Arterial Hypertension in a 10-Year-Old Girl

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Clinical Presentation

A previously healthy 10-year-old girl presented with occasional routine blood pressure measurements by her pediatrician above the 99th percentile for her age, sex, and height. She had noted mild hand edema over the previous days and reported recent nocturia. She was taking no medications. Family history was unremarkable. The physical examination was without significant findings other than an elevated blood pressure of 139/113 mm Hg. Urine tests showed borderline moderate albuminuria (albumin-creatinine ratio of 50 mg/g). There was no hematuria.

On ultrasound, kidney size and parenchyma were unremarkable but an increased flow rate of the left renal artery in color duplex sonography was detected (systolic flow rate: right, 100 cm/s; left, 300 cm/s [age-adjusted normal values range from 72 to 104 cm/s]) (Fig 1A and B). No additional finding was reported. Magnetic resonance (MR) angiography of the kidney vessels was performed (Fig 2A) and antihypertensive therapy was initiated.

Discussion

What are the most common causes of hypertension in children and adolescents?

Hypertension in children is defined as systolic and/or diastolic blood pressure that is persistently at or above the 95th percentile for the corresponding sex, age, and height. Most children and adolescents with arterial hypertension have secondary causes, that is, not due to “essential hypertension.”

Potential underlying conditions include vascular causes (eg, coarctation of the aorta), neoplasms (eg, adrenal neuroblastoma), other nonrenal causes (eg, endocrine disorders such as hyperaldosteronism or hypercortisolism), or kidney disease, which may include renovascular (eg, renal artery stenosis) and renoparenchymal (eg, glomerular diseases with nephritic syndrome) disorders.

What diagnosis is suggested by the ultrasound and MR findings?

The ultrasound finding is suggestive of renal artery stenosis. Causes of renal artery stenosis in childhood include disorders of the renal arteries themselves or external compression. Inflammatory (eg, Kawasaki syndrome), hereditary (eg, neurofibromatosis), and even atherosclerotic disease resulting from genetic forms of hyperlipidemia can lead to vascular changes. Most commonly, intravascular changes are caused by fibrous dysplasia. External compression can be owing to postoperative adhesions and tumors. Duplex sonography can detect many cases of renal artery stenosis but is technically limited; supplemental MR scanning can help reveal the underlying cause of hypertension.

Figure 1. Sonographic findings. (A) Kidney sonography. (B) Color duplex sonography.
In our patient the MR study showed a solid tumor with cystic features and strong contrast enhancement compressing the left renal vessels (indicated by arrows in Fig 2A). Serum tumor markers were negative. High levels of noradrenaline and normetanephrine were detected in the urine, typical for the mostly benign neuroendocrine tumor pheochromocytoma. Meta-iodobenzylguanidine scintigraphy was compatible with pheochromocytoma (Fig 2B; arrows indicate tracer enhancement close to the left kidney) and did not show evidence of metastasis.

What treatment options are available?
Radical surgery with removal in toto is the definitive therapy of pheochromocytoma. For small tumors a laparoscopic approach in a no-touch technique is recommended. Preoperative management is important to prevent severe intraoperative hypertensive crisis. We initiated antihypertensive therapy with phenoxybenzamine as α blockade along with subsequent expansion of the therapy with a β-blocker.3,4 Treatment was initiated after meta-iodobenzylguanidine scintigraphy to avoid interference causing false-negative results.5 Pathologic examination of the removed tumor confirmed pheochromocytoma. After tumor resection, blood pressure normalized.

Which additional diagnostic tests should be considered?
Pheochromocytoma in childhood may be associated with heritable disorders and thus genetic testing should be offered.3 Pheochromocytoma is strongly associated with some familial cancer predisposition syndromes, including von Hippel–Lindau (vHL) disease. In our patient gene panel analysis identified a recurrent sequence variant in the VHL gene,6 a guanine-to-thymine substitution at nucleotide 311 of the coding sequence, predicted to lead to a glycine-to-valine substitution at amino acid 104 (c.311G>T [p.Gly104-Val]). The variant is classified as pathogenic according to the American College of Medical Genetics and Genomics criteria7 and occurred de novo. Lifetime risk for a patient with vHL disease to develop pheochromocytoma is about 10%-25%, depending on the genotype.8 Our patient is currently in complete remission and receiving close follow-up according to current guidelines,3 without evidence of other manifestations associated with vHL disease.

Final Diagnosis
Secondary hypertension due to compression of renal vessels and catecholamine production by vHL-associated pheochromocytoma.

Article Information
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References


