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Original article

Risk factors for coronary artery calcification in Japanese patients

Tomoki Shikada (MD)[a], Masakazu Washio (MD, PhD)[b], Akiko Nishizaki (MD)[a], Takamori Kakino (MD)[a], Kensuke Ooe (MD)[a], Yuuji Ishibashi (MD, PhD)[a], Shuuichirou Sagara (MD)[a], Kunio Morishige (MD, PhD)[a], Hideki Tashiro (MD, PhD)[a,*]

[a] Division of Cardiology, St. Mary's Hospital, Kurume, Japan
[b] Department of Community Health and Clinical Epidemiology, St. Mary's College, Kurume, Japan

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ABSTRACT

Background: Because the prevalence of coronary artery calcification is lower among Japanese than among Western individuals, aspects of the Japanese lifestyle might be related to the development of calcification. We aimed to clarify the relationship between coronary artery calcium scores in Japanese patients and various lifestyle factors among the Japanese population.
Methods: Study subjects were patients aged ≥20 years who underwent multidetector-row computed tomography. A total of 201 patients agreed to take part in this study and answered a questionnaire regarding lifestyle, medical history, and other factors.
Results: Old age, current and former smoking, sedentary work, short sleep time, coronary artery stenosis, treatment with statins, medical history of cerebrovascular disease, medical history of angina pectoris, medical history of ischemic heart disease, and medical history of dyslipidemia were associated with higher odds ratios than the other factors examined, while the Japanese-style breakfast (e.g. boiled rice, miso soup, grilled fish) was associated with lower odds ratios.
Conclusions: In this study, smoking, sedentary work, short sleep time, and the Japanese-style breakfast were lifestyle factors related to coronary artery calcification. The lifestyle of Japanese people may be related to coronary calcification.

Introduction

The presence and extent of coronary artery calcium are strongly correlated with the overall magnitude of the coronary atherosclerotic plaque burden [1]. Coronary artery calcification is not only a strong predictor of coronary events [2,3], but it worsens the prognosis of coronary interventions [4]. Thus, coronary calcification is a hindrance to the outcomes of medical treatment. Moreover, numerous environmental and genetic factors have been demonstrated to influence the development of coronary artery calcification [5].

The prevalence of coronary artery calcification in Japanese men is half of the prevalence in Caucasian American men [6]. Moreover, a comparative study by Abbott et al. [7] showed that the prevalence of coronary artery calcification scores ≥10 was nearly threefold in Japanese-American men in Hawaii than in Japanese men dwelling in Japan [7]. These results support the notion that the lower prevalence of coronary artery calcification in the Japanese population than in Western populations might be related not to genetic factors, but to environmental factors in Japan (e.g. lifestyle factors). However, which lifestyle-associated factors among the Japanese population are related to coronary artery calcification remains unknown. We investigated the relationship between coronary artery calcification in Japanese patients and various lifestyle-related factors among the Japanese population.

Methods

Subjects

The study subjects were adult patients aged ≥20 years who were suspected of having ischemic heart disease and underwent multidetector-row computed tomography at St. Mary's Hospital, Kurume, Japan from 2009 to 2011. Of 207 patients, 201 (97%) agreed to take part in this study and answered a questionnaire

* Corresponding author at: Division of Cardiology, St. Mary's Hospital, 422 Tsubukuhonmachi, Kurume 830-8543, Japan. Tel.: +81 942 35 3322; fax: +81 942 34 3115.
E-mail addresses: tashiro@st-mary-med.or.jp, mdhidekit@mac.com (H. Tashiro).

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about their lifestyle, medical history, and other factors. The participants were 130 male and 71 female patients aged 64.0 ± 10.5 years.

Multidetector-row computed tomography

Measurement of coronary artery calcification was performed with a 320-row computed tomography scanner (Aquilion 320; Toshiba Medical Systems Corporation, Tokyo, Japan) equipped with an integrated electrocardiography monitor and appropriate software for testing and evaluation of the Agatston calcium score [8]. All patients underwent simultaneous cardiac computed tomography angiography.

Scanning was performed in sequential layers with a thickness of 3 mm. After the scan, images were transferred to a dedicated workstation (TeraRecon, Inc., Foster City, CA, USA) equipped with software apt for Agatston score calculations [8]. After calculations were performed automatically, a trained cardiologist reviewed the lesions and read the results on the workstation monitor. If the patients had undergone implantation of a coronary stent, the stent lesions were excluded from the Agatston score calculation.

Significant coronary stenosis was defined as the presence of severe coronary stenosis on cardiac computed tomography angiography detected by trained cardiologists. The number of coronary arteries with stenosis ranged from 0 to 3.

The mean (±SD) coronary artery calcium score was 238 ± 563. To evaluate the severity of coronary artery calcification, a coronary artery calcium score ≥238 was defined as high.

Behavioral and clinical risk factors

Physicians asked all patients to complete a questionnaire about their lifestyles, including dietary habits, risk factors (i.e. hypertension, diabetes mellitus, dyslipidemia, smoking, and kidney disease [9]), family and medical histories. Exposure to cigarette smoking was expressed as the smoking index (number of cigarettes smoked per day multiplied by number of years of smoking [10]). In addition to calculation of the smoking index, smoking habits were assessed by categorization of patients into three groups: never-smokers, former smokers, and current smokers. Alcohol consumption habits were assessed by categorization of patients into two groups: current drinkers (those who consumed alcohol once a week or more) and nondrinkers. Each patient's body mass index (kg/m^2) was calculated as an index of obesity, which was defined as a body mass index of ≥25.0.

Statistical analysis

We divided all 201 patients into two groups for comparison: those with a high coronary artery calcium score (≥238, n = 51) and those with a low score (<238, n = 150). Comparisons of both groups were performed by an unpaired Student's t test for continuous variables and by chi-square analysis for categorical variables. All variables are expressed as mean ± SD or number (%).

Logistic regression analysis was performed to adjust for potential confounding factors. Age was treated as a continuous variable. Odds ratios and 95% confidence intervals were obtained from the logistic regression coefficient and its standard error. All p-values were two-tailed. A p-value of <0.05 was considered to be statistically significant. All statistical analyses were performed using the Statistical Analysis System software (SAS Institute, Inc., Cary, NC, USA).

Results

Table 1 summarizes the characteristics and lifestyles of patients with high and low coronary artery calcium scores. Patients with high scores were older, had more severe coronary artery stenosis,

Table 1
Characteristics and lifestyle of patients according to coronary artery calcium score.

	High score (238 and more) (n = 51)	Low score (0–237) (n = 150)	p-Value
Coronary artery calcium score	818 ± 892	41 ± 59	<0.01
Age (years old)	69.9 ± 9.4	62.0 ± 11.6	<0.01
Aged persons (65 years old+)	39 (76.5%)	64 (42.7%)	<0.01
Sex (male)	33 (64.7%)	97 (64.7%)	1.00
Current smokers	10 (20.4%)[a]	26 (17.6%)[b]	0.66
Current and former smokers	35 (71.4%)[a]	88 (59.5%)[b]	0.13
Smoking index	507 ± 561[a]	413 ± 488[c]	0.28
Current drinkers	22 (44.9%)[a]	63 (42.9%)[d]	0.80
Feeling stressed	12 (24.0%)[e]	51 (34.5%)[b]	0.17
Hurry to finish work	16 (34.8%)[a]	57 (40.1%)	0.52
Sedentary work	11 (21.6%)	64 (43.2%)[b]	<0.01
Walking (30 min/day or more)	24 (53.3%)[f]	74 (50.3%)[d]	0.73
Sport activity (3 times/week or more)	11 (24.4%)[f]	29 (20.0%)[g]	0.52
Obesity at the time of CT scan	16 (31.4%)	49 (32.7%)	0.86
Obesity at 20 years old	5 (9.8%)	14 (9.3%)	0.92
Experience of Obesity	28 (54.9%)	76 (50.7%)	0.60
Enough sleep time (8 h/day or more)	30 (58.2%)[h]	77 (52.0%)[b]	0.40
Short sleep time (less than 5 h/day)	6 (11.8%)[h]	7 (4.7%)[b]	0.08
Take sleep regularly	38 (74.5%)	111 (74.0%)	0.94
Snore during sleep	8 (16.0%)[e]	46 (31.1%)[b]	0.04
Treated with statin	28 (54.9%)	52 (34.7%)	0.01
Number of coronary arteries with stenosis	1.8 ± 1.0	0.4 ± 0.6	<0.01

CT indicates computed tomography.
[a] n = 49.
[b] n = 148.
[c] n = 146.
[d] n = 147.
[e] n = 50.
[f] n = 45.
[g] n = 145.
[h] n = 51.