Usefulness of troponin in selecting patients for invasive coronary angiography after cardiac surgery

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Background: Great uncertainty exists about the indication for invasive coronary angiography (ICA) in patients with suspected acute coronary syndrome following cardiac surgery.

Aim: The aim of this study was to define clinical criteria that best identify patients who benefit from ICA after cardiac surgery.

Methods: We performed a retrospective analysis of all patients who underwent cardiac surgery between January 2009 and May 2019 at our center. Exclusion criteria included pediatric patients as well as pacemaker, TAVR and LVAD implantation and heart transplantation procedures. The primary outcome was usefulness of ICA as defined by consequent PCI or re-operation due to ICA findings. ECG changes (ST-elevations) and high-sensitivity Troponin I (hsTrop I) were analyzed.
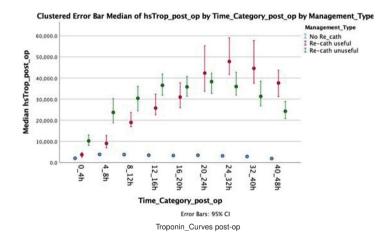
Results: 48,136 patients were screened and after applying exclusion criteria 29,359 patients were finally included in the analysis (mean age 67.8±11.0 years, 31.1% females, Euroscore II 5.14±8.9%). A total of 1,171 patients (4%) underwent post-op ICA. The primary outcome occurred in 440 patients (1.5%) of which 290 underwent consequent PCI and 214 underwent consequent re-operation. Baseline characteristics are shown in table 1. Unadjusted analyses did not identify significant differences in the level of cardiac biomarkers between useful-ICA and unuseful-ICA groups. In multivariate regression analysis, only ST-elevation on ECG predicted the primary outcome (OR 1.33, 95% CI 1.003–1.76).

Dichotomizing hsTrop I concentrations by applying the guideline-specified cut-off (>70x URL) resulted in correct classification of useful-ICA patients in 95.7%. However, the false-positive rate was also extremely high (83.6%) with a positive predictive value (PPV) of 1.6% and a negative predictive value (NPV) of 99.6% (accuracy 17.5%).

Using area under the curve (ROC) analysis following optimal cut-off values for hsTrop I were identified: in CABG patients a cut-off value of >650x URL (corresponding absolute value 17000 ng/L) was defined with a corresponding sensitivity of 83.3%, specificity of 83.6%, PPV of 8.9% and NPV of 99.6% (accuracy 83.6%). In non-CABG patients (i.e. valve or aortic procedures), the cut-off was about twice as high as that for CABG patients (1,350x URL or 35,000 ng/L) with a corresponding sensitivity of 84.1%, specificity of 89.2%, PPV of 5.9% and NPV of 99.9% (accuracy 89.1%).

Conclusion: Our study demonstrates that currently recommended cut-off concentrations of high-sensitivity troponin are not useful for guiding clinical decision-making in patients with suspected acute coronary syndrome following cardiac surgery, while substantially higher cut-off values might be useful. Those cut-off values critically depend on the type of cardiac surgery performed (CABG vs. non-CABG).

Clustered Error Bar Median of hsTrop_post_op by Time_Category_post_op by Management_Type

Error Bars: 95% CI

Troponin_Curves post-op