Balloon Angioplasty for Renal Atherosclerotic Disease: Absolutely Yes

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Key words: balloon angioplasty, renal artery obstruction, atherosclerosis

IMAJ 2004;6:708–709

Increasing longevity worldwide has led to an increased incidence of renal atherosclerotic lesions in patients older than 70 years. This population carries a heavy burden of associated cardiovascular disease risk, including coronary artery disease, stroke, peripheral vascular disease, diabetes mellitus and chronic renal failure. The real challenge is not to question the place of renal angioplasty but to program its optimal timing

When confronted with the critical question of outcome of blood pressure following revascularization, it seems clear that while most patients are improved or stabilized only a small proportion is cured (about 10%). The enthusiasm of nephrologists has declined during the last decade given the rising incidence of cases presenting with advanced renal dysfunction, often following coronaro-angiography and renal angioplasty and, in most cases, is related to cholesterol embolization.

Approximately 3–5% of hypertensive patients have a renovascular etiology. The concomitant presence of atherosclerosis was found to significantly increase the prevalence of renovascular hypertension (9.5%) and renal insufficiency (8%) [1]. Renovascular hypertension, renal failure due to ischemic nephropathy, and flash pulmonary edema unrelated to reduced left ventricular function represent the major indications for renal angioplasty.

Technical success following renal vascularization is high. Balloon angioplasty with stents has become the gold standard option for ostial renal artery stenosis. A meta-analysis reported a 99% technical success rate after stent placement in 1,128 arteries compared with 55% of ostial and 70% of non-ostial stenosis in 1,417 arteries treated with angioplasty [2]. The patency rate at a mean follow-up of 7.9 months was 77%.

Atheroslerotic renovascular hypertension

Curing hypertension in renovascular disease caused by atherosclerotic renal artery stenosis is an unrealistic goal in most cases, occurring in approximately 10% of patients. The results of three prospective randomized controlled studies [3–5] reported a decrease in blood pressure in most patients after renal revascularization, with lower doses of medications.

In the EMMA trial [4], unblinded assessment of office blood pressure showed a larger reduction in diastolic blood pressure in the angioplasty group than in the medical therapy group (systolic/diastolic: 14 $\pm$ 20/8 $\pm$ 11 vs. 7 $\pm$ 23/1 $\pm$ 12 mmHg, $P = 0.04$, for diastolic blood pressure). In the SNRASCG trial [5], blood pressure of 28 patients with bilateral renal artery stenosis decreased by 19/4 mmHg in the angioplasty group versus 2/2 mmHg in the medical therapy group. In the DRASTIC study (Dutch Renal Artery Stenosis Intervention Cooperative) [3], at 12 months, 4 of 56 patients (7%) in the angioplasty group versus none of the patients in the medical therapy group were cured of hypertension. The mean decrease in blood pressure was similar in both groups, from 179 $\pm$ 25/104 $\pm$ 10 to 169 $\pm$ 28/99 $\pm$ 12 mmHg in the angioplasty group and from 180 $\pm$ 23/103 $\pm$ 8 to 176 $\pm$ 31/10 $\pm$ 14 mmHg in the medical group.

Medical control of hypertension can be achieved in the vast majority of patients with renal artery stenosis, but it can also mask a silent deterioration of the ipsilateral stenotic kidney. The removal of the high angiotensin II effect induced by the blockade of the renin-angiotensin system may result in further loss of function and perfusion of the occluded kidney. In the case of ipsilateral renal artery stenosis, this effect can be masked because near-normal renal function can be maintained if the controlateral kidney is well functioning.

Ischemic nephropathy

Ischemic nephropathy is a clinical condition of renal hypoperfusion with impaired nephron function that may be potentially recovered by renal revascularization. The criteria for benefit of revascularization and evaluation of the effect of the procedure remain controversial, but it is clear that delay in revascularization has been associated with a reduction in clinical benefit.

The methodology used in clinical studies to evaluate clinical benefit after renal revascularization greatly influences the significance of the results. Studies that analyzed the reciprocal slope of glomerular function found a statistically significant improvement in renal function in the population treated [6–8]. Studies reporting binary results following renal angioplasty with stenting, utilizing values lower than 20% deterioration and/or 20% lowering of the serum creatinine level as a measure of functional stabilization or improvement, resulted in improvement in 30% of patients and stabilization in 38% [9]. When renal function was expressed as the mean serum creatinine level, three prospective studies did not show any beneficial improvement in the treated group [3–5].

Zeller [10] recently reported the outcome of renal revascularization with stent-supported angioplasty in 456 significant (>70% obstruction) renal artery stenoses. During a mean follow up of 34

± 20 months, serum creatinine level decreased significantly from 1.45 ± 0.87 to 1.39 ± 0.73 mg/dl. Blood pressure control improved in 46%, remained unchanged in 43% and deteriorated in 11% of patients. This report firmly supports the interventional strategy and may encourage reluctant clinicians to be less conservative [10].

Some compelling signs that can increase the success rate of revascularization in selected patients are summarized below:

Factors favoring renal revascularization

- A near normal renal mass
- Recent deterioration of renal function
- Acute renal failure during antihypertensive therapy, especially with angiotensin-converting enzyme inhibitors or angiotensin II receptor antagonists
- Proven viable kidneys:
  - Blood flow preserved on renal scan
  - A Doppler ultrasound resistance index <0.8
  - Renal biopsy demonstrating well-preserved glomeruli and tubulo-interstitium and absence of severe arteriolar sclerosis
- Treatment-resistant hypertension
- Recent onset of hypertension
- Hypertension aggravating unstable coronary syndromes
- "Flash" pulmonary edema

Renal revascularization in cardiac syndromes

Revascularization of renal arteries can be of significant benefit in cardiac patients presenting with recurrent "flash" pulmonary edema or worsening of anginal syndrome. More than 70% of 73 patients with bilateral renal artery stenosis or stenosis of a solitary functional kidney remained free of congestive heart failure and unstable angina at 12 months mean follow-up after renal angioplasty with stenting [11,12].

Complications following renal angioplasty occur in approximately 10% of patients and are rarely life-threatening. The major concern in daily clinical practice, in fact, is treatment failure and/or decline in renal function (sometimes as a part of systemic cholesterol embolization). According to one report [13], symptomatic embolization occurred in 8% of patients treated, but lower incidences (about 1–2%) were also reported in some studies summarized in a meta-analysis [9]. Worsening of renal function can occur in about 20% of patients, but higher rates have been reported when renal angioplasty was performed in poorly selected patients [14].

Conclusion

The real challenge for clinicians is to select atherosclerotic patients with a combined high risk of renal function deterioration, cardiovascular mortality and poorly controlled hypertension. Large prospective studies in well-selected patients should clarify uncertain outcomes. In the meantime, each candidate for renal revascularization must be considered on an individual case basis.

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