We gratefully appreciate the thoughtful comments on our study\(^1\) from Dr Lee. As we showed in our paper, the diagnostic value of matrix metalloproteinase-9 (MMP-9) for acute coronary syndrome (ACS) at the earliest stage was higher than that of high-sensitivity troponin T (hs-TnT), although their overall diagnostic values for ACS were comparable. Our study also revealed that the elevation of plasma MMP-9 level occurs earlier than that of hs-TnT after the onset of ACS. These results appear to reflect the fact that MMP-9 elevation results from rupture or erosion of vulnerable atherosclerotic plaques, and that hs-TnT elevation is caused by ischemic damage of cardiac myocytes after thrombotic occlusion of a coronary artery. Previous experimental and clinical studies suggest that MMP-9 is a biomarker of plaque rupture. Fukuda et al\(^2\) and Park et al\(^3\) revealed that rupture of the ACS culprit lesion plaque, as demonstrated by intravascular ultrasound, was associated with elevation of MMP-9 levels. Some other reports have indicated, as Dr Lee pointed out, that MMP-9 levels had no correlation with the severity of coronary atherosclerosis. However, these cohorts were non-ACS patients, and, therefore, these reports did not represent the MMP-9 levels in patients with plaque rupture. Stenotic severity does not always indicate plaque vulnerability in patients with SAP. Further studies may be necessary to confirm the correlation between MMP-9 levels and plaque morphology demonstrated by intravascular imaging modalities, such as intravascular ultrasound or optical coherence tomography, which has high resolution and is currently available for examining plaque morphology.

Our study measured MMP-9 using EDTA plasma.\(^4\) As Dr Lee pointed out, it has been reported that there are some discrepancies in measured MMP-9 values among serum with and without the use of kaolin-coated granulate as coagulation accelerator, EDTA plasma, heparin plasma and citrate plasma.\(^5\)

It remains to be determined whether similar diagnostic values are observed in different plasma or serum samples. In the future, most importantly, rapid measurement kits for MMP-9 should be developed commercially so that values can be obtained quickly at ER presentation.

References