

08:30 - 10:00 S19 - Nuclear Cardiology and Cardiac CT - II

Hall H

Chairs: **M. Moriel**
A. Solodky

- 08:30 **A Novel Low-Dose CT Attenuation Correction Device Mounted on a Dedicated Cardiac System for SPECT. One Center Preliminary Study**
N. Zafrir¹, G. Kovalski², A. Solodky¹, I. Mats¹, D. Blazar¹, Y. Hasid¹, A. Battler¹
¹ Petah Tikva, ² Haifa
- 08:45 **Long Standing Fever in Patients with Cardiovascular Prostheses ; Role of 18-Fluoro Deoxyglucose Positron Computer Tomography Combined with Computerized Tomography in Diagnosis and Management.**
E.J. Ouzan, M. Klein, M. Orevi, S. Rosenheck, R. Chisin, C. Lotan, M. Bocher
Jerusalem
- 09:00 **Increased Positive Prediction of Myocardial Ischemia on SPECT by Computed Coronary Tomography Angiography**
A. Gutstein, A. Wolak, V. Cheng, I. Cohen, J. Friedman, L. Thomson, S. Hayes, D.S. Berman
Los Angeles
- 09:15 **UKPDS Coronary Heart Disease Risk Score Correlates with Extent and Type of Plaque in Asymptomatic Type 2 Diabetics: A Study Using 64 Slice Coronary CT Angiography**
D. Halon, I. Dobrecky-Mery, T. Gaspar, M. Azencot, N. Peled, B. Lewis
Haifa
- 09:30 **Prospectively Gated Coronary CT – "Step and shoot" in The Chest Pain Unit: Uncompromised Quality with Markedly Reduced Radiation Exposure**
O. Goitein, R. Beigel, E. Konen, D. Oieru, Y. Eshet, E. Di Segni, S. Matetzky
Ramat Gan
- 09:45 **Abnormal Dilation of the Ascending and Descending Thoracic Aorta is Associated with Features of Atherosclerosis on Non-contrast CT**
A. Wolak¹, A. Gutstein², N. Wong⁴, S. Hayes³, L. Thomson³, J. Friedman³, H. Gransar³, V. Cheng³, L. Shaw⁵, D. Berman³
¹ Beer Sheva, ² Petach Tikva, ³ Los Angeles, ⁴ Irvine, ⁵ Atlanta

A Novel Low-Dose CT Attenuation Correction Device Mounted on a Dedicated Cardiac System for SPECT. One Center Preliminary Study

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Purpose: Attenuation correction (AC) of SPECT MPI is shown to improve diagnostic accuracy in detection of significant CAD. We examined a low-dose CT transmission module for AC mounted on a dedicated cardiac camera. The aim of the study was to evaluate the efficacy of this low-dose CT for AC in SPECT MPI.

Methods: We examined 125 pts who referred for MPI with suspicion or known CAD with gated SPECT protocol on a cardiac camera supporting CT based AC. The inclusion criteria were obese patients (≥ 30 BMI) or pts who have coronary angiography within 4 months of the study or pts with low probability of CAD. One min CT transmission scan having an effective radiation dose of 0.17 mSv was preformed followed each gated SPECT scan. The sum stress score (SSS) and sum rest score (SRS) using 17 segments model with 5-point scale score (0-4) were evaluated with AC and with no attenuation correction (NC).

Results: There were 44 (35%) women and 81 (65%) men (mean age 63.6 ± 10.6 years). In 84% of the pts, gated SPECT was performed with Tc 99m sestamibi and in 16% of the pts thallium 201 was used. Image quality was improved when AC was applied ($p < 0.0001$). The mean SSS of SPECT with AC and NC were 3.8 ± 5.8 and 6.1 ± 7.1 respectively ($p < 0.001$). The mean SRS for AC and NC were 2.6 ± 6.3 and 3.9 ± 7.7 respectively ($p < 0.001$). Improved diagnostic confidence (using SSS cutoff of 4), was demonstrated in 23% of the studies, and a change in diagnosis (normal, ischemia or MI) was found in 10% of the studies. In men, all inferior wall attenuation artifacts were corrected. In women, 50% of attenuation breast artifacts were corrected and substantially reduced in the remaining 50%. The specificity was improved from 50% to 85% by AC using SSS cutoff of 4.

Conclusions: The low-dose CT for AC mounted on a dedicated cardiac camera was found to correct for attenuation artifacts and improve image quality as well as diagnostic accuracy.

Long Standing Fever in Patients with Cardiovascular Prostheses ; Role of 18-Fluoro Deoxyglucose Positron Computer Tomography Combined with Computerized Tomography in Diagnosis and Management.

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Background: The diagnosis of infected prostheses in patients with long standing fever is difficult, challenging and has a major impact on the management (medical versus surgical)

Aim: Since 18-Fluoro Deoxyglucose positron emission tomography performed together with computerized tomography (FDG PET-CT) has a role in the diagnosis and localization of infection; we evaluated its value in the diagnosis of infected prostheses, correlating its results with medical workup, echocardiogram and dedicated CT.

Patients : Fourteen patients with cardiovascular prostheses (seven with a pacemaker, four with vascular grafts , two with pulmonary stent and one with a mitral valve prosthesis were hospitalized for prolonged fever.

Methods: All patients received antibiotics and underwent repeated medical workup (Blood cultures, CBC, tissue cultures). Eight of the 14 patients (pts) had a proven bacteremia. Trans-thoracic and trans-esophageal echocardiogram was performed as well as CT, for most of them. FDG PET-CT was performed in all of them, following IV injection of 370 MBq of F-18 FDG. All patients were normoglycemic at the time of injection. Results of the FDG PET-CT were compared with other diagnostic modalities and clinical follow-up.

Results: In the 7 pts with pacemaker, FDG PET-CT was positive in 4, echo in 2/4. In 3/4 the device was removed . A new pacemaker was implanted for two patients after few weeks. FDG PET was negative in 3/7 pts with 1 positive, 1 negative and 1 indeterminate echo results. All 4 pts with vascular graft had positive FDG PET-CT scan and only 1 had a positive echocardiogram. This patient had a surgical proven abscess.

Two pts with pulmonary stent had a positive FDG PET-CT and 1 positive echo. In this patient the stent that was extracted, was infected.

FDG PET-CT and echo were negative in the pt with mitral prosthesis

Conventional CT was positive in only 1 patient.

Twelve patients returned to normal including all the patients after prostheses extraction except one who died during graft replacement .

Conclusion:

FDG PET-CT is a useful tool for the diagnosis of infected cardiovascular prosthesis and is more accurate than stand alone CT. It may play an important role in the management of these very complex patients. Correlation of the clinical, echo and FDG PET-CT findings is crucial for the therapeutic (surgical vs. medical) decision.

Increased Positive Prediction of Myocardial Ischemia on SPECT by Computed Coronary Tomography Angiography

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Background: Previous studies have shown only a moderate positive predictive value of coronary computed tomography angiography (CCTA) for prediction of ischemia by single photon emission computed tomography (SPECT) when the criteria used is the presence of > 50% of luminal stenosis by CCTA.

Objective: We sought to explore the correlation between the number of stenotic vessels and the degree of luminal stenosis by CCTA on myocardial ischemia.

Methods: One hundred seventy two patients with no previous coronary disease underwent SPECT (prone and supine) after stress or adenosine infusion and CCTA (with Dual source CT, Siemens) within six months. Myocardial ischemia was considered to be present when the summed stress score ≥ 4 as assessed blindly by automated quantitative analysis. CCTA stenosis were graded blindly to SPECT results as 0-50%, 50-70%, 70-90% ,>90% of luminal stenosis (LS).

Results: Overall, Ischemia was present in 36/172 patients (20.9%). Ischemia was present in 17/120 patients (14%) for CCTA stenosis < 50%, in 18/52 patients (35%) with CTA stenosis > 50%, in 15/35 patients (43%) with CCTA stenosis > 70% and in 12/20 patients (60%) with CCTA stenosis > 90% (p<0.001for trend). Ischemia was present in 4/21(19%) patients with one vessel coronary disease (VCAD) > 70% LS, in 6/10 patients (60%) of patients with 2 VCAD > 70% LS and in 6/7 (86%) patients with 3 VCAD > 70% LS (p=0.002 for trend).

Conclusion: Increased degree of LS and number of stenotic vessels as assessed by CCTA predicts frequency of ischemia by SPECT.

UKPDS Coronary Heart Disease Risk Score Correlates with Extent and Type of Plaque in Asymptomatic Type 2 Diabetics: A Study Using 64 Slice Coronary CT Angiography

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Background: Characteristics of coronary arterial plaque may be predictive of subsequent coronary events in high risk individuals. We examined differences in extent and characteristics of coronary plaque in asymptomatic type 2 diabetics and their relation to 10 yr risk for late events as defined by the UK Prospective Diabetic Study (UKPDS).

Methods: Coronary CT angiography (64 slice) (CCTA) was performed in 120 asymptomatic diabetics (63% women, age 55-74 (mean 63.7) yrs) enrolled in an ongoing prospective outcomes trial. Coronary arteries were examined using a 17 segment model and presence or absence of plaques was assessed on a segmental basis. Plaques were characterized as calcified ($\geq 50\%$ calcium), non-calcified (no calcium) or mixed ($< 50\%$ calcium).

Results: Plaque was present in 105/120 (87.5%) pts. Percent UKPDS risk correlated with total number of coronary segments with plaque, calcified plaque and non-calcified plaque although not significantly for mixed plaque (Table). Plaque causing luminal narrowing ($> 25\%$ luminal obstruction) showed similar correlation with UKPDS risk.

UKPDS risk score and prevalence and characteristics of coronary plaque

	Total	Calcified	Non-calcified	Mixed
N of coronary segments with plaque (mean \pm 1SD)				
UKPDS risk				
Low (N=23)	2.2 \pm 2.1	1.3 \pm 1.8	0.39 \pm 0.89	0.57 \pm 0.84
Medium (N=46)	3.7 \pm 2.7	1.9 \pm 2.0	1.2 \pm 1.4	0.74 \pm 1.1
High (N=38)	5.6 \pm 3.3	3.4 \pm 3.0	1.3 \pm 1.4	1.1 \pm 1.6
p-value*	<0.001	0.012	0.006	0.232
N of coronary segments with luminal narrowing $> 25\%$ (mean \pm 1SD)				
Low	0.96 \pm 1.5	0.35 \pm 0.71	0.26 \pm 0.75	0.43 \pm 0.79
Medium	1.3 \pm 1.5	0.41 \pm 0.8	0.59 \pm 0.91	0.37 \pm 0.77
High	2.7 \pm 2.2	1.0 \pm 1.7	0.95 \pm 1.2	0.82 \pm 1.3
p-value*	<0.001	0.202	0.007	0.095

* Kruskal Wallis non-parametric

Conclusions: In asymptomatic type 2 diabetics: 1. Non-calcified, calcified and overall extent of coronary plaque and segmental luminal narrowing correlated with percent UKPDS risk. 2. CCTA is an excellent non-invasive tool for assessment of coronary plaque characteristics that may have important consequences for clinical outcomes.

Prospectively Gated Coronary CT – "Step and shoot" in The Chest Pain Unit: Uncompromised Quality with Markedly Reduced Radiation Exposure

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Coronary CT angiography (CCTA) is used daily for patient triage in the chest pain unit (CPU), however the radiation entailed in CCTA is not negligible and has been addressed as a hazard to patients. CCTA using prospective axial ECG gating ("Step and shoot") is a novel technique allowing significant radiation exposure reduction.

Purpose:

The purpose of this study was to compare CCTA "step and shoot" (S&S) with "conventional" CCTA in a CPU setup.

Subjects and methods:

S&S inclusion criteria: stable heart rate (HR) < 60/min and weight < 90 Kg. S&S was performed in 40 patients (mean age 51; 24 males; mean HR 53; mean weight 71 Kg). Conventional CCTA was performed in 27 patients (mean age 43; 19 males; mean HR 60; mean weight 68 Kg). All coronary segments were evaluated for image quality (scale 1-5; An average quality score assigned per patient) and estimated radiation dose.

Results:

Average image quality score were 4.91 ± 0.163 and 4.90 ± 0.383 for the S&S and Conventional CCTA, respectively. Coronary artery assessability (15 segments) was similar between the two groups as well. The mean radiation dose exposure using S&S was 5.8 mSv (range 2.7-12.4 mSv) compared with 17 mSv using conventional CCTA (range 13-26mSv); P value >0/001.

Conclusion:

CCTA using S&S reduces radiation exposure by 65% when compared to conventional CCTA. S&S study diagnostic quality was not inferior to conventional CCTA. Due to the relatively young population in the CPU, considering the life time radiation hazards, significant dose reduction renders CCTA S&S an attractive modality.

Abnormal Dilation of the Ascending and Descending Thoracic Aorta is Associated with Features of Atherosclerosis on Non-contrast CT

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Background: The role of atherosclerosis in abnormal dilation of the thoracic aorta (TA) is controversial and recent studies have suggested little or no association. The TA is included in non-contrast gated computed tomography (CT) obtained for assessment of coronary artery calcium (CAC), and therefore such scans provide an opportunity to readdress this issue.

Methods and Results: A total 3,283 consecutive adults with low likelihood of coronary artery disease testing were studied. Upper 95% CI of normative values of thoracic ascending aorta (TAA) and thoracic descending (TDA) aorta diameter were used to define abnormal aortic dilation. Risk factor-adjusted logistic regression models were used to assess the association between calcification in different segments of the TA and abnormal TAA or TDA dilation. Abnormal dilation of the TAA, TDA or both were identified in 198 (6%), 200 (6%) and 63 (2%) patients, respectively. After adjustment for other risk factors, any arch calcification was independently associated with abnormal TAA dilation (OR=1.45, p=0.02) and any TDA calcification was independently associated with abnormal TDA dilation (OR=1.54, p=0.01).

Conclusion: Abnormal dilation of the TA is strongly associated with evidence of TA atherosclerosis by non-contrast gated cardiac CT. Further studies regarding possible diagnostic and therapeutic implications are warranted.