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Ultrasonographic assessment of coronary flow reserve to predict significant left anterior descending artery stenosis in patients with inferior acute myocardial infarction.
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Background: Non invasive evaluation of coronary flow reserve (CFR) has proven to be useful in the identification of patients with significant coronary artery disease. However, few studies were carried out in subjects with acute myocardial infarction (AMI).

Methods: Eighty subjects with first uncomplicated AMI were included in the present analysis. The occurrence of ST segment elevation > 1 mm in V1-V4 leads and apical or anteroseptal wall motion abnormalities were exclusion criteria. Coronary flow velocity parameters were recorded on the fourth day post-AMI at baseline and after dipyridamole infusion (0.84 mg/kg) and a CFR > 2.0 was defined as normal. All patients underwent coronary angiography and a significant left anterior descending artery stenosis was classified for lumen narrowing > 70%.

Results: CFR > 2 was found in the anterior descending artery was obtained by transthoracic echocardiography in 75/80 patients. A CFR < 2 had a sensitivity of 86% and a specificity of 89% for the presence of significant left anterior descending artery stenosis.

Conclusion: Early CFR assessment is a safe and effective tool to identify a significant left anterior descending artery involvement in patients with acute inferior AMI.

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Comparison of the morphological and functional characteristics of internal mammary artery/ radial artery and venous saphenous grafts.
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Internal mammary coronary grafts have a higher long term patency rate compared to venous grafts. Experience from short and intermediate term patency rate of the radial artery grafts is favorable. Using ultrasound examination we were trying to find some difference between the morphologic and functional characteristics of the grafts. We evaluated 116 grafts in 45 patients (58 internal mammary artery, 38 radial artery and 20 saphenous vein grafts) using ultrasound examination. Coronarography was also performed in all patients. There was no significant difference regarding the timing of postoperative examination (45±6 months postoperatively). Using the diameter and the diastolic flow TVI of the grafts were measured and the grafts flow was calculated. Based on coronary angiography 2 LIMA, 3 radial artery and 7 saphenous vein grafts showed significant stenosis. The diameter of the patent saphenous vein grafts was significantly larger comparing to the radial, and internal mammary arteries (VS: 3.35±0.27 mm, AR: 2.91±0.18 mm, LIMA: 2.72 mm). The diastolicTVI of the saphenous vein grafts were significantly higher, than of internal mammary or radial arteries (VS:0.88±0.13 mm, LIMA:0.65±0.121 mm, AR:0.71±0.109 m). The calculated flow was also higher in saphenous vein grafts. Diastolic TVI of the stenotic grafts was significantly lower comparing to patent grafts.

Conclusions: 1) Ultrasound examination is a promising method for coronary graft flow evaluation. 2) Diastolic flow TVI in VS grafts is higher in VS grafts. 3) Diastolic TVI in stenotic grafts is significantly lower than in patent grafts.

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Testing LIMA graft permeability by transthoracic echo-Doppler.
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Purpose: Post-operative measurement of graft permeability by angiography is invasive. The aim of this study is to evaluate the utility of transthoracic echo-Doppler (TTE) in measuring LIMA graft permeability.

Methods: We studied 89 consecutive patients (average age 65 years, range 37-79 years) who were revascularized with a LIMA. Graft permeability was evaluated by both color- and pulsed-Doppler TTE. We measured the following parameters: systolic velocity peak (SVP), diastolic velocity peak (DVP), average velocity, pulse index (PI), resistance index (RI). Of the 89 patients, 60 also underwent angiography. We considered stenosis to be severe if greater than 70% as indicated by angiography.

Results: We were able to obtain TTE data for 85 patients (95.5%) and of these 57 had angiography too. Doppler registers were biphasic, with both systolic and diastolic components. In patients with grafts functioning normally, registers were predominantly diastolic. When the graft was dysfunctional registers were predominantly systolic (similar to the register of the mammary artery in its anatomic position). Patients with dysfunctional grafts had higher SVP (p < 0.01), higher DVP (p < 0.00), and higher PI (< 0.001). The sensitivity and specificity of TTE in the detection of severe graft dysfunction were 86% and 100% respectively. The positive prediction value was 100%.

Conclusions: TTE has high specificity, sensitivity and predictive value in determination of LIMA graft permeability. Being non-invasive, TTE is ideal for the follow-up of patients with LIMA grafts.

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Noninvasive measurement of coronary flow reserve in the anterior and posterior descending coronary arteries by transthoracic Doppler.
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We measured coronary flow reserve (CFR, hyperemic/resting diastolic flow velocity ratio) in the anterior (LAD) and posterior descending (PD) coronary arteries by transthoracic color-Doppler ultrasound during 90 sec intravenous adenosine infusion (140 mcg/kg/min) in 90 patients. We first used a non-contrast, and more recently a contrast echocardiographic approach, to improve detection of PD flow. Non contrast approach: Baseline PD flow was detected in 62/81 (76%) subjects, and CFR was measurable in 44 of them (54%) because of adenosine-induced hyper-ventilation. According to angiography, these 44 subjects were divided into 3 groups: Group 1, 0-29% stenosis; Group 2, 30-69% stenosis; Group 3, >70% stenosis. PD CFR was 2.62±0.25 in 17 Group 1; 1.33±0.34 in 9 Group 2; 1.40±0.52 in 18 Group 3 subjects (F=4.83, p<0.001). LAD CFR was 3.31±0.54 in 15 Group 1; 2.67±0.71 in 10 Group 2; 1.12±0.49 in 19 Group 3 patients (F=45.68, p<0.001). A cut-off <2 identified >70% stenosis in both the artery supplying the PD, and in the LAD.

Contrast approach. The preliminary experience with contrast echocardiography includes 9 patients receiving intravenous injection of 1-4 mL (5-20 mg) of a novel ultrasound contrast agent (LK565, Koehler, Germany, 50 mg/vial). Color-Doppler imaging of the PD was performed by 3.5 MHz and 7 MHz probes. CFR was measured in 9/9 patients. The average length of the visualized PD segment increased from 5.3 mm without contrast to 11.6 mm with contrast, and the duration of visualization with contrast ranged from 5 to 12 min, allowing easier measurement of CFR compared to the non-contrast approach.

Conclusions: The ultrasound contrast agent LK565 improves imaging of the PD, regardless of its origin from the right or circumflex coronary artery. Coronary Doppler may change the clinical approach in stress echocardiography, since alteration of flow rather than ischemia is safely detected in the two most important vascular districts of the heart.

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Intermediate severity coronary artery stenoses- transthoracic Doppler coronary flow reserve measurement.
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In this preliminary report, we show usefulness of Transthoracic Doppler Echocardiography (TTE) for noninvasive evaluation of the intermediate coronary stenosis, which can serve as a basement for further invasive or noninvasive treatment option in this group of patient.

We demonstrate our own experiences in application of this method as an accessory diagnostic tools, in order to enhance costeffectiveness in CAD treatment. Coronary Flow Reserve (CFR) was assessed using TTE in 20 patients with angina in CCS II or III class, with marginal lesion of LAD in coronary angiogram while other coronaries were lesion-free. Depending on CFR value, patients were qualified to IVUS and eventually to invasive (CFR<2), or to non-invasive treatment (observational group, CFR>2). CFR<2 (1.4±0.24) was measured in 7 patients (35%). Six of them had essential stenosis in IVUS, 5 patients were directed to PCI, and in one case, CABG was performed. In one patient no hemodynamically essential lesion of LAD was found in IVUS examination, despite CFR<2 in TTE. Every patient after PCI was controlled in TTE, showing higher values of CFR (3.03±0.36). In a group of 13 patients with CFR>2, none of them developed Acute Coronary Syndrome (ACS) during follow up (mean 11.2±3.2 months).

Conclusion: Functional assessment of LAD stenosis, essentially increasing sensitivity of noninvasive diagnostic methods of CAD. Based on grasped experiences, we consider TTE-CFR measurement as a useful method, allowing creation of patients subgroup with essential myocardial ischemia, which can benefit from eventual invasive treatment. The usage of this method for patient group with marginal lesions in coronary angiogram permits for isolation of a subgroup for further interventions more precisely, necessitating IVUS and eventually invasive treatment.

The algorithm we use is helpful in selection of patients group, who should be treated invasively, avoiding high costs of IVUS in every patient representing marginal lesion in angiography.