Published in final edited form as:

Clin Biochem. 2018 February ; 52: 171–172. doi:10.1016/j.clinbiochem.2017.11.014.

Are High-sensitivity Cardiac Troponin I Values Stable between Preoperative Visit and Day of Non-Cardiac Surgery?

Eslam Samaha, M.D.,

Division of Clinical and Translational Research, Department of Anesthesiology, Washington University School of Medicine in St. Louis

Mohammad A. Helwani, M.D., M.S.P.H.,

Division of Clinical and Translational Research, Department of Anesthesiology, Washington University School of Medicine in St. Louis

Jamie C. Brown, M.D.,

Division of Clinical and Translational Research, Department of Anesthesiology, Washington University School of Medicine in St. Louis

Frank Brown, B.Sc.,

Division of Clinical and Translational Research, Department of Anesthesiology, Washington University School of Medicine in St. Louis

Allan S. Jaffe, M.D.,

Cardiovascular Division, Department of Internal Medicine and Division of Core Clinical Laboratory Services, Department of Laboratory Medicine and Pathology, Rochester, Minnesota, Mayo Clinic and Medical School

Mitchell G. Scott, Ph.D., and

Department of Pathology & Immunology, Washington University School of Medicine in St. Louis

Corresponding Author: Peter Nagele, MD, MSc, Department of Anesthesiology, Washington University School of Medicine, 660 S. Euclid Ave, Box 8054, St. Louis, MO 63110, nagelep@wustl.edu.; Phone: 314-362-5129; fax: 314-362-1185.

Disclosures

Samaha, Helwani, Brown, Brown: No conflicts of interest.

Nagele: Research Support: Roche Diagnostics US; Abbott Diagnostics.

Scott: Research Support - Siemens Healthcare Diagnostic; Abbott Diagnostics, Instrumentation Laboratories; Consulting - Instrumentation Laboratories; Becton-Dickinson, Alere; Speaker fees: Abbott

Jaffe: Consultation: Beckman, Ortho, Abbott, Alere, Critical Diagnostics, Roche, Radiometer, Amgen and theHeart.org

Contributions

Study conception: ES, JB, MH, MSG, ASJ, PN

Data acquisition: ES, JB, FB, PN

Data analysis: ES, MH, PN

Data interpretation: ES, MH, JB, FB, MSG, ASJ, PN

Initial drafting the manuscript: ES, MH, PN

Critically revising manuscript for important intellectual content: ES, MH, JB, FB, MSG, ASJ, PN

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Peter Nagele, M.D., M.Sc.

Division of Clinical and Translational Research, Department of Anesthesiology, Washington University School of Medicine in St. Louis

Abstract

Background—It is unclear if cardiac troponin values are stable in patients prior to undergoing non-cardiac surgery, or if they tend to rise towards the day of surgery.

Methods—In this small pilot study (n=18) among patients with cardiac risk undergoing non-cardiac surgery, we determined if high-sensitivity cardiac troponin I (hscTnI) changes between the preoperative clinic visit and the day of surgery. HscTnI was measured on an Abbott Architect STAT (Abbott Laboratories, USA) platform.

Results—The mean duration between preoperative clinic visit and day of surgery was 8.7 ± 2.8 (SD) days. Median hscTnI was 3.4 ng/L [2.0 – 4.8, IQR] at the preoperative visit and 2.8 ng/L [2.3 – 4.4] on the day of surgery (mean difference -0.24 ng/L, 95% CI -0.73 to 0.24 ng/L, $p=0.30$). Only one patient had a large change ($>50\%$) along with symptoms.

Discussion—Evidence from this small study suggests that cardiac troponin values are stable in most high-risk patients, absent clinical events, within 10 days prior to non-cardiac surgery.

Brief Report

Cardiac troponins (cTn) are not only the standard biomarker for diagnosing myocardial infarction, but have recently become a marker for risk prediction in stable patients due to the increased sensitivity of cTn assays, also referred to as high-sensitivity cTn (hscTn).(1,2) Several studies have shown that hscTn can be detected in most adult patients prior to non-cardiac surgery and that higher values are associated with increased risk. (3–5) However, these hscTn measurements were routinely obtained on the day of surgery. It is unknown if cTn values are stable in high-risk patients prior to undergoing non-cardiac surgery, or if they tend to change proximate to surgery, which might indicate an increased risk of myocardial ischemia in the days preceding surgery.

Methods

This was an ancillary analysis of hscTnI values obtained in a small pilot trial, which was designed to determine the feasibility of using a novel, titrated postoperative metoprolol regimen in patients at high risk of developing adverse cardiac events after major non-cardiac surgery. The population of the pilot study was beta-blocker naïve patients, who had either diagnosed coronary artery disease or a combination of risk factors that predisposed them to high risk, such as diabetes, hypertension, old age, etc. As part of this trial, serial hscTnI values were obtained, including one during preoperative testing (typically 7–14 days prior to surgery) and one on the day of surgery. In this analysis, only patients were included who had complete preoperative and day of surgery hscTnI samples.

Samples were collected in lithium heparin tubes, immediately put on ice, and centrifuged within 30 minutes after collection. Plasma was then transferred into cryogenic tubes and

stored at -70°C . Hs-cTnI (reported as ng/L) was measured on an Abbott Architect STAT[®] platform (Abbott Laboratories, Abbott Park, IL) (limit of blank 0.7 – 1.3 ng/L; limit of detection 1.1 – 1.9 ng/L; LOQ: 10.0 ng/L; 99th percentile URL female: 15.6 ng/L; male: 34.2 ng/L). (6) Imprecision of the assay at the 99th percentile concentrations is 6% coefficient of variation. (2) The study was approved by the Washington University in St. Louis institutional review board. All patients provided written, informed consent. Data were described using descriptive statistics and a paired, two-sided t-test was used to determine if hscTnI concentrations were statistically significantly different between the two time points. To count for normal physiological variability, we reported numbers and percentages of patients with 15% and 50% changes in the hscTnI levels.

Results

The average age of patients in the cohort ($n=18$; 9 female) was 65 ± 11 years. Co-morbidities included diabetes ($n=6$, 33%), hypertension ($n=14$, 78%), coronary artery disease ($n=4$, 22%), and a history of smoking ($n=10$, 56%). The average time between preoperative visit and the day of surgery was 10.7 ± 6.2 days. Median hscTnI was 3.4 ng/L [2.0 – 4.8, IQR] at the preoperative visit and 2.8 ng/L [2.3 – 4.4] on the day of surgery (mean difference -0.24 ng/L, 95% CI -0.73 to 0.24 ng/L, $p=0.30$). In five patients (28%) hscTnI values increased by 15%, and in one patient (6%) $>50\%$; in six patients (33%) hscTnI decreased by 15% and in one hscTnI decreased by $>50\%$ (Figure 1). There was no difference between male and female patients ($p=0.82$). Interestingly, when reviewing the medical record of the patient with $>50\%$ hscTnI increase, we found that the patient was admitted from emergency department for dyspnea and chest pain one day prior to scheduled surgery (negative work-up using a non-high sensitivity assay).

Discussion

By comparing hscTnI values between preoperative visit and the day of surgery, we found that hscTnI values appear to be stable in patients with increased cardiac risk in the 1–2 week period prior to non-cardiac surgery. High-sensitivity cardiac troponin have or are about to become the standard cTn assay in most countries. (1,2) The increased sensitivity of the hscTn assay will allow the determination prior to surgery, and possibly aid in the identification of patients with elevated cardiac risk. (7) Although evidence from small studies like ours are not robust, our data suggest that hscTn values do not increase in the immediate period leading up to the day of surgery, absent clinical events. They also suggest that a single hscTn value obtained either on a preoperative clinic visit or day of surgery may be sufficient to determine a representative hscTn value in most patients.

Acknowledgments

Funding/Support

This study was funded by NIH/NHLBI (R01HL126892). Abbott Diagnostics (Abbott Park, IL) provided the hscTnI assays and covered the costs of running these assays.

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Highlights

- High-sensitivity cardiac troponin cTn (hscTn) can be measured before surgery and has shown prognostic significance
- It is, however, unclear if preoperative hscTn values are stable in the period before surgery
- Results from this small study suggest that hscTnI values are stable in the preoperative period

Figure 1. Before-and-after Plot of individual high-sensitivity cardiac troponin I values (hscTnI) in 18 high-risk patients prior to elective major non-cardiac surgery. First time point was at the visit to the preoperative clinic; second time point was on the day of surgery.