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Korean Circulation Journal

Editorial

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Which Individuals Could Benefit from Repeat Coronary Calcium Scans among Asymptomatic Korean Adults with a Baseline Coronary Artery Calcium Score of Zero?

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Conflict of Interest
The author has no financial conflicts of interest.

The contents of the report are the author's own views and do not necessarily reflect the views of the *Korean Circulation Journal*.

Coronary atherosclerosis is responsible for the majority of coronary events and deaths in the developed world. The coronary artery calcium (CAC) score is strongly associated with overall coronary artery plaque burden. Over the last two decades, CAC score testing has been extensively examined in asymptomatic individuals as a marker for subclinical coronary artery disease.[1-3] Many studies have established that the CAC score provides powerful prognostic information across different age groups, genders, baseline cardiovascular risk factors (RFs), and ethnicities, and adds incremental risk stratification value to traditional RFs in the prediction of adverse cardiac events, primarily in the asymptomatic population.[3-5]

A coronary calcium scan (or CAC score testing) via electrocardiography-gated non-contrast cardiac computed tomography (CT) enables direct visualization and quantification of calcified atherosclerotic plaques.[1)2)] CAC is defined as a hyperattenuating lesion above a threshold of 130 Hounsfield units with an area of at least 3 adjacent pixels (at least 1 mm^2). Coronary artery calcification is traditionally quantified with the Agatston score. There is an ongoing debate about baseline CAC score and the role of follow-up CAC score in estimating cardiovascular disease risk.[1)3)] Recently, Lee et al.[6] showed that a zero CAC score was associated with improved survival based on a warranty period, defined as the time to a cumulative mortality rate >1% (9 years for a CAC score=0 vs. 5 years for a CAC score>0) in asymptomatic Korean adults when no other RFs were observed. CAC progression is associated with an increased risk for future cardiac events.[6] In the Heinz Nixdorf Recall study, the CAC score increased by about 20–25% per year, and about 20% of the subjects with a CAC score=0 progressed to a CACS>0 in 5 years. A CAC score of 0 at baseline and 5 years later was associated with a 10-year risk of 1.4%, followed by a risk of new-onset CAC at 5 years of 1.8%.[7] Even though no guideline currently advocates for repeated CAC scanning according to the CAC score (especially in individuals with a CAC score of zero), serial assessment of CAC scores has been proposed for monitoring atherosclerosis progression and for determining the response to medical treatment aimed at reducing the risk of coronary and cardiovascular events.[3)8)] Therefore, reducing interscan variability of CAC is critical to accurately quantify CAC progression. The main disadvantage of CAC score testing is radiation exposure; however, the radiation exposure associated with the coronary calcium scan has decreased over recent years to below 1 mSv in most cases.[1-3]

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Current guidelines have recommended that CAC scoring is reasonable for cardiovascular risk assessment, primarily in the intermediate risk population (defined as a Framingham risk score-estimated 10-year risk between 10% and 20%).[3] The coronary calcium scan is generally obtained as part of a contrast-enhanced coronary CT angiography (CCTA) procedure at many Korean health checkup centers. We cannot deny that many experts point out misuse and overuse of coronary calcium scan and CCTA as part of a general health evaluation in asymptomatic Korean adults, particularly low-intermediate risk individuals. Recently, Cho et al.[8] demonstrated that CCTA failed to enhance prognostication beyond traditional RFs when CAC scoring was taken into consideration in an asymptomatic population across a long-term follow-up period. Nonetheless, many asymptomatic Korean adults are still willing to pay for the routine repetition of coronary calcium scan or CCTA, even if their initial CAC score was zero. Of course, even with an initial CAC score of zero, a significantly higher mortality rate was observed with increasing RF burden.[6,9] The selection of which particular individuals receive a follow-up coronary calcium scan and when to conduct the scan are very important issues. Accordingly, we await the guideline for use of repeat coronary calcium scans in asymptomatic Korean adults with a baseline CAC score of zero under the influence of coronary RFs.

In this issue of the *Korean Circulation Journal*, Lee et al.[10] investigated the association of traditional RFs and 10-year predicted atherosclerotic cardiovascular disease (ASCVD) risk score with the progression of CAC in 6,268 asymptomatic Korean individuals with a baseline CAC score of zero from the Korea Initiatives on Coronary Artery Calcification registry, which is a retrospective, single-ethnicity, multicenter registry of asymptomatic individuals who underwent at least 2 coronary calcium scans as part of health checkups. The probability of CAC progression was very low during the early stages, but it increased nonlinearly over time (0.3%, 1.9%, 4.3%, 8.6%, and 16.7% CAC progression rate in years 1–5, respectively) in 719 (11.5%) individuals. In addition, the probability of CAC progression increased as the 10-year ASCVD risk increased (13.1%, 22.0%, and 27.9% probability of CAC progression at 5 years for individuals with a 10-year ASCVD risk of <5%, ≥5% but <7.5%, and ≥7.5%, respectively). Among traditional RFs (age, male sex, waist circumference, diabetes, and low-density lipoprotein cholesterol level) were independently associated with annualized CAC progression. The authors acknowledged that the differences between this study and previous studies were primarily study design (observational retrospective, self-referred individuals, and data analysis), cohort (only Koreans), and follow-up coronary calcium scan guideline (absence of an established study protocol). This study is the first quantitative assessment report of CAC progression in a Korean population, and it demonstrates clinical importance by revealing how CAC progressed over time in a large sample of exclusively asymptomatic Korean individuals with a baseline CAC score of zero, particularly according to the 10-year ASCVD risk.[10]

According to this study, many asymptomatic Korean adults underwent coronary calcium scans at similar timeframes, regardless of the individual risk for CAC progression. Moreover, traditional RFs were not considered in determining how often coronary calcium scans were performed. The results of this study reflect the current practice regarding coronary calcium scans at Korean health checkup centers. Therefore, the present study provides valuable information for identifying a subset of asymptomatic individuals with a baseline CAC score of zero who may benefit from repeated coronary calcium scans.

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