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## Abstract 32: Particle Analysis of ex vivo Calcified Atherosclerotic Lesions: Does the Agatston Score Measure Up?



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**Introduction:** The Agatston method of calcium scoring is unable to identify vulnerable atherosclerotic lesions. Since its development, our understanding of the role of calcification in plaque stability has matured. Calcification morphology, specifically calcified particle distribution, could be a key factor in high-risk lesion identification. However, it is not clear whether the Agatston score possesses the ability to determine the calcified particle distribution of atherosclerotic lesions. Therefore, we analysed the calcified particle distribution of ex vivo atherosclerotic lesions and correlated the results to Agatston score approximations.

**Methods:** The study group included 20 carotid (14 male and 6 female with mean age of  $72 \pm 8$ ) and 13 peripheral lower limb (11 male and 2 female with a mean age of  $68 \pm 9$ ) ex vivo atherosclerotic lesions. High-resolution micro-computed tomography ( $15.68\mu\text{m}$  resolution) was performed on the specimens to analyse their internal structure. The 3D Objects Counter Plugin for ImageJ was employed to determine the calcified particle distribution of each sample using a threshold of 130 Hounsfield Units. The image files were downsampled to mimic the in vivo resolution which is used to calculate Agatston calcium scores ( $0.7 \times 0.7 \times 3\text{mm}$ ) and custom macros were then applied to estimate the Agatston score for each sample.

**Results:** Calcified particles were detected in 100% of the samples analysed in this study. Peripheral lower limb lesions contained a greater number of calcified particles and higher Agatston scores than carotid lesions;  $5515 \pm 8157$  versus  $3056 \pm 5403$  and  $522 \pm 335$  versus  $136 \pm 185$ , respectively. Linear regression analysis was used to

determine the relationship between the Agatston approximations and the calcified particle count. As shown in the figure, there is a low degree of correlation between the two variables,  $R^2 = 0.29$ .

**Conclusions:** The Agatston calcium score does not correlate well with the calcified particle count of ex vivo atherosclerotic lesions and therefore an inadequate in vivo method of determining calcification morphology. Novel scoring methodologies are required to identify unstable atherosclerotic lesions using current clinical imaging capabilities.

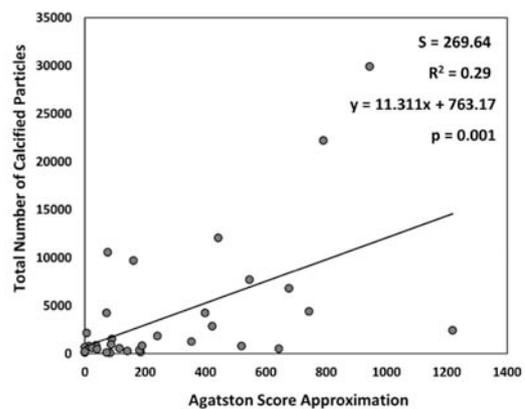


Figure: Agatston score approximations versus the total number of calcified particles.

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