

Cardio-Ankle Vascular Index as a Surrogate Marker of Early Atherosclerotic Cardiovascular Disease in Koreans with Type 2 Diabetes Mellitus (*Diabetes Metab J* 2018; 42:285-95)

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We appreciate Dr. Yi for expressing his interest and giving kind comments on our article entitled “Cardio-ankle vascular index as a surrogate marker of early atherosclerotic cardiovascular disease in Koreans with type 2 diabetes mellitus,” which was published in *Diabetes & Metabolism Journal* [1].


The cardio-ankle vascular index (CAVI) is used to compensate for the weakness of pulse wave velocity because it is not affected by blood pressure [2,3]. However, low ankle-brachial index (ABI) may affect CAVI [4], and three patients with ABI <0.9 were included in our study. One had an ABI of 0.66, and others had ABI of 0.88. The number of patients with ABI <0.9 was very small, and the ABI value was not significantly reduced except one. Therefore, it could not significantly affect the results of the study.

This study was a retrospective, non-interventional study with a review of medical records. Because of the retrospective study design that is dependent on medical history and examination records, this study has some limitations. One of them is that some patients in the non-atherosclerotic cardiovascular disease (ASCVD) group have not undergone examinations to detect ASCVD. Further study with prospective design is required to complement the limitations of this study.

The results of comparative analysis of microalbuminuria according to CAVI values were as follows: 30.5 ± 67.1 $\mu\text{g}/\text{mg}$ Cr

in CAVI <8, 31.4 ± 88.7 $\mu\text{g}/\text{mg}$ Cr in $8 \leq \text{CAVI} < 9$, and 78.6 ± 123.9 $\mu\text{g}/\text{mg}$ Cr in CAVI ≥ 9 . As the CAVI value increased, the value of microalbuminuria tended to increase, but it was not statistically significant ($P=0.083$). The broad range of microalbuminuria values in our study might be associated with failure to provide statistical evidence. There could be a difference in the results compared with Kim et al. [5] study because our study measured microalbuminuria using spot urine instead of 24 hours urine, and the number of enrolled patients was relatively small. If the number of patients is higher, the microalbuminuria value would be statistically different according to the CAVI value. This study was not designed to evaluate the relationship between CAVI and microvascular complications in patients with type 2 diabetes mellitus. We could not confirm the results of microvascular complications other than microalbuminuria. Therefore, the authors fully agree with Dr. Yi's opinion that further research about the correlation between CAVI and microvascular complications are needed.

The authors divided the non-ASCVD group into three subgroups according to the CAVI: low (CAVI <8), moderate ($8 \leq \text{CAVI} < 9$), and high (CAVI ≥ 9) according to the manufacturer's instructions [6]. The instructions suggest that CAVI <8.0 is considered to be “normal,” $8 \leq \text{CAVI} < 9$ to be “borderlines,” and CAVI ≥ 9 to be “suspected atherosclerosis.” There

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are other studies that have analyzed the relationship between the range of CAVI values and cardiovascular disease (CVD). Namekata et al. [7] compared CAVI values between the CVD risk-free group and the CVD high-risk group. As a result, average age-specific baseline values of CAVI in the CVD high-risk group were higher than in the CVD risk-free group in both genders after 40 years of age [7]. In their study, the mean CAVI value was ≤ 8 in group aged < 50 years with no risk factors for CVD, and this was consistent with the low risk classification of our study. And the mean CAVI value increased more than 8 in group aged ≥ 50 years with risk factors for CVD, which is consistent with our study and the borderline and high risk classification. Shirai et al. [8] represented that CAVI values were higher in hypertension, diabetes mellitus, dyslipidemia, smoking and metabolic syndrome, and lower when those risk factors of coronary artery disease were improved. However, there is no prospective study that evaluates the relationship between the range of CAVI values and cardiovascular diseases. Therefore, further research will be needed in the future.

Thank you again for your interest in our research and thoughtful comments.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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