Diagnostic Accuracy of Heart-Type Free Fatty Acid Binding Protein for the Early Diagnosis of ST Elevation Myocardial Infarction Among Egyptian Patients

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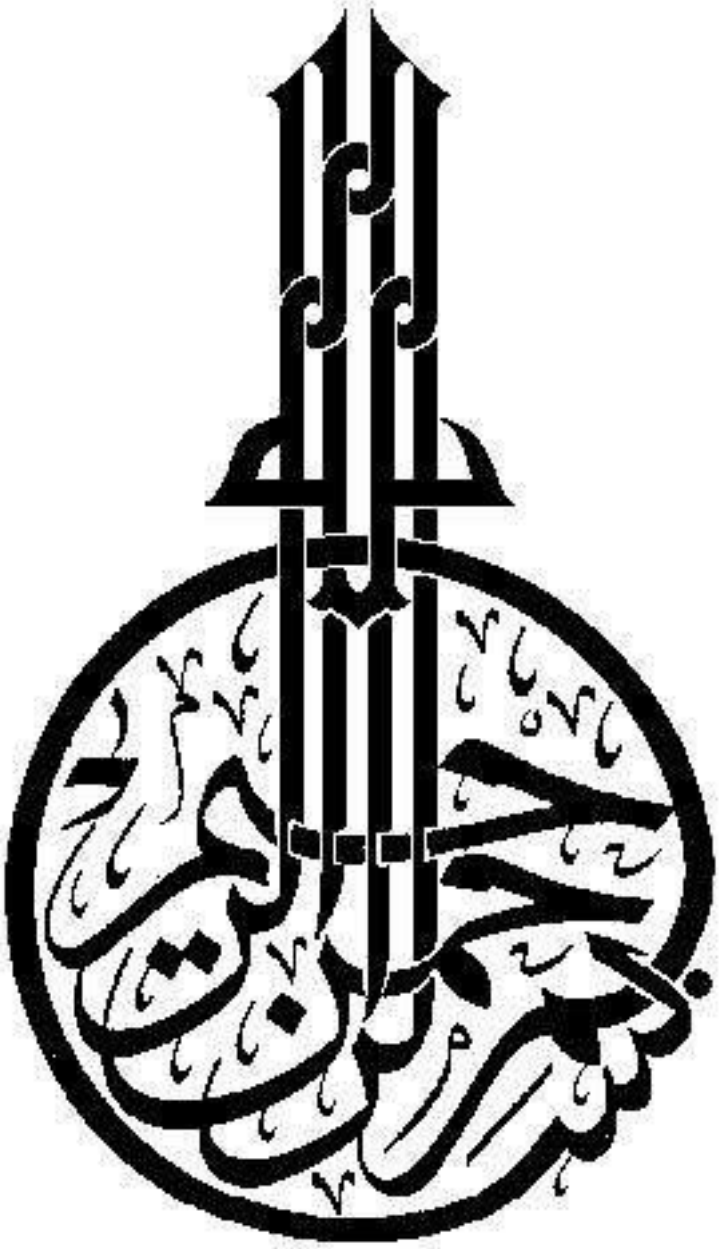

Diagnostic Accuracy of Human Heart-Type Free Fatty Acid Binding Protein for the early diagnosis of ST Segment Myocardial Infarction among Egyptian patients

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Abstract

Background: Chest pain is a non-specific complaint and is the most frequent reason for patients to seek urgent medical attention. The immediate challenge is to be able to identify acutely impaired myocardial perfusion before the necrotic process starts. Myocardial infarction with its complications is one of the most serious challenges in contemporary cardiology. Among biochemical markers of myocardial ischemia, human heart-type free fatty acid binding protein (h-FABP) showed excellent sensitivity and specificity for the early diagnosis of an acute MI as it is released rapidly (30 minutes) from the cardiac myocyte to the circulation in response to myocardial injury; hence it may be useful for rapid confirmation or exclusion of MI.

Aim: The purpose of this study is to determine the diagnostic value of (h-FABP) in patients with acute chest pain (within 3 hours from symptom onset) accompanied with ST elevation in ECG and compare it to the standard cardiac biomarkers.

Study design and methods: Single-center study included fifty five patients selected from the emergency department in a tertiary center. All patients were subjected to complete medical history, physical examination and full labs including (h-FABP). Transthoracic echocardiogram was done in all the patients. Pharmacological thrombolytic therapy and/or coronary angiography followed by percutaneous coronary intervention (PCI) (rescue or primary) were carried out in these patients.

Results: The diagnostic accuracy, sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) for (h-FABP) were evaluated. Our study results showed that there was a higher percentage of (h-FABP) positive results in cases (90.0%) compared to controls (6.7%). There was a highly significant difference between (h-FABP) and (CK-MB) as regard sensitivity in the diagnosis of (STEMI) during 3 hours from the onset of chest pain in admission to ED, as (h-FABP) sensitivity was 90.9% compared to (CK-MB) sensitivity which was 7.3%. There was no significant difference between (h-FABP) (on admission) and (cTn I) at 4-6 hours after admission (90.9% vs. 100%, P value=1.0). There was no significant difference between (h-FABP) and (cTn-I) as regard specificity in the diagnosis of myocardial injury, (93.3% vs. 100%, p=1.0). In regard to the time of presentation to the (ED); there was significant difference between the (h-FABP) positive and the (h-FABP) negative groups; where 80% of the patients of the (h-FABP) negative patients group presented within 60 minutes from the onset of typical ischemic chest pain while no patient from the (h-FABP) positive group presented in this time frame (mean±SD was 59.0±7.42 hours vs. 143.1±29.28).

Conclusions: The (h-FABP) seems to be an excellent and sensitive early cardiac biomarker of cardiac ischemia in the group of patients with chest pain lasting less than 3 hours, compared to the other standard cardiac biomarkers (CK, CK-MB & cTn-I).

Key words: myocardial ischemia, myocardial necrosis, STEMI, (h-FABP).

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DEDICATION

I dedicate my dissertation work to my family.

A special feeling of gratitude to my loving parents, **Ibrahim Salih Ibrahim** and **Maimouna Mohamed Saeed Abu-Raidah** who provided me with passionate and love and was a source of inspiration throughout my life and whose words of encouragement and push for tenacity ring in my ears.

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LIST OF CONTENTS

ABBREVIATIONS

α-HBDH	α-hydroxybutyrate dehydrogenase
AAV-9	Adeno-Associated Virus-9
ACB	Albumin cobalt binding
ACC	American college of cardiology
ACCA	Acute Cardiac Care Association
ACCF	American College of Cardiology Foundation
ACE	Angiotensin converting enzyme
ACEP	American College of Emergency Physicians
ACS	Acute coronary syndrome
ADM	Adrenomedullin
ADP	Adenosine di-phosphate
A & E	Accident and emergency
AHA	American heart association
AHCPR	Agency for Health Care Policy and Research
AMI	Acute Myocardial Infarction
ANP	Atrial natriuretic peptide
Asp-Ala	Aspartate – Alanine
ATP	Adenosine tri-phosphate
AUC	Area under the curve
AVP	Arginine vasopressin
B-FABP	Brain type free fatty acid binding protein
BNP	B-type natriuretic peptide
CABG	Coronary artery bypass graft
CCU	Coronary care unit
CHD	Coronary heart disease
CK	craetine kinase
CK-BB:	Creatine kinase brain type
CKm	Mitochondrial creatine kinase
CK-MM	Creatine kinase muscle type
CK-MB	Creatine kinase myocardial band
Co-A	Co- enzyme A
CP-gene	Protein coding gene
CPK	Creatine phosphokinase

Cr	Creatine
CRP	C-reactive protein
cTn	Cardiac troponin
cTn-I	Cardiac troponin I
cTn-T	Cardiac troponin T
CTproET1	C-terminal pro-endothelin 1
Cu	Copper
CV	Coefficient of variation
CVD	Cardiovascular disease
DNA	Deoxyribonucleic acid
ECG	Electrocardiogram
ECM	Extracellular matrix
ED	Emergency department
EDTA	Ethylenediaminetetraacetic acid
ELISA	Enzyme-linked immunosorbent assay
ERK-MAP kinase	Extracellular signal-regulated kinase–mitogen activated protein Kinase
ESC	European Society of Cardiology
et.al	and others
ET-1	Endothelin-1
ET-A	Endothelin receptor type A
ET-B	Endothelin receptor type B
FABP	Fatty acid binding protrein
FAS gene	Fatty acid synthase gene
Fe	Iron
FLASH	FLICE-associated huge protein
FRISC-II	Fast Revascularization during Instability in CAD
G	Gram
GDF-15	Growth differentiation factor 15
GFR	Glomerular filtration rate
GRACE	Global registry of acute coronary events study
GP IIb/IIIa	Glycoprotein 2b/3a
HbA1c	Glycosylated haemoglobin

HCM	Hypertrophic cardiomyopathy
HCR	High capacity runner
HDL	High density lipo-protein
HF	Heart failure
h-FABP	Heart type fatty acid binding protein
HIF-1α	Hypoxia-inducible factor-1α
His	Histadine
HPLC-MS	high performance liquid chromatography spectrometry
HSA	Human serum albumin
H & E	Hematoxylin and eosin stain
HR	Hazard ratio
HsCRP	High sensitivity C-reactive protein
hs-cTn	High sensitive cardiac troponin
ICU	Intensive care unit
i.e.	id est, which mean "that is"
I-FABP	Intestinal fatty acid binding protein
IGF-1	Insulin-like growth factor 1
IHD	Ischemic heart disease
IL-33	Interleukin -33
IM	Intramuscularly
IMA	Ischemia modified albumin
IU	International unit
IU/L	International unit per liter
i.v.	Intravenously
kDa	Kilo Dalton
L	Liter
LBBB	Left buddle branch block
LDL-C	Low density lipoprotein-Cholesterol
L-FABP	Liver type free fatty acid binding protein
LMWH	Low molecular weight heparin
LV	Left ventricle
LVEF	Left ventricular ejection fraction
LVH	Left ventricular hypertrophy

Lys	Lysine
M	Muscle type
Mb	Myoglobin
Mean± 2 SD of controls	The assigned mean ± 2 assigned standard deviations
MDA-LDL	Malondialdehyde low density lipoprotein
Mg	Milligram
µg	Micro-gram
µmol	Micro-mol
MI	Myocardial infarction
mIU	Milli international unit
MMP	Matrix metalloproteinase
MPI	myocardial perfusion imaging
MPO	Myeloperoxidase
miRNA	Micro- Ribonucleic acid
MRproANP	Mid regional pro-atrial natriuretic peptide
MRproADM	Mid regional proadrenomedullin
mV	Milli-Volt
N-ANP	N-terminal pro-atrial natriuretic peptide
NBT	Nitro blue tetrazolium
NHAAP	National Heart Attack Alert Program
Ng	Nanogram
NSTEACS	Non-ST elevation acute coronary syndromes
NSTEMI	Non-ST elevation myocardial infarction
NTproBNP	N-terminal pro-B type natriuretic peptide
OPERA	Observatoire sur la Prise en charge hospitalière, l'Evolution à un an et les caRactéristiques de patients présentant un infArctus du myocarde avec ou sans onde Q
OPUS –TIMI-16	The Orbofiban in Patients with Unstable Coronary Syndromes – Thrombolysis in Myocardial infarction study- 16
PAGE	Polyacrylaminde gel electrophoresis

PaPPA	Pregnancy associated Plasma Protein A
PCI	Percutaneous coronary intervention
PCr	Phospho-creatine
Pg	Picogram
PH	Power of hydrogen
PI	Iso-electric point
PPCM	Peripartum cardiomyopathy
PTCA	Percutaneous transluminal coronary angioplasty
P value	Statistical significance testing
RA	Rheumatoid arthritis
RNA	Ribonucleic Acid
ROC	Reciever operating characteristic curve
ROC AUC	Area under the receiver operating characteristic curve
ROS	Reactive oxygen
SDS	Sodium dodecyl sulfate
SLE	Systemic Lupus Erythrematosis
SPECT	Single-photon emission computer tomography
$	United States dollars
T3	Triiodothyronine
TACTICS-TIMI 18	Treat angina with Aggrastat and determine Cost of Therapy with an Invasive or Conservative Strategy-Thrombolysis in Myocardial Infarction
TGF-B	Transforming growth factor-beta
TIMI	Thrombolysis in Myocardial infarction study
TIMP	Tissue inhibitors of metalloproteinases
Trop	Troponin
TTC	Triphenyl tetrazolium chloride
UA	Unstable angina
URL	Upper refrence limit
US	United States
USA	United States of America

V1-receptor	Vascular vasopressin receptor
WBCHO	Whole blood choline
WHF	World Heart Federation
WHO	World Health Organization

Patients and Methods