



## Review

## Coronary and carotid atherosclerosis: Similarities and differences



Fisnik Jashari, Pranvera Ibrahim, Rachel Nicoll, Gani Bajraktari, Per Wester,  
Michael Y. Henein\*

Department of Public Health and Clinical Medicine, and Heart Centre, Umea University, SE-901 87 Umea, Sweden

## ARTICLE INFO

## Article history:

Received 28 July 2012

Received in revised form

10 November 2012

Accepted 12 November 2012

Available online 23 November 2012

## Keywords:

Atherosclerosis

Carotid disease

Coronary disease

## ABSTRACT

Although a relationship is commonly accepted between coronary and carotid arterial disease, suggesting that atherosclerosis is a systemic condition, the extent of this association and correspondence has not been fully elucidated. This review discusses recent research in this field and highlights areas for future study. The prevalence of severe carotid stenosis increases with prevalence of coronary stenosis, with the latter being found in a significant number of stroke patients, while those with carotid stenosis may be at higher risk of myocardial infarction than stroke. There also appear to be common risk factors (age, diabetes, hypertension, smoking and dyslipidemia), although the effects in both vascular systems may not be identical. Furthermore, while the degree of stenosis in the coronary artery has little ability to predict acute coronary syndrome, which is caused by local thrombosis from a ruptured or eroded plaque, severe carotid stenosis causing hypoperfusion is highly predictive of stroke, although this effect may be time-limited. This apparent difference in event mechanism in the two arteries is interesting as is the difference in the rate of development of collaterals. Overall, the evidence shows that a clear relationship exists between disease in the coronary and carotid arteries, since conventional risk factors and the extent of stenosis and/or previous events emanating from one artery have a strong bearing on the prevalence of events in the other artery. Nevertheless, the exact correspondence between the two arteries is unclear, with sometimes contradictory study results. More research is needed to identify the full extent of risk factors for severe stenosis and cardio- or cerebral vascular events, among which, inflammatory biomarkers such as hs-CRP and prior vascular events are likely to play a key role.

© 2012 Elsevier Ireland Ltd. All rights reserved.

## Contents

1. Introduction .....	194
2. Concomitant coronary and carotid atherosclerosis .....	194
2.1. Prevalence .....	194
2.2. Clinical importance .....	194
3. Risk factors .....	194
4. Gender and age differences in presentation and outcome after myocardial infarction and ischemic stroke .....	194
5. Degree of vessel stenosis and acute syndromes in coronary and carotid atherosclerosis .....	195
6. Inflammation in coronary and carotid atherosclerosis .....	195
7. Shear stress and plaque instability in coronary and carotid arteries .....	195
8. Plaque rupture and erosion in coronary and carotid atherosclerosis .....	196
9. Pathomechanisms of cardiovascular events: hypoperfusion or embolism? .....	196
10. Collateral recruitment in coronary and carotid atherosclerosis .....	197
11. Antithrombotic therapy in coronary and carotid atherosclerosis .....	197
11.1. Fibrinolysis .....	197
11.2. Anticoagulation therapy .....	198
11.3. Antiplatelet therapy .....	198
12. Conclusion .....	198
References .....	198

\* Corresponding author. Tel.: +46 90 785 00 00; fax: +46 90 13 76 33.

E-mail address: [Michael.henein@medicin.umu.se](mailto:Michael.henein@medicin.umu.se) (M.Y. Henein).

## 1. Introduction

Atherosclerosis-related cardiovascular events and cerebrovascular (CV) events are the cause of death in almost 50% of cases in developed countries [1]. The presence of atherosclerotic disease in more than one arterial system is associated with a higher risk of recurrent symptoms and complications. At three year follow-up, the rates of myocardial infarction, stroke, vascular death or rehospitalization are 25.5% for patients with symptomatic disease in one vascular system and 40.5% for multiple vascular systems [2], suggesting that atherosclerosis is a diffuse vascular disease whose effects are potentially additive. Indeed, patients with detectable disease in the coronary and peripheral arteries carry twice the level of risk as those presenting with coronary artery disease (CAD) alone [2]. Despite the fact that carotid atherosclerosis develops later in life compared to coronary disease [3], plaque morphology and their anatomical location at branching points and arterial curves is similar in the two arterial systems [4,5], suggesting that development of the shared disease is likely to be influenced by similar systemic factors. However, the extent of association and concordance between the two arterial systems remains to be determined (Fig. 1).

This review will consider the various similarities and differences between atherosclerotic disease in the coronary and carotid arteries, comparing the pathomechanism of the conditions, their symptomatology, their risk factors, the mechanism of their acute syndromes and treatment (Tables 1 and 2).

## 2. Concomitant coronary and carotid atherosclerosis

### 2.1. Prevalence

The prevalence of severe carotid artery stenosis increases progressively concurrent with coronary artery stenosis and is a known predictor of worse CV outcome. A general review showed that the prevalence of >50, >60, >70, and >80% carotid stenosis was reported in 14.5%, 8.7%, 5.0%, and 4.5% of CAD patients respectively [6]. The prevalence of clinically significant severe carotid artery stenosis (>50%) was progressively increased among patients with either non-obstructive CAD, single vessel disease (VD), double VD, triple VD and disease of the left main coronary artery [7]. Likewise, CAD has been reported in 70.4% of 1304 patients with stroke but without prior CA events, one third of whom had significant stenosis [8].

### 2.2. Clinical importance

The clinical relevance of concurrent carotid and coronary disease is important, with some considerable evidence suggesting that CAD is the major cause of death in patients who survive an ischemic stroke [9–11] and patients with asymptomatic carotid stenosis are at higher risk for MI than for stroke [12]. However, investigation of stroke patients for asymptomatic CAD remains debatable since many patients do not go on to suffer a cardiac event, suggesting a need for identification of specifically high risk patients who would benefit from CAD screening. The American Heart Association/American Stroke Association (AHA/ASA) Scientific Statement recommends noninvasive testing for CAD in selected stroke patients with high CV risk profiles (10-year CAD risk of more than 20% on the basis of Framingham profiles) and in those with significant carotid disease [13]. Contrary to this recommendation, the Framingham results show a lower risk of cardiac events associated with an increased probability for CAD in patients with prior cardiac event or stroke than in those free of CV disease [14],

which suggests that following stroke, the risk of severe coronary events is not related solely to the presence of risk factors. In the European Carotid Surgery Trial, patients with bilateral carotid disease were more likely to have had a previous MI and to suffer a fatal event [15]. Interestingly, the presence of bilateral carotid disease proved a better predictor of CAD than the extent or severity of disease in either bifurcation [16]. Furthermore, the presence of triple vessel coronary disease is an independent predictor of severe or total internal carotid occlusion [7].

In addition, carotid artery stenosis is known as a potential cause of peri/post-operative stroke in patients undergoing coronary artery bypass grafting (CABG), with a prevalence of 3% in unilateral stenosis, 5% in bilateral stenosis and 7% in total carotid occlusion [6]. Identification of patients with CAD suitable for CABG with concomitant carotid artery disease is important, who may benefit from a hybrid revascularization by carotid stents or carotid endarterectomy [17].

Timaran et al. compared the in-hospital outcome of patients who underwent carotid stenting before CABG with those treated by combined surgery and demonstrated lower rates of post-operative strokes in those with carotid stents (2.4% vs. 3.9% respectively;  $P < 0.001$ ) despite similar in-hospital death rate (5.2% vs. 5.4%, respectively) [18]. It can therefore be concluded that the co-existence of severe carotid disease in patients with CAD is a sign of widespread atherosclerosis, with a high risk of the presence of atherothrombotic lesions in the aortic arch, another risk factor for stroke [19]. Identification of these patients should optimize clinical management, particularly avoiding aortic cross clamping during off-pump surgery in order to minimize the risk of perioperative stroke [19].

### Summary

- The co-existence of severe carotid disease in patients with CAD is a sign of widespread atherosclerosis
- CAD is the major cause of death in patients who survive an ischemic stroke
- Identification of patients with aggressive vascular disease should assist in optimizing clinical management

## 3. Risk factors

Carotid and coronary atherosclerosis share common risk factors such as diabetes mellitus, hypertension, smoking, older age, high triglyceride levels and low high-density lipoprotein cholesterol levels [20]. Studies suggested that the classic CV risk factors have a different impact in different arterial systems, with cholesterol being particularly important in CAD, hypertension in ischemic stroke, whereas smoking and diabetes in intermittent claudication [21,22]. Greater understanding of these artery-specific risk factors should assist in optimum disease prevention. The potential role of additional risk factors such as obesity, chronic infection, high sensitivity-C-reactive protein (hs-CRP) and insulin resistance (HbA1c) remains to be determined.

## 4. Gender and age differences in presentation and outcome after myocardial infarction and ischemic stroke

Prevalence of carotid and coronary atherosclerosis increase gradually with age, and is more prevalent in man than in women [23]. The median age of MI and stroke onset is higher in females,

Download English Version:

<https://daneshyari.com/en/article/5947721>

Download Persian Version:

<https://daneshyari.com/article/5947721>

[Daneshyari.com](https://daneshyari.com)