
The Pulse of Asia

May 22–23, 2015, Shanghai, China

Guest Editor
Ji-Guang Wang, Shanghai

Contents

- Orals**
52 Abstracts O-01–O-33
- Posters**
67 Abstracts P-01–P-43

Program

May 22, 2015 (Intercontinental Shanghai Ruijin, Jin Yi Xuan)

15:45–16:00	Opening Remarks <i>Lisheng Liu</i> (Beijing, China), Honorary President, Chinese Hypertension League <i>Zhaosu Wu</i> (Beijing, China), President, Chinese Hypertension League <i>Byung-Hee Oh</i> (Seoul, Korea), President, The Pulse of Asia Society
16:00–18:00	Session 1: Technology and Methodology of Arterial Measurements Chairpersons: <i>Byung-Hee Oh</i> (Seoul, Korea), <i>Alberto Avolio</i> (Sydney, Australia), <i>Xiongjing Jiang</i> (Beijing, China)
16:00–16:30	<i>Michael O'Rourke</i> (Sydney, Australia) 'Central Haemodynamics and Cerebral Blood Flow'
16:30–16:50	<i>Masanori Munakata</i> (Sendai, Japan) 'Evidence-Based Evaluation of Two Major Arterial Stiffness Measures in Japan: Brachial-Ankle PWV and Cardio-Ankle Vascular Index'
16:50–17:10	<i>Alberto Avolio</i> (Sydney, Australia) 'Arterial Calcification and Stiffness'
17:10–17:30	<i>Yan Li</i> (Shanghai, China) 'Sublingual Microcirculation: Perfused Capillary Density and Glycocalyx Width in Populations of Different Ethnicity'
17:30–18:00	Panel Discussion <i>Jue Li</i> (Shanghai, China), <i>Masahisa Shimpo</i> (Tochigi, Japan), <i>Hirofumi Tomiyama</i> (Tokyo, Japan), <i>Shouling Wu</i> (Tangshan, China)
18:00–18:30	Lifetime Achievement Award Chairpersons: <i>Lisheng Liu</i> (Beijing, China), <i>Ningling Sun</i> (Beijing, China)
19:00–21:00	Welcome Dinner (Art Deco)

May 23, 2015 (Intercontinental Shanghai Ruijin, Jin Yi Xuan)

08:00–09:40	Session 2: Arterial Measurements for Prediction and Prevention Chairpersons: <i>Hirofumi Tomiyama</i> (Tokyo, Japan), <i>Jun Tao</i> (Guangzhou, China)
08:00–08:20	<i>Jacques Blacher</i> (Paris, France) 'Blood Pressure Parameters and Pulse Wave Velocity for Cardiovascular-Renal Prevention'
08:20–08:40	<i>Chen-Huan Chen</i> (Taipei, Taiwan) 'Central Hypertension and the Management of Hypertension'
08:40–09:00	<i>James Sharman</i> (Tasmania, Australia) 'Central Haemodynamics for the Therapeutic Management of Hypertension'
09:00–09:20	<i>Hirofumi Tomiyama</i> (Tokyo, Japan) 'Pathophysiological Differences Between Conduit/Resistant Arterial Endothelial Function Tests in Hypertension'
09:20–09:40	Panel Discussion <i>Xiaoping Chen</i> (Chengdu, China), <i>Nanfang Li</i> (Urumuqi, China), <i>Sung-Ha Park</i> (Seoul, Korea), <i>Liangdi Xie</i> (Fuzhou, China)
09:40–10:00	Tea Break
10:00–12:00	Session 3: Guidance on Clinical Applications of Arterial Measurements Chairpersons: <i>Jeong-Bae Park</i> (Seoul, Korea), <i>Ji-Guang Wang</i> (Shanghai, China)
10:00–10:20	<i>Jan A. Staessen</i> (Leuven, Belgium) 'Vascular Complications Associated with MGP, a Vitamin-K Dependent Protein Synthesized in the Arterial Wall'
10:20–10:40	<i>Zhiming Zhu</i> (Chongqing, China) 'Chronic Caffeine Intake Antagonizes Salt Sensitive Hypertension Through Improvement of Renal Sodium Handling'

10:40–11:00	<i>Sung-Ha Park</i> (Seoul, Korea) 'Current Recommendations on the Use of Arterial Measurements in Cardiovascular Prevention'
11:00–11:20	<i>Jeong-Bae Park</i> (Seoul, Korea) 'Consensus Document on the Use of Morning Blood Pressure Monitoring in the Management of Hypertension in Asia'
11:20–11:40	<i>Ji-Guang Wang</i> (Shanghai, China) 'Specific Guidelines on the Use of Arterial Measurements'
11:40–12:00	Panel Discussion <i>Chen-Huan Chen</i> (Taipei, Taiwan), <i>Jinxiu Lin</i> (Fuzhou, China), <i>Jianjun Mu</i> (Xi'an, China), <i>Xinjuan Xu</i> (Urumuqi, China), <i>Hong Yuan</i> (Changsha, China)
12:00–12:45	Lunch (satellite) Symposium 1 (Fukuda Denshi) Chairperson: <i>Ji-Guang Wang</i> (Shanghai, China) Speaker: <i>Piyamit Sritara</i> (Bangkok, Thailand) 'Arterial Stiffness is an Independent Predictor of Cardiac Mortality in Asymptomatic Patients with Intermediate Atherosclerotic Risk Factors'
12:45–13:30	Lunch (satellite) Symposium 2 (Astra Zeneca) Speaker: <i>Ji-Guang Wang</i> (Shanghai, China) 'Comprehensive Management of Blood Pressure: Promote the Conception of 24 Hours ABPM' Speaker: <i>Liangdie Xie</i> (Fujian, China) 'Dual Management of Blood Pressure and Heart Rate'
13:30–15:10	Session 4: Free Communications 1: Basic Research on the Arterial System Chairpersons: <i>Kee Sik Kim</i> (Daegu, Korea), <i>Ding-Liang Zhu</i> (Shanghai, China)
13:30–14:00	<i>Pingjin Gao</i> (Shanghai, China) 'Inflammatory and Metabolic Interaction for Arterial Injury'
14:00–15:10	Oral Communications (7, 8'+2' each)
15:10–15:30	Tea Break
15:30–17:10	Session 5: Free Communications 2: Clinical and Population Research on the Arterial System Chairpersons: <i>Masahisa Shimpo</i> (Tochigi, Japan), <i>Yuqing Zhang</i> (Beijing, China)
15:30–16:40	Oral Communications (7, 8'+2' each)
16:40–17:10	<i>Murray Epstein</i> (Miami, FL, USA) 'Hyperkalemia as a Constraint for Renin-Angiotensin-Aldosterone Inhibition; Current Status and Emerging Treatment Paradigms'
17:10–17:40	Guided Poster Presentations
	Central Haemodynamics: <i>James Sharman</i> (Sydney, Australia)
	Pulse Wave Velocity: <i>Jacques Blacher</i> (Paris, France)
	Endothelial Function: <i>Yan Li</i> (Shanghai, China)
	Vascular Biology: <i>Zhiming Zhu</i> (Chongqing, China)
	Hypertension: <i>Jianjun Mu</i> (Xi'an, China)
17:40–18:00	Closing and Award Ceremony
	Best Oral and Poster Presentation Award Chairpersons: <i>Zhaosu Wu</i> (Beijing, China), <i>Ding-Liang Zhu</i> (Shanghai, China)
Adjourn	
19:00–21:00	Presidential Dinner (By invitation)

Oral Communications

Oral Communication Session 4:

Xuechen Hu	The Influence of Remote Ischemic Preconditioning on Blood Pressure and Vascular Protective Effect in Healthy Young Volunteers
Hsin-Fu Lin	Arterial Stiffening and Wave Reflections Induced by Difference Eccentric Exercise
Qun Li	Skin-Derived Mesenchymal Stem Cells Alleviate Atherosclerosis via Modulating Macrophage Function
Chisa Matsumoto	Gender Difference of the Association of Serum Polyunsaturated Fatty Acids Profiles with the Evolution of Hemodynamics
Xiaodong Li	Renal Denervation Attenuates Angiotensin II-Induced Cardiovascular Remodeling
Sungha Park	Nocturnal Blood Pressure is Associated with Localized Retinal Nerve Fiber Layer Defects on Optical Coherence Tomography
Chengchao Ruan	Complement-Mediated Perivascular Inflammation Contributes to Vascular Injury in Hypertensive Mice
Yuanyuan Zhang	Increased Plasma Neopterin Levels are Associated with Reduced Endothelial Function and Arterial Elasticity in Hypertension

Oral Communication Session 5:

Xiaoping Chen	Effects of Hydrochlorothiazide and Indapamide Combined with Losartan on Renal Function and Arterial Stiffness in Elderly Hypertensive Patients
Yuko Ohno	Arterial Stiffness is Associated with Left Ventricular Geometry and Diastolic Dysfunction in the Elderly
Yibang Cheng	Interrelationship Between Brachial-Ankle and Carotid-Femoral Pulse wave Velocity and Their Associations with Cardiovascular Risk Factors and Target Organ Damage
Masahisa Shimpo	To Prevent Cardiovascular Event in Asian Population: Systemic Hemodynamic Atherothrombotic Syndrome (SHATS) as a Novel Disease entity
Zhifang Li	The Distribution and Major Influencing Factors for Orthostatism Brachial-Ankle Pulse Wave Velocity of the Elder People
Chen-huan Chen	Central Aortic Reservoir-Wave Analysis Predicted 20-Year Cardiovascular Mortalities Independently of Wave Reflection and Arterial Stiffness: A Community-Based Study
Tongshuai Guo	Relationship Between Circadian Variation of Blood Pressure and Urinary Sodium Excretion Changes in Patients with Salt-Sensitive Hypertension
Changsheng Sheng	Pulse Waves in the Lower Extremities as a Diagnostic Tool of Peripheral Arterial Disease and Predictor of Mortality in Elderly Chinese

Abstracts

Orals

O-01

Arterial Calcification and Stiffness

Alberto Avolio

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Stiffening of arteries occurs when the pressure load is transferred from distensible elastic structures to less distensible components in the arterial wall. The causes are multifactorial and complex, involving both cellular and non-cellular mechanisms. While the fatiguing effects of unceasing mechanical pulsations contribute to passive mechanisms, which are essentially not reversible, modifications of the extracellular matrix driven by molecular process also play a significant role, and have the potential to be reversed.

Arterial calcification is generally considered to be due to the phenotypic change of smooth muscle cells where they undergo functional transdifferentiation leading to osteogenesis, resulting in deposition of calcium in the media of the arterial wall. A significant connection between loss of elasticity and arterial calcification is that fracture of elastin fibres is associated with the signaling pathway for the smooth muscle cell to undergo transdifferentiation from a contractile phenotype to a osteochondrogenic phenotype, with elastocalcinosis as a downstream effect, resulting in increased wall stiffness.

In experimental investigations, increase in arterial stiffness mediated through calcification is associated with administration of vitamin D and nicotine. Elevated calcification is also a hallmark of chronic kidney disease. However, large changes in vascular calcium content are required for detectable changes in aortic functional stiffness. In rodent models, a 6–8 fold increase in aortic calcification was associated with a 33% increase in aortic pulse wave velocity and 20% reduction in elastin density. In these models, calcium-dependent arterial stiffness was found to be reduced by angiotensin-converting enzyme inhibition.

O-02

Central Aortic Reservoir-Wave Analysis Predicted 20-Year Cardiovascular Mortalities Independently of Wave Reflection and Arterial Stiffness: A Community-Based Study

Hao-Min Cheng^{a,h}, Shao-Yuan Chuang^c, Shih-Hsien Sung^b, Harold A. Spurgeon^d, Chih-Tai Ting^e, Samer S. Najjar^d, Edward G. Lakatta^d, Frank C.P. Yin^f, Pesus Chou^h, Chen-Huan Chen^{a,g,h}

^aDepartment of Medical Education, ^bDepartment of Medicine and Taipei Veterans General Hospital, Taipei, Taiwan; ^cDivision of Preventive Medicine and Health Service, Research Institute of Population Health Sciences, National Health Research Institutes, Miaoli, Taiwan; ^dThe Laboratory of Cardiovascular Science in the National Institute on Aging Intramural Research Program in Baltimore, MD, USA; ^eCardiovascular Center, Taichung Veterans General Hospital, Taichung, Taiwan; ^fDepartment of Biomedical Engineering, Washington University, St. Louis, MO, USA; ^gCardiovascular Research Center, and ^hDepartment of Public Health, National Yang-Ming University, Taipei, Taiwan

Central aortic pressure waveforms contain incremental prognostic value in addition to traditional cardiovascular risk factors. Recently, pressure wave propagation theory and its derived parameters, pulse wave velocity (PWV) and backward wave amplitudes (Pb) has been demonstrated to provide incremental value in addition to currently accepted biomarkers in various study population. Subsequently, parameters calculated based on the reservoir-wave concept, combining elements of wave transmission and Windkessel models of arterial pressure generation, has been shown to predict clinical outcomes in elderly patients with hypertension. However, whether the above parameters provide incremental prognostic value in prediction of cardiovascular events is unknown. Carotid blood pressure waveforms were measured in a community-based survey of 1172 patients (47% women, mean age 52±13 years old, range 30–79 years), which were decomposed into their forward wave amplitudes (Pf), backward wave amplitudes (Pb), and a reflection index (RI, = [Pb/(Pf+Pb)]). Reservoir-wave analysis was performed and indices of arterial function, including the systolic and diastolic rate constants, were derived. During a median follow-up of 19.8 years, 315 (26.9%) deaths occurred, including 84 (7.2%) cardiovascular origins. In multivariate analysis accounting for age, sex, body mass index, systolic blood pressure, fasting glucose, HDL cholesterol, LDL cholesterol, smoking, PWV and Pb, reservoir-wave parameters:

systolic rate constant (Wald $X^2 = 14.60$, $p < 0.0001$), diastolic rate constant (Wald $X^2 = 20.25$, $p < 0.0001$), and reservoir pressure integral (Wald $X^2 = 17.26$, $p < 0.0001$), could independently predict cardiovascular mortality. Moreover, to predict cardiovascular mortality, the addition of diastolic rate constant to the above multivariate model resulted in significant net incremental improvement in the risk assessment (net reclassification index = 0.14; $p = 0.002$). In conclusion, reservoir-wave approach could predict long term outcomes in general population independently of arterial propagation parameters.

O-03

Effects of Hydrochlorothiazide and Indapamide Combined with Losartan on Renal Function and Arterial Stiffness in Elderly Hypertensive Patients

Xiaoping Chen, Si Wang, Kai Liu, Hang Liao, Yong Wang

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Objective: To compare the effects of hydrochlorothiazide and indapamide combined with losartan on renal function and arterial stiffness in elderly hypertensive patients.

Methods: One hundred twenty two elderly patients with hypertension (50% male, mean age 69.52±10.55 years old) were randomized to treatment with 12.5 mg/d of hydrochlorothiazide (group 1, $n = 62$) or 1.5 mg/d of indapamide (sustained release) (group 2, $n = 60$) combined with losartan 50 mg/d after treatment only with losartan 50 mg/d for two weeks and failed to reach a target blood pressure (140/90 mm Hg). In addition to the office blood pressure at baseline and the 2 weeks, 6 weeks, 14 weeks and 26 weeks of follow up, 24 hour ambulatory blood pressure, creatinine, estimated glomerular filtration rate (eGFR), Urine albumin creatinine ratio (UACR), neutrophil gelatinase-associated lipocalin (NGAL) and pulse wave velocity (PWV), renal resistive index (RRI) were collected at baseline and the 26 weeks of follow up.

Results: Blood pressure decreased equally in the two groups at each follow-up. Before and after treatment, there were no statistically significant differences in the 24 hour average blood pressure, mean blood pressure during the day and night and creatinine, eGFR, UACR between the two groups. But after treatment, NGAL in group 2 was significantly lower than in group 1 (26.93±11.41 vs 32.52±16.50 ng/ml, $P < 0.001$), and decreased more significantly compared to the baseline (29.79±8.33 vs 16.39±7.54 ng/ml, $P < 0.001$). At the same time, PWV (2.22±0.75 vs 1.64±0.63 m/s, $P < 0.001$) and RRI (0.078±0.028 vs 0.038±0.015, $P < 0.001$) in group 2 decreased more significantly from the baseline than in group 1.

Conclusions: Indapamide combined with losartan can protect renal function and reduce vascular stiffness more effectively than hydrochlorothiazide combined with losartan in elderly hypertensive patients.

O-04

Interrelationship between Brachial-Ankle and Carotid-Femoral Pulse Wave Velocity and Their Associations with Cardiovascular Risk Factors and Target Organ Damage

Yi-Bang Cheng, Yan Li, Yi Zhang, Li-Hua Li, Chang-Sheng Sheng, Qi-Fang Huang, Ji-Guang Wang

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Background: Carotid-femoral pulse wave velocity (cfPWV) is currently the standard measure of aortic stiffness. Brachial-ankle PWV (baPWV) can be more conveniently measured with a cuff-oscillometric technique. We investigated the interrelationship between baPWV and cfPWV and their associations with cardiovascular risk factors and target organ damage.

Methods: Our study was conducted in the framework of comprehensive cardiovascular examinations in a workplace population living in a coast area, 300 kilometers south of Shanghai. BaPWV and cfPWV was measured using the Colin VP1000 (OMRON, Japan) and SphygmoCor (AtCor, Australia) devices, respectively. Mean intima-media thickness (IMT) at the right carotid artery was determined by an echo tracking system (Esaote, Italy). Echocardiography was performed with a Mylab 30 CV machine (Esaote, Italy). Pearson's correlation and single and multiple regressions were applied for analyses.

Results: The 954 participants (630[66.0%] men, mean [±standard deviation] age 42.6±14.2 years) included 203 (21.3%) hypertensive patients, of whom 89(9.4%) took anti-hypertensive medication. BaPWV and cfPWV averaged 13.4±2.7 and 7.3±1.6 m/s, respectively. In unadjusted analysis, baPWV was significantly ($P < 0.001$) associated with cfPWV in all subjects ($r = 0.75$) and in men ($r = 0.72$) and women ($r = 0.80$). BaPWV and cfPWV shared similar major determinants, such as age (both partial $r^2 = 0.11$) and systolic blood pressure (partial $r^2 = 0.51$ and 0.44 for baPWV and cfPWV respectively). BaPWV and cfPWV were significantly ($P < 0.001$) and similarly ($P \geq 0.29$) associated with carotid IMT ($r = 0.53$ and 0.50, respectively), left ventricular mass index ($r = 0.19$ and 0.15), E/A ratio ($r = -0.56$ and -0.53) and deceleration time of E velocity (DTE, $r = 0.43$ and 0.39). After adjustment for other common cardiovascular risk factors, all above associations became non-significant ($P \geq 0.15$), except for both PWVs with DTE (partial $r^2 = 0.19$ and 0.16, $P \leq 0.02$).

Conclusions: BaPWV and cfPWV were closely correlated, and had similar major determinants and associations with cardiovascular target organ damage, indicating that baPWV can be an alternative measure of arterial stiffness and surrogate of cardiovascular damage.

O-05**Central Hypertension and the Management of Hypertension***Chen-Huan Chen*

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Blood pressure (BP) is conventionally measured with a pressure cuff over an upper arm and a cutoff of 140/90 mm Hg in the office is the current criteria for diagnosing hypertension. Recently, out of office BP has been suggested as the reference standard for the management of hypertension, due to its better prognostic value over office BP.

However, the above BP parameters are all measured at brachial arteries and may be different from the central blood pressure (CBP) measured in the ascending aorta or carotid arteries. The individual discrepancies between CBP and peripheral BP may be substantial and highly variable, and may magnify during hemodynamic changes or after pharmacological interventions. Growing evidence suggests that central BP may be more relevant than peripheral BP in predicting target organ damage and cardiovascular outcomes, central and peripheral BP may respond differently to antihypertensive medication in randomized controlled trials, and end-organ changes after antihypertensive medication are more strongly related to changes in central BP than peripheral BP.

Currently, non-invasive CBP can be obtained with either tonometry-based or cuff-based techniques. Using an outcome-driven approach to examine the discriminatory ability of CBP for long-term cardiovascular outcomes, an operational threshold for CBP has been derived and validated in two independent Taiwanese cohorts. A CBP cutoff, 130/90 mm Hg, was characterized by a greater discriminatory power for long-term events, and can be considered to be implemented for the management of hypertension in routine daily clinical practice. CBP may have greater sensitivity and negative predictive value than peripheral BP in the diagnosis of hypertension. In the recently updated hypertension management guidelines, we have made a Level IIb recommendation that Measurement of CBP with a cutoff of 130/90 mm Hg is recommended when a diagnosis of hypertension is clinically suspected but cannot be established by current conventional BP criteria. The new recommendation is expected to increase the detection rate of hypertension and decrease the cardiovascular risk associated with hypertension.

O-06**Hyperkalemia as a constraint for Renin-Angiotensin-Aldosterone Inhibition: Current Status and Emerging Treatment Paradigms***Murray Epstein*

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Hyperkalemia, an often asymptomatic condition, is associated with an increased risk of mortality. Hyperkalemia has been shown to be prevalent and recurrent in patients with certain cardiorenal disorders including heart failure, chronic kidney disease (CKD), diabetes mellitus and/or hypertension. Current guidelines and quality metrics for these disease states recommend use of renin-angiotensin-aldosterone system inhibitors (RAASi) and mineralocorticoid receptor antagonists (MRAs). Ironically, treatment with these life-extending interventions frequently exacerbates the chronic risk for hyperkalemia, so many of the guidelines generally recommend adjusting or discontinuing them. Weighing the risk of hyperkalemia against the risk of discontinuing reno- and cardio-protective therapies can present a paradox to clinicians treating CKD and heart failure. Hyperkalemia will remain an issue with newer agents such as the angiotensin receptor neprilysin inhibitor LCZ-696. In the PARADIGM Heart Failure Study, hyperkalemia rates in the patient cohort treated with LCZ-696 remained high despite a carefully selected population (>5.5 mmol/l: 16.1%).

The potential availability of two polymer-based, non-systemic oral agents that sequester potassium in the gastrointestinal tract could obviate our concerns about hyperkalemia. Recent analyses of randomized studies suggest that both patiromer FOS and ZS-9 can both reproducibly lower serum potassium concentrations without inducing hypokalemia and help maintain potassium concentrations in the normal range in patients with heart failure taking renin-angiotensin-aldosterone system inhibiting drugs recommended by treatment guidelines. I recently presented data demonstrating that Patiromer FOS treatment reproducibly decreased serum K⁺ and that the decrease was sustained in the normal range for up to 52 weeks duration in hyperkalemic CKD patients on RAASi. Patiromer was well tolerated, with a low rate of discontinuations due to adverse events. Hopefully, the availability of new and safe therapies to treat hyperkalemia will enable clinicians to overcome the constraint of suboptimal dosing; and discontinuation of dosing, thereby allowing patients to continue with optimal therapeutic doses of both renin-angiotensin system inhibitors and mineralocorticoid receptor antagonists.

O-07

The Influence of Remote Ischemic Preconditioning on Blood Pressure and Vascular Protective Effect in Healthy Young Volunteers

Xuechen Hu, Xinzhu Tong, Bingbo Yu, Jiang He, Yan Li, Jun Tao*

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Background: Remote ischemic preconditioning (RIPC) refers to protective effect for a remote organ to following severe or lethal ischemic and hypoxia caused by short non-lethal ischemic conditioning for one organ. We designed a randomized clinical trail to identify the effect of RIPC on blood pressure and vascular function in healthy young volunteers.

Methods: 43 healthy, young, normotensive volunteers (aged 22.35 ± 1.54 years) were randomly assigned to RIPC group (23 individuals) or sham RIPC group (20 individuals). 42 volunteers completed 1-month follow-up (23 and 19 individuals respectively). All underwent a 1-month daily exposure to RIPC or sham RIPC (RIPC group: 200 mm Hg, 3×5 min; sham RIPC group: 20 mm Hg, 3×5 min). Assessment of blood pressure, vascular function (including pulse wave velocity (PWV), ankle brachial index (ABI), central blood pressure (CBP) and RHI) and miR-126 and miR-34a levels in peripheral blood mononuclear cells (PBMCs) were performed before, 7 days and 1 month after RIPC.

Results: The diastolic blood pressure (DBP) immediately after intervention in RIPC group was significantly decreased (59.78 ± 7.57 , 55.22 ± 5.59 , and 57.50 ± 4.79 in RIPC group; 63.08 ± 6.06 , 61.68 ± 5.97 and 60.58 ± 5.02 in sham RIPC group, between-group difference $P < 0.05$). The augmentation pressure (AP) (2.73 ± 3.10 , 2.09 ± 3.48 and 0.73 ± 3.71 in RIPC group; 4.11 ± 2.51 , 3.05 ± 2.66 and 4.11 ± 2.33 in sham RIPC group, $P < 0.05$) and augmentation index (Alx) (3.00 ± 10.68 , -0.05 ± 11.54 and -1.82 ± 10.40 in RIPC group; 9.84 ± 8.91 , 6.79 ± 7.51 and 9.74 ± 7.67 in sham RIPC group, $P < 0.01$) were significantly decreased too. MiRNA-126 level in RIPC group was significantly increased (1.59 ± 1.37 , 1.64 ± 1.37 , and 1.90 ± 1.97 in RIPC group; 0.86 ± 0.62 , 0.90 ± 1.15 and 0.70 ± 0.48 in sham RIPC group, $P < 0.05$).

Conclusions: Daily exposure to RIPC for 1 month may lower DBP and CBP, and elevate PBMC microRNA-126 level in healthy young volunteers. DBP was more sensitive to RIPC compared to SBP. CBP, especially AP and Alx, responded to RIPC earlier than peripheral vascular function. MicroRNA-126 has a vascular protective effect and may serve as new target of RIPC.

O-08

Arterial Stiffening and Wave Reflections Induced by Difference Eccentric ExerciseHsin-Fu Lin^{a,e}, Chun-Chung Chou^b, Hao-Min Cheng^{c,d}, Hirofumi Tanaka^e

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Eccentric exercise is known to induce muscle damage accompanied by sensations of stiffness and soreness of working muscles, which is mediated by the increase in inflammatory responses and consequent transient vasculature dysfunction.

Purpose: We tested the hypothesis that systemic eccentric exercise could evoke greater arterial stiffening than local eccentric resistance exercise, and determined whether such effects impose central hemodynamic burden following exercise.

Methods: Twenty apparently healthy young men (22 ± 1 yr) were randomly assigned into either the downhill running (DR) or eccentric resistance exercise (RE) groups. Peak oxygen uptake (VO_{2peak}) and one repetition maximum (1RM) of inclined leg press were determined prior to experiments. The DR group performed a 30-min downhill (-10° slope) running on the treadmill at a speed that could elicit 75% VO_{2peak} . The RE group performed eccentric muscle contractions on inclined leg press for 6 sets X 10 reps at 120% of 1RM. Carotid-femoral pulse wave velocity (cfPWV), wave reflection measures such as augmentation index (AI75), pressure magnitude of forward (Pf) and backward wave (Pb), reflected wave transit time (RWTT) and characteristic impedance (Zc) as well as creatine kinase (CK) and C-reactive protein (CRP) were measured pre-exercise, 90 minutes, 24, 48, and 72 hr post-exercise.

Results: Plasma CK concentrations were elevated from 24 to 72 hr post exercise ($p < 0.05$). CRP was also elevated from 24 to 48 hr in DR, and 48 hr in RE. Carotid-femoral PWV increased significantly 48 hr in both groups and remained elevated at 72 hr in DR. The increases in cfPWV were associated with the corresponding elevations in CRP in DR ($r = 0.70$, $p < 0.05$). There were no changes on wave reflection measures following exercise.

Conclusions: Both exercise modes induced transient arterial stiffening with more pronounced changes observed in downhill running. The effect on arterial stiffening was associated with systemic inflammatory responses, but did not produce any changes in arterial wave reflection parameters regardless of exercise modes.

O-09

The Distribution and Major Influencing Factors for Orthostatism Brachial-Ankle Pulse Wave Velocity of the Elder PeopleZhi-fang Li^a, Shou-ling Wu^b^aGraduate School of Hebei United University;^bDepartment of Cardiology, Affiliated Kailuan Hospital, Hebei United University, Tangshan, China

Objective: Brachial-ankle pulse wave velocity (baPWV), a direct measure of aortic stiffness, has become increasingly important for cardiovascular risk estimation. Previous studies about baPWV mainly researched based on supine-baPWV (s-baPWV). Actually, for some people, there may be a third or even more time in a day spent in standing position. However, no study has reported Orthostatism-baPWV (o-baPWV). The aim of the present study is to investigate the distribution and influencing factors of o-baPWV in a high Cardiovascular risk population—the elder people.

Methods: We gathered data from 1913 retired workers (66.84±6.45 years, 1255 men) selected with random sampling from the retired workers (age ≥60 years) of Tangshan Kaiuan company who received the health examination, in which o-baPWV, s-baPWV and basic clinical parameters were measured. Multivariate regression model were used to analyze the the influencing factors of o-baPWV.

Results: (1) The mean of o-baPWV of the Cohort were 3909.50 cm/s (male, 3990.97 cm/s VS female, 3754.10 cm/s; $P < 0.05$), significantly higher than the s-baPWV (1775.10 cm/s). With the increase of age, o-baPWV increased in both male and female (by every 5 years, P -trend < 0.05). (2) Multiple regression analysis showed that s-baPWV, Orthostatism heart rate, age, body mass index were not only linear correlated with o-baPWV, also were influencing factors for o-baPWV, and the corresponding odds ratio were 7.56 (95% CI 4.35~13.15), 2.36 (95% CI 1.46~3.39), 1.79 (95% CI 1.30~2.46), 0.48 (95% CI 0.33~0.71), respectively.

Conclusion: The mean o-baPWV of the Cohort were significantly higher than the supine-baPWV. With the growth of age, o-baPWV increased both in men and women. S-baPWV, age, Orthostatism heart rate, body mass index are influencing factors for o-baPWV. However, compared with s-baPWV, whether o-baPWV is a better indicator for cardiovascular risk estimation or not and its clinical significance are still unknown, we need further study.

O-10

Skin-Derived Mesenchymal Stem Cells Alleviate Atherosclerosis via Modulating Macrophage Function

Qun Li, Weihong Sun, Xinwen Wang, Ke Zhang, Wenda Xi, Pingjin Gao

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Objective: Mesenchymal stem cells (MSCs) exhibit immunosuppressive efficacy and significantly inhibit the formation of the atherosclerosis (AS) plaque in apolipoprotein E-knockout (apoE^{-/-}) mice. Of note, the largest lymphoid organ-skin provides a readily accessible and ideal source of tissue for the isolation of MSCs, skin-derived MSCs (S-MSCs). But the effect and mechanism of therapeutic properties of S-MSCs in the progression of AS are unclear. Herein we investigated a direct effect of S-MSCs treatment in the formation of atherosclerotic plaque in apoE^{-/-} mice.

Methods and Results: Forty apoE^{-/-} mice were divided into 3 groups, AS (control group), S-MSCs treatment group (S-MSCs treatment) and S-MSCs migration group. Brachiocephalic artery UBM analysis showed that S-MSCs treatment significantly reduced lesion size compared to the control groups ($p < 0.01$). Histological studies displayed that the plaque area of mice aortic arch was significantly decreased after S-MSCs treatment. S-MSCs after tail vein injection were capable of migrating to atherosclerotic plaque, and selective took up residence in close proximity to macrophages. S-MSCs treatment reduced the release of proinflammatory cytokine TNF- α and increased the expression of anti-inflammatory factor IL-10 in the atherosclerotic plaque. *In vitro*, we found Lipopolysaccharide (LPS) induced NF- κ B-dependent expression of cyclooxygenase-2 (COX2) in S-MSCs. Prostaglandin E2 (PGE2) expression was markedly increased after LPS-stimulated S-MSCs co-cultured with macrophages. LPS-stimulated macrophages produced less TNF- α /IL-1b and more IL-10 when cultured with S-MSCs, which were all NF- κ B-dependent manner, however the release of IL-10 was diminished if the S-MSCs were pretreated with COX2 inhibitor or EP2/EP4 antagonist.

Conclusions: Our data demonstrated that S-MSCs inhibited the formation of the atherosclerotic plaque in apoE^{-/-} mice by modulating the functionality of macrophages, suggesting that S-MSCs might harbor a potential in stem cell-based therapy of AS.

O-011

Renal Denervation Attenuates Angiotensin II-Induced Cardiovascular Remodeling*Xiaodong Li, Mona Hong, Dongrui Chen, Pingjin Gao*

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Objective: Renal denervation (RDN) is successful for treatment of resistant hypertension. However, the role of renal sympathetic nerve in hypertensive cardiovascular diseases is not entirely clear. We investigated the impact of renal denervation on Angiotensin II (Ang II)-induced hypertensive rats to determine the role of renal nerve in cardiovascular remodeling.

Methods: Male Sprague-Dawley rats weighing between 300 and 350 g were divided into four groups: SHAM group; Ang II group; Ang II + RDN group; RDN group. Blood pressure was measured by tail cuff. Cardiac hypertrophy and function were evaluated by echocardiography. Hearts and aortas were obtained at 14 days to perform western blotting and immunohistochemistry.

Results: The achievement of renal denervation was confirmed by reduction of renal norepinephrine levels at 14 days after procedure. In aortas and hearts, Ang II caused vascular and cardiac hypertrophy were significantly blunted by RDN compared with SHAM group. In addition, Ang II induction of vascular and myocardial fibrosis was suppressed by RDN with concurrent decrease of collagen deposition. Most importantly, Ang II promoted macrophage infiltration into vascular adventitia and myocardial interstitial was also attenuated by RDN. And extracellular signal-regulated kinases (ERK)1/2 and transforming growth factor- β (TGF- β)/Smad signaling pathway were both inhibited by RDN in hearts.

Conclusion: These results demonstrate that renal sympathetic nerve is involved in the Ang II-induced cardiovascular remodeling, and providing new insight into RDN as a therapeutic strategy for hypertensive cardiovascular diseases.

O-12

Sublingual Microcirculation: Perfused Capillary Density and Glycocalyx Width in Populations of Different Ethnicity*Yan Li^a, Yu-Mei Gu^b, Shuai Wang^a, Jan A. Staessen^{b,c}*

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Hypertension is consistently associated with capillary rarefaction in animal models and human patients, but little is known about the association of capillary density with blood pressure or other cardiovascular risk factors in the general population. The endothelial glycocalyx regulates nitric oxide synthase activity and serves as a physical barrier for macromolecules. The development of capillaroscopy made it possible to visualize the sublingual capillaries and to estimate the dimensions of the glycocalyx by measuring the sublingual perfused boundary region (PBR). Our recently published study characterized these microcirculatory traits in relation to cardiovascular risk factors in 252 Han and 220 She Chinese and 254 Flemish people representing random population samples (mean age, 51.1 years; 54.7% women). Compared with Chinese, Flemish had lower total (577 vs. 546 N°/mm²) and perfused (338 vs. 320 N°/mm²) capillary density, but similar perfused-to-total capillary density ratio. Perfused-to-total capillary density ratio increased with age (effect size per 1-SD increase, +0.015/year), body mass index (+0.008/kg/m²), total cholesterol (+0.012/mmol/l), and Framingham risk score (+0.018/point). PBR standardized for hematocrit, perfused capillary density and pulse rate, decreased with body mass index (-26.7 nm/kg/m²), mean arterial pressure (-30.6 nm/mm Hg), and diastolic pressure (-28.5 nm/mm Hg). No ethnic differences in these associations were observed. In conclusion, cardiovascular risk factors are associated with capillary rarefaction. But in capillaries that remain perfused, the glycocalyx is preserved. Future longitudinal studies should clarify whether the microvascular alterations are early markers or the primary instigator of disease, e.g. hypertension.

O-13**Gender Difference of the Association of Serum Polyunsaturated Fatty Acids Profiles with the Evolution of Hemodynamics**

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Background: While abnormal hemodynamics and abnormal serum polyunsaturated fatty acids profiles are noted as risks for cardiovascular disease, their association has not been fully clarified.

Objective: We examined whether serum polyunsaturated fatty acids levels (Arachidonic acid (AA), Eicosapentaenoic acid (EPA), Docosahexaenoic acid (DHA)) are associated with 3 years changes of hemodynamics in healthy middle aged Japanese men and women.

Methods: 1,527 healthy Japanese subjects (316 women) were prospectively followed up for three years. Subjects with inaccurate measurement of radial augmentation index ($SD \geq 6\%$), Ankle/Brachial Index (ABI) < 0.95 , atrial fibrillation, regular hemodialysis, history of cardiovascular disease, or medication for risk factors for cardiovascular disease were excluded.

Hemodynamics were assessed as arterial stiffness, central blood pressure, and brachial blood pressure. Arterial stiffness was evaluated by brachial-ankle pulse wave velocity (baPWV) measured with a volume-plethysmographic apparatus and central blood pressure was measured by arterial applanation tonometry. Multivariate linear regression adjusted for established risk factors for raised blood pressure. We conducted overall and stratified analyses by gender.

Results: Mean age was 40.3 ± 6.3 years. In a multivariable model controlling for established risk factors for raised blood pressure, None of AA, DHA, EPA were not significantly associated with change of hemodynamics. However, only among women, plasma DHA was significantly associated with change in central blood pressure. The 1 standard deviation (SD) increase of serum DHA was associated with decreased central blood pressure of 1.77 mm Hg ($P < 0.05$).

Conclusions: The association of serum lipid profiles with the evolution of central hemodynamics may be different between genders. In women, low DHA levels may be a risk for the progression of abnormal central hemodynamics.

O-14**Relationship between Circadian Variation of Blood Pressure and Urinary Sodium Excretion Changes in Patients with Salt-Sensitive Hypertension**

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Objective: To observe the 24 h circadian variation of patients with salt-sensitive hypertension and to explore the relationship between the circadian changes in urinary sodium excretion and the blood pressure variability.

Methods: The 58 hospitalized patients with grade 1 and 2 essential hypertension were selected. All subjects underwent 24-hour ambulatory blood pressure monitoring, and diurnal and nocturnal urinary sodium excretion were collected and measured, respectively. The combined method of rapid intravenous infusion of normal saline and furosemide natriuresis volume reduction was used to determine the salt sensitivity.

Results: Of the 58 cases, 25 cases (43%) were detected to be salt-sensitive. 24 h ambulatory blood pressure monitoring results showed that the daytime blood pressure difference between the salt-sensitive (SS) group and the non-salt-sensitive (NSS) group was not significant, but the nocturnal decline rate of SBP ($4.0\% \pm 2.0\%$ vs $11.0\% \pm 3.0\%$, $P < 0.05$) and the nocturnal decline rate of DBP ($7.0\% \pm 4.0\%$ vs $13.0\% \pm 4.0\%$, $P < 0.05$) in SS group were significantly smaller than those in NSS group. The 24-hour urinary sodium excretion showed no significant difference between SS group and NSS group, but the nocturnal urinary sodium excretion of the SS group was significantly greater than that of the NSS group (108.2 ± 39.2 mmol vs 70.6 ± 35.0 mmol, $P < 0.01$); In SS group, the percentage of nocturia Na in the total day (0.48 ± 0.23 mmol vs 0.35 ± 0.22 mmol, $P < 0.05$) was higher than that in NSS group.

Conclusions: Salt sensitive hypertension patients were increased in nocturnal urinary sodium excretion, causing nighttime compensatory increase in blood pressure and expressed in a 'non-dipper' changes.

O-15**Evidence-Based Evaluation of Two Major Arterial Stiffness Measures in Japan: Brachial-Ankle PWV and Cardio-Ankle Vascular Index**

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Brachial-ankle pulse wave velocity (baPWV) and Cardio-Ankle Vascular Index (CAVI) are two major arterial stiffness measures in Japan. Chief difference of the two is a blood

pressure dependency. However, it remains unclear if arterial stiffness normalized by blood pressure shows better clinical values than plain arterial stiffness. The Japanese Circulation Society (JCS) fairly compared the clinical values of the two arterial stiffness measures based on thorough evaluation of all available evidence.

The evaluation was limited to studies, reviews, and other evidence on humans that were published in English. Some reviews written in Japanese were included in the analysis following mutual agreement of committee members. The level of evidence and classification of recommendation were evaluated according to the American College of Cardiology/American Heart Association guidelines (Circulation 2010).

Disease specific increase of baPWV has been confirmed in hypertension, diabetes, metabolic syndrome and chronic kidney disease (evidence level B) and end-stage renal disease and coronary artery disease (evidence level C). CAVI showed evidence level C for hypertension, diabetes, metabolic syndrome, dyslipidemia, end-stage renal disease and coronary artery disease, and showed evidence level B for chronic kidney disease. For prognostic significance, baPWV demonstrated evidence level B for hypertension and chronic kidney disease, and evidence level C for diabetes, end stage renal disease and coronary artery disease. CAVI showed evidence level C only for end-stage renal disease.

Classification of recommendation was IIa for hypertension, end-stage renal disease, chronic kidney disease and coronary artery disease, and IIb for diabetes in baPWV but no evidence-based recommendation was created for CAVI.

In conclusion, current evidence supports that baPWV is better clinical measure than CAVI. Further longitudinal study is necessary to confirm the clinical significance of arterial stiffness measure normalized by blood pressure.

O-16

Arterial Stiffness is Associated with Left Ventricular Geometry and Diastolic Dysfunction in the Elderly

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Purpose: Increased arterial stiffness is reported to be associated with left ventricular hypertrophy (LVH) and LV diastolic dysfunction. However, the impact of arterial stiffness on LV geometry including concentric LVH, eccentric LVH and concentric remodeling and on the interplay between LV geometry and LV diastolic dysfunction (LVDD) have not been fully elucidated.

Methods: 431 subjects (mean 70 years, 57% men, 41% diabetes mellitus) were evaluated after exclusion of patients with coronary artery disease, severe valvular disease, cardiomyopathy and LV ejection fraction <50%. The brachial-ankle pulse wave velocity (baPWV), a marker of arterial stiffness,

was measured using a Form BP (Omron, Kyoto, Japan). LV structure (LV mass index [LVMI], relative wall thickness [RWT]) and the parameters of LV diastolic function (e' and E/e') were determined using echocardiography. LV geometry was determined by RWT and LVMI, and LVDD was defined using E/e' , LVMI, and LAVI according to ESC guideline.

Results: When patients were classified based on LV geometry, baPWV and prevalence of LVDD in patients with concentric LVH was the highest than those in patients with other LV geometry. There was a significant correlation between baPWV and LVMI ($r = 0.17$, $p < 0.01$), RWT ($r = 0.20$, $p < 0.01$), e' ($r = 0.34$, $p < 0.01$), and E/e' ($r = 0.16$, $P < 0.01$). When patients were divided into tertile according to baPWV, multiple logistic analysis revealed that the highest tertile of baPWV was independently associated with concentric LVH (odds ratio: 2.53, 95% CI: 1.03 to 6.23, $p = 0.04$) and LVDD (odds ratio: 2.16, 95% CI: 1.32 to 3.57, $p < 0.01$) after adjustment of covariates.

Conclusions: Increased arterial stiffness influence LV geometry as well as the interplay between LV geometry and LV diastolic dysfunction in the elderly.

O-17

Nocturnal Blood Pressure Is Associated with Localized Retinal Nerve Fiber Layer Defects on Optical Coherence Tomography

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Introduction: Retinal damages have been suggested a surrogate marker of end-organ damage and prognostic marker in hypertensive patients. Recent study reported that localized retinal nerve fiber layer defects (RNFLDs) assessed by noninvasive optical coherence tomography (OCT) was related to the degree of hypertension severity and cerebrovascular disease.

Purpose: We hypothesize that RNFLDs are related to the parameters of 24 hour ambulatory blood pressure monitoring (ABPM).

Methods: RNFLDs were assessed by retinal OCT in 562 consecutive subjects enrolled in Cardiovascular and Metabolic Disease Etiology Research Center - High Risk Cohort (CMERC-HI, NCT02003781). We excluded the patients with glaucoma, which known to be related to RNFLD independently of cardiovascular risk factors.

Results: RNFLD was found in 129 (23.0%) patients. In patients with RNFLD, there were higher proportion of men, higher prevalence of hypertension, higher glucose levels and lower HDL-cholesterol levels. The RNFLD patients had higher 24 hour mean systolic and diastolic blood pressure (SBP/DBP, 133±16/80±9 vs. 129±13/78±8, $p = 0.022/p = 0.015$, respectively) and nocturnal mean SBP/DBP (124±19/74±9 vs. 120±15/72±9, $p = 0.013/p = 0.010$, respectively) compared to those without RNFLD. Multivariate stepwise linear regression analysis revealed that RNFLD was independently associated with nocturnal mean SBP after controlling for age, gender, diabetes mellitus, smoking, body mass index, brachial systolic blood pressure, heart rate, estimated glomerular filtration rate, heart to femoral pulse wave velocity ($\beta = 0.093$, $p = 0.036$, $R^2 = 0.263$).

Conclusion: We reported that RNFLD on OCT was related to nocturnal blood pressure in 24 hour ABPM for the first time. Further studies which validate RNFLD as a cardiovascular surrogate and risk marker should be warranted.

O-18

Current Recommendations on the Use of Arterial Measurements in Cardiovascular Prevention

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Arterial measurements such as coronary calcium score, carotid IMT, pulse wave velocity and ankle/brachial index are commonly used for cardiovascular risk stratification. All the major guidelines are in agreement with regards to the beneficial effect of coronary calcium score and ankle/brachial index for risk stratification in intermediate risk subjects. However, there is an ongoing controversy regarding the predictive value of carotid IMT and pulse wave velocity. With regards to carotid IMT, the European guidelines on cardiovascular disease prevention in clinical practice (version 2012) gave a class IIa recommendation for utilizing carotid IMT for risk stratification in asymptomatic adults with moderate risk. However, in the recent 2013 ACC/AHA guideline on the assessment of cardiovascular risk, the use of carotid IMT for risk assessment was given a class III recommendation based on an analysis from the ARIC study. The measurement of pulse wave velocity, which is recommended by the European society of Hypertension as a marker of target organ damage, was not recommended by the 2010 ACCF/AHA guideline for assessment of cardiovascular risk in asymptomatic adults. In this talk, we will discuss up to date evidence regarding the various arterial measurements and discuss the recommendations from the major guidelines.

O-19

Central Hemodynamics and Central Blood Flow

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The cerebral circulation is complex and difficult to understand. The brain and spinal cord are, together with incompressible blood and cerebrospinal fluid, contained in the rigid cranium and vertebral canal. Carotid, vertebral and jugular foramina allow entry and exit of blood but these must be identical beat by beat, since the content is incompressible. Implications of the brain in a box constitute the 200 year old Monro-Kellie doctrine.

Pressure waveforms entering the brain are approximated by central aortic pressure generated from the radial artery waveforms. Pressure waveforms can also be measured by carotid tonometry or phase contrast echocardiography. Flow waves entering the brain can be recorded in the carotid artery or by transcranial Doppler, usually in the anterior and middle cerebral arteries, and the vertebral and basilar arteries.

We have been able to analyse and interpret flow and pressure waveform from Ruijin Hospital in 1020 persons undergoing 24 hour BP study, in Cambridge UK in 8 patients showing elevation of intracranial pressure following head injury, in 26 patients with normal pressure hydrocephalus in Oslo, and 24 normal subjects in Sydney.

Findings to date suggest different ways for explaining and managing ill effects of the cerebral circulation disturbance, in acute and chronic conditions and are principally as follows:

- Normal blood flow to the brain takes the form of a small pulsatile component superimposed over high mean flow
- Return of wave reflection from the lower body, timed to diastole is an important contribution to maintenance of cerebral mean flow, and for minimising flow pulsations
- All waves of pressure and flow in or entering the skull show prominent initial waves generated by the heart, and a secondary wave caused by wave reflection
- Amplitude of the reflected component in the pressure and flow waveforms increases with age and with aortic stiffening
- There is a consistent relationship seen in the time domain between pressure and flow waveforms
- There is a consistent relationship seen in the frequency domain between pressure and flow waveforms, with this expressed as cerebrovascular impedance
- Patterns of cerebrovascular impedance are those expected in a low resistance bed with low terminal reflection coefficient
- Patterns of pressure and flow waveforms and their absolute values provide useful information on medial circumferential strain and on intimal shear – and on development of cerebral vascular lesions and amyloid plaques

- In persons with elevated intracranial pressure following stroke or cerebral trauma, intracerebral flow pulsations are increased to a level where cerebral ‘spasm’ or secondary stroke may occur: it is possible that reduction of wave reflection from the lower body by drugs such as nitroglycerine may ameliorate abnormally high pulsations from the lower body and improve outcome.

O-20

Technical Issues Related to Central Aortic Pressure Measurement

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In a report by Herbert et al (EHJ 2014;35:3122–32), different methods were used to estimate central pressure in 82,930 individuals at 53 centres around the world. SphygmoCor was used in 51% of centers, Omron in 37%, and carotid and brachial tonometry or carotid diameter echotracking were used in 12%. An accompanying editorial from a related group urged use of carotid measurements, but made a series of errors on underlying principles.

Use of radial tonometry is well based. Over eons, physicians have used the radial pulse in preference to any other site. The principles of accurate tonometry are easily satisfied at the radial site – the artery is superficial and its anterior wall can be flattened by a finger or tonometer against the radius behind. Pressures are frequently recorded by indwelling catheter in the radial and brachial artery, and no significant difference has been established, and Form Factor (FF), a measure of wave shape ($= (MP - DP) \div PP$) is similar at both sites. The US Food and Drug Administration (FDA), a highly competent Government agency, has set standards for BP measuring devices over the last 40 years. The agency has accepted equivalence of brachial and radial pressures and has decreed that radial tonometry should be calibrated to brachial systolic and diastolic pressure by brachial cuff K sound technique. The agency has further accepted other approximation – that mean and diastolic pressure can be regarded as the same in aorta, carotid, brachial and radial arteries. The main approximation for the SphygmoCor system is that a Generalised Transfer Function (GTF) can characterise the arterial properties in the upper limb independent of age, gender, heart rate, BP, exercise, drug therapy and vasomotor challenge. The SphygmoCor system was accepted by FDA in 2000 for non-invasive as well as invasive use, after presentation of validation data from different sites.

The Omron device depends on many of the above issues. It also uses radial tonometry calibrated to brachial cuff pressure. Measurement of central pressure is based on close agreement of central peak systolic pressure with the second shoulder of the radial pressure wave. The same method is available in SphygmoCor as a check on the GTF method if required.

Both SphygmoCor and Omron have been widely used in different studies over the last 25 years and have shown better outcome for central aortic pressure over and above the brachial pressure.

The minority experience with estimation of central aortic pressure is with combinations of carotid and brachial tonometry. Tonometry is difficult to apply at these sites, uncomfortable, provides varying waveforms, has not been shown to provide information over and above brachial cuff pressure. The principal problem is with tonometry at the brachial site. This does not satisfy theoretic or physical requirements. The artery is deep, covered by brachial tendon aponeurosis and is not supported by bone behind. The brachial tonometric wave is ‘blunted’ as compared to the radial wave, with FF consistently higher than the radial, but almost identical to the carotid (J Hypertens 2012; 30:1540–51). Since amplification depends on the ratio of FF between two sites, carotid and brachial pulse pressures are virtually identical so that there is no advantage in using the device. Artificially blunted brachial waveform leads to all amplification in the upper limb appearing to be in the forearm. Brachial tonometry methods are used by some prestigious institutions, but no value has been shown for their use in clinical practice. The ‘Popeye phenomenon’ of supposedly high amplification of the pulse between brachial and radial sites, has not been seen with invasive studies, and is attributable to inappropriate use of tonometry at this site.

O-21

Complement-Mediated Perivascular Inflammation Contributes to Vascular Injury in Hypertensive Mice

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Rational: Macrophage polarization plays a pivotal role in the pathogenesis of hypertensive vascular remodeling. Our previous study has demonstrated that the expression of complement 3 (C3) dramatically increases in perivascular adipose tissue (PVAT) of deoxycorticosterone acetate (DOCA)-salt hypertensive model.

Objective: This study aims to elucidate the complement-mediated macrophage polarization and adipocytokine

expression in PVAT, and their causal roles in hypertensive vascular injury.

Methods and Results: We investigated C3 in macrophage polarization using peritoneal macrophages from wild-type (WT) and C3-deficient (C3KO) mice. Results showed that C3KO inhibited M1 but enhanced M2 phenotypic markers expression, and DOCA-salt treatment in recipients of C3KO bone marrow transplantation (BMT-C3KO) resulted in fewer M1 and more M2 macrophages in PVAT compared with those of WT donor. Furthermore, we found that complement 5a (C5a), but not complement 3a (C3a) was involved in the regulation of macrophage polarization, and accelerated DOCA-salt induced vascular damage. Consistently, macrophage depletion blocked C3 and C5a expression, and attenuated vascular injury. In addition, BMT-C3KO increased whereas C5a treatment reduced adiponectin (APN) expression in perivascular adipocytes of DOCA-salt mice. APN-overexpression relatively inhibited C3 deposition in PVAT, the vascular protective effect of BMT-C3KO was abolished in APN-deficient recipient mice, while the vascular protective effect of APN-overexpression was enhanced by BMT-C3KO.

Conclusions: We conclude that complements in bone marrow-derived macrophages play pathological roles in DOCA-salt hypertensive vascular damage by shifting macrophage phenotype to more M1 and less M2 in PVAT, in which, at least partly, APN is involved.

O-22

Inflammatory and Metabolic Interaction For Arterial Injury

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Obesity-induced metabolic inflammation may play an important role in the development of vascular dysfunction. It is well documented that various factors released from perivascular adipose tissue (PVAT) influence the vascular function, even in hypertensive animal models without obesity. We have previously shown an increased macrophage infiltration in perivascular tissue in the carotid arteries of balloon injury rats, however, the underlying mechanism remains unclear. In this study, we investigate whether a phenotypic change of perivascular cells either prevent or promote the development of vascular injury in DOCA-salt hypertensive models. We found that morphologic changes of PVAT in DOCA-salt hypertensive models, which perivascular adipocytes were smaller in size and increased in number. Interestingly, there is a phenotypic change of white adipocytes into brown-like cells in PVAT, a process called 'browning'. These effects were associated with increased β 3-adrenergic receptor (β 3-AR) expression. β 3-AR antagonist treatment resulted in reduced lipid droplets and accelerated vascular injury in DOCA-salt

hypertensive mice. Nebivolol, potential β 3-AR activation, improves vascular inflammation by inhibiting NLRP3 inflammasome activation. Moreover, β 3-AR agonist treatment significantly increased the phosphorylation of endothelial NOS (eNOS) and AMP-activated protein kinase (AMPK). These results suggest that β 3-AR upregulation inhibits the vicious cycle of adipocytes and macrophages through the inhibition of macrophage-mediated pro-inflammatory cytokines.

O-23

Pulse Waves in the Lower Extremities as a Diagnostic Tool of Peripheral Arterial Disease and Predictor of Mortality in Elderly Chinese

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Objective: Patients with peripheral arterial disease (PAD) may have elongated upstroke time in pulsewaves in the lower extremities. We investigated elongated upstroke time in pulse waves in the lower extremities as a diagnostic tool of PAD and predictor of mortality in elderly Chinese.

Methods: In a population-based prospective study in the elderly (≥ 60 years), we recorded pulse waves at the left and right ankles by pneumoplethysmography, and calculated the percentage of upstroke time per cardiac cycle. Diagnostic accuracy was compared with the conventional ankle-brachial index (ABI) method and CT angiography. Information on total and cardiovascular mortality was collected during follow-up.

Results: In the 4055 participants (1803 men, mean age 68.5 years), upstroke time per cardiac cycle at baseline (mean \pm SD, 16.4% \pm 3.1%) was significantly ($P < 0.0001$) associated with ABI in men ($r = -0.44$) and women ($r = -0.32$), and had a sensitivity and specificity of 86% and 80%, respectively, for the diagnosis of PAD ($\geq 21.7\%$) in comparison with CT angiography. During 5.9 years (median) of follow-up, all-cause and cardiovascular deaths occurred in 366 and 183 subjects, respectively. In Cox regression analysis adjusted for age, sex and cardiovascular risk factors, an upstroke time per cardiac cycle of 21.7% or greater ($n = 219$, 5.4%) significantly ($P < 0.0001$) predicted total and cardiovascular mortality. The corresponding hazard ratios were 1.98 (95% confidence interval [CI], 1.48–2.65) and 2.29 (95% CI, 1.58–3.32), respectively, as compared with that of 2.10 (95% CI, 1.48–3.00) and 2.44 (95% CI, 1.57–3.79), respectively, associated with an ABI of 0.90 or smaller ($n = 115$, 2.8%).

Conclusion: Pulse waves in the lower extremities, obtained by pneumoplethysmography, may behave as an accurate and ease of use diagnostic tool of PAD and predictor of mortality in the elderly.

O-24

To Prevent Cardiovascular Event in Asian Population: Systemic Hemodynamic Atherothrombotic Syndrome (SHATS) as a Novel Disease Entity*Masahisa Shimpo, Satoshi Hoshida, Kazuo Eguchi, Kazuomi Kario*

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Systemic vascular evaluation, including coronary arteries, cerebral arteries and peripheral arteries, is essential to detect high risk patients who have polyvascular diseases in clinical setting. Then, it is important to control the patients' atherothrombotic risk factors to reduce cardiovascular events and mortality. We recognize that hemodynamic stress should be the major target for prevention of systemic vascular diseases, especially in Asian population.

We have recently proposed a novel disease entity, systemic hemodynamic atherothrombotic syndrome (SHATS), which is characterized by a synergistic risk of exaggerated hemodynamic stress (exaggerated variability of blood pressure [BP] and blood flow) and thrombometabolic inflammatory risk factors, not only for advancing organ damage but also for triggering cardiovascular events. There are several phenotypes of BP variability in SHATS, such as morning BP surge, orthostatic hypertension, sleep BP surge, and extreme-dipping of nocturnal BP, that have been reported to confer cardiovascular risk. Some of these conditions overlap, indicating a partly shared common pathophysiology involving vascular damage such as impaired baroreceptor sensitivity caused by increased sympathetic activity or increased large artery stiffness and small artery remodeling.

We recommend that clinicians recognize the synergistic relationship between the risk of exaggerated BP variability and vascular damage, the novel entity of SHATS. Even when patients are well controlled for conventional risk factors and their average BP values are controlled, patients may have risk for advanced organ damage and cardiovascular events—especially patients with advanced vascular disease. The detection of phenotypes of BP variability to assess SHATS and a relevant strategy for targeting BP variability may be effective for cardiovascular protection. Further study on antihypertensive treatment considering BP variability should be performed in clinical practice in the near future.

O-25

Macrovascular Complications Associated with Inactive Matrix Gla, a Protein Synthesized in the Arterial Wall*Jan A. Staessen, Fang-Fei Wei, Nadja E.A. Drummen and Cees Vermeer on behalf of the FLEMENGHO investigators*
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Background: Cardiovascular disease remains the leading cause of mortality and is worldwide directly re-sponsible for approximately 12 million deaths and 20% of total mortality. 1 Calcification of the conduit arteries is an independent risk factor for myocardial infarction, stroke and cardiovascular death. 2 Vascular smooth muscle cells synthesize a small secretory protein (11 kD), which contains five γ -carboxyglutamate (Gla) amino-acids and which was therefore named matrix Gla protein (MGP). 3 Activation of MGP requires two posttranslational modifications: γ -glutamate carboxylation in a vitamin K dependent manner and serine phosphorylation. Carboxylated MGP is a potent inhibitor of arterial calcification. In the presence of vitamin K deficiency, MGP is partly synthesized in a nonphosphorylated and uncarboxylated form (dp-ucMGP). The risk associated with dp-ucMGP in the population is unknown.

Methods: In the Flemish Study on Environment, Genes and Health Outcomes (FLEMENGHO), we measured circulating dp-ucMGP at baseline (1996–2011), genotyped MGP, recorded adverse health outcomes until December 31, 2012, and assessed the multivariable-adjusted associations of adverse health outcomes with dp-ucMGP. We applied a Mendelian randomization analysis using MGP genotypes as instrumental variables.

Results: Among 2318 participants, baseline dp-ucMGP averaged 3.61 $\mu\text{g/l}$. Over 14.1 years (median), 197 deaths occurred, 58 from cancer and 70 from cardiovascular disease; 85 participants experienced a coronary event. The risk of death and non-cancer mortality curvilinearly increased ($P \leq 0.008$) by 15.0% (95% confidence interval, 6.9–25.3) and by 21.5% (11.1–32.9) for a doubling of the nadir (1.43 and 0.97 $\mu\text{g/l}$, respectively). With higher dp-ucMGP, cardiovascular mortality log linearly increased (hazard ratio for dp-ucMGP doubling, 1.14 [1.01–1.28]; $P = 0.027$), but coronary events log linearly decreased (0.93 [0.88–0.99]; $P = 0.021$). dp-ucMGP levels were associated ($P \leq 0.001$) with MGP variants rs2098435, rs4236 and rs2430692. For non-cancer mortality and coronary events ($P \leq 0.022$), but not for total and cardiovascular mortality ($P \geq 0.13$), the Mendelian randomization analysis suggested causality.

Conclusions: In the general population, dp-ucMGP predicts total, non-cancer and cardiovascular mortality and lower coronary risk. These associations are probably causal for non-cancer mortality and coronary events. Our findings, pending confirmation, might open new ways to improve health by vitamin K substitution in addition to the management of classical cardiovascular risk factors.

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O-26

Pathophysiological Differences between Conduit/Resistant Arterial Endothelial Function Tests in Hypertension

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Flow-mediated vasodilatation of the brachial artery (FMD) and reactive hyperemia index (RHI) measured by peripheral arterial tonometry have been used as the assessment of endothelial function in clinical settings. Several studies have reported that both markers to reflect pathophysiological abnormalities related with early stages of atherosclerosis and also to predict future cardiovascular events. Even so, they are known to be weakly associated with each other, however, the mechanisms underlying this weak association remain to be fully clarified. We examined whether the autonomic nervous activation induced by the 5 minutes' forearm clamping used to induce reactive hyperemia might exert any influence on the FMD and RHI in subjects with hypertension. In 115 subjects with hypertension (age 61 ± 1 y/o), the FMD and RHI were measured simultaneously, and the heart rate variability (HRV) parameters {low-frequency component (LF), high frequency component (HF), and the ratio (LF/HF) between the two} were calculated from the electrocardiographic recordings obtained before (5 minutes' recording) and after the start of forearm clamping (10 minutes' recording). Then, the change in HRV induced by forearm clamping was measured as the percent change after the start of clamping relative to that before the start of clamping. A multivariate linear regression analysis with adjustments for confounding variables demonstrated that the RHI, but not FMD, was significantly associated with the percent change of the LF/HF associated with forearm clamping (beta = -0.204 , $p = 0.043$). In conclusion, sympathetic nervous activation induced by 5-minutes forearm clamping to induce reactive hyperemia may affect the RHI, but not the FMD in subjects with hypertension. This difference may be one of the mechanisms underlying the existence of only a weak association between FMD and RHI.

O-27

Arterial Stiffness is an Independent Predictor of Cardiac Mortality in Asymptomatic Patients with Intermediate Atherosclerotic Risk Factors

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Background: To identify predictors of cardiac death in patients with intermediate atherosclerotic risk patients, we studied the prognostic value of arterial stiffness as measured by Cardio Ankle Vascular Index (CAVI) in these patients.

Methods: We prospectively followed 1,382 asymptomatic patients with intermediate risk factors as assessed by RAMA-EGAT score showing predicted 10-years event rate of 10–20%. RAMA-EGAT Score is a Framingham risk score equivalent but more well-validated in Thai population. These patients were referred for Coronary Computed Tomography Angiography (CTA) for cardiac risk assessment. Patients were followed over 6.9 ± 0.7 years for cardiac death (54 patients). A multi-variable Cox regression was performed to identify associations with events.

Results: Event free survival was $96 \pm 0.5\%$ at 6 years. Cardiac mortality was predicted by CAVI (Hazard ratio 1.23 [95% CI 1.01–1.54], $p = 0.046$), independent of traditional risk score validated in our population (RAMA-EGAT Score) (Hazard ratio 1.01 [95% CI 0.95–1.07], $p = 0.824$), presence of significant CAD by Coronary CTA (Hazard ratio 1.19 [95% CI 0.52–2.73], $p = 0.684$) and visceral fat area (Hazard ratio 1.01 [95% CI 1.00–1.01], $p = 0.073$). A mean CAVI > 8 was associated with a significant excess mortality ($p = 0.011$) and this measurement added incremental prognostic value to the clinical risk factors (age, gender, cholesterol, diabetes, hypertension, smoking and waist circumference) and visceral fat area.

Conclusion: Arterial stiffness evaluated by Cardio Ankle Vascular Index is not only an independent predictor of cardiac mortality in patients with intermediate atherosclerotic risk factors but also incremental to other clinical and coronary CTA variables.

O-28

Long-Term Blood Pressure Control and the Severity of Atherosclerosis as Reflected by Cardio-Ankle Vascular Index

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Purpose: High blood pressure is an important atherosclerotic risk factor. Despite the fact that treating hypertensive reduces cardiovascular death, percent of controlled hypertension in community is not optimal. We aim to demonstrate the effect of controlled hypertension on arterial stiffness, a marker of atherosclerosis, using cardio-ankle vascular index (CAVI), in a longitudinal survey in Thailand.

Methods: In 2012, 1,609 participants revisited the 5th quinquennial survey of the Electricity Generating Authority of Thailand (EGAT) study. Left and right CAVI were measured, means were used. Hypertension; awareness, treatment and control; in 1997, 2002, 2007 and 2012 were reviewed. Controlled hypertension (blood pressure <140/90 mm Hg) from each visit was quantified and transformed into 0–100% achieving target blood pressure. Association between controlled hypertension and CAVI were calculated using linear regression models, adjusted for common factors related to CAVI.

Results: 1,387 participants had completed data. In 1997, mean age was 47 years, 26% were female. Older age, male sex, diabetes and hypertension were independent predictors for higher CAVI in 2012 (all $p < 0.05$). Adjusting for age, sex, diabetes, cholesterol, smoking and obesity, CAVI increased monotonically with severity of hypertension in every visits as well as duration of hypertension (both $p \leq 0.01$). Receiving treatment was not related to CAVI ($p > 0.05$). Amongst hypertensives in 1997, those who had 100% achieving target in all subsequent visits had the lowest CAVI followed by 75%, 50%, 25% and 0% (CAVI 8.98, 9.04, 9.09, 9.19 and 9.42 respectively, p for trend 0.02). Those unaware hypertensives in 2012 had significantly higher CAVI than normotensives (9.19 versus 8.78, $p < 0.0001$) and were indifferent from aware hypertensives (9.19 versus 9.11, $p = 1.0$).

Conclusions: This study addresses important issues of long-term blood pressure management in a community setting. Not just treat but treating hypertensives to blood pressure target results in lesser arterial stiffness in a long-term follow up. Hypertensive surveillance is encouraged since unaware hypertensives have already had abnormally high CAVI as aware hypertensives.

O-29

Chronic Caffeine Intake Antagonizes Salt Sensitive Hypertension Through Improvement of Renal Sodium Handling

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High salt intake is a major risk factor for hypertension and cardiovascular diseases. Currently, there is no effective way to reduce salt retention in general population other than diuretic drugs. Caffeine, the main component of coffee, produces moderate diuresis and natriuresis, but its long-term effects on urinary sodium excretion and blood pressure are rarely investigated. In this study, we demonstrate that chronic consumption of caffeine attenuates hypertension induced by high salt diet without affecting sympathetic nerve activity in Dahl salt-sensitive (Dahl-S) rats. Chronic caffeine intake increased urinary sodium excretion in vivo by inhibiting the α -subunit of the epithelial Na^+ channel (α -ENaC) protein expression and activity. Caffeine reduced amiloride-sensitive rather than hydrochlorothiazide-sensitive natriuresis in Dahl-S rats. In vitro evidence indicated that caffeine increased phosphorylation of α -AMP kinase (p-AMPK) expression in cortical collecting duct cells. Caffeine-induced changes in expressions of α -ENaC and p-AMPK were abolished by AMPK inhibitor. Moreover, drinking of regular caffeinated coffee increased urinary sodium excretion in humans more than decaffeinated coffee did. Regular coffee increased 24 hr urinary sodium excretion by 56 mmol, which is equal to 3.27 g salt intake, without obvious cardiovascular effects. It concluded that chronic caffeine intake prevented the development of salt-sensitive hypertension through promoting urinary sodium excretion. The beneficial effect of caffeine was associated with activation of renal AMPK and inhibition of renal tubular ENaC. Daily drinking of caffeinated coffee may be a promising lifestyle intervention in the prevention of hypertension in salt-sensitive individuals.

O-30

Increased Plasma Neopterin Levels are Associated with Reduced Endothelial Function and Arterial Elasticity in Hypertension

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Objective: Inflammation has been shown to play a pivotal role in the pathogenesis and development of hypertensive vascular injury. Neopterin is a novel marker of immune activation produced mainly by activated macrophages. Few data are available to show the association between neopterin and vascular function in hypertension. The present study was designed to investigate the relationship between neopterin levels related to arterial stiffness and endothelial function in patients with hypertension, and their changes after blood pressure lowering treatment.

Methods: Twenty-four hypertensive patients and 30 age- and gender-matched healthy volunteers were recruited. Correlation analysis between plasma neopterin levels with brachial-ankle pulse wave velocity (baPWV) and brachial flow-mediated dilation (FMD) was made in the two groups respectively. Fifteen hypertensives received three months of standard anti-hypertensive treatment, and the changes in neopterin levels and vascular function parameters were analyzed.

Results: Plasma neopterin levels were higher in hypertensive patients compared to their counterparts (log-neopterin: 0.77 ± 0.18 versus 0.61 ± 0.16 , $P = 0.003$). Increased neopterin levels were correlated with increased baPWV (control: $r = 0.659$, $P < 0.001$; hypertension: $r = 0.487$, $P = 0.021$), and inversely associated with impaired FMD (control: $r = -0.735$, $P < 0.001$; hypertension: $r = -0.557$, $P = 0.005$). After three months of antihypertensive treatment, plasma neopterin levels decreased (log-neopterin: 0.63 ± 0.17 versus 0.50 ± 0.19 , $P = 0.001$) while arterial elasticity (baPWV: 1764 ± 101 cm/sec versus 1685 ± 96 cm/sec, $P = 0.272$) and endothelial function (FMD: $5.92 \pm 1.43\%$ versus $7.73 \pm 1.31\%$, $P < 0.05$) were improved. The decline in neopterin levels was correlated with baPWV decrease ($r = 0.451$, $P = 0.032$), and inversely correlated with FMD improvement ($r = -0.606$, $P = 0.022$).

Conclusion: Our present study demonstrated for the first time that neopterin is closely correlated with vascular dysfunctions and measurement of plasma neopterin levels might be used as a surrogate biomarker for the clinical evaluation of vascular damage and risk stratification of future atherosclerotic cardiovascular disease in patients with hypertension.

O-31

Central Haemodynamics for the Therapeutic Management of Hypertension

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Brachial blood pressure (BP) is an important cardiovascular risk factor, but it is now well established that central systolic BP (SBP) could be markedly different from brachial SBP, and that central BP indices independently predict future cardiovascular events. Importantly, responses to antihypertensive therapy can differ substantially between brachial and central arteries. These disparities are likely to have implications regarding diagnosis and therapeutic management of hypertension, particularly in patients at risk from overtreatment. Recent studies have shown that managing treatment using central BP techniques offers potential advantage to individual patients and health care systems above and beyond conventional brachial BP methods. Despite the evidence favoring use of central BP in clinical practice, there still remains limited uptake of central BP techniques. This is likely to change with the recent advent of cost recovery options for doctors in some countries, and also with additional targeted research to fill evidence gaps.

O-32

Blood Pressure Parameters and Pulse Wave Velocity for Cardiovascular-Renal Prevention

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Several works have focused on the ability of different blood pressure components to best assess cardiovascular and renal risks. It is now well accepted that, before the age of 50 years old, diastolic blood pressure is the parameter the better related to prognosis and after 60 years of age the systolic component becomes the major parameter, in terms of cardiovascular risk assessment. Nevertheless, we do not know if the best parameter defined by risk assessment strategies remains the best blood pressure parameter in terms of risk reduction strategies.

Furthermore, it is now well accepted that pulse pressure has an additive value over and above systolic blood pressure in terms of risk assessment in the elderly. Should anti-hypertensive drugs be titrated according to the level of the pulse pressure and, if yes, what would be the optimal goal?

Due to the presence of pulse pressure amplification similar questions are raised concerning the value of central pulse pressure in comparison to peripheral pulse pressure.

Finally, further questions could be asked concerning integrative parameters in comparison with blood pressure, such as carotid-femoral pulse wave velocity.

Such questions are not only theoretical and patho-physiologic but are also clinically important. For example, we don't know since now if we need to pharmacology treat isolated systolic blood pressure in the young and what should be the blood pressure goals in different sub-populations. Systolic, diastolic, pulse, others? Of course, all those hemodynamic parameters are highly inter-correlated, and then, answers cannot easily arise from classical statistical analysis of the existing data.

A methodological answer of this important problem could come from both:

(i) meta-analysis of the observational studies and the therapeutic trials using multilinear models, especially structural models in order to refine and quantify the different possible ways whereby the different parameters affect cardiovascular risk and cardiovascular risk reduction,

(ii) dedicated therapeutic trials (focusing on one hemodynamic parameter versus another), acknowledging however the fact that, even in case of difference between groups, these therapeutic trials will be difficult to interpret because of the presence of collinearity.

These ways to refine risk assessment and risk reduction strategies should probably be one of the best ways to further individualize treatment of hypertension, in order to improve cardiovascular and renal prevention at the population level.

O-33

Consensus on the Management of Morning Hypertension in Asia

Jeong Bae Park on behalf of Asia Pacific Management of Morning Blood Pressure Expert Consensus (AMBEC)

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The clinical management of hypertension and its associated outcomes has consistently been at the forefront of prevention-based clinical practice. Increasingly, the evidence points to the need for control of blood pressure fluctuations in the management of hypertension and associated cardiovascular and cerebrovascular diseases. Mornings are the peak periods for cardiovascular events and stroke, due to morning hypertension with or without the morning surge in blood pressure. Clinical studies have addressed these phenomena and their associated consequences, but there is a lack of guidance regarding the monitoring and management of morning blood pressure in Asia. Key Asian experts involved in clinical research and patient care gathered to discuss the evidence and develop a consensus specifically on the management of morning hypertension. This consensus

document is an evidence-based outcome of published studies and collective experience with Asian patients. These consensus recommendations are provided within the framework of fostering collaborations between Asian countries. The main aim of this consensus is to highlight the necessity of recognizing and managing morning blood pressure, one of the often neglected aspects of hypertension management in Asia. Recommendations in this consensus statement should not override clinical judgment, with particular consideration for individualized patient care.

Poster

P-01

Body Mass Index Independently Influences on Brachial-Ankle Pulse Wave Velocity in General Adults: Results from Kailuan Study

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Background: There are contradictory results in the literature concerning the relationship between body mass index (BMI) and arterial stiffness, assessed by brachial-ankle pulse wave velocity (baPWV). In this study, we investigate the correlation between BMI and baPWV.

Methods: BaPWV was assessed with a device of OMRON (BP-203RPE III) in 8306 general adults. Multivariate linear regression analysis (stepwise) was used to analyze the correlation between BMI and baPWV.

Results: In the whole cohort (58.66±12.44 years, 5446 men), baPWV was significantly higher in the group of BMI <24 kg/m² than in the groups of 24 kg/m² ≤ BMI <28 kg/m² and BMI ≥28 kg/m² (e.g., 1756.57±8.63, 1736.32±8.08 and 1685.84±12.93 cm/s, respectively, P < 0.05). Multivariate linear regression analysis (stepwise) showed that after adjusting for other confounding factors, BMI was independently associated with baPWV, from normal weight status to obesity, baPWV decreased. Likewise, BMI z score is negatively related to baPWV, BMI z score increased 1 SD, baPWV decreased by 39.14 cm/s.

Conclusion: The body mass index (BMI) is negatively related to brachial-ankle pulse wave velocity (baPWV).

P-02

Relationship between Vascular Overload Index and Cardiovascular Structure and Function in Hypertensives

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Objectives: To investigate the relationship between vascular overload index (VOI) and cardiovascular structure and function, which were evaluated by endothelium-dependent vasodilatation (FMD) of brachial artery, intima media thickness of carotid artery (CA-IMT), left ventricular mass index (LVMI).

Methods: A total of 646 essential hypertensives (EHs), 386 male and 260 female, with an average age of 62.2 years old, were enrolled. Based on the cut-point of IMT, EHs were divided into the low IMT (IMT <1.0 mm, n = 376) and the high IMT group (IMT ≥1.0 mm, n = 270). 98 subjects with normal blood pressure and without any drug administration served as controls. Body height and weight, systolic and diastolic blood pressure (SBP and DBP) were recorded. VOI was calculated as $(1.33 \times \text{SBP} - 0.33 \times \text{DBP} - 133.3)$ in mm Hg. Fasting plasma glucose, lipid profiles and other clinical biochemical indexes were determined. Flow mediated dilation (FMD) of brachial artery induced by reactive hyperemia was examined by high-resolution vascular ultrasound. The bilateral CA-IMT was recorded and defined as 1.5 mm if any plaque was found on either side of the carotid artery. Left ventricular mass index (LVMI) was calculated according to the Devereux equation: $\text{LVM (g)} = 0.8 \times 1.04 \times [(\text{LVEDD} + \text{LVPWT} + \text{IVST})^3 - \text{LVEDD}^3] + 0.6$.

Results: Gradually increased VOI level was found among the control, low IMT and high IMT group [10.56(0.54, 14.04) mm Hg vs 23.20 (10.06, 34.50) mm Hg, 26.50 (14.36, 38.47) mm Hg, $P < 0.05$]. Compared with normotensive controls, FMD was attenuated with the increases of LVMI in EHs. The LVMI were increased, while FMD was obviously decreased in high IMT group than in low IMT group. Stepwise multiple regression analysis revealed that VOI was associated with CA-IMT, FMD and LVMI in all subjects. With an increase of VOI by 10 mm Hg corresponding to an increased thickness of CA-IMT by 0.05 mm, FMD was decreased by 0.45% and LVMI was increased by 2.04 g/m². For EH patients <70 years old, VOI was a main determinant for FMD and LVMI. However this correlations became insignificant when EHs were over 70 years old. For EHs with ≤3 risk factors, VOI was an influential factor for FMD. Similarly, the correlation became weak for EHs with over 3 risk factors. The relationship between VOI and CA-IMT in EHs was independent of age, gender and other risk factors.

Conclusion: VOI was an influential factor for FMD, CA-IMT and LVMI. With the increase of age or risk factor, the influences of VOI on FMD and LVMI were weakened in EH patients. VOI was a main determinant for CA-IMT in EHs.

P-03

Increased Galectin-3 Was Closely Associated with Arterial Wave Reflections and Provided Incremental Prognostic Value Upon Natriuretic Peptide in Patients with Acute Heart Failure

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Background: Galectin-3, a marker of cardiac fibrosis, is an emergent prognostic biomarker in heart failure. However, its associations with hemodynamic parameters and whether it has an incremental prognostic value upon natriuretic peptide in acute heart failure syndrome (AHFS) remained unclear.

Methods and Results: Galectin-3 and N-terminal pro-brain natriuretic peptide (NT-proBNP) levels were measured in 125 participants hospitalized due to AHFS (mean age 70.4 years; 82% women). We assessed determinants of increased Galectin-3 using logistic regression model and the relation of Galectin-3 to adverse cardiovascular (CV) outcomes by proportional hazards regression. Measures of hemodynamic parameters by tonometry and thoracic fluid content (TFC) by impedance cardiography were obtained within 24 hours of admission. During a median follow-up of 601 days, 66 adverse events developed. In multivariate model, increased Galectin-3 (>25.9 ng/ml) was significantly associated with estimated creatinine clearance with odd ratio (OR) 0.194 (95% confidence interval [CI] 0.101–0.373; $p < 0.0001$) and backward arterial wave reflections (Pb; OR 2.11; 95% CI 1.20–3.71; $p = 0.0096$). Elevated Galectin-3 was associated with risk for adverse outcomes after adjustment for clinical variables and NT-proBNP (HR: 3.49; 95% CI: 1.04 to 11.72; $p = 0.04$). Moreover, the addition of Galectin-3 resulted in significant net incremental improvement in risk assessment (net reclassification index 0.514, 95% CI 0.078–0.949, $p = 0.021$).

Conclusion: The association of Galectin-3 with Pb linked increased Galectin-3 with small arteriolar pathology in AHFS. The independent and incremental prognostic value of Galectin-3 upon NT-proBNP lend support to the clinical application of Galectin-3 in the management of AHFS.

P-04

Ankle-Brachial Index and Brachial-Ankle Pulse Wave Velocity Jointed to Predict Total and Cardiovascular Mortality in a Community Study

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Background: Pulse volume recordings and blood pressures at arms and ankles can be obtained automatically and simultaneously to allow fast measurements of the brachial-ankle pulse wave velocity and the ankle-brachial index. We evaluated the association between ankle-brachial index, brachial-ankle pulse and mortality in a community.

Methods: A total of 1329 residents (≥ 40 yrs) in Kinmen completed a health survey, including interview, physical examination, blood test, and the measurements of brachial-ankle pulse wave velocity and ankle-brachial index in 10 working days. By linking with the National Death Registry, we retrieved the dates and causes of death of all participants until December 31, 2012. The median follow-up durations was 10 years. The Cox proportional hazard model was used to estimate the hazard ratios (HRs) of abnormal Ankle-brachial index (ABI <0.9 or >1.3) and high brachial-ankle pulse wave velocity (baPWV ≥ 1670 cm/sec) for total/cardiovascular mortality.

Results: A total of 115 deaths occurred and 26 cardiovascular mortality during the 10-yrs (median) follow period. The prevalence of abnormal ABI and high baPWV were 3.09% ($n = 41$) and 26.34% ($n = 350$), respectively. The total mortality was 4.1 per 1000 persons for normal PWV and normal ABI, 20.6 per 1000 PYS for normal PWV and abnormal ABI, 19.6 per 1000 PYS for high PWV and normal ABI, and 48.3 per 1000 PYS for high PWV and abnormal ABI. The crude hazard ratio (HR) of 12.43 (95% confidence intervals: 6.03–25.6) for high baPWV and abnormal ABI, 4.92 (3.30–7.32) for high PWV and normal ABI, and 5.16 (1.85–14.42) for normal baPWV and abnormal ABI, compared to those with normal ABI and normal baPWV. In the multivariate model, the HRs of total mortality was 2.82 (1.12–7.11) for high baPWV and abnormal ABI, was 1.87 (1.09–3.21) for high PWV and normal ABI, and was 2.67 (0.87–8.19) for normal baPWV and abnormal ABI.

Conclusion: Ankle-brachial index and brachial-ankle pulse wave velocity jointed to significantly predict total and cardiovascular mortality in a general community cohort.

P-05

Do White Blood Cells Count Predict Diabetes Incidence in General Community Population as Time Goes by?

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Background: Little prospective data that whether white blood cells count predict diabetes incidence in general community population over time, have been reported from China. Our aim was to examine whether white blood cells count could predict diabetes incidence in a general Chinese community population during a 15-year follow-up.

Methods: The data were collected in 1992 and then again in 2007 from the same group of 687 individuals. Questionnaire, physical examination and laboratory tests were performed by a standard protocol. To assess the effects of baseline White blood cell count on the new onset of diabetes, Cox's proportional hazards regression models were used to estimate the hazard ratios, and the discriminatory power of anthropometric measures for diabetes was assessed by the area under the receiver operating curve.

Results: Seventy-four individuals were diagnosed with diabetes during a 15-year follow-up period (incidence: 10.8%). Time of diabetes onset was 11.2 ± 3.8 years. White blood cells count, as a marker of subclinical inflammation, was significantly associated with the risk of incident diabetes during a long-term follow-up after adjustment for potential risk factors ($P = 0.041$). The areas under the receiver-operating adjustment for potential risk factors ($P = 0.041$). The areas under the receiver-operating curves for WBC were not significantly better than that for traditional risk factors such as BMI in the general community cohort at 7–8 years (ΔAUC 0.06, 95% CI: -0.162–0.282, $P = 0.597$) or 15 years follow-up (ΔAUC 0.1, 95% CI: 0.006–0.205, $P = 0.065$).

Conclusions: Total WBC count was significantly associated with Type 2 Diabetes. Yet, it was an inappropriate predictor in diabetes in middle-aged community residents compared to traditional risk factors such as BMI.

P-06

Hypercholesterolemia Up-Regulates the Expression of Intermedin and Its Receptor Components in the Aorta of Rats via Inducing the Oxidative Stress

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Objective: Hypercholesterolemia can cause damage to the artery before the atherosclerotic lesion has formed. Intermedin (IMD) is a novel member of the calcitonin gene-related peptide family. Endogenous IMD is reported to participate in several cardiovascular pathological states. Using the rats fed with high-cholesterol diet, this study aims to investigate the aortic expression of IMD and its receptors in hypercholesterolemia without atherosclerosis. Furthermore, by the antioxidant intervention, we also explore the influence of oxidative stress.

Methods: Male Wistar rats were fed with high cholesterol diet, with or without concurrent administration of simvastatin and vitamin C. The serum lipid levels were measured, and the aortic histopathology features were examined. Both the malondialdehyde (MDA) and superoxide dismutase (SOD) in plasma and aorta were determined as the oxidative stress biomarkers. The plasma IMD was assessed by radioimmunoassay. Within the aorta, the mRNA expression of IMD along with its receptor components were determined by quantitative Real-Time Polymerase Chain Reaction (qRT-PCR), and the corresponding protein level of the CRLR/RAMPs were assessed by Western blot analysis.

Results: The hypercholesterolemia rats without atherosclerotic lesion manifested higher level of MDA and SOD. The IMD in plasma was elevated. Within the aorta, increased expression of IMD and all its receptor components (CRLR, RAMP₁, RAMP₂, and RAMP₃) were displayed. The simvastatin indirectly attenuated oxidative stress by improving lipid profiles, while the vitamin C directly reduced oxidative stress without interfering with the serum lipids. Both simvastatin and vitamin C ameliorated the aortic injury, decreased the plasma IMD level, and recovered the expression of IMD and its receptors within the aorta.

Conclusions: For the first time, the up-regulated expression of IMD is observed within the aorta of the hypercholesterolemia rats, demonstrating the pathophysiological role which IMD has performed in hypercholesterolemia absent of atherosclerosis lesion. In addition, the oxidative stress is evidenced to participate in the up-regulation.

P-07

Investigation of the Relationship between Arterial Stiffness and Sleep Architecture in Patients with Essential Hypertension

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Background: A change in sleep architecture might increase the risk of hypertension and worsen target organs. This study aims to explore whether sleep architecture is associated with pulse wave velocity (PWV).

Methods: In patients with essential hypertension and normal people aging 45–65 (n = 106), We collected demographic data, serum index and ambulatory blood pressure in addition to measuring arterial stiffness and monitoring sleep respiration.

Results: Carotid-femoral pulse wave velocity (cfPWV) among patients with essential hypertension was correlated with body mass index; FBG (fasting blood-glucose); NSBP (night mean systolic blood pressure); nighttime blood pressure decrease rate (NBPDR), sleep latency, duration and efficiency; microarousal index (MI) and non-rapid eye movement (NREM), but not with rapid eye movement (REM) and apnea hypopnea index (AHI). A further multiple liner regression analysis revealed that cfPWV was in correlation with NBPDR (B = -0.056, P = 0.024), MI (B = 0.048, P = 0.007) and the ratio of the third stage of NREM (N3) (B = -0.051, P = 0.015).

Conclusion: Patients with essential hypertension were with longer sleep latency and duration. Their sleep efficiency decreased along with the ratio of N3 in NREM and R stage in REM while there was an increase in MI, as well as the lasting of N1 and N2 in NREM and AHI.

P-08

Prevalence of Resistant Hypertension in Western China

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Background: Resistant hypertension (RH) is a common clinical problem, but the exact prevalence of RH is unknown. Data from the National Health and Nutrition Examination Survey from 2003 through 2008 indicated that the prevalence of RH in the United States was 12.8%. It is noticeable that the prevalence of RH in China has not been reported.

Objective: To investigate the prevalence of RH in a community and in our outpatient hypertension clinic simultaneously in Chengdu, and compare these data with those from the USA.

Methods: From 2011 to 2012, 2740 adults with hypertension from our hypertension clinic were sequentially evaluated and 583 adults with hypertension from a community were recruited by random sampling method. Definition of RH established by JNC7 and AHA was adopted, described as failure to achieve goal BP (<140/90 mm Hg in the general hypertensive population and <130/80 mm Hg in patients with diabetes or CKD) when patients adhere to full doses of an appropriate regimen of 3 antihypertensive drugs, including a diuretic.

Results: 1. In 2740 patients from clinic, 2257(82.4%) were taking medications for hypertension. In 583 patients from community, 331(56.8%) were taking anti-hypertension medications. 2. The prevalence of RH in the antihypertensive drug-treated patients was 1.8% (2.0% for men, 1.7% for women, respectively) in the community and 7.0% (7.2% for men, 6.7% for women, respectively) in outpatient clinic ($P < 0.001$). 3. To compare with figures in the USA, we redone statistics on the basis of RH definition they adopted (if blood pressure was $\geq 140/90$ mm Hg and using antihypertensive medications from 3 different drug classes or using drugs from ≥ 4 antihypertensive drug classes regardless of blood pressure). The prevalence of RH was then raised to 4.2% (5.3% for men, 3.9% for women, respectively) in the community and 13.5% (13.4% for men, 13.5% for women, respectively) in outpatient clinic ($P < 0.001$). 4. Comparing the type of antihypertensive medications used by patients with RH, use of diuretics in our clinic is significant lower than in the USA (51% vs 85.6%, $P < 0.001$).

Conclusions: 1. The prevalence of RH was lower than suspected, the real rate of RH in the USA may be lower than 12.8%. 2. The prevalence of RH in the general population was evidently lower in western China than in the USA. As the use of diuretics increases, the prevalence of RH may decrease. Ethnicity may be an important contributor to the difference.

P-09

Resting Heart Rate Predicts Metabolic Syndrome in Women Rather Than in Men: A 15-Year Prospective Study

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Background: The causality of sympathetic activity and metabolic syndrome (MS) remained to be a 'chicken and egg' question. The aim of the study is to reveal the causality of sympathetic activity and MS and to investigate whether there are gender differences in the relationship between sympathetic activity and MS in a 15-year follow-up cohort in our Chinese people.

Methods: A total of 711 subjects aged 35 to 65 years accepted health examinations both in 1992 and 2007. Since

114 subjects were identified MS and 7 subjects with heart disease in 1992, they were excluded from the analysis. Therefore, only 590 subjects with complete data (male: 61.5%) were available and analysed. These subjects were divided into four groups according to the baseline resting heart rate. Trend tests of MS incidences across the four groups of resting heart rate were conducted by Cochran-Armitage trend tests in both men and women. Additionally, four logistic regression models were used to estimate the effects of resting heart rate on the new onset of MS.

Results: The incidences of MS according to the resting heart rate (RHR) categories showed a statistical linear trend in women (P for trend = 0.018) rather than in men (P for trend = 0.194). The ORs [95% confidence intervals (CIs)] of MS for each categorical increase in RHR was 1.514(1.070–2.141) ($P = 0.019$) in a univariate model, 1.561(1.096–2.222) ($P = 0.014$) adjusted for age and health related behaviors only, 1.689(1.161–2.459) ($P = 0.006$) adjusted for age, exercise habits and pre-existing components of MS and 1.735(1.147–2.624) ($P = 0.009$) adjusted for age, exercise habits and values of MS components in the baseline in women. Otherwise, RHR did not predict the development of MS in men neither in a univariate model nor in multivariate models.

Conclusions: The incidence of MS increased with elevated RHR in women while not in men. Elevated RHR can predict the development of MS in women rather than in men.

P-10

The Effects of Initial and Subsequent Overweight or Obese on Hypertension

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Background: The aims of our study were to examine whether becoming nonobese could reverse the adverse effects of initial overweight or obesity on hypertension in adulthood.

Methods: We collected the data in 1992 and again in 2007 from the same group of 577 individuals. The subjects were classified into four groups: individuals with a normal BMI (body mass index) in 1992 and 2007 were in group I; those with a normal BMI in 1992 but overweight or obese in 2007 were in group II; those who were overweight or obese in 1992 but normal BMI in 2007 were in group III; and those who were kept overweight or obese in 1992 and 2007 were in group IV.

Results: The cumulative incidence of hypertension was 36.2%, 62.2%, 38.7% and 62.0% for group I to IV, respectively. Compared with group I, the HR is 1.817 for group II ($p < 0.001$), 1.065 for group III ($p = 0.746$) and 2.254 for group IV ($p < 0.001$). There was not significantly different between groups I and III, and the same as between groups II and IV.

Conclusion: Compared with the individual who persist being overweight or obesity, becoming nonobese could

reverse the adverse effects of overweight or obesity on hypertension; compared with who were persisted in normal BMI, being overweight or obese will increase the morbidity of hypertension. In short, overweight or obese would increase the risk for hypertension, and loss weight might reverse the adverse effect.

P-11**Effects of Salt Loading and Potassium Supplement on the Blood Pressure Rhythm in Salt-Sensitive Chinese People**

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The salt-sensitive subjects has a higher prevalence of non-dipper blood pressure rhythm and more serious target organ damage than non salt-sensitive ones. We aims to investigate the effects of salt loading and potassium supplement on blood pressure rhythm in salt-sensitive Chinese people. In the present study, 49 normotensive and mild hypertensive Chinese patients received a study protocol of 3 days baseline history and physical examination, 7 days low-salt diet (3 g NaCl/d), 7 days high-salt diet (18 g NaCl/d) and 7 days high-salt diet with potassium supplement (18 g NaCl and 4.5 g KCl/d). The 24-hour noninvasive ambulatory blood pressure was obtained during the end of each period. 14 patients were classified as salt-sensitive according to a 10% increase of mean arterial pressure (MAP) after high-salt load. The nocturnal MAP fall was significantly smaller in salt-sensitive subjects than non salt-sensitive ones during the high-salt period (5.52 ± 1.26 vs 9.19 ± 0.85 , $P < 0.01$). After potassium supplement, The nocturnal MAP fall in salt-sensitive group increased significantly and had no statistic difference compared with the non salt-sensitive group (10.66 ± 1.44 vs 10.22 ± 1.21 , $P = 0.2$). These results indicate that potassium can eliminate the adverse effect of high-salt intake on blood pressure rhythm in salt-sensitive patients.

P-12**Osteopontin and Osteoprotegerin Activate Monocytes into Anti-Inflammatory Properties in the Patients with Hypertension-Related Vascular Calcification**

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Objective: Monocytes/macrophages are believed to play roles in vascular calcification (VC). Here, we analyzed whether OPN and OPG might exert effects by promoting macrophage polarization into an anti-inflammatory phenotype in the patients with hypertension (HT)-related VC.

Methods: In this study, 527 HT patients with or without VC were identified by using artery electronic calculators tomography. Histological analysis was performed in the samples of aortic blood vessel from calcified vessels. Human peripheral blood CD14+ monocytes including M1~like CD11c+ and M2~like CD163+ cells were analysed by flow cytometry. The effects on M1 and M2 macrophages correlated with cytokines and chemokines were assessed by qPCR.

Results: We show that in HT patients, VC was correlated with higher systolic pressure, the higher incidence and more intima-media thickness of the plaque of carotid artery and was associated with arterial stiffness (including higher carotid-femoral pulse wave velocity, aortic systolic pressure, augment pressure, augment index, $P < 0.05$). Furthermore, the phenotype of M1~like monocyte/macrophages was significantly increased in HT patients with VC ($P < 0.05$). Although both Serum OPN and OPG levels increased in HT patients with VC, they significantly upregulated anti-inflammatory M2 macrophages marks ($P < 0.05$) and only OPN downregulated pro-inflammatory M1 macrophages marks.

Conclusion: The phenotype of M1 macrophages and M2 macrophages is promoted by VC. The ability of OPN and OPG to promote differentiation of macrophages into an alternative, anti-inflammatory phenotype may explain their protective effects in VC of HT patients. These data provide novel insight into the link between inflammation and VC diseases.

P-13

The Serum Sodium to Urinary Sodium to (Serum Potassium)² to Urinary Potassium (SUSPPUP) Ratio in Patients with Primary Aldosteronism

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Objective: The aldosterone-to-renin ratio (ARR) is a diagnosis method in the screening for primary aldosteronism (PA). However, hormonal determination are expensive, and not readily available in all hospitals. There, we assessed the effectiveness of the serum sodium to urinary sodium to (serum potassium)² to urinary potassium (SUSPPUP) in diagnosis of primary aldosteronism (PA).

Methods: Records of patients who were referred to the Hypertension Center of Xinjiang Uygur Autonomous Region for investigation of primary aldosteronism between January 2008 and January 2011 were retrieved. 952 Patients who had renin activity and aldosterone measurements and concomitant serum and urinary biochemistry data were included if diagnosed with PA (n = 204) or essential hypertension (n = 261). Diagnosis of PA was made in accordance with established laboratory criteria (including measurements of renin activity and aldosterone, ARR, Saline loading test). Primary aldosteronism was diagnosed as following: subjects with sitting plasma rennin activity <1.0 ng/ml/h and sitting aldosterone concentration ≥12 ng/dl and sitting ARR ≥20 performed saline infusion test, after which aldosterone concentration > 10 ng/dl was a sign of primary aldosteronism. We compared the SUSPPUP ratio with the ARR in two groups.

Results: The AUCs of SUSPPUP and ARR were 0.797 and 0.796 respectively according to ROC curve, optimal cutoff of SUSPPUP was 1.0, the sensitivity and specificity of SUSPPUP was 98.9% and 81%.

Conclusions: The SUSPPUP ratio is a cheap and simple tool to assess the extent of mineralocorticoid excess, therefore, SUSPPUP ratio can be offered to screen PA in hypertensive patients.

P-14

Accuracy of Home versus Ambulatory Blood Pressure Monitoring in the Diagnosis of White-Coat and Masked Hypertension

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Background: We investigated accuracy of home blood pressure (BP) monitoring in the diagnosis of white-coat and masked hypertension in comparison with ambulatory BP monitoring.

Methods: Our study subjects were enrolled in the China Ambulatory and Home BP Registry and underwent clinic, home and 24-hour ambulatory BP measurements. We defined white-coat hypertension as an elevated clinic systolic/diastolic BP (≥140/90 mm Hg) and a normal 24-hour ambulatory (<130/80 mm Hg) or home systolic/diastolic BP (<135/85 mm Hg) and masked hypertension as a normal clinic systolic/diastolic BP (<140/90 mm Hg) and an elevated 24-hour ambulatory (≥ 130/80 mm Hg) or home systolic/diastolic BP (≥ 135/85 mm Hg).

Results: In untreated subjects (n = 573), the prevalence of white-coat hypertension (13.1% vs. 19.9%), masked hypertension (17.8% vs. 13.1%) and sustained hypertension (46.4% vs. 39.6%) significantly ($P \leq 0.02$) differed between 24-hour ambulatory and home BP monitoring. In treated subjects (n = 1201), only the prevalence of masked hypertension differed significantly (18.7% vs. 14.5%, $P = 0.005$). Regardless of the treatment status, home compared with 24-hour ambulatory BP had low sensitivity (range, 47%–74%) but high specificity (86%–94%) and accordingly low positive (41%–87%) but high negative predictive values (80%–94%), and had moderate diagnostic agreement (82%–85%) and Kappa statistic (0.41–0.66). In untreated and treated subjects, age advancing was associated with a higher prevalence of white-coat hypertension and a lower prevalence of masked hypertension defined by 24-hour ambulatory ($P \leq 0.03$) but not home BP ($P \geq 0.10$).

Conclusions: Home BP monitoring has high specificity but low sensitivity in the diagnosis of white-coat and masked hypertension, and may therefore behave as a complementary to, but not a replacement of, ambulatory BP monitoring.

P-15

Inter-Arm Difference of Blood Pressure in Hypertensive Patients and Cardiovascular Risk in Cooperative Network Construction of Nationwide Clinical Trial (Coconet Study)*Su-A Kim^a, Jang-Young Kim^b, Jeong Bae Park^a*^aCheil General Hospital, ^bWonju Severance Hospital, Yonsei University, Korea

Objective: There has been a rising interest in inter-arm difference (IAD) of blood pressure (BP) due to the increasing incidence of atherosclerotic cardiovascular diseases, for its relation to the peripheral arterial disease and for the suspicion of its relation to cardiovascular disease. The present study aimed to characterize the hypertensive patients with a significantly larger IAD with relation to cardiovascular risk in a large cohort of hypertensive patients.

Methods: Total 3,701 patients (mean age, 61±11 years; male/female, 1952/1749) were prospectively enrolled for the study. BP was measured in both arms simultaneously for 3 times with 2-minutes' interval using automated cuff-oscillometric device (Watch BP office, Microlife, Taiwan). Systolic IAD was defined as the absolute difference of systolic BP of left and right arm, and the presence of significant IAD was determined by the IAD >10 mm Hg using mean BP of three BP measurements in each arm. Cardiovascular risk was calculated using Framingham risk score.

Results: The average blood pressure was 128±14 mm Hg in systole and 79±10 mm Hg in diastole. Systolic IADs was 4.3±4.1 mm Hg, and 266 (7.2%) patients showed significant IAD. Patients with significant IAD showed larger body mass index (25.5±3.28 kg/m² vs 26.6±4.07 kg/m², *p* < 0.001) and greater pulse pressure (49±11 mm Hg vs 50±11 mm Hg, *p* = 0.035). They were more likely to have coronary artery disease with a relative risk of 1.3 (*p* = 0.047), and cerebrovascular disease with a relative risk of 1.5 (*p* = 0.063). Patients with significant IAD received more beta blockers than without (28.5% vs 37.2%, *p* = 0.003). The mean Framingham risk score in hypertensive patients was 9.7±8.0%. Systolic IAD was weakly correlated with the 10-year cardiovascular risk determined by the Framingham risk score (*r* = 0.071, *p* = 0.013).

Conclusion: Increased systolic IAD was significantly related with the higher prevalence of coronary artery disease and 10-year cardiovascular event risk. Precise measurements of systolic IAD may be a simple and cost-effective tool for screening of cardiovascular disease in the clinical settings.

P-16

Reproducibility of Inter-Arm Systolic Blood Pressure Difference in Treated Hypertensive Patients: Coconet Study*Jang Young Kim^a, Jeong Bae Park^b, Sua Kim^b, CoCoNET Investigators*^aDepartment of Cardiology, Wonju College of Medicine, Yonsei University, Wonju, Korea; ^bDepartment of Cardiology, Cheil General Hospital, Kwandong University College of Medicine, Seoul, Korea

Objective: Inter-arm systolic blood pressure difference (sIAD) is recognized as a risk factor for cardiovascular mortality. However, the reproducibility of sIAD in treated hypertensive patients is unclear.

Methods: We examined 1,875 (45.1% female) hypertensive participants aged 20 years and older (mean age of 61.1 years) from 27 primary and tertiary hospitals in Korea. The blood pressure of the two arms was 3 times simultaneous measurements using automatic device (Watch BP, office, Microlife). Blood pressure was repeatedly measured in the baseline and 3 month follow up. An increased sIAD was defined as ≥10 mm Hg using the average of 3 times simultaneous measurements of blood pressure obtained in both arms.

Results: The mean inter-arm systolic blood pressure difference was 4.33±4.17 mm Hg. The Bland-Altman plot for IAD between baseline and follow up measurements were the limits of agreement. (bias -0436, 95% CI, -13.96–12.89 mm Hg). The kappa value between baseline and follow up sIAD was 0.165. The prevalence of increased sIAD at baseline was 142 (7.6%) participants. The likelihood with increased sIAD detected in 3 month follow-up examination in the group with increased sIAD at baseline was 21.8% (31 out of 142).

Conclusion: The reproducibility of sIAD determination between baseline and 3 month follow-up is poor agreement in treated hypertensive patients.

P-17

Abnormal Pulsatile Hemodynamics in Hypertensive Patients Under a Combination Therapy of Three or More Anti-Hypertensive Agents

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Background: Hemodynamic abnormalities in hypertensive patients who require a combination of three or more classes of antihypertensive medications to achieve the goals defined by office or out-of-office systolic (SBP) and diastolic (DBP) blood pressures are not well characterized.

Methods: A total of 73 hypertensive patients (68.5±11.4 years, 47.9% males) who received three or more classes of antihypertensive medications were enrolled in this study. Another 73 age- and sex-matched never-treated hypertensive patients were randomly selected from a community survey. Office and out-of-office (by 24-hour ambulatory blood pressure monitoring) SBP, DBP, pulse pressure (PP), central-

femoral pulse wave velocity (cf-PWV), amplitudes of the forward and reflected pressure waves from a decomposed carotid pressure wave (Pf and Pb, respectively), cardiac output (CO), total peripheral resistance (TPR), and left ventricular mass index (LVMI) were measured for every participant.

Results: Compared with the never-treated patients, the treated patients had significantly lower office and 24-h SBP, DBP and HR (average 24-h SBP/DBP = 124/68 mm Hg). The treated patients had significantly lower Pf, but the two groups had similar 24-h PP, Pb, CO, TPR, and LVMI. Moreover, the treated patients had significantly higher cf-PWV than the never-treated patients (11.9±4.3 m/sec vs. 9.2±2.3 m/sec, P < 0.001). Multi-variable regression analysis revealed that SBP (office or 24-h) was a significant independent determinant of LVMI in the never-treated patients. In contrast, PP (office or 24-h) but not SBP was a significant independent determinant of LVMI in the treated patients. Furthermore, cf-PWV and Pb were the significant independent determinants of 24-h PP.

Conclusion: Hypertensive patients whose SBP and DBP are controlled by a combination of three or more antihypertensive medications may still have abnormal hemodynamics (arterial stiffness and wave reflections in particular) and LVMI that are not significantly different from those of the never-treated hypertensive patients.

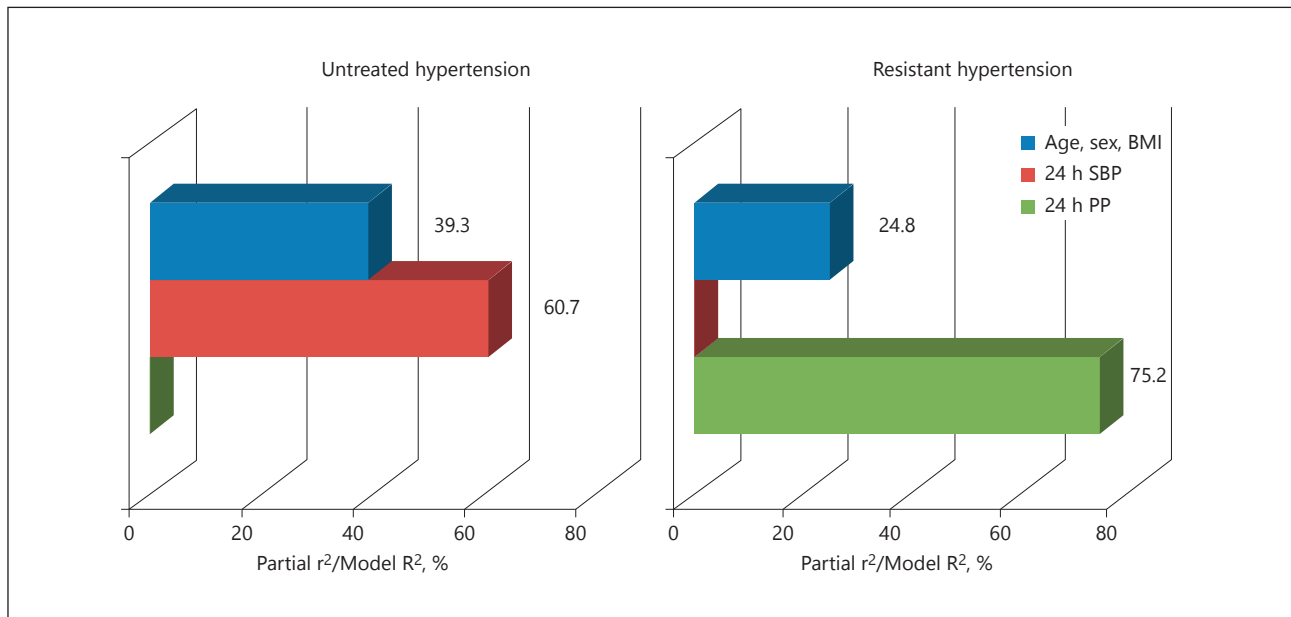


Fig. 1. Determinants of LVMI: multiple stepwise analysis (for Abstract P-17).

P-18

Characteristics of Traditional Chinese Medicine Constitutions and the Relationship with Hypertension in Adult Chinese Resident: A Cross-Sectional Study*Ying Li^a, Xin Huang^b, Cheng-xian Guo^a, Xiao-Hui Li^c, Xing Liu^a, Zhi-Jun Huang^a, Hong Yuan^{*a}*^aCenter of Clinical Pharmacology, Third Xiangya Hospital, Central South University, Changsha, China; ^bSchool of Public Health, Central South University, Changsha, China; ^cDepartment of Pharmacology, School of Pharmaceutical Sciences, Central South University, Changsha, China

Objective: Traditional Chinese Medicine Constitution (TCMC) theory is widely applied in the practice of medical treatment for thousand years in China, which is identified as the treasure of Chinese civilization. TCMC determined the susceptibility to certain disease and therapy effect, which can be divided into normal constitution and unbalanced ones. This study aims at investigating the distribution and the characteristic of TCMCs in adult Chinese resident in Changsha and the effects on susceptibility and therapy effect of hypertension.

Design and Method: The study used cross-sectional survey, collected all available information which including age, gender, occupation, alcohol/smoke intake, family history, body mass index (BMI), blood pressure (BP), TCMC and blood test in part respondents from community healthy registry system in Yuelu district, Changsha city. The association between independent factors and each TCMCs, as well as TCMCs and the prevalence and control rate were analyzed. Prediction prevalence model of hypertension were established by Logistic analysis with TCMC and other factors.

Results: A total of 237,485 individual records were collected, of which 188,136 (79.2%) were balanced TCMC. Statistical analysis indicated that age, BMI, occupation, smoking and alcohol intake, hemoglobin, fasting blood-glucose, cholesterol, triglyceride, creatinine, potassium and sodium in blood were different in balance and unbalance TCMCs groups. The prevalence of hypertension was significantly different between balance and unbalance TCMCs groups (9.3% vs 30.7%, $P < 0.01$). Logistic analysis indicated age, sex, BMI, alcohol and smoke intake, family history and TCMCs were significant correlated the prevalence of hypertension. PW (OR 4.16), ND (OR 3.34) and PD (OR 2.78) were more likely to suffering from hypertension, while QDP (OR 0.65) may be a protective TCMC by hypertension after controlling confounding factors. 29,123 (88.2%) hypertensive patients were under administrated by community physician. Blood pressure was significant higher in unbalance TCMCs group compared with balance TCMCs group in both systolic and diastolic blood pressure (SBP/DBP) (133.91 ± 14.79 vs 132.62 ± 15.07 mm Hg, $P < 0.01$; 80.51 ± 9.03 vs 80.27 ± 8.90 mm Hg, $P < 0.05$). Wetness-heat had the worst

SBP/DBP control level, while Yin-deficiency had the best SBP/DBP control level.

Conclusions: Age, occupation, smoking and alcohol intake, BMI, blood glucose/lipid metabolism, hemoglobin, blood electrolytes may contribute the formation of TCMCs. TCMCs have an impact on incidence and therapy effect of hypertension, could be a potential subtyping for hypertension.

P-19

Relationship of Brachial and Central Blood Pressure with Age in Patients with Hypertension*Meng Liu, Xiao-huan Zhou, Hai-ming Liu, Xin-juan Xu**

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Objective: To study central and brachial blood pressure and pulse pressure change according to age and blood pressure.

Methods: The hypertensive patients ($n = 1300$, including male 672, female 628, and aged 54 ± 24) were selected randomly. Central and brachial blood pressures were measured. The patients were divided into groups according to their age and pressure.

Results: The changing trend of brachial blood pressure (bBP) and central blood pressure (cBP) is consistent with age, and consistency of bBP is better than cBP. Brachial artery systolic blood pressure (bSBP) is higher than the central artery systolic blood pressure (cSBP), differential value is $(15.15 + 10.20)$ mm Hg, $P < 0.01$, brachial artery diastolic pressure (bDBP) is lower than the central artery diastolic pressure (cDBP), differential value is $(1.68 + 1.68)$ mm Hg, $P < 0.01$, brachial pulse pressure (bPP) is greater than the central pulse pressure (cPP), differential value is $(16.94 + 10.67)$ mm Hg, $P < 0.01$. Multiple stepwise regression analysis shows that the main factors influencing the bBP are age, heart rate, height.

Conclusion: Brachial and central blood pressure both change proportionally with increased age, the bBP consistency is better than cBP. However, it is different between two types of blood measurement, bBP is more sensitive than cBP with age; Central and brachial blood pressure are correlated with height, weight, heart rate, age.

P-20**The Study of Chronotherapy in Chronic Kidney Disease with Hypertensive Patients***Xing Liu, Hong Yuan**

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Numerous studies have proved the close relationship between non-dipping status and cardiovascular events in CKD patients. Our study is designed to identify the effect of evening dosing antihypertensive drugs in CKD with hypertensive patients.

In an open-label uncontrolled trial, we assigned 155 CKD with hypertensive patients either to take all prescribed hypertension medications in the morning or to take at least one of them at night. We measured 24-hour ambulatory blood pressure (BP) at baseline and 8 weeks after treatment.

After 8 weeks of treatment, there was no difference between two groups in CKD with hypertensive patients. However, CKD with INH treated with nighttime doses of anti-hypertensive drug showed a greater reduction in 24 h average systolic BP ($P = 0.045$), 24 h average diastolic BP ($P = 0.021$), daytime average systolic BP ($P = 0.035$), nighttime average systolic BP ($P = 0.036$), nighttime average diastolic BP ($P = 0.019$). After adjusting eGFR, the difference in the reduction of nighttime average diastolic BP between two groups was still statistically significant.

Regimen of taking ≥ 1 antihypertensive drugs in the evening should be considered for CKD with hypertension patients to lower the nighttime blood pressure.

P-21**Air Pollution, Exercise and Arterial Stiffness***Yanlei Li*

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Arterial stiffness is as an early biomarker in the assessment of vascular health such as atherosclerosis. Large artery stiffening is independently associated with cardiovascular events and all-cause mortality. Exercise training is an important component of lifestyle modification, some of which can improve arterial stiffness. Long-term exposure to air pollution has been associated with cardiovascular morbidity and mortality. The effects of exposure to air pollution while exercise on arterial stiffness has not been reported. The aim of this study is to understand the effects of habitual exercise with air pollution exposure on arterial stiffness and to determine which exercise modality would modify the effects of air pollution on arterial stiffness.

P-22**Downregulation of Dynamin-Related Protein 1 (DRP1) Contributes to Impaired Autophagic Flux and Angiogenic Function in Senescent Endothelial Cells***Jing-Rong Lin*

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Objective: Recent studies have shown that altered mitochondrial dynamics impairs the function in senescent endothelial cells (ECs); however, the underlying molecular mechanism remains to be elucidated. Herein, we investigated the role and underlying mechanism of mitochondrial fission protein dynamin-related protein 1 (DRP1) in vascular aging.

Approach and Results: We found that DRP1 expression is decreased in senescent ECs, accompanied with long interconnected mitochondria and impaired angiogenic function. In addition, there was marked increase of autophagosomes but not autolysosomes (assessed as punctate dual fluorescent mCherry-GFP tandem-tagged light chain-3 expression) in senescent ECs, indicating impaired autophagic flux. DRP1 knockdown or pharmacological inhibition in young ECs resulted in elongated mitochondria, suppressed autophagic flux, premature senescence, and impaired angiogenic function. In contrast, adenoviral-mediated overexpression of DRP1 in senescent ECs restored autophagic flux and improved angiogenic function. EC senescence was associated with increase of mitochondrial reactive oxygen species (ROS) and antioxidant N-acetyl-cysteine (NAC) restored autophagosome clearance and improved angiogenic function. Furthermore, en face staining of old rat thoracic aorta revealed a decrease of DRP1 expression and increase of autophagosomes accumulation *in vivo*.

Conclusions: These results suggest that loss of DRP1 during the senescence exacerbates ECs dysfunction by increasing mitochondrial ROS and subsequently inhibiting autophagic flux.

P-23

The Association Study of Single Nucleotide Polymorphisms and Haplotypes of VEGF Genes with Longevity in Xinjiang Uygur Population*Xiao-Hui Liang, Xin-Juan Xu, Su-Hua Li, Jun-Shi Zhang, Hai-Ming Liu*

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Objective: To investigate the correlation of the single nucleotide polymorphisms and haplotypes of VEGF genes with longevity in Xinjiang Uygur population.

Methods: A case-control design was applied in this study. In brief, a total of 361 Uygur subjects were selected in the study including 112 individuals ≥ 90 years old and 249 controls. The genomic DNA was extracted from all peripheral blood samples. Based on genotype data from the international HapMap project, the tagging single nucleotide polymorphisms (tSNPs) were selected. The locus of VEGF gene including rs2146323 (SNP1), rs3024997 (SNP2), rs10434 (SNP3) were genotyped by snapshot method and the haplotype distribution was estimated, while the relationship of single nucleotide polymorphisms and haplotypes with genetic susceptibility to longevity was investigated.

Results: 1) All polymorphisms were in Hardy-weinberg equilibrium both in longevity and in control group. The frequencies of C and A allele of VEGF SNP1 in longevity group were 70.1%, 29.9% and 62.3%, 37.7% in the control group. The frequencies of SNP1 genotypes of CC, CA and AA in longevity group were 47.3%, 45.5%, 7.2% and 42.6%, 39.3%, 18.1% in control group respectively. The distributions of AA genotype and A allele of SNP1 in longevity group were lower than in control group and P equals to 0.025, 0.041. The SNP rs2146323 was significantly associated with longevity (AA versus CC: $P = 0.011$, OR = 0.356, 95% CI: 0.156~0.808; A versus C: $P = 0.041$, OR = 0.704, 95% CI: 0.502~0.987); 2) The haplotype analysis revealed that the frequency of Hap1-CG was highest in both groups. The frequency of Hap1-CG was higher in longevity group than in control group, while the frequencies of Hap2-CA, Hap3-AG were lower in longevity group. There was no statistically significant difference. 3) The level of PP in CA+AA genotype combination was markedly higher than in CC genotype of VEGF SNP1 in control group.

Conclusion: Our study revealed that VEGF gene rs2146323 polymorphism might be associated with longevity. AA genotype and A allele were the adverse factors of longevity in Xinjiang Uygur population. rs2146323 might be associated with longevity through impacts on vascular function.

P-24

Relationship between 24-Hour Mean Pulse Pressure and the Cardiac Function in the Elderly with Isolated Systolic Hypertension*Jianjun Mu*, Tongsuai Guo, Yang Wang, Chao Chu*

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Objective: To investigate the effect of mean pulse pressure during 24- hours on cardiac function in the elderly with isolated systolic hypertension.

Methods: 172 elderly patients with isolated systolic hypertension were enrolled to determine mean pulse pressure by monitoring 24-hour ambulatory blood pressure and to analyze the cardiac function by nuclide cardiac blood pool imaging.

Results: 24-hours mean pulse pressure negatively correlated with left ventricular ejection fraction (LVEF) ($r = -0.46$, $P < 0.01$), and also with peak filling rate (RFR) ($r = -0.41$, $P < 0.05$). The greater the mean pulse pressure, the worse the cardiac function ($P < 0.01$).

Conclusion: The 24-hours mean pulse pressure was an important factor predicting risk for cardiac dysfunction in the elderly with isolated systolic hypertension.

P-25

Change in Wave Reflection and Arterial Stiffness in Patients Undergoing Endovascular Aortic Repair*Toru Miyoshi^a, Ohno Yuko^a, Masayuki Doi^b*^aDepartment of Cardiovascular Medicine, Okayama University Hospital, Okayama, Japan; ^bDepartment of Cardiology, Kagawa Prefectural Central Hospital, Takamatsu, Japan

Objective: Endovascular aortic repair for abdominal aneurysm or thoracic aortic aneurysm has been widely used in recent clinical setting. The placement of a stent graft within the aorta may affect wave reflection or pulse wave velocity. The purpose of this study was to evaluate the change in wave reflection and aortic stiffness after endovascular aortic repair.

Methods: A total of 28 patients (mean age 77 years old, 25 men) were evaluated before and one to three months later after the implantation of aortic stent graft. Wave reflection was examined at the wrist using applanation tonometry (HEM-9000AI, Omron Healthcare Co., Kyoto, Japan). Arterial stiffness was evaluated with cardio-ankle vascular index (VaSera Vascular Screening System (Fukuda Denshi, Tokyo, Japan)).

Results: 23 patients with abdominal aortic aneurysm and 5 patients with thoracic aortic aneurysm were treated with endovascular aortic repair. Systolic and diastolic blood pres-

tures did not differ before and after aortic stent implantation (131 ± 21 mm Hg vs. 127 ± 19 mm Hg, $p = 0.30$ and 73 ± 13 mm Hg vs. 70 ± 13 mm Hg, $p = 0.13$, respectively). Heart rate also did not differ (67 ± 10 bpm and 69 ± 13 bpm, $p = 0.14$). Crude radial augmentation index and corrected radial augmentation index by heart rate at 75 bpm were significantly reduced after stent implantation ($89\pm 10\%$ vs. $82\pm 14\%$, $p = 0.02$ and $86\pm 10\%$ vs. $80\pm 12\%$, $p = 0.01$, respectively). Central aortic pressure tended to be decreased after stenting (139 ± 23 mm Hg vs. 131 ± 22 mm Hg, $p = 0.11$). However, cardio-ankle vascular index was not changed by aortic stent grafting (10.0 ± 1.4 vs. 10.2 ± 1.5 , $p = 0.49$).

Conclusion: Aortic graft stenting reduced augmentation index, but not arterial stiffness. Aortic aneurysm may affect wave reflection.

P-26

Characteristics of Lipid Metabolism in Patients with Primary Aldosteronism: Analysis of 87 Cases

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Objective: To analyze the clinical characteristics and profile of lipid metabolism in patients with primary aldosteronism (PA).

Methods: The clinical data were retrospectively collected from 87 patients with PA from Feb. 2011 to Jan. 2014. Biochemical data, serum aldosterone (Ald), adrenal imaging and efficacy were recorded.

Results: 1. The levels of Ald in PA patients were (0.23 ± 0.06) ng/ml and (0.21 ± 0.06) ng/ml in upright and supine position respectively. Moreover, there were no significant difference between the adenoma and hyperplasia group ($P > 0.05$). 2. The level of serum potassium was significant lower in adenoma group [3.19 (2.56 – 3.83) mmol/l] than in hyperplasia [3.80 (3.58 – 4.27) mmol/l]. While the level of serum sodium in adenoma group [(143.34 ± 3.09) mmol/l] was higher than those in hyperplasia group [(140.87 ± 2.08) mmol/l] ($P < 0.05$, respectively). 3. The levels of triglyceride [1.10 (0.81 – 1.53) mmol/l] and very-low-density lipoprotein cholesterol (VLDL-C) [0.50 (0.36 – 0.69) mmol/l] in adenoma group were higher than in hyperplasia group [1.41 (1.05 – 2.44) mmol/l, 0.64 (0.48 – 1.11) mmol/l]. Meanwhile, the level of high-density lipoprotein cholesterol (HDL-C) [1.35 (1.15 – 1.58) mmol/l] was significant lower than those in hyperplasia group [1.08 (0.95 – 1.32) mmol/l] ($P < 0.05$, respectively). 4. Multi-factor Logistic regression analysis showed that high VLDL-C (OR 164.688), high level of triglyceride (OR 15.740) were the predictors of adrenal cortical hyperplasia. Nevertheless, hypo-

kalemia (OR 0.103) and high level of serum sodium (OR 0.653) were the predictor of adrenocortical adenoma ($P < 0.05$, respectively).

Conclusions: The patients with adrenal cortical adenoma were prone to be in a condition of hypokalaemia, while the patients with adrenal hyperplasia were susceptible to lipid metabolism disorders.

P-27

Balanced Optimal Medical Therapy is Essential in Management of Patients with Coronary Artery Disease: Pulse Wave Velocity Long Follow-Up Study

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Background: Global cardiovascular risk stratification is essential in high-risk hypertensive patients. However, it is uncertain how often the strategy is executed in real clinical practice. We sought to evaluate the management of cardiovascular risk in hypertensive patients with coronary artery disease (CAD) using brachial-ankle pulse wave velocity (baPWV).

Methods: A total of 851 hypertensive patients with CAD (age 65 ± 11) were enrolled and baPWV were measured every year (mean follow up periods 4.5 years). All subjects were divided into two groups: optimal medical therapy group (systolic blood pressure < 130 mm Hg, LDL-cho < 100 mg/dl and HbA1c $< 7.0\%$) and sub-optimal therapy group.

Results: In optimal medical therapy group, change of baPWV/year were significantly lower than in sub-optimal therapy group ($p < 0.05$). These results suggest that combination of optimal medical therapy is essential in management of high-risk hypertensive patients, and it might also reduce cardiovascular risk.

P-28

Predictors of Mild Diastolic Dysfunction Among Middle-Aged and Aged Women: A Population-Based Prospective Cohort StudyJing Wu^{a,b}, Miaomiao Zhao^a, Lijuan Zhang^{a,b}, Jue Li^{*,a,b}^aHeart, Lung and Blood Vessel Center, Tongji University School of Medicine, Siping Road 1239, Shanghai 200092, China; ^bKey Laboratory of Arrhythmias of Ministry of Education of China, Tongji University, Shanghai 200092, China

Background: Diastolic dysfunction (DD) is closely linked to the progression of heart failure (HF). It remains unknown what factors contribute to the onset of DD.

Method: This study included randomly selected women, age >45 years, who had >2 echocardiography between 2009 and 2012. Patients were excluded if they had a prior HF diagnosis or echocardiographic evidence of DD. Mild DD was defined as: LVEF >50%, E/A ratio <0.75 and E/e' ≤8.

Results: Of the total 776 subjects (age 64.35±7.29 years), 109 (14%) developed mild DD. Independent predictors of mild DD included: age [HR1.009, 95% CI 1.006–1.013], History of hypertension [HR1.442, 95% CI 1.231–1.597], BMI [HR1.073, 95% CI 1.044–1.102], Total triglycerides (TG) [HR1.068, 95% CI 1.013–1.127], Interventricular septal thickness (IVST) [HR 1.105, 95% CI 1.020–1.197], brachial-ankle pulse wave velocity (baPWV) ≥16 m/s [HR1.704, 95% CI 1.420–2.046]. E/A ratio was inversely associated with age ($r = -0.337$, $p < 0.001$), BMI ($r = -0.290$, $p < 0.001$), baPWV ($r = -0.359$, $p < 0.001$) and TG ($r = -0.255$, $p < 0.001$), IVST ($r = -0.188$, $p < 0.001$). The AUC for a linear combination of Age, BMI, baPWV, TG was 0.737 (95% CI: 0.683–0.804, $p < 0.001$) which was better than any of the variables taken alone.

Conclusion: 'Mild' form of diastolic dysfunction was prevalent among middle-aged and elderly women. Subclinical abnormalities and cardiovascular comorbidities contribute to the onset of DD.

P-29

Impact of Visit-to-Visit Blood Pressure Variability on Brachial-Ankle Pulse Wave Velocity: The Kailuan StudyYang Wang^{*,a,b}, Anxin Wang^{*,c,d}, Shasha An^{*,a,b}, Zhifang Li^{*,a,b}, Chunxue Wang^c, Yuntao Wu^b, Chunyu Ruan^b, Yan Liu^b, Yilong Wang^c, Yongjun Wang^c, Shouling Wu^b^aGraduate School, Hebei United University, Tangshan, China; ^bDepartment of Cardiology, Kailuan Hospital, Hebei United University, Tangshan, China; ^cDepartment of Neurology, Beijing Tiantan Hospital, Capital Medical University, Beijing, China; ^dDepartment of Epidemiology and Health Statistics, School of Public Health, Capital Medical University, Beijing, China

Background: Blood pressure variability (BPV) is independently associated with the occurrence of hypertensive target organ damage and cardiovascular events and the poor prognosis of cardiovascular diseases. Brachial-ankle pulse wave velocity (baPWV) is an index of arterial stiffness and a marker of atherosclerosis. It has been shown to be an independent predictor of all-cause and cardiovascular mortality as well as an indicator for cardiovascular diseases. However, few studies have investigated the impact of BPV on baPWV.

Objective: The objective of this study was to investigate the relationship between visit-to-visit BPV and baPWV in a general population.

Methods: The cohort is a general Chinese population and included participants with an age of 40+ years without history of stroke and coronary heart disease. The study participants were asked to join a face-to-face interview every two years. BPV was defined as the standard deviation of all SBP values at the baseline visit and following visits. We used multivariate linear regression models to test the relationship between BPV and baPWV.

Results: The study included 3994 participants with a mean age of 50.57±10.9 years. Mean BPV and baPWV were 10.93 mm Hg and 1599.22 cm/s. Significant ($P < 0.0001$) linear relationships were found between higher baPWV and higher BPV. After adjusting for confounding parameters such as age, sex, educational level, body mass index, the increasing of baPWV was 6.17 cm/s for per increasing 1 mm Hg of BPV ($P < 0.0001$).

Conclusion: The higher visit-to-visit BPV was independently associated with a higher baPWV in the general population.

P-30

Loss of OGN Promotes Angiogenesis in Limb Ischemia Mouse Model via Modulation of VEGF-VEGFR2 Signaling Pathway*Qi-Hong Wu, Yu Ma, Xin-He Liu, Chen-Chao Ruan, Yan Yang, Ke Zhang, Hui Jiang, Ping-Jin Gao*

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Objective: Osteoglycin (OGN) plays important roles in cardiovascular disease. However, the relationship between OGN and angiogenesis remains unknown. Therefore, we sought to investigate the effect of OGN on ischemia-induced angiogenesis and address the underlying mechanisms.

Method and Results: We found OGN was down regulated in intermuscular endothelial cells during angiogenesis in patients of peripheral artery disease and mice model of limb ischemia. Limb ischemia model was established in OGN knockout (KO) (n = 12) and wild type (WT) (n = 12) mice. Perfusion recovery was estimated by Laser Doppler imaging. The blood flow recovery of WT mice was 24.8%, 44.6% and 63.5%, respectively at day4, day7 and day14 after limb ischemia, while that of KO mice was 46.5%, 71.5%, and 83.0% coordinately. Capillary density indicating by CD31 positive staining was also higher in OGN KO mice in the gastrocnemius muscle of the ischemia limb. Meanwhile, aortic rings isolated from OGN KO mice had stronger sprouting than those from WT ones. In vitro study revealed tube formation was promoted in OGN knockdown group, compared with negative control group. Proliferation of human umbilical vein endothelial cells (HUVECs), as well as migration, was enhanced in OGN knockdown group. OGN knockdown did not alter protein level of VEGF or VEGFR2, but changed activation of VEGFR2 and its downstream signaling pathways. Co-immunoprecipitation assay revealed association of OGN and VEGFR2. And OGN was found to modulate interaction of VEGF and VEGFR2. Molecular docking showed OGN docked into the binding pocket of VEGFR2 on the extracellular domain2 and domain3, which is the exact binding site of VEGF.

Conclusions: This study demonstrates the crucial role of OGN in the setting of ischemia-induced angiogenesis. Down regulation of OGN promoted endothelial cell functions and angiogenic pathways. In mechanism, this phenomenon can be attributed to OGN binding to VEGFR2 and modulation of VEGF-VEGFR2 signaling pathway.

P-31

Influence of Salt Loading and Potassium Supplement on Short Term Blood Pressure Variability in Salt-Sensitivity Adults*Haixia Xu, Jianjun Mu*, Keyu Ren, Chao Chu, Tongshuai Guo*

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Objective: To observe the change of short term blood pressure variability in salt-sensitive normotensive people after sodium-potassium diet, and explore the relationship between blood pressure variability and salt-sensitivity.

Methods: A baseline survey was carried out in 93 normotensive adults (age >18) in Mei county, Shanxi province from April to October, 2004. All subjects were recruited and sequentially maintained on a protocol with 7 days low salt diet (51.3 mmol/day sodium), 7 days high salt diet (307.7 mmol/day sodium), and high salt diet with potassium supplementation (307.7 mmol/day sodium and 60 mmol/day potassium) for another 7 days. We measured blood pressure 3 times on the last day of each stage, and computed the standard deviation and coefficient of variation as indicator of short term blood pressure variability.

Results: The detecting rate of the salt sensitivity was 32.26 percent of all normotensive adults. Compared with non-salt-sensitive group, baseline short-term blood pressure variability of salt-sensitive group was larger (3.70 ± 1.67 vs 2.75 ± 0.91 , $p < 0.01$), and especially there was significant difference on systolic pressure (4.37 ± 1.13 vs 2.49 ± 0.54 , $p < 0.01$). Salt restriction and potassium supplementation reduced short term blood pressure variability of salt-sensitivity (3.24 ± 1.60 vs 3.08 ± 1.18 , $p > 0.05$ and 3.27 ± 1.38 vs 3.26 ± 1.47 , $p > 0.05$), while high-salt diet increased blood pressure variability (3.70 ± 1.89 vs 2.97 ± 1.10 , $p < 0.05$). Whereas there was no statistically significant difference in non-salt-sensitive group, although the same phenomenon were observed.

Conclusion: High salt intake may play an important role in increasing short-term blood pressure variability, especially salt-sensitivity adults. Salt restriction and potassium supplementation show a protective effect by decreasing short-term blood pressure variability.

P-32

Positive Relationship between Mortality and Severity of Chronic Kidney Disease and Peripheral Arterial Disease in Chinese Hypertension PopulationSiyun Yu^{a,b}, Lijuan Zhang^{a,b}, Jue Li^{a-c}

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Background and Objectives: Chronic kidney disease (CKD) and peripheral arterial disease (PAD) independently predict poor prognosis. The purpose of this study were to estimate the combined effect of CKD and PAD on all-cause and cardiovascular disease mortality and investigate whether a linear relationship exists between the mortality and the severity of both CKD and PAD in Chinese hypertensive population.

Methods: A total of 2931 hypertensive patients with available records were enrolled in 2004 and implemented the follow-up visit in 2010. The presence of PAD was assessed based on the ankle-brachial index (ABI) and renal function was evaluated using estimated glomerular filtration rate (eGFR). Patients were categorized into groups for different research purposes according to their CKD and PAD status.

Results: Patients with both CKD and PAD had the highest all-cause and CVD mortality (49.8% and 29.2%) as well as increased odds for death, compared with patients with CKD alone (29.0% and 15.7%), PAD alone (31.9% and 18.1%), and neither condition (20.2% and 9.4%). After adjustment for conventional cardiovascular risk factors, the Cox regression model further identified that the mortality risk increased as either or both ABI and eGFR decreased. Patients with ABI ≤ 0.70 and eGFR 15–29.9 ml/min per 1.73 m², had an more than five-fold increased risk for all-cause death and an approximately five-fold increased risk for CVD death compared with no disease group (RR: 5.543 and 4.997).

Conclusions: The combination of CKD and PAD multiplicatively increased the mortality risk for all-cause and CVD death in hypertensive individuals. And a positive correlation was further confirmed between the mortality risk and severity of both PAD and CKD.

P-33

Comparison of Screening Value between baPWV and hs-CRP to ASCVD in Middle and Elderly Community PopulationLiang Zheng^a, Qin Lan^a, Yuzhen Zhang^a, Jian Feng^b, Huimin Fan^a, Zhongmin Liu^a, Li Jue^b

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Objective: To estimate the prevalence of ASCVD in middle and elderly community population in Shanghai. To compare the screening value of baPWV and hs-crp to ASCVD and explore the risk factors to cause ASCVD.

Methods: Simple linear correlation was adopted to indicate the relationship between different variables; ROC curve analysis was used to compare the screening value between baPWV and hs-crp predicting ASCVD. Logistic regression was conducted to explore the risk factors of ASCVD.

Results: In present study, 1150 subjects were included in Lujiazui community, Shanghai, and 1065 individuals had completed data including of 295 men and 770 women. The mean of age, BMI, SBP, BNP and baPWV were significantly higher in ASCVD group while TG was higher in non-ASCVD group ($P < 0.05$). As for the constituent ratio, there were differences on variables smoking and drinking between two groups ($P < 0.05$). On the other hand, the prevalence of ASCVD was 12.58% in target population.

There are significant relationship between baPWV and age ($r = 0.49, P < 0.05$)/SBP ($r = 0.56, P < 0.05$)/WC ($r = 0.15, P < 0.05$), while there are no significant relationship between baPWV and hs-CRP ($r = 0.04, P > 0.05$). ROC curve analysis was conducted to estimate the screening value of baPWV and hs-CRP to ASCVD. The AUC and its 95% CI was 0.65 and 0.61–0.71 for the baPWV and 0.59 and 0.53–0.65 for hs-CRP. Compared with hs-CRP, the screening value of baPWV was more significant to discriminate the ASCVD.

When adjusted variables were gender and baPWV, the logistic regression (in model 1) showed that higher baPWV over 1550 cm/s was a risk factor for ASCVD (OR: 1.53 and 95% CI: 1.04–2.27) comparing to lower baPWV under 1350 cm/s. In model 2, overweight and baPWV (≥ 1550 cm/s) entered the final regression equation after adjusting gender, marital, overweight, drinking and baPWV.

Conclusions: The prevalence of ASCVD was 12.58% in middle and elderly community population in Shanghai, China. Compared with hs-CRP, the screening value of baPWV was more significant to discriminate the ASCVD. Overweight and higher baPWV rank (≥ 1550 cm/s) were risk factors to cause the ASCVD when adjusting gender, marital, BMI, drinking status and baPWV.

P-34

Case-Control Analysis of Coal Workers' Pneumoconiosis and Higher Brachial-Ankle Pulse Wave Velocity within Kailuan StudyYao Zheng^a, Lirong Liang^b, Shouling Wu^{*,a}^aKailuan Hospital, Hebei United University, Tangshan, Hebei, China; ^bBeijing Institute of Respiratory Medicine, Beijing Chaoyang Hospital, Capital Medical University, Tangshan, China

Background: The baPWV is an independent predictor of cardiovascular events and mortality. But no related data on the association of baPWV with coal workers' pneumoconiosis (CWP).

Objective: To explore brachial-ankle pulse wave velocity (baPWV) in subjects with coal workers' pneumoconiosis (CWP) and associated risk factors.

Methods: This nested case-control study included 1,007 male CWP cases without history of stroke and coronary heart disease and 1,007 matched controls from the Kailuan cohort study. All participants underwent measurement of baPWV and assessment of traditional cardiovascular risk factors. Cumulative silica dust exposure (work history linked to a job-exposure matrix) was estimated for cases with CWP.

Results: Compared with controls, CWP cases had higher baPWV (1762.0±355 cm/s vs. 1718.6±354 cm/s, $P = 0.006$) and a higher risk of increased baPWV (defined as more than the median baPWV of the population distribution; odds ratio 1.43, 95% confidence interval 1.11–1.83) after adjustment for traditional cardiovascular risk factors. Age ≥ 60 years, body mass index, heart rate, and hypertension were significantly associated with increased baPWV in CWP cases. Compared to non-CWP subjects lacking hypertension, odds ratios for increased baPWV gradually increased (P for trend, 0.001) across CWP subjects without hypertension (1.20, 95% confidence interval 0.90–1.61), subjects with hypertension alone (2.54, 95% confidence interval 1.95–3.30), and CWP subjects with hypertension (3.34, 95% confidence interval 2.56–4.37). We detected a significant positive exposure-response relationship between silica dust-exposure quartiles and increased baPWV in CWP cases (P for trend < 0.001).

Conclusions: For patients with CWP, increased baPWV was associated with traditional cardiovascular risk factors and long-term silica dust exposure.

P-35

Induction of Activating Transcription Factor 3 (ATF3) SUMOylation by AngiotensinII (AngII) Stabilizes Itself and Increases Endothelial Inflammation

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Background and Objective: Angiotensin II-induced endothelial inflammation is a big risk for vascular diseases. Our work found that both ATF3 expression and SUMOylation were induced by Angiotensin II in endothelial cells, so we aimed to explore how ATF3 and ATF3 SUMOylation participated in endothelial inflammation caused by AngII.

Methods and Results: Mice were sacrificed after infusion of Angiotensin II (AngII) for 14 days, thoracic aorta immunofluorescence showed that both ATF3 and SUMO1 expressions increased, and merge analysis exhibited ATF3 was SUMOylated. Human Umbilical Vein Endothelial Cells (HUVECs) in culture were exposed to AngII, western blot and co-immunoprecipitation (co-IP) exhibited both ATF3 expression and ATF3 SUMOylation were up-regulated. When Anacardic acid (AA), an inhibitor of SUMOylation and SUMO1 siRNA were introduced to HUVECs, AngII failed to increase ATF3 protein level. Co-IP experiment demonstrated that when SUMO1 and ubiquitin were overexpressed at the same time, ATF3 combined SUMO1 rather than ubiquitin, means that ATF3 SUMOylation avoided its ubiquitination. Real-time PCR confirmed that both ATF3 siRNA and SUMO1 siRNA blocked AngII-induced transcription of IL6, TNF- α and IL-8. As a member of AP-1 complex, overexpressed ATF3 plasmid alone failed to increase inflammation cytokines. But inflammation responses were triggered when ATF3 and other AP-1 members' plasmids demonstrated to HUVEC together.

Conclusion: Angiotensin II induced ATF3 SUMOylation protected ATF3 from ubiquitination. ATF3 heterodimer with AP-1 members increase endothelial inflammation. SUMOylation may be a potential therapeutic target for the treatment of vascular diseases caused by endothelial inflammation.

P-36

Relation of Long- and Short-Term Blood Pressure Variability with Brachial-Ankle Pulse Wave Velocity in Elders: Results from Kailuan StudyHualing Zhao^a, Shouling Wu^{*,b}^aGraduate School, Hebei United University, Tangshan, China; ^bDepartment of Cardiology, Kailuan Hospital, Hebei United University, Tangshan, China

Background: Recent studies have suggested that not only long-term systolic blood pressure variability (SBPV) but also short-term (within 24 hours) SBPV was associated with atherosclerosis assessed by brachial-ankle pulse wave velocity (baPWV). But that which one is more significantly correlated with baPWV is unclear, neither the mechanisms.

Objective: The objective of this study is to simultaneously investigate the relationship between the long- and short-term SBPV and baPWV.

Methods: Long-term SBPV was defined as the standard deviation (SD) of five clinic systolic values and short-term SBPV was SD of 24-hour ambulatory blood pressure. 1787 and 1370 participants had long- and short-term SBPV, respectively. BaPWV was assessed by a device of OMRON (BP-203RPE III). We used multivariate linear regression models to test the relationship between SBPV and baPWV.

Results: Significant ($P < 0.0001$) linear relationships were found between higher baPWV and higher SBPV (long- and short-term SBPV). In the multivariate linear regression analysis, after adjustment for other confounding factors, long-term SBPV was independently associated with baPWV, the increasing of baPWV was 4.956 cm/s for per increasing 1 mm Hg of long-term SBPV ($P = 0.009$). Whereas the short-term BPV does not associate with baPWV.

Conclusion: These results indicate that long-term SBPV is significantly correlated with baPWV, but short-term SBPV does not have the correlation.

high prevalence of Mets. Previous research indicates that the FURIN gene may play a pivotal role in the renin-angiotensin system, maintaining the sodium electrolyte balance and glucose metabolism, lipid metabolism. Because these systems influence Arteriosclerosis, we considered FURIN as a candidate gene for Arteriosclerosis. The purpose of this study was to systematically investigate the association between genetic variations in the FURIN gene and Mets in a Xinjiang Uygur population.

Objectives: to investigate the relationship between Furin gene polymorphism and metabolic syndrome in Xinjiang Uygur population.

Methods: according to different Waist circumference, body mass index, blood glucose level, blood pressure, blood lipids levels, 1134 individual in xinjiang hetian area were divided into 2 groups that is 707 patients with MetS and 474 non-MetS subjects. Selecting representative variant in application of TaqMan-PCR in a large population of genotype identification and case-control study. Based on HapMap and NCBI databases we selected the polymorphism rs2071410 SNP (htSNP) sufficiently covering the genetic variation of the whole gene. We therefore examined the association between rs2071410 Furin and in the Xinjiang Uygur population in two independent study populations; The genotype and allele frequencies and relative clinic data were compared among groups.

Results: The rs2071410 variant was associated with MetS in Uygur subjects ($P = 0.010$). Logistic regression analysis indicated that TT genotype of rs2071410 variation is a risk factor for MetS (OR = 1.471, $P = 0.013$). Further analysis found that the level The blood pressure, blood sugar, LDL related to homozygote TT were higher than CC and CT, that is to say the role of homozygote TT was Increase the risk of MetS.

Conclusion: Our study suggested that the rs2071410 polymorphism of Furin gene is associated with MetS in ethnic Uygur population from Xinjiang, China.

P-37

Relationship between Polymorphisms of Furin Gene and Metabolic Syndrome in Uygur Population of Xinjiang

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Background: Furin protease enzyme is a protein transformation inside the cell. Metabolic syndrome (Mets) is a complex disease influenced by multiple genetic and environmental factors. The Uygur ethnic group is characterized by a relatively

P-38

The Relationship between the KCNJ5 Gene Polymorphisms and Lipid Metabolism in Patients with Primary Aldosteronism

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Background: Primary aldosteronism (PA) is strongly associated with the increasing prevalence of cardiovascular events and metabolic syndrome. Study on the genetic mechanism of dyslipidemia is of great significance for the prevention and treatment of cardiovascular and cerebrovascular disease. Inwardly rectifying subfamily J, member5 (KCNJ5) gene has become an important candidate gene in PA research. Meanwhile, the KCNJ5 gene expression have been implicated in the

development of obesity and appears to be a key feature of metabolic syndrome (MetS). However, the relationship between the genetic variation of KCNJ5 gene and lipid metabolism is complex and still remains poorly understood. Aim of our study was to assess whether KCNJ5 gene polymorphisms are associated with dyslipidemia among patients with PA.

Methods: Patients hospitalized at the Center for Hypertension of the People's Hospital of Xinjiang Uygur Autonomous Region were selected from January 2010 to December 2011. A total of 494 subjects who diagnosed with primary aldosteronism were recruited base on a history and laboratory tests. 338 of whom (68.4%) were diagnosed with dyslipidemia, and 156 individuals were confirmed without dyslipidemia (31.6%). The polymorphisms of rs2604204, rs3740835, rs4937391, rs6590357, rs11221497, rs138295501 among the patients with primary aldosteronism (PA) were genotyped by Taqman polymerase chain reaction (PCR). Blood samples were collected from all subjects and genotyping was performed on DNA extracted from blood cells. Lipid levels were measured by conventional methods and were analyzed.

Results: When all dyslipidemia cases were compared against non-dyslipidemia controls, we found that the rs3740835 variant was associated with dyslipidemia in the PA population ($P = 0.023$). Also, the frequencies of AA haplotype of rs3740835 significantly increase prevalence of dyslipidemia compared with (AC+CC) genotype.

Conclusions: Our study demonstrates the polymorphisms of rs3740835 of KCNJ5 gene may play a role in the development of lipid metabolism abnormality in patients with PA.

P-39

Thyroid Stimulating Hormone Is Increased in Hypertensive Patients with Obstructive Sleep Apnea

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Purpose: To evaluate alteration in serum TSH in OSA and its relation with cardio-metabolic risk factors.

Methods: Consecutive 517 hypertensives were cross-sectionally studied. OSA was determined by polysomnography; thyroid, renal and hepatic functions by standard methods.

Results: OSA was diagnosed in 373 patients (72.15%). Prevalence of subclinical hypothyroidism was significantly higher in OSA subjects than in non-OSA subjects (15.0% vs 6.9%, $p = 0.014$). Serum LnTSH in severe OSA was significantly

higher (0.99 ± 0.81 vs 0.74 ± 0.77 uIU/ml, $p < 0.05$) than in controls and AHI, LSaO₂, ODI₃ and ODI₄ were observed to independent risk factors for serum TSH for those aged between 30–65 years, even after adjusting confounders. After dividing subjects into four groups as TSH < 1.0 uIU/ml, $1.0 \leq$ TSH ≤ 1.9 uIU/ml, $1.91 <$ TSH < 4.5 uIU/ml and TSH ≥ 4.5 uIU/ml, TSH ≥ 2.0 uIU/ml was observed in significantly more OSA subjects than in non-OSA subjects (64.9% vs 55.5%, $p = 0.01$). DBP and serum LDL-c elevated with TSH increasing, and was only significantly higher in TSH ≥ 4.5 uIU/ml group than in $1.0 \leq$ TSH ≤ 1.9 uIU/ml group (96.32 ± 14.19 vs 92.31 ± 12.86 mm Hg, $p = 0.040$; 0.99 ± 0.60 vs 0.87 ± 0.34 mmol/l, $p = 0.023$). Dyslipidemia prevalence showed increased trend in TSH ≥ 1.0 uIU/ml groups, significantly differing between $1.0 \leq$ TSH < 1.9 uIU/ml and TSH ≥ 4.5 uIU/ml groups (50.3% vs 63.4% $p = 0.04$).

Conclusion: OSA might be a risk factor for increased TSH even within reference range and OSA patients should be evaluated for thyroid function.

P-40

The Influence of Body Positions on Blood Pressure in Hypertensive Patients

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Objective: To study blood pressure variation patterns according to body positions, and to explore the possible factors that associated with blood pressure (BP) among standing, sitting and supine position in patients with hypertension.

Methods: Standing, sitting and supine BP was measured in turns in 334 hypertensive patients, who were choosed from clinic and division of hypertension, using a standard mercury sphygmomanometer (CBP) and ambulatory blood pressure monitoring (ABP), and each position must hold on for two hours. During test, ABP measured BP per 15 minutes, while CBP was measured after endpoint of each posture. Clinical characteristics and medication, such as patient's body weight, height, bilateralis pulses and blood glucose levels were also measured.

Results: Both systolic and diastolic blood pressures (SBP and DBP respectively) were significantly different among standing, sitting and supine positions except ABP-SBP. CBP-SBP in supine position was higher compared to standing and sitting position [by (6.0 ± 1.0) mm Hg/(2.6 ± 0.9) mm Hg respectively ($P < 0.05$), but CBP-DBP in supine position was lower than in standing and sitting position [by (1.8 ± 0.8) mm Hg/(2.4 ± 0.7) mm Hg respectively, ($P < 0.05$); ABP-DBP were significantly lower in supine position than in standing and sitting position [by (7.3 ± 0.8) mm Hg/(7.2 ± 0.7) mm Hg respec-

tively, $P < 0.05$. Except supine DBP, both ABP-BP were significantly higher than CBP-BP in standing, sitting and supine positions [by (8.6 ± 15.0) mm Hg/ (4.4 ± 11.9) mm Hg, (7.3 ± 16.4) mm Hg/ (3.7 ± 12.2) mm Hg, and (2.9 ± 15.2) mm Hg respectively, $(P < 0.05)$. Multivariate regression analysis showed that duration of hypertension, gender and fasting blood glucose (FBG) were independent factors of SBP variation ($P < 0.05$), while age and cholesterol were independent predictors for DBP variation ($P < 0.05$).

Conclusions: The change of body positions contributes to blood pressure measured values in hypertensive patients. Blood pressure measured values are significant different in each position. Factors as course of hypertension, age, FBG, and cholesterol can influence blood pressure variation among standing, sitting and supine positions.

P-41

Effect of Age on Primary Aldosteronism Screening

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Objective: The aldosterone/renin ratio (ARR) is the most reliable screening test for primary aldosteronism (PA), but false positives and negatives occur in some conditions, in which greater age is one of the important factors. The purpose of this study is to investigate the effect of age on plasma renin activity (PRA), plasma aldosterone concentration (PAC) and plasma aldosterone/renin ratio (ARR) in PA identification.

Methods: We recruited 230 in-patients with primary aldosteronism (PA) and 221 in-patients with essential hypertension (EH) of the center of hypertension in People's Hospital of Xinjiang Uygur Autonomous Region, China. All subjects were asked to cease common antihypertensive medications which may affect the ARR at least 4 weeks before testing for ARR (diuretics for 6 weeks), for those whose blood pressure was difficult control was suggested to take verapamil (slow-release) and/or doxazosin when necessary. We adopt midmorning seated sample for ARR testing by seated for 15 min and saline infusion as confirmatory test. Levels of PRA, PAC and ARR were compared at different ages range for the respective four groups of subjects (<40 years, 40–49 years, 50–59 years, and ≥ 60 years).

Result: (1) 45.2% patients was in 40–49 years old in PA group and 37.8% in EH group. Patients over 60 years were common in PA group (11.8%). (2) No significant difference of PRA, PAC and ARR was found in different age groups in patients with PA. (3) In patients older than 60 years, there was no significant difference of PRA between PA and EH group, but the level of aldosterone was significantly different. (4) In EH group, PRA of patients over 60 years old was significantly

lower than that of patients under 40 years old ($P < 0.01$). ARR of patients over 60 years old was significantly higher than patients under 40 years old and from 50 to 59 years old ($P < 0.05$). (5) With advancing age, the screening accuracy of ARR was decreased, the optimal cutoff value in diagnosis for PA was increased. In the patients older than 60 years, the optimal cutoff value of ARR in diagnosis for PA was 40.0 calculated from the Receiver Operating Characteristics (ROC), area under the ROC curve (AUC) was 0.88, the highest sensitivity was 69% and specificity was 79%.

Conclusion: Our data suggest that an ARR ≥ 40 strongly indicates PA in the patients older than 60 years. As a result of low rennin levels, the cutoff value of ARR in diagnosis for PA was increased with greater age, saline infusion as a confirmatory test is particularly important for this population.

P-42

Plasma Aldosterone Concentration is Positively Correlated with Pulse Pressure in Hypertensive Population

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Objective: There is increasing evidence of a link between vessel stiffness and pulse pressure (PP), in which plasma aldosterone concentration (PAC) may play a role. The study was performed to explore the potential relationships between plasma aldosterone concentration and pulse pressure in patients with hypertension.

Methods: We evaluated the relationship between baseline pulse pressure, measured by 24-hour ambulatory monitoring blood pressure and plasma concentration of aldosterone in supine, seated and upright positions in 195 general hypertensives. They were divided in three groups by tertiles of PP: PP ≤ 44 mm Hg ($n = 70$), $44 < \text{PP} \leq 51$ mm Hg ($n = 63$) and $\text{PP} \geq 51$ mm Hg ($n = 62$). The PAC in different postures was compared respectively.

Results: (1) The baseline characteristics of the patients when segregated by tertiles of PP showed that statistically significant differences were found in K⁺ concentration, 24-hour Systolic blood pressure (BP), 24-hour diastolic BP, sex, upright PAC, and sitting PAC. (2) The levels of PAC were significantly different in 3 levels of PP groups whatever postures takes by multifactor ANOVA analysis, the individuals with $\text{PP} \geq 51$ mm Hg had the highest levels of PAC. On contrast, the subjects with higher baseline level of Ald (PAC > 12 ng/dl) showed greater PP than those with lower Ald (PAC ≤ 12 ng/dl). (3) Weak association between pulse pressure and upright ($r = 0.288$, $P < 0.001$), seated ($r = 0.265$, $P < 0.001$) and supine posture ($r = 0.191$, $P = 0.008$) respectively were detected by

using simple correlation analysis. After corrected plasma potassium, age and sex, the partial correlation coefficients did not change greatly. (4) The Logistic regression model was constructed with PP ≥ 40 mm Hg or PP < 40 mm Hg as the dependent variable, the plasma potassium and Ald were included as contributing factors, in which the plasma Ald played a risk role [OR = 0.025, 95% CI: 0.35 (0.13–0.88)] in higher PP rather than the plasma potassium showed a protective factor [OR = 0.043, 95% CI: 1.09 (1.00–1.12)].

Conclusions: Although these data provide weak evidence for a link between pulse pressure, which is related to vessel stiffness, and plasma aldosterone concentration in general hypertensive patients, the PAC indicated to be a risk factor for higher pulse pressure.

P-43

Relationship between Obstructive Sleep Apnea and Blood Pressure Variability in Hypertensive on Treatment

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Background: Obstructive sleep apnea (OSA) was more common in middle-aged hypertensive males. Though few data show OSA may have effect on night blood pressure variability

(BPV), it is still unclear whether diurnal blood pressure variability was influenced by OSA.

Methods: Consecutive 93 middle-aged hypertensive males, suspicious of OSA, underwent 24-h ambulatory blood pressure monitoring. BPV was assessed by the standard deviation of blood pressure measurements. Severity of OSA was assessed by AHI and lowest oxyhemoglobin saturation. The association between the sleep measures and BPV was analyzed by univariate and multivariate methods.

Results: OSA was diagnosed in 70 patients (75.27%). Mean BMI and age was 27.77 ± 3.11 kg/m², 44.05 ± 8.07 years. There were no significant differences in terms of age, glycosylated hemoglobin, fasting blood glucose, hs-CRP, smoking history, duration of hypertension, number of medications, 24 h SBPSD, day SBPSD, night SBPSD between moderate to severe OSA (AHI ≥ 15 events/h) and non to mild OSA subjects (AHI ≤ 15 events/h). 24 h DBPSD (10.65 ± 2.03 vs 11.81 ± 2.55 mm Hg, $p = 0.016$), day DBPSD (9.57 ± 2.11 vs 10.66 ± 2.90 mm Hg, $p = 0.04$) and night DBPSD (9.30 ± 2.73 vs 10.76 ± 3.68 mm Hg, $p = 0.018$), significantly higher in moderate to severe OSA subjects than in non to mild OSA subjects. Adjusting age, body mass index and total sleep time, ODI showed significantly associated with 24 h DBPSD, day DBPSD and night DBPSD, while the association between severity of OSA and 24 h DBPSD was also observed, the association between severity of OSA and diurnal DBPSD and night DBPSD was not observed.

Conclusions: In our population, both diurnal and nocturnal diastolic blood pressure variability is increased in hypertensive males on treatment with moderate to severity OSA, compared to non to mild OSA. Effects of nocturnal respiratory events on diastolic blood pressure variability might be continue until the day.