Angina in patients with an active lifestyle

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The care of the active angina patient comprises risk stratification, risk factor modification, cardiac rehabilitation and pharmacotherapy. Risk stratification may be undertaken using a symptom-limited exercise test, with the possibility of myocardial perfusion imaging to improve sensitivity. Higher-risk patients may be evaluated angiographically. Risk factor modification should be tailored to the individual patient and should include weight reduction, cessation of smoking, treatment of hypertension and a controlled increase in levels of exercise for the sedentary patient. Cardiac rehabilitation is comprised of patient education, risk factor management and an individualized exercise prescription, based on a symptom-limited exercise tolerance test. Exercise training is associated with measurable physiological improvements in exercise tolerance. The risk of myocardial infarction due to sudden bouts of heavy exertion is also reduced, by approximately 50-fold, in those who exercise regularly. Pharmacological management should be based on the patient’s anginal threshold. Those with a high threshold may be treated symptomatically with nitroglycerin, while \( \beta \)-blockers may be the most appropriate therapy for those with a lower threshold. Those with a variable threshold may respond better to calcium channel blockers. Long-acting agents are preferred, ideally providing therapeutic coverage in the morning, and throughout the day, until the next daily dose reaches therapeutic levels.

Key Words: Angina, \( \beta \)-blockers, calcium antagonists, exercise, cardiac rehabilitation.

Introduction

The care of patients who have angina and wish to maintain an active lifestyle, like other patients with angina, presents problems in diagnosis, symptom control and prevention of acute coronary events. Challenges specific to the care of these patients can be categorized as risk stratification, risk factor modification, cardiac rehabilitation and pharmacotherapy.

Risk stratification

The first issue in the management of patients with angina who lead an active lifestyle is risk stratification (Fig. 1)\(^1,2\). Since this group of patients is active, the use of a symptom-limited exercise tolerance test is a reasonable testing modality. Addition of myocardial perfusion imaging will increase the sensitivity of the test and may result in a more thorough classification of high-risk patients\(^3\). Guidelines outlining exercise testing protocols and their interpretation, including classification of high-risk status, have recently been updated and published by the American Heart Association (AHA)\(^2,4\).

High-risk patients may be evaluated angiographically and be considered for a revascularization procedure based on their coronary anatomy, while most low-risk patients can be managed with medical therapy. However, a subset of patients exists that will have intolerable symptoms and may need to undergo angiography and revascularization for symptom control\(^4\).

This paper will focus on patients who are considered to be at low risk following their initial evaluation, together with those rendered low risk as a result of stabilization and revascularization as indicated.

Risk factor modification

It is important to assess the risk factor profile of each patient individually. Patients with modifiable risk factors should be educated about the importance of altering their risk of future acute coronary events by aggressive management of these risk factors. Furthermore, altering several such risk factors may not only reduce the long-term risk of cardiovascular events\(^5,6\) but may also reduce anginal symptoms that interfere with the patient’s activities.

Modifiable risk factors which have a direct impact on anginal symptoms and which may be targeted for intervention include obesity, smoking, hypertension and a sedentary lifestyle\(^7\). Weight reduction in
overweight patients is important, since attainment of ideal body weight may increase the anginal threshold and, in some cases, completely abolish angina. Smoking cessation can also increase the anginal threshold and reduce symptoms to a level that is no longer limiting for many patients. This occurs because inhalation of tobacco smoke is associated with increased carbon monoxide levels in the blood, which are associated with a concomitant reduction in oxygen carrying capacity and thus myocardial oxygen supply. In addition, a component of cigarette smoke causes coronary vasoconstriction, which can lead to a variable and decreased anginal threshold. Patients with hypertension should have their blood pressure adequately controlled. In addition to its long-term consequences, hypertension increases myocardial oxygen requirements and results in a lower anginal threshold in the presence of a fixed coronary artery stenosis. Thus, restoring normal blood pressure may reduce anginal symptoms. Patients with hypertension should be instructed on symptom recognition and an appropriate response to episodes of angina with rest and/or sublingual nitroglycerin. Patients should be taught techniques to reduce the occurrence of anginal episodes by altering the way they exercise or the environment in which they undertake such activities. For example, patients with a fixed and predictable anginal threshold may be instructed to take nitroglycerin before engaging in activities known to produce symptoms. Another example is that some patients may benefit from avoiding exertion in the cold if this is a trigger of their angina. In addition, all patients should be taught safe exercise habits, including the importance of warm-up and cool-down periods.

The exercise prescription in these patients, consideration should be given to those agents that have anti-anginal properties in addition to their effectiveness as anti-hypertensives. Issues related to a sedentary lifestyle are addressed in the following section on cardiac rehabilitation.

**Cardiac rehabilitation**

A comprehensive programme should include patient education, risk factor management and an individualized exercise prescription. Patient education is the cornerstone of a comprehensive cardiac rehabilitation programme which should include instruction on symptom recognition and an appropriate response to episodes of angina with rest and/or sublingual nitroglycerin.
There is now considerable evidence to suggest that regular exercise and higher levels of physical fitness are associated with lower rates of acute coronary events and total mortality[11,13-18]. However, there is concern among patients that isolated bouts of heavy exertion may actually trigger the disease it is meant to prevent[19].

There are now several studies that address the issue of triggering of both fatal and non-fatal myocardial infarction (MI) by heavy exertion. Siscovick et al.[20] and others[21] have convincingly demonstrated that heavy exertion can trigger the occurrence of sudden cardiac death. More recently, Mittleman et al.[22] and Willich et al.[23] also demonstrated that non-fatal MI could be triggered by heavy exertion. The increase in risk of MI appears to be elevated only transiently, lasting less than 1 h[22]. It is important to note, however, that in both studies of non-fatal MI[22,23], and in Siscovick’s study[20] of sudden cardiac death, regular exercise greatly reduced the risk of triggering acute coronary events. Figure 3 shows data from the Myocardial Infarction Onset Study[22], which demonstrated that subjects who exercised regularly reduced their risk of triggering an acute infarction by about 50-fold compared with habitually sedentary individuals who engaged in isolated bouts of heavy exertion. Although the Onset Study included patients with and without a history of angina or other manifestations of coronary artery disease, the triggering effect of exertion could be demonstrated in both groups of patients, together with the protection against triggering that was provided by regular exercise.

In considering all of the data on both the long-term protective effect of exercise and the short-term risk of triggering an acute coronary event, the benefit of regular exercise clearly outweighs the small and transient risk of triggering a new event[19,22]. This apparent paradox can be explained by the observation that regular exercise reduces the risk of experiencing an acute coronary event while at rest and during periods of exertion. Although each episode of exertion is associated with a transient increase in risk, these episodes generally last less than 1 h, while the protective effect is operative all of the time. Thus, over time, habitually active individuals will have a lower risk of acute coronary events than sedentary individuals.
Table 1  Effects of anti-anginal agents on indices of myocardial oxygen supply and demand. (Adapted with permission from Shub et al.13)

<table>
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<th>Index</th>
<th>Nitrates</th>
<th>β-adrenoceptor blockers</th>
<th>Calcium antagonists</th>
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<td></td>
<td>ISA</td>
<td>Cardio-selective</td>
<td>Nifedipine   Verapamil Diltiazem Amlodipine</td>
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<td></td>
<td>No</td>
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<td>Coronary resistance</td>
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<td>Vascular tone</td>
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<td>Intramyocardial diastolic tension</td>
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<td>Coronary collateral circulation</td>
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<td>Duration of diastole</td>
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<td>Demand</td>
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<td>Intramyocardial systolic tension</td>
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<td>Preload</td>
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<td>Afterload (peripheral vascular resistance)</td>
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<td>Heart rate</td>
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▲=increase; ▼=decrease; O = little or no definite effect. Number of arrows represents relative intensity of effect. Symbols in parentheses indicate reflex-mediated effects.

†Effect of calcium entry blockers on left ventricular contractility, as assessed in the intact animal model. The net effect on left ventricular performance is variable, being influenced by alterations in afterload, reflex cardiac stimulation and the underlying state of the myocardium. ISA = intrinsic sympathomimetic activity.
There are several mechanisms through which exercise may reduce the risk of triggering acute coronary events. Regular exercise can result in reduction of low-density lipoprotein (LDL) cholesterol and evaluation of high-density lipoprotein (HDL) cholesterol[9]. It has been hypothesized that intracoronary atherosclerotic plaques may be stabilized by higher levels of HDL and lower levels of oxidized LDL within the plaques[24]. The risk of plaque disruption in response to an isolated bout of exertion may also be reduced in the habitually active because they tend to have smaller surges in systolic arterial blood pressure in response to exercise than do sedentary individuals[21]. Furthermore, even if a plaque is disrupted in response to exercise, it may not lead to an acute infarction or sudden death syndrome in the absence of occlusive thrombus formation[24,25]. In addition, regular exercise may reduce the tendency to intracoronary thrombosis, due to enhanced fibrinolytic potential and reduced platelet aggregability[26-30].

Pharmacotherapy

The choice of pharmacological therapy for use in the physically active depends most importantly on the anginal threshold of the individual patient. Patients with a high anginal threshold, who have symptoms only with maximal exertion, can often be managed with nitrates, to attenuate the tendency to develop tolerance, is often useful if symptoms are not adequately controlled on a single drug regimen[1-7]. Moreover, every patient must be assessed individually, since some patients may have contra-indications or suffer intolerable side effects with specific medications.

Finally, the issue of dosing schedules must be addressed to ensure that the patient receives adequate therapeutic coverage during periods of exertion. Long-acting preparations may provide specific advantages, since there are well documented circadian patterns of MI, sudden cardiac death and silent myocardial ischaemia with a prominent peak in the morning hours[23]. Thus, it is reasonable to speculate that there may be benefit in using agents which remain active in the morning, or even throughout the day, until the patient’s first daily dose reaches therapeutic levels.

Conclusions

In conclusion, many patients with angina can maintain an active lifestyle. Some may even be able to participate in competitive athletics[40]. However, to reach this goal, patients must first undergo appropriate risk stratification, risk factor modification and cardiac rehabilitation, together with medical management or revascularization, as dictated by the presentation of the individual patient.

References

Angina and an active lifestyle


