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Latest PAT Publications

Systemic vascular function is associated with muscular power in older adults.

Heffernan KS, Chalé A, Hau C, Cloutier GJ, Phillips EM, Warner P, Nickerson H, Reid KF, Kuvin JT, Fielding RA.
J Aging Res. 2012;2012:386387. Epub 2012 Aug 26.

Examined the association of systemic vascular function (SVF), and measures of muscle strength and power in 24 older adults. SVF measurements included brachial artery flow-mediated dilation (FMD), EndoPAT - RHI, and Augmentation index (AIx). Muscular strength index was one repetition maximum (1RM) for a bilateral leg press, and peak muscular power during 5 repetitions performed as fast as possible for bilateral leg press at 40% of 1RM.

RESULTS: Muscular power was associated with brachial FMD, RHI, and AIx (r=0.43, r= 0.42, r=0.54, P < 0.05 respectively). Muscular strength was not associated with any measure of SVF.

CONCLUSION: In older adults, SVF is associated with lower-limb muscular power but not strength. Whether loss of muscular power with aging contributes to SVF deconditioning, or vice versa, remains to be determined.

http://www.ncbi.nlm.nih.gov/pubmed/22966457

High-polyphenol chocolate reduces endothelial dysfunction and oxidative stress during acute transient hyperglycaemia in Type 2 diabetes: a pilot randomized controlled trial.

Mellor DD, Madden LA, Smith KA, Kilpatrick ES, Atkin SL.
Diabet Med. 2012 Oct 6. doi: 10.1111/dme.12030.
[Epub ahead of print]

Investigated the effects of high-polyphenol chocolate (HPC) on endothelial function (EF, EndoPAT-RHI), serum markers, and oxidative stress (Urinary 15-F2t-isoprostane adjusted for creatinine), in 10 Type 2 diabetes mellitus (T2DM) subjects, during hyperglycaemia induced by 75 g oral glucose challenge, 60 min after ingesting either low polyphenol chocolate (LPC) or HPC, at baseline and 2 h post glucose. Subjects were tested weekly, after a cocoa-free period.

RESULTS: HPC before glucose load improved RHI (1.7 ± 0.1 vs. 2.3 ± 0.1%, P = 0.01), whereas prior LPC resulted in significant increase in serum markers intercellular adhesion molecule 1 and 15-F2t-isoprostane (P = 0.02).
RHI, serum markers, and urinary 15-F2t-isoprostane showed significant changes from baseline with HPC vs. LPC (P < 0.05).

CONCLUSION: HPC protected against acute hyperglycaemia-induced endothelial dysfunction and oxidative stress in individuals with Type 2 diabetes mellitus.

http://www.ncbi.nlm.nih.gov/pubmed/23039340

Early Vascular Alterations in SLE and RA Patients-A Step towards Understanding the Associated Cardiovascular Risk.

Santos MJ, Carmona-Fernandes D, Canhão H, Canas da Silva J, Fonseca JE, Gil V.
PLoS One. 2012;7(9):e44668. Epub 2012 Sep 4.

Assessed early endothelial changes in 127 female systemic lupus erythematosus (SLE), and 107 rheumatoid arthritis (RA) patients, without previous CV events. Endothelial cell activation biomarkers, endothelial function (EndoPAT - RHI), and augmentation index (AIx), traditional CV risk factors, disease activity and medication were all assessed.

RESULTS: SLE patients displayed higher sICAM-1, higher TM and lower TF levels than in RA (p=0.001, for all), even after controlling for CV risk factors and medication.
Biomarker, sVCAM-1 was moderately correlated with SLE activity (r=0.246) and likewise TF levels with RA activity (r=0.301). RHI was similar across groups, but trended lower in SLE (p=0.06), while AIx was higher in SLE than RA (p=0.04).

CONCLUSION: In women, SLE and RA present with distinct patterns of endothelial cell activation biomarkers, unexplained by differences in traditional CV risk factors. Early vascular changes are more pronounced in SLE patients, in line with their higher CV risk.

http://www.ncbi.nlm.nih.gov/pubmed/22962622

Screening for Sleep Disordered Breathing Among Applicants for a Professional Driver's License.

Tzischinsky O, Cohen A, Doveh E, Epstein R, Ribak J, Klein D, Pillar G, Lavie P.
J Occup Environ Med. 2012 Sep 19. [Epub ahead of print]

Identified variables predictive of sleep disordered breathing (SDB) among 301 healthy young applicants for a professional driver's license, based on a self-administered questionnaire. Sleep was recorded for one night with the Watch PAT100, and SDB was defined as a Respiratory Disturbance Index (RDI) >15.

RESULTS: Employing new statistical methods, body mass index, age, Mini Sleep Questionnaire, smoking, father snoring, afternoon nap-taking, and falling asleep while traveling as a passenger, were identified as significant predictors of SDB: Moderate or severe SDB was prevalent in at least 25% of the applicants.

CONCLUSION: New statistical methods revealed that a combination of questions related to sleep habits, complaints, and demographic data predicted most of the clinically significant cases.

http://www.ncbi.nlm.nih.gov/pubmed/22995810

Long-term evaluation of endothelial function in Kawasaki disease patients.

Pinto FF, Laranjo S, Paramés F, Freitas I, Mota-Carmo M.
Cardiol Young. 2012 Oct 8:1-6. [Epub ahead of print]

Evaluated endothelial dysfunction, (ED), as a long-term complication after Kawasaki disease, (KD) in children, using EndoPAT – RHI, in KD patients over 11 years of age, diagnosed for >5 years, with no coronary lesions, or any other risk factors for cardiovascular disease (n=19), and controls without cardiovascular risk factors (n=16). Subjects were assessed clinically, and RHI and augmentation index (AI) measured.

RESULTS: Average RHI in KD was significantly lower than in controls, (1.68 ± 0.49 versus 2.31 ± 0.53; p = 0.001), and 68% of KD patients had ED vs. 12% of controls. AI was similar in both groups.

CONCLUSION: EndoPAT is feasible and reproducible in children. ED is a frequent long-term complication in patients after KD with normal appearing coronary arteries. Results need validation in a larger population.

http://www.ncbi.nlm.nih.gov/pubmed/23040585

Impaired endothelium-dependent vasodilator response in patients with pulmonary fibrosis.

Aihara K, Handa T, Nagai S, Tanizawa K, Ikezoe K, Watanabe K, Chihara Y, Harada Y, Yoshimura C, Oga T, Ozasa N, Uno K, Chin K, Mishima M.
Respir Med. 2012 Oct 25. pii: S0954-6111(12)00369-1. doi: 10.1016/j.rmed.2012.10.005. [Epub ahead of print]

Investigated the relationships between endothelial function, (EndoPAT - RHI), and clinical characteristics, laboratory cardiovascular risk factors, disease-related factors and circulating levels of inflammatory biomarkers, in 39 newly-diagnosed chronic interstitial pneumonitis/ fibrosis, (P/F), patients and 30 matched controls.

RESULTS: In P/F, RHI and HDL were significantly lower, and LDL significantly higher than in controls. Total cholesterol, triglycerides, HbA1c and fasting glucose did not differ significantly between groups. RHI was significantly associated with the diffusing capacity for carbon monoxide, alveolar-arterial oxygen pressure difference, 6-min walk distance and end-exercise oxygen saturation, and inversely correlated with circulating levels of intercellular adhesion molecule-1 and vascular cell adhesion molecule-1.

CONCLUSION: Confirmed a possible link between P/F and cardiovascular disease by demonstrating an impairment of endothelial function which was significantly associated with P/F severity and circulating levels of adhesion molecules.

http://www.ncbi.nlm.nih.gov/pubmed/23102612

Niacin improves lipid profile but not endothelial function in patients with coronary artery disease on high dose statin therapy.

Philpott AC, Hubacek J, Sun YC, Hillard D, Anderson TJ.
Atherosclerosis. 2013 Feb;226(2):453-8

Determined the effect of three months of extended release niacin (ERn) 1500 mg/day, versus placebo, on endothelial and vascular function assessed by brachial flow-mediated dilatation (FMD), peak hyperemic velocity (VTiRH) and EndoPAT- RHI, in 66 patients with established coronary artery disease (CAD), already treated with atorvastatin 80 mg per day. FMD, VTiRH and RHI measurements were performed at baseline and after each treatment period.

RESULTS: ERn significantly improved LDL and HDL parameters, however, there was no observed improvement in endothelial function as assessed by FMD, VTiRH or EndoPAT.

CONCLUSION: Niacin as an add-on treatment to high dose statins in patients with established CAD significantly improves lipid profile, but was not associated with improved endothelial or microvascular function.

http://www.ncbi.nlm.nih.gov/pubmed/23174368

Cardiovascular risk escalation with caloric excess: a prospective demonstration of the mechanics in healthy adults.

Gupta AK, Johnson WD, Johannsen D, Ravussin E.
Cardiovasc Diabetol. 2013 Jan 24;12(1):23. [Epub ahead of print]

Prospective 8 week study of effects of 40% caloric excess in 11 male and 3 female healthy adults on: weight gain (BW), body fat (BF), waist circumference (WC), visceral adipose tissue (VAT), systemic inflammation (sIF), insulin resistance (IR), intrahepatic lipid (IHL), fasting insulin; (FI) and functional cardiovascular disease (CVD), assessed by circadian blood pressure variability (CBPV) over 7-days, and endothelial function (EF; EndoPAT- RHI).

RESULTS: BW, BF, WC, VAT, and IHL, all increased, ($p < 0.01$). Increased subcutaneous adipose cell size ($p = 0.02$) accompanied significant sIF ($p = 0.04$), IR ($p = 0.01$), FI ($p = 0.001$), and HOMA-IR ($p = 0.02$). CBPV increased, (systolic, $p = 0.002$, diastolic, $p = 0.07$, and pulse pressure, $p = 0.003$) and heart rate (HR) was elevated, ($p = 0.003$). Mean RHI declined from 2.24 to 1.77 ($p = 0.001$).

CONCLUSION: Controlled caloric excess in healthy human adults over only 8-weeks significantly increased BF, VAT, sIF (hs-CRP), IR (FPG, FI, HOMA-IR) and functional CVD risk, and impaired EF.

http://www.ncbi.nlm.nih.gov/pubmed/23347533

Systemic inhibition of nitric oxide synthesis in non-diabetic individuals produces a significant deterioration in glucose tolerance by increasing insulin clearance and inhibiting insulin secretion.

Natali A, Ribeiro R, Baldi S, Tulipani A, Rossi M, Venturi E, Mari A, Macedo MP, Ferrannini E
Diabetologia. 2013 Jan 31

Assessed effects of NO synthesis inhibition on glucose homeostasis in 24 non-diabetics during two hyperglycaemic clamps, and during OGTT (n=5), with either saline, or L-NG-nitroarginine methyl ester (L-NAME), infusion. Blood pressure (BP), and heart rate (HR), were measured to monitor NO blockade during OGTT, endothelial function was assessed by EndoPAT - RHI, and insulin secretion measured by C-peptide deconvolution and insulin secretion modelling.

RESULTS: Compared with saline, L-NAME at the highest dose raised mean BP (+20±2 mmHg), depressed HR (-12±2 bpm) and increased insulin clearance (+50%). First-phase insulin secretion was impaired, but insulin sensitivity (M/I index) was unchanged. During OGTT, L-NAME raised 2 h plasma glucose ($p<0.01$), doubled insulin clearance and impaired beta cell glucose sensitivity, and reduced RHI.

CONCLUSION: Systemic NO blockade does not affect insulin action but significantly impairs glucose tolerance by increasing plasma insulin clearance and depressing insulin secretion.

http://www.ncbi.nlm.nih.gov/pubmed/23370528

Dipeptidyl Peptidase-4 Inhibitor, Sitagliptin, Improves Endothelial Dysfunction in Association With Its Anti-Inflammatory Effects in Patients With Coronary Artery Disease and Uncontrolled Diabetes.

Matsubara J, Sugiyama S, Akiyama E, Iwashita S, Kurokawa H, Ohba K, Maeda H, Fujisue K, Yamamoto E, Kaikita K, Hokimoto S, Jinnouchi H, Ogawa H.
Circ J. 2013 Feb 2. [Epub ahead of print]

Investigated whether sitagliptin could improve endothelial function (EF, EndoPAT-RHI), in diabetes mellitus (DM) patients with coronary artery disease (CAD), by comparing additional treatment with sitagliptin (50mg/day, n=20), to aggressive conventional treatment controls, (n=20), for 6 months.

RESULTS: Baseline RHI and clinical characteristics were not different between groups. After treatment, fasting blood glucose, insulin levels, and lipid profiles were not different between groups.
HbA(1c) levels significantly improved in both groups. The percent increase in RHI was greater in the sitagliptin group than in controls (62.4±59.2% vs. 15.9±22.0%, P<0.01). C-reactive protein (hsCRP) level was significantly decreased in sitagliptin, but not in controls. Changes in hsCRP were significantly negatively correlated with changes in RHI in sitagliptin, but not in controls.

CONCLUSION: Sitagliptin significantly improved EF and inflammatory state in patients with CAD and uncontrolled DM beyond its hypoglycemic action, suggesting that it has beneficial cardiovascular effects in DM patients.

http://www.ncbi.nlm.nih.gov/pubmed/23386232

Consumption of High-Polyphenol Dark Chocolate Improves Endothelial Function in Individuals with Stage 1 Hypertension and Excess Body Weight

Nogueira LP, Knibel MP, Torres MRSG, Neto JFN, and Sanjuliani AF.
International Journal of Hypertension Volume 2012 (2012), Article ID 147321, 9 pages

Evaluated the association of 4 weeks of daily 50 g, 70% cocoa chocolate intake, with metabolic profile, including oxidative stress, inflammation, blood pressure, and endothelial function (EF EndoPAT – RHI), in stage 1 hypertensives aged 18 to 60 years with excess body weight, without previous antihypertensive treatment.

RESULTS: 20 subjects (10 men) completed the study. There were no significant changes in anthropometric parameters, percentage body fat, glucose metabolism, lipid profile, biomarkers of inflammation, adhesion molecules, oxidized LDL, and blood pressure; however RHI significantly increased from 1.94 ± 0.18 to 2.22 ± 0.08, ($p=0.01$) .

CONCLUSION: High-polyphenol dark chocolate improves EF In stage 1 hypertension and excess body weight.

http://www.ncbi.nlm.nih.gov/pubmed/23209885

Atrial fibrillation-induced endothelial dysfunction improves after restoration of sinus rhythm.

Yoshino S, Yoshikawa A, Hamasaki S, Ishida S, Oketani N, Saihara K, Okui H, Kuwahata S, Fujita S, Ichiki H, Ueya N, Iriki Y, Maenosono R, Miyata M, Tei C.
Int J Cardiol. 2012 Dec 23. pii: S0167-5273(12)01634-8. doi: 10.1016/j.ijcard.2012.12.006. [Epub ahead of print]

Assessed endothelial function (EF, EndoPAT - lnRHI), in patients with Atrial Fibrilation (AF), before and after restoration of sinus rhythm by catheter ablation (ABL), in 27 patients with persistent AF before ABL, and in 21 controls with sinus rhythm (SR).
ABL patients were divided into four groups: day 1-recurred AF (n=8), day 1-restored SR (n=19), which was further subdivided into month 6-maintained SR (n=11) and month 6-recurred AF (n=6).

RESULTS: lnRHI was significantly lower in the persistent AF group than in the control (SR) group (0.52±0.20; 0.69±0.24, $p<0.01$). By multivariate logistic regression analysis, persistent AF was the only independent predictor of impaired endothelial function defined as lnRHI<0.6, (odds ratio, 4.96; 95% CI, 1.2 to 21.3; $p<0.05$). lnRHI was significantly higher after ABL (0.73±0.25, vs. 0.53±0.20; $p<0.01$), in the day 1-restored SR. lnRHI of month 6-maintained SR was comparable to that of day 1-restored SR.

CONCLUSION: AF is associated with EF impairment, and is reversed by restoration of sinus rhythm.

http://www.ncbi.nlm.nih.gov/pubmed/23269316

JCS 2013, Japan

Assessment of Endothelial Function in clinical practice

臨床における血管皮機能の評

日時：2013年3月16日（土）19：00 - 20：30

場所：パシフィコ浜　第22場（アネックスホルF205）

Pacifico Yokohama,
Annex Hall 2F F205, Room 22
March 16, 2013 19:00-20:30
Chair: Prof. Hisao Ogawa
Speakers: Prof. Seigo Sugiyama
& Prof. Amir Lerman

Meet Us @

JCS
77th Annual Scientific Meeting of the Japanese Circulation Society
March 15 – 17, 2013
Yokohama, Japan
Booth # B-2

AAPP
American Academy of Private Physicians Spring 2013 Summit
March 22-23, 2013
Palm Spring, CA, USA

79th Annual Meeting of the German Cardiac Society
April 3-6, 2013
Mannheim, Germany
Booth # 325

ERS/ESRS - Sleep & Breathing
April 11-13, 2013
Berlin, Germany
Booth # 17

IFM
Institute for Functional Medicine 2013 Annual International Conference
May 30 – June 1, 2013
Dallas, TX, USA
Booth 105

Spotlight on

Prof. Kevin Heffernan

Prof. Kevin Heffernan, Ph.D. is an assistant Professor of Exercise Science, and Director of the Human Performance Laboratory at Syracuse University, New York. His research examines the interaction of diet, nutritional supplementation and exercise on vascular function in health, disease and disability throughout the human lifespan, and he has published extensively on the role of exercise in modulating vascular function.

Prof. Heffernan's work has been funded by the NIH, AHA and the American College of Sports Medicine, which awarded him a New Investigator Award, and he is currently on the organizing board of the North American Artery Society.

Prof. Heffernan, in collaboration with Prof. Jeffrey Kuvin, and Prof Richard Karas at Tufts Medical Centre used the EndoPAT to explore clinical correlates of vascular endothelial function in numerous disease states, and has also published extensively on use of the PAT signal derived Augmentation Index, as a measure of vascular function related to arterial stiffness that is provided by the EndoPAT, in addition to the index of endothelial function (RHI - Reactive Hyperemia Index) .

Professor Heffernan and colleagues have contributed greatly to the scientific base and clinical acceptance of the EndoPAT, as evidenced by the following publications:

Heffernan KS, Chalé A, Hau C, Cloutier GJ, Phillips EM, Warner P, Nickerson H, Reid KF, Kuvin JT, & Fielding RA. *Systemic vascular function is associated with muscular power in older adults.* J Aging Res 2012; 2012:386387.

Heffernan KS, Patvardhan E, Kapur NK, Karas RH, and Kuvin JT.
Peripheral Augmentation Index as a Biomarker of Vascular Aging: An Invasive Hemodynamics Approach.
European Journal of Applied Physiology 2012; 112(8):2871-9.

Heffernan KS, Patvardhan E, Karas RH, Kuvin JT. *Peripheral Augmentation Index is Associated with the Ambulatory Arterial Stiffness Index in Patients with Hypertension.* Cardiology Research 2011; 2(5): 218-223.

Patvardhan E, Heffernan KS, Ruan J, Hession M, Warner P, Karas RH, & Kuvin JT. *Augmentation index derived from peripheral arterial tonometry correlates with cardiovascular risk factors.* Cardiol Res Pract 2011; 2011:253758.

Heffernan KS, Kuvin JT, Sarnak MJ, Perrone RD, Miskulin DC, Rudym D, Chandra P, Karas RH, Menon V.
Peripheral augmentation index and vascular inflammation in polycystic kidney disease.
Nephrol Dial Transplant 2011; 26(8):2515-21.

Heffernan KS, Suryadevara R, Patvardhan EA, Mooney P, Karas RH, Kuvin JT.
Effect of atenolol versus metoprolol succinate on vascular function in patients with hypertension.
Clinical Cardiology 2011; 34:39-44.

Heffernan KS, Patvardhan EA, Hession M, Ruan J, Karas RH, Kuvin JT.
Elevated Augmentation Index Derived from Peripheral Arterial Tonometry is Associated with Abnormal Ventricular-Vascular Coupling. Clinical Physiology and Functional Imaging 2010; 30:313-7.

Heffernan KS, Karas RH, Patvardhan EA, Jafri H, Kuvin JT. *Peripheral arterial tonometry for risk stratification in men with coronary artery disease.* Clinical Cardiology 2010; 33: 94-98.

Heffernan KS, Karas RK, Mooney PJ, Patel AR, and Kuvin JT. *Pulse wave amplitude is associated with brachial artery diameter: implications for gender differences in microvascular function.* Vascular Medicine 2010; 15: 39-45.

Patvardhan EA, Heffernan KS, Ruan J, Soffler M, Karas RK, Kuvin JT. *Assessment of Vascular Endothelial Function with Peripheral Arterial Tonometry: Information at Your Fingertips?* Cardiology in Review 2010, 18:20-28.