

**TABLE 8-3** INDICATIONS FOR CORONARY ANGIOGRAPHY IN PATIENTS WITH STABLE ANGINA PECTORIS

Unacceptable angina despite medical therapy (for consideration of revascularization)  
 Noninvasive testing results with high-risk features  
 Angina or risk factors for coronary artery disease in the setting of depressed left ventricular systolic function  
 For diagnostic purposes, in the individual in whom the results of noninvasive testing are unclear

considerations of chest discomfort include esophageal disease (esophageal reflux may mimic typical angina pectoris), chest wall-related pain, pulmonary embolism, pneumonia, and trauma. The clinical presentation of the patient usually points in one direction or another, but patients with chest discomfort commonly undergo an evaluation for CAD, typically with the use of stress testing. Once CAD is reliably ruled out, the physician needs to consider alternative causes of the symptom. In the acute setting of severe chest discomfort, particularly in a hemodynamically unstable patient, the differential diagnosis includes acute MI, pulmonary embolism, and aortic dissection. Prompt and accurate diagnostic evaluation, commonly with the use of invasive angiography, can be lifesaving in this situation.

## Treatment

### Medical Management of Stable Angina

The treatment of CAD and angina pectoris is multifaceted. The presence of CAD with or without angina requires the physician to recommend risk factor modification, frequently associated with lifestyle changes. For angina pectoris, pharmacologic therapy is typically used to control symptoms, allowing for maintenance of reasonable exercise tolerance. Revascularization is commonly used to control symptoms to a degree better than what can be achieved with medications alone, but only a small group of patients with CAD benefit from revascularization in terms of increased longevity.

It is also incumbent on the physician to recognize other medical conditions that can lower the threshold for angina, thus worsening symptoms and affecting quality of life. Anemia is a common medical problem that, when addressed, can significantly reduce the frequency of angina pectoris. Hyperthyroidism, with its increased metabolic demand and tachycardia, can increase the frequency of angina pectoris. Uncompensated congestive heart failure lowers the anginal threshold through the effects of LV dilation and filling pressure elevation on myocardial oxygen demand. Chronic obstructive pulmonary disease (COPD) and obstructive sleep apnea leading to hypoxemia can trigger angina pectoris.

Attention to the major modifiable risk factors for CAD is a cornerstone of therapy. Poorly controlled diabetes mellitus, hypertension, hyperlipidemia, and ongoing smoking all drive the progression of CAD and increase the risk for catastrophic events such as MI or sudden death. The wealth of clinical research on preventing death and disability from CAD has led to the development of evidence-based guidelines that form the basis of contemporary therapy for CAD (Table 8-4). Complete smoking cessation is a must for patients with CAD regardless

**TABLE 8-4** GOALS OF RISK FACTOR MODIFICATION

RISK FACTOR	GOAL
Dyslipidemia	
Elevated LDL-cholesterol level	
Patients with CAD or CAD equivalent*	LDL <70 mg/dL
Without CAD, $\geq 2$ risk factors <sup>†</sup>	LDL <130 mg/dL (or <100 mg/dL <sup>‡</sup> )
Without CAD, 0-1 risk factors <sup>†</sup>	LDL <160 mg/dL
Elevated TG	TG <200 mg/dL
Reduced HDL-cholesterol level	HDL >40 mg/dL
Hypertension	Systolic blood pressure <140 mm Hg Diastolic blood pressure <90 mm Hg
Smoking	Complete cessation
Obesity	<120% of ideal body weight for height
Sedentary lifestyle	30-60 min moderately intense activity (e.g., walking, jogging, cycling, rowing) five times per week

CAD, Coronary artery disease; CRP, C-reactive protein; HDL, high-density lipoprotein; hsCRP, high-sensitivity C-reactive protein; LDL, low-density lipoprotein; TG, triglycerides.

\*CAD equivalents include diabetes mellitus, noncoronary atherosclerotic vascular disease, or >20% 10-year risk for a cardiovascular event as predicted by the Framingham risk score.

<sup>†</sup>Risk factors include cigarette smoking, blood pressure  $\geq 140/90$  mm Hg or taking antihypertensive medication, HDL-cholesterol level <40 mg/dL, family history of premature coronary atherosclerosis (male, <45 yr; female, <55 yr).

<sup>‡</sup>Target of 100 mg/dL should be strongly considered for men  $\geq 60$  yr and for individuals with a high burden of subclinical atherosclerosis (coronary calcification >75th percentile for age and sex), hsCRP >3 mg/dL, or metabolic syndrome.

of the presence of symptoms. The use of statin medications to reduce LDL cholesterol (to <100 mg/dL, with possible additional benefit if  $\leq 70$  mg/dL) has revolutionized the therapy for CAD. Statins have been shown to reduce the risk of MI in patients with proven CAD and in those at significant risk. There is also interest low HDL levels, which appear to confer increased risk for coronary events. It is unclear whether niacin, which raises HDL, actually reduces the risk of MI or death. Exercise increases HDL levels and may confer protective effects through other mechanisms. Pharmacologic strategies to elevate HDL and hopefully reduce risk are under development.

Antiplatelet therapy is known to reduce the risk of MI in those who have known CAD or are at risk. Patients should be instructed to take aspirin, 81 to 325 mg/day (clopidogrel 75 mg/day may be used in those who are aspirin intolerant or allergic). Angiotensin-converting enzyme (ACE) inhibitors reduce the risk of recurrent MI and are also beneficial for patients with diabetes mellitus or reduced LV function. Angiotensin receptor blockers (ARBs) can be substituted in those who experience significant side effects from ACE inhibitors.

Regular aerobic exercise can benefit patients with CAD by reducing their risk for complications related to the disease. Aerobic exercise also increases exercise tolerance and may reduce the frequency of exercise-related angina pectoris. Positive benefits also accrue from weight loss related to exercise and improved blood pressure control. In sedentary individuals, isometric activities such as snow shoveling can trigger MI and should be avoided. There may be some benefits to judicious weight training in patients with CAD.

In addition to antiplatelet therapy, the commonly employed medications to control angina pectoris include  $\beta$ -blockers, nitrates, and calcium channel blockers. These agents work by