Review

Cardio-Ankle Vascular Index in a Thai Population

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Key Words

Cardio-ankle vascular index · Arterial stiffness · Atherosclerosis · Mortality · Cardiovascular disease

Abstract

Arterial stiffness as measured by the cardio-ankle vascular index (CAVI) is a widely available method in Thailand. Data from a large cross-sectional study revealed a significant correlation of CAVI and the presence of coronary artery disease as detected from 64-slice coronary computed tomography arteriography. Furthermore, CAVI was shown to predict long-term cardiovascular events in the patients with intermediate cardiovascular risk.

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Arterial stiffness, a direct indicator of arterial distensibility, has been identified as an independent predictor of prognostic outcomes of patients with cardiovascular diseases. Arterial stiffness can be measured by several methods including applanation tonometry with pulse wave velocity, brachial-ankle pulse wave velocity and the relatively new method of cardio-ankle vascular index (CAVI). The most outstanding feature of the CAVI is the lack of dependence on blood pressure at the time of measurement.

In a previous cross-sectional study of arterial stiffness and coronary artery disease (CAD), conducted at the Ramathibodi Hospital, Mahidol University, Bangkok, Thailand, the CAVI was reported to predict the presence of CAD as assessed by 64-slice coronary CT angiography (CTA). A total of 1,391 patients (45.7% male) with a mean age of 59 years and a CAVI as part of a comprehensive cardiovascular risk assessment underwent 64-slice CTA. CAVI was shown to have a strong correlation with the presence of CAD after being adjusted for other traditional risk factors such as age, gender, hypertension, diabetes, hyperlipidemia, and smoking.

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The ROC curves of CAVI were performed and revealed that the optimal cutoff value of CAVI to predict CAD in Thais was 8.0 (sensitivity 92%, specificity 63% and accuracy 70%).

There is a large cohort study conducted in a Thai population on the incidence of cardiovascular disease, called the Electricity Generating Authority of Thailand (EGAT) study [1]. According to this study, a score is provided to estimate risk, called the RAMA-EGAT score. A previous study demonstrated that the RAMA-EGAT score was more accurate for risk estimation in a Thai population than the Framingham Heart Score. Although the RAMA-EGAT score has been validated and provides modest prediction of patients with intermediate atherosclerotic risk factors in a Thai population, an assessment of the effect of obesity and metabolic syndrome is still lacking.

To prove whether the CAVI has additional prognostic value over the RAMA-EGAT score, a modified RAMA-EGAT score was created. CAVI was found to add incremental value to our traditional cardiovascular risk score (modified RAMA-EGAT score). The modified RAMA-EGAT score model showed good discrimination and performed better than the traditional RAMA-EGAT score [C-statistics of 0.72 (95% CI, 0.689–0.748) and 0.85 (95% CI, 0.825–0.870), respectively] [2].

The CAVI may play a role in predicting the long-term prognosis of patients with intermediate atherosclerotic risk factors. These patients are the majority of those who seek cardiology consultation as outpatients, and there are limited good prognostic tools to guide the primary prevention or to slow the progression of subclinical atherosclerotic diseases in these patients. Therefore, we conducted a post hoc analysis of our previous study on long-term prognosis. We also included abdominal fat measurements in this analysis using axial computed tomography images of the abdomen. The visceral fat area and the subcutaneous fat area were measured by autonomic planimetry methods. The analysis shows that arterial stiffness evaluated by the CAVI is not only an independent predictor of cardiovascular events in patients with intermediate atherosclerotic risk factors [hazard ratio (HR) 1.24 (95% CI 1.070–1.440)], but also incremental to other clinical and coronary CTA variables (presence of significant CAD and visceral fat area), and a mean CAVI >8 was associated with a significant excess mortality ($p = 0.011$) [3]. These findings underpinned the importance of arterial stiffness as a strong predictor of cardiovascular outcome among several candidate predictors.

As arterial stiffness is one of the earliest detectable manifestations of structural and functional alterations within the vessel wall, CAVI should be considered as a physiological surrogate marker for lifestyle modifications, such as tight blood pressure control, smoking cessation, obstructive sleep apnea detection and treatment, and weight control.

Due to its availability in Thailand, technical feasibility for office-based examination and low cost of the test, CAVI is one of the most practical tools for noninvasive comprehensive cardiovascular risk assessment. In the near future, the result from the CORE study (Cohort of patients with high risk for cardiovascular events: a multicenter study) will emphasize the prognostic importance of CAVI in patients with a high cardiovascular risk and will give us ideas of how the CAVI affects the population of one of the most important cohort studies in Thailand.

Disclosure Statement

The authors received research instrumental support from Fukuda Denshi Co. Ltd., Japan.

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