Imaging Noninvasive: CT, MR, PET and Nuclear

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TCT-290

Assessment Of Myocardial Viability After Acute Myocardial Infarction: A Head-To-Head Comparison Of The Perfusable Tissue Index By PET And Delayed Contrast-Enhanced CMR

Paul F. Teunissen[1], Stefan A. Timmer[1], Ibrahim Danad[1], Lourens F. Robbers[1], Pieter G. Raijmakers[1], Aernout M. Beek[1], Albert C. van Rossum[1], Adriaan A. Lammertsma[1], Niels van Royen[1], Paul Knaapen[1]
[1]VU University Medical Center, Amsterdam, Netherlands

Background: Early recognition of viable myocardium is of great clinical importance after acute myocardial infarction (AMI). Delayed contrast-enhanced magnetic resonance imaging (DCE-CMR) has been validated extensively for the detection of viability. An alternative method for detecting viability is the perfusable tissue index (PTI), a positron emission tomography (PET) derived parameter, which is inversely related to the extent of myocardial scar (non-perfusable tissue). The aim was to investigate the predictive value of PTI on recovery of LV function after percutaneous coronary intervention (PCI) for AMI.
Methods: Twenty-six patients with AMI successfully treated by PCI were included. Subjects were examined one week and three months after AMI with $H_2^{15}O$ PET and DCE-CMR to assess PTI, regional function and scar. Viability was defined as recovery of systolic wall thickening (SWT) $\geq$ 3.0 mm at follow-up.
Results: A total of 396 segments were available for serial analysis. At baseline, 166 segments were dysfunctional, of which 125 (75%) exhibited significant DCE and were located in the myocardial territory supplied by the culprit-artery. Forty-nine of these dysfunctional segments showed full recovery during follow-up (viable), whereas 76 segments remained dysfunctional (nonviable). Baseline PTI of viable segments was 0.94 ± 0.07 and was significantly higher compared to nonviable segments (0.80 ± 0.11, p = 0.01). The optimal cut-off value for the PTI was 0.85 with a sensitivity of 92% and specificity of 71%, and an area under the curve (AUC) of 0.88. In comparison, a cut-off value of 40% for the extent of DCE resulted in a sensitivity of 75% and a specificity of 65%, and an AUC of 0.75 (p = 0.02 vs PTI).
Conclusions: This study shows that assessment of myocardial viability shortly after reperfused AMI is feasible with PET, and that the PTI is a good prognostic indicator for recovery of contractile function when compared to DCE-CMR.

TCT-291

Abstract Withdrawn

TCT-292

Identification of culprit carotid plaques in patients with ischemic stroke with a new noninvasive method

Georgios Benetos[1], Konstantinos Toutouzas[2], Christina Deligianni[3], Andreas Synetos[4], Maria Drakopoulou[5], Andreas Katsaros[6], Konstantinos Stathogiannis[7], Elias Siores[8], Kostas Spengos[3], Christodoulos Stefanadis[9]
[1]Athens Medical School, University of Athens, Athens, Greece, [2]N/A, Holargos, Greece, [3]Eginition Hospital of Athens, First Department of Neurology, University of Athens, Athens, Greece, [4]Hippokration Hospital, Athens, Attica, [5]Hippokration, Athens, IL, [6]Department of Cardiac Surgery, Hippocration Hospital, Athens, Greece, [7]Hippokration, Athens, Greece, [8]University of Bolton, Bolton, IL, [9]Athens Medical Center, Athens, Greece

Background: Carotid atherosclerosis is a major cause of stroke. Inflammation contributes to the progression and destabilization of carotid atherosclerotic plaques, leading to clinical events. Microwave Radiometry (MWR) allows in vivo noninvasive measurement of the internal temperatures of tissues, reflecting inflammation. The aim of the present study was to evaluate the utility of MWR in identifying symptomatic carotid plaques in patients with recent ischemic stroke.
Methods: Consecutive patients with recent acute noncardioembolic anterior circulation ischemic stroke were evaluated within 24 hours from symptoms onset by: 1) ultrasound echo-color Doppler study of both carotid arteries, and 2) MWR. During ultrasound study, lumen stenosis was evaluated according to Doppler criteria. Carotid plaques were defined as local intima-media thickening (IMT) ≥1.2mm. Only patients with bilateral carotid plaques were included in the study. Temperature difference (ΔT) by MWR was assigned as maximal temperature along the carotid artery minus minimum.
Results: Thirty patients were finally included in the study. Symptomatic carotid arteries had higher IMT and stenosis degree, compared to asymptomatic carotid arteries (3.24±1.99mm, 51.09±32.60% vs 2.15±1.06mm, 31.82±18.93%, p=0.03 and p=0.02 respectively). ΔT was higher in symptomatic carotid arteries compared to asymptomatic (0.98±0.60 vs 0.54±0.33oC, p=0.003). In multivariate logistic regression analysis, ΔT was an independent predictor for symptomatic carotid plaques, when adjusted for sex, age, smoking, dyslipidemia, hypertension, family history of coronary artery disease, IMT and prestroke treatment with statins, aspirin or ADP-inhibitor (OR=18.63, 95% CI 1.31-264.91, p=0.03). By ROC curve analysis the optimal cutoff point of ΔT for predicting a symptomatic carotid plaque was ≥0.70°C with a sensitivity of 70% and a specificity of 83% (AUC 0.782, 95% CI 0.741 to 0.922, p< 0.01).
Conclusions: The evaluation with MWR of carotid atherosclerotic plaques could be useful in identifying symptomatic plaques, implying the potential value of this new noninvasive method in risk stratification of asymptomatic patients with intermediate carotid stenosis.

TCT-293

Quantifying Total Atherosclerotic Burden Non-Invasively Through Coronary Computed Tomography Angiography: A Comparison With Multivessel Intravascular Ultrasound Data

Rafael C. Silva[1], Breno A. Falcao[1], Thais P. Lima[1], Gustavo R. Morais[1], Carlos E. Rochitte[1], Andre G. Spadaro[2], Jose Mariani Jr[3], Expedito Ribeiro[4], Roberto Kalil-Filho[5], Pedro A. Lemos[6]
[1]HEART INSTITUTE UNIVERSITY OF SAO PAULO SCHOOL OF MEDICINE, SAO PAULO, SP, [2]Heart Institute - InCor, University of Sao Paulo Medical School, Sao Paulo, SP, [3]Heart Institute of University of São Paulo, Sao Paulo, Brazil, [4]Assistant Professor of Cardiology, São Paulo, Brazil, [5]Heart Institute - InCor, University of Sao Paulo Medical School, Sao Paulo, Sao Paulo, [6]Heart Institute - InCor, University of Sao Paulo Medical School, São Paulo, Brazil

Background: The extension of atherosclerotic disease is one the most powerful predictors of cardiovascular outcomes. Accurate methods that quantify coronary disease extension may be useful in assessing prognosis, guiding treatment and evaluating disease progression. While intravascular ultrasound (IVUS) is the gold-standard method to quantify atherosclerosis, coronary computed tomography angiography (CCTA) is a promising non-invasive alternative. We compared previously proposed and novel CCTA scores to multivessel IVUS parameters in order to explore the best way to non-invasively assess the global extent of coronary atherosclerotic disease.
Methods: Patients with high risk coronary disease referred for PCI were prospectively enrolled. For all patients, CCTA and multivessel IVUS imaging were obtained. Calcium score and 4 previously reported CCTA scores were calculated and compared to average IVUS derived percent atheroma volume (PAV). A novel score was created though comparison with IVUS. Spearman's correlation coefficients were used to correlate score data with IVUS parameters. Receiver-operating characterist (ROC) curves were created to establish the ability of each score to predict a PAV above the median.
Results: 62 patients with a mean age of 59.7 ± 9.2 years were enrolled. 67.7% were males, 41.9% diabetics and 75.8% had multivessel coronary disease. 2.7 ± 0.5 territories were imaged with IVUS per patient. All evaluated scoring systems, with the exception of the CONFIRM score, correlated significantly with IVUS derived percent atheroma volume. A novel "soft plaque" CCTA score derived from the previously described "SSS score" that excludes segments with purely calcified plaques showed the strongest correlation with IVUS PAV (ρ=0.73, p< 0.001). It also showed the greatest area under the ROC curve (0.90) to predict PAV above the median.
Conclusions: A soft plaque score that takes into account the number of segments with significant non-calcified or mixed plaques correlates better with multivessel IVUS percent atheroma volume. This is possibly the most sensible way to quantify total coronary atherosclerotic burden non-invasively through CCTA.

TCT-294

Symptomatic carotid plaques exhibit higher temperature. Insights from a new noninvasive method

Georgios Benetos[1], Konstantinos Toutouzas[2], Christina Deligianni[3], Maria Drakopoulou[4], Andreas Synetos[5], Konstantinos Stathogiannis[6], Haralampos Grassos[7], Kostas Spengos[3], Elias Siores[8], Christodoulos Stefanadis[9]
[1]Athens Medical School, University of Athens, Athens, Greece, [2]N/A, Holargos, Greece, [3]Eginition Hospital of Athens, First Department of Neurology, University of Athens, Athens, Greece, [4]Hippokration, Athens, IL, [5]Hippokration Hospital, Athens, Attica, [6]Hippokration, Athens, Greece, [7]Hippokration Hospital, Athens, Greece, [8]University of Bolton, Bolton, IL, [9]Athens Medical Center, Athens, Greece