Abstract: P6178

The optimal point of CT-FFR measurement in comparison with invasive FFR

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Topic(s):
CT-derived FFR

Citation:

Background: Currently, invasive fractional flow reserve (FFR), has become a gold standard to select patients requiring revascularization. Coronary computed tomography angiography (CTA)-derived FFR (FFRCT/CT-FFR) can be used for the management of coronary artery disease, which would be a gatekeeper of invasive coronary angiography. In most of the previous report to evaluate the diagnostic performance of FFRCT/CT-FFR, FFRCT/CT-FFR value was measured at the same point as the invasive FFR. Clinically, FFRCT/CT-FFR should be measured without the information of invasive FFR. However, optimal measurement point for CT-FFR has not been established yet.

Purpose: To assess the optimal measurement point of CT-FFR in comparison with invasive FFR as a gold standard.

Methods: CTA images scanned at 70-99% of R-R interval with 320 slice CT were screened. In the de-novo lesions with invasive FFR data were included in this study. Since calcified lesions could affect CT-FFR value, severe calcified lesions on CTA were excluded from the analysis. The CT-FFR analysis was performed by 2 cardiologists blinded to the results of the invasive FFR using a standard desktop computer and dedicated software. CT-FFR values could be provided at any point from ostium of coronary artery to the distal with vessel diameter of 1.8mm. To determine the optimal point for measurement of CT-FFR, CT-FFR values were obtained at 3 points in each coronary artery; 1) at the same point as invasive FFR; 2) lowest CT-FFR at distal point of coronary artery; 3) at 2.0 cm distal to the lesion. The diagnostic performance at each point was compared with invasive FFR.

Results: Fifty vessels of 44 patients (average age 68 years, male were 32) were included. Average Agatston score was 279.4. There was significant correlation between CT-FFR at each point and invasive FFR. CT-FFR at the same point as invasive FFR showed the good correlation with invasive FFR (R=0.641, 95%CI= 0.041-0.127, p<0.0001). Compared to the lowest CT-FFR at distal (R=0.608, 95%CI= 0.069-0.160, p<0.0001), CT-FFR at 2.0 cm distal to the lesion (R=0.604, 95%CI= 0.007-0.061, p<0.0001) revealed better correlation with invasive FFR. Sensitivity, specificity, positive and negative predictive value at each point were 92.8 / 93.3 / 81.8; 75.0 / 57.1 / 94.2; 61.9 / 48.2 / 60.0; and 96.0 / 95.2 / 84.6, respectively. Diagnostic accuracy showed that CT-FFR at 2cm distal to the lesion (0.84) was similar to CT-FFR at the same point as invasive FFR (0.80), and it was better than far distal (0.68) to detect invasive FFR derived ischemia.

Conclusions: CT-FFR was feasible to detect invasive FFR derived ischemia at the same point.

CT-FFR at 2.0 cm distal to the lesion showed higher diagnostic performance compared with CT-FFR measured at the far distal. CT-FFR measurement at 2.0 cm distal to the lesion would be a optimal position clinically.