Intraoperative transesophageal assessment of coronary artery flow can predict 5 type myocardial infarction

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Background: Stenosis of a coronary artery results in an increase in flow velocity in the pathologic segment. Effective grafting should decrease the stenotic native coronary velocity according to hemodynamic law. The range of decreased velocity before and after cardiac surgery can hypothetically reflect the effectiveness of a graft. The aim of the study is to determine if measuring coronary flow velocity changes during coronary artery bypass grafting (CABG) can predict intraoperative myocardial infarction.

Methods: One hundred sixty-six (166) consecutive patients (121 men, 64±9 years old) referred for cardiac surgery, were prospectively included in the study. A standard basic perioperative transesophageal echocardiography (TEE) examination was performed with additional scans of the left main, left anterior descending (LAD), and circumflex (LCx) arteries' proximal segments. Measurements of coronary flow velocities were performed before and after grafting in the same sites of the arteries. The maximal value of cardiac troponin I (cTnI) after CABG and the additive criteria were accounted for in the analysis as it is described in the expert consensus document for Type 5 myocardial infarction (MI) definition.

Results: One hundred sixty-three patients (98%) had arterial hypertension, 28 patients (17%) had diabetes mellitus, 35 patients (21%) were currently smokers. The feasibility of coronary flow assessment during cardiac operations was 95%. Before grafting, the mean velocity in the left main artery was 91±49 cm/s, in LAD 101±35 cm/s, and in LCx 117±49 cm/s. There was a significant correlation between changes in coronary flow velocities during operation and the value of cTnI (R=0.34, $p<0.0001$). Ten patients met the criteria for Type 5 MI. There were no differences in age, body mass index, number of coronary arteries with stenoses, frequency of prior MI, ejection fraction or coronary flow velocity before surgery in patients with and without Type 5 MI. The group of patients with Type 5 MI had an increase in native artery velocities during surgery in comparison with patients without MI, who had a significant decrease in coronary flow velocity after grafting (30±48 vs. −10±30 cm/s; $p<0.0006$). Increases in native coronary velocities greater than 3 cm/s predicted Type 5 MI with 81% accuracy (sensitivity 88%, specificity 70%).

Conclusion: Coronary flow velocity assessment during cardiac surgery could predict an elevation of cardiac troponins and Type 5 MI.