Influence of Westernization of Lifestyle on the Progression of IMT in Japanese

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Evaluation of carotid intima media wall thickness (IMT) by using ultrasonography is a validated quantitative method for assessing atherosclerosis, and is closely correlated with pathological findings observed in the carotid artery. Furthermore, the appearance of atherosclerosis in the carotid artery has been highly associated with atherosclerosis in the aorta and a close relationship has been observed between IMT and the incidence of coronary heart disease. In the present study, we investigated the association of risk factors for atherosclerosis with pre-clinical atherosclerosis as evaluated by IMT in native Japanese and Japanese Americans living in the United States. J Atheroscler Thromb, 2004; 11: 330–334.

Key words: IMT, Atherosclerosis, Japanese-Americans, Westernization of lifestyle

Introduction

Although Japanese people have been considered as having few atherosclerotic diseases compared with Americans, it is admitted that the morbidity of diabetes was increased for the last decade with the westernization of the Japanese lifestyle and because of this trend the mortality rate by atherosclerotic disease, especially coronary heart disease (CHD) is increasing.

Previous immigrant studies have pointed out an association between westernization of lifestyle, with increased mortality and morbidity of atherosclerotic disease, particularly CHD (1–4). Yano et al. compared the incidence of mortality due to CHD between native Japanese and Japanese-Americans in Hawaii, and found a 1.4-fold higher incidence in the latter, which showed the impact of environmental factors on the development of CHD in native Japanese (5). Unfortunately, it is difficult to evaluate the impact of environmental factors on the development of CHD, because many factors such as genetic background and the duration of exposure to coronary risk factors are also affected. Thus it is important to assess the signs of pre-clinical atherosclerosis instead of focusing on the occurrence of CHD event.

In the present study, we investigated the association of risk factors for atherosclerosis with pre-clinical atherosclerosis as evaluated by IMT in native Japanese and Japanese-Americans with the same genetic background but having a more westernized lifestyle.

Subjects and Methods

Subjects in this study were members of the Japanese-American community in Hawaii who were enrolled in the Hawaii-Los Angeles-Hiroshima study. This is a long-term epidemiological study of risk factors for diabetes and cardiovascular disease conducted since 1970, in which subjects are limited to a population genetically identical to the Japanese. The current analysis utilized data obtained over the period from 1981 to 1998. Subjects diagnosed with diabetes, elevated fasting triglycerides (TG) (> 400 mg/dl), under treatment of hyperlipidemia or having liver and kidney dysfunction were excluded.
We measured the IMT in 222 subjects in Hawaii, aged 66.6 ± 0.9 (mean ± SE) years, who were randomly selected from the participants in the 1998 examination and 271 subjects in Hiroshima, Japan, aged 60.9 ± 0.8 years.

Carotid IMT was measured by B-mode ultrasonography (EUB-405X, Hitachi, Tokyo, Japan) with a 10-MHz probe using the technique by Pignoli et al. (6). All measurements (scans and image analyses) were performed by one physician and using the same equipment, which was calibrated again in Hawaii.

The details of this study have been described elsewhere (7–14).

Comparison of Lifestyle and Coronary Risk Factors between Native Japanese and Japanese-Americans

Eating habits and physical activity

In the 1980’s study, the difference of eating habits between Japanese-Americans and native Japanese were not in quantity but in quality (8). Although total energy consumption was similar between the two groups, Japanese-Americans consumed 1.6 times more animal fat compared to that of native Japanese. The intake of saturated fatty acids (1.6 times) and cholesterol (1.4 times) were also significantly higher among Japanese-Americans (8). The intake of simple carbohydrates also increased 1.6 times compared to that of native Japanese.

Assessment of physical activity through interviews showed that the proportion of subjects with strenuous physical activity was less common in Japanese-Americans compared to native Japanese in the 1980’s (8, 9).

Recently, the difference of two groups in both eating habits and physical activity has gradually decreased, most likely because the lifestyle of native Japanese have been westernized.

Obesity

Body mass index (BMI) was significantly higher in Japanese-American men than Japanese men, but women showed similar BMI levels among the two groups.

On the other hand, the waist-hip ratio was significantly higher in Japanese-American men and women as compared to Japanese subjects (10) (Fig. 1).

During 1980 to 1990, the difference in prevalence of subjects with BMI greater than 26.4 between Japanese-American men and Japanese men reduced from 5 times to 2 times. This was mainly due to the increase in prevalence of subjects with BMI greater than 26.4 among Japanese men.

Serum lipids

Japanese-Americans had higher serum levels of total cholesterol (TC), TG and LDL-C than native Japanese prior to the 1995 study. Serum HDL-C levels were also marginally higher in Japanese-Americans until 1998. No significant difference was observed in TC, TG, HDL-C, or LDL-C levels between the two groups in the 1998 study (Fig. 2). The sum of TC, TG, LDL-C but not HDL-C levels in six examinations during the period from 1981 to 1998 was significantly higher in Japanese-Americans than in native Japanese (11). Previously observed differences have diminished recently due to a rapid increase in serum TC (4.97 ± 0.04 in 1981 vs 5.58 ± 0.09 in 1992, (mean ± SE) p < 0.0001), TG (1.20 ± 0.03 in 1995 vs 1.56 ± 0.05 in 1998, ns), HDL-C (1.18 ± 0.01 in 1981 vs 1.48 ± 0.03 in 1998, p < 0.0001), and LDL-C (3.26 ± 0.04 in 1981 vs 3.62 ± 0.04 in 1992, p < 0.01) levels in native Japanese, and a gradual decrease in Japanese-Americans (TC: 5.90 ± 0.05 in 1981 vs 5.40 ± 0.07 in 1998, p < 0.0001, LDL-C: 3.93 ± 0.05 in 1981 vs 3.27 ± 0.06 in 1998, p < 0.0001) (Fig. 2). This trend remained after adjustments for age, sex, BMI, blood pressure, smoking, and insulin resistance (11).

Diabetes

In both men and women, Japanese-Americans had a significantly higher fasting and sum of insulin levels post glucose load than the Japanese after adjusting BMI and category of glucose tolerance (7, 12).

In the 1980’s the prevalence of diabetes was 13.7–18.9% in Japanese-Americans and this was three times more than that of native Japanese. The prevalence of

Fig. 1. Change of waist-hip ratio with increasing of body mass index (BMI) in Japanese (J), first generation Japanese-Americans (JA-I), and second and later generation Japanese-Americans (JA-II) men (upper panel) and women (lower panel).

* p < 0.05, ** p < 0.005 as compared to the value for Japanese.
impaired glucose tolerance (IGT) was 19.5–24.9% in Japanese-Americans which was 1.1–1.4 times higher compared with native Japanese. In the 1990’s the prevalence of diabetes was 12.6–18.3% in Japanese-Americans and the prevalence of IGT was 15.1–26.7% comparable to the value in the 1980’s (12, 14).

In the 1980’s, the incidence of diabetes in Japanese-Americans was 17.2/1000 person-years, and it was twice that value of native Japanese. In the 1990’s, the incidence of diabetes in Japanese-Americans was 19.1/1000 person-years comparable to the value in the 1980’s study (12).

**Carotid intima media wall thickness (IMT)**

Compared with native Japanese, Japanese-Americans exhibited significantly higher IMT values in 1998 (1.20 ± 0.03 mm vs 0.98 ± 0.03 mm, mean ± SE) p < 0.0001). An age related regression curve of IMT between the two groups indicated that the Japanese-Americans reached an IMT of 1.1 mm at age 50, whereas native Japanese reach this value at age 70. Thus, westernization of lifestyle has caused the progression of pre-clinical atherosclerosis twenty-years earlier in Japanese subjects (11) (Fig. 3).

We observed higher mean IMT levels in Japanese-Americans compared to native Japanese even in those aged 40 or less, although the difference was small as compared to aged subjects (11).

**Discussion**

The lifestyle of Japanese-Americans, with an identical genetic background to that of native Japanese, has been rapidly westernized to a higher degree (3, 7, 8). Risk factors for atherosclerosis such as hyperlipidemia, obesity

![Fig. 2.](Atherosclerosis, 166: 67–72, 2003)

![Fig. 3.](Atherosclerosis, 166: 67–72, 2003)

**Fig. 2.** Chronological changes in serum total cholesterol (A), TG (B), HDL cholesterol (C) and LDL cholesterol (D) levels during the last 20 years in native Japanese (●) and Japanese-Americans (○). *p < 0.05, **p < 0.01, ***p < 0.001

**Fig. 3.** Age related changes in IMT in non diabetic native Japanese and Japanese-Americans. Estimated IMT increase with age in native Japanese (●) and Japanese-Americans (○). Lowess regression lines and 95% confidence intervals are shown.
and diabetes have been increased in Japanese-Americans. Possible explanation for these observations are altered environmental factors such as eating habits and the degree of physical activity should be considered.

The lifestyle of the native Japanese has been westernized for the last few decades. Although total energy consumption did not change, the intake of animal fat, saturated fatty acids and simple carbohydrates were increased in native Japanese. Moreover, prevalence of subjects with strenuous physical activity have been reduced in native Japanese.

Along with these changes, the prevalence of obesity in the Japanese male has increased about two times from the 1980’s to the 1990’s. Moreover, the prevalence of diabetes was increased to 10% for the last decade in Japanese, but insulin resistance among Japanese-Americans is still greater and their serum insulin concentration is higher than that of the native Japanese (7, 12, 13).

Previous study showed that serum TC level was higher among Japanese-Americans than that of US subjects (11, 15). Because serum lipids have increased quite rapidly in Japanese, and gradually decreased in Japanese-Americans, no significant differences were observed in serum TC, TG HDL-C, and LDL-C levels between the two groups in 1998, although over the past twenty years Japanese-Americans have displayed significantly higher levels of serum TC, TG and LDL-C levels than native Japanese (11) (Fig. 2).

The mortality rate of Japanese-Americans due to CHD was approximately 50% to that of Caucasians during the 1950’s, but has gradually increased thereafter. During the 1970’s, the mortality rate of Japanese-Americans due to CHD became similar to that of Caucasians (14). Define this was still five times greater than that of Japanese.

The incidence of CHD is affected by many factors such as the level of medical care, disease prevention strategies, and the degree and duration of exposure to risk factors for atherosclerosis, thus it is important to assess the signs of pre-clinical atherosclerosis instead of focusing on coronary events alone.

Evaluation of carotid IMT using ultrasonography is a validated quantitative method for assessing atherosclerosis in middle aged Japanese-Americans as the level of medical care, disease prevention strategies, and the degree and duration of exposure to risk factors for atherosclerosis, thus it is important to assess the signs of pre-clinical atherosclerosis instead of focusing on coronary events alone.

In conclusion, westernization of lifestyle promotes the development of pre-clinical atherosclerosis in Japanese. Since IMT is a validated endpoint for atherosclerotic disease risk, it can be concluded that Japanese-Americans are at increased risk for cardiovascular disease compared to native Japanese.

References


