BIOMARKERS OF ACUTE KIDNEY INJURY

Essay
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By

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Abstract

Acute kidney injury (AKI) is a protean syndrome of varied severity. It is characterized by a rapid decline in the glomerular filtration rate (GFR) and retention of nitrogenous waste products such as blood urea nitrogen (BUN) and creatinine.

AKI is diagnosed using blood urea, and serum creatinine levels, but serum creatinine is an unreliable indicator of kidney function during acute changes, as serum creatinine level can vary widely with age, gender, muscle mass, muscle metabolism, medications, and hydration status, another cause is that its concentration may not change until about 50% of kidney function has already been lost, at lower rates of glomerular filtration the amount of tubular secretion of creatinine results in overestimation of renal function, during acute changes in renal filtration, serum creatinine does not accurately depict kidney function until steady state equilibrium has been reached, which may require several days.

The application of innovative technologies such as functional genomics and proteomics to human and animal models of AKI had uncovered several novel biomarkers, such as; neutrophil gelatinase associated lipocalin (NGAL) which can be measured in blood and urine and was found to diagnose AKI 1-3days before serum creatinine is elevated. Urinary interleukin 18 (IL-18) was found to detect contrast induced nephropathy 24 hours before serum creatinine elevation. Kidney injury molecule 1 (KIM-1) level in renal transplant patients was found to correlate with the incidence of graft loss. Growth related oncogene alpha (GRO-α) was found to be elevated in renal transplant patients whose renal biopsy showed acute tubular necrosis. Alpha-1 microglobulin was

found to predict the need for renal replacement therapy in non-oliguric acute renal failure.

Key words: AKI, biomarkers, NGAL, IL-18, KIM-1, GRO-α, Alpha-1 microglobulin,, cystatin C, Fetuin-A, Meprin.

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ADQI	**The Acute Dialysis Quality initiative**
ADF	**Actin Depolymerizing factor**
AKI	**Acute Kidney injury**
ARF	**Acute Renal failure**
AUC	**Area Under the curve**
α-MSH	**Alpha Melanocyte -Stimulating Hormone**
CPB	**Cardio-Pulmonary Bypass**
CIN	**Contrast-Induced Nephropathy**
G-CSF	**Granulocyte-Colony Stimulating Factor**
GRO-α	**Growth Related Oncogene Alpha**
HRG	**Histidin- Rich Glycoprotein**
HSCs	**Hematopoietic Stem Cells**
ICAM-1	**Intercellular Adhesion Molecule 1**
IRI	**Ischemia Reperfusion Injury**
IL-I8	**Interleukin-18**
KIM-1	**Kidney Injury Molecule-1**
KNG	**Kininogen**
MIP-2	**Macrophage Inflammatory Protein-2**

MAP-II	**Monocyte-Activating polypeptide II**
MSCs	**Mesenchymal Stem Cells**
SIRS	**Systemic Inflammatory Response Syndrome**
THP	**Tamm-Horsfall Proteins**
TLR	**Toll Like Receptors**
TNF-α	**Tumor Necrotic Factor Alpha**
VCAM	**Vascular Cell Adhesion molecule**

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To My Father and Mother,,

My Husband,,

My Sister and brothers,,

& My Dear daughter

Thank you.....

INTRODUCTION

Acute kidney injury (AKI) is a term proposed to reflect the entire spectrum of acute renal failure (ARF), a complex disorder that occurs in a wide variety of settings with clinical manifestations ranging from a minimal elevation in serum creatinine to anuric renal failure **(Mehta et al., 2007)**.

AKI represents a significant but under-recognized problem in clinical medicine, with serious immediate and long term consequences; the incidence of AKI varies from 5% of hospitalized patients to 30 – 50% of patients in intensive care units **(Liangos et al., 2006)**.

Despite significant improvements in therapeutics, the mortality and morbidity associated with AKI remain high. A major reason for is the lack of early markers for AKI, and hence an unacceptable delay in initiating therapy **(Palevsky 2006).**

The application of innovative technologies such as functional genomics and proteomics to human and animal models of AKI had uncovered several novel biomarkers and therapeutic targets. These include the identification of biomarker panel in plasma, which include neutophil gelatinase-associated lipocalin