

Prediction of Adequate Myocardial Perfusion by Upright Bicycle Exercise and First Pass Right Anterior Oblique Radionuclide Angiography

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To assess the potential of upright bicycle exercise utilizing first pass right anterior oblique radionuclide angiography to detect or predict significant coronary artery disease, 57 healthy volunteers (Group 1) were studied to document the normal left ventricular response to exercise. In addition, 63 patients with at least 50% stenosis of one major coronary artery (Group 2) were studied. Eleven of 57 Group 1 and all patients of Group 2 had coronary arteriography and left ventricular angiography prior to their study. To assess the effects of myocardial revascularization on exercise induced myocardial ischemia, 41 of the Group 2 patients with coronary artery disease who had surgery were prospectively studied by rest and exercise radionuclide angiography one to three days pre-operatively and ten days post-operatively. An additional 22 patients with severe left ventricular dysfunction were similarly studied.

Using a graded protocol, patients were exercised on a bicycle ergometer to fatigue, dyspnea or chest pain. Radionuclide angiography was done at rest and peak effort and the parameters of heart rate, mean arterial blood pressure, ejection fraction, end diastolic volume and exercise induced regional wall motion dysfunction were monitored and analyzed. Group 1 patients are characterized by having an increase in ejection fraction, a slight to moderate increase in end diastolic volume, and no exercise induced regional wall motion dysfunction at peak stress. Group 2 patients were characterized by having one or all of the following signs of left ventricular decompensation: a decrease in ejection fraction, new or increased exercise induced regional wall motion dysfunction, and often marked left ventricular dilatation at peak effort. Pre-operatively, 56 of the 63 patients with coronary artery disease had an abnormal response, post-operatively only 8 of the 63 failed to improve. Six of these 8 patients were felt to have inadequate revascularization as defined by post-operative coronary arteriography.

In conclusion, exercise radionuclide angiography demonstrates the presence of coronary artery disease in most patients. Myocardial revascularization can improve myocardial performance during exercise by abolishing evidence of ischemia (decreased ejection fraction, increased end diastolic volume, and exercise induced regional wall motion dysfunction) as assessed by first pass radionuclide angiography. In fact, failure to abolish such an abnormal response by this testing may reflect incomplete revascularization.