The Optimum Hypoglycemic Therapy Can Improve Coronary Flow Velocity Reserve In Diabetic Patients: Demonstration by Transthoracic Doppler Echocardiography

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Background: Although hyperglycemia is known to be one of the pivotal factors for the reduction of coronary flow reserve in diabetic patients, it has not been determined whether the reduction or elimination of hyperglycemia would improve coronary microvascular dysfunction. Transthoracic Doppler echocardiography (TTDE) is a suitable method for serial assessment of coronary flow velocity reserve (CFVR). Methods: To explore the effect of hypoglycemic therapy on CFVR, we performed TTDE in 27 consecutive diabetic patients without a history of coronary artery disease who required admission for the treatment of their high blood glucose level. On admission, we measured coronary flow velocity (CFV) in the distal part of the left anterior descending coronary artery (LAD) at rest and during continuous infusion of adenosine triphosphate (140 mcg/kg/min). CFVR was defined as hyperemic CFV divided by CFV at rest. The same procedure was repeated after the reduction of blood glucose level by intensive treatment. Results: Adequate quality of CFV at baseline and during hyperemia was obtained in all but one patient (feasibility: 96%). Fasting blood glucose level reduced from 229 ± 80 mg/dl on admission to 119 ± 28 mg/dl at 10 days after the treatment. CFV at rest did not change between two measurements (19.7 ± 3.2 cm/s vs. 18.5 ± 4.1 cm/s, p = 0.5). CFVR during hyperemia increased significantly after the treatment (43.2 ± 12.4 cm/s vs. 49.6 ± 10.4 cm/s, p = 0.01). Thus, CFVR after the treatment (2.75 ± 0.62) was significantly increased compared to that on admission (2.25 ± 0.44, p < 0.01). There was a significant positive correlation between the reduction of fasting blood glucose levels and the change in CFVR (r = 0.64, p < 0.01). Even if we confined patients with retinopathy, the significant correlation was also noted (r = 0.77, p < 0.01). Conclusion: We demonstrated that the reduction of hyperglycemia leads to an increase in CFVR in diabetic patients. These results suggest that optimal hypoglycemic therapy is important to improve coronary microvascular dysfunction even in patients with diabetic retinopathy.

Assessment of the Reduction of Coronary Flow Velocity Reserve In Patients With Diabetic Retinopathy by Transthoracic Doppler Echocardiography

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Methods: Transthoracic Doppler echocardiography (TTDE) is a suitable method for serial assessment of coronary flow velocity reserve (CFVR). We measured CFVR at baseline and during hyperemia induced by continuous infusion of adenosine triphosphate (140 mcg/kg/min). Results: Adequate quality of CFVR at baseline and during hyperemia was obtained in all but one patient (feasibility: 97%). The mean value of fasting blood glucose was 126 ± 32 mg/dl. CFVR was significantly lower at rest and at maximal hyperemia compared to baseline conditions. The relation between CFVR and the severity of diabetic retinopathy was inversely correlated with the severity of retinopathy. These results suggest that optimal hypoglycemic therapy is important to improve coronary microvascular dysfunction even in patients with diabetic retinopathy.

Coronary Flow Velocity Reserve In the Right Coronary Artery: Comparison With Invasive Data

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Background: Measurement of coronary flow reserve (CFR) is an important diagnostic tool providing valuable clinical and pathophysiological information about coronary artery function. Transthoracic Doppler echocardiography (TTE) has proven to reliably assess CFR non-invasively, but so far the method is limited to the left anterior descending artery. Methods: Introduction of a modified transthoracic two-chamber view with the transducer rotated anteclockwise and angled anteriorly allows visualization of the posterior interventricular descending branch (RPD) of the right coronary artery. Images were obtained in fundamental mode at 2.5 MHz color Doppler and 2.0 MHz pulsed wave Doppler using a sector ultrasound system (Acuson Sequoia C555). Coronary flow velocities were recorded in the RPD at rest and during maximal hyperemia induced by iv. Adenosine (0.140 mcg/kg/min). CFR was calculated by the ratio of average systolic-diastolic peak velocity during maximal hyperemia compared to baseline conditions. Coronary flow velocity was recorded in all patients (pts) after TDE has been done. A total of 45 pts (33 men, 12 women, mean age 56±12) were investigated by TDE. In a subgroup of 20 pts TDE measurement was repeated on the same day (measurement, measurement) to assess reproducibility. Additionally, CFR was recorded invasively in 22 pts using a modified apical two-chamber view. Results: Coronary flow velocity reserve was obtained in all but one patient (feasibility: 97%). The mean value of fasting blood glucose was 126 ± 32 mg/dl. Comparing CFR between RPD and LAD, we found that CFR was lower in patients with PDR (2.03 ± 0.34) than in patients with NDR (3.11 ± 0.53, p<0.01). The correlation of CFR between RPD and LAD was highly significant (r=0.87, p<0.01). Even if we confined patients with retinopathy, the significant positive correlation between the reduction of fasting blood glucose level and the change in CFR (r = 0.64, p<0.01). Even if we confined patients with retinopathy, the significant correlation was also noted (r = 0.77, p < 0.01). Conclusion: We demonstrated that the reduction of hyperglycemia leads to an increase in CFVR in diabetic patients. These results suggest that optimal hypoglycemic therapy is important to improve coronary microvascular dysfunction even in patients with diabetic retinopathy.