11 pts (8 men, mean age 60±11 years) received on top of their unchanged medication the ARB irbesartan (300 mg twice daily, after a titration phase of 16 weeks) for a total of 3 months. The control group consisted of 9 pts (7 men, mean age 57±12 years) on antihypertensive treatment except ARB or ACE-inhibitors. Exclusion criteria were relevant left ventricular hypertrophy (septum thickness >13 mm), ARB- or ACE-inhibitor treatment in the last 3 months, ejection fraction <40%, previous myocardial infarction or atrial fibrillation. In all pts coronary flow reserve (CFR) was measured in the left anterior descending artery at baseline and at the end of the study non invasively by transthoracic Doppler echocardiography (TDE) (Siemens-Acuson, Sequoia CD5); hyperemia was induced by 140 µg/kg bodyweight adenosine i.v. All TDE were performed by the same experienced investigator.

Results: Baseline CFR results did not differ in the treatment group (mean CFR=270%, range 220-350) compared to the control group (mean CFR=250%, range 200-300). In the treatment group CFR increased by more than 40% at the end of study after 3 months to a mean CFR of 375% (range 350-410, p<0,001); the control group showed no significant difference compared to the baseline examination (mean CFR=270% at study end). Septum thickness remained unchanged in both groups.

Conclusions: RAS blockade by the ARB irbesartan over 3 months significantly increases CFR in pts with arterial hypertension, demonstrating improvement of coronary microvascular function independent of hypertrophy reduction.

1069
Comparison of angiography, IVUS, coronary flow reserve measurement by TEE in angiographically borderline lesions

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Background: The angiographic assessment of proximal left anterior descending artery (LAD) stenosis can be difficult for borderline lesions in the 30 to 60% range at visual assessment. Intravascular ultrasound (IVUS) and transesophageal coronary flow reserve measurement (TEE-CFR) could offer an alternative correlation between IVUS, quantitative coronary angiography (QCA) and TEE-CFR measurement in assessing angiographically borderline LAD lesions.

Methods: Forty-two patients (mean age 62.9±9 years, 25 males) with lesions referred for IVUS examination of proximal LAD entered in the study. Exclusion criteria were: severe left ventricular hypertrophy, angiographically significant left main or ostial LAD stenosis, significant contraindication to dipyridamole. IVUS measurements were taken using a 40 MHz Atlantis Plus (Boston Sci.) IVUS catheter. Standard IVUS and routine QCA measurements were assessed before the intervention. During TEE the standard dipyridamole stress protocol (0.56 dipyridamole over 4 minutes) was employed. The coronary flow reserve was calculated as the ratio of the peak/resting diastolic velocities measured in the left anterior descending coronary artery. The minimal lumen cross-sectional area (LCSA), minimum lumen diameter (MLD) assessed by IVUS, the diameter stenosis assessed by QCA and the CFR measured by TEE were compared.

Results: Nine patients were excluded from the study due to significant left main or ostial LAD lesions. The average MLD assessed by IVUS was 3.66±1.38 mm² for proximal LAD. Baseline mean doppler velocity in the proximal LAD was 54.79±21.44 cm/s, and increased to 94.56±25.86 (p<0.01). The average CFR measured by TEE was 1.90±0.42. The average diameter stenosis assessed by QCA was 37.92±10.43%. IVUS-derived LCSA was unrelated to angiography-derived stenosis (r=0.15, p=ns) and correlated better to IVUS-derived LCSA (r=0.49, p<0.05) than to angiographic assessment (r=0.12, p=ns).

Conclusion: Angiographic and intravascular ultrasound based assessment of coronary stenoses can be substantially unrelated in angiographically borderline proximal LAD disease. TEE-CFR provides an alternative physiological approach, better related to intravascular than to angiographic appearance of the stenosis.

1070
Increase of coronary flow after levosimendan infusion is associated with improvement in cardiac performance in patients with decompensated heart failure

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Levosimendan is a novel calcium sensitizer which improves cardiac contractility, coronary blood flow and myocardial oxygen demand. We examined the effects of levosimendan infusion on coronary flow and the relation between changes in coronary flow and the reciprocal changes in BNP, in echocardiographic and clinical indices of cardiac performance after levosimendan infusion in patients with decompensated heart failure.

Methods: We studied 42 patients, of mean age 62±12 years, with heart failure (NYHA III-IV) refractory to conventional therapy and LV ejection fraction (EF) 22±16%. Patients were randomized to receive levosimendan 0.1 µg/kg/min (n=21) or placebo (n=21) for 24 hours. Before and 48h after each treatment patients underwent: A) assessment of max and mean and time integral (VTI) of the coronary flow velocity (CFV) in LAD using a 7MHZ transducer during colour-guided 3 months. The control group consisted of 9 pts (7 men, mean age 57±12 years) on antihypertensive treatment except ARB or ACE-inhibitors. Exclusion criteria were relevant left ventricular hypertrophy (septum thickness >13 mm), ARB- or ACE-inhibitor treatment in the last 3 months, ejection fraction <40%, previous myocardial infarction or atrial fibrillation. In all pts coronary flow reserve (CFR) was measured in the left anterior descending artery at baseline and at the end of the study non invasively by transthoracic Doppler echocardiography (TDE) (Siemens-Acuson, Sequoia CD5); hyperemia was induced by 140 µg/kg bodyweight adenosine i.v. All TDE were performed by the same experienced investigator.

Results: Baseline CFR results did not differ in the treatment group (mean CFR=270%, range 220-350) compared to the control group (mean CFR=250%, range 200-300). In the treatment group CFR increased by more than 40% at the end of study after 3 months to a mean CFR of 375% (range 350-410, p<0,001); the control group showed no significant difference compared to the baseline examination (mean CFR=270% at study end). Septum thickness remained unchanged in both groups.

Conclusions: RAS blockade by the ARB irbesartan over 3 months significantly increases CFR in pts with arterial hypertension, demonstrating improvement of coronary microvascular function independent of hypertrophy reduction.

1071
Thransthoracic three-dimensional imaging of coronary artery flow

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The determination of the coronary flow reserve by transthoracic Doppler echocardiography during adenosine stress offers the possibility of detection of restenosis mainly in the left anterior descending artery (LAD). However, there is only a small number of hospitals in Germany performing this non-invasive measurements of coronary flow reserve by ultrasound mainly due to the necessary expertise and training of this procedure. One problem for visualisation of coronary arteries using 2D-echocardiography is the three dimensional course of the vessels. Thus, the aim of the present study was to analyze the feasibility of three-dimensional visualization of coronary flow by 3D4D color coded echocardiography.

Methods and results: Investigations were performed in 15 patients (pts) using a Vivid 7 ultrasound system (GE Healthcare) with a 3D-probe. In all pts 2D visualization of parts of the coronary arteries was possible by 2D color-coded imaging. A full color coded volume set was acquired within a time interval of 8 heart cycles during breathhold. Complete coronary artery flow was illustrated by changing tissue transparens of the full data set. In all pts flow velocities of the LAD could also be detected with 2D color imaging using the 3D probe, but in only 11 of 15 pts a threedimensional flow reconstruction was possible. The distal parts of the right coronary artery (RCA) were detected in only 2 pts. The 3D reconstruction of RCA flow was only partially possible. In one case the direct visualization of a stenotic flow was detected as could be shown by angiography after the echocardiography.

Summary: 3D visualization of coronary artery flow is possible. Thus, an individual diagnostic feature for evaluating stenosis of coronary arteries by echocardiography is available. However, for clinical routine technical improvements are still necessary.

1072
Independent association between coronary flow velocities at rest and left ventricular filling pressure in arterial hypertension

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Purpose: Hypertensive patients free of coronary artery disease often present altered coronary blood flow (CBF) because of pressure overload and left ventricular (LV) hypertrophy. Little is known about the influence of LV filling pressure (LVFP) on CBF in arterial hypertension. Aim of the present study was to evaluate possible association between LVFP and CBF at rest by Tissue Doppler and transthoracic Doppler measurement of distal left anterior descending artery (LAD) in a population including both normotensive and hypertensive subjects.

Methods: After exclusion of patients with coronary disease (angina and/or ECG signs at rest/maximal treadmill exercise), diabetes mellitus, congestive heart failure and primitive/valvular cardiomyopathy, 12 normotensive subjects and 33 recently onset, never treated hypertensive patients underwent transthoracic echocardiography including color-guided Doppler measurement of CBF diastolic peak velocities in distal LAD and Tissue Doppler of mitral annulus. The average of lateral and septal annular early diastolic velocity (Ere) (cm/s) was determined and transmural E/E’ velocity (Em ratio) (E/E’ em calculated as index of LVFP. The population was divided in 2 groups: 31 with normal LVFP (=>E/Em ratio<8) and 14 with increased LVFP (E/Em ratio >8).

Table 1

<table>
<thead>
<tr>
<th>Levosimendan</th>
<th>Max-CFV (m/sec)</th>
<th>VTI-CFV (m/sec)</th>
<th>RVSP (mmHg)</th>
<th>E/E’</th>
<th>EF (%)</th>
<th>BNP (pg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASELINE</td>
<td>0.29±0.1</td>
<td>10.3±2.6</td>
<td>59±8</td>
<td>26±21</td>
<td>25±7</td>
<td>1115±611</td>
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<tr>
<td>4th POST</td>
<td>0.43±0.2</td>
<td>16.3±6.1</td>
<td>51±7</td>
<td>33±5</td>
<td>33±4</td>
<td>588±471</td>
</tr>
</tbody>
</table>

0.017 <0.002 <0.002 <0.014 <0.01 <0.01