Al-Kufa University Journal for Biology / VOL.8/ NO.3/ Year: 2016

Print ISSN: 2073-8854 & Online ISSN: 2311-6544

Relationship of Salivary & Plasma Troponin Levels of Patients with AMI in Merjan medical city of Babylon Province: Cross-Sectional Clinical Study

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Abstract :

Myocardial infarction (MI) is a disorder that could be a reason for morbidity & mortality. Effective & early identification is crucial for management. One analytical technique for the diagnosis of MI is evaluating plasma troponin (Tn) values. Bearing in mind the problems of blood aspiration from patients, a noninvasive practice like measuring of saliva Tn can be used as an alternative way. The present works aims to inspect variations in plasma & salivary Troponin I (TnI) measurements in AMI patients.

Methods: The study involved 100 patients diagnosed as AMI by physicians. After obtaining their agreement, both salivary & plasma TnI levels was assessed by saliva & blood sampling consequently by means of; VIDUS® techniques and kits.

Results: The mean age of patients was 56.5years and 79% of patients were male. There was week positive correlation between blood and serum troponin levels ($r=0.1$, $P<0.05$). The mean troponin level in serum was 8.07ng/L and troponin level in salvia was 0.16 ng/L showing a steady increase in saliva and blood during the process of AMI. There was no significant correlation of both serum & salivary TnI with increasing age or with gender differences.

Conclusion: There was week positive significant correlation between S TnI & Sal TnI concentrations showing a steady increase in saliva and blood during the process of AMI.

Introduction

Atherosclerosis (AS) is a chronic insidious pathology that may cause serious morbidity & mortality (1). The etiology of AS may precludes atheromatous plaque buildup initiating arterial blockage, subsequently impair both O2 supply & flow to the cardiac myocytes that produces MI (2).

Principal management of AMI intended to minimize cardiomyocytic damage which may carry valuable outcomes (3). Several methods can be used for the diagnosis of AMI including electrocardiography (ECG) changes. A typical chest pain accompanied with segmental ST elevation (STEMI) are most useful (4). Nevertheless, not more than a 1/3rd of subjects referred to emergency department (ED) show ECG suggestion of cardiac necrosis, while the rest may not display evidence of STEMI. To detect such cases, assessment of blood biomarkers like creatine kinase (CK-MB), troponins (Tn) and many other markers are vital (5). Among biochemical markers used to evaluate AMI, troponin has been suggested ever since 2000 (6). Tn particle comprises 3 subunits: Tn C, I, plus

Print ISSN: 2073-8854 & Online ISSN: 2311-6544

T which afford the function of calcium binding, inhibition of ATPase action and tropomyosin bonding respectively (7). Assessment of blood &/or its constituents were exploited for the estimation of markers, nowadays other samplings for instance spinal or salivary secretions are also used (8, 9). Saliva has benefits over blood like ease of collection & assessment, high amounts of electrolytes & markers, less invasive and painless in subjects with AMI (pain may magnify necrosis by enhancing catecholamines secretion) (10,11). Furthermore, saliva is easier for resampling if required to confirm diagnosis. However, the normal range of salivary TnI in healthy population is not known (12).

This study examine the relation between serum (S) & salivary (Sal) TnI & whether saliva could be applied as an alternate practice for diagnosing AMI in case of positive relationship.

Methods:

A cross-section study was completed in Merjan Medical city. It comprised of 100 patients in cardiac care unit under a physician's management. All diagnosed as AMI for the first time, after physical examination and by ECG & serum enzymes assessment. This study lasted for ten months and throughout this period we had to take history, perform oral examination, interrogate all the patients that had IHD and admitted to the hospital for further management &/or follow up. Meanwhile, we had to review the final diagnosis, investigations & echocardiography findings. Exclusion criteria include history of (proven CAD, stable IHD & PCI or CABG), heart failure, non-cardiac causes of elevated Tn levels, cardiac arrhythmias. Plasma & salivary Tn assessment were performed by ELISA® method, according to manufacturing guidelines of Troponin I Ultra (TNIU) assay by VIDAS® technique (25). A written consent was obtained for each patient. Subjects were inquired not to eat, drink, smoke, and brush their teeth for one hour before saliva collection (12, 24). Subjects asked to wash their mouths with water, and then, swallow entire his mouth content. Unstimulatory – noninvasive 5 ml saliva sampling gained into a sterile tube. Three cc of blood drained after saliva collection. Thereafter, both the blood and saliva were centrifuged at 3500 rpm for about 3-5 minutes, then the samples placed in tubes and kept at -20 °C for further assessment.

T-test was used to match the Tn in blood & saliva and Pearson-correlation used to link the linearity. P-value <0.05 was regarded significant. The statistical analysis was completed using SBSS-22 software package. Baseline physical features were assembled for all subjects using a survey formula with fixed questions for their demographic data and clinical history. The choice of subjects was completed so that finally no participant had any of the ensuing confounders (may alter Tn measurements *per se*): trauma, CHF, kidney failure, hypothyroidism, sepsis, and burns.

Results:

Tables (1) shows baseline characteristics of individuals enrolled in the study. Risk factors for all subjects of the study were hypertension (HT), diabetes mellitus (DM) & smoking. The most common was smoking (37%), followed by HT (26%) & then DM (21%). (79%) were males & (21%) were females, male to female ratio was 3.5 to 1. Mean ages of the patients was 56.5±13.5 years (table-2). There was week positive significant correlation (r=0.1, P<0.05) between S TnI & Sal TnI concentrations (table 3). There was no statistical difference noticed in salvia troponin levels between males and females. Also no significant correlation of both serum & salivary TnI with increasing age (table 5).

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Table (1): Mean, Standard Deviation, Min/Max Age of the patients

Characters	Patients		
Age (year)	SD ± Mean	Min.	Max.
	56.5±13.5	28	90

Table (2): Baseline Characteristics of Subjects of Study Groups

Characters	Patients (*N*=100)
Mean age	56.5
Hypertension No (%)	26 (26%)
Diabetes Mellitus No (%)	21 (21%)
Smoking No (%)	37 (37%)
Male	79 (79%)

Table (3): The Serum & Salivary TnI Levels in studied Patients

	Mean ± SD	Minimum	Maximum	No.	*Correlation P-Value*
Serum Tn ng/l	8.07 ± 2.3	0.1	30.0	100	0.1 < 0.05
Salivary Tn ng/l	0.16± 0.05	0.0	1.9	100	

Table (4): Serum & Salivary TnI levels in males & Females

	Sex	N	Mean	Std. Deviation	P-Value
Serum TnI ng/l	M	79	6.643	7.6	0.1
	F	21	13.447	11.1	
Salivary	M	79	0.11	.06	

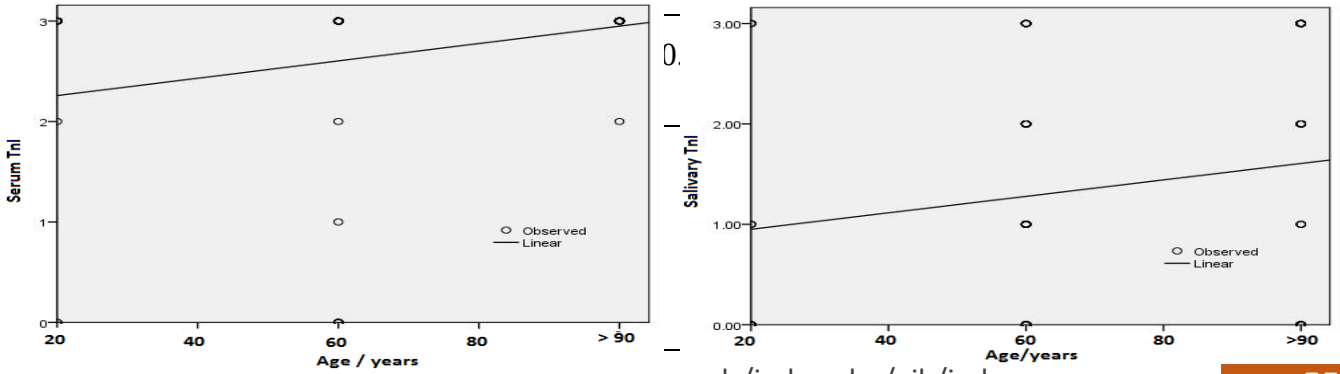

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Figure (1): Correlation of Both Serum TnI & Salivary TnI with Age

Discussion:

In table (1); the mean age of patients was 56.5±13.5 year that is nearly equal to the mean ages in another contemporary (Asian countries) studies (13), though studies from USA & European countries involved patients of older ages (≈68 year) (14). On the other hand, current research from China revealed average age was 36.8 year (15). These differences in age of the patients can be attributed to higher incidence of risk factor (e.g. early smoking), high apolipoprotein (Apolip.) B_{100} / Apolip A-I ratio (2,3), dyslipidemia, high CRP levels at younger ages (2), in addition to other factors as stressful situations of Iraq. Lower protecting factors of ACS were also an attributable issues; such as lack of exercise, inadequate daily consumption of vegetal & fruitlets (15).

The association of smoking & AMI had been demonstrated by many recent researches (1 &16). Meanwhile, there was no association between smoking & carotid atherosclerosis (2). The latest news advocate that over-all smoking occurrence has dropped since 1980s to near 30% of population, but remains common in many developing countries. However, due to people growth, the total smokers count raised considerably (16). The smoking rates were even higher in this study (53%), although the number of cigarettes per smoker per day is another fact. Lack of educational programs & health education along with poor regulations that prohibit smoking are part of the problem (table-2).

The hypertensive patients represent about 26 % of all subjects (table-2). This is generally accepted due to a known injurious effect of hypertension on CVS & its correlation with AMI, which is evidenced by many studies (1,4 & 14) this is in part may be due to (1) sharing risk issues like hereditary factors, insulin resistance, autonomic adrenergic overactivity & vasoactive molecules (e.g. Angiotensin-II & nitrous oxide) (2) Hypertension intern is risk factor for AS or aortic calcifications, (that its intern) may progress to AMI (14). In addition, DM prevalence was 21% in this st6udywhich is comparable to many revisions that showed such association (1, 6, and 17).

Salivary secretions are a hypotonic watery liquid, most of its constituents assimilated from topical vasculatures & intracellular secretion, & since local capillaries arises from the heart branches so both saliva and plasma may be reasonably associated (18,19). There was no significant differences between S TnI & Sal TnI concentrations ($P>0.05$) (table 3, 5). Floriano et al publicized that salivary investigations together with ECG may be utilized as a technique for fast screen for AMI patients, before admission (20). This is seems to be similar to other recently published studies (21), while other studies fail to prove such associations (22, 23). Such dissimilarities in the studies might be in part owing to inconsistency of evaluated people, the kind of saliva collected & the procedure of handling. Any sample of protein nature is thermosensitive, hence unexpected variations or increases of sample temperature throughout the handling must be avoided. Other explanation is that secretion of saliva is increased by mastication or food odor, this intern, may dilute salivary constituents and in so doing their concentrations altered (21).

It's well known that AMI is influenced by risk factors like age & sex, however, our study showed no major effect of increasing age & sex on TnI levels in both salivary & serum samples (table 4,5). This is seems to be concordant to the finding of recent researches (8, 9). This may be explained by knowing that variations in Tn levels are related to myocardial necrosis rather than age or gender (18, 21).

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Bearing in mind the fact that performing serum tests is a disturbing technique that may increases discomfort and stressful in AMI patient thereby more catecholamines secretion that worsens necrotic changes. In due course salivary tests were collected in a short duration, at different occasions and can be repeated easily. Nevertheless, establishing salivary samples as a substitute standard to serum for different biochemical bioassays, a strongly correlated levels of TnI must be obtained.

Conclusion:

There was week positive significant correlation between serum TnI & salivary TnI concentrations suggesting a steady increase in saliva & blood during the process of AMI**.**

Acknowledgments:

I wish to express my thanks for the patients that had contributed in the completion of the present study**.**

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