Case Report

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An Unusual Cause of Hypertension: Bilateral Accessory Renal Arteries

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Abstract

Hypertension in childhood is a significant risk factor for the subsequent development of vascular diseases in later life. It is recommended that all children with hypertension undergo investigation for potential secondary causes. The bilateral accessory renal artery represents a rare etiological factor in the development of renovascular hypertension. We presented a hypertensive adolescent patient who was admitted to the pediatric emergency department with complaints of dizziness and dyspnea and was diagnosed with bilateral accessory renal arteries, which was a rare condition. In renal color Doppler ultrasonography, measurements of both renal arteries at the renal hilum and interlobar levels were identified as significant for diagnosing stenosis. CT angiography revealed right renal and additional accessory renal arteries. A multidisciplinary approach and individualized patient management are critical for the diagnosis and treatment of renal vascular diseases. In this case, a rare variation, bilateral accessory renal artery, was diagnosed during the investigation of hypertension etiology. It is recommended that renal CT imaging is utilized for the precise diagnosis of renal artery abnormalities in hypertensive children.

Keywords: Accessory renal artery, childhood, secondary hypertension

Introduction

Secondary hypertension is more prevalent in children than in adults, with a reported prevalence of 1–3%. The most frequent cause is underlying renal disease. Renovascular hypertension (RVH) refers to elevated blood pressure secondary to renal artery stenosis (1). In contrast, renal vascular anomalies such as accessory renal arteries are rarely encountered. These anomalies are usually asymptomatic and are often detected incidentally during imaging (2).

Case Report

A 13-year-old boy presented to the pediatric emergency department with complaints of dizziness and shortness of breath. On physical examination, sitting blood pressure measurements were 140/90 mmHg in the right arm and 130/90 mmHg in the left arm. His body weight was 81 kg (above the 97th percentile, +3.03 SD), height 168 cm (93rd percentile, +1.47 SD), and body mass index (BMI) was 28.7 kg/m² (above the 95th percentile, +2.26 SD). Other systemic findings on physical examination were unremarkable. The patient's personal medical history was unremarkable. However, a positive family history of hypertension was noted in the father and paternal grandmother. Complete blood count, serum and urine biochemistry, urine culture, and arterial blood gas analyses were within normal limits. Plasma renin activity was 18.4 uIU/mL (reference range: 5.3-99.1), while aldosterone level was elevated at 53.8 ng/dL. Both electrocardiogram and transthoracic echocardiography revealed normal findings.Renal Doppler ultrasonography revealed increased peak systolic and end-diastolic velocities, with resistive index values ranging from 0.46 to 0.49 in both renal arteries at the hilum and interlobar levels-findings that were suggestive of stenosis. However, captopril-enhanced renal scintigraphy showed no evidence of renovascular disease in either kidney.Renal computed tomographic (CT) angiography was performed due to persistently elevated blood pressure values above the 95th percentile during follow-up after initiation of enalapril. CT angiography revealed the presence of the right renal artery and two accessory renal arteries supplying the upper and lower poles of the right kidney, respectively. On the left side, both the main renal artery and an accessory renal artery were seen to originate separately from the abdominal aorta (Figure 1, 2). These vessels converged at the renal hilum. The accessory renal artery on the left had a smaller diameter, but there was no evidence of stenosis. During follow-up, the patient was

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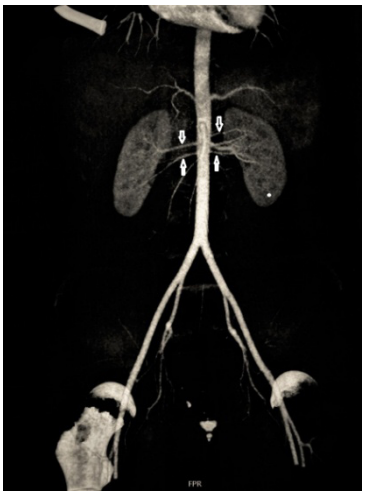

Figure 1. Three-dimensional computed tomographic angiography showing bilateral renal and accessory renal arteries. Two accessory arteries are observed on the right, supplying the upper and lower poles of the kidney. On the left, an accessory renal artery originates separately from the abdominal aorta and joins the main renal artery at the hilum. Arrows indicate the accessory vessels.

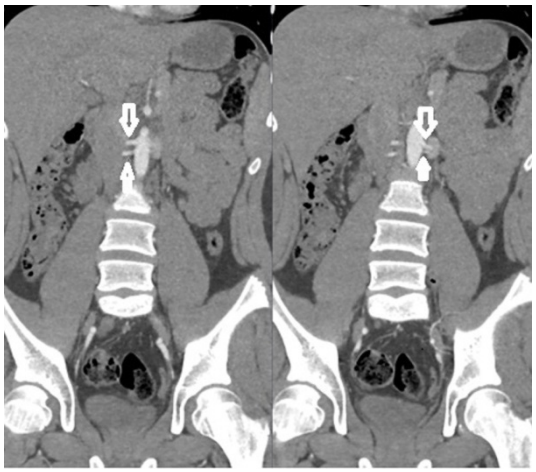

Figure 2. Coronal CT angiography images demonstrating the origins of the main and accessory renal arteries from the abdominal aorta. Both kidneys show separate vascular supplies, with accessory arteries visible on each side. Arrows indicate the vascular origins.

advised to follow lifestyle modifications, including dietary salt restriction and increased physicalactivity. However, blood pressure remained elevated despite these non-pharmacological interventions. Amlodipine was initiated at a dose of 0.05 mg/kg/day and gradually increased to the maximum tolerated dose. As hypertension persisted and echocardiography revealed left ventricular hypertrophy along with bilateral hypertensive retinopathy, enalapril was added to the treatment regimen. Subsequently, blood pressure progressively decreased and was maintained below the 90th percentile for age and height during out patient follow-up.

Discussion

Hypertension represents a significant public health issue in children, paralleling its impact in adults. It is therefore imperative that hypertension in childhood is diagnosed and treated as early as possible, given the potential for complications to arise in adulthood. In children, blood pressure measurement is recommended at each examination from the age of three onwards. Furthermore, in the presence of associated risk factors, routine blood pressure measurement is recommended prior to the age of three (3).

Prior research has demonstrated that the presence of a unilateral accessory renal artery is observed in 20–36.1% of hypertensive adults. Nevertheless, a study reported a prevalence of 2-14.7% for the bilateral accessory renal artery. It is established that the presence of an accessory renal artery does not influence the diameter of the main renal artery (4). Similarly, the diameter of the main renal arteries was maintained in our patient.

In cases of renal artery stenosis, hypertension results from the disruption of blood flow in the renal artery or its associated branches. In the context of an ischemic kidney, the production of excess renin leads to an abnormal release of aldosterone. Hypertension is linked to the stimulation of the renin-angiotensin system and inadequate perfusion resulting from sodium and volume retention. This is the primary cause of elevated blood pressure in renovascular hypertension. Several studies have suggested that accessory renal arteries may contribute to hypertension due to increased renal vascular resistance or abnormal flow patterns. In some cases, these vessels are associated with segmental ischemia that may stimulate renin secretion and activate the renin-angiotensin-aldosterone system (RAAS) even in the absence of overt stenosis. Although the exact mechanism remains debated, accessory renal arteries should be considered potential contributors to pediatric hypertension when no other cause is identified (4,5).

The use of captopril renal scintigraphy is an effective diagnostic tool for the identification of RVH. A normal result does not preclude the possibility of RVH, and an abnormal result may be attributable to parenchymal lesions. In this case, the results of the captopril renal scintigraphy did not corroborate the diagnosis.

Computed tomography angiography provides a non-invasive method of imaging the anatomical structure and defining pathological findings in renal pathologies. Consequently, a diagnosis of bilateral accessory renal artery was made on the basis of CT angiography in our patient.

Renal artery variations are classified into two principal groups: early division and extra renal arteries (ERA).

Segmental branching of the main renal arteries from proximal of renal hilum level is called as early division. ERA is divided into two groups as hilar (accessory) and polar (aberrant) arteries. While the hilar arteries enter the kidneys from the hilum with the main renal artery, polar arteries enter the kidneys directly from the capsule outside the hilum (6).

Occlusive diseases of the renal arteries are characterized by poor prognosis in children. Endovascular techniques, surgery and medical approaches are used for the treatments of the renovascular diseases. Success rate is reported as 79% with these methods (6). A multidisciplinary approach involving nephrology, interventional radiology, and surgery, as well as individualized patient management, is critical for accurate diagnosis and effective treatment.

In addition to renovascular anomalies, the role of obesity should also be considered in the pathogenesis of hypertension. The patient in this case had a body mass index above the 95th percentile, meeting the criteria for obesity. Obesity is known to contribute to elevated blood pressure through mechanisms such as increased sympathetic nervous system activity, sodium retention, and vascular dysfunction. Therefore, it is possible that both obesity and bilateral accessory renal arteries acted synergistically in the development of hypertension in this patient (7, 8).

Conclusion

In our case, bilateral accessory renal artery was found while investigating the causes of hypertension as a rare variation. Although unilateral accessory renal artery has been reported in the literature, the bilateral accessory renal artery is rarely seen in children. Therefore, we suggest that renal CT angiography be considered for the accurate diagnosis of renal artery abnormalities in hypertensive children.

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