High sensitivity troponin: do lower values predict better prognosis in acute myocardial infarction with ST-segment elevation? High sensitivity troponin in myocardial infarction

ABSTRACT

Design of the study: historical cohort

Objectives: To verify which risk factors contribute to raise high-sensitivity troponin I in patients with miocardial infarction and assess its prognostic impacts.

Methodology: It was assessed medical records of patients admitted in the Coronary Unit of the Hospital de Clínicas (HC-UFPR) in Curitiba, South of Brazil, diagnosed with ST segment elevation Myocardial Infarction and whose serum levels of high sensitivity troponin I (hsTnI) were collected at admission moment. The select data were: gender, age, high blood pressure, tabagism, diabetes, previous myocardial infarction, dyslipidemia and serum levels of high sensitivity troponin I. For prognostic proposes, it was analysed intrahospital death and ventricular function, based on left ventricular ejection fraction.

Findings: Patients addmited with previous myocardial infarction had lower levels of hs-TnI. Gender, age, presence of high blood pressure, tabagism, diabetes and dyslipidemia didn't reveal correlation with troponin values, allowing the inference that high sensitivity troponin values at first apresentation of these patients have no direct relation to these variables. Regarding prognosis, levels of high sensitivity troponin could not be associated to mortality or ventricular malfunction

Conclusions: At admission, high-sensitivity troponin I levels were lower in patients with prior myocardial infarction.

Relevance: This work correlates the values of the high-sensitivity troponin of patients with ST segment Elevation Miocardial Infarction to cardiovascular risks factors and to the prognosis of these patients. This approach is not found in current medical literature, whose works mainly relates to acute events.

Keywords: diagnosis; myocardial infarction; prognosis; troponin.

INTRODUCTION

The use of biomarkers for diagnosis of acute myocardial infarction (AMI) is a clinical practice that has been used since the last century. Laboratory research for acute myocardial infarction had measures of creatine phosphokinase and it's MB fraction (CK-MB) as gold standards, while conventional cardiac troponin test (cT-T) was in the background. From 2003, more sensitive cardiac troponin (cTn) dosing tests were available, and in 2007 the creation of a "ultra-sensitive" test occurred. In this context, in 1995, the diagnosis of AMI required plasma levels of cTn above1.5 ng / mL to be made; in 2003, these biomarkers became identifiable from 0.10 ng / mL; and currently, ultra-sensitive tests have further reduced this value and levels higher than 0.04 ng / mL can be scanned.[1]

The evolution of cardiac biomarkers implies a new reality to medical practice, which includes early diagnosis of Acute Coronary Syndrome, allowing acknowledgment of patient's prognosis in severe cases and the follow-up of therapeutic effects generated by treatment.[2]

Several studies have shown that conventional troponin levels are related to prognosis of patients with acute myocardial infarction[3-5] Bertin Lindahl et al. concluded that elevations of conventional T troponin (cTnI) were associated with a higher probability of coronary stenosis, thrombogenesis, and increased risk of reinfarction and death.[5]

Unlike cTnI, which lacks a further increase to be detected by laboratory tests, Ultrasensitive Troponin Test (hsT-T) means that tiny variations in levels of these markers of myocardial necrosis can be detected and, therefore, time from one measure to the next can be shortened, making diagnosis and therapy more efficient.[6]

On the other hand, the use of these more accurate tests generates a diagnostic difficulty, since it's high sensitivity predisposes the evaluator to be more frequently facing "false positive" results - aortic dissection, cardioverter, pulmonary embolism, renal failure and sepsis are examples of clinical situations that generate troponin elevations, even in the absence of myocardial necrosis;[7] and, despite what is known about conventional troponins, there is no scientific evidence in literature that variation of High-sensitivity troponin sérum levels have a prognostic relationship with infarcted patients.

Given the need for a better understanding of this exame (hsT-T) and the benefits that it's interpretation can bring to proper care of patients suffering from an acute coronary event, this study aimed to verify which risk factors contribute to increase hs-TnI in patients with Miocardial Infarcion with ST segment elevation and analyze if and which prognostic impacts it may have.

METHODS

This study is a historical cohort in which medical records of patients of the Hospital de Clínicas (HC / UFPR), admitted to the Coronary Unit in the period between January 1, 2014 and December 31, 2014, with diagnosis of acute myocardial infarction with ST-segment elevation and who had serum levels of hs-TnI dosed on admission. Patients under 18 years old, patients who did not present electrocardiographic findings of AMI with ST-segment elevation, or whose hs-TnI serum level was not collected at admission were excluded from this study.

Data on gender, age, High Blood Pressure (HBP), smoking, diabetes mellitus (DM), previous infarction, dyslipidemia, hs-TnI, intra hospital death and left ventricular

ejection fraction (EF) were collected. Among these data, intra hospital death and ventricular dysfunction (EF<45%) were used for prognostic analysis.

All procedures were submitted and approved for the Research Ethics Committee (CEP) of the Hospital de Clínicas da Universidade Federal do Paraná, where the study was conducted.

RESULTS

We selected 77 patients who met the inclusion criteria. 30 were female (38.9%) and 47 male (61.0%), with a mean age of 61.2 years. (table 1). In this population, risk factors for acute coronary events and their relationship with high-sensitive troponin values obtained at hospital admission were assessed (table 2). As for variables of prognostic value, intra hospital death occurred in 11.1% of the cases and ejection fraction was lower than 45% in 28.3%.

Table 1: Characteristics of the population included in the study

Table 2: Prevalence of risk factors for Acute Coronary Syndrome (ACS) in the studied population

Statistical analysis was based on models for independent samples. There was statistical significance in the relation of hs-TnI with previous myocardial infarction (graph 1). For the other analyzed variables, no statistical significance ways obtained in their comparisons with hs-TnI values (Table 3).

Graph 1: Comparison of hs-TnI (pg / mL) with episode of previous infarction.

Table 3: Relationship of hs-TnI values with independent variables studied, according to Mann-Whitney test, Hs-TnI (pg/mL) values correspond to the medians obtained

DISCUSSION

Patientes with history of previous heart infarction had lower serum hs-TnI, when compared to those patients without previous infarction. This might reflect the importance of cardiac collateral circulation in reincident patients, which contributes to a less muscle loss in a second event.[9-10] In patients with chronic coronary artery disease, there is development of a collateral circulation network to supply the cardiac tissue demand. Therefore, in an acute ischemic event, myocyte loss due to the arteriolar obstruction is lower than that in patients who do not have chronic coronary artery disease and, because of this, do not have a compensatory collateral vascularization. This fact may justify the lower levels of hs-TnI in patients who have had an infarction, since the existence of this previous event suggests that coronary heart disease is present for a longer period of time and a collateral circulation network is better established .

It is important to emphasize that lower muscle loss can not be translated into a better prognosis, since patients already infarcted tend to have more comorbidities than patients who is suffering the acute coronary event for the first time. The HORIZONS-AMI[11] study indicates that reinfarction is a strong predictor of worse prognosis, and it has been found that these patients, besides having more comorbidities, are older, less likely to receive the treatment recommended by the guidelines and most often suffer cardiogenic shock. In our study, prognostic analysis - which included intra hospital death and ventricular dysfunction - was unable to determine a relationship between hs-TnI serum levels and prognosis.

Current studyes have approached hs-TIn levels and its relation to acute events, especially acute myocardial infarction and possible differential diagnoses. In addition, it was found that periodic dosing of hs-TnI in the investigation of acute infarction provides a high negative predictive value - 99.6% according to Gimenes et al[12], however, the international literature lacks studies that assess the interference of the risk factors, usually present in patients who develop acute coronary syndrome, in the alteration of hs-TnI.

Our study aimed to supply this literary need and, through its results, generated new hypotheses to be evaluated. There is a need to carry out a study that contemplates a larger number of patients and, in addition to assessing hs-TnI on admission moment, also analyze the variation of this cardiac biomarker over time and the relationships thereof with cardiovascular risk factors and with the prognosis of the patients.

CONCLUSION

High-sensitivity troponin I levels were lower in patients with previous myocardial infarction. No correlation was found with the other risk factors evaluated. Finally, high-sensitive troponin I serum levels could not be correlated with prognosis of patients who were having an acute coronary ischemic event.

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227 TABLES AND GRAPH
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230 Table 1: Characteristics of the population included in the study
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Data	Lowest value	Highest Value	Average	Median
Age (years)	28	89	61,2	61
hs-TnI (pg/mL)	50	309.895	76.010	44.356

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235 Table 2: Prevalence of risk factors for Acute Coronary Syndrome (ACS) in the
236 studied population
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Risk factor	Prevalence
Dyslipidemia	81,5%
High Blood Pressure	66,1%
Tabagism	56,9%
Diabetes	36%
Previous infarction	8,4%

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Graph 1: Comparison of hs-TnI (pg / mL) with episode of previous infarction.

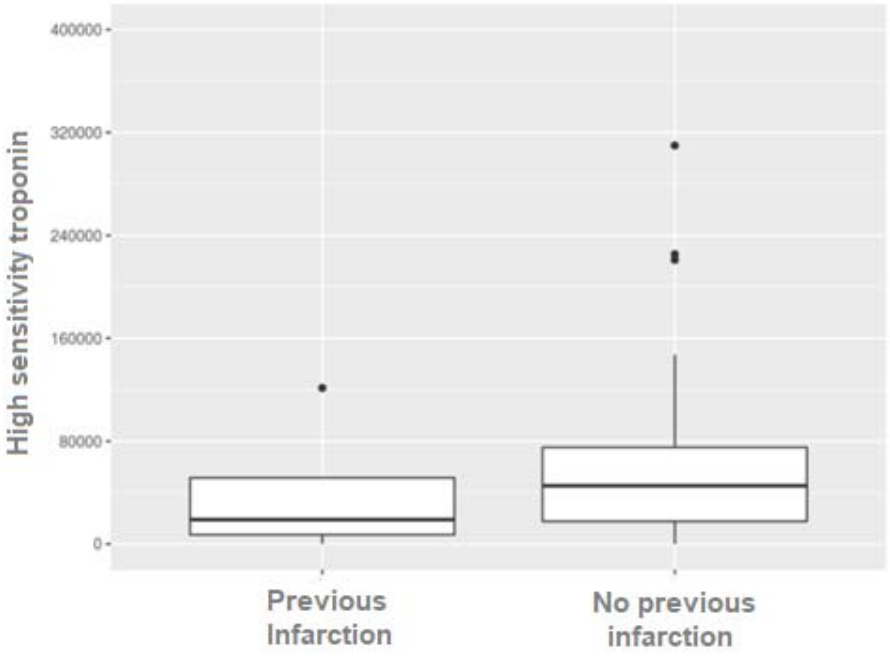

Table 3: Relationship of hs-TnI values with independent variables studied, according to Mann-Whitney test, Hs-TnI (pg/mL) values correspond to the medians obtained

Variables	Hs-TnI with Risk Factor	Hs-TnI without Risk factor	Significância estatística (p)
Previous infarction	4899	50.000	0,0211
Diabetes	50.000	35.201	0,4171
HBP	50.000	46.214	0,5154
Dyslipidemia	45.289	53.239	0,9306
Intra Hospital Death	30.501	39.831	0,9786
EV<45%	28.751	48.111	0,5358