Stable Angina Pectoris
(Management of)

The Task Force on the Management of Stable Angina Pectoris of the European Society of Cardiology
Guidelines on the management of stable angina pectoris: full text†

The Task Force on the Management of Stable Angina Pectoris of the European Society of Cardiology

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Paul Hjemdahl (Sweden)
<table>
<thead>
<tr>
<th>Strength of recommendation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Evidence and/or general agreement that a given diagnostic procedure/treatment is beneficial, useful and effective</td>
</tr>
<tr>
<td>Class II</td>
<td>Conflicting evidence and/or divergence of opinions about the usefulness/efficacy of a treatment or procedure</td>
</tr>
<tr>
<td>IIa</td>
<td>Weight of evidence/opinion is in favour of usefulness/efficacy</td>
</tr>
<tr>
<td>IIb</td>
<td>Usefulness/efficacy is less well established by evidence/opinion</td>
</tr>
<tr>
<td>Class III</td>
<td>Evidence or general agreement that the treatment or procedure is not useful/effective and in some cases may be harmful</td>
</tr>
<tr>
<td>Level of evidence</td>
<td>Available evidence</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>A</td>
<td>Multiple randomized clinical trials or meta-analyses</td>
</tr>
<tr>
<td>B</td>
<td>Single randomized clinical trial or large non-randomized studies</td>
</tr>
<tr>
<td>C</td>
<td>Consensus opinion of experts and/or small studies, retrospective studies, registries</td>
</tr>
</tbody>
</table>
Definition, diagnosis and assessment

- **Stable angina**: clinical syndrome characterized by discomfort in the chest, jaw, shoulder, back or arms
  - Elicited by exertion or emotional stress
  - Relieved by rest or nitroglycerin
- **Term is usually confined to cases in which the syndrome can be attributed to myocardial ischaemia**
- **Purpose of diagnosis and assessment**:
  - Confirmation of the presence of ischaemia in patients with suspected stable angina
  - Identification or exclusion of associated conditions or precipitating factors
  - Risk stratification
  - To plan treatment options
  - Evaluation of the efficacy of treatment
Algorithm for initial evaluation of patients with clinical symptoms of angina (1)

ACS management algorithm

Unstable syndrome

Clinical Evaluation
History and physical
ECG
Laboratory tests

Suspected pulmonary
disease

CXR

Suspected heart failure,
prior MI, abnormal ECG
or clinical examination,
hypertension or DM

Assessment of Ischaemia
Exercise ECG or Pharmacological
stress imaging
or Exercise stress imaging

Re-assess likelihood of ischaemia as
cause of symptoms

No evidence for cardiac
cause of symptoms

Echocardiography
(or MRI) to assess structural
or functional abnormalities

Evaluate prognosis on basis of clinical evaluation and non-invasive tests

If diagnosis of CAD is secure, but
assessment of ventricular function not
already performed for Class I indications
then assess ventricular function at this stage
Algorithm for initial evaluation of patients with clinical symptoms of angina (2)

Low risk
Annual CV mortality <1% per year
Medical therapy
Coronary arteriography if not already performed

Intermediate risk
Annual CV mortality 1-2% per year
Medical therapy ± Coronary arteriography Depending on level of symptoms and clinical judgement
Evaluates response to medical therapy
If symptomatic control unsatisfactory, consider suitability for revascularisation (PCI or CABG)

High risk
Annual CV mortality >2% per year
Medical therapy AND Coronary arteriography for more complete risk stratification and assessment of need for revascularization

NO
High risk coronary anatomy known to benefit from revascularization?
YES
Revascularise
Canadian Cardiovascular Society classification of angina severity

<table>
<thead>
<tr>
<th>Class</th>
<th>Level of symptoms</th>
</tr>
</thead>
</table>
| Class I | “Ordinary activity does not cause angina”  
Angina with strenuous or rapid or prolonged exertion only |
| Class II | “Slight limitation of ordinary activity”  
Angina on walking or climbing stairs rapidly, walking uphill or exertion after meals, in cold weather, when under emotional stress, or only during the first few hours after awakening |
| Class III | “Marked limitation of ordinary physical activity”  
Angina on walking one or two blocks* on the level or one flight of stairs at a normal pace under normal conditions |
| Class IV | “Inability to carry out any physical activity without discomfort” or “angina at rest” |

* Equivalent to 100–200 m.
Reasons to terminate exercise stress test

- Symptom limitation, e.g., pain, fatigue, dyspnoea, and claudication
- Combination of symptoms such as pain with significant ST changes
- Safety reasons:
  - Marked ST-depression
  - ST-elevation ≥ 1 mm
  - Significant arrhythmia
  - Sustained fall in systolic blood pressure > 10 mmHg
  - Marked hypertension (>250 mmHg systolic or > 115 mmHg diastolic
- Achievement of maximum predicted heart rate in patients with excellent exercise tolerance who are not tired and at the discretion of the supervising physician
Test characteristics for investigations used in the diagnosis of stable angina

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise ECG</td>
<td>68</td>
<td>77</td>
</tr>
<tr>
<td>Exercise echo</td>
<td>80–85</td>
<td>84–86</td>
</tr>
<tr>
<td>Exercise myocardial perfusion</td>
<td>85–90</td>
<td>70–75</td>
</tr>
<tr>
<td>Dobutamine stress echo</td>
<td>40–100</td>
<td>62–100</td>
</tr>
<tr>
<td>Vasodilator stress echo</td>
<td>56–92</td>
<td>87–100</td>
</tr>
<tr>
<td>Vasodilator stress myocardial perfusion</td>
<td>83–94</td>
<td>64–90</td>
</tr>
</tbody>
</table>
## Recommendations for routine non-invasive investigations for stable angina (1)

<table>
<thead>
<tr>
<th>Test</th>
<th>For Diagnosis</th>
<th>For Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laboratory tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full blood count, creatinine</td>
<td>I C</td>
<td>I B</td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>Fasting lipid profile</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>hs CRP, homocysteine, lp(a), apoA, apoB</td>
<td>IIb B</td>
<td>IIb B</td>
</tr>
<tr>
<td><strong>ECG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial evaluation</td>
<td>I C</td>
<td>I B</td>
</tr>
<tr>
<td>During episode of angina</td>
<td>I B</td>
<td></td>
</tr>
<tr>
<td>Routine periodic ECG on successive visits</td>
<td>IIb C</td>
<td>IIb C</td>
</tr>
<tr>
<td><strong>Ambulatory ECG monitoring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suspected arrhythmia</td>
<td>I B</td>
<td></td>
</tr>
<tr>
<td>Suspected vasospastic angina</td>
<td>IIa C</td>
<td></td>
</tr>
<tr>
<td>Suspected angina with normal exercise test</td>
<td>IIa C</td>
<td></td>
</tr>
</tbody>
</table>
# Recommendations for routine non-invasive investigations for stable angina (2)

<table>
<thead>
<tr>
<th>Test</th>
<th>For Diagnosis</th>
<th>For Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chest X-ray</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suspected heart failure, or abnormal cardiac auscultation</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>Suspected significant pulmonary disease</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td><strong>Echocardiogram</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suspected heart failure, abnormal auscultation, abnormal ECG, Q waves, BBB, marked ST changes</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>Previous myocardial infarction</td>
<td>I B</td>
<td>I B/C</td>
</tr>
<tr>
<td>Hypertension or diabetes mellitus</td>
<td>I C</td>
<td>I B/C</td>
</tr>
<tr>
<td>Intermediate or low risk patient not due to have alternative assessment of LV function</td>
<td>Ila C</td>
<td></td>
</tr>
<tr>
<td><strong>Exercise ECG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First line for initial evaluation, unless unable to exercise/ECG not evaluable</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>Patients with known CAD and significant deterioration in symptoms</td>
<td>I B</td>
<td></td>
</tr>
<tr>
<td>Routine periodic testing once angina controlled</td>
<td>Iib C</td>
<td>Iib C</td>
</tr>
</tbody>
</table>

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## Recommendations for routine non-invasive investigations for stable angina (3)

<table>
<thead>
<tr>
<th>Test</th>
<th>For Diagnosis</th>
<th>For Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exercise imaging technique (echo or radionuclide)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial evaluation in patients with uninterpretable ECG</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>Patients with non-conclusive exercise test (but adequate exercise</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>tolerance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For angina post-revascularization</td>
<td>IIa B</td>
<td>IIa B</td>
</tr>
<tr>
<td>To identify location of ischaemia in planning revascularization</td>
<td>IIa B</td>
<td></td>
</tr>
<tr>
<td>Assessment of functional severity of intermediate lesions on</td>
<td>IIa C</td>
<td></td>
</tr>
<tr>
<td>arteriography</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pharmacological stress imaging technique</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients unable to exercise</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>Patients with non-conclusive exercise test due to poor exercise</td>
<td>I B</td>
<td>I B</td>
</tr>
<tr>
<td>tolerance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To evaluate myocardial viability</td>
<td>IIa B</td>
<td></td>
</tr>
<tr>
<td>Other indications as for exercise imaging where local facilities</td>
<td>IIa B</td>
<td>IIa B</td>
</tr>
<tr>
<td>favour pharmacological rather than exercise stress</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-invasive CT arteriography</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients with low probability of disease and non-conclusive or</td>
<td>IIb C</td>
<td></td>
</tr>
<tr>
<td>positive stress test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Aims of treatment

- To improve prognosis by preventing myocardial infarction and death
  - Reduce plaque progression
  - Stabilize plaque
  - Prevent thrombosis if endothelial dysfunction or plaque rupture occur
- To minimize or abolish symptoms
General management and non-pharmacological considerations (1)

- Patients and their close associates should be informed of the nature of angina pectoris, and the implications of the diagnosis and the treatments that may be recommended.
- Advice should be given for the management of an acute attack, i.e., to rest, at least briefly, from the activity that provoked the angina and the use of sublingual nitrate for acute relief of symptoms.
- The patient should be informed of potential side-effects of nitrates and appropriate prophylactic use of nitrate.
- Patients should be informed of the need to seek medical advice if angina symptoms persists for > 10-20 minutes after rest and/or is not relieved by sublingual nitrate.
- Cigarette smoking should be strongly discouraged.
- Patients should be advised to adopt a “Mediterranean” diet, with vegetables, fruit, fish and poultry being the mainstays. A weight reducing diet should be recommended if the patient is overweight.
- Alcohol in moderation may be beneficial, but excessive consumption is harmful.
General management and non-pharmacological considerations (2)

- Fish oils rich in omega-3 fatty acids (n-3 polyunsaturated fatty acids) are recommended at least once weekly
- Physical activity within the patient’s limitations should be encouraged
- Concomitant disorders such as diabetes and hypertension should be managed appropriately
  - Patients with concomitant diabetes and/or renal disease should be treated with a blood pressure goal of <130/80 mmHg
  - Multifactorial intervention in diabetic patients may reduce both cardiovascular and other diabetic complications markedly
- Anaemia or hyperthyroidism, if present, should be corrected
- Sexual intercourse may trigger angina
  - Nitroglycerin prior to intercourse may be helpful
  - Phosphodiesterase inhibitors, such as sildenafil, tadalafil or vardenafil, can be safely prescribed to men with coronary artery disease but should not be used in those receiving long-acting nitrates

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Recommendations for pharmacological therapy to improve prognosis

- **Antithrombotic drugs**
  - Low-dose aspirin (75 mg/day) in all patients without specific contraindications (i.e., active gastrointestinal bleeding, aspirin allergy or intolerance) **CLASS I LEVEL A**
  - Clopidogrel as an alternative in patients who cannot take aspirin **CLASS IIa LEVEL B**

- **Lipid-lowering drugs**
  - Statin therapy for all patients with coronary disease **CLASS I LEVEL A**
  - High-dose statin therapy in high-risk patients with proven coronary disease **CLASS IIa LEVEL B**
  - Fibrate therapy in patients with low HDL and high triglyceride who have diabetes or metabolic syndrome **CLASS IIb LEVEL B**
  - Fibrate or nicotinic acid as adjunctive therapy to statin in patients with low HDL and high triglyceride at high risk **CLASS IIb LEVEL C**

- **ACE (angiotensin-converting enzyme) inhibitors**
  - Patients with coincident indications for ACE-inhibition (e.g., hypertension, heart failure) **CLASS I LEVEL A**
  - All patients with angina and proven coronary disease **CLASS IIa LEVEL B**

- **Beta-blockers**
  - Patients post-MI or with heart failure **CLASS I LEVEL A**
<table>
<thead>
<tr>
<th>Drug</th>
<th>Action</th>
<th>Comments</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| Short-acting nitrates   | Venodilatation, ↓diastolic filling, ↓reduced intracardiac pressure, ↓subendocardial perfusion | -Sublingual administration  
-Situational prophylaxis                                                   | I C             |
| Long-acting nitrates    |                                                          | -Oral or transdermal formulations  
-Care to maintain a nitrate-free period                                  | I C             |
| Beta-blockers           | ↓oxygen demand by ↓heart rate, ↓contractility, ↓blood pressure | -Less side-effects with B1 receptor selective agents  
-Titrate dose to reduce symptoms and heart rate  
-Proven to reduce frequency of symptoms and improve exercise tolerance  
-May worsen vasospastic angina | I A             |
Pharmacological agents to reduce symptoms and ischaemia (2)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Action</th>
<th>Comments</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium channel blockers</td>
<td>- Heterogeneous class</td>
<td>- Proven to reduce frequency of symptoms and improve exercise tolerance</td>
<td>I A</td>
</tr>
<tr>
<td></td>
<td>- Systemic and coronary vasodilation by inhibition of calcium influx by L-type channels</td>
<td>- Efficacy comparable to beta-blockade</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Verapamil and diltiazem also reduce myocardial contractility</td>
<td>- Particularly effective in vasospastic angina</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- HR and A-V conduction Dihydropyridine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- CCBs are more vaso-selective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium channel opener</td>
<td>- Activates potassium channels</td>
<td>- Nicorandil shown to reduce death</td>
<td>I C</td>
</tr>
<tr>
<td></td>
<td>- Also has nitrate-like vasodilator effects</td>
<td>- MI and hospitalization for angina in one large RCT in addition to other treatments</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Not available in all countries</td>
<td></td>
</tr>
<tr>
<td>Sinus node inhibitor</td>
<td>- Reduces HR via direct inhibition of I1 channel in sinus node</td>
<td>- As effective as beta-blockade in reducing symptoms (in one RCT)</td>
<td>IIa B</td>
</tr>
<tr>
<td>Metabolic agents</td>
<td>- Increases glucose utilization relative to fatty acid metabolism</td>
<td>- Limited haemodynamic effects</td>
<td>IIb B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Trimetazidine not available in all countries</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Ranolazine not yet licensed in Europe</td>
<td></td>
</tr>
</tbody>
</table>
General recommendations for pharmacological therapy

- Anti-anginal drug treatment should be tailored to the needs of the individual patient, and should be monitored individually.
- Short-acting nitrate therapy for all patients for immediate relief of acute symptoms as tolerated.
- Different drug classes may have additive anti-anginal effects in clinical trials.
- Dosing of one drug should be optimized before adding another one.
- Advisable to switch drug combinations before attempting a three drug regimen.
- Poor compliance should be considered when drug therapy is unsuccessful.
- Patients with symptoms that are poorly controlled on double therapy should be assessed for suitability for revascularization if not already considered.
Algorithm for medical management of stable angina

Stable angina for medical management

Immediate short term relief
- Short acting sublingual or buccal nitrate, prn
  - Aspirin 75-150 mg od
  - +/- Titrate dose to get target cholesterol

Level of evidence
- Prognosis
  - A
- Symptoms
  - B

Treatment aimed at improving prognosis
- Statin
  - +/- Titrate dose to get target cholesterol
  - Intolerant or contraindication
  - Contraindication (e.g., aspirin allergic)
  - Clopidogrel 75 mg od
- ACE-inhibitor in proven CVD
- Beta blocker post MI
  - Beta blocker-no prior MI

Treatment aimed at relief of symptoms
- Symptoms not controlled after dose optimisation
  - Add calcium antagonist or long acting nitrate
  - Symptoms not controlled after dose optimisation
  - Consider suitability for revascularisation
  - Intolerant
    - Calcium antagonist or long acting nitrate or nitrates
    - Symptoms not controlled after dose optimisation
  - Intolerant (e.g., fatigue) or contraindication
    - Calcium antagonist or long acting nitrate
    - Symptoms not controlled after dose optimisation
  - Either substitute alternative subclass of calcium antagonist or long acting nitrate
  - Combination of nitrates and calcium antagonist or K channel opener
  - Symptoms not controlled on 2 drugs after dose optimisation

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Coronary artery bypass surgery

• Main indications: prognostic and symptomatic
• Prognostic benefit mainly due to reduction in cardiac mortality
• Anatomical groups shown to have better prognosis compared with medical treatment:
  – Significant stenosis of the left main stem
  – Significant proximal stenosis of the 3 major coronary arteries
  – Significant stenosis of 2 major coronary arteries, including high grade stenosis of the proximal left anterior descending coronary artery
  – 3 vessel disease with impaired ventricular function
• Reduces symptoms of angina and ischaemia in patients with coronary disease
• Overall operative mortality is 1–4%

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Percutaneous coronary intervention (PCI)

- Single or multivessel PCI can be performed with high likelihood of success using stents, drug-eluting stents and adequate adjuvant therapy
  - Risk of death is 0.3–1%
- Either PCI or surgery may be considered as an effective option for the treatment of symptoms in the population without high-risk indicators
- Compared with medical therapy:
  - PCI does not provide survival benefit in stable angina
  - PCI is more effective at reducing events that impair quality of life
Specific patient and lesion subsets

- Patients in whom surgical risk is prohibitively high may benefit from revascularization by PCI, particularly when residual viability can be demonstrated in the dysfunctioning myocardium perfused by the target vessel(s).
- PCI in left main stem disease is feasible, and good results have been achieved in registries comparing drug-eluting and bare metal stents. However, surgery should remain the preferred approach until the outcome of further trials are known.
- Subgroup analyses of randomized trials have shown reduced mortality with bypass surgery compared to PCI in diabetic patients with multivessel disease.
  - PCI should be used with reservation in diabetics with multivessel disease until the results of clinical trials currently comparing these techniques are available.
- There are no randomized controlled trials comparing treatment options in patients with previous bypass surgery.
  - Re-do surgery may be undertaken on symptomatic grounds where the anatomy is suitable.
  - Operative risks are high.
  - In such cases PCI provides a useful alternative to re-do surgery for symptomatic relief.

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Revascularization versus medical therapy

- Initial pharmacological approach to symptom control may be taken in patients not at high risk
- Revascularization may be recommended for patients with suitable anatomy who do not respond adequately to medical therapy, or for the patient who wishes to remain physically active
- Optimal secondary preventative medical therapy (e.g., antiplatelet therapy, statins) should be continued in patients after revascularization irrespective of the need for anti-anginal therapy
Method of revascularization

- Selection should be based on:
  - Risk of periprocedural morbidity and mortality
  - Likelihood of success, including factors such as technical suitability of lesions for angioplasty or surgical bypass
  - Risk of restenosis or graft occlusion
  - Completeness of revascularization
  - Diabetic status
  - Local hospital experience in cardiac surgery and interventional cardiology
  - Patient’s preference
## Recommendations for revascularization in stable angina (1)

<table>
<thead>
<tr>
<th>Indication</th>
<th>For Prognosis*</th>
<th>For Symptoms**</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI (assuming anatomy suitable for PCI, appropriate risk stratification and discussion with the patient)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angina CCS Class I to IV despite medical therapy with single vessel disease</td>
<td>I A</td>
<td></td>
</tr>
<tr>
<td>Angina CCS Class I to IV despite medical therapy with multi-vessel disease (non-diabetic)</td>
<td>I A</td>
<td></td>
</tr>
<tr>
<td>Stable angina with minimal (CCS Class II) symptoms on medication and 1, 2 or 3 vessel disease but objective evidence of large ischaemia</td>
<td>IIb C</td>
<td></td>
</tr>
<tr>
<td><strong>CABG (assuming suitable anatomy for surgery, appropriate risk stratification and discussion with the patient)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angina and left main stem disease</td>
<td>I A</td>
<td>I A</td>
</tr>
<tr>
<td>Angina and 3 vessel disease with objective large ischaemia</td>
<td>I A</td>
<td>I A</td>
</tr>
</tbody>
</table>
## Recommendations for revascularization in stable angina (2)

<table>
<thead>
<tr>
<th>Indication</th>
<th>For Prognosis</th>
<th>For Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG (assuming suitable anatomy for surgery, appropriate risk stratification and discussion with the patient)</td>
<td>I A</td>
<td>I A</td>
</tr>
<tr>
<td>Angina and 3 vessel disease with poor ventricular function</td>
<td>I A</td>
<td>I A</td>
</tr>
<tr>
<td>Angina with 2 or 3 vessel disease including severe disease of the proximal LAD</td>
<td>I A</td>
<td>I A</td>
</tr>
<tr>
<td>Angina CCS Class I to IV with multi-vessel disease (diabetic)</td>
<td>IIa B</td>
<td>I B</td>
</tr>
<tr>
<td>Angina CCS Class I to IV with multi-vessel disease (non-diabetic)</td>
<td>I A</td>
<td></td>
</tr>
<tr>
<td>Angina CCS Class I to IV despite medical therapy and single vessel disease including severe disease of the proximal LAD</td>
<td>I B</td>
<td></td>
</tr>
<tr>
<td>Angina CCS Class I to IV despite medical therapy and single vessel disease not including severe disease of the proximal LAD</td>
<td>IIb B</td>
<td></td>
</tr>
<tr>
<td>Angina with minimal (Class II) symptoms on medication and 1, 2 or 3 vessel disease but objective evidence of large ischaemia</td>
<td>IIb C</td>
<td></td>
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</tbody>
</table>
Special diagnostic considerations: Angina with “normal coronary arteries”

- Features of chest pain may suggest:
  - Non-cardiac chest pain
  - Atypical angina including vasospastic angina
  - Cardiac Syndrome X

- Important to differentiate non-cardiac chest pain from other 2 conditions:
  - Intravascular ultrasound or assessment of coronary flow reserve or fractional flow reserve may be considered to exclude missed obstructive lesions, if angiographic appearances are suggestive of a non-obstructive lesion, and stress imaging techniques identify an extensive area of ischaemia
  - Intracoronary acetylcholine or ergonovine may be administered during coronary arteriography, if the angiogram is visually normal, to assess vasospasm or endothelium-dependent coronary flow reserve
Syndrome X

- Syndrome X requires the presence of:
  - Typical exercise-induced angina (with or without additional resting angina and dyspnoea)
  - Positive exercise stress ECG or other stress imaging modality
  - Normal coronary arteries
- Resting echocardiogram should be performed to assess for the presence of left ventricular hypertrophy and/or diastolic dysfunction
- Survival prognosis is favourable; morbidity is high
- Treatment should focus on symptom relief
- Other risk factors associated with endothelial dysfunction (e.g., hypertension, hyperlipidaemia) which may contribute to symptoms should be treated appropriately
Vasospastic/variant angina

- Characterized by typically located pain
- Usually occurs at rest (occasionally with exertion)
- Relieved within minutes by nitrates
- Pain is associated with ST elevation
- May coexist with typical exertional angina due to fixed coronary lesions
- Vasospasm may occur in response to:
  - Smoking
  - Electrolyte disturbances (potassium, magnesium)
  - Cocaine use
  - Cold stimulation
  - Autoimmune diseases
  - Hyperventilation
  - Insulin resistance
- Prognosis depends on extent of underlying coronary artery disease
- Ambulatory ST segment monitoring may be useful
- Treatment focuses on removing the stimulus, and calcium channel blockade or nitrate therapy