Diagnosis of Carotid Artery Occlusive Disease in Patients Scheduled for Cardiac or Vascular Surgery: Is This a Place for Invasive Selective Carotid Angiography?

To the Editor:

Doppler ultrasound\(^1\) and recently angio–computerized-tomography (angio-CT)\(^2\) and angio–magnetic-resonance (angio-MR)\(^3\) are rapidly becoming the gold standard of diagnosis of carotid occlusive disease. Advantages of these techniques are the wide availability, relative operator independence, good imaging resolution, and noninvasiveness.\(^4\) On the other hand, in certain anatomical situations such as occlusion or bilateral stenosis, or particular clinical settings such as coronary or aortic surgical emergency, they can be problematic, doubtful, or impractical, and selective carotid angiography may still play a role.

Acute coronary syndromes require prompt coronary artery angiography and eventual percutaneous intervention or referral to cardiac surgeon for urgent myocardial revascularization. Every invasive cardiologist has this problematic experience of a patient undergoing urgent coronary angiography for segment (ST) elevation or non-ST-elevation acute coronary syndrome (ACS) in whom unexpected severe stenosis of the left main trunk has been detected. In this case, waiting for a Doppler ultrasound scanning of the carotid arteries or for an angio-CT in order to rule out any carotid atherosclerotic involvement before cardiac surgery may be cumbersome and not really safe. A selective 2-projection carotid angiography with the same Judkins Right catheter used during the coronary artery angiography is more practical, less time-consuming, and can offer good image resolution with a low contrast dose of 10 to 15 mL.

In my opinion it is the preferred strategy and in at least 15 cases of left main trunk subocclusion in the last 5 years no complications occurred except one carotid spasm, which was resolved with nitrates.

Aortic dissection in adults and elderly is another clinical situation in which selective carotid artery angiography performed at the same time as diagnostic preoperative coronary arteriography may be a rapid and practical way to rule out carotid artery involvement or significant atherosclerosis. Similarly, carotid artery angiography at the same time as coronary arteriography performed before thoracic or thoraco-abdominal aneurysm endovascular or open repair may be a practicable diagnostic option in patients with cardiovascular risk factors.

Combined aortic valve stenosis (AVS) and carotid artery disease constitute a high-risk clinical setting for simultaneous open-heart and vascular surgery.\(^5\) Duplex sonography constitutes the most accepted imaging modality for screening patients undergoing major vascular and cardiac surgery,\(^6–8\) but it normally has limitations due to technical difficulties, overestimation of lesions in cases of bilateral disease,\(^9\) difficult appreciation of occlusion, and complex anatomy\(^10\) that may be exacerbated by the characteristic abnormalities in flow velocity pattern due to aortic valve stenosis, such as increased acceleration time, decreased peak velocity, and delayed upstroke.\(^11\) Candidates for aortic valve surgery can benefit from a carotid artery angiography performed at the time of complete cardiac catheterization. In my experience, 15 patients (8.3% of all aortic valve stenosis patients, mean age 70±10.4 years) with severe aortic valve stenosis and inconclusive Doppler sonography were diagnosed to have critical stenosis of one (14 patients) or both (1 patient) internal carotid arteries on carotid angiography performed at the same time as cardiac catheterization. Mean carotid angiography time, mean contrast material quantity injected, and mean number of projection needed for complete study were 9.4±2.3 minutes, 16.5±3.4 mL and 2.1±1.5, respectively. Two arterial spasm cases (3.3%) and no in-hospital complications have been observed (unpublished data, 2003).

Obviously selective carotid artery angiography cannot be proposed nowadays for stratification of all patients undergoing major surgery, noninvasive techniques being recognized as the gold standard in this setting, but for patients in whom emergency revascularization cannot delayed, or for patients undergoing coronary arteriography before cardiac or major vascular surgery, it can still play a role. Selective carotid artery angiography allows a careful assessment of anatomical location, morphology, and degree of atherosclerotic lesions and may help expedite diagnostic route and provide the surgeon with the best anatomical picture, thus avoiding long intraoperative time. My experience suggests that carotid artery angiography is not time consuming, accounting for about 10 minutes, if performed during the same session of complete right and left cardiac catheterization. Moreover, it does not require much more contrast material, adjunctive catheters, or multiple projections.

Combined cardiac catheterization and selective carotid angiography in medium to high volume laboratories may be safer, faster, more practical, and more complete in aged patients with combined comorbidities, particularly in urgent or emergent conditions, without increased cost.

Moreover, combined endovascular therapy of coronary and carotid arteries,\(^12\) combined endovascular and surgical therapy of carotid and heart valves,\(^13\) and, in the future, combined percutaneous cardiac valve implantation and carotid artery disease angioplasty\(^14\) can enhance the role of selective carotid artery angioplasty in assessing carotid artery atherosclerosis in patients in whom a cardiac or peripheral invasive diagnostic procedure is planned or a cardiac or peripheral endovascular intervention is scheduled.

Gianluca Rigatelli, MD, FESC, FACC, FANMCO, FASA, FSCAI
E.C.V.T.
Legnano, Italy

References

Response: Combined Testing of Cardiac and Carotid Artery Stenosis?

In this issue of Stroke, Rigatelli suggests that combined cardiac catheterization and selective carotid angiography may be safe, more practical, and faster to obtain in patients with potential combined comorbidities than staged coronary angiography followed by noninvasive examination of the carotid arteries, particularly in urgent or emergent conditions.

First, we would like to emphasize the importance of the right indication of diagnostic testing of the carotid artery. From randomized trials we know that carotid endarterectomy (CEA) is beneficial in symptomatic patients with a significant stenosis of the internal carotid artery (ICA).1,2 However, the indication for CEA is less clear in patients with combined cardiac and carotid artery stenosis. The overall complication rate for patients undergoing synchronous coronary artery bypass and carotid surgery is much larger than of CEA alone.3 No significant difference was found in outcomes for staged or synchronous surgery, and, moreover, there is no data available from randomized clinical trials for the best treatment of patients with combined cardiac and carotid disease. Therefore, the cardiovascular history is crucial in this group of patients. The issue whether invasive diagnostic testing of the ICA should be performed prior to cardiac surgery should be more dependent on a history of a recent transient or minor disabling ischemic stroke than on the feasibility of the procedure. We agree with Rigatelli that combined coronary and carotid angiography is an option if the cardiovascular surgeon would need information about the anatomy of the aortic arch and its side branches, but this is necessary in a minority of the patients that need cardiac surgery.

In the carotid surgery trials the degree of stenosis was assessed with conventional digital subtraction angiography (DSA), which consequently has become the standard of reference for selecting patients for carotid surgery. DSA, however, has a small but significant risk of transient ischemic attack (TIA) or minor stroke (4%), major stroke (1%), and even a small risk of death (<1%).4,5 More recently a lower rate of neurological complications due to DSA was reported: 0.5% for stroke and 0.4% for TIA.4 However, even patients without apparent neurological complications after DSA have been shown to develop minor asymptomatic infarctions due to microembolisms.6,7 Over the last decade many diagnostic studies have been published suggesting noninvasive diagnostic tests such as duplex ultrasound and magnetic resonance angiography to avoid these complications in patients in whom CEA is considered.8 The noninvasive tests have proven to be more cost-effective than DSA.9 Rigatelli suggests that routinely performing combined cardiac catheterization and selective carotid angiography is a safe procedure according to the present knowledge of complications of DSA for diagnosing carotid artery stenosis alone, together with the reported diagnostic accuracy of noninvasive testing, from an ethical point of view does not allow such a study anymore.

In our opinion DSA of the carotid artery has a potential risk that does not outweigh the benefits of routinely collecting information about the cerebropetal arteries in patients undergoing coronary angiography who do not have a history of neurological symptoms. DSA should be done only if its result could influence clinical management.
Diagnosis of Carotid Artery Occlusive Disease in Patients Scheduled for Cardiac or Vascular Surgery: Is This a Place for Invasive Selective Carotid Angiography?
Gianluca Rigatelli

Stroke. 2004;35:e89-e90; originally published online March 25, 2004;
doi: 10.1161/01.STR.0000125304.23773.70
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2004 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/35/5/e89

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/