

Latest PAT Publications



Usefulness of peripheral arterial tonometry in the detection of mental stress-induced myocardial ischemia.

Hassan M, York KM, Li H, Li Q, Lucey DG, Fillingim RB, Sheps DS.
Clin Cardiol. 2009 Sep;32(9):E1-6.

Evaluated PAT in the detection of MSIMI (Mental stress-induced myocardial ischemia) in 211 patients with known CAD, vs. Rest-Stress myocardial perfusion imaging.

RESULTS: Vascular response during stress anticipation (speech preparation) was more pronounced than during actual speaking. PAT response during speech preparation had modest accuracy for predicting MSIMI (area under the ROC= 0.63; P = 0.015). A PAT index of 0.52 was identified as the best cut off value for detecting MSIMI with a sensitivity of 76% and a specificity of 56%.

CONCLUSIONS: PAT response to mental stress has a relatively modest accuracy in predicting MSIMI. Further research is needed to validate the findings of this study.

<http://www.ncbi.nlm.nih.gov/pubmed/19672865>



Endothelial dysfunction in type 2 diabetic patients with normal coronary arteries A digital reactive hyperemia study.

Gargiulo P, Marciano C, Savarese G, D'Amore C, Paolillo S, Esposito G, Santomauro M, Marsico F, Ruggiero D, Scala O, Marzano A, Cecere M, Casaretti L, PerroneFilardi P.
Int J Cardiol. 2011 Aug 16.

Compared endothelial function (EF) amongst: A - 58 type 2 diabetics (DM) with CAD, B - 58 DM patients without CAD, C - 31 non-diabetics with CAD, D - 36 non-diabetics without CAD (n=36), and 20 healthy controls.

RESULTS: EndoPAT index was significantly lower in DM vs. non DM patients, and was comparable among groups A, B and C, with each being significantly lower than group D. By multivariate analysis, DM and CAD were significant predictors of endothelial dysfunction (ED). Diabetics with ED (n=67) had higher levels of HbA1c than diabetics without ED (p=0.008), and RHI inversely correlated to HbA1c (p=0.02; r=-0.210).

CONCLUSIONS: Diabetic patients with and without CAD show significantly impaired peripheral vascular function compared to non-diabetic patients without CAD. Endothelial Dysfunction in diabetic patients without CAD is comparable to that of patients with CAD but without DM. HbA1c is a weak independent predictor of endothelial Dysfunction.

<http://www.ncbi.nlm.nih.gov/pubmed/21851998>



Augmentation Index Derived from Peripheral Arterial Tonometry Correlates with Cardiovascular Risk Factors.

Patvardhan E, Heffernan KS, Ruan J, Hession M, Warner P, Karas RH, Kuvin JT.
Cardiol Res Pract. 2011;2011:253758. Epub 2011 Jul 9.

Evaluated the association between Endo PAT derived augmentation index (Aix), with cardiovascular risk factors, (CRF) and coronary artery disease (CAD) in 186 patients.

RESULTS: Aix was associated with age, heart rate, systolic blood pressure, mean arterial pressure, pulse pressure, body weight and BMI, was lower in patients with <3 CRFs than those with >5 CRFs (p = .02) and in CAD- versus CAD+ patients (p = .008, area under the ROC curve = 0.604, P < .01). In cardiac catheterization, Aix was a significant predictor of aortic systolic and pulse pressures after adjusting for age, height and heart rate (p < .05)

CONCLUSIONS: EndoPAT Aix correlates with cardiac risk factors and CAD and may be useful in assessing overall risk for coronary artery disease.

<http://www.ncbi.nlm.nih.gov/pubmed/21785712>



Endothelial Function as Measured by Peripheral Arterial Tonometry Increases during Pubertal Advancement.

Bhangoo A, Sinha S, Rosenbaum M, Shelov S, Ten S.
Horm Res Paediatr. 2011 Jul 22.

Studied the relation of puberty and sex steroids with endothelial function using EndoPAT in 89 healthy boys and girls divided into 3 pubertal groups on the basis of their estrogen levels: group 1, Tanner stage I; group 2, Tanner stages II-III, and group 3, Tanner stages IV-V.

RESULTS: EndoPAT index was lowest at 1.42 ± 0.44 in group 1 and significantly increased in group 2 at 1.71 ± 0.35 (p = 0.02) and group 3 at 1.92 ± 0.38 (p < 0.001). The Endo-PAT index correlated positively with E(2), DHEAS and age.

CONCLUSIONS: Increase of the EndoPAT index was associated with an increment in Tanner stages. Changes in E(2) and DHEAS levels may contribute to increasing endothelial response to shear stress or arterial blood flow.

<http://www.ncbi.nlm.nih.gov/pubmed/21778688>



An observational cohort study of the kynurenine to tryptophan ratio in sepsis: association with impaired immune and microvascular function.

Darcy CJ, Davis JS, Woodberry T, McNeil YR, Stephens DP, Yeo TW, Anstey NM.

PLoS One. 2011;6(6):e21185. Epub 2011 Jun 22.

Examined the relation between IDO (indoleamine 2,3-dioxygenase) activity (measured as kynurenine to tryptophan [KT] ratio) in sepsis to plasma interferon- γ , interleukin-10, T cell lymphopenia and impairment of microvascular reactivity assessed by EndoPAT, in 80 sepsis patients and 40 controls.

RESULTS: Plasma KT ratio was increased in sepsis (median 141 [IQR 64–235]) compared to controls (36 [28–52]); $p < 0.0001$, and correlated with plasma interferon- γ and interleukin-10, and inversely with total lymphocyte count, CD8+ and CD4+ T-lymphocytes, systolic blood pressure and microvascular reactivity. In response to treatment of severe sepsis, the median KT ratio decreased.

CONCLUSIONS: IDO-mediated tryptophan catabolism is associated with dysregulated immune responses and impaired microvascular reactivity in sepsis and may link these two fundamental processes in sepsis pathophysiology.

<http://www.ncbi.nlm.nih.gov/pubmed/21731667>



Alterations in Platelet Function and Cell-Derived Microvesicles in Recently Menopausal Women: Relationship to Metabolic Syndrome and Atherogenic Risk.

Jayachandran M, Litwiller RD, Lahr BD, Bailey KR, Owen WG, Mulvagh SL, Heit JA, Hodis HN, Harman SM, Miller VM.

J Cardiovasc Transl Res. 2011 Jul 24.

Correlated platelet functions and cellular origin of blood-borne microvesicles in recently menopausal women ($n=118$) with components of MS and noninvasive measures of cardiovascular disease [carotid artery intima medial thickness (CIMT), coronary artery calcium (CAC) score, and endothelial reactive hyperemic index (RHI)].

RESULTS: Platelet number increased with increasing waist circumference, and platelet secretion of ATP and expression of P-selectin decreased with increasing blood glucose ($p=0.005$) and blood pressure ($p<0.05$), respectively. Waist circumference and systolic blood pressure were independently associated with monocyte- and endothelium-derived microvesicles ($p<0.05$). Platelet-derived and total procoagulant phosphatidylserine-positive microvesicles, and systolic blood pressure correlated with CIMT ($p<0.05$), but not with CAC or RHI.

CONCLUSIONS: Among recently menopausal women, specific platelet functions and concentrations of circulating activated cell membrane-derived procoagulant microvesicles change with individual components of MS.

<http://www.ncbi.nlm.nih.gov/pubmed/21786187>



Skin SO₂ measurement using visible lightguide spectrophotometry in a black population: a feasibility study.

Harrison DK, Greenidge AR, Landis RC.

Adv Exp Med Biol. 2011;701:277-82.

Investigated the influence of melanin content on the visible wavelength range spectrophotometric measurement of skin SO₂ in normal healthy black and white volunteers and in diabetic patients. The reactive hyperemia of the SO₂ test was compared with EndoPAT index of endothelial function and arterial stiffness (AI).

RESULTS: There was no correlation between SO₂ and melanin index ($r^2=0.02$). There was a poor correlation between the degree of reactive hyperemia assessed using tissue SO₂ measurement and EndoPAT indices.

CONCLUSIONS: This pilot study demonstrated that the measurement of tissue SO₂ in the skin of black subjects is feasible.

<http://www.ncbi.nlm.nih.gov/pubmed/21445798>



Effects of calcium channel blockers on glucose tolerance, inflammatory state, and circulating progenitor cells in non-diabetic patients with essential hypertension: a comparative study between Azelnidipine and amlodipine on glucose tolerance and endothelial function - a crossover trial (AGENT).

Fukao K, Shimada K, Hiki M, Kiyonagi T, Hirose K, Kume A, Ohsaka H, Matsumori R, Kurata T, Miyazaki T, Daida H.

Cardiovasc Diabetol. 2011 Sep 10;10:79.

Assessed whether azelnidipine and amlodipine affect glucose tolerance and insulin resistance in 17 non-diabetic patients with controlled essential hypertension. Blood and urine samples were collected at baseline and after each therapy, 75 g oral glucose tolerance test (OGTT) was performed, and hematopoietic progenitor cells (HPCs) were measured at each point, and endothelial function was measured by EndoPAT.

RESULTS: Blood pressure was identical after each treatment. Compared with amlodipine, azelnidipine decreased heart rate ($p < 0.005$), levels of glucose and insulin 120 min after 75 g OGTT (both $p < 0.05$), serum high-sensitivity C-reactive protein ($p = 0.067$) and interleukin-6 ($p = 0.035$). Endothelial function was not different, and the number of circulating HPCs was significantly increased after azelnidipine administration ($p = 0.016$).

CONCLUSIONS: Azelnidipine treatment may have beneficial effects on glucose tolerance, insulin sensitivity, the inflammatory state, and number of circulating progenitor cells in non-diabetic patients with essential hypertension.

<http://www.ncbi.nlm.nih.gov/pubmed/21906391>



Circulating endothelial progenitor cells and large artery structure and function in young subjects with uncomplicated Type 1 Diabetes.

Palombo C, Kozakova M, Morizzo C, Gnesi L, Barsotti MC, Spontoni P, Massart F, Salvi P, Balbarini A, Saggese G, Di Stefano R, Federico G.

Cardiovasc Diabetol. 2011 Oct 8;10:88.

Compared indices of large artery structure and function, endothelial function and regenerating capacity, and associations with endothelial progenitor cells (EPCs), glyco-metabolic control, serum advanced glycation end products (AGEs), soluble receptors for AGEs (sRAGE) and adiponectin, between adolescents with T1DM and healthy control of similar age (n=42).

RESULTS: Compared to controls, T1DM adolescents had significantly higher carotid IMT ($p < 0.005$), carotid WS ($p < 0.005$), PWV ($p = 0.01$), AIX ($p < 0.0001$) and central PP ($p < 0.01$) and lower EPCs ($p = 0.02$). EndoPAT index was reduced only in diabetic patients with HbA1c $\geq 7.5\%$ ($p < 0.05$).

CONCLUSIONS: These findings suggest that young subjects with relatively long-lasting T1DM have a generalized preclinical involvement of large artery structure and function, and a blunted endothelium regenerating capacity.

<http://www.ncbi.nlm.nih.gov/pubmed/21981808>



Vascular function and short-term exposure to fine particulate air pollution.

Pope CA 3rd, Hansen JC, Kuprov R, Sanders MD, Anderson MN, Eatough DJ.

J Air Waste Manag Assoc. 2011 Aug;61(8):858-63.

Explored the effects of fine particulate pollution on vascular function in 26 nonsmoking healthy volunteers during two study visits, at least 7 days apart with subjects spending 3 hr in a controlled-exposure chamber exposed to fine particles generated from coal or wood combustion, and 3 hr in a clean room. Exposure and non-exposure periods alternated between visits.

RESULTS: There was no contemporaneous vascular response to the few hours of controlled exposure. Declines in vascular response were associated with elevated ambient exposures for the previous 2 days, especially for female subjects.

CONCLUSIONS: Cumulative exposure to real-life fine particulate pollution may affect vascular function.

<http://www.ncbi.nlm.nih.gov/pubmed/21874957>



Effect of angiotensin receptor blockade on insulin sensitivity and endothelial function in abdominally obese hypertensive patients with impaired fasting glucose.

Perlstein TS, Henry RR, Mather KJ, Rickels MR, Abate NI, Grundy SM, Mai Y, Albu JB, Marks JB, Pool JL, Creager MA.

Clin Sci (Lond). 2012 Feb 1;122(4):193-202

Compared angiotensin receptor blocker (ARB) vs. Placebo therapy on insulin sensitivity and endothelial function, HOMA-B, and markers of inflammation and oxidative stress in 53 subjects with stage one hypertension, abdominal obesity and impaired fasting glucose.

RESULTS: ARB therapy improved HOMA-B ($p = 0.05$), but did not alter insulin sensitivity, endothelial function, or markers of inflammation and oxidative stress compared with placebo.

CONCLUSIONS: ARB therapy did not alter peripheral insulin sensitivity or endothelial function in essential hypertension, abdominal obesity, and impaired fasting glucose, but did improve pancreatic beta cell function.

<http://www.ncbi.nlm.nih.gov/pubmed/21861845>



Noninvasive Ventilation in Mild obesity hypoventilation syndrome: A randomized controlled trial.

Borel JC, Tamisier R, Gonzalez-Bermejo J, Baguet JP, Monneret D, Arnol N, Roux-Lombard P, Wuym B, Levy P, Pepin JL.

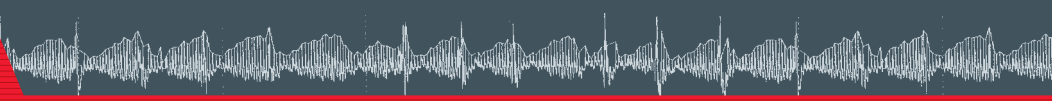
Chest. 2011 Sep 1.

Compared the effects on blood gases, sleep quality, vigilance, cardiovascular, metabolic and inflammatory parameters, of life style counseling vs. one-month non-invasive ventilation (NIV) in 35 patients with obesity hypoventilation syndrome, (OHS).

RESULTS: NIV significantly reduced daytime PaCO₂ and apnea-hypopnea-index. Sleep architecture was restored although non-respiratory micro-arousals increased and daytime sleepiness was not completely normalized. Despite improvement in sleep hypoxemia, glycemic, lipidic metabolism parameters and cytokines profiles did not vary significantly, nor were EndoPAT index or arterial stiffness improved.

CONCLUSIONS: One month of NIV dramatically improved sleep and blood gases but did not change inflammatory, metabolic and cardiovascular markers.

<http://www.ncbi.nlm.nih.gov/pubmed/21885724>



Japanese
Authorities
announced
reimbursement for
EndoPAT

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November 16-19, 2011
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Israel Pavilion
Booth # 1610, Hall 16

APSSM
Asia Pacific Society for Sexual Medicine
November 17-20, 2011
Kaohsiung, Taiwan
Booth # 12

ESSM
European Society for Sexual Medicine
December 1-4, 2011
Milano, Italy
Booth # 14

American Academy of Anti Aging Medicine
December 8-10, 2011
Las Vegas, NV, USA

Spotlight on

Dr. David Sheps



Dr. David Sheps is Professor of Medicine at Emory University. His research focuses on the relationship between mental stress and heart disease.

Dr. Sheps published the first study examining the relationship between myocardial perfusion changes and PAT responses to mental stress in patients with Coronary Artery Disease (CAD). This study used equilibrium radionuclide ventriculography to

detect the time course of myocardial ischemia produced by mental stress and found a high correlation with PAT changes. Since then, many groups have conducted further studies in this area using SPECT imaging and EndoPAT technology, reporting similar findings. PAT responsiveness to mental stress is a promising new technique that may have clinical utility in the diagnosis and prognosis of CAD.

Dr. Sheps, under an NIH Program project grant, together with colleagues at Emory, Viola Vaccarino and Arshed Quyyumi, are working to expand the understanding of mental stress and its relation to PAT, thus significantly contributing to the scientific base and clinical acceptance of the EndoPAT, building on work evidenced by the following publications:

Goor DA, Sheffy J, Schnall RP, Arditti A, Caspi A, Sheps DS. **Peripheral Arterial Tonometry (PAT). A Diagnostic Method for Detection of Myocardial Ischemia Induced during Mental Stress Tests.** *Clinical Cardiology* 2004; 27(3):137-141.

Hassan M, York KM, Li Q, Li H, Sheps DS. **Mental Stress-induced Myocardial Ischemia in Coronary Artery Disease Patients with Left Ventricular Dysfunction.** *J Nucl Card*, 2007; 14:308-313.

Hassan M, Li Q, Brumback B, Lucey DG, Bestland M, Eubanks B, Fillingim RB, Sheps DS. **Comparison of Peripheral Arterial Response to Mental Stress in Men Versus Women With Coronary Artery Disease** *American Journal of Cardiology* 2008; 102(8):970-4

Hassan M, Quyyumi AA, Sheps DS. **A Noninvasive Clinically Useful Predictor for Mental Stress-Induced Ischemia.** *Psychosom Med*, 2009 Jan;71 (1): 21-2.

Hassan M, York KM, Li H, Li Q, Lucey DG, Fillingim RB, Sheps DS. **Usefulness of peripheral arterial tonometry in the detection of mental stress-induced myocardial ischemia.** *Clin Cardiol.* 2009 Sep;32(9):E1-6