Coronary artery disease (CAD) can be managed by optimal medical therapy (OMT) and/or mechanical revascularization, either by percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). In the setting of evolving drugs, techniques and evidence regarding these therapeutic options, the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) have published [1, 2] a guidelines document, establishing indications for revascularization and the appropriate modalities of achieving it. This editorial lists the essential messages of these Joint ESC/EACTS Guidelines on Myocardial Revascularization.

SCORE AND RISK STRATIFICATION

Risk models have a role to play in the assessment of patients undergoing revascularization; however, they should only be used as a guide and not as a replacement for sound clinical judgment and multidisciplinary dialogue. Proper implementation of the guidelines’ recommendations in specific clinical situations will often require calculation of GRACE (http://www.outcomes.umassmed.org/grace/acs_risk/acs_risk_content.html) or SYNTAX (http://www.syntaxscore.com) scores, or EuroSCORE (www.euroscore.org/calc.html), as relevant.

PROCESS FOR DECISION-MAKING AND PATIENT INFORMATION

Revascularization strategy should be based on best evidence and discussed within a Heart Team, either on a case-by-case basis or through approved protocols. The patient should have access to all relevant information on short- and long-term outcomes. In elective situations, consent of properly informed patients should not be obtained under time pressure.

REVASCULARIZATION FOR STABLE CAD

For patients with severe CAD (SYNTAX scores >22 for 3-vessel disease or SYNTAX scores >32 for left main disease), CABG offers a survival advantage as well as a reduced need for repeat intervention at 2 years. In patients with less complex disease (SYNTAX scores ≤22 for 3-vessel disease or SYNTAX scores ≤32 for left main patients), PCI is an acceptable revascularization. These findings have been confirmed at 3-year follow-up [3], but longer follow-up is needed to evaluate these two revascularization strategies.

While recommendations for coronary intervention by PCI or CABG should be mainly evidence-based, the overall clinical picture, such as advanced age, significant comorbidities or need for dual antiplatelet therapy (DAPT), as well as patient preferences should also be considered.

REVASCULARIZATION IN NON-ST-SEGMENT ELEVATION ACUTE CORONARY SYNDROME

Patients with high risk for progressive myocardial damage and those with ongoing symptoms and anterior ST-segment depression with suspected posterior thrombotic occlusion should undergo angiography without delay.
Patients at high-risk (GRACE score >140 or multiple other high-risk criteria) should be planned for angiography as soon as possible and not delayed beyond 1 day. Patients with non-ST-segment elevation myocardial infarction (non-STEMI) at lower risk and those with recurrent symptoms or inducible ischaemia at stress test should be scheduled for angiography and subsequent revascularization during hospital stay.

**REVASCULARIZATION IN STEMI**

Organization of a network ensuring prompt pre-hospital diagnosis, rapid transfer to a 24/7 primary PCI-capable centre and short door-to-balloon time are the most effective methods to reduce mortality and to improve long-term outcomes.

Patients who cannot receive primary PCI within the recommended intervals of 90–120 min after first medical contact should be promptly treated with fibrinolysis and transferred to a PCI centre, immediately if there are doubts on the effectiveness of the pharmacological reperfusion (rescue PCI), within 24 h in all other cases (elective urgent angiography).

**DIABETES**

In stable diabetic patients with extensive CAD, revascularization is indicated in order to improve major adverse cardiac and cerebral event (MACCE)-free survival.

In diabetic patients, CABG, rather than PCI, should be considered when the extent of the CAD justifies a surgical approach and the patient’s risk profile is acceptable. When PCI is performed, use of a drug-eluting stent (DES) is recommended in order to reduce restenosis and repeat target vessel revascularization.

**MYOCARDIAL REVASCULARIZATION IN PATIENTS WITH CHRONIC KIDNEY DISEASE**

Surgical myocardial revascularization should be preferred in patients with mild or moderate chronic kidney disease (CKD) and multivessel disease, in particular, if diabetes is the cause of the CKD. Percutaneous revascularization may be preferred in more fragile patients with severe CKD and several comorbidities.

All patients with CKD undergoing angiography or myocardial revascularization should receive preventive hydration with isotonic saline to be started at least 12 h before angiography and continued at least 24 h afterwards, in order to reduce the risk of contrast-induced nephropathy. The amount of contrast media should be as low as possible and not exceed 4 ml/kg.

**ARRHYTHMIAS IN PATIENTS WITH ISCHAEMIC HEART DISEASE**

Atrial fibrillation (AF), before or after CABG, is associated with increased mortality. Beta-blockers are recommended to decrease the incidence of AF after CABG.

**PROCEDURAL ASPECTS**

In CABG, arterial grafting to the LAD system is indicated and is also preferred if possible to non-LAD vessels in patients with reasonable life expectancy. During CABG, minimization of aortic manipulation is recommended.

Fractional flow reserve-guided PCI is recommended for the detection of ischaemia-related lesion(s) when objective evidence of vessel-related ischaemia is not available. DESs are recommended for reduction of restenosis/reocclusion, if there is no contraindication to extended DAPT. Distal embolic protection is recommended during PCI of saphenous vein graft disease to avoid distal embolization of debris and prevent MI.

**ASSOCIATED CAROTID/PERIPHERAL VASCULAR DISEASE**

Carotid revascularization is justified in patients scheduled for CABG with a prior history of stroke/transient ischaemic attack and high-grade carotid stenosis, especially if symptoms are recent. In patients undergoing CABG who present unilateral asymptomatic carotid artery disease, there is little evidence demonstrating superiority of prophylactic carotid endarterectomy (CEA) or carotid artery stenting (CAS) over optimal medical treatment.

CEA and CAS are complementary methods that should be performed only by teams that can demonstrate a 30-day death/stroke rate <3% for neurologically asymptomatic patients and <6% for patients with previous neurological symptoms. Selection between CEA and CAS should be based on patient profile assessment made by a multidisciplinary team.

**MYOCARDIAL REVASCULARIZATION IN CHRONIC HEART FAILURE**

Myocardial revascularization should always be performed in patients with chronic heart failure (CHF) and systolic left ventricular (LV) dysfunction, presenting predominantly with anginal symptoms regardless of ventricular volumes.

In patients with CHF presenting predominantly with HF symptoms and no or mild angina, myocardial revascularization should be performed only in the presence of viability and LV end-systolic volume index (LVESVI) ≤60 ml/m². Conversely, myocardial revascularization should not be performed in the absence of viability, regardless of volumes.

CABG combined with surgical ventricular restoration may be considered in selected patients with a scar in the left anterior descending (LAD) artery territory and LVESVI ≥60 ml/m².
SECONDARY PREVENTION

Myocardial revascularization is one component of CAD management and must be accompanied by adequate secondary prevention strategies. OMT, risk factor modification and permanent lifestyle changes should be prescribed because they reduce future morbidity and mortality, in a cost-effective way.

Secondary prevention strategies should be initiated during hospitalization when patients are highly motivated. The (interventional) cardiologist and cardiac surgeon should stress its importance: failure to do this may lead to the patient’s perception that it is less valuable than the revascularization procedure itself.

STRATEGIES FOR FOLLOW-UP

Follow-up strategies should focus on secondary prevention, as well as on the assessment of patients’ functional status and symptoms. Stress electrocardiogram (ECG) should preferably be combined with functional imaging due to low sensitivity and specificity of stress ECG alone in revascularized patients.

Early stress imaging is indicated even in asymptomatic patients such as with primary PCI or emergency CABG for STEMI, resuscitated from sudden death, patients with incomplete or suboptimal revascularization and others who may have security jobs/competitive sports and those with high risk for atherosclerosis progression.

REFERENCES