
Role of PCI in Multivessel CAD: *What do the new guidelines say?*

William F. Fearon, MD

Professor of Medicine

Director, Interventional Cardiology

Stanford University School of Medicine

Chief, Cardiology Section

VA Palo Alto Health Care System



Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest /arrangement or affiliation with the organization(s) listed below

Affiliation/Financial Relationship

Grant/ Research Support:

Consulting Fees/Honoraria:

Major Stock Shareholder/Equity Interest:

Royalty Income:

Ownership/Founder:

Salary:

Intellectual Property Rights:

Other Financial Benefit:

Company

Abbott, Medtronic, Boston Scientific

CathWorks

NIH R61 HL139929-01A1 (PI)

Minor Stock Options: HeartFlow



ACC/AHA/SCAI CLINICAL PRACTICE GUIDELINE

2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

Writing Committee Members*

Jennifer S. Lawton, MD, FAHA, Chair†; Jacqueline E. Tamis-Holland, MD, FAHA, FACC, FSCAI, Vice Chair‡; Sripal Bangalore, MD, MHA, FACC, FAHA, FSCAI†; Eric R. Bates, MD, FACC, FAHA†; Theresa M. Beckie, PhD, FAHA†; James M. Bischoff, MEd†; John A. Bittl, MD, FACCT; Mauricio G. Cohen, MD, FACC, FSCAI§; J. Michael DiMaio, MD†; Creighton W. Don, MD, PhD, FACC||; Stephen E. Fremes, MD, FACC; Mario F. Gaudino, MD, PhD, MSCE, FACC, FAHA†; Zachary D. Goldberger, MD, FACC, FAHA‡; Michael C. Grant, MD, MSE†; Jang B. Jaswal, MST†; Paul A. Kurlansky, MD, FACCT; Roxana Mehran, MD, FACCT; Thomas S. Metkus Jr, MD, FACCT; Lorraine C. Nnacheta, DrPH, MPH†; Sunil V. Rao, MD, FACCT; Frank W. Sellke, MD, FACC, FAHA†; Garima Sharma, MD, FACCT; Celina M. Yong, MD, MBA, MSc, FSCAI, FACC, FAHA†; Brittany A. Zwischenberger, MD†



How Should We Assess for PCI

4.3. Use of Coronary Physiology to Guide Revascularization With PCI

Recommendations for the Use of Coronary Physiology to Guide Revascularization With PCI
Referenced studies that support the recommendations are summarized in Online Data Supplement 5.

COR	LOE	Recommendations
1	A	1. In patients with angina or an anginal equivalent, undocumented ischemia, and angiographically intermediate stenoses, the use of fractional flow reserve (FFR) or instantaneous wave-free ratio (iFR) is recommended to guide the decision to proceed with PCI. ¹⁻⁶
3: No benefit	B-R	2. In stable patients with angiographically intermediate stenoses and FFR >0.80 or iFR >0.89, PCI should not be performed. ⁷⁻¹⁰



How Should We Assess for PCI

4.4. Intravascular Ultrasound to Assess Lesion Severity

Recommendation for Intravascular Ultrasound to Assess Lesion Severity
Referenced studies that support the recommendation are summarized in Online Data Supplement 6.

COR	LOE	Recommendation
2a	B-NR	1. In patients with intermediate stenosis of the left main artery, intravascular ultrasound (IVUS) is reasonable to help define lesion severity. ¹⁻⁵

Not stated in the guidelines is that IVUS may be particularly helpful to assess intermediate left main disease when there is downstream disease in the both the LAD and left circumflex, as this makes interpreting coronary physiology (FFR/NHPR) more challenging.



STEMI with Multivessel CAD

5.2. Revascularization of the Non-Infarct Artery in Patients With STEMI

Recommendations for Revascularization of the Non-Infarct Artery in Patients With STEMI

Referenced studies that support the recommendations are summarized in Online Data Supplement 8.

COR	LOE	Recommendations
1	A	1. In selected hemodynamically stable patients with STEMI and multivessel disease, after successful primary PCI, staged PCI of a significant non-infarct artery stenosis is recommended to reduce the risk of death or MI. ¹⁻⁴

Based on the COMPLETE trial which showed a reduction in death/MI at 3 years in over 4,000 patients randomized to culprit only PCI or staged PCI of non-culprit if >70% or abnormal FFR.



STEMI with Multivessel CAD

5.2. Revascularization of the Non-Infarct Artery in Patients With STEMI

Recommendations for Revascularization of the Non-Infarct Artery in Patients With STEMI

Referenced studies that support the recommendations are summarized in Online Data Supplement 8.

COR	LOE	Recommendations
2b	B-R	3. In selected hemodynamically stable patients with STEMI and low-complexity multivessel disease, PCI of a non-infarct artery stenosis may be considered at the time of primary PCI to reduce cardiac event rates. ^{1,2,5-7}

Based on the COMPARE ACUTE trial which randomized 885 patients with STEMI and multivessel CAD to immediate FFR-guided complete revascularization or to culprit only PCI and found lower rates of MACCE at one year in the FFR-guided complete revascularization group.



STEMI with Multivessel CAD

5.2. Revascularization of the Non-Infarct Artery in Patients With STEMI

Recommendations for Revascularization of the Non-Infarct Artery in Patients With STEMI

Referenced studies that support the recommendations are summarized in Online Data Supplement 8.

COR	LOE	Recommendations
3: Harm	B-R	4. In patients with STEMI complicated by cardiogenic shock, routine PCI of a non-infarct artery at the time of primary PCI should not be performed because of the higher risk of death or renal failure. ⁸⁻¹⁰

Based on the randomized CULPRIT-SHOCK trial which found higher rates of death or renal replacement therapy in patients randomized to complete revascularization at the time of presentation.



Left Main Revascularization

Recommendations for Revascularization to Improve Survival in SIHD Compared With Medical Therapy

Referenced studies that support the recommendations are summarized in Online Data Supplement 10.

COR	LOE	Recommendations
Left main CAD		
1	B-R	3. In patients with SIHD and significant left main stenosis, CABG is recommended to improve survival. ⁹⁻¹²
2a	B-NR	4. In selected patients with SIHD and significant left main stenosis for whom PCI can provide equivalent revascularization to that possible with CABG, PCI is reasonable to improve survival. ⁹

Based on old randomized studies for CABG, registries for PCI and RCTs showing similar survival after PCI or CABG .



Revascularization to Improve Survival in Stable Multivessel CAD

Multivessel CAD		
2b	B-R	5. In patients with SIHD, normal ejection fraction, significant stenosis in 3 major coronary arteries (with or without proximal LAD), and anatomy suitable for CABG, CABG may be reasonable to improve survival. ^{10,13-15}
2b	B-R	6. In patients with SIHD, normal ejection fraction, significant stenosis in 3 major coronary arteries (with or without proximal LAD), and anatomy suitable for PCI, the usefulness of PCI to improve survival is uncertain. ¹⁴⁻²⁴

This represents a downgrade for CABG from Class 1, based primarily on more recent registry and meta-analysis data and the ISCHEMIA trial



Revascularization to Improve Survival in Multivessel CAD

Single- or double-vessel disease not involving the proximal LAD		
3: No Benefit	B-R	8. In patients with SIHD, normal left ventricular ejection fraction, and 1- or 2-vessel CAD not involving the proximal LAD, coronary revascularization is not recommended to improve survival. ^{10,14,16,26,28,29}
3: Harm	B-NR	9. In patients with SIHD who have ≥ 1 coronary arteries that are not anatomically or functionally significant ($<70\%$ diameter of non-left main coronary artery stenosis, $\text{FFR} > 0.80$), coronary revascularization should not be performed with the primary or sole intent to improve survival. ^{26,30}

These recommendations highlight the concept that the less myocardium at risk, the lower the likelihood of survival benefit.



PCI to Reduce MACE in Stable Patients with Multivessel CAD

Recommendation for Revascularization to Reduce Cardiovascular Events in SIHD Compared With Medical Therapy
Referenced studies that support the recommendation are summarized in Online Data Supplement 11.

COR	LOE	Recommendation
2a	B-R	1. In patients with SIHD and multivessel CAD appropriate for either CABG or PCI, revascularization is reasonable to lower the risk of cardiovascular events such as spontaneous MI, unplanned urgent revascularizations, or cardiac death. ¹⁻⁸

Both the ISCHEMIA trial and FAME 2 found lower rates of spontaneous MI in patients undergoing revascularization/FFR-guided PCI.



PCI to Improve Symptoms in Stable Patients with Multivessel CAD

7.3. Revascularization to Improve Symptoms

Recommendations for Revascularization to Improve Symptoms
Referenced studies that support the recommendations are summarized in Online Data Supplement 12.

COR	LOE	Recommendations
1	A	1. In patients with refractory angina despite medical therapy and with significant coronary artery stenoses amenable to revascularization, revascularization is recommended to improve symptoms. ¹⁻⁶
3: Harm	C-LD	2. In patients with angina but no anatomic or physiological criteria for revascularization, neither CABG nor PCI should be performed. ^{7,8}

Based on the ISCHEMIA trial and FAME 2 as well as numerous other studies which have shown improved quality of life and reduced angina after PCI compared with medical therapy in stable CAD patients.



IVUS/OCT to Optimize PCI

10.3. Use of Intravascular Imaging

Recommendations for Use of Intravascular Imaging
Referenced studies that support the recommendations are summarized in Online Data Supplement 25.

COR	LOE	Recommendations
2a	B-R	1. In patients undergoing coronary stent implantation, IVUS can be useful for procedural guidance, particularly in cases of left main or complex coronary artery stenting, to reduce ischemic events. ¹⁻¹⁰
2a	B-R	2. In patients undergoing coronary stent implantation, OCT is a reasonable alternative to IVUS for procedural guidance, except in ostial left main disease. ¹¹⁻¹³
2a	C-LD	3. In patients with stent failure, IVUS or OCT is reasonable to determine the mechanism of stent failure. ¹⁴⁻¹⁷



PCI of Chronic Total Occlusions

10.7. Treatment of CTO

Recommendation for Treatment of CTO

Referenced studies that support the recommendation are summarized in Online Data Supplement 29.

COR	LOE	Recommendation
2b	B-R	1. In patients with suitable anatomy who have refractory angina on medical therapy, after treatment of non-CTO lesions, the benefit of PCI of a CTO to improve symptoms is uncertain. ¹⁻⁴

Based primarily on the randomized DECISION CTO trial which did not show an improvement in angina or quality of life with CTO PCI.



Conclusions:

- The guidelines stress the importance of a multidisciplinary heart team approach to decision-making.
- The guidelines stress a patient-oriented approach to decision-making.
- The guidelines reflect the challenges of finding consensus when there are conflicting or limited data.

