

Slow Flow Phenomenon During Renal Angioplasty: Does It Have the Same Predictors and Treatment as Coronary Angioplasty?

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Citation

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Abstract

Percutaneous treatment of renovascular disease offers a relatively safe and effective therapy. Restoration of blood flow in the large arteries is not necessarily associated with microvascular and tissue perfusion. Even in coronary bed the mechanisms responsible for no-reflow or slow-flow and consequently the treatment are uncertain. Nitroprusside for prevention of slow flow during Percutaneous coronary intervention had conflicting results. Despite reported slow or no-reflow phenomenon during coronary angioplasty but never has been proposed during renal angioplasty. Here in we report a case with this complication that responded to direct injection of nitroprusside.

INTRODUCTION

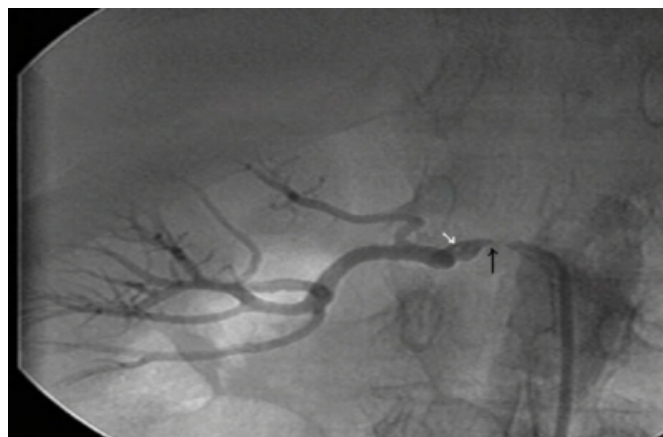
Renovascular disease is an important and often unrecognized contributor to renal insufficiency, refractory hypertension, and overall cardiovascular mortality. Percutaneous treatment of renovascular disease offers a safe and effective therapy. It can ameliorate hypertension, can improve and stabilize renal function, and may delay the need for hemodialysis. This technique, as is true for other fields of intervention, could be associated with complications. Here in we report a case:

CASE REPORT

The patient was a 70 year old diabetic hypertensive man whose blood pressure had been uncontrollable recently. Despite gradually increase in the number and dose of his antihypertensive medications, his blood pressure could not be lowered. Due to high possibility of renal artery stenosis, magnetic resonance angiography (MRA) was performed which yielded bilateral stenosis. Meanwhile the patient's renal function deteriorated during the last 4 months with three-fold of rise in blood urea nitrogen and creatinine. So the patient was brought to catheterization laboratory for renal angiography. Renal angiography revealed bilateral severe renal artery stenosis (Image1, Movie clip 1).

Figure 1

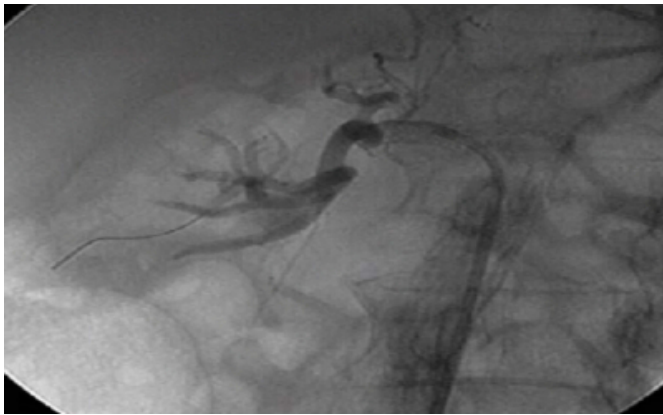
Image1, Movie clip 1: Severe proximal stenosis (black arrow) in right renal artery with a white oscillating area (white arrow).



So staged renal angioplasty with special precautions for minimizing further renal damage was done. After right renal angioplasty and stent insertion renal blood flow deteriorated obviously (Image2, Movie clip 2.).

Figure 2

Image 2, Movie clip 2: Reduction in renal blood flow after renal artery stenting.



Due to unpredictability of the situation and lack of access to every medication and equipment, nitroprusside was injected directly into renal artery (totally 200 microgram) that lead to resumption of renal blood flow (Image3, Movie clip 3).

Figure 3

Image 3, Movie clip 3: The final result after nitroprusside injection which has normal renal blood flow.



Interestingly, left renal angioplasty was not associated with the same complication despite similar lesion. His blood pressure dropped to 160/80 in the catheterization lab, renal failure recovered during one week and his blood pressure controlled with amlodipine.

DISCUSSION

Renovascular hypertension is among the most common secondary forms of hypertension and is not easily recognizable¹. The most common type is atherosclerotic which affects mainly the proximal third of the main renal artery and is seen most commonly in elderly men. Renovascular stenosis is often bilateral; although usually one

side is clearly predominant. The possibility of bilateral disease should be suspected if it develops after the start of angiotensin converting enzyme inhibitor or angiotensin receptor blockers therapy, onset of hypertension before 30 or after 50 years of age, severe or resistant hypertension, elevated serum creatinin and etc^{2, 3}. As it is obvious, considering the aforementioned points in our patient had a high clinical likelihood of having renovascular hypertension. The initial diagnostic study in most patients, as our case was, could be noninvasive and, if abnormal, followed by a study of renal anatomy invasively^{1, 4, 5}. The availability of stents and the associated technological improvements that facilitate secure delivery of devices to the target site, compared to surgical approach and its complications, given the advanced age of many patients with atherosclerotic disease and the significant perioperative morbidity and operative mortality has led to increase in utilization of the former therapy⁶.

Endovascular renal artery stenting complications include dissection of renal artery or the wall of aorta, acute or delayed thrombosis, infection, rupture of renal artery, access site complication (the most common) and probably the most dreaded complication: atheroembolism⁷. Here in we present a complication which wasn't reported previously. As is evident in renal angiography of our patient, there is a white oscillating area in proximal of renal artery. Distal embolization of debris or microparticulate atheromatous material in this patient, maybe the cause of slow flow after stenting. Direct injection of nitroprusside resulted in recovery of renal blood flow. It is important to mention that this phenomenon is different from atheroembolism which is more likely to occur with aggressive manipulation of the diagnostic and/or guiding catheters. Although slow or no-reflow phenomenon was previously reported during coronary angioplasty but never has been proposed during renal angioplasty.

REVIEW OF LITERATURE

Restoration of blood flow in the large arteries is not necessarily associated with microvascular and tissue perfusion. Restoration of perfusion at the tissue level is expected to have beneficial effects on renal function. Impaired flow following percutaneous coronary angioplasty (no-reflow or slow reflow phenomenon) is described thoroughly in the literature^{8, 9, 10}. The mechanisms responsible for no-reflow or slow-flow are uncertain and prevailing mechanism operating in the individual patient may also differ: distal embolization of debris or

microparticulate atheromatous material, capillary edema, inflammation, neurohormonal reflexes and vasoconstriction may play a crucial role^{8, 9}. If almost similar pathogenesis exists in renal vascular bed (as could be assumed), the treatment would be probably alike. When predictors of impaired flow are discovered, prophylactic pharmacological measures (glycoprotein IIb/IIIa inhibitors) should be undertaken probably^{11, 12, 13}. Other medications such as adenosine^{14, 15}, nicorandil^{16, 17}, verapamil¹⁸, nitroprusside^{19, 20} were used also.

Intracoronary nitroprusside for prevention of slow flow during Percutaneous coronary intervention had conflicting results^{19,20}. Intracoronary bolus injection of nitroprusside using a 3 ml syringe appears to be a feasible, safe, and effective technique for the management of slow/no-reflow phenomenon complicating primary PCI⁽²⁰⁾ while others believe that in patients with STEMI, selective intracoronary administration of a fixed dose of nitroprusside failed to improve coronary flow and myocardial tissue reperfusion but improved clinical outcomes at 6 months¹⁹.

CONCLUSION

Because of rarity of this complication (slow flow after renal stenting) and lack of previous studies there is need for further studies for finding the best treatment of slow flow phenomenon. Direct administration of nitroprusside could be one of the solutions.

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