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Comparison of serum troponin level and echocardiographic parameters between male and femal patients with ACS

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***Abstract*---**Background: Acute Coronary Syndrome is one of the commonly diagnosed life threatening condition as of now. Hence it is necessary to diagnose early and assess the severity of disease as soon as possible. *Troponin is considered a specific marker for the diagnosis of acute coronary syndrome (ACS). Aim:* To estimate the *high-sensitivity cardiac troponin (hs-cTn)* in Acute coronary syndrome patients. Also to compare serum *troponin* levels *and echocardiographic parameter* in patient's gender. *Materials and Methods:* 70 patients of both sexes who got admitted within 24 hours after onset of symptoms and diagnosed as Acute Coronary Syndrome in Hospital of Baghdad /medical city during the period of December 2020 to December 2021. The *(hs-cTn)* was measure in the blood with Elisa Assay kit. *Results: This study included 70 patients, they divided into two groups: Male group and female group. The control group included 20 healthy persons. There was a significant increase in* the frequency of ACS among males in comparison to females (P-value =0.0027). The mean (± SEM) value of serum hs-troponin I concentrations did not differ significantly (p=0.372) as compared with mean (± SEM) value of serum control group. The mean(± SEM) value of deceleration time was found significantly higher in Female group than Male group, (P-value=0.0377), while mean(± SEM) of left atrium diameter and E/e value were found significantly higher in Male group than in Female group, (P-value=0.026, P-value=0.042 respectively). The mean (± SEM) value of serum hs-troponin I, isovolumic relaxation time and ejection fraction were non significantly higher in Female group than Male group (P-value= 0.215, 0.762, 0.681 respectively). Conclusion: The currently used hs-cTn assays are highly valuable for rule-in and rule-out of ACS. The value of serum hs-troponin I, higher in Female group than Male group. International guidelines have been published for appropriate use of hs-cTn.

Keywords*---Acute Coronary Syndromes, sex,* hs-cTn.

Introduction

Acute coronary syndromes caused by sudden blockage of a coronary artery. According to degree and location of blockage it ranges from unstable angina to non–ST-segment elevation myocardial infarction (NSTEMI), ST-segment elevation myocardial infarction (STEMI), and sudden cardiac death.[1] The root cause of ACS is unstable plaque within the coronary arteries. Rupture of coronary plaque causes their thrombogenic contents to become exposed to the circulation. This leads to platelet activation, initiation of the coagulation cascade and other physiological effects resulting in myocardial ischemia. A second class of MI, type 2, is related to a supply/demand mismatch resulting from coronary spasm, high or low blood pressure, anemia, arrhythmia or stenosis due to a fixed atherosclerotic lesion [2].

A rapid and accurate diagnosis is critical in patients with presumed acute coronary syndrome for the initiation of effective evidence-based medical management and revascularization. The third universal definition of myocardial infarction defines an acute myocardial infarction (AMI) as evidence of myocardial necrosis in a patient with the clinical features of acute myocardial ischemia, and defines the 99th percentile of cardiac troponins as the decision value for AMI.[3] There is a misconception that troponin elevation is secondary only to myocyte injury and necrosis. There are six mechanisms that have been proposed to explain the release of troponin into the bloodstream: normal cell turnover, myocyte necrosis, apoptosis or programmed cell death, proteolytic fragmentation, increased cell membrane permeability membranous blebs.[4]

Material and Methodology

This study is conducted among 70 patients of age group between 30 to 84 of both sexes who got admitted within 24 hours after onset of symptoms and diagnosed as Acute Coronary Syndrome (STEMI, NSTEMI & Unstable Angina) in Baghdad Medical College &medical city Hospital, during the period of December 2020 to December 2021 Laboratory Investigations includes blood urea serum creatinine to rule out frank renal failure. Other investigations includes serial ECG monitoring, Echocardiography, blood levels of hs-Troponin T Within24 hours of the onset of symptoms, Determination of serum High sensitive cardiac Troponin.

By kit uses enzyme-linked immune sorbent assay (ELISA) based on the Biotin double antibody sandwich technology to assay the Human High sensitive cardiac troponin (hs-cTn). Add High sensitive cardiac troponin (hs-cTn)to the wells, which are pre-coated with High sensitive cardiac troponin (hs-cTn) monoclonal antibody and then incubate. After that, add anti hs-cTn antibodies labeled with biotin to unite with streptavidin-HRP, which forms immune complex. Remove unbound enzymes after incubation and washing. Add substrate A and B. Then the solution will turn blue and change into yellow with the effect of acid. The colour of solution and the concentration of Human High sensitive cardiac troponin (hs-cTn) are positively correlated. **Echocardiographic parameters** were measured in all patients by consultant cardiologists at echocardiographic unit/ Baghdad Teaching Hospital. They involve:

Diameter of left aterium, Diastolic dysfunction stage (can be graded according to the diastolic filling pattern.), Mitral regurgitation, E (left ventricular inflow velocity) / e (tissue doppler velocity) ratio to estimate ventricular filling pressure, Isovolumic relaxation time, Decceleration time, Left ventricular Ejection Fraction. The patients were subdivided into groups according to Gender (male & female).

Results

Clinical data

This study included 70 patients divided into two groups: Male group included 52(74.3%) patients, and female group included 18 (25.7%) patients. The control group included 20 healthy persons, divided into two groups male group included 10 (50%) persons and female group included 10 (50%) persons, table (1),(2).

Table (1) Frequency distribution of total study sample by gender

Sex	Control		patients	
	No.	%	No.	%
Male	10	50	52	74.3
Female	10	50	18	25.7
Total	20	100	70	100
P-value	---	1.00 NS	---	0.0027 **

Biochemical markers in Acute Coronary Syndrome (ACS) patients and control group

Serum level of (hs-TnI) was compared between the patients group and the control group using analysis of variance (ANOVA) and t-test of significant as in table (2), the mean (± SEM) value of serum hs-troponin I concentrations did not differ significantly (p=0.372) as compared with mean (± SEM) value of serum control group.

Table (2) Comparison between patients & control according to biochemical markers

		TnI: Troponin I (ng/L)
Patients	70	8.1 ± 0.88 8.1 ±7.28
Control	20	7.74 ± 0.49 7.74 ±2.15
T-test value P-value	--	1.973 NS 0.372

- Results expressed as Mean (± SEM).

Gender

The table (3) shows effect of gender on biochemical markers & echocardiographic finding, study patients divided into Male (n = 52) and Female (No. = 18) groups, The mean(± SEM) value of deceleration time was found significantly higher in Female group than Male group, (P-value=0.0377), while mean(± SEM) of left atrium diameter and E/e value were found significantly higher in Male group than in Female group, (P-value=0.026, P-value=0.042 respectively). The mean(± SEM) value of serum hs-troponin I, isovolumic relaxation time and ejection fraction were non significantly higher in Female group than Male group(P-value= 0.215, 0.762, 0.681 respectively).

Table (3) Effect of gender on biochemical markers & echocardiographic Finding

Parameters	Gender Mean ± SEM		P-value
	Male (No. = 52)	Female (No. = 18)	
hs-TnI: Troponin I (ng/L)	6.81 ± 0.71	11.84 ± 1.03	0.215 NS
LAD: Left atrium diameter (cm)	3.71 ± 0.05	3.37 ± 0.08	0.026 *
E/e	10.10 ± 0.26	7.79 ± 0.12	0.042 *
IVRT: Isovolumic relaxation time (ms)	87.97 ± 7.53	89.44 ± 12.96	0.762 NS
DT: Deceleration time(ms)	181.94 ± 7.62	228.61 ± 11.79	0.0377 *
EF%: Ejection fraction	48.73 ± 6.91	53.33 ± 8.06	0.681 NS
* (P≤0.05) significant, NS: Non-significant (P>0.05).			

Statistical Analyses

SPSS version 16 was used in analysis of the data. The cardiac markers were expressed as mean± standard errors. ANOVA tests were used to compare between different cardiac markers, the p-value less than 0.05 were considered statistically significant.

Discussion

Acute causes of hs-cTn elevation are associated with a corresponding significant rise or fall of hs-cTn. Acute cardiomyocyte injury causes a steep release of troponins, such as in AMI, shock, myocarditis, pulmonary embolus, Tako-tsubo (stress-induced) cardiomyopathy. Chronic, stable elevations of hs-cTn at or above the 99th percentile without a significant rise or fall are common in patients with structural heart disease.[5] In these cases, increased ventricular wall tension is thought to cause direct myofibrillar filament damage and an increase in programmed cell death, both of which contribute to hs-cTn release.[6]

The mean (± SEM) value of serum hs-troponin I concentrations was non significantly higher when compared with mean (± SEM) value of serum control group, table(2). An increased circulating cardiac troponin concentration indicates myocardial injury and aids in the diagnosis of acute myocardial infarction (MI).[7] Increased cardiac troponin concentrations have been associated with more frequent thrombi, impaired myocardial tissue perfusion, and a higher probability of adverse outcomes following coronary intervention.[8] In addition, the risk of both short- and long-term cardiac events and mortality is related strongly and directly to increased cardiac troponin concentrations in patients who present with symptoms of acute coronary syndrome (ACS). The prognostic information obtained from the measurement of cardiac troponin I or T (cTnI or cTnT) has been shown to be independent of clinical risk factors, such as age, electrocardiogram (ECG) results, renal disease, and diabetes mellitus . [9]

International associations of cardiology, laboratory medicine, epidemiology, and emergency medicine have all issued guidelines that have designated cardiac troponin as the preferred biomarker, both for aiding in MI diagnosis and for risk stratification in patients presenting with suspected ACS, and have recommended that independent studies be conducted to validate all cardiac troponin assays after clearance by the US Food and Drug Administration before they are to be clinically accepted**.** [10]

The study found that the frequency of male patients group was (74.3%) patients, and female group was (25.7%) patients, table(1). So there was a significant increase in the frequency of MI and UA among males in comparison to females, these results agree with the study reported by Villar et al. (2008) who found greater incidence of CVD in men and postmenopausal women compared with premenopausal women implies a vasoprotective phenotype of females, which may be influenced by sex hormones. These hormones, particularly estrogen, have modulator effects on the endothelium and circulating cells that have been implicated in vascular inflammation and in the development of CVD. [11]

Gender

The mean(± SEM) value of serum hs-troponin I, isovolumic relaxation time and ejection fraction were non significantly higher in Female group than Male group. Due to a more atypical presentation, women remain a challenging group with regard to the diagnosis of myocardial infarction. Studies regarding gender-specific lower thresholds for women for the diagnosis of acute myocardial infarction have not shown consistent results: Shah et al. proposed that women-specific lower diagnostic thresholds for hs-cTn may double the diagnosis of myocardial infarction in women, and identify those at high risk of re-infarction and death.[12]

Kuan Ken Lee etal report that use of a hs-cTnI assay with sex-specific thresholds identified 5 times as many additional women with myocardial injury than men, such that the proportion of women and men with myocardial injury is now equivalent. Despite this increase, women remain less likely than men to receive treatment for myocardial infarction, and the rates of subsequent myocardial infarction or cardiovascular death were not substantially reduced in either women

or men following the implementation of high-sensitivity troponin testing into clinical practice.[13]

Conclusion

Cardiac biomarkers for diagnosis of ACS have become more and more sensitive in recent decades. The currently used hs-cTn assays are highly valuable for rule-in and rule-out of ACS. The value of serum hs-troponin I, higher in Female group than Male group. International guidelines have been published for appropriate use of hs-cTn.

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