Incidence & Impact of Cardio-Renal Syndrome on Top of Acute Coronary Syndrome

Thesis

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By

Aya Gomaa Zakria Ahmed
M.B.B.Ch
Faculty of Medicine
Misr University for Science and Technology

Under Supervision of

Prof. Dr. Sherif Wadie Nashed
Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Ashraf El Sayed ELAgmy
Assist. Prof. of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Wael Abdelmoneim Mohamed
Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Faculty of Medicine – Ain Shams University
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List of Contents

List of Abbreviations

Abb.	Full term

ACEI ..... *Angiotensin converting enzyme inhibitors*
ACS ..... *Acute coronary syndrome*
ADHD ..... *Attention-deficit/hyperactivity disorder*
ADHF ..... *Acute decompensated heart failure*
ADQI ..... *Acute Dialysis Quality*
AF ..... *Atrial fibrillation*
AKI ..... *Acute kidney injury*
AKIN ..... *Acute Kidney Injury Network*
Alk Phos ..... *Alkaline phosphatase*
AMI ..... *Acute myocardial infarction*
ANOVA ..... *A one-way analysis of variance*
ANP ..... *Atrial natriuretic peptide*
ARBs ..... *Angiotensin II receptor blockers*
ARF ..... *Acute renal failure*
ATN ..... *Acute tubular necrosis*
AVP ..... *Arginine vasopressin*
CI ..... *Contrast induced*
CKD ..... *Chronic kidney disease*
CO ..... *Cardiac output*
Cr. ..... *Creatinine*
CRS ..... *Cardio-renal syndrome*
CSA- AKI ..... *Cardiac surgery-associated acute kidney injury*
CVP ..... *Central venous pressure*
eGFR ..... *Estimated glomerular filtration rate*
ESRD ..... *End-stage renal disease*
ET-1 ..... *Endothelin-1*
GFR ..... *Glomerular filtration rate*
GGT ..... *Glutamyl transferase*
GST ..... *Alpha/pi glutathione S-transferase*
HF ..... *Heart failure*
ICU ..... *Intensive care unit*

List of Abbreviations cont...

Abb.	Full term
IL	*Interleukin*
IL-18	*Interleukin-18*
KDIGO	*Kidney Disease: Improving Global Outcomes*
KIM-1	*Kidney injury molecule-1*
LDH	*Lactate dehydrogenase*
L-FAP	*L-type fatty acid protein*
LSD	*Least Significant Difference*
LV	*Left ventricular*
MDRD	*Modification of Diet in Renal Disease*
NAG	*N-acetyl-D-glucosaminidase*
NGAL	*Neutrophil gelatinase-associated lipocalin*
NO	*Nitric oxide*
PCI	*Percutaneous Coronary Intervention*
RAAS	*Renin–angiotensin-aldosterone system*
RIFLE	*Risk, Injury, Failure, Loss*
ROS	*Reactive oxygen species*
RRT	*Renal replacement therapy*
RV	*Right ventricular*
S.Cr.	*Serum creatinine*
SD	*Standard deviation*
SPSS	*Statistical package for social science*
STEMI	*ST-Elevation Myocardial Infarction*
UOP	*Urine output*

List of Tables

List of Tables cont...

Table No.	Title	Page No.

List of Figures

List of Figures cont...

List of Figures cont...

INTRODUCTION

Acute kidney injury (AKI) has a fatal impact on critically ill patients. Some researches reveal not only its impact on disease course in intensive care unit (ICU), but also its hazards on post-discharge course and even unplanned 90-day hospital readmission ***(Sawhney et al., 2017)***. Combined heart and kidney dysfunction is common ***(Dar and Cowie, 2008)***.

A disorder of one of these two organs often leads to dysfunction or injury to the other. This is the pathophysiological basis for the clinical entity defined cardio-renal syndrome (CRS). The CRS is more common than many clinicians realize ***(Davis and Virani, 2012).***

In 2008, the Acute Dialysis Quality Initiative (ADQI) Working Group proposed a consensus definition for CRS as: a complex pathophysiological disorder of the heart and kidneys whereby acute or chronic dysfunction in one organ may induce acute or chronic dysfunction in the other organ ***(Ronco, 2010).***

AIM OF THE WORK

- The primary objectives of our study are the incidence and impact of CRS-1 on top of ACS regarding course of the disease, length of stay in ICU and mortality.
- The secondary objectives are to determine the AKI predictors in ACS, persistent KI predictors, all cause-mortality predictors in ACS.

Chapter (1)

CARDIO-RENAL SYNDROMES: DEFINITIONS AND CLASSIFICATION

I. Introduction

In November 1913, Thomas Lewis from University College Hospital, London, delivered a lecture entitled "*Paroxysmal Dyspnoea in Cardio–Renal Patients*," in which he provided his clinical observations on patients with dyspnea related to advanced cardiac and renal disease, referred to as cardiac and uraemic asthma respectively. Over the past decades, there has been increasing evidence that a complex interplay exists between heart and kidney diseases ***(Sowers, 2011).*** This pathophysiological interaction between the heart and kidneys represents the basis for clinical entity called cardio-renal syndrome ***(Neki, 2015).*** An impairment in the function of one of them results in a dysfunction of or an injury to the other ***(Liang et al., 2008).*** The syndrome is characterized by the damage/ dysfunction induced to one of the two organs (heart or kidney) by an acute or chronic dysfunction of the other organ ***(Neki, 2015).*** CRS is assuming significance because of its increasing incidence, awareness and complications ***(Sahasranam, 2014).***

The coexistence of cardiac and renal disease significantly increases mortality, morbidity, complexity and cost of care

(Ronco et al., 2008). This relationship includes the vast array of interrelated derangements and, to stress, the bidirectional nature of heart-kidney interactions ***(Vijayaraghavan et al., 2014).***

The depth of knowledge and complexity of care necessary to offer best therapy to these patients demands a multidisciplinary approach, combining the expertise of cardiology, nephrology and critical care ***(Ronco et al., 2008).*** ***AS*** presented a definition and new classification of CRS with 5 types depending on the pathophysiology, the time-frame, and the nature of concomitant cardiac and renal dysfunction. A consensus conference was organized under the auspices of ADQI later on in 2008 to formulate and establish a definition and classifications for this syndrome ***(Ronco et al., 2010a)*** followed by another one in 2012 ***(McCullough et al., 2013).***

- **Historical Background & Definition**

Any definition should address key dimensions of the cardio-renal interaction: first, the primary failing organ, second, the interaction being unidirectional or bidirectional, third, the nature of the disease affecting the organs, fourth, the pathophysiological mechanism (hemodynamic versus non-hemodynamic) and, finally, the time course of development of the interaction (acute versus chronic). None of the following current definitions at this time addresses all of the dimensions ***(Braam et al., 2014).***

The term *cardio-renal syndrome* increasingly has been used without a consistent or well-accepted definition ***(Ronco et al., 2008)***. The inter-relationship between heart and kidneys has been studied and described under many terms such as: cardiorenal failure ***(Gil et al., 2005)***, worsening renal function ***(Goldberg et al., 2005)***, cardiorenal disease ***(Kalra et al., 2005),*** cardiorenal insufficiency, kidney-heart interactions ***(Berl et al., 2006),*** cardiorenal interactions ***(Nohria et al., 2008),*** cardiorenal dysfunction ***(Merhaut et al., 2010)*** and the increasingly used term, cardiorenal syndrome (CRS) ***(Tasic et al., 2016).***

Many other studies used the names of original cardiac diseases and renal diseases to describe the condition ***(Shacham et al., 2016).*** Many researchers studied heart–kidney interaction as a worsening renal functions due to ADHF e.g. ***(Forman et al., 2004),*** while others in case of acute ischemic heart or ACS e.g. ***(Neves et al., 2016).*** Those research works were not unified either in the "heart/kidney cross-talk" concept or definition or, even, kidney dysfunction terms or definition. The common view was that a relatively normal kidney is dysfunctional because of a diseased heart ***(Ronco et al., 2010).***

Advances in the definition and classification of CRS enabled the characterization of the complex organ crosstalk and have proposed specific preventive and therapeutic plans to control the end organ injury ***(Ronco et al., 2008).***