Quantification of Abdominal Aortic Aneurysm Calcification Using the Agatston Method Can Predict Accelerated Expansion Rate

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We recently reported that calcification index $<2.74\%$ is a good predictor for the accelerated expansion of abdominal aortic aneurysm (AAA),¹ but it is not easy to put this into practice because of the requirement for manual plotting on the reconstructed volume-rendered AAA images (**Figure A,C**). Simpler evaluation of AAA calcification should facilitate its practical use. Here, we explored whether the Agatston method, established as a simple and accurate quantification of calcification in coronary arteries,² could be used for the measurement of AAA calcification. After setting both ends of all AAA ($n=414$) in the same manner as our previous study,¹ Agatston score and AAA calcification volume were automatically calculated with the Agatston method using 3D Slicer (**Figure B,D**). The study was approved by the Ethics Committee of the University of Tokyo Hospital. The calcification index was significantly correlated with Agatston score and with calcification volume ($R=0.525$, $P<0.001$, and $R=0.531$, $P<0.001$, respectively). According to the area under the receiver operating characteristic (ROC) curve for predicting accelerated AAA expansion (>5 mm/year), Agatston score and AAA calcification volume could be significant markers for AAA expansion ($P=0.016$ and $P=0.004$, respectively; **Figure E**). AAA Agatston score $<1,181$, corresponding to the inflection point of the ROC curve, was the optimal cut-off, having a sensitivity of 66% and specificity of 55%. Even after adjusting for age >65 years, sex, body mass index >25 kg/m², hypertension, dyslipidemia, diabetes, ex-smoking, current smoking, past history of chronic obstructive pulmonary disease, and statin use, AAA Agatston score $<1,181$ remained a significant predictor of accelerated AAA expansion >5 mm/year (hazard ratio, 2.920; 95% CI: 1.474–5.788, $P=0.002$). In conclusion, the Agatston method can be used to evaluate AAA calcification and hence predict AAA expansion.

Figure. Calculation of abdominal aortic aneurysm (AAA) calcification. (**A**) 3-D volume rendering method (axial view). (**B**) Agatston method (axial view). Red area in aortic wall, region of interest of calcification (>130 HU) with any Agatston score. Green area, bone. (**C**) Volume-rendering method (horizontal view) to reconstruct contiguous 5-mm thick transverse computed tomography AAA slices. (**D**) Agatston method (horizontal view). (**E**) Receiver operating characteristic (ROC) curve for predicting accelerated AAA expansion (>5 mm/year). Area under the ROC curve was as follows: calcification index, 0.73 ($P<0.001$); Agatston score, 0.604 ($P=0.016$); and calcification volume, 0.623 ($P=0.004$).

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Disclosures

The authors declare no conflicts of interest.

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