

Editöryal Yorum / Editorial

Koroner kalsifikasyon: Kalsiyum skoru ne anlama geliyor?

Coronary calcification: What does calcium score mean?

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Atherosclerosis, and resultant cardiovascular diseases are the most important causes of mortality, and morbidity, in the whole world. Debates on the mechanisms leading to atherosclerosis, factors effective on the emergence of complications after development of atherosclerosis, and the determination of patients, and the plaques with higher risk as for these complications are still the subjects of the most important debates in

the field of cardiology. Despite faster developments in the preventive cardiology and cardiac imaging, risk scoring systems used in daily practice to determine the individuals with higher cardiovascular risks can not detect substantial proportion of the individuals at risk. In addition, physical properties of vulnerable plaque, and the method of their detection are not fully acknowledged.

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In their studies published in this issue of the *Journal of Archives of the Turkish Association of Cardiology*, Erciyes et al, [1] have reported that calcium accumulation in the coronary arteries is more frequently localized in the proximal segments. This finding is in compliance with the results of the previous histopathological, and angiographic studies. Those studies have demonstrated that atherosclerosis is more frequently seen in the proximal segments of the coronary arteries relative to the distal segments.[2] Subintimal calcium accumulation in coronary arteries is an organized, and well-controlled process developed on areas with typical atherosclerotic lipid accumulation which is accepted as pathognomonic for atherosclerosis. The finding detected by Erciyes et al. which indicated increased calcium accumulation in the proximal segments might arise from the higher incidence of atherosclerosis in these segments. Besides, in this study where computed tomography (CT) was used to measure the degree of calcification, higher total calcium scores were detected in patients with traditional risk factors associated with coronary artery disease.[1] Since coronary calcification indicates the presence of atherosclerosis, it is intrinsically related to cardiovascular risk factors. Large scale studies demonstrated that calcium scores calculated by non-contrasted CT scans using a reasonable radiation dose are independent predictive

factors for coronary artery disease, and also provide information for the determination of cardiovascular risk beyond those elicited by traditional risk scoring methods. The advantage of calcium scoring over other traditional risk scoring methods is that it also considers preexisting atherosclerosis in a given individual. It has been demonstrated that calcium scores measured on CT scans can be used to predict total atherosclerotic load.[3] Therefore, as stated in guidelines, calcium scoring can be used to identify patients with clinically higher risk among those with moderate risk. [4]

As revealed in invasive coronary angiographic studies, it is acknowledged that majority of the plaques responsible for acute coronary occlusions stem from the proximal one third of the coronary arteries.[5] This phenomenon suggests that atherosclerosis affects more frequently proximal segments, and susceptible plaques are more often localized in the proximal segments. The underlying basic mechanism which enables calcium scoring to predict cardiovascular events is still debatable. In fact, in most of the studies, calcification has been demonstrated as a kind of reparative mechanism ensuring stabilization of the plaque. Punctate calcifications are characteristic features seen in vulnerable plaques, and some evidence suggests that blocks of calcification prevent plaque rupture.[6] Since current calcium scoring techniques

are based on non-contrast CT scans, they can demonstrate only plaques with certain amount of calcification, but fail to reveal soft plaques known to be more frequently associated with acute coronary events. Therefore, in patients with stable plaques containing dense calcifications the association between calcium scores of coronary arteries, and clinical events might be also due to higher number of non-calcified soft plaques in their early stage of atherosclerosis. Considering that most of the plaques responsible for acute occlusive coronary disease arise from the proximal segments of the coronary arteries, the conclusions arrived by Erciyes et al. confirms the hypothesis demonstrating the mechanism with which calcium scores predict the cardiovascular risk.

On the other hand, while investigating the extent of atherosclerotic load using calcium scoring system, it must be kept in mind that calcium score has significant disadvantages in estimating total coronary atherosclerotic load. First of all, calcium scoring can only identify plaques containing certain amount of calcification. It fails to demonstrate noncalcified plaques. This phenomenon is especially important with respect to diabetic patients. A substantial number of plaques found in asymptomatic diabetic patients was shown to be noncalcified soft plaques [7]. In addition, since a significant number of calcified plaques also contain

noncalcified tissue, calcium score can underestimate total atherosclerotic load. Also, the relationship between actual calcium content (of the plaques) and the severity of luminal narrowing is variable. Besides, even though calcifications detected in coronary arteries generally accepted as an indicator of atherosclerosis, irrespective of the atherosclerosis, medial calcification can be seen in patients with chronic renal failure and uncontrolled diabetes, and calcification of the internal elastic lamina can be observed in HIV-positive patients.[8]

In conclusion, all these data demonstrate that calcium scores can not precisely measure, but rather predict potential extent, and severity of atherosclerosis. This limitation of the calcium scoring system should not be forgotten while interpreting calcium scores in daily practice, and employing calcium scores as an indicator of the extent, and progression of atherosclerosis in relevant investigations.

Conflict of interest: None declared

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