Exploring the Correlation Between Radiomics Features and Coronary Artery Calcification

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Aims: This study aims to evaluate the correlation between radiomics features from coronary artery branches and the presence of calcification.

Methods: In this study, contrast enhanced computed tomography (CECT) images from a set of 40 patients (27 M, 13 F) were analyzed. Coronary arteries were segmented applying the Chan-Vese model. Postprocessing to divide the four branches of the coronary arteries (right and left coronary arteries, left anterior descending and left circumflex arteries) was implemented in 3DSlicer. Following this, the PyRadiomics library in Python was used to extract the radiomic features for each branch. Specific classes of features were analyzed, including first order and texture features including the Gray Level Co-occurrence Matrix (GLCM).
Based on CECT reports, a label was assigned based on the presence of the calcification. A correlation analysis between calcified (n=40) and non-calcified (n=120) branches was conducted to identify features related to calcification.

Results: Among the 95 features evaluated, the features were that showed to be more relevant for the presence of calcification were correlation of the GLCM (p=0.45), its skewness (p=0.40), its maximal correlation (p=0.36) and its normalized inverse difference moment normalized (p=0.35) and the first order skewness (p=0.43), showing a potential difference in grey level uniformity and asymmetry of grey level distribution about the mean value between healthy vessels and vessels with calcification.

Conclusion: The inclusion of a radiomic approach in the standard clinical workflow for the evaluation of in coronary artery disease is important because it can increase the diagnostic accuracy. We demonstrated the association between specific radiomic features and calcification. This approach can improve risk assessment, through the integration of sophisticated data analysis, potentially reducing healthcare costs while offering personalized care to patients.