

## Indications for Renal Arteriography at the Time of Coronary Arteriography

### A Science Advisory From the American Heart Association Committee on Diagnostic and Interventional Cardiac Catheterization, Council on Clinical Cardiology, and the Councils on Cardiovascular Radiology and Intervention and on Kidney in Cardiovascular Disease

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**Abstract**—Atherosclerotic renal artery stenosis is commonly present in patients with clinically manifest atherosclerosis in other vascular beds and is independently associated with increased cardiovascular morbidity and mortality. Screening tests such as renal angiography should be selectively applied to patients at high risk for renal artery stenosis who are potential candidates for revascularization. This multispecialty consensus document describes the rationale for patient selection for screening renal angiography at the time of cardiac catheterization. (*Circulation*. 2006;114:1892-1895.)

**Key Words:** AHA Scientific Statements ■ arteriography ■ atherosclerotic renal artery stenosis ■ atherosclerosis ■ hypertension, renal

Atherosclerotic renal artery stenosis (ARAS) is a common anatomic finding in patients with atherosclerosis in other arterial circulations.<sup>1</sup> This science advisory will address the appropriate use of diagnostic screening arteriography for ARAS at the time of coronary arteriography, pejoratively called “drive-by renal arteriography,” in patients at increased risk for ARAS (Tables 1 and 2) who have clinical indications for renal artery revascularization as defined in the recently published American College of Cardiology/American Heart Association (ACC/AHA) guidelines for management of peripheral vascular disease.<sup>3</sup>

The association between ARAS and peripheral arterial atherosclerosis is well established, occurring in 22% to 59% of cases.<sup>5,6</sup> This frequency of concomitant disease explains why abdominal aortography with run-off for lower-extremity ischemic disease routinely includes imaging of the renal arteries. There is also a marked increase in the prevalence of ARAS in patients with known or suspected coronary artery disease<sup>7-9</sup> (Table 3). In the largest series of screening renal

arteriography, 1235 unselected, consecutive patients had both coronary arteriography and abdominal aortography.<sup>9</sup> Thirty percent of patients were found to have some evidence of ARAS, and 15% had lesions  $\geq 50\%$  diameter stenosis. In a selected population of 297 hypertensive patients referred for coronary arteriography who also had concurrent abdominal aortography during the same procedure, 34% had evidence of renal artery stenosis, and 19% had ARAS lesions  $\geq 50\%$  diameter stenosis.<sup>11</sup> Bilateral ARAS was noted in 19% to 29% of patients with  $\geq 50\%$  ARAS (Table 3).

The diagnosis of ARAS, even if not hemodynamically significant, provides information that affects patient management. ARAS is associated with premature cardiovascular events (myocardial infarction, stroke, and death), and the presence of ARAS in patients with coronary disease independently doubles a patient's risk of mortality even when coronary revascularization is performed.<sup>12</sup> The increase in mortality is directly related to the severity of ARAS: The more severe the stenosis, the higher the mortality risk. The

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**TABLE 1. Clinical Clues to the Diagnosis of Renal Artery Stenosis**

- Onset of hypertension at <30 years of age or severe hypertension at >55 years of age\* (Class I; LOE B)
- Accelerated, resistant, or malignant hypertension\* (Class I; LOE C)
- Unexplained atrophic kidney or size discrepancy >1.5 cm between kidneys† (Class I; LOE B)
- Sudden, unexplained pulmonary edema (Class I; LOE B)
- Unexplained renal dysfunction, including individuals starting renal replacement therapy (Class IIa; LOE B)
- Development of new azotemia or worsening renal function after administration of an ACE inhibitor or ARB agent (Class I; LOE B)
- Multivessel coronary artery disease or peripheral arterial disease (Class IIb; LOE B)
- Unexplained congestive heart failure or refractory angina (Class IIb; LOE C)

ACE indicates angiotensin converting enzyme; ARB, angiotensin receptor blocker; LOE, level of evidence (see Table 2).

\*For definition of hypertension, see Chobanian et al.<sup>2</sup>

†For example, a kidney that has become atrophic owing to chronic pyelonephritis is not an indication for renal artery stenosis evaluation.

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presence of bilateral ARAS significantly reduced 4-year survival in affected patients to 47% compared with 59% ( $P<0.001$ ) in patients with unilateral ARAS.<sup>12</sup>

Progression or worsening of ARAS occurs commonly, with occlusion and loss of renal function more likely with more severe renal stenoses.<sup>13,14</sup> Sequential coronary and abdominal aortography performed in 1189 patients, with an average of  $2.6\pm 1.6$  years between studies, demonstrated progression of ARAS in 11.1% of patients.<sup>13</sup> Patients with normal renal arteries at baseline who demonstrated progression to severe ARAS ( $\geq 75\%$ ) had significant deterioration in their renal function compared with those without progression of ARAS.<sup>13</sup> Serial ultrasound studies in patients with ARAS confirmed that lesion progression occurred in about one third of 295 arteries serially imaged over 3 years, but that progression to occlusion only occurred if baseline ARAS was  $>60\%$ .<sup>14</sup> A randomized trial of hypertensive patients with ARAS lesions  $\geq 50\%$  demonstrated that 16% of the medical treatment group had progressed to occlusion at 1 year.<sup>15</sup>

The cost or risk versus the benefit of performing screening renal arteriography at the time of diagnostic coronary arteriography in patients with indications for renal revasculariza-

**TABLE 2. Classification and Levels of Evidence**

Classification	
Class I:	Intervention is useful and effective.
Class IIa:	Weight of evidence/opinion is in favor of usefulness/efficacy.
Class IIb:	Usefulness/efficacy less well-established by evidence/opinion.
Class III:	Intervention is not useful/effective and may be harmful.
Levels of Evidence	
A:	Sufficient evidence from multiple randomized trials
B:	Limited evidence from single, randomized trial or other nonrandomized studies
C:	Based on expert opinion, case studies, or standard of care

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tion must be considered. Although aortography does add cost to the coronary angiographic procedure, it is comparable to the cost of the noninvasive imaging test that it replaces. There is good evidence that the addition of abdominal aortography to coronary arteriography in patients with a baseline serum creatinine  $\leq 2.0$  mg/dL is not associated with an increase in procedure-related morbidity or mortality.<sup>11</sup> In a series of 297 patients with hypertension undergoing coronary arteriography and concurrent abdominal aortography, no patients experienced deterioration in renal function, clinical atheromatous embolization, or prolongation in the length of hospital stay.<sup>11</sup> The additional contrast administration is negligible, and the catheter used for nonselective renal arteriography is atraumatic. Patients at increased risk for contrast-induced nephropathy should be pretreated with N-acetylcysteine and receive vigorous hydration before the administration of low-osmolar contrast.<sup>3</sup>

Ideally, patients with a clinical indication for investigation of renal artery patency will undergo a noninvasive diagnostic test (duplex ultrasonography, magnetic resonance arteriography, or computer-assisted tomographic arteriography) before diagnostic coronary arteriography. However, some patients at “high risk” for ARAS (Table 1) who are potential candidates for renal revascularization will present for urgent coronary arteriography without having had the opportunity for noninvasive screening for ARAS.

The increased prevalence of ARAS in patients with coronary artery disease and the poor prognosis independently associated with the presence of ARAS supports a strategy of increased awareness of this disease process and a need to

**TABLE 3. Prevalence of ARAS at Cardiac Catheterization**

Study, Year <sup>Reference</sup>	Patients, n	ARAS >30%, n (%)	ARAS >50%, n (%)	Bilateral,* n (%)
Vetrovec et al, 1989 <sup>10</sup>	116	34 (29)	27 (23)	8 (29)
Harding et al, 1992 <sup>9</sup>	1302	375 (29)†	188 (15)	52 (28)
Jean et al, 1994 <sup>7</sup>	196	65 (33)	36 (18)	NR
Rihal et al, 2002 <sup>11</sup>	297	101 (34)‡	57 (19)	11 (19)
Weber-Mzell et al, 2002 <sup>8</sup>	177	45 (25)	19 (11)	5 (26)

n indicates No. of patients; NR, not reported.

\*Defined as bilateral ARAS=50%.

†<50% ARAS.

‡>25% ARAS.

identify ARAS as early as possible. We conclude that it is reasonable to perform screening renal arteriography at the time of cardiac catheterization in patients at increased risk for

ARAS (Table 1) who are candidates for revascularization as defined in the ACC/AHA peripheral arterial disease management guideline document.<sup>3</sup>

## Disclosures

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\*Modest.

†Significant.

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