Results: Compared to PRE, a reduction in SVG (11%±3% and 9%±1.1%) and corresponding widening in SA (27%±3% and 21%±5%) were found at HDTS in both CTRL and EXE, respectively. The EXE countermeasure significantly reduced CA and SA changes compared to CTRL. Tmax presented the same changes, being reduced of 8%±3% in CTRL and only of 4%±2% in EXE. At POST, in both groups SA was restored to PRE values; conversely, while in EXE the SVG returned to PRE values, in CTRL it was found still reduced by 3%. Also, while Tmax was back to PRE values in EXE, it was increased by 5% in CTRL.

Conclusions: Despite the short-term 6'-BR immobilization, cardiac adaptation to this deconditioning condition affected ventricular repolarization during the night period, thus widening SA and reducing SVG as result of increased heterogeneity, thus increasing the risk of arrhythmia development. Selective beat averaging allowed quantifying these changes. Application of 25 min/day standing exercise reduced, but not canceled, these effects. This should be taken into account in patients with cardiovascular diseases, when immobilized in bed, to properly adjust the pharmacological therapy or set the rehabilitation training, in order to avoid further complications.

P255 | BENCH
Non-invasive mapping of endocardial and epicardial activation: a validation study

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Introduction: Non-invasive mapping of cardiac activation before ablation of arrhythmic foci can reduce EP procedure duration. A novel non-invasive activation mapping technique was developed that estimates both endocardial and epicardial activation times from body surface electrograms. To evaluate the clinical applicability of this technique, we performed an experimental in-vivo validation study by non-invasively localizing various endo- and epicardial stimulation sites.

Methods: Three male pigs (62-65 kg) were sedated and catheterized (endocardial and epicardial access). A 64 lead body surface map was recorded during cardiac stimulation from various endocardial and epicardial sites. Stimulation electrode positions were determined with fluoroscopy images recorded in three different directions. A detailed volume conductor model was derived from computer tomography images recorded immediately prior to the procedure. We used the equivalent double layer source model located on the endo- and epicardial ventricular surface, its local strength proportional to the estimated transmembrane electric field of this technique. We performed an experimental in-vivo validation study by non-invasively localizing various endo- and epicardial stimulation sites.

Results: A total of 127 beats, stimulated from 11 endocardial and 9 epicardial sites were analyzed. Median distance between stimulus site and estimated location of first activation was 17 mm (16, 20 and 16 mm resp.). The stimulation surface (endo- or epicardial) was identified correctly for 82% of the analyzed beats.

Conclusion: Our non-invasive activation mapping technique was able to discriminate endocardial from epicardial foci of activation with clinically relevant accuracy. This can be used to support the choice of the initial approach (endocardial or epicardial) prior to ablation procedures.

P257 | BEDSIDE
Detection of coronary artery disease in postmenopausal women: the significance of integrated stress imaging tests in a 4-year prognostic study

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Objectives: The present prospective study investigated whether a combined approach integrating two different stress imaging modalities may improve the diagnostic accuracy and prognostic impact of non-invasive CAD tests.

Methods: In women, especially postmenopausal, non-invasive tests for detecting coronary artery disease (CAD) are less accurate than in men, leading to a high proportion of unnecessary coronary angiographies (CAs).

Methods: 522 consecutive postmenopausal women (mean Reynolds Risk Score 13±3.9%) with symptoms suggestive of CAD were prospectively enrolled. Each patient underwent CA, cardiac magnetic resonance (CMR), dobutamine stress echocardiography (DSE), and single-photon emission computed tomography (SPECT) within 7±3 days. 424 women (mean 61±7 years) completed the invasive and non-invasive test protocols and were followed up for 4±1 years. Anatomically obstructive coronary artery disease (≥50% diameter stenosis) was present in 157 women (37%).

Results: The combination of two stress imaging modalities significantly increased the positive predictive values (PPV) to 90%, 88% and 87% for CMR/DSE, DSE/SPECT and CMR/SPECT, respectively. For patients with negative combined test results, the survival analysis showed a 4-year cumulative event-free survival rate of 96-97% for all combinations. This new approach is cost effective due to the resulting reduction in unnecessary CAs (with potential side effects and corresponding therapies) as well as reducing hospitalization time.

Conclusions: In symptomatic postmenopausal women, combination of two negative stress imaging results significantly increases the PPV for detection of CAD and excludes future cardiovascular events with high accuracy. This approach may be applied to improve the prognostic precision of non-invasive CAD tests and to avoid unnecessary CAs.

P259 | BEDSIDE
Noninvasive compound ultrasound elastography for vulnerable plaque detection: in vivo validation

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Purpose: Carotid stenosis with plaque rupture is one of the main underlying causes of stroke. Key issue in the risk assessment is identification of the plaque prone to rupture. We developed a noninvasive method to estimate deformation (strain) in a carotid plaque. In this study the relation between measured strain and histological plaque vulnerability was assessed.

Methods: Raw ultrasound radio-frequency (RF) data were recorded in vivo of 18 severely stenotic (>70%) carotid arteries of symptomatic patients before carotid endarterectomy (CEA). Radial strains in each vessel wall were estimated with compound elastography in a transversal plane at the site of highest stenosis using dedicated signal-processing algorithms that combined RF data from three different acquisition angles. To record at the multiple angles without repositioning the used LS-13 linear array transducer, a Medison Acuvix V10 ultrasound system with a custom made imaging sequence was used. For each plaque the percentage of plaque area with strain values above 1.5% was determined. After CEA, the segments of highest stenosis were cut and histologically stained. The sensitivity and positive predictive value (PPV) of the strain area parameter were determined for the detection of a thin fibrous cap, a large lipid pool, a high concentration of superficial macrophages, and a lack of smooth muscle cells (SMCs).

Results: Table 1 shows the results for the 18 plaques. As shown the estimated strains are clearly related to plaque vulnerability features. The highest sensitivity and PPV were observed for thin fibrous caps and superficial macrophages: 80% and 80%, and 100% and 100%, respectively.

Table 1. Sensitivity and positive predictive value (PPV) for the detection of 5 histological features of plaque vulnerability using the strain area parameter

<table>
<thead>
<tr>
<th>Plaque vulnerability feature</th>
<th>Sensitivity (%)</th>
<th>PPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipid pool</td>
<td>80</td>
<td>67</td>
</tr>
<tr>
<td>Thin fibrous cap</td>
<td>80</td>
<td>89</td>
</tr>
<tr>
<td>High macrophage concentration</td>
<td>70</td>
<td>56</td>
</tr>
<tr>
<td>Superficial macrophages</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Low SMCs concentration</td>
<td>70</td>
<td>78</td>
</tr>
</tbody>
</table>

Conclusions: Within an in vivo setting, we confirmed that compound elastography provides a validated noninvasive assessment of plaque vulnerability features.

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Impact of chronic kidney disease on carotid atherosclerotic plaque prevalence and morphology: results from the high-risk plaque bioimage study

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Purpose: Ischemic stroke risk is higher among those with versus without chronic kidney disease (CKD). Whether this is attributable to differences in the prevalence or morphology of carotid atherosclerosis remains unknown.

Methods: In the High-Risk Plaque (HRP) Bioimage study, 5875 asymptomatic adults underwent multimodality non-invasive imaging for evaluation of subclinical