The specificity of cardiac troponin elevations for myocardial infarction declines with age

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Background: Cardiac troponin T (cTnT) and I (cTnI) are the gold standard biomarkers of myocardial infarction (MI). Studies have shown that the concentration of cTn increases with age among healthy individuals, but the clinical impact of this is unclear. Further, there seem to be a difference in the increases in cTnT and in cTnI - the latter being more sensitive to increasing age.

Purpose: To investigate the impact of age on the diagnostic ability of cTnT and cTnI for myocardial infarction.

Methods: This nationwide cohort study includes patients admitted with cTn measurements from 2009-2022 using one of five cTn assays: Roche high-sensitivity cTnT (hs-cTnT), Abbott Alinity high sensitivity cTnI (hs-cTnI), Siemens Vista Hs-cTnI, Siemens Atellica hs-cTnI and Beckman-Coulter hs-cTnI. We selected the peak concentration of cTn on admission and grouped patients into those who had cTnI and those who had cTnT measured which were divided into age groups of <40 years, 40-50 years, 50-60 years, 60-70 years, 70-80 years, 80-90 years and >90 years. The primary outcome was a diagnosis of MI during admission. Receiver operating characteristics (ROC) were used for the concentration of cTn normalized to the assays 99th percentile, and we explored the specificity of elevations of each assay above the 99th percentile.

Results: A total of 350,428 patients were included in this study with a median age of 67 years (IQR 52-77); 188,382 (54%) were males and 48,262 (14%) had a history of ischemic heart disease prior to the admission. When grouping for type of cTn used, more patients were treated when hs-cTnT (240,660, 69%) was used compared with hs-cTnI (109,768, 31%). The patient treated using hs-cTnT were slightly older than patients treated with hs-cTnI, 67 years (IQR 53-77) vs 65 years (53-77) \( p < 0.001 \).

During the admission 29,023 patients (8.3%) had a MI. Figure 1 panel A shows the ROC curve of hs-cTnT and hs-cTnI for each age group. Both biomarkers showed a decline in the area under the curve (AUC) with increasing age. Figure 1 panel B shows the AUC for each age group. hs-cTnI had a higher AUC for all age groups and seemed to decrease less with age. Figure 2 shows the specificity for the 99th percentile of each assay for the age groups. There were substantial differences in the specificity at the 99th percentile between cTn assays, with the cTnT assay being the least specific for all age groups, while the two Siemens assays had the highest specificity. An elevation above the 99th percentile of the cTnT assay had a specificity of 3% in the group of patients >90 years old.

Conclusion: The specificity of elevation of cTn for MI declined with increasing age for all assays. This decline seemed to be largest for the cTnT assay were an elevation above the 99th percentile among patients >90 years old had a specificity of 3% for MI.