

## Letters

### TO THE EDITOR

## Myocardial Mass at Risk for Physiological Significance



We have read with interest the report by Kim et al.<sup>1</sup> Their study was a post hoc analysis of a pooled population of multicenter, international prospective cohorts including 655 patients who underwent coronary computed tomography angiography (CCTA) before invasive fractional flow reserve (FFR) measurements. Despite similar stenosis severity, the FFR values were significantly higher in women, as the previous studies reported. However, sex was not an independent predictor of FFR after adjustment for myocardial mass and plaque characteristics, which were acquired from CCTA. It is clinically implicated to reveal that myocardial mass, rather than sex, is one of the critical factors to determine FFR values. By contrast, FFR is considered the reference of the culprit lesion for myocardial ischemia. Thus, the myocardial mass at risk (MMAR), representing the volume of myocardium distal to the culprit lesion,<sup>2</sup> must be strongly related to FFR rather than the total myocardial mass examined in the study.

As Kim et al<sup>1</sup> mentioned, we agree that the difference in myocardial mass should determine the differences in coronary flow and FFR rather than the difference in hyperemic response between men and women. Indeed, we and others have demonstrated that MMAR had a significant correlation with FFR, and MMAR combined with an anatomical severity parameter showed a better relationship,<sup>2-4</sup> whereas MMAR was referred to as the fractional myocardial mass or the myocardial volume subtended by a stenotic coronary segment. Therefore, analysis with MMAR instead of total myocardial mass could reveal the influence of myocardial mass on the difference in FFR values between men and women more clearly.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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### REPLY: Myocardial Mass at Risk for Physiological Significance



We appreciate the thoughtful letter by Drs Sadamatsu and Fukumoto regarding our recent publication.<sup>1</sup> They suggested that myocardial mass at risk (MMAR)<sup>2</sup> might better reveal the influence of myocardial mass on fractional flow reserve (FFR) than total left ventricular (LV) myocardial mass. It may seem natural that MMAR, which represents the perfusion territory of a target lesion, can be more specific for the physiological significance of that lesion rather than the whole LV mass.<sup>3,4</sup> Moreover, MMAR can discriminate the effect of anatomical variations in the epicardial coronary system, such as left or right coronary dominance. However, there are gaps between theory and practice. Because FFR is a per-vessel index rather a per-lesion index, it is

difficult to define the MMAR for the measured FFR value in cases of diffuse or tandem lesions. This may be the reason why the authors excluded diffuse or tandem lesions in their paper with MMAR.<sup>2</sup> Moreover, the practical impact of replacing total mass with MMAR may not be high, even in a single lesion. The difference between the total myocardial mass and MMAR becomes greater if the lesion is located more distally. However, considering the relatively small flow in a distal lesion, the influence of that difference on pressure decrease across the lesion can be small. In the current study,<sup>2</sup> the influence of myocardial mass between men and women can be depicted by total myocardial mass, a per-patient index, given that sex is not a per-vessel but a per-patient characteristic. In this context, we definitely concur with the advantage of using MMAR over total myocardial mass in terms of lesion-specific ischemia, but future studies are warranted to compare the relative importance between the 2 as determinants of FFR values.

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