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MEASUREMENT OF CREATINE KINASE AND CREATINE KINASE – MB ISOENZYME IN MYOCARDIAL INFARCTION PATIENTS

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ABSTRACT

Objective -this study has been carried out to determine the significance of measurement of total CK and Ck –MB in the diagnosis of acute myocardial infarction.

Method -We evaluated diagnosis strategy by studding 800 patients aged 30-70 (with control group). Suspected of having had an acute myocardial infarction. investigation were carried at king Hussein Medical Center (Queen Alia Heart Center)

Serum total CK and CK-MB was done by CK,CK –MB NAC activated methods using Hitachi autoanlyzer.

Results -In AMI patients,the mean value of total Ck is greater than that of the normal range . Also the mean value of Ck – MB and % CK– MB is greater than that of normal range in both sexes . The maximum peak was found to be 8 hours for males and females . After the onset of myocardial infarction.

Conclusion -This study demonstrated that measurement of total CK and CK- MB is currently the test of choice to confirm the diagnosis of an AMI . Measurment of total CK and CK-MB every 8 – 12 hours is an adequate coast – effective method for the diagnosis of AMI It was found that total CK and CK – MB is an effective way of identifying people at high risk of AMI .

Key words -Myocandial infarction , creatine kinase creatine Kinase Isoenzyme.

INTRODUCTION

The determination of Creatinine Kinase and Creatinine Kianse -MB plays a major role in the differential diagnosis and monitoring myocardial infarction patients.

Although, the methods for determination of these parameters are easy to apply; they are not specific for cardiac muscle damage (24)- (1). Indeed, an increased CK-MB level in patients with normal total CK has been reported (2).

Immunoassay teachnique is a conventient procedure for cardial care unit patients which is characterized by simplicity of procedure and the availability of the results that make a significant contribution to clinical diagnosis (3) measurement of total creaine Kinase, and immunoassay of creatinine Kinase —MB plays a major role in the differential diagnosis and monitoring myocardial infarction. Elevated CK a ctivity appears within 6 hours of the acute episode. At the time of maximum activity, approximately 10-20 hours after the onset of the infarct, the CK activity attains levels between 160 and 2000 U/L. (Using Wurzburg U.et. al methods) creatinine Kinase return to normal after 3-4 days. Testing was carried out on system which uses prepared (4) reagent analystic measurement based on Wurzburg method, a specific antibody inhibits the CK-M moiety without affecting the CK-B moiety. The system can safely handle high—risk specimen by washing the instrument by 1% Sodium hypochloride then with distilled water (3).

An increase in creaine Kinase may be caused by myocardial disease or skeletal muscle lesion. Creatine activities are greatest in skeletal muscle, followed by the heart, brain and smooth muscle. (4,5).

Earleir emergency deteminations of CK, CK-MB enzymes carry a considerable risk of falsely negative result (10), and infact, may instill a false feeling of security in the Clinician, leading to erroneaus decision. Because AMI can be definitely excluded by means of these enzyme tests only in the 10-20 hours interval after onset of symptoms, it is ratienal to obtain samples only within this time period (6).

CK, CK-MB may be increased in some patients earlier than 10 hours after the onset of symptoms. However, it would a ppear irresponsible to deny a patient a dequate care unit 1 a laboratory verification of an AMI has been obtained, especially, because the risk of dangerous arrhythmias is greater during the initial phase of an AMI. (6,7)

Creatine Kinase is a bundant in most tissues. Activities as high as 12000 IU/g and as 225 JU/g have been reported in striated muscle. There are approximately 1600 IU of CK activity pergram in myocardium 15% to 30% of which is CK-MB. Results with sensitive mass assays have shown that most skeletal muscle contain small amount (1-3%) of CK-MB when skeletal is injured, it produces increased amount of B subunits, just as it does during fetal development. Transient increase the percentage of CK-MB: in skeletal muscle and elevations in circulating levels occur after a cute muscle injury (including extremely rigorous exercies). (1,8,9)

The world health organization criteria for the diagnosis of AMI generated in 1994 suggestal that atypical rising and falling pattern of CK - MB alone in the proper clinical setting should surfice for confirmation of AMI (10). However, recent publications suggested that the CK-MB isoform type 2 may detect earlier stages of AMI (11). Earlier publications (12) indicated that controversial findings of CK and CK-MB be seen in PTCA patients.

MATERIAL AND METHOD

Control group, 300 (200M, 100F) age (25-65) male, (35-65) female non-acute myocardial infarction were studied in parallel to the AMI patients.

All the patients in the control group were casuality patients with various discomfort.

Indiviuals with MI (N=500, 300M (30-70), 200F (35-70), were studied from patients admitted to King Hussein Medical Centre . All the patients included in the study presented with symptoms indicative of having had an AMI. Within the previous 24 hours,

For each patients 7 specimens were collected within 48 hours and after the onset of the acute symptoms, preferably after the admission (0,4,8,12,16,24,48, hours) . serum was seperated, done within 30 minute after collection using NAC- activated method for CK, CK-MB . CK – NAC-activated kinase EC 2.7.3.2 , Wsechr, 54: 357 (6) by Hitachi autoanalyzer

RESULT

Patients showed that both serum total CK and sedrum CK-MB approach their respective peak activities within 4 to 8 hours after the onset of the acutre symptoms. *

Table (1) shows the result of total serum CK, serum CK-MB and percentage of CK-MB in both sexes . As can be seen , the mean value of total serum CK in males and females at admession time)TO) is greater than the normal value and control groups. Aslo, the mean value of CKMB and % CK-MB in males or females is greater than that of the normal value and control groups.

The mean value of total serum CK, CK-MB and % CK-MB in males and females reaches maximum at T8, T12.

DISCUSSION

The literature cited indicates that it is desirable enzyme activities be determined as soon as possible after the acute episode, with further tests performed after 6,12,24 and 48 hours and then at intervals of 1 and 2 days (13). In contrast, this study performed at admission time, 4,8,12,16,24 and 48 hours. Early determination of enzyme activities permits the detection of any pre-existing abnormal levels, as they may occur, for example in-patients with liver or muscle diseases. CK-MB is found mainly in heart muscle, where more than 20% of the total CK activity is present as CK-MB, and nearly 80% as CK-MM. The MB isoenzyme is not considered to be myocardium — specific. Skeletal muscle contain predominantly CK-MM, its CK-MB content usually being less than 3% CK-BB is demonstrable in the brain, but is also found in the stomach, intestine, and uterus. In healthy individuals, the total CK activity in the serum consists almost exclusively of CK-MM. (14)

An increase in CK-MB is virtually always detectable in-patients with recent infarcts. The diagnosis of MI is determined by the fraction of total CK contributed by the MB isoenzyme. CK activities greater than 100 U/L and a CK-MB fraction exceeding 6% of the total CK activity raise the suspicion of myocardial infarction. (3)

The same serum specimen that was used for the determination of the total CK activity should be taken for the assay of CK-MB. CK-MB rises, as does the total CK, during the first hours after the infarction episode. Maximum CK-MB activities may appear shortly before the peaking of the total CK. CK-MB usually reverts to normal on the second or third day. (5,14)

Increases in MBCK in plasma usually are attributable to release from myocardium in the absence of conditions known to increase MBCK in muscle.

Patients with arising and falling pattern of MBCK and apeak value that exceeds the upper limit of the reference range should be considered to have had an AMI until shown other wise. (15)

Measurement of CK-MB is currently the test of choice to confirm the diagnosis of an AMI. (16)

E llis et al reported that increases in plasma level usually occur between 6 to 10 hours after the onset of infarction (in the absence of thrombolysis peak at 24 hours, and return to normal by 36 to 72 hours.

Incontrast, in this study, increases in plasma level occur between 4 to 8 hours after the onset of infarction, peak at (8-12) hours, and return to normal by 72 hours. Given this kinetics, measurement of CK-MB every 12 hours is adequate, cost - effective method measure for diagnosis of AMI. Obtaining value more frequently will increase diagnostic sensitivity. Levels of CK-MB peak slightly earlier, and the MB fraction disappears slightly more rapidly than total CK.(17) . In general, small amount of damage to healthy skeletal muscle does not release enough CK-MB into plasma to cause diagnostic confusion, for example, intramuscular injections. Approximately 20% of myocardial infarcts are silent occurring particularly in diabetics, the elderly, and hypertensive subjects. Increase serum CK activity is liable to occur, if there is damage to skeletal or cardiac muscle (18) .

CONCLUSION

It was concluded from the persent study that CK-MB alone is not a good practical way for the diagnosis of AMI. Patients with arising and falling pattern of CK-MB and a peak value that exceeds the upper limit of the reference range should be considered to have had an AMI until shown otherwise.

Measurement of CK-MB and CK is currently the test of choice to confirm the diagnosis of an AMT. Increases in plasma level usually occur between 4 to 8 hours after the onset of infarction (in the absence of thrombolysis) peak at 8-12 hours, and return to normal by 48 hour. Given these kinetics, measurement of total CK, CK-MB every 8-12 hours for admitted patients is an adequate, cost-effective method for diagnosis of AMI.

In this study most patients(males or females) have a peak CK, CKMB, %CK-MB at 8-12 hours after the onset of MI.

It was found that measurement of total CK & CK-MB is an effective way of identifying patients at high risk of AMI.

Table (1) results of total sem CK, …in both sexes

	CK		**CK-MB**		**% CK – MB**		**Age**	
	Males	Females	Males	Females	%Males	%Females	M(300)	F(200)
T0	130(25-825)	80(25-70)	21(8.1-40)	15.2(9.2-17.5)	6.5(3.5-10.9)	6.2(3.6-9)	(30-70)	(35-70)
T4	710(65-2902)	353(55-1350)	36.6(5.1-16.8)	33(13.5-68.2)	7.6(4.4-14.1)	9.6(5.1-14)		
T8	1285.2(251-2935)	1025(620-1560)	96.3(21-265)	73.2(35-138)	10.4(5.1-15.4)	10.6(5.4-15.1)		
T12	1255.4(240-2980)	1015(270-2270)	85.2(43-272.4)	70.3(32.2-121.3)	8.7(4.3-12.5)	7.8(5.2-10.8)		
T16	1122(225-1630)	754(215-1440)	68.7(8.8-133)	45(15.3-69)	6.1(3.6-9.7)	6.2(4.9-7.7)		
T24	804.1(110-2155)	510(190-940)	41.5(5.5-79.4)	22.9(7-37.5)	5.2(2.3-7.5)	5.8(3.8-7)		
T48	220.5(70-560)	325(115-420)	8.5(3.1-16.2)	15.7(4.8-30)	4.8(2.0-6.2)	4.7(3-5.8)		

Table (2) Result of CK ,CK- MB in – control group

	Total CK			**CKMB**			**Age**
	Av	Males	Females	Male	Females	M	F
T0	58	(22-63)	45(21-71)	2.5(2.1-3.4)	2.(1.3-2.6)		
T4	63	(37-76)	61(49-86)	3(2.6-3.8)	2.3(1.5-3)		
T6	63	(57-79)	74(52-92)	3.2(3-4.2)	2.5(2-3.5)		
T8	92	(85-100)	83(57-100)	4(3.5-5.5)	3.4(3.2-4.5)		
T2	87	(75-97)	92(84-101)	3.6(3.2-5)	4.1(3.5-5.4)		
T6	78	(69-89)	85(72-92)	3.3(3-4.7)	3.7(3.2-4.8)		
T18	75	(58-85)	76(64-85)	3.1(2.8-4.3)	2.8(2.5-4.1)		
T24	65	(52-74)	64(56-76)	2.6(2.1-3.5)	2.6(2.1-3.8)		
T36	55	(49-66)	60(52-63)	2.3(2-3.1)	2.2(1.6-3.1)		
T48	48	(33-56)	51(49-56)	2.1(1.5-2.5)	2.1(1.2-2.6)		

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