

The Cardiologist in the Periphery: Indications and Usefulness of Peripheral Artery Invasive Angiography in Patients Undergoing Coronary Angiography

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Abstract: Although the most widely used screening techniques for extra-cardiac atherosclerotic distributions are noninvasive, in selected patients undergoing coronary arteriography a coincident angiography of certain peripheral arteries may appear justified. Subclavian artery angiography may be indicated in patients undergoing coronary angiography and candidates to internal mammary artery by pass surgery in order to prevent any subclavian coronary steal syndrome after coronary surgery using arterial conduits: in the authors experience should be always performed in patients with multiple risk factors and multivessel coronary artery disease. An extensive literature supports the need of a renal artery angiography in patients with unexplained renal dysfunction, flash pulmonary edema, and severe hypertension. Renal angiography in patients undergoing coronary angiography is diagnostic of unknown renal artery stenosis in 11% to 18% of patients, the prevalence of unsuspected renal artery stenosis increasing from 7% to 22% in patients with coronary artery disease. Aortoiliac lesions are detected in 40.5% of patients undergoing coronary angiography and in a significant proportion of patients with aortic aneurismal disease by a simple 35-40 ml injection of contrast medium at level of L1. Data given by an abdominal aorta angiography may be important to choose the correct treatment strategy in case of abdominal aorta aneurysms or renal artery stenosis especially in patients candidates to coronary bypass surgery and generally in emergent or urgent clinical setting.

Invasive angiography of peripheral arteries performed by the cardiologist at the time of coronary angiography appears justified following clear criteria in patients over 60 years, multi-vessel CAD and multiple risk factors especially if candidates to cardiac surgery in order to detect potentially dangerous peripheral artery disease and to improve long-term results of myocardial revascularization or other cardiac surgical procedures.

Keywords: Coronary disease, catheterization, angiography, peripheral vascular disease.

INTRODUCTION

The increasing age of the population makes multiple vascular atherosclerotic distributions more likely to be found in patients arriving at the cath lab for coronary artery angiography or complete cardiac catheterization: coronary artery disease (CAD) is frequently associated with extra-cardiac atherosclerosis. [1]. Noninvasive techniques, although accurate, still have some limitations in diagnosing vascular atherosclerotic distributions [2-3] and thus, in selected patients undergoing coronary arteriography a coincident angiography of certain peripheral arteries may appear justified. In this brief review the authors attempt to outline the main indication criteria and the effectiveness of peripheral artery angiography in patients undergoing coronary artery angiography.

SUBCLAVIAN AND INTERNAL MAMMARY ANGIOGRAPHY

As the use of the internal mammary artery for myocardial revascularization has increased, there is a risk of recurring

angina pectoris in patients who have or who develops high-grade stenosis or occlusion of the subclavian artery, because of the coronary-subclavian steal syndrome. Proximal subclavian artery occlusive disease in the presence of a patent internal mammary artery used as a conduit for a coronary artery bypass graft procedure may cause the reversal of the internal mammary artery flow (coronary-subclavian steal) and leading to myocardial ischemia [4].

Visualization of the subclavian artery by duplex ultrasound is possibly in nearly all cases at least for the distal part of the vessel. Unfortunately stenoses and occlusions occur mostly at the origin of the vessel. The proximal part of the right subclavian artery, as well as the distal part of the innominate artery are visible in most cases, but the origin of the left subclavian artery, where lesion occur three times more often, is practically never directly visible by duplex ultrasound.

Thus, all patients undergoing cardiac catheterization prior to coronary artery bypass grafting using the internal mammary artery should be evaluated for the presence of upper extremity and cerebrovascular ischemia, the presence of cervical or supraclavicular bruits, and an upper extremity blood pressure differential of 20 mm Hg or greater [5]. Patients with these findings or with evidence of diffuse

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atherosclerotic vascular disease should have brachiocephalic arteriography at the time of coronary arteriography to identify significant subclavian artery occlusive disease. The selective or semiselective (during brachiocephalic arteriography) visualization of the IMA in patients in whom the internal mammary artery is going to be used as a graft, can assess the suitability of this vessel for surgical purpose. Some authors [6-7] have produced significant findings in 12-15% of cases of concomitant angiography of the internal mammary artery and coronary angiography, such as too narrow caliber to be used as a graft, and occlusions related and unrelated to previous surgery.

Authors' Experience

In our series of 110 patients undergoing coronary angiography and submitted to coincident subclavian and internal mammary angiography on the basis of presence of significant CAD, haemodynamically relevant stenosis was observed in 23/110 patients (20.9%) (Fig. 1).



Fig. (1). Subclavian artery stenosis detected in a patient with 3-vessel CAD candidates to arterial conduits.

Angiography was performed by a standard Right Judkins diagnostic catheter placed at the origin of the subclavian artery and injection of 6-8 ml of iodinated contrast medium in postero-anterior view. Logistic regression analysis revealed 3-vessel CAD (odds ratio[OR] 9.917 ; 95% confidence interval [CI] 2.2 to 43.8 ; $p=0.002$), hypercholesterolemia (OR 2.74 ; 95% CI 1.05 to 7.7 ; $p=0.044$) and age >65 (OR 3.55; 95% CI 2.2 to 9.2, $p=0.038$) to be predictors of brachiocephalic disease. Previous breast irradiation/thoracic surgery (OR 9.55; 95% CI 3.1 to 21.2;

$p<0.001$) were found to be predictors of LIMA unsuitability as arterial conduit.

Angiography of brachiocephalic arteries at the time of coronary angiography is effective in preventing any coronary-subclavian steal syndrome and in assessing suitability of LIMA as conduit, but it makes sense only in patients over 65 years with multi-vessel CAD, upper extremity and cerebrovascular ischemia, cervical or supraclavicular bruits, and an upper extremity blood pressure differential of 20 mm Hg or greater, previous thoracic or neck brachiotherapy or thoracic surgery. In patients <65 years with no clear risk factors and monovessel CAD, the preoperative brachiocephalic angiography is no effective due to the rare frequency of significant angiographic findings: it should be considered as an adjunctive hazard and should be avoided.

ABDOMINAL AORTOGRAPHY

Some differences exist in current literature as regards the prevalence of the association of CAD with different sites of atherosclerotic involvement. The prevalence of the association of renal artery stenosis and CAD in patients undergoing coronary angiography with other risk factors ranges from 11% to 18% [8-9]. Moreover, the prevalence of unsuspected renal artery stenosis increases from 7% to 22% in patients with CAD and is much higher in patients with hypertension and impaired renal function [10-11] and in patients with established CAD, particularly in those with 3-vessel disease. The prevalence of RAISA ranges from 14 to 32% of patients depending on severity of CAD [12], and in particular coronary artery disease is associated with aortoiliac lesions in 40.5% of patients undergoing coronary angiography [13]. The extent of the coronary disease was directly related to the prevalence and extent of the aortoiliac lesions. Frequencies of aortoiliac lesions were strongly related to a history of smoking and intermittent claudication and directly related to the extent of CAD. Finally, as regards aortic aneurysmal disease associated with CAD, the prevalence of this association has been reported to range from 4.4 to 7% [14-15]. A knowledge of aortic involvement in such atherosclerotic phenomenon may influence the operative strategy in patients undergoing urgent coronary angiography privileging the complete revascularization which reduces the risk of cardiac events in patients undergoing thoracic aortic surgery [16] or in the case of severe thoraco-abdominal aneurysm by referring the patient for a combined surgical management which has a low mortality and good event-free survival rates [17-23].

Authors' Experience

In our series of 504 consecutive patients (335 males, mean age 69.1 ± 10.8 years, mean serum creatinine 1.1 ± 0.8 mg/dl) who were enrolled in the retrospective registry, angiographically significant renal or aortoiliac obstructive or aneurysmal disease was observed in 180 (35.7%): renal artery stenosis was found in 13.1% of cases (66 patients), aortoiliac artery disease in 13.7% (69 patients), and aortic aneurysmal disease in 8.9% (45 patients) including patients with combined renal artery and aortic stenosis, renal artery stenosis and abdominal aneurysm, and iliac stenosis/

occlusion and thoraco-abdominal aneurismal disease. Significant renal or aortoiliac obstructive or aneurismal disease was associated with CAD in 98.8%. Angiography was performed by a simple 35-40 ml injection of contrast medium at level of L1 in 20° Left Anterior Oblique view: dubious renal artery stenosis was clarified with selective renal angiography using a Right Judkins or Mammary diagnostic catheter (Fig. 2). Complications of combined coronary and abdominal vessel angiography included 5 contrast-induced nephropathy (1%); no case required renal replacement therapy. The additional contrast volume used for abdominal aorta and/or renal angiography was 38±15 ml, whereas the additional fluoroscopy time was 2.0±1.1 minutes. Multivariate logistic regression analyses revealed ≥3-vessel CAD (odds ratio[OR] 9.917 ; 95% confidence interval [CI] 2.2 to 43.8 ; p=0.002), age >60 years old (OR 3.817 ; 95% CI 2.2 to 6.5.8 ; p=0.036), ≥ 3 risk factors (OR 2.8; 95% CI 0.63-9.1; p=0.048) and hypertension (OR 2.851; 95% CI 1.03 to 7.9 ; p=0.044) as independent predictors of renal and aortoiliac obstructive diseases.



Fig. (2). Renal artery stenosis detected in a patients with 2-vessel coronary disease and normal creatinine during coincident coronary angiography and selective renal angiography through a brachial approach.

CONCLUSIONS

As previously suggested [24-25] peripheral artery angiography in patients undergoing coronary angiography may be considered common sense if performed following clear general criteria such as age > 60 years, multivessel CAD, multiple risk factors, and specific indications such as previous thoracic brachytherapy of surgery for patients candidates to arterial conduits, uncontrolled hypertension, unexplained renal failure, flashing pulmonary oedema, abdominal bruit, loss of femoral arterial pulse for abdominal aortography. This strategy may detect unknown subclavian, renal and aortoiliac atherosclerotic involvement improving the global management of patients with CAD and associated

peripheral vascular disease and impacting their mortality and morbidity.

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