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Letter by Shaikh and Budoff Regarding Article, "Multimodality Intracoronary Imaging With Near-Infrared Spectroscopy and Intravascular Ultrasound in Asymptomatic Individuals With High Calcium Scores"

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Authors

Shaikh, Kashif
Budoff, Matthew J

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Letter Regarding Article “Multimodality Imaging With Near-Infrared Spectroscopy and Intravascular Ultrasound in Asymptomatic Individuals With High Calcium Scores”

We read with great interest the article by Madder et al about the “Multi-modality intracoronary Imaging with near infrared spectroscopy and intravascular ultrasound in asymptomatic individuals with high coronary artery calcium scores”. The study assessed frequency of lipid rich plaque (LRP) in asymptomatic patients with coronary artery calcium scores(CACS) >300 Agatston units. Authors concluded that in patients mostly on statins, CACS>300 Agatston units correlated with total plaque volume but not LRP and it is LRP that underlies the most of acute events. Histological studies show coronary calcification starts with microscopic foci in regions of inflammation, usually lipid rich/necrotic core of plaque(1). These micro-calcification foci as they grow in size become visible on CT imaging and are clinically indicated as spotty calcification. Furthermore, pathological studies suggest as plaque becomes more calcified, it contains less lipid rich material(2, 3). IVUS and CTA studies have shown that spotty calcification is associated with plaque rupture(4), whereas more established plaques are densely calcified and are associated with less plaque rupture. CACS remains a robust predictor of future of cardiovascular events as extent and prevalence of coronary calcification is closely associated with overall plaque burden. CAC provides independent incremental information in prediction of coronary heart disease in several published studies including Multi Ethnic Study of Atherosclerosis(MESA) (5). Nadirji et al.(6) showed that low attenuation plaque volume on CTA (which correlates well with LRP) only slightly improved prediction of cardiac events beyond the established method of Agatston score. We do agree with point raised on editorial that Agatston score up-weights calcified plaque area for greater calcium density.

$$\text{Agatston Score} = \text{Area} \times \text{DWF (Density weighing factor)}$$

Some reports suggest that calcium density is positively associated with age and inversely linked with traditional cardiovascular risk factors. Criqui et al.(7) showed that CAC volume was positively and independently associated with CHD and CVD risk. At any level of CAC volume, CAC density was inversely and significantly associated with CHD and CVD risk. Since most of the patients in current study were on statins, statins have also shown to increase CAC scores through calcification of lipid rich plaque and therefore increased calcium density. It would be interesting to see if utilizing calcium area and calcium density as distinct plaque features as suggested by Criqui et al. could identify more patients with vulnerable plaque. In summary,

CACS utilizing Agatston method correctly identifies high risk and vulnerable patients and their future risk of incident CHD and all-cause mortality,⁸ while the incremental value of vulnerable plaque still needs further study.

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