Computer Aided Detection for Coronary CT Angiography in Low to Intermediate Risk Population

Malhotra V,[1] **Poon M,**[3] **Krishnan U,**[1] **Mcnerthney M,**[1] **Goldenberg R,**[2] **Ward N.**[1]

[1]Cardiac Study Center, Inc. PS, Tacoma, Wa, United States; [2]RCADIA Imaging, Haifa, Israel; [3]Stony Brook Medical Center, Stony Brook, NY, United States.

Introduction: Computer-aided detection (CAD) proved to be a useful tool for a number of medical imaging applications. In this study we explore the applicability of CAD for coronary CT angiography (CCTA) and identify ways it can be used in different clinical scenarios.

Methods: A retrospective study was conducted to assess the diagnostic performance of automated CCTA analysis system (COR Analyzer by Rcadia Medical Imaging). The study was performed on two sets of patients: 208 patients in the low risk category (as determined by the Framingham risk score) and 75 patients in the intermediate risk category (including diabetics). Both CCTA and cath lab results were available for the studies. The cath lab results were taken as the ground truth and the CT data was fed into the automatic system. The COR Analyzer automatically analyzed and reported significant coronary lesions (>50% stenosis) in 10 major coronary segments (LM, proximal, mid and distal sections of LAD, LCX and RCA). These findings were compared to the cath-based ground truth to measure the diagnostic performance of the automatic system.

Results: Each coronary segment was classified into one of the following seven categories by recording the most severe lesion reported for that segment – no obstruction, 0-25%, 25-50%, 40-60%, 50-75%, 75-99% and total occlusion. We used the 40-60% and 50-75% as the significant lesions cutoff value for the low and intermediate risk groups respectively. The results comparing the COR Analyzer to the ground truth are displayed in table 1.

Conclusions: The automatic CCTA analysis system exhibited very good sensitivity for significant lesions in both test groups, while maintaining the specificity at a clinically useful level. Due to the unique intrinsic properties of the CCTA exam and the exhibited CAD performance, it can be used to add value by providing a wet read for fast triage, reading sequence prioritization, workflow optimization and boosting reader's confidence. In this way it is quite different and unique in comparison to other CAD systems.

Table 1:

	Sensitivity	Specificity	PPV	NPV
Low Risk Group				
Per Patient	100%	41.1%	21.3%	100%
Per Segment	80.8%	86.97%	76.4%	99.6%
Intermediate Risk Group				
Per Patient	97.8%	33.3%	71.4%	90%
Per Segment	87.9%	83%	30.9%	98.8%