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Review article

The cardiovascular risk of patients with carotid artery stenosis

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ABSTRACT

It is commonly accepted that a relationship exists between coronary and carotid arterial disease, given that the prevalence of coronary artery disease (CAD) in patients with carotid stenosis is as high as 77%, depending on the population studied. Elevated cardiovascular (CV) risks are apparent in patients with either asymptomatic or symptomatic carotid stenosis. Patients with asymptomatic carotid stenosis are at about a three-fold higher risk of CV death/myocardial infarction compared with a matched population without carotid stenosis, and this risk may be even higher among patients with symptomatic carotid stenosis. Thus, antiplatelet and lipid-lowering therapies are indicated not only to prevent stroke, but also especially to lower elevated CV risks. Carotid revascularization has become well established in patients with symptomatic carotid stenosis, which is associated with significant absolute risk reductions in terms of recurrent stroke, but remains controversial for patients with significant but asymptomatic carotid stenosis. Carotid revascularization in those with asymptomatic carotid stenosis seems to principally benefit patients with specific clinical/imaging features indicating a high risk of stroke. Screening and treatment of asymptomatic CAD can be beneficial for patients with recently symptomatic carotid stenosis and especially for those for whom surgical or endovascular carotid revascularization is planned. Because evidence of the benefits afforded by prophylactic revascularization of asymptomatic carotid artery stenosis in all CABG candidates (in terms of reducing perioperative stroke) is lacking, it may be reasonable to restrict prophylactic carotid revascularization to patients at the highest risk of postoperative stroke, thus those with severe bilateral lesions or a history of prior stroke/transient ischemic event.

Contents

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Introduction

When treating a patient with significant carotid artery disease, it is important to realize that atherosclerosis is a systemic inflammatory vascular disorder involving multiple arterial beds. These patients are threatened not only by stroke; the presence of carotid artery disease places them into very high-risk group for any of several atherosclerotic cardiovascular (CV) events, especially coronary events. The presence of atherosclerotic disease in more than one arterial system is associated with a higher risk of recurrent symptoms and complications, and patients with detectable disease in the coronary and peripheral arteries are at twice the risk of those presenting with coronary artery disease (CAD) alone [1].

Although modern pharmacotherapy and revascularization techniques have markedly improved the prognosis of patients with atherosclerotic vascular disease, atherosclerosis-related CV events and cerebrovascular events remain the causes of death in almost 46% of all cases in developed countries [2]. Detection and treatment of preclinical CAD in patients with significant carotid artery stenosis may improve long-term outcomes and survival, because CAD is a major cause of death not only during follow-up in stroke patients, but also in patients with asymptomatic carotid stenosis [3–6].

The purpose of this review is to summarize the known levels of association between carotid and coronary atherosclerosis, to present the CV risk profile of patients with carotid stenosis, and to summarize recommendations for the investigation and treatment of asymptomatic coronary artery disease among patients with carotid stenosis.

Association between carotid and coronary atherosclerosis

A relationship between coronary and carotid arterial disease is commonly accepted, confirming that atherosclerosis is a systemic condition. Similar plaque morphology at both vascular sites and predominant plaque location at the branch points of arteries suggest that development of atherosclerotic changes at both sites share similar systemic factors [3,7]. The prevalence of concomitant atherosclerosis in the carotid and coronary arteries has been studied under different circumstances, and the proportions vary widely (Table 1).

Most clinical studies have sought to determine the prevalence of carotid artery atherosclerosis in patients with known CAD. This prevalence differs depending on the study population and is highly dependent on the extent of CAD [8]. The weighted mean prevalences of carotid stenosis greater than 50, 60, 70, and 80% described in an earlier review were 14.5, 8.7, 5.0, and 4.5%, respectively [9]. Risk factors most commonly associated with carotid stenosis in patients with CAD are extension of CAD, older age, and a history of cerebrovascular disease and concomitant peripheral artery disease [10–13]. The presence of peripheral artery disease may also be associated with more high-risk hypoechogenic carotid lesions [14].

Few studies have been performed to determine the prevalence of CAD in patients presenting with carotid artery disease. Hofmann et al. described the prevalence of CAD (defined as stenosis ≥ 50% or previous percutaneous intervention/coronary artery bypass grafting) in a population of patients (both symptomatic and asymptomatic) admitted for elective carotid artery stenting as being as high as 77.1% [15]. Enomoto et al. described the prevalence of CAD in 112 patients undergoing elective carotid artery stenting 49.1%. Almost 60% of these patients were neurologically symptomatic [16]. The prevalence of concomitant CAD has also been studied in stroke patients using both noninvasive and invasive tools (Table 2). The prevalence of CAD in this population was lower, likely because atherosclerotic stenosis of the carotid artery is a minor cause of stroke in such patients. The literature states that only 10–12% of strokes involve acute occlusion or thromboembolism caused by 50–99% stenosis of the carotid artery [17,18].

Table 1 – Prevalence of carotid stenosis in patients with known CAD.

Author	No. of patients	Population	Method	Prevalence of carotid stenosis > 50%	Prevalence of carotid stenosis > 70%	Ref.
Brevetti et al. (2009)	169	Patients with stable CAD	DUS	20.7%		[14]
Fassiadis et al. (2008)	117	Patients 65–75 years of age with histories of PCI	DUS	13.7%	3.7%	[19]
Fichet et al. (2008)	152	Patients admitted to the ICU for ACS	DUS	2.6%*		[20]
Steinvil et al. (2011)	1116	Consecutive patients with confirmed CAD undergoing same-day coronary angiography and carotid Doppler studies	DUS	14.5%	5.2%	[8]
Tanimoto et al. (2005)	433	Consecutive patients with confirmed CAD on clinically driven coronary angiography	DUS + angiography confirmation	25.4%		[21]

* Stenosis > 60%. CAD, coronary artery disease; DUS, duplex ultrasonography; ICU, intensive care unit; ACS, acute coronary syndrome; PCI, percutaneous coronary intervention.

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