Key Words: Large artery elasticity index; Windkessel model; athletic training

B023

IMPACT OF ARTERIAL STIFFNESS ON CARDIOVASCULAR DISEASE IN RENAL TRANSPLANT RECIPIENTS

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Objective: To test the hypothesis whether reduced carotid artery distensibility is a predictor of cardiovascular disease in patients after renal transplantation.

Design and Methods: 61 asymptomatic renal transplant recipients were studied between July 1990 and July 1992, 3 to 6 months after transplantation. The mean duration of follow-up was 95±2 months (mean±SEM). At entry, vessel wall movements of the common carotid artery were recorded using a pulsed multigate doppler system, blood pressure was measured by sphygmomanometry. 19 cardiovascular events (CVE) occurred during the follow-up, in 6 cases leading to death. Blood pressure was not different between patients with and without CVE (144±4/85±2 mmHg versus 145±2/87±2 mmHg, n.s.).

Results: The distensibility of the common carotid artery was significantly lower in patients with CVE than in those without CVE (12.5±1.0 10-3/kPa versus 17.1±0.8 10-3/kPa, p<0.005). Enddiastolic diameter of the common carotid artery was not significantly different between both groups (7.7±0.9 mm versus 7.2±1.0 mm, p=0.09). Cox regression analysis showed that carotid artery distensibility was a strong independent predictor of cardiovascular disease (p=0.005). The enddiastolic diameter (p=0.48), systolic (p=0.34) and diastolic (p=0.96) blood pressure levels and age (p=0.20) were not significant predictors of cardiovascular disease in the Cox regression analysis.

Conclusions: The data show that the distensibility of the common carotid artery is a strong independent predictor of cardiovascular disease in renal transplant recipients.

Key Words: Renal transplantation; arterial distensibility; cardiovascular disease

B024

INCREASED MUSCLE SYMPATHETIC NERVE ACTIVITY CONTRIBUTES TO DISTURBED LARGE ARTERY DISTENSIBILITY IN RENAL TRANSPLANT PATIENTS

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In renal transplant recipients (RTX) both increased sympathetic nerve activity and disturbed mechanical vessel wall properties of large arteries are observed. To investigate a possible relation between the two, we measured in RTX receiving cyclosporine (RTX-CSA, n=16) or tacrolimus (RTX-FK, n=16) and in healthy volunteers (CTR, n=10) blood pressure (MAP, automatic sphygmonanometer), muscle sympathetic nerve activity (MSNA, microneurography) and distensibility coefficients of the brachial and carotid arteries (DC bra, DC car, pulsed doppler). Data are mean±SEM. There was a significant correlation between DC bra and MSNA (r=-0.46, p<0.01), but not between DC car and MSNA (r=-0.16, n.s.). The correlation between DC bra and MSNA remained statistically significant on separate analysis of RTX-CSA and RTX-FK and after correction for arterial diameter, blood pressure, graft function, age, sex and smoking habits by stepwise multiple regression analysis.

The results show that increased sympathetic nerve activity in RTX can adversely influence mechanical vessel wall properties of muscular type arteries. In contrast, the results failed to demonstrate an effect of MSNA on mechanical properties of elastic type arteries.

Key Words: Renal transplantation; sympathetic nervous system; arterial distensibility

B025

LARGE ARTERY VESSEL WALL PROPERTIES ARE IMPAIRED IN PATIENTS WITH SYSTEMIC SCLERODERMA

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Arterial hypertension as well as morphologic alterations of small arteries and the endothelium are common manifestations of systemic scleroderma. However, whether functional properties of large arteries are affected is not clear. We studied endothelial function and distensibility of large arteries in patients with systemic scleroderma and healthy control subjects.

In 12 patients with systemic scleroderma (SC, age 51±14 years) and 12 healthy controls (CON) matched for age, sex and blood pressure flow-mediated (FMD) and nitroglycerin-induced (NMD) vasodilation of the brachial artery and distensibility coefficient (DC) of the carotid artery as well as aortal pulse wave velocity (PWV) were determined using a
multigate pulsed doppler device (echo-tracking) and the Complior system.

<table>
<thead>
<tr>
<th>SC</th>
<th>CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP/DBP (mmH)</td>
<td>132 ± 4/76 ± 2</td>
</tr>
<tr>
<td>FMD (%)</td>
<td>6.1 ± 1.5*</td>
</tr>
<tr>
<td>NMD (%)</td>
<td>20.0 ± 3.0</td>
</tr>
<tr>
<td>carotid diameter (mm)</td>
<td>6.4 ± 1.5</td>
</tr>
<tr>
<td>carotid DC (10^−3/kPa)</td>
<td>16.4 ± 1.9*</td>
</tr>
<tr>
<td>aortal PWV (m/s)</td>
<td>12.1 ± 1.2*</td>
</tr>
</tbody>
</table>

Data are mean±SEM *p<0.01 vs. CON

Flow-mediated vasodilation—but not nitroglycerin-induced dilation—of the brachial artery is impaired in patients with systemic scleroderma. Additionally, distensibility of the carotid artery and systemic compliance measured as pulse wave velocity are reduced. Endothelial dysfunction and reduced elastic vessel wall properties may contribute to the increased cardiovascular morbidity and mortality in systemic scleroderma.

Key Words: Arterial distensibility; endothelial function; pulse wave velocity; systemic scleroderma

**B026**

LOSS OF OSCILLATORY ARTERIAL COMPLIANCE IS DETECTABLE IN YOUNG PATIENTS BY RADIAL ARTERY PULSE CONTOUR ANALYSIS

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**Background:** Arterial compliance (AC) is an index of the capacity of vessels to accommodate changes in blood pressure (BP). It has been postulated that the loss of AC may precede clinical manifestations of hypertension, and that AC may have prognostic value in early identification of patients (pts) at risk. A noninvasive method has been developed to determine large (capacitive) and small (oscillatory) AC from the radial artery (RA) pulse pressure contour by modified Windkessel analysis. In this study we evaluated the ability to detect changes in AC in young pts at risk for hypertension using this method.

**Methods:** RA waveforms were obtained in 54 pts (age 33 ± 8 years, range 22–61) using a tonometric device combined with oscillometric BP measurements. Of these, 23 pts had a family history of hypertension (mean age = 32 years), and 31 had no known family history (mean age = 33 years), and 53 pts were normotensive (BP<140/90).

**Results:** Values for large AC and small AC for the entire patient population ranged from 0.670 to 1.94 and 0.025 to 0.147 ml/mm Hg, respectively. Small (oscillatory) AC correlated negatively with age for the entire set (p=0.011), and tended to be lower in the patients with family history of hypertension. Large artery compliance was constant with age in this young cohort. An inverse relationship between small AC and diastolic and mean BP was observed.

**Conclusions:** This study suggests that the loss of small (oscillatory) AC may be the earliest detectable change in arterial properties, manifesting itself in people in their 20s and 30s before development of elevated BP. Loss of small AC may be accelerated in patients with positive family history.

Key Words: arterial compliance; Windkessel model; pulse pressure contour

**B027**

A PROSPECTIVE, RANDOMIZED, OPEN-LABEL, BLINDED ENDPOINT, PARALLEL GROUP PILOT STUDY COMPARING THE EFFECTS OF QUINAPRIL AND LOSARTAN ON ARTERIAL STIFFNESS IN PATIENTS WITH MILD TO MODERATE HYPERTENSION (AC/DC)

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**Background:** Increasing arterial stiffness is an important factor in hypertension. Angiotensin II plays a critical role in hypertension through stimulation of the AT1 receptor and consequent proliferation and hypertrophy of vascular smooth muscle and collagen deposition. Angiotensin II may also contribute to endothelial dysfunction and facilitate lipid deposition in the media of blood vessels—important events in the development of atherosclerosis. Thus, blockade of the renin-angiotensin system (RAS) improves vascular compliance and may reverse atherosclerosis. The ACE inhibitor quinapril (Q) effectively reduces blood pressure (BP) over 24 hours with once-daily dosing. Because it is highly lipophilic, Q penetrates tissue with rapid and profound effects on the RAS. Q has been shown to significantly improve arterial structure and function. In addition to ACE inhibition, the RAS may be blocked at the receptor. Losartan (L) is an AT1 receptor blocker; however, the effects of AT1 receptor blockade on arterial stiffness are unknown. This study is being conducted to determine the effect size and variability of ACE inhibition versus AT1 receptor blockade on arterial stiffness, BP, left ventricular mass and ventricular compliance.

**Methods:** Following a single-blind placebo run-in period, mild to moderately hypertensive adult patients who were not taking antihypertensive medication were randomized to Q(n=50) or to L (n=52). A forced-titration dosing regimen was begun as follows: Q 20 mg or L 50 mg (2 weeks), Q 40 mg or L 100 mg (2 weeks), Q 80 mg or L 100 mg (8 weeks). Doses were administered once each morning. With dosing complete, patients entered a 72-hour drug-free period. Arterial compliance and 24-hour ambulatory BP were measured following the placebo run-in period and at the end of the 12-week active treatment period. To compare residual drug effects, arterial compliance and 12-hour ambulatory BP were measured at the end of the 72-hour drug-free period. Left ventricular mass and ventricular compliance were evaluated by resting echocardiogram at the end of the placebo run-in period and at the end of the active treatment period. The last study participants have completed treatment and final results are pending analysis.

Key Words: ACE inhibitors; hypertension; quinapril; arterial compliance