Guideline Updates

Written by Maria Vinall

Myocardial Revascularization

Fausto J Pinto, MD, University of Lisbon, Lisbon, Portugal, reviewed the 2010 Guidelines for Myocardial Revascularization as issued by the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) [*Eur Heart J* 2010; *Eur J CardioThoracic Surg* 2010].

One of the highlights of the new guidelines is the recommendation on the use of risk stratification scores for patients who are candidates for percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG; Table 1).

For PCI the SYNTAX score is preferred to quantify the complexity of coronary artery disease (CAD) but additional testing is needed [Class IIa; Level of Evidence B]

For CABG either the EuroSCORE or STS score can be used; however, the STS score undergoes periodic adjustment which makes longitudinal comparisons difficult [Class I; Level of Evidence B]

Table 1: Recommended Risk Stratification Scores in Candidates for PCI or CABG.

Score	Validated Outcomes	Class/Level	
		PCI	CABG
EuroScore	Short and long-term mortality	IIb B	I B
SYNTAX score	Quantify CAD complexity	IIa B	III B
Mayo Clinic Risk Score	MACE and procedural death	IIb C	III C
NCDR CathPCI	In-hospital mortality	IIb B	
Parsonnet score	30 day mortality		IIIB
STS score	Operative mortality, stroke, renal failure, prolonged ventilation, deep sternal infection, re-operation, morbidity, length of stay <6 or >14 days		IB
ACEF score	Mortality in elective CABG		IIb C

Source: Adapted from *E Heart J 2010*; 31:2501–2555.

The new guidelines also address the issue of informed consent in cardiac surgery and PCI. Patients too often have partial/poor understanding of the risks, benefits, and alternatives yet those patients who play an active role in decision making have better outcomes. Thus, the new guidelines recommend that patients be adequately informed about the potential benefits and short- and long-term risks of revascularization. A sample patient information document is available in the Appendix in the online version of the guidelines.

The 2010 Guidelines also recommend multidisciplinary decision making by a consolidated Heart Team in each institution. Collaboration and discussion between the clinical non-interventional cardiologist, the interventional cardiologist, and the cardiac surgeon are strongly recommended as is the inclusion of other medical specialists (ie, nephrologists, diabetologists, neurologists, geriatricians) when treating patients with complex CAD and/or multiple associated co-morbidities.

While the guidelines recognize that *ad hoc* PCI is convenient for the patient, associated with fewer access site complications, and is often cost effective, there is also a recognition that it is not desirable for all patients and should not be applied as the default approach. Thus, the potential indications for *ad hoc* PCI and revascularization at an interval are defined (Table 2).

Table 2 Timing of PCI.

***ad hoc* PCI**[a]
Hemodynamically unstable patients (including those in cardiogenic shock)
STEMI and NSTE-ACS
Stable low-risk patients with single or double vessel disease (proximal LAD excluded) and favorable morphology
Non-recurrent restenotic lesions
Revascularization at an Interval[b]
Lesions with high-risk morphology
Chronic heart failure
Renal failure
Stable patients with multi-vessel disease include LAD involvement
Stable patients with ostial or complex proximal LAD lesion
Any clinical or angiographic evidence of higher peri-procedural risk with *ad hoc* PCI

[a]therapeutic interventional procedure performed immediately following the diagnostic procedure versus a staged procedure performed during a different session; [b]A procedure performed at some time after the diagnostic procedure.

Source: *E Heart J* 2010; 31:2501–2555.

CAD can be treated with optimal medical therapy (OMT) alone or combined with revascularization using PCI or CABG, depending on symptomatic, functional, and anatomic complexity. Treatment decisions must consider the appropriateness of the revascularization and the relative merits of PCI and CABG for different types of CAD. The guidelines recognize the increasing use of Fractional Flow Reserve (FFR) measurements to identify functionally more important lesions. Revascularization can be justified on either prognostic or symptomatic grounds (Table 3). Significant left main stenosis and significant proximal left anterior descending artery disease, especially in the presence of multivessel CAD, are strong indications for revascularization. While the choice of whether to use PCI or CABG must consider individual patient preferences and clinical characteristics, the guidelines provide some recommendations (Table 4).

New recommendations with respect to revascularization in non-ST-segment elevation acute coronary syndrome (NSTE-ACS) recognize the importance of a patient's GRACE score in determining the timing of the intervention. For PCI in ST-segment elevation myocardial infarction (STEMI) the new guidelines recommend that patients be transferred to a primary PCI center if PCI is possible within 2 hours and that rescue PCI should be considered in patients who have failed fibrinolysis.

Table 3 Indications For Revascularization in Stable Angina or Silent Ischemia.

	Subset of CAD by Anatomy	Class	Level
For Prognosis	Left main >50%*	I	A
	Any proximal LAD >50%*	I	A
	2VD or 3VD with impaired LV function*	I	B
	Proven large area of ischaemia (>10% LV)	I	B
	Single remaining patent vessel >50% stenosis*	I	C
	1VD without proximal LAD and without >10% ischaemia	III	A
For Symptoms	Any stenosis >50% with limiting angina or angina equivalent, unresponsive to OMT	I	A
	Dyspnea/CHF and >10% LV ischaemia/viability supplied by 50% stenotic artery	IIa	B
	No limit symptoms with OMT	III	C

Source: *E Heart J* 2010; 31:2501–2555.

Table 4 Indications for CABG versus PCI in Stable Patients with Lesions Suitable for Both Procedures and Low Predicted Surgical Mortality.

Subset of CAD by Anatomy	Favors CABG	Favors PCI
1VD or 2VD - non-proximal LAD	IIb C	I C
1VD or 2VD - proximal LAD	I A	IIa B
3VD simple lesions, full functional revascularization achievable with PCI, SYNTAX score ≤22	I A	IIa B
3VD complex lesions, incomplete revascularization achievable with PCI, SYNTAX score >22	I A	III A
Left main (isolated or 1VD, ostium/shaft)	I A	IIa B
Left main (isolated or 1VD, distral bifurcation)	I A	IIa B
Left main + 2VD or 3VD, SYNTAX score ≤32	I A	IIa B
Left main + 2VD or 3VD, SYNTAX score ≥33	I A	III B

Source: *E Heart J* 2010; 31:2501–2555.

Both prasugrel and ticagrelor have been added to the approved list of antithrombotic treatment options for myocardial revascularization [both Class I; Level of Evidence B]. Specific recommendations have been added for myocardial revascularization in diabetic patients and in patients with chronic heart failure. The importance of OMT and lifestyle changes is emphasized in all patients with CAD.

Cardiac Resynchronization Therapy (CRT)

Over the last decade there has been much progress in CRT including improved lead delivery systems, improved programmability, and higher success rates of endocardial left ventricular (LV) lead placement. There is also a wealth of evidence from clinical trials showing that CRT improves quality-of-life, NYHA class, and performance on the 6-Minute Walk Test. CRT achieves its effects by optimizing atrioventricular (AV) delay and synchronizing the left and right ventricles. Optimized AV delay decreases mitral regurgitation, increases diastolic filling time, and improves LV dP/dt while synchronization of the left and right ventricles improves interventricular synchrony, reduces paradoxical septal wall motion, improves LV regional wall motion, lowers end-systolic volumes, and improves LV dP/dt

Mohammad Shenasa, MD, O'Connor Hospital, San Jose, California, USA, discussed the current Guidelines and Indications for CRT in patients with HF (Table 5) and reviewed the results of several trials evaluating CRT in HF.

Table 5. ACC/AHC/HRS Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities.

Recommendations for CRT	Class	Level
For patients with LVEF ≤35%, QRS≥0.12 seconds, and sinus rhythm, CRT with or without ICD is indicated for the treatment of NYHA Class III or ambulatory Class IV HF on OMT	A	I
For patients with LVEF ≤35%, QRS≥0.12 seconds, and AF, CRT with or without ICD is reasonable for the treatment of Class III or ambulatory Class IV HF on OMT	B	IIa
For patients with LVEF ≤35% with Class III or ambulatory Class IV symptoms who are receiving OMT and who have frequent dependence of ventricular pacing, CRT is reasonable	C	IIa

LVEF=left ventricular ejection fraction; OMT=optimal medical therapy; ICD=implantable cardiac device; AF=atrial fibrillation; CRT=cardiac resynchronization therapy; HF=heart failure.

Source: E Heart J 2010; 31:2501–2555.

Although the majority of the evidence for CRT in HF comes from studies in patients with NYHA class III or IV, HF several trials have examined the value of CRT alone or in combination with an implantable cardioverter-defibrillator (CRT-D) in patients with mild (class I or II; Table 5) HF. Dr. Shenasa discussed several of these trials. Among these were the Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction (REVERSE) and Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy (MADIT-CRT) trials.

The objective of the REVERSE study was to determine if CRT could prevent or slow HF progression in patients with asymptomatic LV dysfunction or mildly symptomatic disease. The REVERSE study did not meet its primary endpoint (a composite response comparing the proportion of patients with worsened disease in the CRT-on vs CRT-off groups); however, among the subgroups of patients who improved, remained the same, or worsened, patients in the CRT-on group were significantly more likely to have improved over the course of 12 months ($p<0.0001$) [Linde C et al. *J Am Coll Cardiol* 2008].

In the MADIT-CRT trial patients with ischemic or nonischemic cardiomyopathy, an ejection fraction of ≤30%, a QRS duration ≥130 m/sec, and NYHA class I or II symptoms were randomly assigned to receive CRT-D or an ICD alone. CRT-D decreased the risk of HF events. In addition, CRT was associated with a significant reduction in LV volumes and improvement in ejection fraction. These findings suggest that CRT may be used as an early management of heart failure with LV dysynchrony. However 12 patients need to be treated in order to save 1 heart failure patient. [Jessup M. *N Engl J Med* 2009] no significant difference between the two groups in the overall risk of death. Serious adverse events were infrequent [Moss AN et al. *N Engl J Med* 2009].

Tang and colleagues [*N Engl J Med* 2010] have recently reported results from the Resynchronization/Defibrillation for Ambulatory Heart Failure Trial (RAFT) showing that among patients with NYHA class II or III heart failure, a wide QRS complex, and LV systolic dysfunction, the addition of CRT-D reduces the rates of death and hospitalization for HF, although the improvement was accompanied by more adverse events.

Despite these studies, controversy remains concerning the use of CRT in patients with NYHA I-II HF [Reynolds CR et al. *Circulation* 2011; Tang WHW & Francis GS. *Circulation* 2011].