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**ALTERED STRUCTURE AND REDUCED DISTENSIBILITY OF CAROTID ARTERY IN DAHL SALT-SENSITIVE RATS**

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The structural basis of reduced arterial distensibility in Dahl salt-sensitive (DS) rats was investigated.

3-month old male DS rats received normal (0.7% NaCl) or high-sodium (2% NaCl) diet for 3 months. Dahl salt-resistant (DR) rats on normal or high-sodium diet were controls. Pressure-volume (distensibility) relationships were measured in excised, in vitro perfused segments of right carotid arteries (CA). The left CA of rats was perfused in situ with papaverine followed by fixative at 100 mmHg and then embedded for morphometric measurements.

The average monthly tail SBP of DS rats on normal and high-sodium diet, 125±2 (N=10) and 142±4 (N=10) mmHg, were increased (p<0.05 and <0.01), compared to that of DR rats, 116±2 (N=10) and 115±2 (N=10). Compared to controls, CA pressure-volume curves of DS rats on normal and high-sodium diet were shifted toward the pressure axis (p<0.05 for both comparisons), but stress-strain relationships of CA were similar in DS and DR rats. Reduced distensibility of CA of DS rats was accompanied by increased lumen diameter (909±24 μm, mean±SE, N=15, vs. 805±34, N=18, p<0.01) and increased thickness of media (64±3 μm vs. 54±3, p<0.02) and of elastic lamellae (1.1±0.06 μm, N=11, vs. 0.7±0.04, N=11, p<0.05). Wall-to-lumen ratio remained unchanged. High-salt diet had no effect on either distensibility or dimensions of CA in DS and DR rats.

Reduced distensibility of CA in DS rats is due to dilatation not fully compensated for by increased medial thickness. Altered structure and function of CA in DS rats are either genetically determined or adaptation to salt-sensitivity occurs also on “normal” sodium diet.

**Key Words:** Hypertension, Sodium, Remodeling

**P-87**

**REDUCED DISTENSIBILITY AND ALTERED STRUCTURE OF ARTERIES IN SALT-FED RATS**

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The role of physiologically meaningful high-sodium diet in the pathogenesis of age-related arterial stiffening was investigated.

Adult male Sprague-Dawley rats were fed 2% NaCl diet for 3 or 6 months; rats fed 0.7% NaCl diet were controls. Pressure-volume (distensibility) relationships were measured in excised, in vitro perfused segments of right carotid artery (CA) and of 2nd order mesenteric arteries (MA). The left CA and the remaining MA of rats were perfused in situ with papaverine followed by fixative at 100 mmHg, and then embedded in epoxy for morphometric measurements.

The average tail SBP and in subgroups of rats the directly measured daily MAP of salt-fed rats at 3 and 6 months were unchanged. At 3 months, there was dilatation of the CA (lumen diameter, Ld, μm, mean±SE: 831±20, N=17, vs. 775±16, N=15, p<0.05) and of MA (Ld: 248±8, N=14, vs. 235±4, N=17, p<0.02) of salt-fed rats, without a change in distensibility. At 6 months, the lumen diameter of the CA of salt-fed rats returned to control value (inward remodeling), and its wall-to-lumen ratio (W/L) was unchanged; CA distensibility remained unchanged. At 6 months, there was further dilatation (Ld: 267±8, N=14, p=0.01), reduced W/L (p<0.01), and reduced distensibility (p=0.01) of MA of salt-fed rats.

Time is an independent variable in the development of structural vascular changes in salt-fed rats. There are regional variations in the structural and functional adaptation of arteries to high-sodium diet. Dilatation of arteries without compensatory inward remodeling or medial hypertrophy leads to reduced distensibility and may ultimately result in systolic hypertension.

**Key Words:** Systolic Hypertension, Sodium, Remodeling

**P-88**

**TIME IS AN INDEPENDENT VARIABLE IN THE DEVELOPMENT OF STRUCTURAL VASCULAR CHANGES IN SALT-FED RATS**

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The hypothesis that long-term administration of physiologically relevant high-sodium diet to rats leads to the development of structural vascular changes that predispose to hypertension was tested.

Adult male Sprague-Dawley rats were fed 2% NaCl diet for 3 or 6 months; rats fed 0.7% NaCl diet were controls. Then, the systemic circulation of rats was perfused with papaverine followed by fixative at 100 mmHg. The junction of mesentery and small intestine, the renal cortex, and segments of left carotid artery (CA), thoracic aorta, and 2nd order mesenteric arteries (MA) were embedded in paraffin or epoxy for morphometric measurements.

The average monthly tail SBP and in subgroups of rats the directly measured daily MAP of salt-fed rats at 3 and 6 months were unchanged. The only morphometric change after 3 months of high-sodium diet was dilatation of CA and 2nd order MA (p<0.05). At 6 months, in salt-fed rats: 1. the wall-to-lumen ratio (W/L) of small mesenteric resistance arteries (50-100μMOD) was increased (8.8±0.3 vs. 8.2±0.3, p<0.05, mean±SE, N=14 vs. 10, p<0.05); 2. W/L of renal cortical resistance arteries was decreased (7.5±0.2 vs. 8.4±0.3, N=12 vs. 10, p<0.05); 3. lumen diameter of CA returned to control value (inward remodeling); 4. 2nd order MA dilated further (lumen diameter: 267±8 vs. 246±7 μm in controls, N=14 vs. 10, p<0.01); and 5. the dimensions of aorta remained unchanged.

A 3-fold increase in dietary sodium intake applied long enough will have significant effect on the structure of arteries. There are important regional and segmental variations in the long-term adaptation of arteries to high-sodium diet.

**Key Words:** Diet, Remodeling, Sodium

**P-89**

**CHANGES IN PULSE WAVE VELOCITY IN HYPERTENSIVE PATIENTS TREATED WITH PERINDOPRIL FOR 48 MONTHS**


Pulse wave velocity (PWV) is a marker of arterial compliance. Studies concerning long term effects of antihypertensive treatment on PWV are very few. To evaluate changes in PWV due to antihypertensive treatment and its relationship with systolic (SBP) and diastolic blood pressure (DBP) decrease, 22 untreated hypertensive patients (18 women and 4 men) from 55 ± 9 years (range 39 - 70) were studied with PWV (COMPLIOR®), before treatment and throughout 48 months. All patients received treatment with perindopril (4-8mg/day) through the study. Statistical analysis: ANOVA with α = 0.05. SBP, DBP and PWV showed a significant decrease from baseline to 48 months (p < 0.05). The reduction in PWV at 48 months was of more magnitude than the decrease either in SBP or in DBP (p < 0.05). Antihypertensive treatment with perindopril results in decrease of PWV relatively independent from its effect on blood pressure decrease. In conclusion, antihypertensive treatment with perindopril during 48 months results in
a substantial and significant reduction in PWV relatively independent from decrease in blood pressure.

Key Words: Arterial Compliance, ACE Inhibitors, Pulse Wave Velocity

P-90

ASSESSMENT OF IMMEDIATE TEST REPEATABILITY OF ARTERIAL STIFFNESS INDEX MEASURED BY CARDIOVISION® MS-2000

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Diminished arterial elasticity is an early indicator of vascular disease. The CardioVision® MS-2000 (IMDP, Las Vegas, NV) is a noninvasive device that uses cuff pressure to measure vascular dynamics, including systolic, diastolic, mean and pulse pressure, heart rate, and arterial stiffness index (ASI). Arterial stiffness index is derived from the pulse wave pattern of oscillometric brachial artery pressure. To determine the immediate test repeatability of the CardioVision® MS-2000, 51 healthy hospital employees had five sitting measurements of the arterial stiffness index recorded after a 5 to 10 minute period of rest. Their mean age was 37 years and 33% were males. The mean value and standard deviation (Std Dev) for each group is shown in the table below:

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASI 1</td>
<td>41.2</td>
<td>17.1</td>
</tr>
<tr>
<td>ASI 2</td>
<td>40.7</td>
<td>13.3</td>
</tr>
<tr>
<td>ASI 3</td>
<td>37.7</td>
<td>12.0</td>
</tr>
<tr>
<td>ASI 4</td>
<td>40.6</td>
<td>17.1</td>
</tr>
<tr>
<td>ASI 5</td>
<td>39.7</td>
<td>12.3</td>
</tr>
</tbody>
</table>

We computed an intraclass correlation coefficient of 0.693, which is the measure of consistency or agreement of arterial stiffness index values within cases. Using the average of the first three measurements together and comparing it to the average of all five measurements the correlation coefficient was 0.893. When comparing the average of the last three measurements together to the average of all five measurements, the correlation coefficient was 0.894. When comparing the average of the first three to the average of the last three, we calculated a correlation coefficient of 0.656. These data show moderate repeatability of serial measurements and supports the recommendation of taking the average of five measurements of ASI as the value for a single visit.

Key Words: Arterial Compliance, Repeatability, Noninvasive Monitoring

P-91

EFFECT OF CAFFEINE ON LARGE AND SMALL ARTERY COMPLIANCE

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Decreased artery compliance is strongly associated cardiovascular disease. Although caffeine is known to acutely increase blood pressure (BP), effect of caffeine on artery compliance is not well defined. We examined change in large artery elastic index (SAEI) and small artery elastic index (SAEI) in response to caffeine. The study is designed as a single-blind crossover study in healthy volunteers. The study group consisted of 16 subjects (9 males and 7 females) with age between 21 and 62 (mean 35 ± 12.6) years. Study was conducted after 12-hour abstinence of caffeine containing products. Systolic BP (SBP), diastolic BP (DBP), LAEI, SAEI, and systemic vascular resistance (SVR) were measured using HDI/Pulse wave CR-2000 non-invasively from radial artery waveforms. Measurements were made at predrug baseline, 20, 40, and 60 minutes after placebo or caffeine (200mg) consumption. The results at baseline and 60 minutes postdrug are summarized in following table.

<table>
<thead>
<tr>
<th>Test</th>
<th>SBP</th>
<th>DBP</th>
<th>LAEI</th>
<th>SAEI</th>
<th>SVR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>114 ± 8</td>
<td>65 ± 8</td>
<td>15 ± 4</td>
<td>7.1 ± 2</td>
<td>1214 ± 106</td>
</tr>
<tr>
<td>Placebo</td>
<td>111 ± 7</td>
<td>66 ± 10</td>
<td>16.8 ± 3</td>
<td>8 ± 2.3</td>
<td>1263 ± 155</td>
</tr>
<tr>
<td>Baseline</td>
<td>113 ± 11</td>
<td>66 ± 9</td>
<td>16.3 ± 3</td>
<td>7.5 ± 2.1</td>
<td>1279 ± 173</td>
</tr>
<tr>
<td>Caffeine</td>
<td>*120 ± 10</td>
<td>*71 ± 10</td>
<td>15.9 ± 3</td>
<td>*6.3 ± 2.9</td>
<td>*1368 ± 208</td>
</tr>
</tbody>
</table>

Values are (Mean ± SD). *P < 0.05 from baseline

This study showed that caffeine decreased small artery compliance resulting elevated BP and SVR. Caffeine does not have significant effect on the compliance of large arteries. The increased arterial stiffness in response to caffeine may have clinical significance. Long-term use of caffeine might contribute to hypertension and increased cardiovascular disease.

Key Words: Artery Compliance, Caffeine, Blood Pressure

P-92

SYSTEMIC ARTERIAL COMPLIANCE IN PATIENTS WITH HIGH AND LOW RENIN ESSENTIAL HYPERTENSION

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The aim was to evaluate the systemic arterial compliance (SAC) in patients with essential arterial hypertension (AH) and different plasma total renin (PTR) levels.

29 patients with moderate to severe AH according to their plasma total renin level were divided in 2 groups: 1st -11 patients with PTR level > 400 ng/l; 2nd -18 patients with PTR level < 300 ng/l. Plasma renin concentration was measured by immunoradiometric assay with 2 monoclonal antibodies to active renin (plasma treated with trypsin). All patients were done carotid applanation tonometry.

Patients of the 1st group characterized higher pulse blood pressure (68 ± 6 vs 44 ± 7 mm Hg, p < 0.05) and lower SAC (7,6 ± 0.8 vs 10,2 ± 0.7 ml/mmHg X 10, p < 0.05), but the same mean systolic and diastolic blood pressure (178 ± 14,5/100 ± 7 vs 157 ± 12,3/105 ± 14 mm Hg, NS).

In spite of equal systolic and diastolic blood pressure levels patients with high PTR level had worse large artery mechanical properties, than patients with normal or low PTR level.

Key Words: Renin, Compliance, Hypertension