

Introducing a new score to quantify the distribution of coronary artery calcification based on coronary CT angiography

Introduction: The coronary artery calcium score (CACS) is an independent predictor of mortality and may influence further preventive therapy. However, CACS does not provide information on the spatial distribution of calcified plaques. The coronary calcium entropy score proposed by our research group takes into account the distribution of calcified plaques and may, therefore, provide additional information for further risk assessment.

Aims: We aim to determine the predictive value of the coronary calcium entropy score regarding the need for further testing after coronary CT angiography (CTA).

Methods: We retrospectively included consecutive patients who underwent coronary CTA for suspected coronary artery disease (CAD) at Semmelweis University Medical Imaging Centre. We used multivariate logistic regression to fit three diagnostic models. Model 1 included clinical data (age, gender, type of angina, heart rate, and rhythm), which was augmented by CACS (Model 2) and CACS and calcium entropy score (Model 3). Chi-squared test was used to compare the diagnostic performance of the models.

Results: After exclusion, data from 255 patients was analyzed (42.7% female, 63.8±10.0 years); 51 patients (20.0%) were recommended for further testing. For the clinical parameters (Model 1), rhythm and sex significantly influenced the likelihood of further investigation. For Model 2, a CACS greater than 100 was a significant predictor (101-400: $p=0.01$, 401-1000: $p=0.04$, >1000: $p<0.001$). When supplemented with the calcium entropy score (Model 3), a high entropy score (>75th pc) was found to be a significant predictor ($p=0.004$), while only an extremely high CACS remained significant (>1000: $p=0.02$). Comparing the diagnostic performance of the models, Model 3 showed significantly better performance than Model 2 ($p<0.001$).

Conclusions: The coronary calcium entropy score was found to be a significant predictor of the need for further testing following CTA beyond clinical data and CACS score. Based on our results, the formula developed for the distribution of calcified plaques may have a potential role in the investigation of CAD.

Funding: M.D.G. received a Research Excellence Grant from Semmelweis University (EFOP-3.6.3-VEKOP-16-2017-00009) and was supported by the New National Excellence Program of the Ministry of Innovation and Technology of Hungary (ÚNKP-23-2-III-SE-43).