Atherosclerotic Renal Artery Stenosis, the Oculostenotic Reflex, and Therapeutic Nihilism

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Fifteen years ago, Topol and Nissen described the oculostenotic reflex as an “irresistible temptation … to perform angioplasty on any significant residual stenosis,” highlighting a widely held misperception that an angiographically severe stenosis must cause ischemia and that revascularization results in clinical benefit. Although quantitative angiography improves the accuracy of stenosis severity, it does not improve the accuracy of diagnosing ischemia. In fact, more than one third of angiographically severe coronary stenoses are hemodynamically insignificant by fractional flow reserve (FFR), and FFR results are highly correlated with findings of ischemia by myocardial perfusion imaging. Similarly, angiographic renal artery stenosis (RAS) severity correlates poorly with hemodynamic significance.

Five randomized trials demonstrated that a strategy of renal revascularization based on the oculostenotic reflex was not associated with improvement in blood pressure or renal function or reduction in clinical events compared to medical therapy alone. These results lead some to recommend a nihilistic approach to all patients with RAS and to even withhold reimbursement for renal stent procedures. Potential explanations for the negative results of revascularization include treatment of patients with anatomic stenosis but no renal ischemia, baseline parenchymal renal disease precluding improvement in hypertension and renal function, and essential hypertension without renovascular components.

In this issue of Circulation: Cardiovascular Interventions, Mangiacapra et al suggest that invasive assessment of renal ischemia by measurement of translesional pressure gradient after administration of intraarterial dopamine might predict the blood pressure response after renal artery stenting. These investigators are authorities on the physiological assessment of arterial stenoses, and a dopamine-induced mean pressure gradient ≥20 mm Hg before revascularization was the only independent predictor of improvement in blood pressure. However, only 53 patients with RAS were evaluated, and the receiver operating characteristic area under the curve was 0.77, consistent with only modest accuracy in predicting a decrease in systolic blood pressure ≥20 mm Hg at 3 months. Although the number of medications was reduced from 3.2 to 2.8 after stenting, this observation alone probably is insufficient to justify renal revascularization. It is interesting that 18% of nonresponders had a dopamine-induced mean pressure gradient >20 mm Hg, suggesting considerable heterogeneity in blood pressure response.

There are several explanations for the variable blood pressure response, even if renal ischemia is present. Although experimental Goldblatt models elegantly demonstrate renin-angiotensin activation due to RAS, patients with atherosclerotic RAS often have indistinguishable levels of renin activation compared to hypertensive patients without RAS, suggesting that most patients with hypertension and RAS do not have renovascular hypertension (defined as hypertension caused by RAS and cured by renal revascularization). Instead, hypertension may be due to other etiologies, including essential hypertension associated with sympathetic and cerebral nervous system activation, vasoactive oxygen species, abnormalities in endothelial-dependent relaxation, or ischemic and hypertensive intrarenal injury. Accordingly, patients with hemodynamically significant RAS may not have renovascular hypertension, so the expectation that hypertension will be cured after revascularization probably is unrealistic. Although profound clinical benefits are achieved even by modest reductions in blood pressure, further studies in more patients are needed to assess the clinical outcome of patients with RAS after invasive assessment of translesional pressure gradients.

The most important observation from this study is the unreliability of invasive angiography to identify hemodynamically significant RAS because stenosis severity correlated poorly with baseline and dopamine-induced mean pressure gradients. Other methods are readily available to assess the physiological impact of RAS. Nuclear scintigraphy and direct glomerular filtration rate measurements are reliable for measuring single-kidney blood flow and total renal blood flow and may obviate the need for invasive assessment. Invasively, renal ischemia can be evaluated with FFR or translesional pressure gradients.

Although the study of Mangiacapra et al is an incremental step in evaluating renal ischemia, clinical criteria for selecting patients with RAS for revascularization remain ambiguous. It is incredulous that contemporary clinical trials, including the Cardiovascular Outcomes Renal Atherosclerotic Lesions trial, continue to rely on the oculostenotic reflex, exclude patients who are not likely to benefit, include patients who are least likely to benefit, receive major funding, and are published in prestigious journals without assessment of renal ischemia. On the basis of their design, it is not
surprising that these studies recommend a nihilistic approach to renal revascularization. We must insist on the performance of contemporary studies that rely on objective assessment of renal ischemia, confirmation of the absence of irreversible renal injury, and presence of clinical indications for revascularization. In the meantime, the occlutionist reflex will lead to therapeutic nihilism, and many patients who might benefit from renal intervention may be denied revascularization.

Disclosures

None.

References


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