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Acute Coronary Syndrome without ST Elevation: is The Level of Ultrasensitive Troponin T Correlated to the Severity of Coronary Involvement?

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Abstract **Original Research Article**

Introduction: Acute coronary syndromes without ST segment elevation are heterogeneous entities. Troponins contribute to the early identification of patients at high risk for cardiac complications. The objective of this work is to study the severity of coronary artery disease according to the ultrasensitive troponin T (T us) level. ***Methods:*** We have performed a descriptive retrospective of patients hospitalized in the cardiology department of CHU Mohammed VI in Marrakech, between January 2018 and February 2022 for acute coronary syndromes without ST segment elevation. Patients were divided into two groups according to the rate of troponin Tus. ***Results:*** 50 patients were included, comprising 35 men and 15 women. Group 1, made of 20 patients whose ultrasensitive troponin T level is less than 4 times normal, group 2, whose troponin T level is more than 4 times normal, made of 30 patients. Demographic analysis shows that there is no significant difference between the two groups in terms of average age and sex. Hypertension is slightly more common in Group 1 (45% vs. 43.3%). De novo angor was more frequent in group 1 compared to group 2 (10% vs 6.7%;p=0.01). At electrocardiogram, subendocardial lesions are more in Group 2 (15% vs. 43.3%; p=0.0006). Group 1 had angiographical coronaries more frequently normal or non-significant coronary involvement compared to group 2 (40% vs 6.67%; p<0.001). Tritroncular lesions are more frequently found in Group 2 (33.3% vs. 5%;p=0.02). Monotroncular and bi-roncular lesions are recorded identically in both groups. Ischemic recurrences are more common in Group 2 (35% vs. 46.6%;p=0.02). ***Conclusion:*** Stable Troponin US levels are associated with the degree of coronary involvement, and frailty measurements were significantly associated with the severity of coronary lesions, this could help to identify patients who are at a high risk of death. These findings may help clinicians guide further diagnostic assessment.

Keywords: Acute coronary syndrome without ST elevation, Troponin Us, Coronarography.

INTRODUCTION

Acute coronary syndromes without ST segment elevation are heterogeneous entities and leading cause for morbidity and mortality, with various coronary lesions and are associated with frailty, cognitive decline, and hospitalization leading to an enormous impact on the health care system, particularly in aging populations.

Cardiac high-sensitivity troponin Us has become well-established biomarker to identify patients with acute coronary syndrome, being used worldwide, it has a high specify and sensibility, its value is very important to predict coronary lesions.

However, elevated troponin levels are observed frequently in the absence of acute myocardial infarction, complicating the interpretation of Troponin us blood levels. Increased troponin levels were also identified as predictors of all-cause mortality and adverse cardiovascular outcome

Studies in the general population have found an association between high-sensitivity cardiac troponin levels and age related structural changes in the heart.

A general premature biological ageing can be measured as frailty, which is a clinical condition characterized by increased vulnerability.

The purpose of our study was to assess the severity of coronary artery disease according to the ultrasensitive troponin T (T us) level at the University Hospital of Marrakech, during a 4 years period study.

PATIENTS AND METHODS

Study population

This is a descriptive retrospective study, conducted over a 4-year period from between January 2018 and February 2022.

We collected 50 hospitalized patients for Acute coronary syndromes without ST segment elevation of diverse topography at the Intensive Care Department at the University Hospital in Marrakech.

Patients hospitalized for acute coronary syndrome with ST elevation, chronic coronary syndrome and patients with a history of ischemic heart disease were excluded from our study.

The retrospective analysis was done by collecting data from the department folders. Only patients with at least two troponin levels recorded in their medical records were included.

Assessments were based on all available information in the medical records. Troponin Us levels from other visits helped us to further identify patients with acute myocardial injury, in whom the concentrations may have had plateaued at the time of blood sampling.

The parameters studied were epidemiological (age, sex, and cardiovascular risk factors), clinical (blood pressure, heart rate and Killip stage), angiographic and therapeutic data. in addition to information on medication use, and deaths from the Patient Register, the Prescribed Drug Register, and the Cause of Death Register, respectively. The study protocol was approved by the Ethics policies. Each patient was given written informed consent.

Coronary morphology

Coronary angiograms were analyzed by experienced cardiologists who quantified the severity of lesions according to the number of affected major epicardial vessels by ≥50% diameter stenosis.

Coronary sclerosis was defined as affected major epicardial vessels with stenosis <50% lumen diameter. In patients without history of coronary artery bypass grafting, quantification was additionally done according to the SYNTAX score.

Laboratory methods

Baseline blood samples were drawn for routine laboratory measurement and biobanking. Standard clinical parameters, as well as high- sensitivity Troponin were analyzed immediately after blood withdrawal by standardized in-house routine laboratory methods.

The blood samples were correctly identified using the name of patients and their reference number attributed at the moment of the admission in emergencies. Afterwards the samples were preserved in convenient temperature and stored for further analyzes.

Statistical methods

To analyze the severity of coronary lesions, the study population was divided into severity groups by the troponin levels and by the SYNTAX score.

Continuous variables were described by mean ± standard deviation (SD) if they were normally distributed and otherwise as median and interquartile range (IQR) with a use of the between-group comparison of two groups and to evaluate the main differences.

Ordinal logistic regression for the severity of coronary lesions adjusted by age, gender, arterial hypertension, hyper- lipoproteinemia, smoking, diabetes mellitus, body mass index, and eGFR was performed with each troponin assay as an independent variable.

RESULTS

Baseline characteristics

A total of 50 patients were included in this analysis. Mean age was 74.9 ± 9.8 years. Median eGFR was 42.5 ml/min/1.73 m2.

Baseline median troponin blood levels differed between the investigated assays across all investigated assays, troponin blood levels were significantly higher in patients with severe coronary lesions compared to those with mild values. Detailed baseline characteristics for the study population are reported in the following Table.

Table-1: Baseline characteristics

	Number	Rate
Age (years)		
>60	32	64%
<60	18	36%
Sex		
Male	35	70%
Female	15	30%
Diabetes	26	52%
High Blood Pressure	38	76%
Dyslipidemia	27	54%
Smokers		
Current	22	44%
Ex	5	10%
Previous myocardial event	11	22%
Left ventricular failure	14	28%
Hospital Death	2	4%

Clinical Presentation

	Group 1	Group 2
Resting chest pain	80%	76%
Chest pain de novo	10%	6.7%
Atypical chest pain	10%	17.3%
Ischemic recurrence	35%	46.6%
Myocadiac infarction	5%	6.6%
Hospital mortality	0%	4%

Fig-1: Clinical Presentation

Cardiac enzymes

The study population was divided into two groups, Group 1, made of 20 patients whose ultrasensitive troponin T level is less than 4 times normal, group 2, whose troponin T level is more than 4 times normal, made of 30 patients

Of the 50 patients with Troponin Us measurements, peak values were significantly higher in groups with severe coronary lesions.

Coronary angiography

All of our patients had undergone coronary angiography. Group 1 had angiographical coronaries more frequently normal or non-significant coronary involvement compared to group 2 (40% vs 6.67%; $p<0.001$).

Tritroncular lesions are more frequently found in Group 2 (33.3% vs. 5%;p=0.02). Monotroncular and bi-roncular lesions are recorded identically in both groups. Ischemic recurrences are more common in Group 2 (35% vs. 46.6%;p=0.02).

	Group 1	Group 2
Normal coronarography or No significant lesions	40%	6.67%
Monotroncular lesions	35%	30%
Bitroncular lesions	20%	30%
Tritroncular lesions	5%	33;3%

Fig-2: Angiographic results

Prognosis and survival

Survival analysis showed that patients with high Troponin rates had a higher cardiac mortality than patients with low rates.

There was a clear gradient of risk for patients with elevated Troponins with an increase in the estimated mortality. Therefore, Troponin level is a well-

recognized prognosis factor in the coronary involvement.

DISCUSSION

Troponin is suggested to be a better marker used for diagnosis and risk stratification of acute coronary syndromes.

Its prognostic value is shown in several studies. A close relationship exists between the degree of elevation of troponins and the importance of the risk of occurrence of complications.

In the literature, the age group most affected is between 50 and 60 years (24.2%), in our series, the average age in both groups is between74.9 ± 9.8 years, and there is no gender discrimination in both groups.

High blood pressure was a dominant cardiovascular risk factor; the same finding had been made by other authors. We stratified various variables that are cardiovascular risk factors (hypertension, overweight, dyslipidemia, stress) if there was a correlation of these with the development of severe lesions.

It should also be noted the greater frequency of under-endocardial lesions in group 2. Chest pain is often severe in patients with high troponin. There is also a higher frequency of de novo chest pain in Group 1 compared to Group 2.

On the agiographic level, elevation troponin is correlated with severe and complex coronary involvement. In our work, coronary involvement is more severe in group 2, with a high rate of tritroncular involvement.

The level of risk associated with troponin elevation is independent of other prognostic risk factors, including electrical changes and markers of inflammation.

The main contribution of troponins is to identify among patients admitted for acute coronary syndrome without ST segment mismatch, those who present a high risk of complications and who should benefit from an invasive strategy.

Strengths of the study are the use of a very contemporary and well- characterized all-comers data, as well as the performed characterization of coronary lesions not only by the number of affected coronary vessels but also by using the SYNTAX score algorithm.

Nevertheless, the following limitations merit consideration. Potential dynamic changes were not taken into account.

However, based on a well characterized collective, possible circumstances that may have led to a troponin kinetic were excluded from current analyses. Second, the current analyses were based on a single-center experience.

On the other hand, the investigation allowed a detailed characterization of coronary morphology based on established scoring systems and other standardized parameters and built therefore a unique and contemporary platform for individualized analyses.

Last, further studies will be needed to investigate whether or not the reported association of troponin blood levels with the severity of lesions could be translated into therapeutic strategies, such as intensified secondary prevention, to avoid subsequent major cardiovascular events in the high-risk subpopulation of patients with acute coronary syndromes.

In conclusion, baseline high-sensitivity troponin blood levels were elevated in patients with severe lesions. Our results may help clinicians interpret elevated troponin measurements and guide further non-invasive or invasive strategies.

CONCLUSION

In a large study of patients with acute coronary syndrome without ST elevation, we found a graded association between the Troponin level and the degree of lesions, with an almost four-fold increased risk of being frail among patients with high levels.

Frailty and myocardial injury were both strongly and independently associated with a high risk of premature death and cardiovascular events. The findings support the hypothesis that acute myocardial injury could be a marker of a biologically aged heart. These findings may help clinicians guide further diagnostic assessment.

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