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Screen 16 - Exploring the Utility of Radiomic Feature Extraction to Improve the Diagnostic Accuracy of Cardiac Sarcoidosis Using FDG PET

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This study aimed to explore the radiomic features from PET images to detect active cardiac sarcoidosis (CS). Methods: Forty sarcoid patients and twenty-nine controls were scanned using FDG PET-CMR. Five feature classes were compared between the groups. From the PET images alone, two different segmentations were drawn. For segmentation A, a region of interest (ROI) was manually delineated for the patients'myocardium hot regions with standardized uptake value (SUV) higher than 2.5 and the controls'normal myocardium region. A second ROI was drawn in the entire left ventricular myocardium for both study groups, segmentation B. The conventional metrics and radiomic features were then extracted for each ROI. Mann-Whitney U test and a logistic regression classifier were used to compare the individual features of the study groups. Results: For segmentation A, the SUVmin had the highest area under the curve (AUC) and greatest accuracy among the conventional metrics. However, for both segmentations, the AUC and accuracy of the TBRmax were relatively high, greater than 0.85. Twenty-two (from segmentation A) and thirty-five (from segmentation B) of 75 radiomic features fulfilled the criteria: P-value less than 0.00061 (after Bonferroni correction), AUC greater than 0.5, and accuracy greater than 0.7. Principal Component Analysis (PCA) was conducted, with five components leading to cumulative variance higher than 90%. Ten machine learning classifiers were then tested and trained. Most of them had AUCs and accuracies ≥ 0.8. For segmentation A, the AUCs and accuracies of all classifiers are greater than 0.9, but k-neighbors and neural network classifiers were the highest (=1). For segmentation B, there are four classifiers with AUCs and accuracies ≥ 0.8. However, the gaussian process classifier indicated the highest AUC and accuracy (0.9 and 0.8, respectively). Conclusion: Radiomic analysis of the specific PET data was not proven to be necessary for the detection of CS. However, building an automated procedure will help to accelerate the analysis and potentially lead to more reproducible findings across different scanners and imaging centers and consequently improve standardization procedures that are important for clinical trials and development of more robust diagnostic protocols.

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