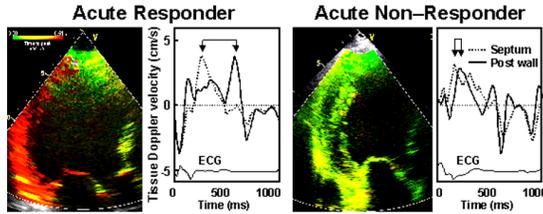


to CRT, although long term response was not studied. TSI has the potential for guiding patient selection.



POSTER SESSION

1093 Computed Tomography: Assessment of Calcification

Monday, March 08, 2004, Noon-2:00 p.m.
 Morial Convention Center, Hall G
 Presentation Hour: 1:00 p.m.-2:00 p.m.

1093-141 A Modified Diamond-Forrester Score Accurately Identifies Asymptomatic Patients With a High Coronary Artery Calcium Score

Aaron J. Tande, Jeffrey Haroldson, Geoffrey Bodeau, Thomas Knickelbine, Minneapolis Heart Institute Foundation, Minneapolis, MN

Background: A modified Diamond-Forrester (MDF) score for pretest probability of coronary artery disease (CAD) was recently developed for symptomatic patients presenting with suspected CAD. We assessed the hypothesis that the MDF score will identify asymptomatic patients with high coronary artery calcium (CAC) scores.

Methods: From September 2001 to July 2003, 12,171 asymptomatic patients completed health questionnaires and underwent electron beam computed tomography (EBCT). The MDF score, exclusive of the estrogen portion, was calculated for each patient using the following weighted risk factors: Age (men: <40 = 3 pts., 40-54 = 6 pts., ≥ 55 = 9 pts; women : <50 = 3, 50-64 = 6, ≥65 = 9), diabetes (2 pts. if positive), BMI >27, history of smoking, hyperlipidemia, hypertension, 1° history of family heart disease (1 pt. each if positive).

Results: Patients were grouped according to low, intermediate, and high MDF groups. Between these groups, there were significant differences between the average CAC scores, average age and sex adjusted percentile score, percent of patients with CAC = 0, and percent with CAC > 400 (Table 1).

Conclusion: In asymptomatic patients with a low MDF, CAC scoring appears to offer limited diagnostic information. EBCT may be of greatest value in patients with intermediate to high MDF scores. The MDF may serve as a useful and cost-effective tool for determining appropriate use of calcium scoring.

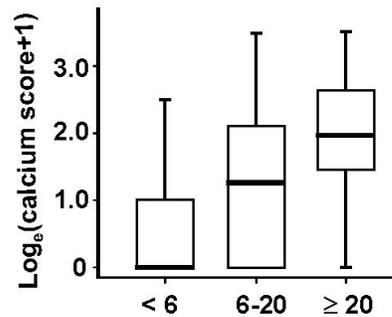
	Modified Diamond-Forrester Score Groups				
	Low (3 to 6)	Intermed. (7 to 11)	High (12 to 16)	p value	Total sample
Men					
Number of patients	845	5966	1262	-	8073
Mean CAC score (± SD)	14.7 ± 73.3	139.8 ± 351.4	401.7 ± 734.6	<0.001	167.6 ± 433.3
Mean percentile score (± SD)	16.5 ± 31.7	38.2 ± 35.9	53.8 ± 30.0	<0.001	38.4 ± 35.9
Percent of patients with CAC = 0	77.2	39.6	11.7	<0.001	39.2
Percent of patients with CAC >400	0.5	9.7	28.7	<0.001	11.7
Women					
Number of patients	734	2883	481	-	4098
Mean CAC score (± SD)	4.4 ± 39.1	42.6 ± 148.1	176.8 ± 348.3	<0.001	54.7 ± 9.2
Mean percentile score	8.9 ± 26.3	26.3 ± 37.2	45.2 ± 36.7	<0.001	25.4 ± 36.8
Percent of patients with CAC = 0	89.6	65	33.5	<0.001	65.7
Percent of patients with CAC >400	0.1	2.7	12.9	<0.001	3.4

1093-142

Independent Information Provided by Framingham Risk Algorithm and Coronary Calcium Scores in a Large German Population Sample: Heinz Nixdorf Recall Study

Axel Schmermund, Nils Lehmann, Stefan Mohlenkamp, Andreas Stang, Susanne Moebus, Dietrich Gronemeyer, Rainer Seibel, Karl-Heinz Jockel, Raimund Erbel, The Heinz Nixdorf Recall Study Investigative Group, University Clinic Essen, Essen, Germany

The Heinz Nixdorf Recall study is an ongoing prospective population-based cohort study on cardiovascular risk factors and coronary calcium for predicting cardiovascular events. A random sample of men and women aged 45 – 75 years is recruited from mandatory citizen registries in the German Ruhr area cities of Bochum, Essen, and Mulheim. We report on the first 1,370 study participants free of ischemic heart disease. Mean age was 59 ± 8 years, and there were 657 men (48%). Coronary calcium was determined using electron-beam CT (EBCT) and the Agatston method. The Framingham risk algorithm was used to calculate absolute 10-year risk. Mean coronary calcium score was 157 ± 388 (25th percentile, 0; 50th, 13; 75th, 111). Mean Framingham risk was 11.2 ± 8.4% (25th percentile, 6%; 50th, 9%; 75th 14%). The correlation between Framingham risk and coronary calcium score was significant (r = 0.42; p < 0.001). However, the risk group classification often differed between the 2 methods. Using "high-risk thresholds", 182 subjects (13%) had a 10-year Framingham risk ≥ 20%, and 141 (10%) had a calcium score ≥ 400 (Figure). Whereas 49 subjects (4%) were classified "high-risk" by both methods and 1092 (80%) moderate or low risk, discordant classification was observed in 225 (16%) (kappa = 0.21). We conclude that approximately one out of 6 subjects in the general population is classified discordantly as "high-risk" by the Framingham algorithm or by coronary calcium scores. Implications for clinical management remain to be defined.



1093-143

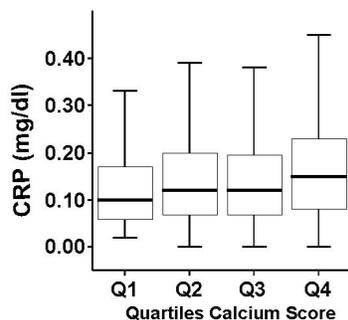
Is There an Association of High-Sensitive C-Reactive Protein With Coronary Calcium? The Heinz Nixdorf Recall Study

Axel Schmermund, Andreas Stang, Susanne Moebus, Stefan Mohlenkamp, Nils Lehmann, Klaus Mann, Karl-Heinz Jockel, Raimund Erbel, The Heinz Nixdorf Recall Study Investigative Group, University Clinic Essen, Essen, Germany

Coronary calcium and high-sensitive C-reactive protein (CRP) may be useful for predicting cardiovascular events. The Heinz Nixdorf Recall study is an ongoing prospective population-based cohort study. A random sample of men and women aged 45 – 75 years is recruited in the German Ruhr area. We report on the first 1,370 study participants free of ischemic heart disease. Mean age was 59 ± 8 years, and there were 657 men (48%). Cardiovascular risk factors were determined by direct laboratory and anthropometric measurements. CRP was measured using a nephelometric assay (Dade Behring) and was non-missing in 1,298 (95%) participants. Coronary calcium was determined using electron-beam CT (EBCT, Agatston method). Mean CRP was 0.26 ± 0.41 mg/dl (25th percentile, 0.07; 50th, 0.14; 75th 0.28) and was within the normal range (< 1.0 mg/dl) in 1,262 subjects (97%). Mean coronary calcium score was 161 ± 394 (25th percentile, 0; 50th, 14; 75th, 115). There was a weak association of normal-range CRP with coronary calcium (Spearman correlation coefficient 0.15, p < 0.0001) (Figure). After adjustment for traditional risk factors, the correlation coefficient was 0.07 (p = 0.01). After additional adjustment for body mass index, no significant association could be demonstrated (correlation coefficient 0.03, p = 0.33).

We conclude that no significant association remains between CRP and coronary calcium after adjusting for traditional risk factors and body mass index in the general population in the German Ruhr area.

Relation of aortic calcification assessed by MSCT and severity of aortic stenosis



1093-144

Association of Elevated C-Reactive Protein Levels to Aortic Valve Calcification as Quantified by Electron Beam Tomography

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Background: Aortic valve calcification (AVC) is an actively regulated process with pathophysiological similarities to atherosclerosis. Electron beam tomography (EBT) allows the detection and exact quantification of calcifications in coronary vessels (CC) and in the aortic valve. The aim of this study was to investigate the association between systemic inflammation and degenerative calcification of the aortic valve.

Methods: C-reactive protein (CRP) was analysed using a high-sensitive immunoassay in 200 patients (mean age: 69.13 years, 66% men) with aortic valve sclerosis documented in echocardiography. In all patients, the amount of coronary and aortic valve calcification was quantified by EBT.

Results: The mean volume score of AVC was 625.19 ± 886 mm³ and of CC 201.8 ± 431 mm³; the mean CRP-level was 1.89 ± 1.54 mg/dl. A weak, but significant correlation to the CRP-level was observed both for the extent of AVC (r=0.37, p<0.001) and for the amount of CC (r=0.17, p=0.03). Patients with AVC above the 75th percentile had a significantly higher mean CRP-level than patients below the 25th percentile (3.2 mg/dl vs. 0.9 mg/dl, p=0.01). For coronary calcium, the mean CRP-level showed no significant difference when comparing patients above the 75th percentile to those below the 25th percentile (2.6 mg/dl vs. 1.5 mg/dl, p=0.08). However, in patients with both aortic and coronary calcium above the 75th percentile, the difference in CRP-levels was highly significant when compared to patients with both AVC and CC below the 25th percentile (3.8 mg/dl vs. 0.7 mg/dl, p<0.001).

Conclusion: This study demonstrates a statistically significant relationship between the extent of aortic valve calcification and systemic inflammation, especially in patients with a high amount of calcification in the aortic valve and coronary arteries.

1093-145

Assessment of Aortic Valve Calcification by Electrocardiogram-Gated Multislice Spiral Computed Tomography as a Marker for Severe Aortic Stenosis

Ralf Koos, Andreas Horst Mahnken, Anil Martin Sinha, Joachim Ernst Wildberger, Harald Peter Kühl, Rainer Hoffmann, University of Technology, Aachen, Germany

Background: To correlate the degree of valvular calcification in patients with aortic stenosis (AS) determined by retrospectively ECG-gated Multislice Spiral Computed Tomography (MSCT) with stenosis severity assessed by cardiac catheterization.

Methods: Prospective study on 41 patients (18 men, mean age 71 ± 8 years) with AS, who underwent 4 detector row MSCT (Somatom Volume Zoom, Siemens, Forchheim, Germany) with scan parameters as follows: 500ms tube rotation time, 4x 2.5mm collimation, 133mAs tube current, tube voltage 140KV and cardiac catheterization. Images were reconstructed at 60% of the RR interval with an effective slice thickness of 3mm and a reconstruction increment of 2mm. Severity of AS was classified by cardiac catheterization and aortic valve area (AVA) was correlated with the degree of calcification determined by MSCT. Aortic valve calcification (AVC) was assessed using Agatston AVC score, mass AVC score and volumetric AVC score.

Results: All measured AVC scores were significantly higher in patients with severe AS (n=29) than in patients with moderate (n=7) or mild AS (n=5, p<0.001). AVC scores correlated significantly with AVA (r = -0.49, p<0.001 for mass AVC score).

Conclusion: As severity of aortic valve calcification assessed by MSCT is inversely related to AVA, AVC scores should be calculated in patients receiving MSCT. High AVC scores indicate severe aortic stenosis and should be taken as indication for further functional evaluation.

	Mild AS	Moderate AS	Severe AS	P value
Agatston AVC score	1608 ± 669	2478 ± 1464	4299 ± 1448	P<0.001
Volumetric AVC score	1315 ± 542	1922 ± 1115	3381 ± 1124	P<0.001
Mass AVC score	290 ± 128	478 ± 291	960 ± 362	P<0.001
Cardiac catheterization	1.68 ± 0.16	1.07 ± 0.05	0.70 ± 0.18	P<0.001
Aortic valve area (cm ²)				
Mean systolic gradient (mmHg)	20.2 ± 6.5	40.3 ± 7.6	62.9 ± 17.5	P<0.001
Peak systolic gradient (mmHg)	30.0 ± 7.1	54.7 ± 8.4	92.0 ± 26.0	P=0.01

1093-146

The Association of Plasma Homocysteine With Coronary Artery Atherosclerosis Is Modified by Conventional Risk Factors

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Background: Whether plasma homocysteine is related to coronary atherosclerotic burden is unclear. We hypothesized that the association of plasma homocysteine with coronary artery calcification (CAC) may be modified by the background of conventional risk factors for atherosclerosis.

Methods: Subjects included 815 individuals (60% women) participating in the Genetic Epidemiology Network of Arteriopathy Study. Fasting plasma homocysteine was measured by liquid chromatography electrospray tandem mass spectrometry. CAC was measured non-invasively by electron beam computed tomography and CAC score calculated using the method of Agatston. The association of homocysteine with log transformed CAC score was assessed after adjusting for conventional risk factors. Multiple linear regression was used to derive a predicted value for CAC based on conventional risk factors (predCAC). To assess the possible dependence of the homocysteine-CAC association on the predicted level of atherosclerotic burden, the residuals from this model were regressed on homocysteine in 3 strata defined by predCAC (lowest quartile, middle quartiles, and highest quartile).

Results: Homocysteine was associated with CAC after adjusting for age and sex (P = 0.009) and after further adjusting for the remaining conventional risk factors (P = 0.049). Interindividual variation in homocysteine was significantly associated with the residual variation in CAC in the middle quartiles (P = 0.006), but not in the highest or lowest quartiles of predCAC.

Conclusion: The association of plasma homocysteine with CAC is attenuated by adjusting for the conventional risk factors. After adjustment, the association was strongest in subjects with an intermediate predicted level of coronary atherosclerotic burden based on conventional risk factors. These results suggest that the association of homocysteine with coronary atherosclerosis is modified by conventional risk factors.

1093-147

Age-Gender Differences in Subclinical Atherosclerosis Among Ethnic/Racial Groups

Khurram Nasir, Santos D. Raul, Wendy S. Post, Joel B. Braunstein, John A. Rumberger, Romeu Meneghelo, Jose A. Carvalho, Matthew J. Budoff, Armando Pereira, Eduardo Mauricio, Miguel A. Barreiros, Roger S. Blumenthal, Johns Hopkins Medical Institutions, Baltimore, MD, International Group for Studies of Coronary Calcification, Dao Paulo, Brazil

Background: The aim of the study is to assess the ethnic differences in sub-clinical atherosclerosis assessed by coronary artery calcification (CAC) in ethnic groups such as Brazilians (BR) of Portuguese ancestry compared to Caucasians (CS), in a large asymptomatic cohort.

Methods & results: The study consisted of 6555 males (66% BR) and 2694 females (18% BR) who underwent electron beam tomography (EBT). BR had a higher prevalence of diabetes and smoking (p<0.0001) in both genders, while an increased prevalence of high cholesterol (P<0.0001) was seen only in BR females compared to CS. No differences were seen in the prevalences of hypertension or family history of CHD. In separate logistic regression models predicting CAC (>0, >100, >400), a significant interaction between gender and race was observed, whereas an interaction between race and age was seen in males only. Among males, in each class of CAC severity, young (<45 yrs) BR had more CAC than CS whereas a significantly lower CAC was seen in older (≥45 yrs) BR compared to CS (table). BR females tend to have higher calcification although the difference was not significant.

Conclusions: Significant differences in CAC between BR and CS were observed according to gender and age. CAC is more prevalent in young BR and older CS males, and tended to be somewhat higher in BR females in all age groups. In summary, use of EBT as an accurate risk tool in different races will require ethnic-gender-age data on the presence and severity of CAC