Is There a Role for Revascularization in Stable Ischemic Heart Disease?

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Disclosure

An Author of the SIHD ACP/ACC/AHA Guideline on Stable Ischemic Heart Disease

2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS
Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease

Developed in Partnership with American College of Cardiology Foundation, American Heart Association, American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons.

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67 year old man with hypertension for 10 years who was diagnosed with CAD one year ago because of Class II angina and a positive exercise test at stage 3. He was treated with aspirin, a beta blocker and a statin. Currently he complains of tiredness when walking fast but no chest pain. ETT is repeated and he stops at the end of stage 2. What should be done?

A. CTO of mid LAD
B. Nonobstructive RCA disease
C. Right to left collaterals via septal perforators
D. Late reconstitution of LAD via left to left collaterals
What do the latest guidelines say?

Key Guideline Messages

- Management of SIHD should be based on strong scientific evidence and the patient’s preferences.
- Patients presenting with angina should be categorized as stable vs. unstable. Those at moderate or high risk should be treated emergently for acute coronary syndrome.
- A standard exercise test is the first choice to diagnose IHD for patients with an interpretable ECG and able to exercise, especially if the likelihood is intermediate (10-90%).
  - Those who have an uninterpretable ECG and can exercise, should undergo exercise stress test with nuclear MPI or echocardiography, particularly if likelihood of IHD is >10%. If unable to exercise, MPI or echocardiography with pharmacologic stress is recommended.
Key Guideline Messages

- Patients diagnosed with SIHD should undergo assessment of risk for death or complications.
  - For patients with an interpretable ECG and who are able to exercise, a standard exercise test is also the preferred choice for risk assessment.
  - Those who have an uninterpretable ECG and are able to exercise, should undergo an exercise stress with nuclear MPI or echocardiography, while for patients unable to exercise, nuclear MPI or echocardiography with pharmacologic stress is recommended.

Key Guideline Messages

- Most patients should have a trial of GDMT before considering revascularization to improve symptoms. Deferring revascularization is not associated with worse outcomes.
- Prior to revascularization to improve symptoms, coronary anatomy should be correlated with functional studies to ensure lesions responsible for symptoms are targeted.
- Patients with SIHD should be carefully followed to monitor progression of disease, complications and adherence.
  - Exercise and imaging studies should generally be repeated only when there is a change in clinical status (not annually).

Algorithm for Risk Assessment of Patients With SIHD (cont.)*

*Colors correspond to the ACCF/AHA Classification of Recommendations and Levels of Evidence Table.
Able to Exercise

Standard exercise ECG testing is recommended for patients with an intermediate pretest probability of IHD who have an interpretable ECG and at least moderate physical functioning or no disabling comorbidity.

Exercise stress with nuclear MPI or echocardiography is recommended for patients with an intermediate to high pretest probability of IHD who have an uninterpretable ECG and at least moderate physical functioning or no disabling comorbidity.

Pharmacological stress with CMR can be useful for patients with an intermediate to high pretest probability of obstructive IHD who have an uninterpretable ECG and at least moderate physical functioning or no disabling comorbidity.

CCTA might be reasonable for patients with an intermediate pretest probability of IHD who have at least moderate physical functioning or no disabling comorbidity.

For patients with a low pretest probability of obstructive IHD who do require testing, standard exercise stress echocardiography might be reasonable, provided the patient has an interpretable ECG and at least moderate physical functioning or no disabling comorbidity.
Pharmacological stress with nuclear MPI or echocardiography is recommended for patients with an intermediate to high pretest probability of IHD who are incapable of at least moderate physical functioning or have disabling comorbidity.

Pharmacological stress echocardiography is reasonable for patients with a low pretest probability of IHD who require testing and are incapable of at least moderate physical functioning or have disabling comorbidity.

CCTA is reasonable for patients with a low to intermediate pretest probability of IHD who are incapable of at least moderate physical functioning or have disabling comorbidity.

Pharmacological stress CMR is reasonable for patients with an intermediate to high pretest probability of IHD who are incapable of at least moderate physical functioning or have disabling comorbidity.

Standard exercise ECG testing is not recommended for patients who have an uninterpretable ECG or are incapable of at least moderate physical functioning or have disabling comorbidity.

CCTA is reasonable for patients with an intermediate pretest probability of IHD who a) have continued symptoms with prior normal test findings, or b) have inconclusive results from prior exercise or pharmacological stress testing, or c) are unable to undergo stress with nuclear MPI or echocardiography.

For patients with a low to intermediate pretest probability of obstructive IHD, noncontrast cardiac CT to determine the GAC score may be considered.
Guideline for SIHD

Risk Assessment

Standard exercise ECG testing is recommended for risk assessment in patients with SIHD who are able to exercise to an adequate workload and have an interpretable ECG.

The addition of either nuclear MPI or echocardiography to standard exercise ECG testing is recommended for risk assessment in patients with SIHD who are able to exercise to an adequate workload but have an uninterpretable ECG not due to LBBB or ventricular pacing.

Risk Assessment in Patients Able to Exercise (cont.)

The addition of either nuclear MPI or echocardiography to standard exercise ECG testing is reasonable for risk assessment in patients with SIHD who are able to exercise to an adequate workload and have an interpretable ECG.

CMR with pharmacological stress is reasonable for risk assessment in patients with SIHD who are able to exercise to an adequate workload but have an uninterpretable ECG.
Risk Assessment in Patients Able to Exercise (cont.)

CCTA may be reasonable for risk assessment in patients with SIHD who are able to exercise to an adequate workload but have an uninterpretable ECG.

Pharmacological stress imaging (nuclear MPI, echocardiography, or CMR) or CCTA is not recommended for risk assessment in patients with SIHD who are able to exercise to an adequate workload and have an interpretable ECG.

Risk Assessment in Patients Unable to Exercise

Pharmacological stress with either nuclear MPI or echocardiography is recommended for risk assessment in patients with SIHD who are unable to exercise to an adequate workload regardless of interpretability of ECG.

Pharmacological stress CMR is reasonable for risk assessment in patients with SIHD who are unable to exercise to an adequate workload regardless of interpretability of ECG.

CCTA can be useful as a first-line test for risk assessment in patients with SIHD who are unable to exercise to an adequate workload regardless of interpretability of ECG.

Risk Assessment

Coronary Angiography
**CAD Prognostic Index**

<table>
<thead>
<tr>
<th>Extent of CAD</th>
<th>Prognostic Weight (0-550)</th>
<th>5-Year Survival Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal disease</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>1- vessel disease</td>
<td>50% to 74%</td>
<td>80</td>
</tr>
<tr>
<td>2-vessel disease</td>
<td>&gt;75%</td>
<td>70</td>
</tr>
<tr>
<td>3-vessel disease, both &gt;50%</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>3-vessel disease, &gt;90% proximal LAD artery</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>3-vessel disease, &gt;90% LAD artery</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>3-vessel disease, &gt;90% proximal LAD artery</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>3-vessel disease, &gt;90% proximal LAD artery</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

*Assuming medical treatment only.

**Coronary Angiography to Assess Risk After Initial Workup With Noninvasive Testing**

- Coronary angioGRAPHY is recommended for patients with SIHD whose clinical characteristics and results of noninvasive testing indicate a high likelihood of severe IHD and when the benefits are deemed to exceed risk.

- Coronary angiography is reasonable to further assess risk in patients with SIHD who have depressed LV function (EF <50%) and moderate risk criteria on noninvasive testing with demonstrable ischemia.

- Coronary angiography to Assess Risk After Initial Workup With Noninvasive Testing (cont.)

- Coronary angiography is reasonable to further assess risk in patients with SIHD and inconclusive prognostic information after noninvasive testing or in patients for whom noninvasive testing is contraindicated or inadequate.

- Coronary angiography for risk assessment is reasonable for patients with SIHD who have unsatisfactory quality of life due to angina, have preserved LV function (EF >50%), and have intermediate risk criteria on noninvasive testing.
Algorithm for Risk Assessment of Patients With SIHD (cont.)*

How are these Guideline recommendations used in making treatment recommendations?

Appropriateness Ratings by Intermediate-Risk Findings on Noninvasive Imaging Study and CCS Class I or II Angina (Patients Without Prior Bypass Surgery)

For patients without ACS/prior CABG, only 1% of patients undergoing CABG surgery who could be rated were found to be inappropriate for the procedure according to the ACCF appropriateness criteria, but 14% of the PCI patients who could be rated were found to be inappropriate, and 28% lacked enough noninvasive test information to be rated.

*J Am Coll Cardiol. 2012;59(21):1870-1876*
Revascularization for more advanced disease was uniformly rated as more appropriate and less extensive disease as least appropriate.

Since patients with the most severe disease are referred for surgery, almost all of these procedures were in the appropriate or uncertain category.

Conversely, since percutaneous coronary intervention (PCI) was done on many patients with less extensive disease, the inappropriate classification was more commonly present in those patients.

*J Am Coll Cardiol. 2012;59(21):1870-1876*

**CAD Revascularization**

**Heart Team Approach to Revascularization Decisions**

**Heart Team Approaches to Revascularization Decisions**

A Heart Team approach to revascularization is recommended in patients with unprotected left main or complex CAD.

Calculation of the STS and SYNTAX scores is reasonable in patients with unprotected left main and complex CAD.
Appropriate Use Criteria (AUC) Versus the Heart Team: To lump or to split decision making?

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J Am Coll Cardiol Intv. 2012;5(7):801-802

To lump or to split?

• The Appropriateness Use Criteria (AUC) is a process of lumping into a number of patient scenarios.
• Other decision making processes such as the heart team approach split the patients into an infinite number.

Limitations

• The heart team does not come with predefined rules but depends on the informed judgment of the participants, and therefore seems subjective.
• The AUC type process establishes “rules” for categories, but the individual patient may not fit into a scenario.
Revascularization to Improve Survival

CABG to improve survival is recommended for patients with significant (≥50% diameter stenosis) left main coronary artery stenosis.

PCI to improve survival is reasonable as an alternative to CABG in selected stable patients with significant (≥50% diameter stenosis) unprotected left main CAD with: 1) anatomic conditions associated with a low risk of PCI procedural complications and a high likelihood of good long-term outcome (e.g., a low SYNTAX score [≤22], ostial or trunk left main CAD); and 2) clinical characteristics that predict a significantly increased risk of adverse surgical outcomes (e.g., STS-predicted risk of operative mortality 5%).
Non–Left Main CAD Revascularization

CABG to improve survival is beneficial in patients with significant (≥70% diameter) stenoses in 3 major coronary arteries (with or without involvement of the proximal LAD artery) or in the proximal LAD artery plus 1 other major coronary artery.

CABG or PCI to improve survival is beneficial in survivors of sudden cardiac death with presumed ischemia-mediated ventricular tachycardia caused by significant (≥70% diameter) stenosis in a major coronary artery.

CABG to improve survival is reasonable in patients with significant (≥70% diameter) stenoses in 2 major coronary arteries with severe or extensive myocardial ischemia (e.g., high-risk criteria on stress testing, abnormal intracoronary hemodynamic evaluation, or >20% perfusion defect by myocardial perfusion stress imaging) or target vessels supplying a large area of viable myocardium.

CABG to improve survival is reasonable in patients with mild–moderate LV systolic dysfunction (EF 35% to 50%) and significant (≥70% diameter stenosis) multivessel CAD or proximal LAD coronary artery stenosis, when viable myocardium is present in the region of intended revascularization.
I IIa IIb III

CABG with a LIMA graft to improve survival is reasonable in patients with significant (≥70% diameter) stenosis in the proximal LAD artery and evidence of extensive ischemia. It is reasonable to choose CABG over PCI to improve survival in patients with complex 3-vessel CAD (e.g., SYNTAX score >22), with or without involvement of the proximal LAD artery who are good candidates for CABG. CABG is probably recommended in preference to PCI to improve survival in patients with multivessel CAD and diabetes mellitus, particularly if a LIMA graft can be anastomosed to the LAD artery.

Non-Left Main CAD
Revascularization (cont.)

CAD Revascularization

Revascularization to Improve Symptoms
Revascularization to Improve Symptoms

CABG or PCI to improve symptoms is beneficial in patients with 1 or more significant (≥70% diameter) coronary artery stenoses amenable to revascularization and unacceptable angina despite GDMT.

CABG or PCI to improve symptoms is reasonable in patients with 1 or more significant (≥70% diameter) coronary artery stenoses and unacceptable angina for whom GDMT cannot be implemented because of medication contraindications, adverse effects, or patient preferences.

PCI to improve symptoms is reasonable in patients with previous CABG, 1 or more significant (≥70% diameter) coronary artery stenoses associated with ischemia, and unacceptable angina despite GDMT.

It is reasonable to choose CABG over PCI to improve symptoms in patients with complex 3-vessel CAD (e.g., SYNTAX score >22), with or without involvement of the proximal LAD artery, who are good candidates for CABG.
Algorithm for Revascularization to Improve Symptoms of Patients With SIHD*

Colors correspond to the ACCF/AHA Classification of Recommendations and Levels of Evidence Table.

Algorithm for Guideline-Directed Medical Therapy for Patients With SIHD* (cont.)

Colors correspond to the ACCF/AHA Classification of Recommendations and Levels of Evidence Table.

Additional Therapy to Reduce Risk of MI and Death

Estrogen therapy is not recommended in postmenopausal women with SIHD with the intent of reducing cardiovascular risk or improving clinical outcomes.

Vitamin C, vitamin E, and beta-carotene supplementation are not recommended with the intent of reducing cardiovascular risk or improving clinical outcomes in patients with SIHD.

Treatment of elevated homocysteine with folate or vitamins B6 and B12 is not recommended with the intent of reducing cardiovascular risk or improving clinical outcomes in patients with SIHD.
Use of Anti-Ischemic Medications

Treatment

What evidence is missing from the current guidelines?
FAME 2: Study Design

Stable CAD patients scheduled for 1-, 2- or 3-vessel DES-PCI
N = 1220

Randomized Trial

73%

FFR in all target lesions

At least 1 stenosis with FFR ≤ 0.80 (n=888)

PCI + MT

MT

Randomization 1:1

Follow-up after 1 mo, 6 mo, 1, 2, 3, 4, and 5 years

Registry

27%

When all FFR > 0.80 (n=332)

30% randomly assigned to FU

50%

FFR in all target lesions

Registry

FAME 2: Primary Outcomes

PCI+MT vs. MT: HR 0.32 (0.19-0.53); p=0.001
PCI+MT vs. Registry: HR 1.23 (0.95-1.59); p=0.001
MT vs. Registry: HR 4.32 (1.75-10.7); p<0.001

Primary endpoint: Composite of all-cause death, MI, unplanned hospitalization with urgent revasc.
FAME 2 CONCLUSIONS:

- In patients with stable CAD, FFR-guided PCI improves patient outcome vs. medical therapy alone
- This improvement driven by dramatic decrease in the need for urgent revascularization for ACS
- In patients with functionally nonsignificant stenoses, medical therapy alone resulted in an excellent outcome, regardless of the angiographic appearance of the stenoses

ISCHEMIA (International Study of Comparative Health Effectiveness with Medical and Invasive Approaches)

A randomized controlled trial assessing comparative effectiveness of two initial management strategies for stable patients with moderate-to-severe ischemia on nuclear or echo stress testing: catheterization with revascularization if feasible (PCI or CABG) plus optimal medical therapy (OMT) versus OMT alone.

Patients will be randomized following a stress test but before cardiac catheterization.

Revascularization decisions in SIHD patients should be made with clear achievable goals of either preventing complications or improving symptoms. The informed patient should be part of the Heart Team considering the options.