

Evaluation of Coronary Artery Bypass Grafts and Native Coronary Arteries Using 64-Slice Multidetector Computed Tomography

Onuma Y, Tanabe K, Chihara R, et al.
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Review

Recent development of CT technology enables us to view coronary artery with CT as we see other visceral arteries. The developments of CT technology are three-fold; rapid rotation of gantry tube, fine multi-detectors and rapid acquisition of image data. The facilities of cardiac CT imaging have recently improved from 4- slice multi-detector CT (MDCT) to 16- and 64-slice MDCT.

This month's "ASCI's Choice" is by Yoshinobu Onuma, et al. which appeared in American Heart Journal in September 2007. The title is "Evaluation of coronary artery bypass grafts and native coronary arteries using 64-slice multi-detector computed tomography." As the background of this subject, the imaging of native coronary vessel was somewhat limited in the evaluation in the era of 16-slice MDCT, though evaluation for bypass graft was acceptable. In their study group they included 53 consecutive patients with coronary artery bypass graft (CABG) who underwent both 64-slice MDCT angiography and invasive coronary angiography. The images were analyzed for the significant stenosis more than 50% or occlusion in grafts and coronary arteries.

They compared the results with those of invasive coronary angiography. They described the results into four categories; arterial grafts, venous grafts, distal runoff arteries, and nongrafted arteries. For the evaluability, that of the venous grafts was the best as 98.6% and that of the distal run-off arteries was worst as 84%. After censoring nonevaluable grafts or arteries, the sensitivities of arterial grafts, venous grafts, distal runoff, and nongrafted arteries were 100%, 100%, 83.3%, and 100%, respectively and specificities were 91.4%, 98.1%, 80.2% and 87.5%, respectively. Therefore both the sensitivity and the specificity for distal runoff arteries were the worst. Those for nongrafted arteries were next to the distal runoff arteries. In conclusion, they approve the improvement of ability of 64-slice MDCT to assess bypass grafts and coronary arteries. However, they limit the clinical implementation of MDCT in the assessment of distal

runoff arteries (1).

Since there are chances of complication in the evaluation of patency of coronary artery bypass graft with invasive coronary angiography, CT angiographic evaluation will be a diagnostic tool of choice. Even in the era of 16-slice CT, the accuracy of CABG assessment was excellent, though the evaluability of distal anastomosis and native coronary arteries was not satisfactory (2). Recent report for the 64-slice MDCT evaluation for the CABG stenosis, the sensitivity was 97.8% and specificity 89.3% (3), revealing that, there is no question for the ability of CT evaluation for the patency of CABG in the era of 64-slice MDCT.

The ability of CT for the evaluation of native coronary arteries is still controversial. The limitations yet to be solved in CT evaluation of native coronary arteries include motion artifact due to rapid cardiac motion and blooming artifact due to calcification. Especially, native coronary arteries in patients with CABG show extensive calcification in arterial wall as well as diffuse luminal narrowing. Compared to the previous studies, this study showed improvement in the evaluation of native coronary arteries (4), although the rate of non-evaluable distal runoff arteries was up to 16% (1).

In addition to the problem of diagnostic accuracy in the coronary evaluation by MDCT, there are two other problems. The first one is medication of β -blocker. For the adequate quality of MDCT in this study, medication of β -blockers is indicated if the initial heart rates are higher than 70 beats/min. Even with 64-slice MDCT scanner, administration of β -blockers is recommended for evaluation of the coronary arteries as well as bypass grafts. The second problem is radiation exposure delivered by ECG-gated MDCT. The scanning range of MDCT for bypass grafts is larger than that for native coronary arteries. The estimated effective radiation dose for CABG assessment is ranged between 13 to 24 mSv, which is higher than that for native coronary arteries and much higher than that for invasive coronary angiography.

As a conclusion, authors did not recommend MDCT as routine procedure since they count for those limitations of MDCT in the evaluation of patients with typical angina after CABG. However, they recommended MDCT in the evaluation of patients with atypical chest pain. MDCT may rule out the possibility of progression of coronary artery disease. This article thus recommended the indication of 64-slice MDCT in the evaluation of the patients with CABG. I completely agree with the rationale of the final recommendation of the authors. But, only if I could add one suggestion based on my recent personal experience, I would recommend 64-slice MDCT in patients with typical angina after CABG as well, because there are many strategic ways now available to lower the radiation dose such as using 100 kVp in MDCT examination. In addition, the usage of β -blockers is almost routine work in daily practice in many cardiac CT room nowadays. With the MDCT evaluation, one might know the status of CABG clearly even though the evaluation for native coronary arteries is not satisfactory. The detection or rule-out of

any lesions in CABG vessels and native coronary arteries might be very helpful in proceeding to the next diagnostic steps or choice of further treatment modality including invasive coronary angiography, stent insertion, and re-operation.

References

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