High-sensitivity troponin-i and risk of heart failure in individuals with suspected acute coronary syndrome

C. Byrne¹, M. Vaduganathan², T. Biering-Sorensen³, A.M.D. Kristensen⁴, M. Omar⁵, D.L. Bhatt⁶, M. Schou⁷, L. Kober¹, G. Gislason³, C. Torp-Pedersen⁸, K. Kragholm⁹, M. Pareek³

¹Rigshospitalet - Copenhagen University Hospital, Copenhagen, Denmark
²Brigham and Women’s Hospital, Heart and Vascular Center, Boston, United States of America
³Gentofte Hospital - Copenhagen University Hospital, Hellerup, Denmark
⁴Bispebjerg University Hospital, Copenhagen, Denmark
⁵Odense University Hospital, Odense, Denmark
⁶Mount Sinai Heart, New York, United States of America
⁷Herlev Hospital, Herlev, Denmark
⁸Hillerod Hospital, Hillerod, Denmark
⁹Aalborg University Hospital, Aalborg, Denmark

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Background: Serial high-sensitivity cardiac troponin-I (hsTnI) concentrations are associated with short- and long-term mortality and recurrent ischemic events in individuals with suspected acute coronary syndrome. However, the relation to subsequent heart failure events is less well established.

Purpose: To examine the association between single and serial hsTnI concentrations and subsequent hospitalization or outpatient contact for heart failure in subjects with suspected acute coronary syndrome.

Methods: Using Danish national registries, we identified persons without known heart failure who underwent two hsTnI measurements (Siemens TnI Flex® Reagent, 99th percentile upper reference limit, 45 ng/l) separated by 1-7 hours, during hospitalization for myocardial infarction, unstable angina, observation for suspected myocardial infarction, or chest pain from 2012 through 2019. Individuals were stratified according to their hsTnI concentration pattern from first to second measurement (main groups: normal, rising, persistently elevated, or falling) and the magnitude of hsTnI concentration change (secondary groups: <20%, >20 to 50%, or >50% in either direction). Finally, they were grouped into quantiles based on the first hsTnI measurement (≤15 ng/l, 16-30 ng/l, 31-44 ng/l, ≥45 ng/l) to explore whether the risk of heart failure was greater with higher hsTnI concentrations. We calculated standardized risks of hospitalization or outpatient contact for heart failure using multivariable logistic regression with average treatment effect modeling.

Results: A total of 18,939 individuals were included of whom 21.9% were discharged with a diagnosis of myocardial infarction, 4.8% with unstable angina, and 73.3% with observation for suspected myocardial infarction or chest pain. Median age was 61.9 years, and 52.5% were male. With respect to known cardiovascular disease, 17.6% had coronary artery disease, 5.4% had undergone prior coronary revascularization, and 8.0% had atrial fibrillation or flutter. A total of 429 individuals received a diagnosis of heart failure within the first 30 days while an additional 526 were diagnosed from days 31-365. The standardized absolute risk was lowest in subjects with two normal hsTnI values (days 0-30: 0.45%; days 31-365: <0.01%) and highest in those with persistently elevated concentrations (days 0-30: 8.56%; days 31-365: 9.50%) (Figure). The degree of hsTnI within each main group did not appear to affect the risk of heart failure. Conversely, the risk of heart failure was positively associated with hsTnI concentrations measured on the first sample.

Conclusions: Among individuals with suspected acute coronary syndrome, those with a persistently elevated hsTnI concentration consistently had the highest risk of a subsequent hospitalization or outpatient contact for heart failure. In addition, there appeared to be a dose-response relationship between hsTnI concentrations and the risk of heart failure.
Suspected ACS

Two hsTnl measurements 1-7 hours apart

Risk of HF

<table>
<thead>
<tr>
<th></th>
<th>Normal: 1st hsTnl normal</th>
<th>Rising: 1st hsTnl normal 2nd hsTnl elevated</th>
<th>Persistently elevated: 1st hsTnl elevated 2nd hsTnl elevated</th>
<th>Falling: 1st hsTnl elevated 2nd hsTnl normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days 0-30</td>
<td>Low risk</td>
<td>Intermediate risk</td>
<td>High risk</td>
<td>N/A, no events</td>
</tr>
<tr>
<td>Days 31-365</td>
<td>Low risk</td>
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Figure