Recanalization of Renal Artery CTOs

Is it worth renal artery occlusion?

BY YOSHIAKI YOKOI, MD, AND OSAMI KAWARADA, MD

In endovascular procedures, the most challenging lesions are those with chronic total occlusions (CTOs). In lower-extremity intervention, techniques to recanalize CTO lesions have become extremely important. Similarly, other vessels with CTOs are treated endovascularly with increasing frequency.

Renal artery stenosis (RAS) may cause refractory hypertension, renal impairment, heart failure, and angina pectoris. In some patients, RAS may progress to total occlusion.[1] The affected kidney may show signs of ischemic nephropathy, including loss of renal mass (atrophy) and impairment of renal function.[2] These conditions may lead to end-stage renal failure and permanent need for hemodialysis. Most of the reports regarding renal artery revascularization have included treatment of stenotic lesions, and reports on treatment of CTO lesions are scarce. Although some clinicians believe there is no indication for revascularizing a renal CTO, in some cases, the rich collateral flow may maintain renal viability and thus justify interventional therapy. We report a case in which revascularization of a renal CTO lesion led to recovery of renal function, as well as improvement of refractory hypertension.

CASE REPORT

The patient was a 65-year-old man who had coronary artery disease and refractory hypertension. His creatine value was 2.3 mg/dL and, despite administration of four antihypertensive medications, his systolic pressure remained >160 mm Hg. Both kidneys were atrophied, and the pole-to-pole length was 7.5 cm in the right and 7.5 cm in the left. He underwent cardiac catheterization for angina, resistant hypertension, and renal insufficiency in December 2005. He had a typical severe stenosis in the proximal left anterior descending artery and was successfully treated by stenting. An abdominal aortogram demonstrated abdominal aortic aneurysm, severe left RAS, and CTO of the right renal artery (Figure 1). Refractory hypertension and renal insufficiency coincided with a solitary functioning kidney (left). First, I planned to intervene on the left RAS. The right kidney was considered to be nonfunctioning; however, because the size of the right kidney was the same as the left, there was the possibility of maintaining the right kidney viability.

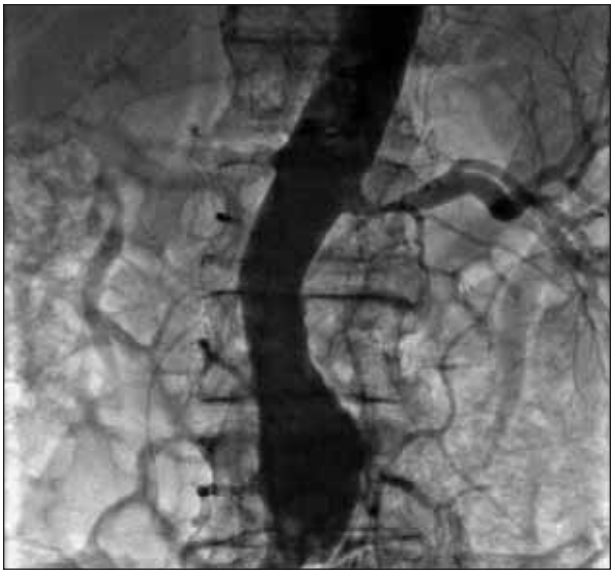

Figure 1. An aortogram showing severe stenosis in the left renal artery; the right renal artery is not visualized.

An 8-F renal double curve (RDC)[1] (Cordis Corporation, a Johnson & Johnson company, Miami, FL) guiding catheter was inserted into the left renal ostium. After crossing the left RAS, a 15-mm Palmaz stent (Cordis Corporation) was deployed successfully, with an excellent angiographic result (Figure 2A, B). The same guiding catheter was placed at the ostium of the right renal artery. A Miracle 3g (Asahi Intec, Nagoya, Japan)

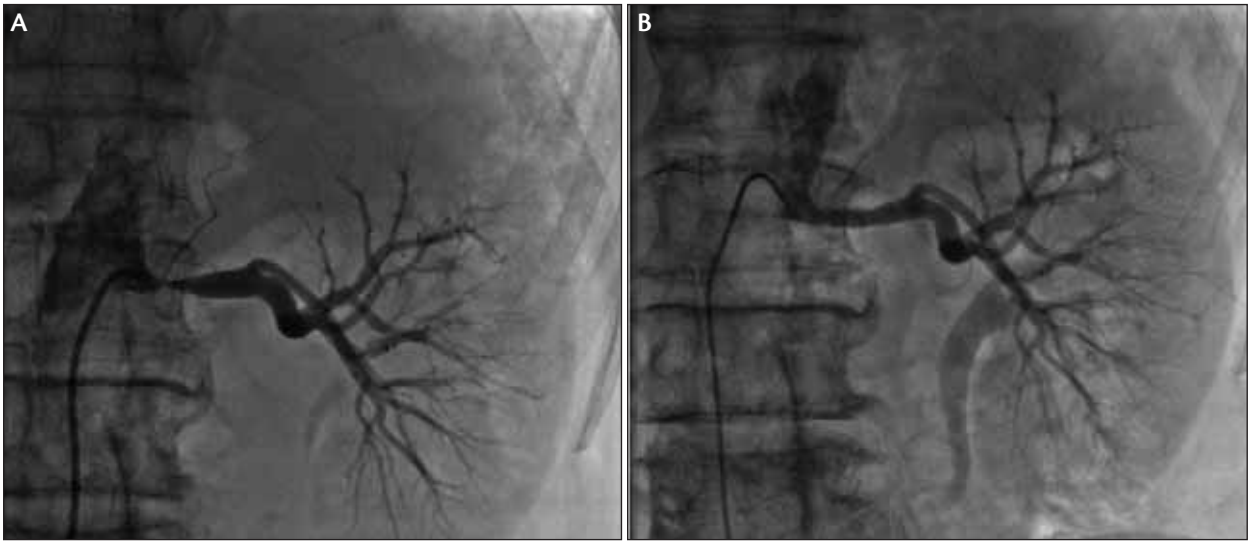

Figure 2. Left renal artery stenting. Severe stenosis in the proximal left renal artery (A). Final angiographic result after stenting (B).

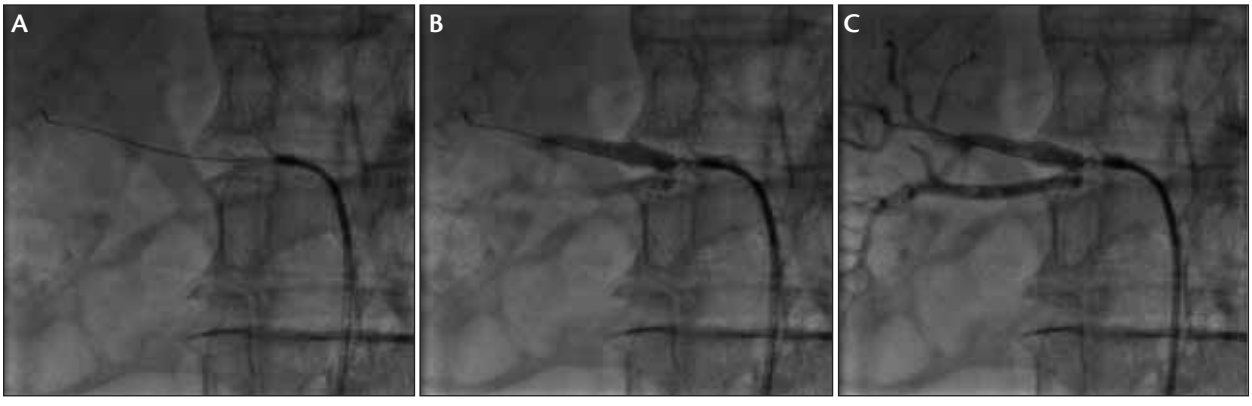

Figure 3. Guidewire crossing of the right renal artery occlusion. The guidewire crossed the lesion (A). The first selective angiogram after guidewire crossing (B). An embolic shower was noted (C).

CTO wire was used to successfully cross the right renal CTO. An angiogram obtained immediately after crossing the lesion with the guidewire revealed massive atheroembolus in the distal renal branches (Figure 3A-C). The decision to perform direct stenting was made after seeing emboli after the wire crossing. A 5-mm X 15-mm Palmaz stent was directly deployed successfully, with an excellent angiographic result (Figure 4).

The patient was evaluated 2 weeks after the procedure. His blood pressure medications were decreased from three to one. At 1 month, his serum creatine level had decreased to 1.5 mg/dL and remained stable. The kidney size had increased from 7.5 cm to 8 cm in the right and 7.5 cm to 9 cm in the left. In September 2006, abdominal aortography was performed to evaluate the abdominal aortic aneurysm. The aortogram showed widely patent renal arteries bilaterally, with no signs of restenosis (Figure 5).

DISCUSSION

CTO of the renal artery is not an uncommon manifestation of atherosclerotic renal artery disease. Schreiber reported that 39% of renal artery stenosis results in complete occlusion within 12 months.[1] In a prospective study using renal duplex scan, 11% of significant renal artery stenoses were occluded within 2 years.[3] The indication of revascularization of an occluded renal artery is not well-defined. The reason not to revascularize an occluded renal artery includes the possibility that the affected kidney is already nonfunctioning and nonviable.

The classic indications for revascularizing a stenotic renal artery are poorly controlled hypertension and progressive worsening of renal function.[4] Renovascular hypertension with normal renal function is best indicated for controlling hypertension with satisfactory results. Conversely, when stenting was performed in patients with impaired renal function, many studies have report-

Figure 4. Final angiogram of the right renal artery. TIMI 3 flow was established, and the intrarenal artery appeared to be normal with absence of filling defects or acute cut-off, suggestive of embolized vessel.

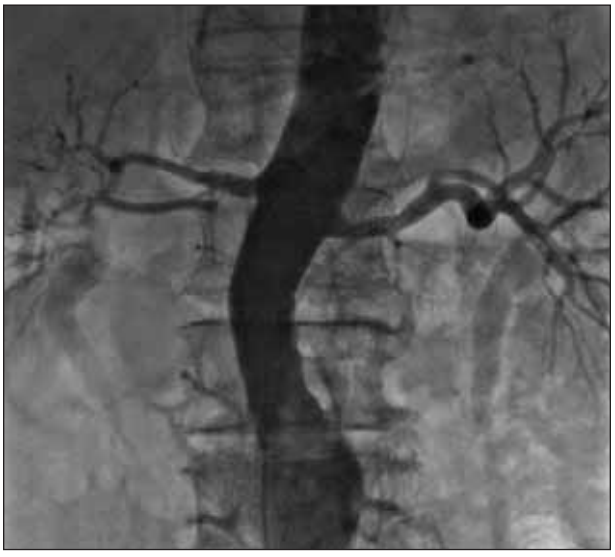

Figure 5. An aortogram obtained at 9 months shows that both renal arteries were patent, with no signs of in-stent restenosis.

ed a low incidence of improvement in renal function.[5] Furthermore, deterioration in renal function due to contrast-induced nephropathy and atheroembolization have been reported.[6] However, if one selects the appropriate patient, such as a patient with ischemic nephropathy secondary to bilateral high-grade RAS and RAS with a solitary functioning kidney, renal artery intervention is associated with satisfactory outcome.

In this patient, renal artery revascularization was indicated because RAS was found in a solitary functioning kidney with renal impairment. However, the indication to revascularize the occluded right renal artery remains controversial because the affected kidney's function was not well elucidated. We decided to stent the left renal artery and to provide a safety net in case the attempt to revascularize the occluded renal artery failed. The occluded right renal artery was successfully recanalized using a coronary CTO guidewire. As for the CTO crossing wire, we selected a noncoated guidewire. The occluded lesion length was thought to be short, and therefore, a .014-inch Miracle 3g CTO wire was chosen. This wire is more controllable than a hydrophilic-coated wire and is able to cross the lesion with ease. At the time of guidewire crossing, massive atheroemboli were seen. However, after completion of the recanalization procedure, TIMI 3 flow was established, and the clinical course was uneventful, with improved renal function. Furthermore, patency of both stents was proven angiographically.

CONCLUSION

The treatment of CTO of the renal artery is a relatively new and challenging field for endovascular therapy. Further study is needed to refine the techniques, its indication, and methods to evaluate the viability of the affected kidney. ■

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1. Schreiber MJ, Pohl MA, Novick AC. The natural history of atherosclerotic and fibrous renal artery disease. Uro Clin N Am. 1984;11:383-392.
2. Caps MT, Zierler RE, Polissar NL, et al. Risk of atrophy in kidneys with atherosclerotic renal artery stenosis. Kidney Int. 1998;53:735-742.
3. Zierler RE, Bergelin RO, Davidson CD, et al. A prospective study of disease progression in patients with atherosclerotic renal artery stenosis. Am J Hypertens. 1996;9:1055-1061.
4. Harden PN, MacLeod MJ, Rodger RS, et al. Effect of renal artery stenting on progression of renovascular renal failure. Lancet. 1997;349:1133-1136.
5. Palmaz JC. The current status of vascular intervention in ischemic nephropathy. J Vasc Intervent Radiol. 1998;9:539-543.
6. Paulsen D, Klow NE, Rogstad B, et al. Preservation of renal function by percutaneous transluminal angioplasty in ischemic renal disease. Nephrol Dial Transplant. 1999;14:1454-1461.

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