TCT-305
Quantification of Coronary Artery and Myocardial Deformation Due to Cardiac Motion using Cardiac-gated Computed Tomography Data
Gilwoo Choi1, Bon-Kwon Koo2, Christopher Cheng1
1Stanford University, Stanford, CA, 2Seoul National University, Seoul, Korea, Republic of

Background: Knowledge of cardiac contractility is crucial for functional assessment of myocardial dysfunction. Since coronary arteries conform to the myocardium, quantification of coronary deformation may be useful for assessing myocardial function. The purpose of this study was to develop methods to estimate myocardial contractility with coronary artery deformation.

Methods: Epicardium and endocardium surfaces, and the left anterior descending coronary arteries (LAD) of 6 patients were extracted from cardiac-gated computed tomography data using level set segmentation methods. Between systole and diastole, curvature changes of the LAD centerlines were quantified, as well as myocardium thickness changes by computing distances between the epicardium and endocardium surfaces along the LAD. Support Vector Machine (SVM) learning algorithm was utilized to estimate the myocardial deformation from other geometric features of the coronary artery.

Results: From diastole to systole, coronary curvature values increased by 0.040±0.063 mm−1 and myocardial thickness increased by 3.9±2.2 mm. Using metrics of curvature, curvature changes, and distance of the coronary to the epicardial surface, heart base, and ventricular septum, the SVM algorithm resulted in a correlation of R=0.77 of prediction to local myocardial thickness change for all 43 bend points along the 6 LADs.

Conclusions: The SVM algorithm shows that myocardial contractility is strongly correlated to geometric information of the coronary arteries and epicardium. These methods may provide a new framework to evaluate myocardial function from coronary artery deformations.

TCT-306
Pulse Wave Velocity and Augmentation Index are predictors of the Coronary Atherosclerosis and Impaired Cerebrovascular Reactivity.
David Raúl1, Jean-Claude M. Labanda1, Tomas Kovarik2, Alex Linhart1
1General Teaching Hospital, 1st Medical Faculty, Charles University in Prague, Prague 2, Czech Republic, 2General Teaching Hospital, 1st Medical Faculty, Charles University in Prague, Prague 2, Czech Republic.

Background: Pulse wave velocity (Pwv) and augmentation index (Aix) are well-known predictors of cardiovascular and cerebrovascular morbidity and mortality. The aim of our work was to analyze correlation between those two parameters of arterial wall stiffness, coronary atherosclerosis and cerebrovascular reactivity, which is the marker of subclinical cerebrovascular disease.

Methods: 187 patients, referred for elective coronary arteryography, were randomized to the study. All of them were examined by a cardiologist and underwent selective coronary arteryography, transcranial doppler ultrasound with estimation the cerebrovascular reactivity (using breath-hold-index BHI) and assessment of arterial stiffness using the Arteriograph TensioMed device. Gensini score and number of significant lesions (more than 50%) were used for evaluation of the coronary atherosclerosis. Data were analysed with Mann-Whitney U-test, Spearman correlation, Kruskal – Wallis test and ROC analysis. Significance level was p < 0.05.

Results: Differences in Pwv and Aix between groups SCG 0 and groups SCG 1-3 were statistically significant (p=0.015 resp. p=0.001). Significant was also the correlation between Pwv, Aix and Gensini score. R2 was 0.063 mm−1 and myocardial thickness increased by 3.9 mm. Pwv showed a strong correlation with Aix with r=0.6 (p<0.05) for Pwv. ROC analysis of Aix >5.3% had 86% sensitivity and 75% specificity in prediction of coronary atherosclerosis. Pwv > 10.5% had 76% sensitivity and 66% specificity. Significant correlation of Aix and Pwv with BHI was proven by linear regression. Spearman correlation coefficient was Aix 0.6 (p<0.05) and 0.42 (p<0.05).

Conclusions: There is a significant correlation between values of pulse wave velocity, augmentation index, presence of coronary atherosclerosis and impaired cerebrovascular reactivity.

TCT-307
Intracycle CT Motion Correction Algorithm in the evaluation of Coronary artery disease
Alejandro Goldsmith1, Patricia Carrascosa2, Alejandro Devigiano2, Carlos Capulay2, Gaston Rodriguez-Granillo2, Aix and 0.43 (p<0.05) for Aix and 0.43 (p<0.05) for Pwv. ROC analysis of Aix > 5.3% had 86% sensitivity and 75% specificity in prediction of coronary atherosclerosis. Pwv > 10.5% had 76% sensitivity and 66% specificity. Significant correlation of Aix and Pwv with BHI was proven by linear regression. Spearman correlation coefficient was Aix 0.6 (p<0.05) and 0.42 (p<0.05).

Conclusions: There is a significant correlation between values of pulse wave velocity, augmentation index, presence of coronary atherosclerosis and impaired cerebrovascular reactivity.

TCT-308
Prevalence and Distribution of Obstructive Pelvic Arterial Lesions by Computed Tomographic Angiography in 261 Patients with Erectile Dysfunction: Endovascular Therapeutic Implications
Tzung-Dau Wang1, Wen-Jeng Lee1
1National Taiwan University Hospital, Taipei City, Taiwan, Republic of China

Background: Pelvic arterial insufficiency is widely present in patients with erectile dysfunction. In this study, we would like to confirm our previous observations
Regarding the prevalence and distribution of obstructive pelvic arterial lesions by using the multi-detector computed tomographic (CT) angiography in a much greater number of patients with erectile dysfunction.

**Methods:** This study included 261 consecutive patients (mean age 61.0 years) with erectile dysfunction. Pelvic angiograms of the arterial system supplying the penis were divided into 5 segments: common iliac artery, internal iliac artery, anterior division, internal pudendal artery, and penile artery. Obstructive arterial lesion was defined by a luminal stenosis of ≥50% on CT.

**Results:** Among the 2,610 segments obtained, only 28 segments (1.1%) of penile arteries were identified as non-analyzable. 189 segments (72%) had at least one obstructive lesion in their pelvic CT angiograms. A total of 432 obstructive, segmental lesions were identified (average 2.3 lesions/patient). The distribution of these obstructive arterial lesions was: 2 (0.5%) in common iliac artery segment, 26 (6.0%) in internal iliac artery segment, 34 (7.9%) in anterior division segment, 169 (39%) in internal pudendal artery segment, and 201 (47%) in penile artery segment. The obstructive lesions were limited in penile artery segments in 63 patients (63/189, 33%), whereas only 22 patients (22/189, 12%) with obstructive lesions limited in the internal pudendal artery segments. 88 patients (47%) had accessory penile blood supply, of which 4 obstructive lesions were found.

**Conclusions:** We confirmed that obstructive pelvic arterial lesions were present in over 70% of patients with erectile dysfunction and most lesions were in the penile artery segment. A higher percentage of patients (~50%) had accessory arterial supply to the distal penile arteries. These findings reinforce the importance of pelvic CT angiography as a comprehensive diagnostic tool and the inclusion of penile artery segment as the essential target for endovascular therapies for patients with erectile dysfunction and inadequate response to phosphodiesterase-5 inhibitors.

**TCT-309**

**FFR and Physiologic Lesion Assessment**

**Washington Convention Center, Lower Level, Hall A**

**Saturday, September 13, 2014, 5:00 PM–7:00 PM**

**Abstract nos: 309-343**

**TCT-310**

Recanalization Of Chronic Total Coronary Occlusions, The Influence On Collateral Donor Artery Physiology & Fractional Flow Reserve

Andrew Ladawaniec1, Michael Cunnington1, Adam N. Mather1, Albert Alahmar1, Richard M. Oliver1, Simon Thackray1, Farquad Alamgir1, Angela Hove2

1Castle Hill Hospital, Kingston-upon-Hall, United Kingdom, 2Hull York Medical School, Kingston-upon-Hall, United Kingdom

**Background:** There is evidence of an outcome benefit supporting the use of Fractional Flow Reserve (FFR) to guide multi-vessel coronary revascularization. The presence of a concomitant chronic total coronary occlusion (CTO) and a large collateral contribution might alter the FFR of the interrogated vessel, making the FFR unreliable. This would be expected to rewire on recanalization of the CTO, such that best treatment strategy could change. We sought investigate the change in donor vessel FFR associated with PCI of a concomitant CTO.

**Methods:** 44 patients undergoing angioplasty to a CTO were included in the study. Distal and proximal coronary pressure and flow velocity were measured using a dual sensor tipped coronary guide-wire (ComboWire, Volcano Corporation, San Diego, California) at rest and adenosine induced hyperemia in distal and proximal segments of both non-target vessels before and after angioplasty. Haemodynamic including FFR, absolute coronary flow and the coronary flow velocity-pressure gradient relation were calculated off-line. The predominant donor vessel was selected blinded to haemodynamic measurements based upon angiography.

**Results:** 32 of 44 cases were successful. Following successful recanalisation of the CTO, mean increase in predominant donor vessel FFR was 0.783 to 0.813, mean difference: 0.029(0.013-0.046, p = 0.001). Mean decrease in rest donor vessel absolute flow, adjusted for rate-pressure product: 169.8ml/min to 138.6ml/min (mean difference -31.1(-54.3 to -7.9, p = 0.01)), mean decrease in hyperemic flow: 205.8ml/ min to 263.2ml/min (mean difference -32.6(-59.1 to -6.1, p = 0.018). Change in predominant donor vessel FFR correlated with angiographic (%) diameter stenosis severity (r = 0.42, p = 0.015) and was strongly related to stenosis severity measured by the coronary flow velocity-pressure gradient relation (r = 0.67, p < 0.001).

**Conclusions:** Recanalization of a CTO results in a modest increase in the FFR of the collateral donor vessel associated with a reduction in coronary flow. A larger increase is FFR associated with greater coronary stenosis severity. The expected change should be considered when planning multi-vessel revascularization in this setting.

**TCT-311**

Pressure Wire Pullback Using the Instantaneous Wave-Free Ratio (iFR) Can Identify Stenoses and Predict the Improvement After Stenting

Sukhjinder S. Nijjer1, Sayan Sen2, Ricardo Petroco3, Javier Escaned4, Mauro Echarvarria-Pinto5, Rasha Al-Lamee6, Nicolas Foin7, Iqbal S. Malik8, Ghada Mikhal9, Amarjit Sethi9, Masood A. Khan10, Christopher S. Baker11, Michael Bellamy12, Darrel P. Francis2, Carlo Di Mario2, Justin E. Davies2

1Imperial College London, London, London, 2Imperial College London, London, London, 3Academic Medical Center - University of Amsterdam, Amsterdam, Amsterdam, 4Academic Medical Center - University of Amsterdam, Amsterdam, Amsterdam, 5Clinical Cardiovascular Institute, Hospital Clinico San Carlos, Madrid, Spain, 6Hospital Clinico San Carlos, Madrid, Spain, 7Hospital Clinico San Carlos, Madrid, Spain, 8Hospital Clinico San Carlos, Madrid, Spain, 9Hospital Universitario Clinico San Carlos, Madrid, Spain, 10Hospital Universitario Clinico San Carlos, Madrid, Spain, 11Academic Medical Center, Amsterdam, Netherlands, 12Academic Medical Center, Amsterdam, Netherlands

**Background:** Fractional flow reserve (FFR), coronary flow reserve (CFR) and index of microcirculatory resistance (IMR) are growingly interwove to interrogate the epicardial and microcirculatory domains of the coronary circulation. Since coronary flow is determined by the size of the perfused vascular bed, the amount of myocardial mass (MM) subtending to the site of measurement may influence their relationships; and most importantly, the assessment of stenosis severity and microcirculatory disease. We aimed to determine how FFR/CFR index of microcirculatory resistance (IMR) and IMR/CFR and IMR were measured using a dual sensor pulled back to calculate the intensity of flow reserve On

**Results:** Whilst CFR was not statistically correlated with MM (p = 0.103, 95% CI: -0.275 to 0.065, p = 0.257), a significant inverse relationship was noted between MM and FFR [MM: p = -0.338, (95% CI: -0.486 to -0.171, p < 0.001)] and IMR [MM: p = -0.408, (95% CI: -0.546 to -0.249, p < 0.001]). FFR <0.80 vessels jeopardized higher MM than CFR >0.80 vessels [MM: 21.3% (Q1-3, 16.7-26.5%) vs 16.7% (Q1-3, 13.0-21.7%), p = 0.001] and; contrarily, IMR >30 U vessels jeopardized lower MM than IMR <30 vessels [MM: 13.0% (Q1-3, 12.5-18.2%) vs 20.4% (Q1-3, 15.10- 25.5%), p = 0.001]. MM differed between agreement groups of the FFR/CFR relation (p for overall comparison <0.009), and vessels with FFR <0.80 and CFR >2 presented the largest subtended MM.

**Conclusions:** The amount of myocardium subtended to a coronary stenosis 1) modulates FFR and IMR 2) does not have an influence on CFR; and 3) plays an important role in the FPR/CFR discordance.