and cholesterol independently predicted incident CAC (n=562; Incidence rate ratio (IRR) 1.47; p=0.02 and 1.34; p=0.04, respectively), while phosphate was the only biomarker independently predicting CAC progression (n=444; IRR 3.60; p=0.007).
Conclusion: In this prospective study, a large part of participants had incidence of CAC or progression of prevalent CAC at 5 years of follow-up. LDL and cholesterol were associated with CAC incidence and phosphate with CAC progression, while 12 other biomarkers had no independent value. The strongest predictor was baseline CAC score.

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Diagnostic performance of coronary CT angiography performed by the novel whole-heart coverage high definition CT scanner in patients with very high heart rate

D. Andreini[1], G. Pontone[2], S. Mushtaq[2], E. Conte[2], M. Guglielmo[2], A. Annoni[2], E. Mancini[2], A. Formenti[2], A. Baggiano[2], S. Zanchi[2], V. Ditali[2], C. Fiorentini[1], A.L. Bartorelli[1], M. Pepi[2]. *[1]University of Milan, Foundation Monzino (IRCCS), Center Cardiology, Dpt of Cardiology, Milan, Italy; [2]Cardiology Center Monzino IRCCS, Milan, Italy*

Objectives: To evaluate image quality, radiation exposure and diagnostic accuracy of coronary CT angiography (CCTA) performed with a newest generation of cardiac-CT scanner in patients with heart rate (HR) >80 bpm and to compare this evaluation with that obtained in patients with HR suitable for conventional CCTA (<65 bpm).
Background: Despite the progressive improvement of temporal resolution in the recent scanner generation, the evaluation of coronary arteries in patients with high heart rate is still a challenging application of cardiac-CT. Moreover, CCTA performed in this conditions is associated with particularly high radiation exposure.
Materials and methods: 202 patients (111 males, mean age 66±8 years old) undergoing CCTA for suspected CAD by using a novel whole organ volumetric CT scanner (16cm z-axis coverage with 256 detector rows and 512 slices, gantry rotation time 0.28 sec), were enrolled in the study. Prospective ECG-triggering was used in all patients. In 100 patients (Group 1), the HR during the scan was ≥80 bpm; in the remaining 102 patients (Group 2), the HR during the scan was ≤65 bpm. In all patients, image quality score and coronary interpretability were evaluated and effective dose (ED) was recorded. Of the 202 patients prospectively enrolled, we evaluated the CCTA diagnostic accuracy vs. invasive coronary angiography (ICA) in the 86 patients (40 patients in group 1, 46 patients in group 2) who were referred for a clinically indicated ICA in the 6 months following CCTA.
Results: The mean HR during the scan was 93±24 bpm in Group 1 and 57±7 bpm in Group 2. The mean image quality was very high in both Groups (Likert=3.35 in Group 1 vs. 3.39 in Group 2). The overall coronary interpretability was 97.3% (1542/1584 segments) in Group 1 and 98% (1569/1600 segments) in Group 2, without statistically significant differences; The mean ED was low in the two Groups, with lower values in Group 2 (2.9±1.6 mSv in Group 1 and 1.1±0.5 mSv in Group 2). Sensitivity and specificity of CCTA for detection of >50% stenosis vs. ICA were 95.2% and 98.9% in a segment-based analysis and 100% and 81.8% in a patient-based analysis, respectively.
Conclusions: The novel whole organ high definition CT scanner allows to evaluate coronary arteries in patients with very high HR with excellent image quality and coronary interpretability and low radiation exposure.

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Diagnostic accuracy of coronary CT angiography performed in 100 consecutive patients with coronary stents using a novel whole-organ high-definition CT scanner

D. Andreini[1], G. Pontone[2], S. Mushtaq[2], E. Conte[2], M. Guglielmo[2], A. Formenti[2], E. Mancini[2], A. Annoni[2], M. Verdecchia[2], A. Baggiano[2], S. Zanchi[2], V. Ditali[2], C. Fiorentini[1], A.L. Bartorelli[1], M. Pepi[2]. *[1]University of Milan, Foundation Monzino (IRCCS), Center Cardiology, Dpt of Cardiology, Milan, Italy; [2]Cardiology Center Monzino IRCCS, Milan, Italy*

Aims: To evaluate image quality, interpretability, diagnostic accuracy and radiation exposure of coronary CT angiography (CCTA) using a new generation CT scanner in consecutive patients with coronary stents, including those with high heart rate (HR) and atrial fibrillation (AF).
Materials and methods: We enrolled 100 consecutive patients (85 males, mean age 65±10 years old) with previous coronary stent implantation scheduled for clinically indicated non-emergent invasive coronary angiography (ICA). A novel whole-organ high-definition CT scanner was used. Image quality score, using a 4-point Likert scale on a per-stent level, coronary interpretability and diagnostic accuracy vs. ICA were evaluated and the effective dose (ED) was recorded.
Results: Mean HR during the scan was 67±13 bpm. Twenty-six patients had >65 bpm HR during scanning and 13 patients had AF. Overall, image quality was high (Likert=3.2±0.9). Stent interpretability was 95.8% (184/192 stents). Among 192 stented segments, CCTA correctly identified 32 out of 33 with >50% in-stent restenosis (ISR) (sensitivity 97%). In the stented-based analysis, specificity, positive and negative predictive values and diagnostic accuracy for ISR detection was 97%, 86%, 99% and 97%, respectively. Overall, mean ED of CCTA was 2.4±1.2 mSv vs 6.7±1.6 mSv of ICA (p<0.001).
Conclusions: A new whole-organ high-definition CT scanner was able to evaluate coronary stents with high image quality, stent interpretability, diagnostic accuracy and low radiation exposure, also in presence of unfavorable HR and heart rhythm.

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Diagnostic performance of CT derived fractional flow reserve using reduced order modelling and CT stress myocardial perfusion imaging for detection of haemodynamically significant coronary stenosis

A.R. Ihdayhid[1], T. Sakaguichi[2], J.J. Linde[3], M. Sorgaard[3], K. Kofoed[3], Y. Fujisawa[2], J. Hislop-Jambrich[4], N. Nerlekar[1], J.D. Cameron[1], R.K. Munnur[1], D.T. Wong[1], S.K. Seneviratne[1], B. Ko[1]. *[1]Monash Cardiovascular Research Centre, Monash University and MonashHeart, Monash Health, Melbourne, Australia; [2]Toshiba Medical Systems Corporation, Otawara, Japan; [3]Department of Cardiology, The Heart Centre, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark; [4]Toshiba Medical, North Ryde, Australia*

Background: Computed tomography derived fractional flow reserve (CT-FFR) and computed tomography stress myocardial perfusion imaging (CTP) are emerging techniques to assess the haemodynamic significance of coronary stenoses. Computation of CT-FFR using analysis conditions derived from structural deformation of coronary lumen and aorta and reduced order modelling has been recently described to be feasible. Comparison of diagnostic performance with visually assessed CTP is not known.
Purpose: To compare the diagnostic performance of CT-FFR and CTP in detecting haemodynamically significant stenosis (FFR ≤0.8), using invasive FFR as a reference standard.
Methods: Forty-three patients (77 vessels) with suspected coronary artery disease from a single institution planned for elective coronary angiography with invasive FFR prospectively underwent 320-detector coronary CTA and CTP. Analyses were performed in separate core laboratories for CT-FFR and CTP blinded to FFR results. For CT-FFR, deformation of coronary cross-sectional lumen and aorta, computed from diastolic CTA images, was used to determine analysis conditions based on hierarchical Bayes modelling. CT-FFR was derived using a reduced order model with dedicated software on a standard desktop computer. Myocardial perfusion was assessed visually by consensus of two interpreters.
Results: Invasive FFR was significant in 24 (31%) vessels. CT-FFR and CTP analyses were feasible in 100% and 88% of vessels respectively. Overall per-vessel sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy for CT-FFR were 79%, 85%, 70%, 90%, 83% respectively and those of CTP were 50%, 91%, 75%, 77% and 77% respectively. Among the 12 false negative vessels in CTP, FFR range was 0.65–0.80. ROC curve analysis showed a significantly larger AUC for CT-FFR (0.89) compared with that for CTP (0.71; p=0.02).
Conclusion: Based on this cohort of patients CT-FFR is superior to CTP in detecting haemodynamically significant coronary stenosis. Further validation in a larger population will be required.

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Clinical utility of annual CAC progression rate combined with baseline CAC using serial calcium scans for the prediction of future outcome in asymptomatic population

T.Y. Choi, H.B. Park, J.H. Lee, H.J. Kim, Y.S. Seo, Y.H. Cho, E.S. Hwang, D.K. Cho. *Hospital Myongji, Cardiology, Goyang, Korea Republic of*

Background: Recently coronary artery calcium scores (CACS) and CACS progression by serial CAC scans have been proven to be robust tools for predicting future coronary artery disease (CAD) events. However, synergistic performance values of annual percent CAC progression rates combined with baseline CACS have not been evaluated yet.
Purpose: We investigated the prognostic utility of annual CACS progression rates combined with baseline CACS in asymptomatic population.
Methods: From July 2009 to July 2014, 829 asymptomatic subjects who had undergone serial calcium scans at least 1 year apart were consecutively enrolled in our hospital. Among these subjects, we excluded those who had histories of prior CAD or coronary revascularization. We also excluded those who had interim CAD events prior to follow-up calcium scanning (n=94). Finally, a total of 735 subjects were analyzed. Median interval time between calcium scans was 1.75±0.88 years. Major adverse cardiovascular events (MACE) such as coronary revascularization, non-fatal myocardial infarction (MI), admission due to ischemic heart failure (HF), cardiac origin death occurrence after 2nd scan had a median of 3.0±1.26 years. The optimal cut-off values of baseline CACS and annual CACS progression rates with logistic regression analysis showed best sensitivity and specificity for predicting MACE.
Results: Among 735 subjects, 43 subjects suffered from MACE (5.9%) during the follow up period; 3 deaths from cardiac origin (0.4%), 11 non-fatal MIs (1.5%), 31 coronary revascularizations (4.2%), and 6 admissions due to HF (0.8%). The optimal cut-off value for baseline CACS was 44 AU with an 80% sensitivity and an 85.8% specificity [Area under the curve (AUC) 0.84, 96% Confidence interval (CI) 0.79–0.89, p<0.001]. The annual percent progression of CACS was revealed as 9%/year with a 90.0% sensitivity and a 74.5% specificity (AUC 0.81, 95% CI 0.76–0.86, p<0.001). We reclassified subjects into three groups according to the two