RECENT GUIDELINES FOR MYOCARDIAL REVASCULARIZATION

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WHEN
WHO
HOW
WHAT
WHICH
WHOSE

CAD Revascularization

3.1. Heart Team Approach to Revascularization Decisions

CLASS I

1. A Heart Team approach to revascularization is recommended in patients with unprotected left main or complex CAD (105–107). *(Level of Evidence: C)*

CLASS IIa

1. Calculation of the STS and SYNTAX (Synergy between Percutaneous Coronary Intervention with TAXUS and Cardiac Surgery) scores is reasonable in patients with unprotected left main and complex CAD (107–114). *(Level of Evidence: B)*

THE GOALS OF REVASCULARIZATION

- TO IMPROVE SURVIVAL
- TO RELIEF THE SYMPTOMS

Revascularization to improve survival compared with medical treatment

UPLM or complex CAD		
CABG and PCI	I—Heart Team approach recommended	C
CABG and PCI	IIa—Calculation of the STS and SYNTAX scores	B

Revascularization to improve survival compared with medical treatment

UPLM*		
CABG	I	B
PCI	IIa—For SIHD when *both* of the following are present: • 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 of ≤22, ostial or trunk left main CAD) • Clinical characteristics that predict a significantly increased risk of adverse surgical outcomes (e.g., STS-predicted risk of operative mortality ≥5%)	B
	IIa—For UA/NSTEMI if not a CABG candidate	B
	IIa—For STEMI when distal coronary flow is TIMI flow grade 3 and PCI can be performed more rapidly and safely than CABG	C
	IIb—For SIHD when *both* of the following are present: • Anatomic conditions associated with a low to intermediate risk of PCI procedural complications and intermediate to high likelihood of good long-term outcome (e.g., low–intermediate SYNTAX score of <33, bifurcation left main CAD) • Clinical characteristics that predict an increased risk of adverse surgical outcomes (e.g., moderate–severe COPD, disability from prior stroke, or prior cardiac surgery; STS-predicted risk of operative mortality >2%)	B
	III: Harm—For SIHD in patients (versus performing CABG) with unfavorable anatomy and for PCI and who are good candidates for CABG	B

Revascularization to improve survival compared with medical treatment

3-vessel disease with or without proximal LAD artery disease*		
CABG	I	B
	IIa—It is reasonable to choose CABG over PCI in patients with complex 3-vessel CAD (e.g., SYNTAX >22) who are good candidates for CABG	B
PCI	IIb—Of uncertain benefit	B

Revascularization to improve survival compared with medical treatment

2-vessel disease with proximal LAD artery disease*		
CABG	I	B
PCI	IIb—Of uncertain benefit	B

2-vessel disease without proximal LAD artery disease*		
CABG	IIa—With extensive ischemia	B
	IIb—Of uncertain benefit without extensive ischemia	C
PCI	IIb—Of uncertain benefit	B

Revascularization to improve survival compared with medical treatment

1-vessel proximal LAD artery disease		
CABG	IIa—With LIMA for long-term benefit	B
PCI	IIb—of uncertain benefit	B

1-vessel disease without proximal LAD artery involvement		
CABG	III: Harm	B
PCI	III: Harm	B

Revascularization to improve survival compared with medical treatment

LV dysfunction		
CABG	IIa—EF 35% to 50%	B
CABG	IIb—EF <35% without significant left main CAD	B
PCI	Insufficient data	

Survivors of sudden cardiac death with presumed ischemia-mediated VT		
CABG	I	B
PCI	I	C

No anatomic or physiological criteria for revascularization		
CABG	III: Harm	B
PCI	III: Harm	B

Revascularization to relief symptoms

Significant Anatomic (≥50% Left Main or ≥70% Non–Left Main CAD)

Physiological (FFR≤0.80) Coronary Artery Stenoses

Clinical Setting	COR	LOE
≥1 significant stenoses amenable to revascularization and unacceptable angina despite GDMT	I—CABG I—PCI	A
≥1 significant stenoses and unacceptable angina in whom GDMT cannot be implemented because of medication contraindications, adverse effects, or patient preferences	IIa—CABG IIa—PCI	C
Previous CABG with ≥1 significant stenoses associated with ischemia and unacceptable angina despite GDMT	IIa—PCI	C
	IIb—CABG	C
Complex 3-vessel CAD (e.g., SYNTAX score >22) with or without involvement of the proximal LAD artery and a good candidate for CABG	IIa—CABG preferred over PCI	B
Viable ischemic myocardium that is perfused by coronary arteries that are not amenable to grafting	IIb—TMR as an adjunct to CABG	B
No anatomic or physiologic criteria for revascularization	III: Harm—CABG III: Harm—PCI	C

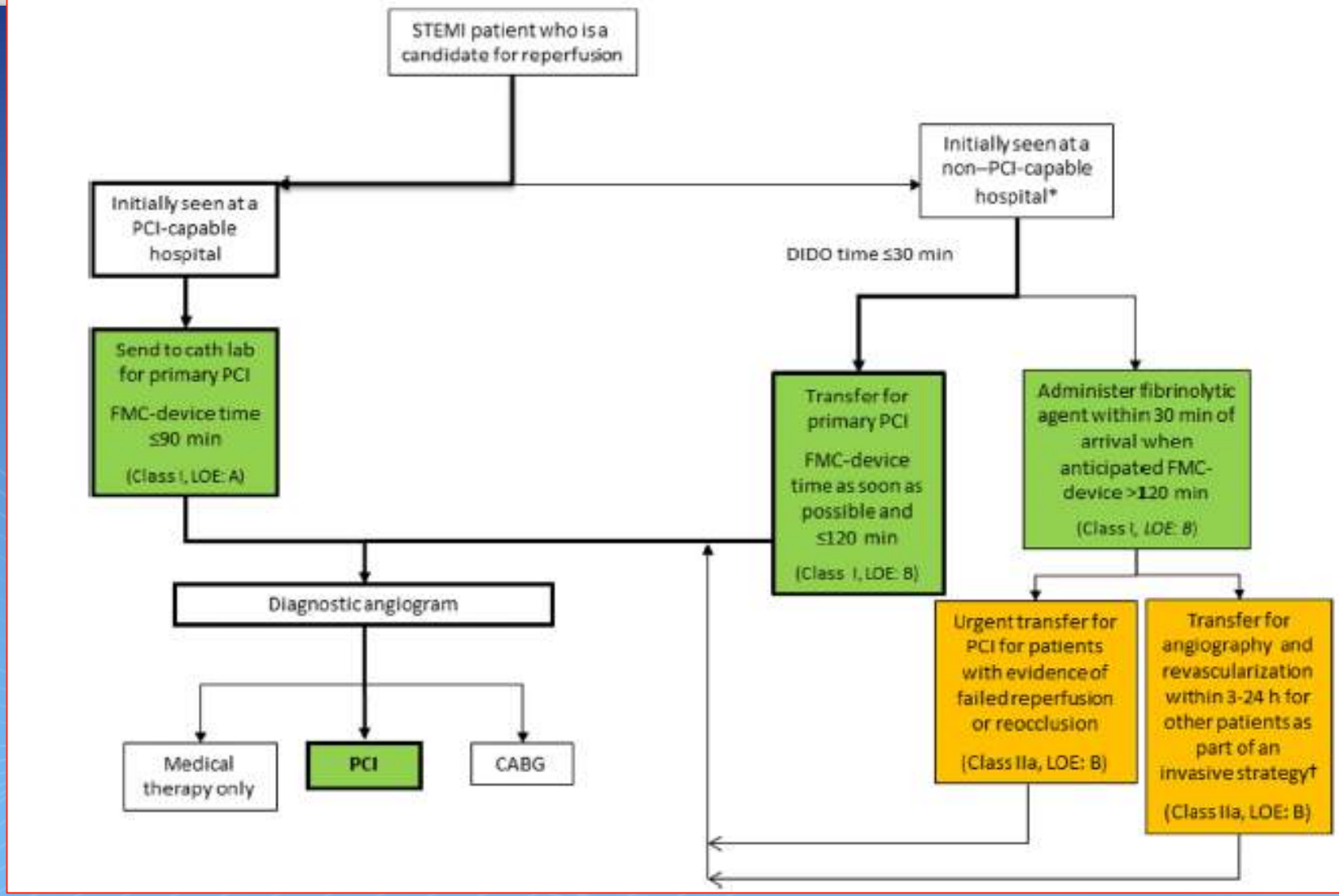
Different Clinical Subsets

Different Clinical Subsets

STEMI

Infarction as new ST elevation at the J point in at least 2 contiguous leads of ≥2 mm (0.2 mV) in men or ≥1.5 mm (0.15 mV) in women in leads V_2–V_3 and/or of ≥1 mm (0.1 mV) in other contiguous chest leads or the limb leads (7). The majority of patients will evolve ECG evidence of Q-wave infarction. New or presumably new LBBB has been considered a STEMI equivalent. Most cases of LBBB at time of

STEMI


STEMI patient who is a candidate for reperfusion
Initially seen at a PCI-capable hospital
Initially seen at a non–PCI-capable hospital*
DIDO time ≤30 min
Send to cath lab for primary PCI
FMC-device time ≤90 min
(Class I, LOE: A)
Transfer for primary PCI
FMC-device time as soon as possible and ≤120 min
(Class I, LOE: B)
Administer fibrinolytic agent within 30 min of arrival when anticipated FMC-device >120 min
(Class I, LOE: B)
Diagnostic angiogram
Medical therapy only
PCI
CABG
Urgent transfer for PCI for patients with evidence of failed reperfusion or reocclusion
(Class IIa, LOE: B)
Transfer for angiography and revascularization within 3-24 h for other patients as part of an invasive strategy†
(Class IIa, LOE: B)

STEMI

Table 2. Primary PCI in STEMI

	COR	LOE
Ischemic symptoms <12 h	I	A
Ischemic symptoms <12 h and contraindications to fibrinolytic therapy irrespective of time delay from FMC	I	B
Cardiogenic shock or acute severe HF irrespective of time delay from MI onset	I	B
Evidence of ongoing ischemia 12 to 24 h after symptom onset	IIa	B
PCI of a noninfarct artery at the time of primary PCI in patients without hemodynamic compromise	III: Harm	B

STEMI

Table 10. Indications for PCI of an Infarct Artery in Patients Who Were Managed With Fibrinolytic Therapy or Who Did Not Receive Reperfusion Therapy

	COR	LOE	References
Cardiogenic shock or acute severe HF	I	B	(354)
Intermediate- or high-risk findings on predischarge noninvasive ischemia testing	I	C	(232,233)
Spontaneous or easily provoked myocardial ischemia	I	C	N/A
Patients with evidence of failed reperfusion or reocclusion after fibrinolytic therapy (as soon as possible)	IIa	B	(344–347)
Stable* patients after successful fibrinolysis, ideally between 3 and 24 h	IIa	B	(358–363)
Stable* patients >24 h after successful fibrinolysis	IIb	B	(213,232,233,366,374–378)
Delayed PCI of a totally occluded infarct artery >24 h after STEMI in stable patients	III: No Benefit	B	(213,376)

STEMI

7.1. CABG in Patients With STEMI: Recommendations

CLASS I

1. Urgent CABG is indicated in patients with STEMI and coronary anatomy not amenable to PCI who have ongoing or recurrent ischemia, cardiogenic shock, severe HF, or other high-risk features (391–393). (*Level of Evidence: B*)
2. CABG is recommended in patients with STEMI at time of operative repair of mechanical defects (394–398). (*Level of Evidence: B*)

CLASS IIa

1. The use of mechanical circulatory support is reasonable in patients with STEMI who are hemodynamically unstable and require urgent CABG. (*Level of Evidence: C*)

CLASS IIb

1. Emergency CABG within 6 hours of symptom onset may be considered in patients with STEMI who do not have cardiogenic shock and are not candidates for PCI or fibrinolytic therapy. (*Level of Evidence: C*)

STEMI

CABG has a limited role in the acute phase of STEMI other than for cardiogenic shock, but it may be indicated for failed PCI, for coronary anatomy not amenable to PCI, and at the time of surgical repair of a mechanical defect, such as ventricular septal, papillary muscle, or free-wall rupture. Older case series highlighted a potential excess mortality risk for CABG when performed early after STEMI, which was related to worsening myocardial injury from cardiopulmonary bypass, aortic cross-clamping, and cardioplegic arrest, with hemorrhagic transformation and infarct expansion. However, contemporary modifications to the standard operative approach, such as on-pump beating-heart surgery, off-pump techniques, or adjunctive temporary mechanical circulatory support devices, may lead to improved survival rates after CABG in the acute hospital phase.

STEMI

7.2. Timing of Urgent CABG in Patients With STEMI in Relation to Use of Antiplatelet Agents: Recommendations

CLASS I

1. Aspirin should not be withheld before urgent CABG (399). (*Level of Evidence: C*)
2. Clopidogrel or ticagrelor should be discontinued at least 24 hours before urgent on-pump CABG, if possible (400–404). (*Level of Evidence: B*)
3. Short-acting intravenous GP IIb/IIIa receptor antagonists (eptifibatide, tirofiban) should be discontinued at least 2 to 4 hours before urgent CABG (405,406). (*Level of Evidence: B*)
4. Abciximab should be discontinued at least 12 hours before urgent CABG (362). (*Level of Evidence: B*)

CLASS IIb

1. Urgent off-pump CABG within 24 hours of clopidogrel or ticagrelor administration might be considered, especially if the bene-

STEMI & ACUTE MR
PAPILLARY MUSCLE RUPTURE OR IMR

not always be appreciated. Suitable patients with papillary muscle rupture should be considered for urgent surgery while temporary stabilization with medical therapy and IABP is attempted. Mitral valve replacement rather than repair usually is required in this setting. Although emergency mitral valve replacement is associated with a relatively high mortality rate (20%), survival and ventricular function are improved with surgery compared with medical therapy alone. Delay to operation appears to increase the risk of further myocardial injury, organ failure, and death (472). Five-year survival rates after surgery average 60% to 70% (397,473–476).

a function of residual mitral regurgitation severity. If surgery is required during the index hospitalization because of ongoing ischemia or HF, mitral valve repair with a downsized annuloplasty ring usually is performed, though valve replacement may be preferred in many cases. In this regard, management of ischemic mitral regurgitation differs importantly from that of myxomatous mitral regurgitation.

STEMI & POST MI VSD

fibrinolytic therapy (477,478). Emergency surgical repair is necessary, even in hemodynamically stable patients (479–481), because the rupture site can expand abruptly, resulting in sudden hemodynamic collapse in previously stable patients (481). Temporizing medical treatment consists of inotropic and vasodilator agents, with IABP when needed. The surgical mortality rate remains high, especially among patients with shock, ranging from 20% to 87% in reported series (395,477–480,482,483). Mortality risk is higher for patients with inferior-basal defects than for those with anterior-apical defects. Percutaneous closure is a less invasive option that might allow for initial hemodynamic stabilization, but experience with this approach is limited, and residual shunts are common. Further technical developments and prospective trials are required to identify patients best suited for transcatheter closure.

STEMI

9.4.4. LV Free-Wall Rupture

Free-wall rupture is characterized by recurrent chest pain and ST-T-wave changes, with rapid progression to hemodynamic collapse, electromechanical dissociation, and death (484). It is observed most frequently in patients with first MI, anterior infarction, the elderly, and women. Other risk factors include hypertension during the acute phase of STEMI, lack of antecedent angina or prior MI, absence of collateral blood flow, Q waves on ECG, use of corticosteroids or nonsteroidal anti-inflammatory drugs, and administration of fibrinolytic therapy >14 hours after symptom onset (485,486). Pseudoaneurysm formation with contained rupture and tamponade can be recognized with transthoracic echocardiography, and emergency surgery should be considered. Most case series of patients reaching the operating room for management of this complication are of small size, with mortality rates approaching 60% (396,487).

9.4.5. LV Aneurysm

Ventricular aneurysm formation after STEMI occurs in <5% of patients and is more frequent in those with anterior infarction. Incidence rates have declined with timely reperfusion. Surgery for LV aneurysm after STEMI is rarely needed but may be considered for treatment of HF, ventricular arrhythmias not amenable to drugs or radiofrequency ablation, or recurrent thromboembolism despite appropriate anticoagulant therapy.

Hybrid Revascularization

CLASS IIa

1. Hybrid coronary revascularization (defined as the planned combination of LIMA-to-LAD artery grafting and PCI of ≥1 non-LAD coronary arteries) is reasonable in patients with 1 or more of the following (212–220) *(Level of Evidence: B)*:
   a. Limitations to traditional CABG, such as heavily calcified proximal aorta or poor target vessels for CABG (but amenable to PCI);
   b. Lack of suitable graft conduits;
   c. Unfavorable LAD artery for PCI (i.e., excessive vessel tortuosity or chronic total occlusion).

CLASS IIb

1. Hybrid coronary revascularization (defined as the planned combination of LIMA-to-LAD artery grafting and PCI of ≥1 non-LAD coronary arteries) may be reasonable as an alternative to multivessel PCI or CABG in an attempt to improve the overall risk–benefit ratio of the procedures. *(Level of Evidence: C)*

Different Clinical Subsets

2.5.2. Life-Threatening Ventricular Arrhythmias

CLASS I

1. CABG is recommended in patients with resuscitated sudden cardiac death or sustained ventricular tachycardia thought to be caused by significant CAD (≥50% stenosis of left main coronary artery and/or ≥70% stenosis of 1, 2, or all 3 epicardial coronary arteries) and resultant myocardial ischemia (92,99,100). *(Level of Evidence: B)*

CLASS III: HARM

1. CABG should not be performed in patients with ventricular tachycardia with scar and no evidence of ischemia. *(Level of Evidence: C)*

Different Clinical Subsets

2.5.3. Emergency CABG After Failed PCI

CLASS I

1. Emergency CABG is recommended after failed PCI in the presence of ongoing ischemia or threatened occlusion with substantial myocardium at risk (101,102). *(Level of Evidence: B)*
2. Emergency CABG is recommended after failed PCI for hemodynamic compromise in patients without impairment of the coagulation system and without a previous sternotomy (101,103,104). *(Level of Evidence: B)*

CLASS IIa

1. Emergency CABG is reasonable after failed PCI for retrieval of a foreign body (most likely a fractured guidewire or stent) in a crucial anatomic location. *(Level of Evidence: C)*
2. Emergency CABG can be beneficial after failed PCI for hemodynamic compromise in patients with impairment of the coagulation system and without previous sternotomy. *(Level of Evidence: C)*

Different Clinical Subsets

Emergency CABG After Failed PCI

CLASS IIb

1. Emergency CABG might be considered after failed PCI for hemodynamic compromise in patients with previous sternotomy. *(Level of Evidence: C)*

CLASS III: HARM

1. Emergency CABG should not be performed after failed PCI in the absence of ischemia or threatened occlusion. *(Level of Evidence: C)*
2. Emergency CABG should not be performed after failed PCI if revascularization is impossible because of target anatomy or a no-reflow state. *(Level of Evidence: C)*

Different Clinical Subsets

2.5.4. CABG in Association With Other Cardiac Procedures

CLASS I

1. CABG is recommended in patients undergoing noncoronary cardiac surgery with greater than or equal to 50% luminal diameter narrowing of the left main coronary artery or greater than or equal to 70%

CLASS IIa

1. The use of the LIMA is reasonable to bypass a significantly narrowed LAD artery in patients undergoing noncoronary cardiac surgery. *(Level of Evidence: C)*
2. CABG of moderately diseased coronary arteries (>50% luminal diameter narrowing) is reasonable in patients undergoing noncoronary cardiac surgery. (*Level of Evidence: C*)

Off Pump Versus Traditional On-Pump CABG

modynamic compromise. As a result, the need for CPB is obviated. This technique does not necessarily decrease the need for manipulation of the ascending aorta during construction of the proximal anastomoses.

CABG AND CONCOMITANT VALVULAR DISEASE

CLASS I

1. Patients undergoing CABG who have at least moderate aortic stenosis should have concomitant aortic valve replacement (476–479). *(Level of Evidence: B)*

2. Patients undergoing CABG who have severe ischemic mitral valve regurgitation not likely to resolve with revascularization should have concomitant mitral valve repair or replacement at the time of CABG (480–485). *(Level of Evidence: B)*

CLASS IIa

1. In patients undergoing CABG who have moderate ischemic mitral valve regurgitation not likely to resolve with revascularization, concomitant mitral valve repair or replacement at the time of CABG is reasonable (480–485). *(Level of Evidence: B)*

CLASS IIb

1. Patients undergoing CABG who have mild aortic stenosis may be considered for concomitant aortic valve replacement when evidence (e.g., moderate–severe leaflet calcification) suggests that progression of the aortic stenosis may be rapid and the risk of the combined procedure is acceptable. *(Level of Evidence: C)*


SYNTAX TRIAL

Components of the SYNTAX Score

EuroInterv 2005;1:219-227

SYNTAX Score: How It Works (I)

The SYNTAX score is lesion based

- A separate number calculated per lesion
- Summed to generate the total SYNTAX score

- *Questions 1–3:* determine dominance, total # of lesions and vessel segments/lesion
- *Questions 4–12:* detail adverse lesion characteristics; are repeated for each lesion
- The SYNTAX score is calculated after answering a set of sequential, interactive self-guided questions

Reduction in Vessel Diameter

- The SYNTAX Score considers only significant or occlusive lesions
  - Multiplication factor based on level of stenosis
  - Specific % stenosis is not used

Total Occlusion
x 5

100%

Significant lesion 50–99%
x 2

50% 99%

EuroInterv 2005;1:219–227

European Journal of Cardio-Thoracic Surgery 43 (2013) 1006–1013
doi:10.1093/ejcts/ezt017 Advance Access publication 14 February 2013

ORIGINAL ARTICLE

Treatment of complex coronary artery disease in patients with diabetes: 5-year results comparing outcomes of bypass surgery and percutaneous coronary intervention in the SYNTAX trial

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Abstract

OBJECTIVES: This prespecified subgroup analysis examined the effect of diabetes on left main coronary disease (LM) and/or three-vessel disease (3VD) in patients treated with percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) in the SYNTAX trial.

METHODS: Patients ($n = 1800$) with LM and/or 3VD were randomized to receive either PCI with TAXUS Express paclitaxel-eluting stents or CABG. Five-year outcomes in subgroups with ($n = 452$) or without ($n = 1348$) diabetes were examined: major adverse cardiac or cerebrovascular events (MACCE), the composite safety end-point of all-cause death/stroke/myocardial infarction (MI) and individual MACCE components death, stroke, MI and repeat revascularization. Event rates were estimated with Kaplan–Meier analyses.

RESULTS: In diabetic patients, 5-year rates were significantly higher for PCI vs CABG for MACCE (PCI: 46.5% vs CABG: 29.0%; $P < 0.001$) and repeat revascularization (PCI: 35.3% vs CABG: 14.6%; $P < 0.001$). There was no difference in the composite of all-cause death/stroke/MI (PCI: 23.9% vs CABG: 19.1%; $P = 0.26$) or individual components all-cause death (PCI: 19.5% vs CABG: 12.9%; $P = 0.065$), stroke (PCI: 3.0% vs CABG: 4.7%; $P = 0.34$) or MI (PCI: 9.0% vs CABG: 5.4%; $P = 0.20$). In non-diabetic patients, rates with PCI were also higher for MACCE (PCI: 34.1% vs CABG: 26.3%; $P = 0.002$) and repeat revascularization (PCI: 22.8% vs CABG: 13.4%; $P < 0.001$), but not for the composite end-point of all-cause death/stroke/MI (PCI: 19.8% vs CABG: 15.9%; $P = 0.069$). There were no differences in all-cause death (PCI: 12.0% vs CABG: 10.9%; $P = 0.48$) or stroke (PCI: 2.2% vs CABG: 3.5%; $P = 0.15$), but rates of MI (PCI: 9.9% vs CABG: 3.4%; $P < 0.001$) were significantly increased in the PCI arm in non-diabetic patients.

CONCLUSIONS: In both diabetic and non-diabetic patients, PCI resulted in higher rates of MACCE and repeat revascularization at 5 years. Although PCI is a potential treatment option in patients with less-complex lesions, CABG should be the revascularization option of choice for patients with more-complex anatomic disease, especially with concurrent diabetes.

JACC Cardiovasc Interv. 2013 Apr;6(4):344-54. doi: 10.1016/j.jcin.2012.11.010. Epub 2013 Mar 20.

Analysis of Stroke Occurring in the SYNTAX Trial Comparing Coronary Artery Bypass Surgery and Percutaneous Coronary Intervention in the Treatment of Complex Coronary Artery Disease.

IN CONCLUSION:

There is a higher risk of periprocedural stroke in patients undergoing CABG versus PCI; however, the risk converges over the first 4 years of follow-up.

Lancet. 2013 Feb 23;381(9867):639-50. doi: 10.1016/S0140-6736(13)60108-7.

Anatomical and clinical characteristics to guide decision making between coronary artery bypass surgery and percutaneous coronary intervention for individual patients: development and validation of SYNTAX score II●

Long-term (4-year) mortality in patients with complex coronary artery disease can be well predicted by a combination of anatomical and clinical factors in SYNTAX score II. SYNTAX score II can better guide decision making between CABG and PCI than the original anatomical SYNTAX score.

Lancet. 2013 Feb 23;381(9867):629-38. doi: 10.1016/S0140-6736(13)60141-5.

SYNTAX trial 5

FINDINGS:

1800 patients were randomly assigned to CABG (n=897) or PCI (n=903).

MACCE were 26·9% in the CABG group and 37·3% in the PCI group (p<0·0001).

Estimates of myocardial infarction (3·8% in the CABG group vs 9·7% in the PCI group; p<0·0001)

Repeat revascularisation (13·7%vs 25·9%; p<0·0001) were significantly increased with PCI versus CABG.

All-cause death (11·4% in the CABG group vs 13·9% in the PCI group; p=0·10)

Lancet. 2013 Feb 23;381(9867):629-38. doi: 10.1016/S0140-6736(13)60141-5.

SYNTAX trial 5

FINDINGS:

- Stroke (3·7%vs 2·4%; p=0·09) were not significantly different between groups.
- 28·6% of patients in the CABG group with low SYNTAX scores had MACCE versus 32·1% of patients in the PCI group (p=0·43)
- 31·0% in the CABG group with left main coronary disease had MACCE versus 36·9% in the PCI group (p=0·12)
- Patients with intermediate or high SYNTAX scores, MACCE was significantly increased with PCI (intermediate score, 25·8% of the CABG group vs 36·0% of the PCI group; p=0·008; high score, 26·8%vs 44·0%; p<0·0001).

Lancet. 2013 Feb 23;381(9867):629-38. doi: 10.1016/S0140-6736(13)60141-5.

SYNTAX trial 5

CABG should remain the standard of care for patients with complex lesions (high or intermediate SYNTAX scores).

Lancet. 2013 Feb 23;381(9867):629-38. doi: 10.1016/S0140-6736(13)60141-5.

SYNTAX trial 5

For patients with less complex disease (low SYNTAX scores) or left main coronary disease (low or intermediate SYNTAX scores), PCI is an acceptable alternative.

Lancet. 2013 Feb 23;381(9867):629-38. doi: 10.1016/S0140-6736(13)60141-5.

SYNTAX trial 5

All patients with complex multivessel coronary artery disease should be reviewed and discussed by both a cardiac surgeon and interventional cardiologist to reach consensus on optimum treatment.

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Am J Cardiol. 2012 Nov 15;110(10):1411-8. doi: 10.1016/j.amjcard.2012.06.051. Epub 2012 Aug 8.

Meta-analysis of three randomized trials and nine observational studies comparing drug-eluting stents versus coronary artery bypass grafting for unprotected left main coronary artery disease.

At 1-year follow-up,

There were trends toward lower risk of death and MI, or stroke in the DES group compared to the CABG group.

However, target vessel revascularization was significantly higher in the DES group compared to the CABG group.

In conclusion, PCI with DESs is associated with favorable outcomes for mortality; composite end point of death, MI, or stroke; and a higher risk of target vessel revascularization compared to CABG in patients with ULMCA disease.

Cost-Effectiveness of Percutaneous Coronary Intervention With Drug Eluting Stents Versus Bypass Surgery for Patients With Diabetes Mellitus and Multivessel Coronary Artery Disease

Results From the FREEDOM Trial

(*Circulation* 2013;127:820-831.)

Conclusions—Despite higher initial costs, CABG is a highly cost-effective revascularization strategy compared with DES-PCI for patients with diabetes mellitus and multivessel coronary artery disease.

Circulation. 2012 Sep 11;126(11 Suppl 1):S145-50.

Cost-effectiveness analysis for surgical, angioplasty, or medical therapeutics for coronary artery disease: 5-year follow-up of medicine, angioplasty, or surgery study (MASS) II trial.

Vieira RD, Hueb W, Hlatky M, Favarato D, Rezende PC, Garzillo CL, Lima EG, Soares PR, Hueb AC, Pereira AC, Ramires JA, Kalil Filho R.

In the long-term economic analysis, for the prevention of a composite primary end point, MT was more cost effective than CABG, and CABG was more cost-effective than PCI.

Circulation. 2012 Sep 11;126(11 Suppl 1):S158-63.

Effect of complete revascularization on 10-year survival of patients with stable multivessel coronary artery disease: MASS II trial.

OUR STUDY SUGGESTS THAT IN 10-YEAR FOLLOW-UP, CR COMPARED WITH IR WAS ASSOCIATED WITH REDUCED CARDIOVASCULAR MORTALITY, ESPECIALLY DUE TO A HIGHER INCREASE IN CARDIOVASCULAR-SPECIFIC MORTALITY IN INDIVIDUALS SUBMITTED TO PC

ESC/ EACTS MYOCARDIAL REVASCULARIZATION GUIDELINE

Table 9
Indications for coronary artery bypass grafting vs. percutaneous coronary intervention in stable patients with lesions suitable for both procedures and low predicted surgical mortality

Subset of CAD by anatomy	Favours CABG	Favours PCI	Ref.[a]
1VD or 2VD – non-proximal LAD	IIb C	I C	–
1VD or 2VD – proximal LAD	I A	IIa B	[30,31,50,51]
3VD simple lesions, full functional revascularization achievable with PCI, SYNTAX score ≤22	I A	IIa B	[4,30–37,53]
3VD complex lesions, incomplete revascularization achievable with PCI, SYNTAX score >22	I A	III A	[4,30–37,53]
Left main (isolated or 1VD, ostium/shaft)	I A	IIa B	[4,54]
Left main (isolated or 1VD, distal bifurcation)	I A	IIb B	[4,54]
Left main + 2VD or 3VD, SYNTAX score ≤32	I A	IIb B	[4,54]
Left main + 2VD or 3VD, SYNTAX score ≥33	I A	III B	[4,54]

ESC/ EACTS MYOCARDIAL REVASCULARIZATION GUIDELINE

Table 6
Recommendations for decision making and patient information

	Class[a]	Level[b]
It is recommended that patients be adequately informed about the potential benefits and short- and long-term risks of a revascularization procedure. Enough time should be spared for informed decision making.	I	C
The appropriate revascularization strategy in patients with MVD should be discussed by the Heart Team.	I	C

ESC/ EACTS MYOCARDIAL REVASCULARIZATION GUIDELINE

Table 19
Recommendations for combined valve surgery and coronary artery bypass grafting

	Class[a]	Level[b]
Combined valve surgery and:		
CABG is recommended in patients with a primary indication for aortic/mitral valve surgery and coronary artery diameter stenosis ⩾70%.	I	C
CABG should be considered in patients with a primary indication for aortic/mitral valve surgery and coronary artery diameter stenosis 50–70%.	IIa	C
Combined CABG and:		
Mitral valve surgery is indicated in patients with a primary indication for CABG and severe[c] ischaemic mitral regurgitation and EF >30%.	I	C
Mitral valve surgery should be considered in patients with a primary indication for CABG and moderate ischaemic mitral regurgitation provided valve repair is feasible, and performed by experienced operators.	IIa	C
Aortic valve surgery should be considered in patients with a primary indication for CABG and moderate aortic stenosis (mean gradient 30–50 mmHg or Doppler velocity 3–4 m/s or heavily calcified aortic valve even when Doppler velocity 2.5–3 m/s).	IIa	C

ESC/ EACTS MYOCARDIAL REVASCULARIZATION GUIDELINE

Following PCI		
In early failure following PCI		
Repeat PCI is recommended for early symptomatic restenosis after PCI.	I	B
Immediate CABG is indicated if failed PCI is likely to cause a large MI.	I	C
In late failure following PCI		
Patients with intolerable angina or ischaemia will eventually require CABG if:		
(a) lesions are unsuitable for PCI.	I	C
(b) there is additional non-discrete disease progression in other vessels.	I	C
(c) restenoses are repetitive and interventional options are not favourable.	I	C