Spontaneous Renal Artery Dissection in A Patient with Contralateral Renal Artery Stenosis:
Treatment with Percutaneous Endovascular Stent Placement

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We report a 36-year-old man with poorly controlled hypertension, who suffered from acute deterioration and marked elevation of blood pressure. Abdominal bruit was heard in the right epigastric area. Renovascular hypertension was highly suspected. Spontaneous right renal artery dissection superimposing contralateral renal artery stenosis was found by computed tomography, and confirmed by conventional angiography. Percutaneous endovascular intervention was done successfully, with dramatic clinical improvement. Renovascular hypertension must be considered in patients with refractory hypertension. Better control of blood pressure, or even cure of hypertension, can be achieved with percutaneous endovascular intervention both in stenosis and dissection of renal arteries.

Key Words: Secondary hypertension • Renal artery dissection • Percutaneous endovascular revascularization

INTRODUCTION

Spontaneous renal artery dissection may both be the etiology and consequence of uncontrolled hypertension. We present a case of spontaneous renal artery dissection, superimposing contralateral renal artery stenosis, presented with sudden deterioration of pre-existing poorly controlled hypertension. The diagnosis was made with CT scan, and the patient was cured of hypertension after percutaneous endovascular revascularization of both renal arteries.

CASE REPORT

A 36-year-old dentist presented to our institution with worsening headache for two weeks. His blood pressure was noted to be high for one year, and had remained at 180/100 mmHg despite medication with calcium channel blocker, beta-blocker, and thiazide diuretic from a community hospital. His father and grandfather had hypertension and were under good medical control. There was no other remarkable past medical history, such as diabetes or dyslipidemia. The patient had no habit of cigarette smoking. On initial examination, the blood pressure was 200/130 mmHg and heart rate was 78 beats/min. His abdomen was soft, but an obvious abdominal bruit was heard in the right epigastric area about 1 inch lateral to the midline. The remainder of the examination was unremarkable. The patient denied fever, dysuria and hematuria, and gave no previous history of renal disease or trauma. Blood chemistry disclosed urea nitrogen of 16.1 mg/dL, creatinine of 1.1 mg/dL, serum potassium of 3.8 mmole/L, fasting sugar of 125
mg/dL, total cholesterol of 175 mg/dL, low-density lipoprotein cholesterol of 105 mg/dL, high-density lipoprotein cholesterol of 38 mg/dL and triglyceride of 57 mg/dL. His thyroid function and 24-hour urine catecholamine were within normal limit. Urinalysis showed pH 6.0, a negative dipstick for protein and occult blood, and normal urine sediment.

With the clinical presentation and physical findings, renal artery stenosis was highly suspected. Tri-phase abdominal CT was arranged. A small wedge-shaped defect was noted at the medial lower aspect of the right kidney, interpreted as a possible previous infarct. With maximum intensity projection, right renal artery dissection (Figure 1A) and left renal artery stenosis (Figure 1B) were suspected. The dissection and stenosis were further demonstrated by volume-rendering CT angiography (Figure 1C and 1D). Because of preserved renal function and no irreversible renal parenchymal damage, vascular reconstructions were suggested.

After admission, renal angiography confirmed left renal artery stenosis and right renal artery dissection (Figures 2A and 2B), corresponding to the CT findings. Endovascular revascularization was considered the optimal procedure for this patient. 8Fr RC1 guiding catheter (Cordis, Miami, FL, USA) was used to engage the right renal artery. A 0.014” angioplasty guide wire (Rinato, Asahi Intec, Aichi, Japan) was advanced across the dissection, and direct stenting using self-expanding carotid Wall stent (8 × 21 mm, Boston Scientific, Galway, Ireland) followed by post-dilation (6 × 20 mm Gazelle balloon, Boston Scientific, Galway, Ireland) was performed with good angiographic result. The left renal artery was then engaged with the same guiding catheter and the stenosis was crossed with the same guide wire. The lesion was pre-dilated with the 6 × 20 Gazelle balloon, followed by balloon expandable Genesis stent (6 × 15 mm, Cordis, Miami, FL, USA) deployment with acceptable angiographic result (Figures 2C and 2D). The patient was discharged uneventfully without any antihypertensive agents. At 6-month follow-up, he still had normal blood pressure and renal function without any medication.

**DISCUSSION**

Renovascular hypertension may be caused by athe-
Rosclerotic stenotic disease, fibromuscular dysplasia, or, less commonly, dissection of the renal arteries. Renal artery dissection may be caused by abdominal trauma, iatrogenic injury, natural extension of aortic dissection, underlying arterial wall disease, or occurs spontaneously without evident cause. Isolated spontaneous dissection of renal artery is a rare condition, and could be either the possible etiology or consequence of poorly controlled hypertension. Risk factors for spontaneous renal artery dissection include fibromuscular dysplasia or atherosclerosis at the dissection site, extreme hypertension, and congenital connective tissue diseases such as Marfan syndrome and Ehlers-Danlos syndrome. Most renal artery dissections develop silently, without impressive symptoms at onset. Flank or abdominal pain, hematuria, and poorly controlled hypertension with deteriorating renal function have also been reported. Early diagnosis and treatment of renal artery dissection is difficult because of its nonspecific presentation and limited clinical alert.

There are some clinical clues to renovascular hypertension, including onset of hypertension before 30 or after 50 years of age, abrupt onset of hypertension, severe or resistant hypertension, symptoms of atherosclerotic disease elsewhere, negative family history of hypertension, being a smoker, worsening renal function after angiotensin-converting enzyme inhibitor, recurrent flash pulmonary edema, abdominal bruits or advanced fundal changes. Also there are laboratory findings which favor renovascular hypertension, such as higher plasma renin activity, low serum potassium, elevated serum creatinine, proteinuria, and more than 1.5 cm difference in kidney size on sonography. In the present case, renal artery stenosis with renovascular hypertension was suspected by the clinical course and associated physical findings. Renal scintigraphy was limited by lower sensitivity and specificity in patients with bilateral renal disease, and Duplex renal artery ultrasound was operator-dependent and time-consuming. Therefore, computed tomography was chosen as our first non-invasive diagnostic tool. The risk of contrast nephropathy was low since the patient’s baseline renal function was normal. The volume-rendering CT angiography clearly demonstrated right renal artery dissection and left renal artery stenosis. From the images of subsequent angiography, fibromuscular dysplasia of left renal artery could not be excluded, and might lead to luminal narrowing and secondary hypertension. Some authors suggested that spontaneous renal artery dissections might be the presentation of a variant form of fibromuscular dysplasia. Harrison et al.\(^1\) reported that renal artery dissection was found in 9.1% of patients with fibromuscular dysplasia. Edwards et al.\(^2\) also found association between fibromuscular dysplasia and dissection, with male-to-female ratio about 10:1. In series reported by Lacombe,\(^3\) the same male predominance of spontaneous renal artery dissection was also noted. However, the nature and the association of renal artery stenosis and dissection in our patient remained unclear.

As a consequence of the rarity of spontaneous renal artery dissection, there is limited experience regarding its management or natural history. The treatment of choice may be dependent on the extent of dissection, renal artery branch or orifice involvement, and degree of renal parenchymal damage. Conservative medical treatment,\(^4\) surgical vessel reconstruction with partial or intervention with balloon angioplasty or stenting,\(^6\) and coil embolization,\(^8\) have all been reported. Ramamoorthy et al. reported four cases of spontaneous renal artery dissection successfully managed by medical treatment alone with anticoagulation and antihypertensive agents.\(^4\) All these four cases were diagnosed at early stage. If medical treatment failed, emergent management with either surgical or percutaneous intervention may render the patient at higher risk. In addition, medical treatment alone may lead to renal parenchyma ischemia or even chronic damage if reperfusion is not restored spontaneously. In Lacombe’s series,\(^3\) surgery was needed for all 22 patients with renal artery dissection in whom extensive medical treatment failed.

Aorto-renal bypass surgery is the most common surgical technique for renal artery dissection. The surgical risk and complication rates are, however, very high. Müller et al.\(^5\) reported 25 cases with renal artery dissection undergoing surgical treatment, with 4% mortality, 20% complication rate, and 20% reconstruction failure. With advances in equipment and technique, percutaneous endovascular intervention may replace surgical intervention as a more effective and safer method to achieve renal reperfusion. Renal stenting has been well proven in treating renal artery stenosis. An analysis of the pooled data of different series of endovascular stenting for renal artery stenosis has given impressively high success rate
exceeding 95%, and low mortality or complication rate of 1-2%. The desired clinical outcome of improved blood pressure control, with reduction in requirement for anti-hypertensive medications, was seen in 2/3 of patients treated with stenting for renovascular disease. Hypertension was more likely to be cured after revascularization in patients with fibromuscular dysplasia than in those with atherosclerotic renal artery stenosis (60% vs. < 30%). Concomitant essential hypertension usually existed in those elderly patients with atherosclerotic renal artery stenosis. Whether this experience is applicable to renal artery dissection warrants further observation.

Early diagnosis is still the crucial determinant for successful treatment of renal artery dissection. Renal salvage by revascularization is dependent on the extent and duration of renal parenchymal ischemia. High clinical alertness and timely diagnosis using non-invasive methods such as CT in the present case are crucial. Percutaneous endovascular intervention provides a fast and safe way to achieve revascularization, while surgical treatment such as nephrectomy may be reserved for patients with extensive renal parenchymal damage or infarction.

REFERENCES

自發性腎動脈剝離合併對側腎動脈狹窄：
經皮血管內支架置放術治療

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我們報告一個三十六歲血壓控制不良的男病患，最近血壓有急速的惡化和顯著的上升。同時在病患的右上腹部可以聽到血管嘈音，高度懷疑是腎血管高血壓。電腦斷層檢查懷疑有自發性的右腎動脈剝離和對側的腎臟血管狹窄，而後經由傳統血管攝影術證實。經由成功地實行經皮血管內介入術，病患有顯著的臨床改善。臨床上，在頑強性高血壓的病人，腎血管高血壓必須被考慮在內。對於腎血管狹窄或剝離，可經由經皮血管內介入術，來達到更佳的血壓控制，甚至於治療高血壓。

關鍵詞：續發性高血壓，腎臟血管剝離，經皮血管重建術。