Follow-Up

Longitudinal monitoring of such patients is crucial, with periodic renal imaging and laboratory tests to assess the need for further interventions. If hypertension becomes refractory to medical management, surgical options should be considered.

Conflicts of Interest

The authors declare no conflicts of interest related to the content of this article.

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