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Influence of cigarette smoking on coronary artery and aortic calcium among random samples from populations of middle-age Japanese and Korean men

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Abstract

Background—Cigarette smoking is a risk factor of coronary heart disease (CHD). Vascular calcification such as coronary artery calcium (CAC) and aortic calcium (AC) is associated with

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Competing Interest
None to declare.

Contributorship Statement
NH performed data interpretation and manuscript writing with AS; TK, AS, JC, HU, and CS collected data; HU, KM (Miura), TO, AF, SK, AK, YN, HM, AK, KM (Masaki), KS, LK and DC helped with the interpretation of the results; HU, KM (Masaki), JC, LK, and DC provided critical comments on the manuscript; AS, HU, CS, DC, and LK designed the study; HU and CS obtained funds for this study.

CHD. We hypothesized that cigarette smoking is associated with coronary artery and aortic calcifications in Japanese and Koreans with high smoking prevalence.

Methods—Random samples from populations of 313 Japanese and 302 Korean men aged 40 to 49 were examined for calcification of the coronary artery and aorta using electron beam computed tomography. Coronary artery calcium (CAC) and aortic calcium (AC) were quantified using the Agatston score. We examined the associations of cigarette smoking with CAC and AC after adjusting for conventional risk factors and alcohol consumption. Current and past smokers were combined and categorized into two groups using median pack-years as a cutoff point in each of Japanese and Koreans. The never smoker group was used as a reference for the multiple logistic regression analyses.

Results—The odds ratios of CAC (score ≥10) for smokers with higher pack-years were 2.9 in Japanese ($P<0.05$) and 1.3 in Koreans (non-significant) compared to never smokers. The odds ratios of AC (score ≥100) for smokers with higher pack-years were 10.4 in Japanese ($P<0.05$) and 3.6 in Koreans ($P<0.05$).

Conclusion—Cigarette smoking with higher pack-years is significantly associated with CAC and AC in Japanese men, while cigarette smoking with higher pack-years is significantly associated with AC but not significantly with CAC in Korean men.

Keywords

atherosclerosis; cigarette smoking; coronary calcium; aortic calcium; Japanese; Koreans

INTRODUCTION

The association between cigarette smoking and coronary heart disease (CHD) is well established in previous publications and has been endorsed by the U.S. Surgeon General.[1, 2, 3] Both clinical and laboratory research provide extensive evidence suggesting that the observed association is mediated through physiological mechanisms including vascular calcification, modification of the lipid profile, thrombosis, and inflammation.[4] Epidemiological studies across various races and ethnicities support research that suggests cigarette smoking is a major cause of CHD.[5]

Electron beam computed tomography (EBT) is a non-invasive instrument that produces images of the central vasculature so coronary artery calcium (CAC) and aortic calcium (AC) can be quantified. CAC and AC are markers of atherosclerosis and increased levels are associated with CHD incidence. [6, 7, 8, 9]

Like reports from many developed countries, cigarette smoking has been shown to be a proven risk factors of CHD in Japanese and Koreans.[10, 11] In contrast to other developed countries, men in Japan and Korea have high rates of cigarette smoking.[12] Although the association of cigarette smoking with CAC and AC is reported in populations in other developed countries, the association in Japanese or Korean population has not been investigated. The association of cigarette smoking with CAC and AC provides further important insights in understanding effect of cigarette smoking on CHD. Therefore, we examined whether cigarette smoking is associated with CAC or AC detected by EBT in middle-aged Japanese and Korean men.

METHODS

Study participants

The design and methods of the ERA-JUMP study have been described in detail previously.[13,14] Samples from populations of 40- to 49-year-old men were recruited from 2002 to 2006. Japanese men (n = 313) were randomly selected from the Basic Residents' Register from the city of Kusatsu, Shiga, Japan, and Korean men (n = 302) were randomly selected from the Korean Health and Genome Study using the telephone directory from the city of Ansan, Gyeonggi-do, South Korea.

Informed consent was obtained from all participants. The study was approved by the Institutional Review Boards of Shiga University of Medical Science, Shiga, Japan; Korean University, Seoul, South Korea; and University of Pittsburgh, Pittsburgh, PA, U.S.A.

Questionnaire variables

Smoking status (never, past, or current) was assessed by a self-administered questionnaire. Current smokers reported the number of cigarettes consumed a day and the age of cigarette smoking onset. Past smokers reported the number of cigarettes consumed a day as an active smoker and the ages of cigarette smoking onset and cessation. For past and current smokers, pack-years consumed was calculated with the formula: [years smoked] × [number of cigarette packs consumed per day] (assuming a pack contains 20 cigarettes). Smokers (both past and current) were further categorized into upper and lower half groups using the median of pack-years consumed as a cutoff point in each of Japanese and Korean men. Alcohol drinkers were defined as persons who consumed any type of alcoholic beverage on a daily basis. Alcohol consumption was calculated from a self-administered questionnaire with inquiries about the type, frequency, and amount of alcoholic beverages consumed on a daily basis. Since alcohol consumption non-linearly modifies CAC and AC, the variable was further categorized into 5 levels, according to their amount of consumption per day (g/day).[15]

Imaging

CAC and AC were examined by a GE-Imatron C150 Electron Beam Tomography Scanner (GE Medical System, San Francisco, CA, U.S.A.) at both study centers as previously reported.[12] CAC scanning was performed following a standardized protocol to obtain 30 to 40 contiguous transverse images (3 mm thick) from the level of the aortic root to the apex of the heart. Images were obtained using electrocardiogram triggering at maximal breath holding so that images with 100 millisecond exposure each were obtained during the same phase of the cardiac cycle (60 percent of R-R interval). Then, the scanner was set to acquire AC images from the aortic arch to the iliac bifurcation, and cross-sectional images (6 mm thick) were taken with a 30 millisecond exposure. Scan data were saved to an optical disc and sent for reading to the Cardiovascular Institute, University of Pittsburgh Medical Center, Pittsburgh, PA, U.S.A.

CAC and AC were assessed by the widely accepted Agatston scoring method.[16] CAC and AC were confirmed when 3 contiguous pixels (1 mm^2) of > 130 Hounsfield Units were detected overlying the vessels of interest. A CAC score and an AC score were then calculated for each region of interest by multiplying the area of all significant pixels by a grade number (1, 2, 3, or 4) indicative of the peak computed tomography number (Hounsfield Unit). The individual region of interest scores were finally summed for a CAC score and an AC score. In the present study, positive calcifications were defined by Agatston score cutoff points (CAC score ≥10; AC scores >0 and ≥100). A score ≥10 was selected to define positive CAC because it has a high interscan variability with a range of 0–10.[17] All

of the images were read by one trained reader at the Cardiovascular Institute, University of Pittsburgh Medical Center, blind to the subjects' status. The intraclass correlation coefficients for a non-zero calcification score were 0.98 for CAC and 0.99 for AC.

Anthropometric and blood pressure measurements

Body mass index (BMI) was calculated as weight (kg) divided by the square of height (m^2). After five minutes of rest, blood pressure was measured twice from the right arm using an automated sphygmomanometer (BP-8800, Colin Medical Technology, Komaki, Japan) with appropriate-sized cuff. The averages of the two measurements for both systolic blood pressure (SBP) and diastolic blood pressure (DBP) were used for analysis.

Blood analyses

Venous blood samples were drawn in the morning after a 12-hour fast. Serum samples were stored at −80°C, shipped on dry ice to Heinz Laboratory, University of Pittsburgh, and analyzed for levels of total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides, and glucose as previously described.[18] Total cholesterol and HDL cholesterol were measured with standardized methods according to the Centers for Disease Control and Prevention. LDL cholesterol was estimated by the Friedewald equation.[19] When the levels of triglycerides exceeded 4.52 mmol/l (400 mg/dl), LDL cholesterol was directly measured by an automated spectrophotometric assay (Equal Diagnostics, Exton, PA). Fasting glucose was measured with the hexokinase glucose-6-phosphate dehydrogenase enzymatic assay.

Statistical analysis

Categorical participant variables were calculated as percentages while continuous variables were calculated as means with standard deviations (SD). Multiple logistic regression analyses were performed to examine the relationship between cigarette smoking and calcium (CAC and AC) after adjusting for conventional risk factors (age, BMI, SBP, HDL and LDL cholesterol, and fasting glucose) and alcohol consumption. Three models (for Japanese, Koreans and pooled) were run for each outcome of calcium (CAC, AC>0 and AC≥100). All the covariates were forced in the model based on the previous reports and our recent review.[13, 20, 21, 22] Cigarette smoking was included in the model with never smokers as the reference category (= 1), lower level of smoking (= 2), and higher level of smoking (= 3) according to participants' pack-years consumed dichotomous categorization. Then, analyses of interaction between ethnicity and cigarette smoking were performed in the model to determine any statistical difference between Japanese and Koreans with respect to cigarette smoking effect on CAC and AC.

All statistical tests were two-tailed with a p-value less than 0.05 considered significant, and confidence intervals were estimated at the 95 percent level. The Statistical Package for the Social Sciences (PASW version 18.0, Chicago, IL) was used for the analyses.

RESULTS

In the present study, response rates were around 50% in both Japanese and Koreans. Table 1 shows the participant characteristics of Japanese and Korean men in the study. The prevalence of cigarette smoking was 49.2 and 37.7 percent for Japanese and Koreans, respectively. The dichotomous cutoff points for cigarette smoking were 16.0 pack-years for Japanese and 18.0 pack-years for Koreans. Cutoff points for alcohol consumption category were 0, 23, 46, 69 g/day for both ethnicities. LDL cholesterol, HDL cholesterol, total cholesterol, SBP, fasting glucose, smoking (pack-years and rate), and alcohol consumption (amount and rate) were significantly higher in Japanese than in Koreans, whereas BMI was

significantly higher in Koreans than in Japanese. Majority of Japanese and Koreans in the study had no CAC and AC, however the prevalence of AC (score >0) was 68.9% in Koreans and significantly higher than in Japanese.

Tables 2 and 3 show the characteristics of Japanese and Korean men by each smoking category. In Japanese, age and alcohol consumption were significantly different among the three smoking categories. In Koreans, alcohol consumption, fasting glucose, and triglycerides were significantly different among the three smoking categories. Prevalence of both CAC and AC (both scores >0 and ≥100) were significantly different between never smokers and smokers with higher pack-years among Japanese men, whereas only the prevalence of AC score ≥100 was significantly different between never smokers and smokers with higher pack-years among in Korean men.

The multiple logistic regression analyses showed significant positive associations between cigarette smoking and the presence of AC (both scores >0 and ≥100) in Japanese men (Table 4). Compared to never smokers, the odds ratios (ORs) of Japanese men having positive AC (score ≥100) were 2.0 (non-significant) for smokers with lower pack-years and 10.4 ($P<0.05$) for smokers with higher pack-years. There was also a significant positive association between cigarette smoking and CAC (score >10) in Japanese men. ORs of CAC in Japanese smokers with lower and higher pack-years were 1.0 (non-significant) and 2.9 ($P<0.05$). The increased risk of calcium was more clearly seen in AC than CAC.

The multiple logistic regression analyses in the Korean men showed a significant positive association between smoking and AC but not between smoking and the presence of CAC (Table 5). Compared to never smokers, the ORs of Korean smokers having positive AC with lower and higher pack-years were 2.1(non-significant) and 3.6 ($P<0.05$). The ORs of Korean smokers with lower and higher smoking group for CAC was 0.9 (non-significant) and 1.3 (non-significant). The interaction terms between ethnicity and cigarette smoking on the effect of CAC or AC were not statistically significant in the regression model.

DISCUSSION

In the present study we demonstrated that cigarette smoking with higher pack-years was significantly associated with CAC and AC in Japanese men. However, cigarette smoking with higher pack-years was only significantly associated with AC but not CAC in Korean men. The ORs of CAC and AC increased in higher pack-years of cigarette smoking in both Japanese and Koreans. Our results in Japanese are consistent with results from other studies reporting the significant association of cigarette smoking with CAC and AC.[23, 24]

The lack of an association of cigarette smoking with CAC in Korean men may be due to lower levels of LDL cholesterol among them. In the present study, Japanese men showed a much higher mean LDL cholesterol level than Korean men (132.5 mg/dl and 115.5 mg/dl, respectively). A recent report from the Multi-Ethnic Study of Atherosclerosis (MESA) showed cigarette smoking was not significantly associated with CHD events among individuals with LDL cholesterol less than 130 mg/dl.[25] The Atherosclerosis Risk in Communities (ARIC) Study showed a significant interaction of cigarette smoking with LDL cholesterol in predicting CHD events, where the combined effect of heavy smoking (≥15 cigarettes per day) and high LDL cholesterol (≥130mg/dl), on risk of CHD, was higher than the product of their individual effects.[26] Although we considered the difference in LDL cholesterol levels between the Japanese and Korean men, and analyzed the interaction between ethnicity and cigarette smoking on the effect of CAC, the interaction was not statistically significant in our regression model. We cannot deny the possibility that the relatively small sample size in our study is the cause for not finding a significant interaction.

Alternatively, the different findings for the significance of the interaction between cigarette smoking and LDL cholesterol may be due to the different outcomes reported for ARIC and our study, i.e. CHD events versus CAC.

Regardless of the potential explanation, the non-association in Korean men does not lessen the importance of nonsmoking status. Cigarette smoking is still a major risk factor for CHD and highly prevalent both in Koreans and Japanese men.[10, 11] Additionally, accumulation of CAC was accelerated by cigarette smoking and slowed down after smoking cessation.[27]

We also found that both Japanese and Korean smokers had higher ORs of AC than CAC. This observation is consistent with the results from previous pathology studies. Tejada et al. reported that atherosclerosis appeared in the aortas earlier and more extensively than in the coronary arteries.[28] Takei et al. also found that Japanese young men and women in the nationwide autopsy study had higher prevalence of aortic than coronary atherosclerotic lesions.[29] Additionally, the Pathobiological Determinants of Atherosclerosis in Youth Study showed that cigarette smoking affects more AC than CAC.[30]

We found a difference in prevalence of AC between Japanese and Koreans. The lower prevalence of AC in Japanese who had higher pack-years smoking compared to Koreans suggests that the association between smoking and AC in Japanese and Koreans may be mediated by other factors. In the present study, the association of cigarette smoking with AC was statistically significant after adjusting for other potential confounders in both Japanese and Koreans. We also showed the magnitude of association between smoking and AC did not differ between Japanese and Koreans as there was no significant interaction between ethnicity and smoking in the association of AC. However, our study does not provide an answer for which factors cause the lower prevalence of AC in Japanese. Factors explaining the lower prevalence of AC in Japanese are of great interest for future investigation.

In our analyses, current and past smoking statuses were combined because time since smoking cessation was short in this study. We also performed analyses without combining current and past smokers, but the results were similar (data not shown). Considering previous reports that moderate alcohol consumption is protective against calcification, we adjusted for the level of alcohol consumption per day in our analyses of the association between cigarette smoking and calcium. [15] Therefore, moderate alcohol consumption should not mask any negative impact of cigarette smoking. Instead of assuming linearity between alcohol consumption and calcification, we categorized alcohol consumption into 5 levels. We determined the risks of CAC and AC after adjusting for these levels of alcohol consumption.

To understand our primary interest in the association between smoking and vascular calcification further, we also tested how alcohol consumption affected the association between smoking and the lipid profile. Cigarette smoking was known to increase LDL cholesterol and to decrease HDL cholesterol, which potentially modifies the mechanism of vascular calcification. Although analysis showed that alcohol consumption had a counter effect on lipid profile, smoking (pack-year) had the expected relation with high LDL cholesterol and low HDL cholesterol both in Japanese and Koreans after adjusting for alcohol consumption (data not shown). Any differences in lipid profile caused by alcohol consumption were unlikely to affect our analysis of smoking effect on CAC and AC.

Strengths of our study include randomly-selected samples to minimize selection bias. Compared to a single non-population based sample, this study has considerably higher generalizability since it found consistent results from two different population-based samples. In addition, investigating the association between cigarette smoking and calcium in

samples with high smoking rates provides valuable insight for men living in many Asian countries where smoking prevalence remains high.[31]

The present study has several limitations. First, variables such as smoking and alcohol status were based on self-reports. Second, the cross-sectional design prevented assessing causality between cigarette smoking and development of CAC and AC. However, since our smoking index is in pack-years, which reflects the period of exposure, our results suggest that period of cigarette smoking was associated with vascular calcification. Finally, we only had men and those aged 40 to 49 in our study. Therefore, future studies should investigate whether cigarette smoking is associated with excess risk for CAC and AC in women and older men.

In conclusion, cigarette smoking with higher pack-years is significantly associated with CAC and AC in middle-aged Japanese men, whereas cigarette smoking with higher pack-years is significantly associated with AC but non-significantly with CAC in middle-aged Korean men whose LDL cholesterol is low.

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What is already known on this subject?

- Cigarette smoking is the risk factor for coronary heart disease (CHD)
- The association coronary artery and aortic calcium with CHD in developed countries have been reported
- However, coronary artery and aortic calcium have not investigated in Japanese and Korean population which have high rates of cigarette smoking

What this study adds?

- In the two ethnicities with high prevalence of cigarette smoking, cigarette smoking with higher pack-years is significantly associated with coronary artery and aortic calcium in Japanese but not in Koreans who has lower LDL cholesterol than Japanese
- Both Japanese and Koreans showed cigarette smoking with higher pack-years is significantly associated with aortic calcium despite the different levels of LDL cholesterol

Table 1

Characteristics of the study participants in 2002–2006

	Japanese	Koreans	*P*
Number	313	302	-
Age (years)	45.1 (2.8)	44.8 (2.8)	
Smoking rate (%)	154 (49.2)	114 (37.7)	†
Smoking (pack-years)	19.7 (16.9)	14.1 (14.2)	‡
Alcohol drinkers[a] (%)	210 (67.3)	133 (44.0)	‡
Alcohol consumption (g/day)	26.8 28.7)	21.1 (32.2)	
Body mass index (kg/m^2)	23.7 (3.1)	24.7 (2.7)	‡
Fasting glucose (mg/dl)	106.8 (18.7)	102.9 (18.0)	*
Total cholesterol (mg/dl)	217.2 (36.0)	192.8 (33.9)	‡
Triglycerides (mg/dl)	154.9 (80.9)	160.5 (104.4)	
HDL cholesterol (mg/dl)	54.1 (13.6)	45.6 (11.5)	‡
LDL cholesterol (mg/dl)	132.2 (35.9)	116.0 (31.8)	‡
Systolic blood pressure (mmHg)	125.0 (16.1)	121.6 (14.1)	†
Diastolic blood pressure (mmHg)	76.5 (11.9)	76.2 (11.1)	
Coronary artery calcium (%) CAC score ≥ 10	36 (11.5)	32 (10.6)	
Aortic calcium (%)			
AC score > 0	111 (35.5)	208 (68.9)	‡
AC score ≥ 100	60 (19.2)	71 (23.5)	

Values are expressed as means (standard deviations) for continuous variables and numbers (percentages) for categorical variables.

HDL indicates high density lipoprotein; LDL, low density lipoprotein; CAC, coronary artery calcium; AC, aortic calcium.

*P<0.05,

†P<0.01,

‡P<0.001

[a]Alcohol drinker is defined as a person who consumed any type of alcohol beverages on a daily basis.

Table 2

Characteristics of participants and prevalence of coronary artery and aortic calcium by smoking category in Japanese men aged 40–49

	Never smokers	Smokers with lower pack-years (less than 16.0 pack-year)	Smokers with higher pack-years (16.0 pack-year or more)	*P*
Number (%)	57 (18.2)	126 (40.3)	130 (41.5)	-
Age (years)	44.1 (2.7)	44.9 (2.9)	45.7 (2.5)	
Pack-years of smoking	- (−)	11.8 (7.0)	35.9 (12.2)	*¶
Alcohol consumption (g/day)	13.9 (18.2)	26.5 (28.4)	32.8 (30.9)	*¶
Body mass index (kg/m^2)	24.0 (2.9)	24.1 (3.0)	23.2 (3.2)	
Fasting glucose (mg/dl)	105.0 (12.4)	107.5 (15.2)	107.1 (106.8)	
Total cholesterol (mg/dl)	220.0 (34.8)	215.1 (38.0)	218.1 (34.6)	
Triglycerides (mg/dl)	141.9 (63.4)	151.4 (78.4)	163.9 (89.2)	
HDL cholesterol (mg/dl)	53.0 (12.7)	53.7 (13.3)	54.9 (14.3)	
LDL cholesterol (mg/dl)	138.5 (33.5)	131.0 (35.1)	130.7 (37.6)	
Systolic blood pressure (mmHg)	125.5 (15.2)	124.8 (15.5)	125.0 (17.1)	
Diastolic blood pressure (mmHg)	76.4 (12.2)	76.8 (12.1)	76.4 (11.7)	
Coronary artery calcification (%, [95% CI]) CAC score ≥ 10	5.3, [1.8, 14.4]	7.9, [4.4, 14.0]	17.7, [12.1, 25.2]	¶
Aortic calcification (%, [95%CI])				
AC score > 0	19.3, [11.1, 31.3]	25.4, [18.6, 33.7]	52.3, [43.8, 60.7]	¶
AC score ≥ 100	3.5, [1.0, 11.9]	9.5, [5.5, 9.5]	35.4, [27.7, 43.9]	¶

Values are expressed as means (standard deviations) for continuous variables and numbers (percentages) for categorical variables.

HDL indicates high density lipoprotein; LDL, low density lipoprotein; CI, confidence interval; CAC, coronary artery calcium; AC, aortic calcium.

* indicates P<0.05 between no smokers and smokers with lower pack-year;

¶ P<0.05 between no smokers and smokers with higher pack-year.

Table 3

Characteristics of participants and prevalence of coronary artery and aortic calcium by smoking category in Korean men aged 40–49

	Never smokers	Smokers with lower pack-years (less than 18.0 pack-year)	Smokers with higher pack-years (18.0 pack-year or more)	*P*
Number (%)	78 (25.8)	111 (36.8)	112 (37.1)	-
Age (years)	44.9 (3.0)	44.8 (2.6)	44.6 (3.0)	
Smoking (pack-years)	- (−)	8.5 (5.0)	29.4 (10.6)	*¶
Alcohol consumption (g/day)	10.5 (20.1)	18.8 (24.8)	31.1 (41.5)	¶
Body mass index (kg/m^2)	24.6 (2.3)	24.5 (2.5)	24.9 (3.1)	
Fasting glucose (mg/dl)	100.4 (13.4)	100.0 (13.1)	107.3 (23.4)	¶
Total cholesterol (mg/dl)	190.0 (28.8)	192.6 (35.3)	195.2 (35.8)	
Triglycerides (mg/dl)	141.2 (94.9)	143.1 (75.7)	191.3 (126.9)	¶
HDL cholesterol (mg/dl)	44.3 (9.8)	47.5 (12.6)	44.7 (11.3)	
LDL cholesterol (mg/dl)	117.7 (23.7)	116.7 (33.8)	114.4 (34.9)	
Systolic blood pressure (mmHg)	119.8 (11.3)	122.1 (14.5)	122.3 (15.4)	
Diastolic blood pressure (mmHg)	75.1 (8.8)	76.1 (11.9)	77.0 (11.8)	
Coronary artery calcification (%, [95%CI]) CAC score ≥ 10	9.0, [4.4, 17.4]	9.0, [5.0, 15.8]	13.4, [8.3, 20.9]	
Aortic calcifications (%, [95%CI])				
AC score > 0	69.2, [58.3, 78.4]	63.1, [53.8, 71.5]	75.0, [66.2, 82.1]	
AC score ≥ 100	11.5, [6.2, 20.5]	23.4, [16.5, 32.1]	32.1, [24.2, 42.3]	¶

Values are expressed as means (standard deviations) for continuous variables and numbers (percentages) for categorical variables.

HDL indicates high density lipoprotein; LDL, low density lipoprotein; CI, confidence interval; CAC, coronary artery calcium; AC, aortic calcium.

* indicates P<0.05 between no smokers and smokers with lower pack-year;

¶ P<0.05 between no smokers and smokers with higher pack-year.

Table 4

Odds ratios [a] of positive coronary artery and aortic calcium by smoking category in Japanese men aged 40–49

	Never smokers (N=57)	Smokers with lower pack-year (N=126)	Smokers with higher pack-year (N=130)	*P*
ORs of coronary calcification, [95% CI] CAC score ≥ 10	1.0	1.0, [0.2, 4.2]	2.9, [0.8, 11.3]	¶
ORs ratios of aortic calcification, [95% CI]				
AC score > 0	1.0	1.3, [0.6, 2.9]	4.1, [1.8, 9.4]	¶
AC score ≥ 100	1.0	2.0, [0.4, 9.8]	10.4, [2.3, 47.1]	¶

[a] Odds ratios were calculated after adjusting for age, systolic blood pressure, high density lipoprotein cholesterol, low density lipoprotein cholesterol, body mass index, fasting glucose, and alcohol consumption.

ORs indicate odds ratios; CI, confidence interval; CAC, coronary artery calcium; AC, aortic calcium.

¶ indicates $P<0.05$ between never smokers and smokers with higher pack-year.

Table 5

Odds ratios [a] of positive coronary and aortic calcium by smoking category in Korean men aged 40–49

	Never smokers (N=78)	Smokers with lower pack-year (N=111)	Smokers with higher pack-year (N=112)	*P*
ORs of coronary artery calcification, [95% CI] CAC ≥ 10	1.0	0.9, [0.3, 2.4]	1.3, [0.5, 3.8]	
Odds ratios of aortic calcification, [95% CI]				
AC score > 0	1.0	0.7, [0.4, 1.4]	1.1, [0.5, 2.4]	
AC score ≥ 100	1.0	2.1, [0.9, 4.9]	3.6, [1.5, 8.6]	¶

[a]Odds ratios were calculated after adjusting for age, systolic blood pressure, high density lipoprotein cholesterol, low density lipoprotein cholesterol, body mass index, fasting glucose, and alcohol consumption.

ORs indicate odds ratios; CI, confidence interval; CAC, coronary artery calcium; AC, aortic calcium.

¶indicates P<0.05 between never smokers and smokers with higher pack-year.