Comparison between L-FABP and Renal Artery Duplex before & after Percutaneous Coronary Intervention for Early Detection of Acute Kidney Injury

Thesis

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مقارنة بين نسبة البروتين الرابط للنوع الكبدي للحمض الدهني وفحص الشريان الكلوي بالموجات فوق الصوتية قبل و بعد القسطرة التداخلية للشريان التاجي للاكتشاف المبكر للقصور الكلوي الحاد

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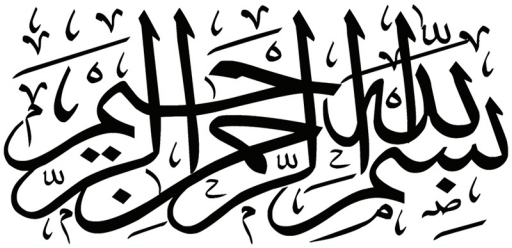

وَعَلَّمَكَ مَا لَمْ تَكُنْ تَعْلَمُ ۚ وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيمًا

[سورة النساء: 113]

رَبِّيَّ لَكَ الْحَمْدَ الْعَظِيمَ لِذاتِكَ حَمِدَا وَلَيْسَ لِوَاحِدٍ إِلاكَ

يا مُنْبَتُّ الْأَزْهَارِ عَاطِرَةَ الشذى مَا خَابَ يَوْمَا مِنْ دَعَا وَرَجَاكَ

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ABSTRACT

Background: *Patient assessment by imaging studies using contrast media is currently replacing open procedures, especially in high-risk patients. However, the use of such contrast media might result in acute events and injuries after the procedure. Contrast-induced nephropathy (CIN) is a complex syndrome of acute renal failure occurring after the administration of iodinated contrast media. With the increasing use of radiocontrast media in diagnostic and interventional procedures over the last 30 years, CIN has become the third leading cause of hospital acquired acute renal failure, at least in the United States and Europe. The performance of urinary L-FABP which is a 14-kDa protein expressed in proximal tubular epithelial cells as an early detection marker of AKI has shown promise in various clinical settings. Determination of the renal resistive index (RI) by Doppler sonography has also been suggested as a means of diagnosing acute tubular necrosis.*

Objective: *The aim of our work is prospective assessment of the clinical biomarker L-FABP and the renal artery duplex for early prediction of acute kidney injury in patients scheduled for coronary angiography.*

Methods: *The present study was conducted on 40 patients admitted to the ICU Critical Care Department, Cairo University Hospitals scheduled for coronary angiography. Different risk factors for AKI were evaluated, including: Patients with diabetes mellitus, hypertensions, dyslipidemia, smoking, ischemic heart disease and the number of diseased coronary arteries. The L-FABP and renal artery duplex was studied for early prediction of acute kidney injury before and after coronary angiography.*

Results: *After coronary angiography mean serum creatinine was significantly increased (p value < 0.006) but still not beyond the critical value. Again the mean creatinine clearance was significantly reduced in our patients after usage of contrast (p value < 0.000). Mean L-FABP significantly increased 4 hours after coronary angiography and the sensitivity of L-FABP to CIN is 41% and specificity is 76% (with an AUC-ROC of 0.55).The mean RRI was significantly increased after angiography but Pulsaticity before and after coronary angiography show no statistically significant difference. The sensitivity of RRI to CIN is 69% and specificity is 48% (with an AUC-ROC of 0.56).*

Conclusion: *This study highlighted the importance of urinary L-FABP levels and RRI in early detection of AKI associated with contrast administration earlier than serum creatinine. The sensitivity of RI to CIN is 69% and specificity is 31% while the sensitivity of L-FABP to CIN is 41% and specificity is 76%.*

Key Words :

Comparison between L-FABP and Renal Artery Duplex before & after Percutaneous Coronary Intervention for Early Detection of

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LIST OF ABBREVIATION

ACEI	Angiotensin converting enzyme
ACR	Albumin to creatinine ratio
ADQI	dialysis quality initiative Acute
AKIN	Acute kidney injury network
AKI	Acute kidney injury
ALT	Alanine transaminase
Ao	Aortic root
ARBs	Angiotensin receptor blockers
AST	Aspartate transaminase
ATN	Acute tubular necrosis
AUC-ROC	Area under the curve- Rock curve
CAD	Coronary artery disease
CHF	Congestive heart failure
CI-AKI	Contrast induced acute kidney injury
CIT	Conventional insulin therapy
CKD	Chronic kidney disease
CM	Contrast medium
COX2	Cyclooxygenase 2
CrCL	Creatinine clearance
CT	Compouted Tomography
ECBP	Exrtracorporeal blood purification
eCCl	estimated Creatinine Clearance
ECG	Electrocardiogram
EF	Ejection fraction
ECHO	Echocardiograms
ELISA	Enzyme linked immunosorbent assay
ESRD	End stage renal disease
FAs	Fatty acids
FGS	Focal glomerulosclerosis
FS	Fractional shortening
GFR	Glomerular filteration rate
eGFR	Estimated Glomerular filteration rate
HD	Heamodialysis
HIF-1	Hypoxia inducible factor-1
H2O2	peroxideHydrogen
HOCM	High osmolar contrast media
ICU	Intensive care unit
IGFBP-7	Insulin like growth factor binding proteins-7
IIT	Intensive insulin therapy

IL-18	Interleukin-18
IV	Intravenous
IVSTd	Interventricular septal thickness diameter
kDa	Kilodalton
KIM-1	Kidney injury molecule-1
LA	Left atrium
L-FABP	Liver fatty acid binding protiens
LOCM	Law osmolar contrast media
LVEDd	Left ventricular end diastolic diameter
LVESd	Left ventricular end systolic diameter
MHz	Megahertz
MI	Myocardial infarction
NAC	N-acetyl cystien
NAG	N-acetyl-B-D-glucosaminidase
NGAL	Neutrophil gelatinase associated molecule
NO	Nitric oxide
O	Oxygen
OH	Hydroxide ion
PAD	Pulmonary artery diameter
PCI	Percautenous coronary intervention
PPAR	Peroxisome Proliferator–Activated Receptors
PWTd	Posterior wall thickness diameter
RCM	Post contrast medium
RIFLE	Risk injury failure loss and end stage renal disease
RRT	Renal replacement therapy
RVEDd	Right ventricular end-diastolic diameter
SCr	Serum creatinine
TIMP-2	Tissue inhibitor of metalloprotinease-2
XDH	Xanthin dehydrogenase

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INTRODUCTION

Patient assessment by imaging studies using contrast media is currently replacing open procedures, especially in high-risk patients. However, the use of such contrast media might result in acute events and injuries after the procedure [1, 2]

AKI is one of a number of conditions that affect kidney structure and function. AKI is defined by an abrupt decrease in kidney function that includes, but is not limited to, ARF. It is a broad clinical syndrome encompassing various etiologies, including specific kidney diseases (e.g., acute interstitial nephritis, acute glomerular and vasculitic renal diseases);non-specific conditions (e.g, ischemia, toxic injury); as well as extrarenal pathology (e.g., prerenal azotemia, and acute postrenal obstructive nephropathy). More than one of these conditions may coexist in the same patient and, more importantly, epidemiological evidence supports the notion that even mild, reversible AKI has important clinical consequences, including increased risk of death. [3, 4]Thus, AKI can bethought of more like acute lung injury or acute coronary syndrome.

Contrast-induced nephropathy (CIN) is a complex syndrome of acute renal failure occurring after the administration of iodinated contrast media. With the increasing use of radiocontrast media in diagnostic and interventional procedures over the last 30 years, CIN has become the third leading cause of hospital-acquired acute renal failure, at least in the United States and Europe.[5]The definition of CIN includes three necessary components: [6] an absolute or relative increase in serum creatinine compared to the baseline values; a temporal relationship between the rise in serum creatinine and exposure to a contrast agent, and [7] the exclusion of alternative explanations for renal impairment (e.g. sepsis).

Contrast-induced nephropathy has been recognized as a serious complication of PCI and may cause increased morbidity and mortality. CIN is one of the most important reasons for hospital-acquired renal failure and can cause prolonged hospitalization, increased cost and incidence of renal and cardiovascular events, and mortality. Elderly patients have a higher risk of CIN because of decreased renal reserve. In addition, some factors, such as an estimated glomerular filtration rate (eGFR) of 60 mL/min/1.73 m2, a left ventricular ejection fraction 45%, diabetes mellitus, hypotension, anemia, emergency PCI, myocardial infarction history, and a contrast agent dose 200 mL have been identified as risk factors for CIN after PCI. Additionally, alcohol consumption and the arterial blood pressure level before contrast exposure may be associated with CIN. [8]

Liver-type fatty acid binding protein (L-FABP), one such candidate biomarker, is a 14-kDa protein expressed in proximal tubular epithelial cells. This endogenous antioxidant promotes free fatty acid metabolism by binding long-chain fatty acid oxidation products. The L-FABP gene is responsive to hypoxic stress, which occurs in the setting of kidney ischemic reperfusion injury. As a consequence, urinary excretion of L-FABP reflects the stress of proximal tubular epithelial cells, correlating with the severity of ischemic tubular injury. The performanceof urinary L-FABP as an early detection marker of AKI has shown promise in various clinical settings. However, there remains skepticism about whether urinary biomarkers will provide reliable diagnostic and prognostic stratification to assist physicians in the early management of AKI to systematically assess the performance characteristics. [9]

Over the past 2 decades, Doppler waveforms of intra-renal arterial blood flow have been extensively investigated to determine physiologic and pathologic correlations. Among the parameters introduced, the renal resistive index (RRI), which is considered a reflection of renal parenchymal resistance, has been widely used to support diagnostic and therapeutic procedures. [(10)]Determination of the renal resistive index (RRI) by Doppler sonography has also been suggested as a means of diagnosing acute tubular necrosis. RI is an index of resistance to flow distal to the point of sampling, with a lower RI being associated with less resistance to flow. [(11)]