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CLINICAL CASE

Renal artery aneurysm as a cause of secondary hypertension in a preschooler

Aneurisma de arteria renal como causa de hipertensión secundaria en un preescolar

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What do we know about the subject matter of this study?

Secondary hypertension is more frequent in children, and an etiological study is required to define its management. Although renovascular causes are common at this age, renal artery aneurysms are rare and require timely diagnosis to prevent life-threatening complications such as aneurysm rupture. Their treatment can be endovascular or surgical by nephrectomy, with refractory hypertension being one of the main indications for surgical management.

What does this study contribute to what is already known?

We present the case of a patient with hypertension of uncommon cause, reinforcing the need to perform a complete etiological study in this age group, as well as the importance of nephrological follow-up in surgical single-renal patients. As this clinical case is very infrequent, it reminds us of the importance of suspecting renovascular causes in patients with hypertensive emergency in pediatric age.

Abstract

Secondary hypertension is more frequent at early ages, with renovascular pathology being a significant cause. Renal artery aneurysms are rare and can be treated through endovascular therapy or may require surgical management with nephrectomy in selected cases. **Objective:** To describe an uncommon case of hypertension secondary to a renal artery aneurysm, and to discuss its management and evolution. **Clinical Case:** A 5-year-old male patient, previously asymptomatic, presented to the Emergency Department with a hypertensive crisis. An etiological study, including an abdominal CT angiography, revealed a fusiform aneurysm of the right renal artery. Antihypertensive treatment was initiated, but blood pressure control was inadequate, so a right unilateral nephrectomy was performed. The patient evolved normotensive without the use of medications and maintained follow-up with nephrology. **Conclusion:** Secondary hypertension in pediatrics requires a comprehensive etiological study, as it can be asymptomatic even in secondary cases. Determining its cause allows for targeted treatment and the prevention of possible complications, such as aneurysm rupture. Furthermore, it is important for surgical solitary kidney patients to continue follow-up with nephrology.

Keywords:
Aneurysm;
Hypertension;
Kidney;
Renal Artery;
Nephrectomy;
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Introduction

Hypertension (HT) in pediatrics has an estimated prevalence of 3.5 - 5%[1]. It is defined as blood pressure (BP) maintained above the 95th percentile for sex, age, and height in children under 13 years of age, using fixed cut-off values for children 13 years of age or older[2]. In pediatrics, HT is most frequently due to secondary causes, among which renovascular etiology is one of the most common[3].

A hypertensive crisis is defined as when BP reaches values that can compromise the patient's life, called hypertensive urgency in asymptomatic patients, and hypertensive emergency when the patient presents symptoms and/or signs of target organ damage[4,5]. The diagnosis of HT in pediatrics requires a complete etiological study and a search for possible target organ damage since it becomes a determining factor in its management. The objective of this report is to present the case of a pediatric patient with HT secondary to a renal artery aneurysm (RAA), an infrequent pathology with few cases reported in the literature, and to expose its diagnostic process and management through right unilateral nephrectomy.

Clinical Case

A 5-year-old male patient with no medical history consulted the emergency department due to intermittent frontal headache, associated with diffuse abdominal pain and 1 day of vomiting episodes. Physical examination revealed BP 190/145 mmHg, heart rate 116 bpm, saturation 98%, Glasgow score 15, axillary T° 37.1°C, and absence of neurological focality. Given the suspicion of intracranial HT, a head CT scan was performed which showed no pathological findings, therefore, the patient was admitted for study and management in the Critical Patient Unit.

Laboratory tests showed ammonia 76.4 mcg/dl (Normal Value 15-45 mcg/dl), lactic acid 40.5 mg/dl (NV 4.5-20 mg/dl), normal cortisol and complete urinalysis, and negative toxicological tests. An etiological study of HT and cardiovascular, renal, neurological, and ophthalmological target organ damage was performed, highlighting creatinine 0.48 mg/dl (NV 0.7-1.3 mg/dl), urea nitrogen 28.3 mg/dl (NV 6-24 mg/dl), serum potassium 3.7 mEq/Lt (NV 3.7-5.5 mEq/lt); fundus without hypertensive retinopathy; echocardiogram showed cardiac chambers of adequate size for age, without findings of congenital heart disease.

Renal Doppler ultrasound showed no pathological findings, however, given the high suspicion of renovascular etiology, a thoracoabdominal MRI was performed, which showed an ovoid-like lesion of the right renal sinus with low signal of 15.1 mm in longitudinal diameter. In this context, an abdominal CT angiography with contrast was requested to expand the study which showed a fusiform aneurysm in the right renal artery of 22mm in its major axis and 10mm in its anteroposterior axis. In addition, post-lesion stenosis and hypoperfusion areas of the right renal parenchyma were observed (Figures 1 and 2).

Hypertensive emergency was treated at first with continuous infusion pump of labetalol at 0.6 mg/kg/hr, dexmedetomidine at 1.5 mcg/kg/hr, and clonidine without adequate response. Given the diagnosis of

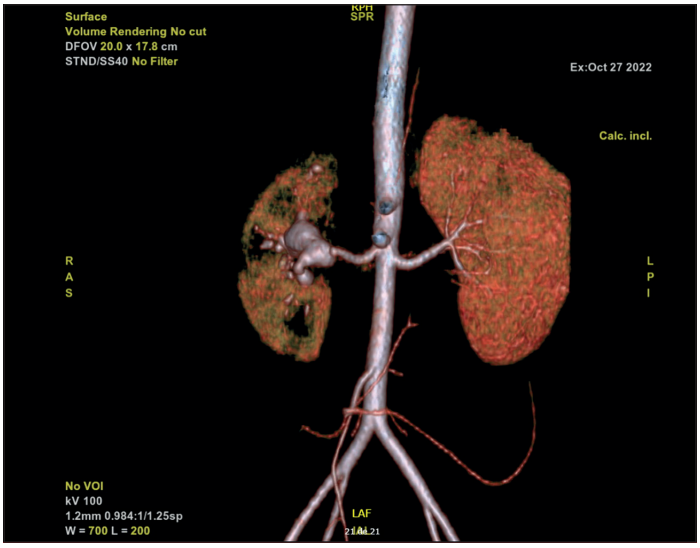

Figure 1. 3D reconstruction of abdominal angio-CT with contrast. Fusiform aneurysm of the right renal artery.

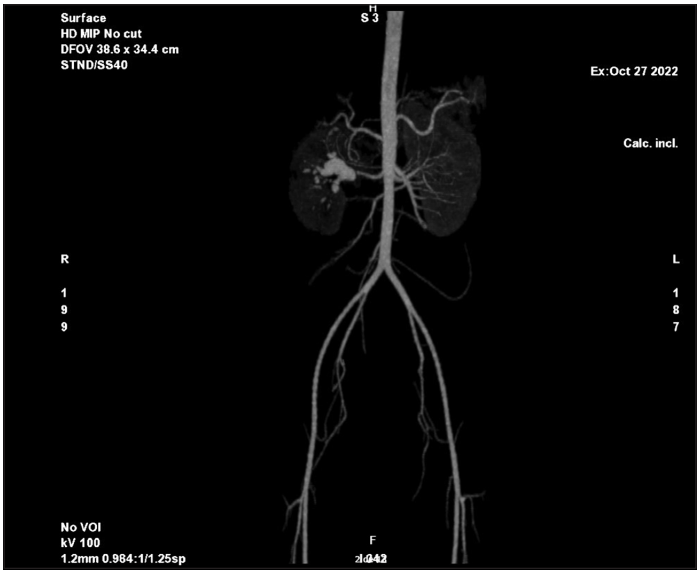

Figure 2. Abdominal angio-CT with contrast. Fusiform aneurysm of the right renal artery.

RAA and secondary refractory HT, he was evaluated by the interventional radiology team who dismissed the possibility of endovascular treatment, due to the anatomical characteristics of the aneurysm and the presence of atrophy and hypoperfusion of the right renal parenchyma. In this context, it was decided to perform a right unilateral nephrectomy by the surgical team, without performing previous dimercaptosuccinic acid (DMSA) renal scintigraphy.

After nephrectomy, the patient was discharged in good condition, on antihypertensive treatment with hydralazine at 7.5 mg every 6 hours and clonidine at 100 mg every 12 hours, which was suspended after 2 days, maintaining BP values within range. The patient continued subsequent follow-up with nephrology, achieving good BP control, creatinine values within the normal range, and negative microalbuminuria, without the need for pharmacological treatment after 1 year post nephrectomy.

Discussion

Renovascular HT is the most frequent cause of secondary HT in children and should be suspected particularly in children under 6 years of age[2]. The increase in BP occurs due to a decrease in renal blood flow and activation of the renin-angiotensin-aldosterone system[6]. Hypertensive children are usually asymptomatic for long periods or present nonspecific clinical manifestations such as headache, abdominal pain, vomiting, tinnitus, epistaxis, and tachycardia, therefore, its diagnosis is usually late and associated with significant comorbidity[1].

RAA is a rare cause of renovascular HT, with an incidence of approximately 0.1% in the general population[7]. It is defined as a dilatation of the renal artery greater than 2 times its normal diameter[8] and is usually associated with conditions such as Marfan syndrome, Ehlers-Danlos syndrome, neurofibromatosis, or tuberous sclerosis[9]. RAA is a rare vascular abnormality in children that requires high suspicion since patients may remain asymptomatic for long periods, or present nonspecific symptoms such as abdominal pain and hematuria[10].

In pediatric patients with HT, a directed study of its cause and target organ damage should be performed. This study should include laboratory tests for renal function analysis and diagnostic imaging such as renal Doppler ultrasound, which allows evaluation of the renal parenchyma and renal artery permeability. However, since it is an operator-dependent test, it may show normal results as in the case of our patient.

In case of a negative ultrasound study but high suspicion of renovascular etiology, the study should be complemented with MR angiography and CT angiography which provide more sensitive images to detect stenosis or RAA[4]. Renal angiogram is the test of choice for the diagnosis of RAA, however, as it is an invasive test, it is usually reserved for patients who are candidates for endovascular procedures[11].

Treatment of RAA is indicated in the presence of aneurysms with a diameter > 2 cm and, the presence of symptoms such as lumbar pain, hematuria, or HT[12]. Therapeutic options for RAA vary from pharmacological treatment to endovascular or surgical interventions such as nephrectomy in selected cases.

Pharmacological therapy is mainly used in patients with larger renal aneurysms who do not meet surgical criteria. The most commonly used antihypertensive drugs are calcium channel blockers and beta-blockers. Also, ACE inhibitors and ARBs should be administered with caution, since they are contraindicated in cases of bilateral renal artery stenosis[13].

Uncommon non-pharmacological management options include revascularization with percutaneous transluminal renal angioplasty or nephrectomy, with balloon angioplasty being preferred as it is less invasive and has a lower risk of complications. There is still controversy about the surgical indications for RAA, and it is usually evaluated on a case-by-case basis[13]. However, indications have been proposed for failure of endovascular management, complex renal artery stenosis associated with systemic vasculitis, refractory HT, and thromboembolism, dissection, or RAA rupture[12].

Considering the long-term morbidity and mortality associated with HT, interventions aimed at keeping pressure under control, such as endovascular therapy or nephrectomy, are decisive measures in the health of children and adolescents. In the case presented, the patient maintained normal BP without the need for the use of antihypertensive drugs after nephrectomy. However, nephrectomy resulted in a condition that is not exactly risk-free: being a surgical single-renal patient. As occurs in congenital single-renal patients, the reduction of nephrons predisposes to a greater risk of HT and renal failure in the future, due to renal damage secondary to hyperfiltration. In cases like this, microalbuminuria could be the earliest sign for the detection of hyperfiltration injury. Therefore, we emphasize the importance of a rigorous follow-up by nephrology teams to identify initial signs of renal hyperfiltration and to monitor BP in order to prevent progression to future complications[14].

Conclusions

This case report presents an infrequent pathology, which seeks to highlight the importance of suspecting

secondary HT in children and searching for its etiology. This determines its management and prognosis, avoiding as much as possible target organ damage and reducing cardiovascular risk. It is also important to maintain nephrological check-ups in those patients who have undergone surgery for the early detection of possible complications. In cases such as the one described above, it should also be considered that the remaining kidney could be damaged secondary to HT, so it is important to carry out a thorough study and follow-up of its long-term renal function.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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