論文題目　Study of relationship between each segment of ECG and reconstruction phase on 320-row coronary CT.

（３２０列冠動脈CTに心電図の各セグメントと再構成位相の関連に関する研究）

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Abstract of the Dissertation

Background

There is a relation of image sharpness with heartbeats. And the Computed Tomographic scanner follows protocols for performing Coronary Angiography with the support of ECG gating. Due to advancement of faster scanning technique this relation should be evaluated further to meet up the high heart rates.

Objective

To evaluate the diagnostic phase and correlate the diagnostic phase with the ECG phases.

Materials and methods

The study included 128 patients who were referred for clinically indicated coronary CT angiography. The patients were divided into two groups. The first group of patients had heart rate ≤ 75 beats per minute and the second group had heart rate more than 75 beats per minute. After collecting the data, they were processed for the best reconstruction phase for an optimum image quality. Full and hybrid iterative reconstruction methods were used and the image quality was compared along with the reconstruction phase after plotting with cardiac cycle through electrocardiography. The different segments of the ECG waves were also measured and analyzed with the reconstruction phase.

Results

Our result shows that when the heart rate is ≤ 75 beats/min the best reconstruction phase is found at PR (66% to 82% of the R-R interval) which is the diastolic phase of the cardiac cycle. But if the heart rate is > 75 beats/min then the reconstruction phase is found irregularly at QT of the ECG wave. In detail, for the first group of patients the optimum quality image was found before P wave in 63% cases, over P wave at 19% cases, after the P wave at 9% cases and end of the T wave is at 9% cases. Prospective scan affirms diagnostic phase if the heart rate is lower. Therefore, the optimal necessary image for making the diagnosis was found at PR for the patients having heart rate ≤ 75 beats/min and on QT for the patients having HR > 75 beats/min.

Conclusion

There is a positive correlation of the reconstruction phase with the specific cardiac phase in patients having heart rate ≤ 75 beats per minute in an advanced setting irrespective of R-R mean. The optimally necessary images were obtained at P-R or the diastolic phase of the cardiac cycle in patients with HR ≤ 75 beats/min or from 66% to 82% of the R-R interval. And if the HR is more than 75 beats/min, the reconstruction phase shifts to QT or at the late systolic phase of the cardiac cycle. We can set a protocol targeting this specific portion of the cardiac cycle that would reduce the radiation dose further. We also can set an auto-reconstruction mode in future CT console software that could narrow down the radiation dose, reduce the radiologist's effort as well as the diagnosis time.