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Clinical report

Renal artery stenosis in a single kidney patient: A case report

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ABSTRACT

Renal Artery Stenosis (RAS) is a pathologic state that may lead to resistant hypertension, progressive decline in renal function, cardiac destabilization syndromes, recurrent heart failure, or acute coronary syndromes. Nowadays, RAS has two therapeutic methods, including drug therapy and balloon angioplasty (with or without stents). This report introduces a 35-year-old man who was referred to a Tehran hospital in Tehran due to rice pill poisoning. In studies performed on the patient, renal artery stenosis was the reason for the sharp increase in creatinine and its resistance to treatment. Renal artery angioplasty was performed and a stent was placed. After that, the patient's creatinine returned to normal and the patient was discharged in good general condition.

Estenosis de la arteria renal en un paciente monorrenal: reporte de un caso

Palabras clave:
Arteria renal
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RESUMEN

La estenosis de la arteria renal (RAS, por sus siglas en inglés) es un estado patológico que puede conducir a hipertensión resistente, disminución progresiva de la función renal y síndromes de desestabilización cardíaca, insuficiencia cardíaca recurrente o síndromes coronarios agudos. Hoy en día, RAS tiene dos métodos terapéuticos, que incluyen la terapia con medicamentos y la angioplastia con balón (con o sin stents). Este informe presenta a un paciente de 35 años que fue remitido a un hospital de Teherán en Teherán debido a una intoxicación con pastillas de arroz. En los estudios realizados al paciente, la estenosis de la arteria renal fue la causa del fuerte aumento de la creatinina y su resistencia al tratamiento. Se realizó angioplastia de la arteria renal y se colocó un stent. Posteriormente, la creatinina del paciente se normalizó y el paciente fue dado de alta en buenas condiciones generales.

Introduction

Renal Artery Stenosis (RAS) is a pathologic state that results in the limitation of renal artery nutritional sources and reduced blood flow to the kidneys. Atherosclerotic renal artery stenosis (ARAS) is defined as a decrease of more than 60% in luminal diameter due to atheroma. ARAS is the most common cause of renovascular hypertension. It is relatively frequent in specific clinical settings: 6.8% in elderly patients (65 years and over), more than 14% in patients with another atherosclerotic lesion, and 24% in patients with resistant hypertension (RHTN)[1]. RAS prevalence can have a 1-5% range in populations with high blood pressure and 15-40% in populations with other atherosclerotic occurrences such as Peripheral Vascular diseases (PVD) and Coronary Artery Diseases (CAD). RAS is mostly found in patients with high blood pressure, chronic renal disease, congestive heart failure, and other consequences of high blood pressure, including myocardial infarction and stroke[2].

Renal Artery Stenosis (RAS) may cause the following clinical syndromes: Reno-vascular blood pressure: activation of Renin-Angiotensin- Aldosterone (RAAS) along with unilateral and bilateral renal hypoperfusion. This results in sodium retention, secondary hyperaldosteronism, and vascular contraction. Excretion of sodium by

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the natural kidneys increases as the blood pressure goes up; so, there is no sodium retention or volumetric overload. Bilateral RAS (or unilateral RAS) may cause renal failure and cardiac failure due to sodium and liquid retention in the kidneys[2].

Ischemic nephropathy: is a potentially irreversible cause of renal failure. It may cause intra-renal hemodynamic disturbance and its following consequences: high blood pressure and chronic renal disease. Cardiac instability syndromes: The most known example of cardiac instability syndrome is Pulmonary Flash Syndrome or Pickering 18. RAS may destabilize patients with heart failure or acute coronary syndromes due to uncontrolled blood pressure and volume retention[3].

Precise diagnosis and detection of RAS is often a challenge due to the following problems: first, this disorder is usually asymptomatic, except the high blood pressure, which is a very common and asymptomatic disease. Second, most RAS cases occur along with other diseases that result in chronic renal diseases, especially high blood pressure and diabetes. Third, precise RAS diagnosis is hard using non-invasive methods. Vascular Doppler ultrasound requires a highly skilled technician, and there are different diagnostic criteria for RAS. Finally, a weak correlation between different diagnostic methods and RAS definition and diagnosis is hard[4]. Due to these, RAS interventional treatment is difficult.

Nowadays, RAS has two therapeutic methods, including drug therapy and balloon angioplasty (with or without stents). Medication includes modification of risk factors (recommendations for lifestyle, including diet counseling, smoking cessation, and physical activity), renin-angiotensin-aldosterone antagonists, lipid-reducing agents, and first-line antiplatelet therapy in all patients. RAS screening can be done with Doppler ultrasound, computed tomography angiography, and magnetic resonance angiography. The endovascular technique of percutaneous transluminal renal angioplasty (PTRA) with or without stenting is one of the standard treatments for RAS. Current guidelines for ARAS recommend PTA as a reasonable option for patients with hemodynamically significant RAS with clinical manifestations such as resistant hypertension, unexplained pulmonary edema, or progressive chronic kidney disease[5]. The present article introduces a patient with a kidney suffering from renal artery stenosis and its treatment.

Case introduction

The patient is a 35-year-old man who was referred to a Tehran hospital in Tehran due to rice pill poisoning about six months ago. He was treated and intubated for about two weeks following the diagnosis in the hospital's poisoning section. In the first week of hospitalization, the patient was transferred to the operating room with abdominal guarding symptoms after surgical consultation and abdominal CT for therapeutic procedures in the case of acute abdomen diagnosis. In the second week of hospitalization, the patient was conscious and extubated, and his creatinine had an increasing trend and reached about Cr = 8.9; however, the initial creatinine of the patient was 0.8, and his urinary output was established. A nephrology consultation was requested. One of the problems proposed in nephrology counseling was the possibility of rhabdomyolysis. A kidney ultrasound was requested and showed that the patient had a kidney. The nephrologist then asked for a permict implant for the patient.

After that, the patient underwent dialysis twice a week. The patient had diuresis, and the creatinine trend was reducing but never returned to the normal level. So that after stopping dialysis for three days, the patient's creatinine reached about 8 or 9 again. Moreover, the nephrologist requested a series of renal examinations, CT, and color Doppler renal ultrasound at the same time. Color Doppler ultrasound revealed severe renal artery stenosis despite normal renal parenchyma and appropriate GFR. The patient was transferred to the heart center for renal angiography. After performing the required preparations, the stenosis site was first dilated with a balloon, and a stent was placed in it to prevent new stent stenosis. During this procedure, no special problems were seen in the patient. After PTRA, renal blood flow was restored so that the blood creatinine of the patient was completely normal (Cr = 1.4). The premicat was removed from the jugular vein, and the dialysis stopped. In a series of follow-ups and after three months, his general condition was good, and he had no particular problem.

Discussion

Renal artery stenosis is the narrowing of one or both renal arteries. It is the main cause of high blood pressure. It is often caused by atherosclerosis or fibromuscular dysplasia. Other complications related to renal artery stenosis are chronic kidney disease and end-stage renal disease[6]. RAS medical treatment includes blood pressure control, lipid-reducing therapy, an antiplatelet agent, and recommendations for lifestyle such as diet counseling, smoking cessation, and physical activity[7]. Accurately correcting dyslipidemia, using drugs that block platelet aggregation, may require three or more different drugs to control blood pressure. Angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) are preferably used for this purpose. Unfortunately, these two classes of drugs can also lead to an increase in serum creatinine and hyperkalemia and limit their use. In such a case, calcium channel blockers are a potential alternative[8]. Fat reduction therapy is widely accepted as an important treatment for all atherosclerotic vascular diseases. A statin is recommended to achieve LDL <70 mg/dL. In a retrospective study, statin treatment was associated with a lower progression rate for renal failure (7.4% vs. 38.9%) and lower overall mortality (5.9% vs. 36.1%), P <0.001 for both[8]. The use of antiplatelet agents and smoking cessation in patients with ARAS has the same benefits as the other forms of atherosclerotic disease, including coronary and peripheral vascular disease[2].

Invasive procedures are the following: ARAS surgical repair was the only available choice for the blood vessels before renal artery angioplasty. Today, renal artery stenting (PTRAS) has largely replaced ARAS renal surgery due to the increased complications and mortality associated with surgery. In adults, CT angiography in the main renal artery has been reported to be significantly more appropriate for diagnosing renal artery stenosis[9]. When the renal function is normal or almost normal, revascularization is recommended to prevent renal failure if the patient has the following conditions: renal artery stenosis of more than 80 to 85%, RAS degree between 50 to 80%. And captopril-enhanced scintigraphy shows the presence of intrarenal renal artery stenosis. There are intravascular interventional techniques (percutaneous transluminal balloon angioplasty, stenting) that are the first line of aggressive RAS treatment in most patients with high-grade ARAS, with symptoms of cardiac instability including recurrence or sudden onset[10]. There are many reports regarding improved kidney function due to renal stenting. In some patients with end-stage renal disease, successful renal artery stenting has stopped dialysis treatments. Stenting was significantly associated with overall survival in patients with minimal or no microalbuminuria (albumin to creatinine ratio less than 22.5 mg/g). Despite the excellent angiographic results obtained using renal stenting, there is a mismatch between angiographic and clinical successes in controlling hypertension and renal dysfunction. About the case reported in this article, After PTRA, renal blood flow was restored so that the blood creatinine of the patient was completely normal (Cr = 1.4). The premict was removed from the jugular vein, and the dialysis stopped. In a series of follow-ups and after three months, his general condition was good, and he had no particular problem.

Conclusion

The pathophysiology of renal artery stenosis is complex and involves many pathophysiological mechanisms that are interrelated and interdependent. RAS may present as an asymptomatic radiologic abnormality or with renovascular hypertension and ischemic nephropathy contributing to chronic kidney disease, and these conditions may coexist and overlap. In recent years, the mortality rate of these people has decreased and their quality of life has improved due to the increasing number of

angiography cases and intravascular revascularization interventions. Therefore, it is recommended to use renal angiography in the treatment of these patients

Author Contributions

ZP and AD visited the patient and collected the data. FF, ZS, and ZP wrote the draft of the manuscript. AD revised and finalized the manuscript. All the authors have read and confirmed the final version.

Ethical approval

This study approved by the Ethics Committee of Sabzevar University of Medical Sciences.

Conflict of Interest

No potential conflict of interest.

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References

1. Courand PY, Dinic M, Lorthioir A, Bobrie G, Grataloup C, Denarie N, et al. Resistant hypertension and atherosclerotic renal artery stenosis: effects of angioplasty on ambulatory blood pressure. A retrospective uncontrolled single-center study. Hypertension. 2019;74(6):1516–23.
2. Cooper CJ, Murphy TP, Cutlip DE, Jamerson K, Henrich W, Reid DM, et al. Stenting and medical therapy for atherosclerotic renal-artery stenosis. N Engl J Med. 2014;370(1):13–22.
3. Hirsch AT, Haskal ZJ, Hertzer NR, Bakal CW, Creager MA, Halperin JL, et al. ACC/AHA Guidelines for the Management of Patients with Peripheral Arterial Disease (lower extremity, renal, mesenteric, and abdominal aortic): a collaborative report from the American Associations for Vascular Surgery/Society for Vascular Surgery, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (writing committee to develop guidelines for the management of patients with peripheral arterial disease)–summary of recommendations. J Vasc Interv Radiol. 2006;17(9):1383–97 quiz 98.
4. AbuRahma AF, Srivastava M, Mousa AY, Dearing DD, Hass SM, Campbell JR, et al. Critical analysis of renal duplex ultrasound parameters in detecting significant renal artery stenosis. J Vasc Surg. 2012;56(4):1052–9 60 e1; discussion 9-60.
5. Iwashima Y, Ishimitsu T. How should we define appropriate patients for percutaneous transluminal renal angioplasty treatment? Hypertens Res. 2020;43(10):1015–27.
6. Ma N, Wang SY, Sun YJ, Ren JH, Guo FJ. Diagnostic value of contrast-enhanced ultrasound for accessory renal artery among patients suspected of renal artery stenosis. Zhonghua Yi Xue Za Zhi. 2019;99(11):838–40.
7. Eusebio CP, Correia S, Silva F, Almeida M, Pedroso S, Martins S, et al. Refractory ascites and graft dysfunction in early renal transplantation. J Bras Nefrol. 2019;41(4):570–4.
8. Safian RD. Renal artery stenosis. Prog Cardiovasc Dis. 2021;65:60–70.
9. Fleury AS, Durand RE, Cahill AM, Zhu X, Meyers KE, Otero HJ. Validation of computed tomography angiography as a complementary test in the assessment of renal artery stenosis: a comparison with digital subtraction angiography. Pediatr Radiol. 2021;51(13):2507–20.
10. Dobrek L. An outline of renal artery stenosis pathophysiology-a narrative review. Life (Basel). 2021;11(3).