“Predicting Cardiovascular Events Is a Journey, Not a Destination.”

The prevention of major cardiovascular and cerebrovascular events remains an essential public health problem. Atherosclerosis is a major contributor to development of cardiovascular diseases and is a major cause of mortality and morbidity in the older population. There are many vascular measurements for evaluating atherosclerosis in routine clinical practice, and a number of measures of vascular function [including measurement of brachial-ankle pulse wave velocity (ba-PWV), flow-mediated vasodilatation of the brachial artery induced by reactive hyperemia, and ankle-brachial blood pressure index] are available to access future cardiovascular risk. The cardioankle vascular index (CAVI) is a relatively novel index of aortic stiffness, and is obtained from measurement of ba-PWV and blood pressure.

In this issue of the Journal, Gohbara et al evaluated the utility of CAVI for predicting cardiovascular events in patients after acute coronary syndrome (ACS). The primary endpoint was a composite outcome including cardiovascular death, nonfatal myocardial infarction, or nonfatal ischemic stroke. Over a period of 15 months, 19 patients (6.6%) reached the primary endpoint. The researchers found a high CAVI (>8.325) was associated with a high incidence of cardiovascular events. After adjustment for age and other covariates, high CAVI was an independent predictor of cardiovascular events (hazard ratio: 18, P=0.005). Interestingly, the ba-PWV level was also associated with the primary outcome, but the association was weak compared with the CAVI.

Although measurement of ba-PWV has been a popular noninvasive method of assessing arterial stiffness, its accuracy is compromised by the influence of blood pressure. Conversely, CAVI is theoretically independent of changes in blood pressure. With this advantage, the CAVI has been broadly used to assess arterial stiffness in subjects with known cardiovascular diseases. Recently, there are signs that the number of publications regarding CAVI is increasing. When we search for CAVI in the literature in the PubMed database, the number of publications related to CAVI has been on the rise in the recent 10 years (Figure 1). The increase can be explained by the wide use of CAVI not just in the evaluation of vascular function in subjects with known cardiovascular disease, but also with a variety of other conditions in the early stage of atherosclerosis. For example, CAVI has been used to measure vascular status in untreated subclinical hypothyroidism to assess for cardiovascular events.

After interventional treatment of ACS, risk stratification for atherosclerosis is clinically important. The main components are cardiovascular imaging and stress testing. Left ventricular ejection fraction is widely used after discharge to predict future hospitalization. Multiple imaging methods, including single photon emission computed tomography, for assessing left ventricular function are also available to assess prognosis. In addition, a noninvasive exercise stress test is widely performed after ACS to detect residual ischemia. Regarding patients with ACS, the contributions of this study to our knowledge are important. First, it is reasonable to use CAVI for risk stratification in patients after ACS. High CAVI (>8.325) was strongly associated with cardiovascular events.

Figure 1. Changes in the number of articles related to cardioankle vascular index (CAVI) in the PubMed database in the past 10 years.

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Second, ba-PWV was not so strongly associated with events. In patients with ACS, we have to carefully use this parameter. The CAVI may be added to our knowledge as a new risk stratification parameter (Figure 2).

On the other hand, we cannot use CAVI to assess prognosis in every outpatient. The clinical utility of CAVI is based on the limited populations in previous studies. For example, some investigators reported that CAVI was not a predictor of cardiovascular events in several conditions including hemodialysis.7 Thus, a consistent database from studies of large populations of groups with different characteristics may have to be established in order to extend the application of CAVI as a standard tool for prediction of future cardiovascular events. In addition, this study has several limitations. An important problem was that they could not enter some clinical important variables (eg, biomarkers) into the model because of the relatively small number of outcomes (19 events), which poses a potential risk of model overfit. Therefore, the authors were unable to completely adjust the final model. The follow-up duration was relatively short (15 months) and long-term follow-up would be needed in further studies.

Although many investigators have tried to utilize several methods for predicting cardiovascular events, there is no final answer. Predicting future cardiovascular events remains unclear. Because there are many imaging, stress and vascular function tests in the clinical setting, overuse may occur in this field. In order to avoid overuse, we have to clarify which method is better in which patients. The journey of predicting cardiovascular events has just begun with this study.

References