to correlate to intima-media thickness, an established surrogate marker for atherosclerosis. We tested the hypothesis, that HSP60 had impact on coronary artery function in apparently healthy volunteers.

Methods: Using transthoracic color Doppler echocardiography, resting and adenosine-induced (140 μg/kg/min) hyperaemic coronary flows were recorded in all the major coronary arteries in 21 healthy volunteers with an average age of 27.6±5.4 years. Coronary flow velocity reserve (CFVR) was calculated as the ratio between hyperaemic and baseline mean diastolic flow velocities in the respective coronary artery. Mean coronary flow velocity reserve (mCFVR) was averaged from the CFVR values from respective coronary artery. HSP60, interleukin-6 (IL-6), cholesterol and ApoA-1 levels were measured.

Results: HSP60 levels was detectable in 9 of 21 subjects. Subjects with undetectable HSP60 (UD) levels had significantly higher mCFVR than those with detectable levels (D) (3.2±0.3 vs 2.6±0.3, p=0.002). This was in turn due to significantly higher adenosine-induced hyperaemic coronary flow velocities in left anterior descending and circumflex arteries in UD compared to D. UD compared to D, had lower IL-6 levels, which was also inversely correlated to mCFVR. Further, UD compared to D had significantly higher HDL, ApoA1 and lower systolic blood pressure. In a multivariate model with age, sex, cholesterol, blood pressure and IL-6 and IL-6, HSP60 was the only independent predictor for mCFVR.

Conclusions: Low serum levels of HSP60 is associated with a beneficial lipid and inflammatory status, and correlated with greater coronary vascular function in young healthy volunteers.

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Tu-P9:367 | OPTIMIZATION OF ULTRASOUND BRACHIAL ENDOTHELIAL FUNCTION
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Objective: Ultrasound measurements of brachial flow mediated dilatation (FMD) can describe endothelial function. Throughout literature great differences in measurement variability are reported. We optimized and standardized the FMD method. Reproducibility was investigated.

Methods: Examination room environmental conditions, positioning of subjects and instrumentation were defined. From the night before FMD assessment subjects were maintained from food, caffeine and heavy exercise. A stable and yet flexible, ultrasound probe holder and arm positioning device was used. Three sonographers performed replicate scans of the right brachial arteries of 35 healthy young adults (mean age 23.8 years; Acuson Aspen, L7). Increased brachial flow was induced using 0.5 minute forearm cuff inflation to 250mmHg. Every third heart beat ECG triggered DICOM still frames were captured in diastole from start, prior to cuff inflation, to 4 minutes after cuff release. Brachial arterial lumen was measured with automated edge detection software (Brachial Analyzer, MIA, 1A, USA). FMD was defined as % difference between maximum lumen after cuff release and start lumen diameter.

Results: The initial and replicate average FMD's were 5.85(SD3.43) and 5.61(1.08%). The paired mean difference was 0.25(1.12%), a CV of 19.6%.

Conclusions: Under standardized conditions and with stable arm and transducer positioning, brachial FMD assessed with automated image analysis software is well and consistently reproducible. Use of digital DICOM image stills makes FMD fit for QA/QC procedures and hence applicable in multicentres studies of CVD risk and clinical trials.

Tu-P9:368 | ALCOHOL CONSUMPTION AND CORONARY ARTERY CALCIFICATION DETECTED BY ELECTRON-BEAM COMPUTED TOMOGRAPHY IN MIDDLE-AGED JAPANESE MEN
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Objectives: Epidemiologic studies from Western countries have investigated the relationship between alcohol intake and coronary calcification with controversial results. The purpose of the present study is to clarify the relationship between alcohol consumption and coronary calcification in middle-aged Japanese men who are drinking more than men in Western countries.

Methods: A random sample of community-based Japanese men aged 40 to 49 without a prior history of cardiovascular disease (n=250) was examined for alcohol consumption and coronary artery calcification (CAC) detected by electron-beam computed tomography. Former drinkers (n=5) were excluded from the analysis.

Results: There was a J-shaped association between alcohol intake and CAC. There was an increase of CAC in heavy drinkers (≥ 46 g/day of ethanol), and participants who consumed ≥ 69 g/day showed a significant increase of CAC (odds ratio, 4.20; 95% Cl, 1.16-15.2) compared with never-drinkers after adjusting for other cardiovascular risk factors including blood pressure, HDL cholesterol, CRP, plasma fibrinogen, and smoking. The nadir for CAC was observed in the group with an alcohol consumption of 1-22 g/day, although it did not reach statistical significance (odds ratio, 0.58; 95% Cl, 0.23-1.43).

Conclusions: Heavy drinking may be a risk factor for coronary heart disease in middle-aged Japanese men.

Tu-P9:369 | CLINICAL IMPLICATION AND METABOLIC FACTORS OF NON-CALCIFIED CORONARY PLAQUES DETECTED WITH CARDIAC COMPUTED TOMOGRAPHY
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Objective: Non-calcified coronary plaques are frequently encountered in cardiac computed tomography (CT) study. However, their clinical implication and associated metabolic factors are not clarified.

Methods: 305 subjects receive electron-beam CT (e-Speed, General Electronics) study. Both coronary calcification measurement and contrast-enhanced electron-beam coronary angiography are performed in all subjects. Non-calcified coronary plaques are identified with the reconstructed maximal intensity projection (MIP) coronary angiography. Biochemical data, high-sensitive CRP and Framingham score are all analyzed.

Results: There are 31.8% subjects in NCNP(no calcification and no non-calcified plaque), 20.4% in NCYP(Non-calcified coronary plaques with Agatston score less than 00), 25.9% in YCYP(Calciﬁed plaque only) and 21.9% in YCYP(both calcified and non-calcified plaques with Agatston score more than 100). No difference in body weight, body-mass index, waist circumference, fasting blood sugar, diastolic blood pressure, HDL-C, LDL-C, total cholesterol and high-sensitive CRP in the NCYP group. However, NCYP group has higher systolic blood pressure and Framingham score than NCNP group. Similar Framingham score are noted between NCYP and YCYP groups. YCYP group has the highest Framingham and Agatston scores but similar metabolic factors with others.

Conclusion: Non-calcified coronary plaques suggest significant cardiovascular risk, especially coexist with calcified plaques. Such increased cardiovascular risk might not relate with conventional metabolic factors but systolic blood pressure.

Tu-P9:370 | ASSOCIATION OF ENDOTHELIAL SHEAR STRESS WITH THE TYPE OF Atherosclerotic LESIONS IN ANGIOGRAPHICALLY NORMAL CORONARY ARTERIES
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Objective: To investigate whether the distribution of atherosclerotic lesion types is related to variations of endothelial shear stress (ESS) in coronary arteries.

Methods: In 5 patients, an angiographically normal coronary artery was interrogated with angiography and IVUS in order to reconstruct the 3D lumen. Segments > 6mm in length in between side branches were selected and ESS was calculated by computational fluid dynamics. Two expert observers independently characterized the atherosclerotic plaques around the luminal border in each IVUS image as fatty, fibrotic or calcific. Subsequently, the location of the lesions was determined in the 3D arterial segments and
matched with the corresponding locations of the computed ESS axially and circumferentially. ESS per segment was normalized with the Potocskai-derived ESS using the average luminal area of the segment and ANOVA was used to compare the normalized ESS (nESS) values among the 3 lesion types in all segments.

**Results:** Eleven segments (mean length: 10.8 mm) were identified and the lesions were mainly fibrotic (64.2% of the matched locations), while fatty plaques were the second most common type (22.4%). ANOVA demonstrated significant differences in nESS values among the 3 lesion types [mean nESS values for calcific, fibrotic and fatty lesions: 1.72, 1.3 and 1.23 respectively (p < 0.001)]. Post-hoc analysis: calcific vs fibrotic: p < 0.001, calcific vs fatty: p < 0.001, fibrotic vs fatty: p = 0.032.

**Conclusions:** Atherosclerotic lesion type in angiographically normal arterial segments is significantly associated with ESS; harder plaques appear in areas with higher ESS.

**Tu-P9:371 RELATION BETWEEN VESSEL REMODELLING AND INTRAVASCULAR ULTRASOUND MEASUREMENTS OF ATHEROSCLEROTIC CORONARY ARTERY PLAQUES**

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**Background:** Positive remodelling is associated with acute and unstable plaques. It is not known what determines the direction and extent of vessel remodelling in response to a growing plaque.

**Objective:** To study the relationship between the extent/direction of remodelling and vessel size, plaque size and eccentricity.

**Methods:** 60 plaques (plaque burden >40%) in 31 patients were studied by IVUS. Measurements included the external elastic membrane area (EEM), plaque area, and reference segment measurements as well as the remodelling (RI) and eccentricity indices. Remodelling was +ve if RI ≥1.05, and -ve when ≤ 0.95.

**Results:** Remodelling was seen in 22 plaques (RI 1.17±0.1). These plaques had a larger plaque area (13.8±4.4 vs 11.1±4.4 cm², p < 0.02), and a smaller mean reference EEM (16.0±4.0 vs 18.5±4.8 mm², p < 0.03) than other plaques yielding a higher plaque/vessel ratio (0.90±0.18 vs 0.61±0.15, p < 0.001). Odds ratio for +ve remodelling in eccentric vs concentric plaques was 6.68 (95% CI: 1.7-26.5, p < 0.009). A significant correlation was seen between the plaque area and RI only in eccentric but not in concentric plaques (r=0.51, p < 0.001 vs r=0.38, p < 0.08).

**Conclusion:** Positive remodelling is seen with larger plaques and smaller vessels (larger plaque/vessel ratio). In eccentric plaques the EEM expanded in relation to the size of growing plaque within. Concentric plaques on the other hand, more often showed -ve remodelling, the extent of which bore no relation to the size of the plaque itself. This highlights the different mechanisms underlying the occurrence of remodelling in eccentric and concentric plaques.

**Tu-P9:372 ATHEROSCLEROTIC LESION AND ENDOTHELIAL DYSFUNCTION IN PATIENTS WITH MYOCARDIAL BRIDGING ASSESSED BY INTRACORONARY ULTRASOUND**

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**Background:** Myocardial bridging (MB) was described when a segment of coronary artery travels through the myocardium. Although intravascular ultrasound (IVUS) is highly useful for visualizing arterial wall and surrounding structures, detailed morphological IVUS characteristics and its relations to endothelial dysfunction are not clarified.

**Methods:** A total 74 patients (pts; 43 men, mean age: 54.3±10.1 yrs) with typical or atypical anginal symptoms who underwent diagnostic coronary angiography with acetylsalicylic (Aspirin) provocation test and in whom typical angiographic "milking effects" in left anterior descending artery were selected for IVUS examination and off-line analysis.

**Results:** A specific, echoluent narrow muscular band-like structure ("half-moon") surrounding MB segment and characteristic systolic compression with delayed relaxation in diastole of MB was observed in all pts. Interestingly, 90.5% (67/74) of the pts showed no atherosclerotic lesions within the MB segment and only 5.4% (4/74) had mild plaque within the MB segment. Significant atherosclerotic plaques were commonly found in the proximal or distal of the MB segment. Significant focal or diffuse spasm was induced in inside (8.1%), outside (2.7%) or both side (89.2%) of MB segment by Ach provocation test in 68.9% (51/74) of pts.

**Conclusion:** All MB pts had the characteristic half-moon sign which causing systolic compression in MB segment by IVUS. The half-moon was commonly located both inside and outside of MB segment. The most common morphological characteristics of half-moon were focal, narrow and curved type. The MB segment commonly spared from the atherosclerotic lesions and frequently associated with Ach induced endothelial dysfunction.

**Tu-P9:373 SPATIAL DISTRIBUTION OF CORONARY ARTERIAL DISTENSIBILITY ASSESSED BY INTRAVASCULAR ULTRASOUND - IN RELATION TO BIFURCATION SITE**

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**Background:** We assessed the spatial distribution of coronary distensibility in relation to tree bifurcations in the angiographically normal looking left anterior descending artery (LAD).

**Methods:** In 104 patients without overt coronary artery diseases and any medications (49.7 yr, 57 men), IVUS assessment was obtained in 3363 sites of LAD, 5 sections, made up to the point 2.5 mm proximal and distal to each 4 consecutive bifurcations of the LAD (LADb) were selected. Each section was 0.5 mm apart. The distensibility of the coronary artery (D) was defined as [d(A/dP)±1000/mmHg, where A = the smallest luminal area in diastole, dP = change in intracoronary pressure during a cardiac cycle].

**Results:** There was a significant reduction of coronary distensibility in areas adjacent to the bifurcation points (p < 0.001). At sites 1.5 mm from the bifurcation ostium, the distensibility was reduced the most (p < 0.01). The reduction of distensibility was more prominent at distal sites than proximal sites (p < 0.04). There was a constant trend towards increasing the coronary distensibility from proximal to distal LAD (r²=51, p < 0.001). There were no significant differences in the plaque burden among each site (p=NS, all).

**Conclusion:** Coronary distensibility was dramatically reduced in areas adjacent to the branching points of LAD, without any relations to the plaque burden. This finding suggests that arterial stiffening is an inherent feature of bifurcation areas of the coronary artery and may be the reason of increasing atherosclerosis at bifurcation areas.

**Tu-P9:374 DETECTION OF CORONARY ARTERY STENOSIS USING BREATH-HOLD MAGNETIC RESONANCE CORONARY ANGIOGRAPHY. COMPARISON WITH CONVENTIONAL X-RAY ANGIOGRAPHY**

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**Objective:** To detect coronary artery stenoses, we compare breath-hold magnetic resonance coronary angiography (MRCA) to conventional coronary angiography (CA).

**Methods:** Sixty-five patients with suspected coronary artery disease underwent MRCA and CA within one week. MRCA examination was performed by using the two-dimensional (2D) breath-hold technique with a fast spiral gradient-echo sequence/spiral. Each imaging sequence was obtained within one breath-hold in expiration (14 seconds of apnea). The assessment of coronary artery stenoses on magnetic resonance (MR) angiograms was independently performed by two blinded readers and compared to conventional CA images.

**Results:** The agreement between the two readers in evaluating MR coronary stenoses was very high: r = 0.90 (mean difference ± 0.26; standard deviation = 17.5 with standard error of estimates = 0.30). Three hundred and ninety segments were evaluated by the two imaging techniques. MRCA correctly detected 76 of 82 (93%) stenoses, and recognized 242 of 302 (80%) plaque segments. The Pearson correlation coefficient between MRCA and CA in assessing coronary narrowings was very high: r = 0.85. Despite this the mean difference was 4.5 with a standard error of estimate of 0.21, indicating that MRCA slightly overestimates the degree of stenoses.

**Conclusions:** Our study showed that 2D breath-hold MRCA is an accurate technique in displaying and quantifying the most significant stenoses in the proximal and middle segments of the coronary arteries.

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