

# Selection of patients for emergency coronary revascularization

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Emergency coronary revascularization is considered for (1) unstable/preinfarction angina; (2) subendocardial myocardial infarction with postinfarction angina; (3) acute coronary occlusion during or immediately after cardiac catheterization; (4) transmural myocardial infarction with left ventricular power failure; (5) coronary obstruction with mechanical sequelae of myocardial infarction; (6) ventricular tachyarrhythmias.

The unstable/preinfarction angina group has constituted approximately 16% (138/843) of the patients undergoing coronary revascularization surgery at the Peter Bent Brigham (1970–1976). This syndrome is defined as unremitting chest pain requiring opiates for control, S-T and T wave abnormalities by electrocardiogram without evidence of a myocardial infarction (Q wave), a negative MB-CPK and myocardial scan, and demonstration of a significant lesion in one or more coronary arteries.

This syndrome was considered a surgical emergency in 1970, but it has been demonstrated that intensive coronary care medical treatment is effective in controlling the ischemic pain, normalizing the electrocardiogram, and preventing arrhythmic complications. Medical

treatment includes maximal propranolol therapy, heavy sedation, including  $N_2O$ , vasodilator therapy, and relief of aggravating conditions. Control of the ischemia then allows the surgeon to operate upon a stable patient in a low-risk situation. Urgent or emergency surgery is reserved for patients with the true preinfarction syndrome who, despite maximal medical therapy, still have signs and symptoms of ischemia; these patients often have left main coronary obstruction, ventricular arrhythmias, or global left ventricular dysfunction. Emergency angiography should be immediately followed by coronary bypass grafting. Precatheterization intra-aortic balloon counterpulsation may be indicated in unusually unstable patients in this group. The operative mortality in the entire group of patients is 4/138 (3%) compared to the 1.2% mortality for patients undergoing elective coronary bypass procedures. The long-term follow-up of the patients at 6 years shows a 90% overall survival and an 80% survival in those patients with unstable/preinfarction angina syndrome.

Subendocardial infarction is similar in clinical and electrocardiographic signs, but cardiac enzymes are mildly elevated, indicating myocardial necrosis. If patients are pain-free after a subendocardial infarct, surgery is deferred for 3 weeks. Emergency revascularization is indicated, however, if there is uncontrollable postinfarction pain and electrical ischemia which are not relieved by medical treatment regardless of time after the infarct. Patients are continued on intensive beta blockade and taken directly to surgery after emergency angiography occasionally with balloon preparation.

In our clinic, propranolol is not discontinued prior to coronary bypass surgery in patients with acute ischemic syndromes. Discontinuation of this agent may lead to a worsening of myocardial ischemia due to increased myocardial oxygen consumption prior to surgery. A saphenous vein graft is used for the coronary bypass grafts; the internal mammary arteries are not used in emergency situations. Myocardial preservation is total ischemic arrest with profound local hypothermia and cardioplegia or intermittent ischemia and reperfusion. Post-bypass usage of isoproterenol or dopamine will overcome the myocardial depressive effects of propranolol.

Acute coronary occlusion shortly following cardiac catheterization is considered a prime indication for immediate reperfusion by coronary bypass grafts. There appears to be a "golden period" of time (4 to 6 hours) during which reperfusion of the ischemic area will not usually produce a hemorrhagic infarct. Revascularization during that period is satisfactory in most instances to prevent progression of the ischemia to a myocardial infarction. The patient's response to reperfusion will depend on the magnitude of the occlusion and the extent of the collateral flow into the threatened area. Eleven patients have been operated upon in our clinic with this diagnosis with one operative death.

Transmural myocardial infarction with cardiogenic shock and left ventricular power failure results from necrosis of 40% of the left ventricular myocardium. The mortality in this patient group with medical treatment approaches 100%. Patients with this syndrome are balloon pump-depend-

ent following onset of cardiogenic shock, but to be surgical candidates they must have at least 50% of their myocardium contracting well and have good distal coronary vasculature visualized for purposes of bypass grafting. The surgical results with this syndrome are considerably worse than with other coronary syndromes; the operative mortality is 60% in our experience and the experience of others. Long-term survival is also not as good as uncomplicated coronary revascularization, and long-term functional improvement in these patients may not be as effective.

Coronary bypass for medically intractable, recurrent ventricular tachyarrhythmias is an unusual indication for surgery because of the variety of successful forms of pharmacologic management which should be exhaustively tried prior to recommending a patient for surgery. Successful surgical management of these patients usually includes resection of an

ischemic area of myocardium as well as coronary revascularization.

Selection of patients for emergency treatment of infarction, VSD, or papillary muscle dysfunction depends on adequate residual ventricular function and timing of operation so that the severely altered perfusion state is ameliorated as much as possible prior to early surgery. Coronary angiography should be a part of the workup and appropriate concomitant revascularization carried out.

Emergency surgical treatment of patients with ischemic coronary artery syndromes has assumed increasing importance in the practice of cardiovascular medical and surgical units. Aggressive medical and surgical treatment combined with appropriate use of intra-aortic balloon counterpulsation and patient selection based on adequate ventricular function and timing of operation will widen applicability of operative therapy and improve results.