Furosemide Stress test in Assessment of Tubular Function in Acute Kidney Injury

Thesis

Submitted for partial fulfillment of the master degree of

Anesthesia, Intensive care and Pain Management

By:

Ahmed Mosad Hussien El Gendy

(M.B.B.Ch.) (Tanta University, 2012)

Prof. Omar Mohammed Taha Elsafty

Professor of Anesthesia, Intensive care and Pain Management

Faculty of Medicine, Ain Shams University

Dr. Sanaa Farag Wasfy

Lecturer of Anesthesia, Intensive care and Pain Management

Faculty of Medicine, Ain Shams University

Dr. Marwa Mostafa Mohamed

Lecturer of anesthesia , Intensive care and Pain Management

Faculty of Medicine, Ain Shams University

Faculty of Medicine

Ain Shams University

2018

﴿وَقُل رَّبِّ زِدْنِي عِلْماً﴾

سورة طـــه الآيـــــه رقم ١١٤

Acknowledgement

First of all, all gratitude is due to **God** *almighty for blessing this work, until it has reached its end, as a part of his generous help, throughout my life.*

Really I can hardly find the words to express my gratitude to **Prof. Omar Mohammed Taha Elsafty**, *Professor of Anesthesia, Intensive care and Pain Management faculty of medicine, Ain Shams University, for his supervision, continuous help, encouragement throughout this work and tremendous effort he has done in the meticulous revision of the whole work. It is a great honor to work under his guidance and supervision.*

I would like also to express my sincere appreciation and gratitude to **Dr. Sanaa Farag Wasfy,** Lecturer of Anesthesia, Intensive care and Pain Management, faculty of medicine , Ain Shams University, *for his continuous directions and support throughout the whole work.*

Really I can hardly find the words to express my gratitude to **Dr. Marwa Mostafa Mohamed,** *Lecturer of anesthesia , Intensive care and Pain Management, Faculty of Medicine, Ain Shams University for his continuous directions and meticulous revision throughout the whole work. I really appreciate their patience and support.*

Last but not least, I dedicate this work to my family, whom without their sincere emotional support, pushing me forward this work would not have ever been completed.

Ahmed Mosad Hussien El Gendy

Contents

List of Abbreviations

`	Angitensin converting enzyme inhibitors
ADQI	Acute dialysis quality initiative
AKI	Acute kidney injury
AKIN	Acute kidney injury network
ANA	Anti nuclear anti body
ANCA	Anti neutrophil cytoplasmic antibody
ANTI GBM	Anti Glomerular basement membrane
APACHI II	Acute physiology and chronic health evaluation version III scoring system
ARDS	Acute respiratory distress syndrome
ARF	Acute renal failure
ASO	Anti streptolysin
ATN	Acute tubular necrosis
BP	Blood pressure
BUN	Blood Urea Nitrogen
Ca	Calcium
CIN	Contrast induced nephropathy
CKD	Chronic kidney disease
CL	Chloride
CT scanning	Computed tomography scanning
CVP	Central venous pressure
Cy C	Cystatin C

List of Abbreviations (Cont.)

ESRD	End stage renal disease
FENa	Fractional excretion of sodium
FEUrea	Fractional excretion of urea
FST	Furosemide stress test
FST	Furosemide stress test
GFR	Glomerular filtration rate
GI	Gastro intestinal system
H	Hydrogen
HCO3	Hydrogen bicarbonate
HR	Heart rate
Hr	Hour
HUS	Hemolytic Uremic syndrome
ICU	Intensive care unit
IN	Inulin
K	Potassium ion
KDIGO	Kidney disease improving global outcome
KFT	Kidney function test
KG	Kilogram
LDH	Lactate de hydrogenase
L-FABP	Liver-type fatty acid binding protein
Mg	Magnesium
ML	Mill liter
Na	Sodium ion

List of Abbreviations (Cont.)

NAC	N-acetyl cysteine
NGAL	Nuetrophil gelatinase-Associated lipocalin
NSAIDs	Non steroidal anti inflammatory drugs
P value	Probability value
PET	Torn emission tomography
RBCs	Red blood cells
RCT	Randomized controlled trial
RRT	Renal replacement therapy
SCr	Serum creatinine
SD	Standard deviation
SOFA	Sequential organ failure assessment score
TAL	Thin part of ascending loop of henle
TTP	Thrombotic thrombocytopenic purpura
UOP	Urine output
WBCs	White blood cells

List of Tables

List of Tables (Cont.)

List of figures:

List of figures (Cont.)

Abstract

Introduction*:* Acute kidney injury is well recognized for its impact on the outcome of patients admitted to the intensive care unit (ICU).
The pursuit of improved biomarkers for the early diagnosis of AKI and its outcomes is an area of intense contemporary research; recent studies have demonstrated the utility of FST dose for predicting the severity of AKI, and possibility of administration as a treatment for AKIN I&II.
Methodology:Our study was conducted on eighty consecutive patients in the general ICU of Nasser institute Hospital from september 2017 till february 2018.
Forty of our patients received FST dose while the other forty patients received standard management of AKIN I, II.
Any patient who develops acute kidney injury grade I – Π according to (AKIN) will be subjected to: History taking including (co-morbidity – drug intake), clinical examination., Kidney function tests (KFT) daily, estimated glomerular filtration rate GFR, Potassium, magnesium, sodium and phosphorus follow up daily for three days ., Hemodynamic monitoring (heart rate HR, mean blood pressure BP, central venous pressure measurement CVP within six hours after inclusion, urine output per hour UOP/6hour).
Results:In first 6 hours, there was a statistically significant increase in urine output in group I after 1^{st}&2^{nd} hours (p value= 0.026, 0.008 respectively), as well as cumulative UOP over 6 hours (P value =0.003),as compared to group II, Cut off point as regards UOP for detection of progress to AKINIII& dialysis was found to be 325ml in both group with sensitivity 86.7 %, specificity 68% in group I and sensitivity 95%, 95%specificity in group II. There was a highly significant difference between the two groups concerning hypotension with 11 patients in group I vs. none in group II with P value =0.001,and there was no significance difference between both groups concerning progression to AKIN III& dialysis with P value =0.260,and there was no significance difference between the two groups concerning length of ICU stay with P value =0.621,and according to mortality there was no significance difference between the two group with P value =0.201.UOP in non progressed patients was higher than progressed patients in group I P value0.001.
Conclusion: Furosemide stress test is a good predictor of severity of tubular damage in early stages of acute kidney injury with no additional privilege over standard management in the treatment of AKI.
Key words:
AKI-Furosemide-Dialysis

Introduction

Acute kidney injury (AKI) refers to an abrupt decrease in kidney function, resulting in the retention of urea and other nitrogenous waste products and in the dysregulation of extracellular volume and electrolytes **(Alderson P et al., 2000)**

Acute kidney injury (AKI) is a common complication of critical illness, seven to ten percent of intensive care units patients present with AKI during their ICU stay. An early detection of adult patients with acute kidney injury may provide the opportunity to treat and prevent the extension of kidney injury **(Akriviadis E et al., 2000)**.

Acute kidney injury can be staged by AKIN criteria into three stages using serum creatinine and urine output **(Andriessen P et al., 2009*)***.

Because serum creatinine and oliguria are often late signs of significant acute kidney injury (AKI), more sensitive diagnostic tests are required. This clinical need has led to the development of multiple candidate acute

kidney injury (AKI) biomarkers **(Bagshaw S M et al., 2008)**

Clinicians have access to limited tools that predict which patients with early AKI will progress to more severe stages. In early AKI, urine output after a furosemide stress test (FST), which involves intravenous administration of furosemide (1.0 or 1.5 mg/kg), can predict the development of stage 3 AKI. **(Uchino S et al., 2005)**

Patients who develop acute kidney injury (AKI) often require renal replacement therapy (RRT), however clinicians often disagree about the optimal timing of the initiation of renal replacement therapy (RRT) **(Bagga A et al., 2007)**

Aim of the work

The Aim of our study is to evaluate the role of furosemide stress test in assessment of tubular function in acute kidney injury