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Case Report

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Renovascular Hypertension Associated with an Anomalous Intrathoracic Originated Renal Artery

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Abstract

Renovascular disease (RVD) is responsible for 5.8% of secondary hypertension cases in young adults, caused mainly by obstructive lesions due to either atherosclerotic renal artery stenosis or fibromuscular dysplasia. Although the renal arteries' supradiaphragmatic origin is exceedingly rare, up to date, three cases of secondary hypertension due to single ectopic renal arteries originating from the thoracic aorta have been reported in patients with customarily positioned kidneys. Herein we describe a case of a 21-year-old man with resistant hypertension whose investigation showed an ectopic right renal artery originated from the internal thoracic artery. Although both renal arteries were free of obstructive lesions, the right one was very long and tortuous, causing kidney hypoperfusion. A bypass surgery between the right renal artery and the aorta was performed uneventfully, leading to better blood press control. To the best of our knowledge, there are no previous reports of secondary hypertension due to renal artery arising from the internal thoracic artery.

Keywords

Renal Artery, Mammary arteries, Hypertension, Renovascular, Saphenous vein

Introduction

Renovascular disease (RVD) is characterized by kidney hypoperfusion, which culminates in renin-angiotensin-aldosterone system over-activation and secondary hypertension or ischemic nephropathy [1]. It is a common cause of difficult-to-treat hypertension. Population-based studies report RVD to have a prevalence of up to 6.8% in free-living American elders and 5.8% in young adults with secondary hypertension [2]. Although nearly all cases are induced by either fibromuscular dysplasia (young adults) or atherosclerotic renal artery stenosis (elderly), a wide range of vascular abnormalities are recognized to cause RVD. Thoracic renal arteries are a rare finding associated with inadequate blood supply and signs of kidney ischemia [3]. All cases reported to date in patients without kidney malformations are from aortic origin, and three are associated with renovascular hypertension (RVH) [3-5]. Herein we report a case of RVD related to an ectopic right renal artery that originated from the left internal

thoracic artery in a patient with normally positioned kidneys.

Case Report

A 21-year-old man visited the nephrology clinic because of severe hypertension. His first detected elevated blood pressure (BP) was at 19 years of age (220/110 mmHg), leading him to the emergency department because of acute dyspnea and chest pain. After antihypertensive and symptomatic medication, they discharged him for outpatient follow-up. His BP remained high despite taking losartan (50 mg bid) and amlodipine (5 mg bid). He denied a past medical history or substance abuse. Physical examination revealed a healthy nonobese man with a BP of 162/112 mmHg. Direct ophthalmoscopy showed no signs of retinopathy. We admitted him to optimize antihypertensive treatment and investigate secondary hypertension etiologies. After a low-salt diet, and addition of clonidine and spironolactone, is blood pressure remained under control (132/85 mm Hg). Laboratory findings (sodium, potassium, blood urea nitrogen, creatinine, blood fasting glucose, thyroid function, lipid profile and urinalysis) were unremarkable, as well as glomerular filtration rate (107,1 mL/min/1.73 m^2). Laboratory limitations prevented the measurement of aldosterone and renin levels. However, renal artery Doppler ultrasound only detected the distal third portion of the right renal artery. Further imaging with angiotomography (Figure 1) revealed an anomalous right renal artery originated from the left internal thoracic artery. The vessel proceeded to the abdomen through the vena cava foramen, following a tortuous path to the right renal hilum. The right kidney was normal in size but showed signs of hypoperfusion, parenchymal thinning, and reduced corticomedullary differentiation. Arteriography revealed tortuous right renal artery and absence of stenosis, which ruled out the possibility of angioplasty (Figure 2). We performed an uneventful arterial bypass procedure between the right renal artery and aorta through a saphenous vein graft, and the patient was discharged home with better BP control (130/80 mmHg) taking losartan (50 mg bid) and amlodipine (10 mg qd). Two months later, he maintained adequate BP control (120–130 mmHg of systolic BP) without symptoms and presented a control angiotomography that revealed a pervious anastomosis and a better right renal perfusion.

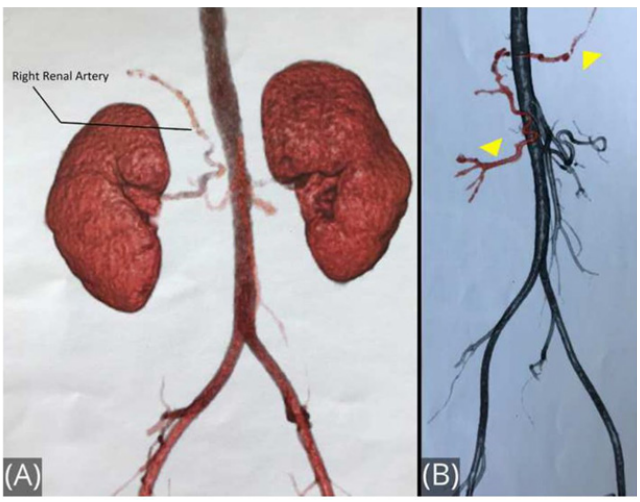

Figure 1: Preoperative (A) computed tomographic (CT) aortogram 3-dimensional reconstruction showing that the right renal artery does not originate from the abdominal aorta. (B) Highlighted right renal artery (arrowhead) unconventional cephalic path.

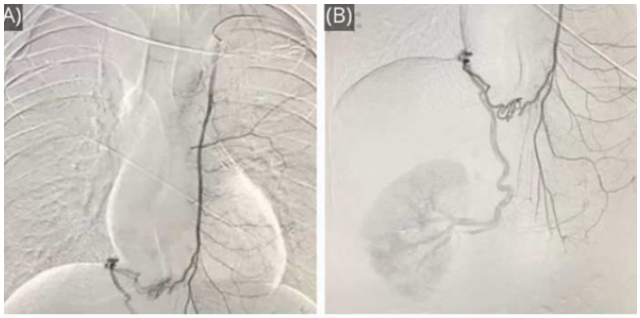

Figure 2: The left mammary artery's preoperative (A) selective angiography showed its path from the thorax with the intercostal branches (B) until it passed through the inferior vena cava ostium at the diaphragm and became the right renal artery.

Discussion

Kidney hypoperfusion, which results in renin-angiotensin-aldosterone system over-activation, characterizes the renovascular disease (RVD). Frequent consequences are secondary hypertension or ischemic nephropathy [4]. In this way, our patient presented with hypertension since young, never achieving target BP levels despite medical therapy. So, on admission, we excluded non-compliance, inadequate BP measurement, and white-coat hypertension (supervised adhesion and BP measurement by multiple professionals, at-home and hospital measures compatible, respectively). Because of technical difficulties and as the imaging tests identified a clear cause of secondary hypertension, we did not measure aldosterone and renin levels. Commonly, renal arteries originate from the abdominal aorta between the L1 and L2 vertebrae [5]. Despite anatomical variations that can occur, higher origins are exceedingly rare. Rameshbabu et al. found only 24 reports of thoracic renal arteries in a literature review, all starting from the lower thoracic aorta [3]. Normal renal development occurs with the involution of all aortoiliac branches of the mesonephric artery supply. Yet, the persistence of a cephalic vessel may lead to a thoracic renal artery of the aorta [3]. However, there is no apparent embryological relationship between the renal arterial supply and internal thoracic artery, which could not explain the present case. In addition, exists earlier descriptions of RVD owing to a thoracic origin of the renal artery in patients with difficult-to-treat hypertension [5]. To our knowledge, this is the first case of RVD because of anomalous right renal artery originating from the left mammary artery. In summary, although rare, vascular anatomic variety can cause RVD and surgical bypass can successfully improve kidney perfusion and blood pressure control in these cases.

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his private information, even if published anonymously which will hopefully help with the progression of medicine and other natural sciences.

Author Contributions

All authors contributed equally to this work.

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Ethical Approval

Ethical approval was not required for our case publication. We got written informed consent from the patient for the publication of his anonymized information in this case report and accompanying images. Written consent was also given for its appearance in print, online and licensed versions of the journal; for elements to be included in social media posting in journal staff to promote the article; and for the journal and its publisher to grant permission to third parties to publish this material. It's also of his understanding that while his name will not be published, even with the best efforts of the authors to maintain anonymity, and even with the journal's best practices in place, complete anonymity cannot be guaranteed. And that consenting to the publication does not remove his privacy rights, the consent can be revoked before the publication, but once the information has been committed to publication ("gone to press"), it cannot revoke consent. Payments or royalties were not given for his consent.

Competing Interests

The authors declare that they have no financial or non-financial competing interests.

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