Optimal Heart Rate Involving Image Quality of CTA coronary Demonstrating by iCT 256 slice MDCT

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Research Background:

Factors Affecting to image quality of CTA coronary

- Patient cooperation in breath holding
- The amount of coronary calcium scoring
- The regularity of heart rhythm
- Heart Rate

Research Background:

- In the era of 64-slice MDCT , we have known that, the target of image quality for CTA coronary scanning has been maintained at heart rates lower than or equal to 65 bpm, so that good-quality images of coronary arteries can be obtained. The pre-medication of the heart rate lowing drug (β-blocker) to achieve a sufficiently low heart rate for scanning is required.

Research Background:

- Beta-blocker Contraindications :
  - Severe asthma
  - Low LVEF
  - Severe obstructive lung disease
  - Bradycardia
- Beta-blocker Complications :
  - Hypotension
  - Bradycardia
  - Asthma

***Pre-medication protocol causes the longer waiting time

Research Background:

- The advantages of the 256-slice MDCT scanner over the 64-slice MDCT for coronary artery scanning are short acquisition time and high temporal resolution , which can capture and overcome motion artifact from high heart rate , but we can observe that good image quality cannot be obtained in every high heart rate. Therefore , this retrospective study is created to demonstrate the highest HR that can produce the good image quality by using of 256-slice MDCT without administration of beta-blocking drug.

Research Question:

- How is the optimal heart rate that produce a good image quality of CTA coronary by using of iCT 256 slice MDCT images without heart rate lowing drug administration?

Objective :

- To compare image quality of CTA coronary examination using of iCT 256 slice-MDCT

  between the lower or equal to 65 bpm and the higher heart rate groups

Populations :

Inclusion criteria

- Every patient who was considered by the consultant to perform coronary artery by 256-slice MDCT.
- Age was over 15 years.
- Consent must be obtained before CT scanning.
- Blood creatinine level must be less than or equal to 1.50 mg/dl.

Exclusion criteria

- CTA result interpretation were the patients who had previous severe allergic reactions to iodinated contrast media, unable to follow breath-hold and history of previous coronary artery bypass graft.
- The amount of coronary calcium scoring > 400

Sample size

Group A	HR ≤ 65 bpm	30 case
Group B	HR 66 – 80 bpm	30 case
Group C	HR > 80 bpm	30 case

Protocol for CTA Coronary

- Bolus tracking protocol.Flow rate (4.5-6 ml./sec.) An iodinated contrast media (Ultravist 370)was injected IV followed by 50 ml. saline solution.As soon as the signal in the ascending aorta reached the threshold (120 Hounsfield units, HU.),the scan started automatically.
- Retrospectively ECG-gated scan mode.

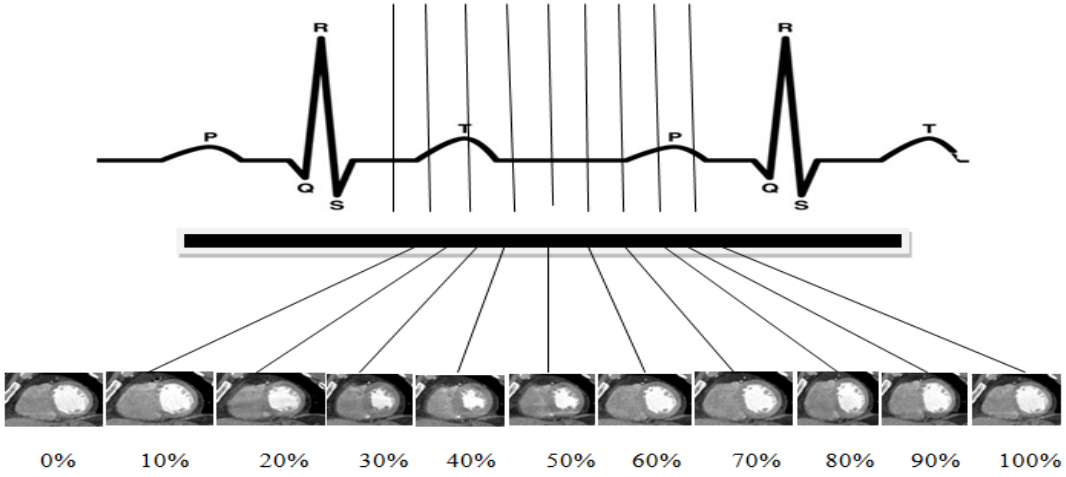
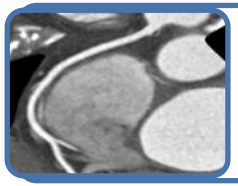


Image Analysis :

Images were reviewed by a cardiologist and a radiologist. The readers were blinded the information, heart rate, phase of cardiac cycle

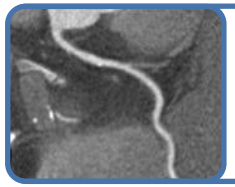
Image Analysis :

5-level image quality scoring



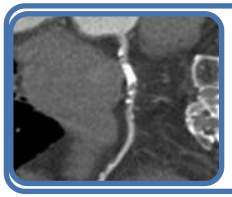
score of 1(excellent)

no motion artifacts or blurring, and no structural discontinuity of the segment.



score of 2 (good)

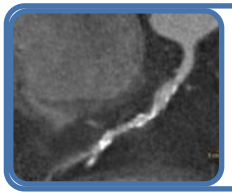
minor motion artifacts ,and no structural discontinuity of the segment.



score of 3 (fair)

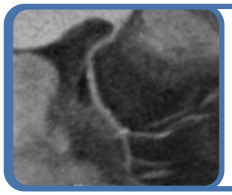
moderate motion artifacts and moderate blurring without structural discontinuity of the segment.

Good



score of 4 (poor)

severe motion artifact with mild structural discontinuity.



score of 5 (very poor)

severe artifacts with discontinuity or doubling in the course of the segment.

Bad

Image Analysis :

A score of ≤ 3 was considered to indicate acceptable image quality for clinical diagnosis.

acceptable for routine clinical diagnostic PLoS One.2012;7(11):e49212

Statistical Analysis :

- Comparison 3 groups were performed , using Chi-square test with P-value>0.05 for non significant of imaging quality.

Result :

GroupA * GroupB Crosstabulation

			GroupB				Total
			Excellent	Good	Fair	Poor	
GroupA	Excellent	Count	4	10	7	3	24
		% of Total	6.7%	16.7%	11.7%	5.0%	40.0%
	Good	Count	2	16	13	2	33
		% of Total	3.3%	26.7%	21.7%	3.3%	55.0%
	Fair	Count	0	1	1	1	3
		% of Total	.0%	1.7%	1.7%	1.7%	5.0%
Total		Count	6	27	21	6	60
		% of Total	10.0%	45.0%	35.0%	10.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.831[a]	6	.566
Likelihood Ratio	4.499	6	.609
Linear-by-Linear Association	.920	1	.338
N of Valid Cases	60		

Result :

GroupA * GroupC Crosstabulation

			GroupC			Total
			Good	Fair	Poor	
GroupA	Excellent	Count	3	11	10	24
		% of Total	5.0%	18.3%	16.7%	40.0%
	Good	Count	7	11	15	33
		% of Total	11.7%	18.3%	25.0%	55.0%
	Fair	Count	2	1	0	3
		% of Total	3.3%	1.7%	.0%	5.0%
Total		Count	12	23	25	60
		% of Total	20.0%	38.3%	41.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.917[a]	4	.205
Likelihood Ratio	6.007	4	.199
Linear-by-Linear Association	1.739	1	.187
N of Valid Cases	60		

Conclusion :

- This study shows that the non significant statistical acceptable image quality of coronary artery **can be obtained** at the heart rates > 65 bpm without beta-blocking drug administration.

- This indicates the advantage of the high speed CT scan (256-slice MDCT) in lowering the unnecessary in use of beta-blocker to reduce the patient's heart rate.

Thank You