Acute kidney injury in ICU patients, relation with intra-abdominal hypertension

Thesis

Submitted for Partial Fulfillment of Master Degree
in **Internal Medicine**

By

Hanan Mohamed Fouad Eid Mohamed
M.B.B.Ch
Faculty of medicine -Ain Shams University

Under Supervision of

Prof. Dr. Sabry Abd El Aziz Gohar
Professor of Internal Medicine and Nephrology
Faculty of Medicine – Ain Shams University

Assist. Prof. Dr. Hayam Mohamed Aref
Assistant Professor of Internal Medicine and Nephrology
Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
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Contents

List of Abbreviations

ACEIs	Angiotensin-Converting Enzyme Inhibitors
ACS	Abdominal Compartment Syndrome
ADH	Antidiuretic Hormone
ADQI	Acute Dialysis Quality Initiative
AKI	Acute Kidney Injury
AKIN	Acute Kidney Injury Network
ALT	Alanine Transferase
ANCA	Anti-Neutrophil Cytoplasmic Antibody
APP	Abdominal Perfusion Pressure
ARBs	Angiotensin II Receptor Blocker.
ARF	Acute Renal Failure
ATIN	Acute Tubulointerstitial nephritis
ATN	Acute Tubular Necrosis
BUN	Blood Urea Nitrogen
CBC	Complete Blood Count
CGN	Crescentic Glomerulonephritis
CNS	Central nervous system
CrCl	Creatinine Clearance
CRRT	Continuous Renal Replacement Therapy
CT	Computed Tomography
DIC	Disseminated Intravascular Coagulopathy

FENa	fractional excretion of sodium
FG	Filtration Gradient
GBM	Glomerular Basement Membrane
GFR	Glomerular Filtration Rate
GN	Glomerulonephritis
Gro-α	Human Growth-Related Oncogene-α
HES	Hydroxyl-Ethyl Starch
HSP	Henoch-Schonlein Purpura
HUS	Hemolytic Uremic Syndrome
IAH	Intra-abdominal Hypertension
IAP	Intra-abdominal Pressure
ICNARC	Intensive Care National Audit and Research Centre
ICU	Intensive Care Unit
IL-18	Interleukin 18
IVP	Intra-vesical pressure
KC	Keratinocyte-derived chemokine
KDIGO	Kidney Diseases Improving Global Outcomes
KIM-1	Kidney Injury Molecule-1
KUB	Kidneys, ureter bladder
LDH	Lactate Dehydrogenase
MAP	Mean arterial blood pressure
MCP-1	Monocyte chemo attractant protein-1

MM	Multiple Myeloma
MRA	Magnetic Resonance Angiography
MPGN	Membrano-Proliferative Glomerulonephritis
NGAL	Neutrophil Gelatinin-Associated Lipocalin
NHE3	The sodium/hydrogen exchanged isoform 3
NKCC2	Sodium/potassium chloride cotransporter
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
NV	Necrotizing Vasculitis
PG	Prostaglandin
PIGN	Postinfectious Glomerulonephritis
PSGN	Post-Streptococcal Glomerulonephritis
RPGN	Rapid Progressive Glomerulonephritis
RRT	Renal Replacement Therapy
SCr	Serum Creatinine
SIRS	Systemic Inflammatory Response Syndrome
SLE	Systemic Lupus Erythematosus
SPSS	Statistical Package for Special Science
TMA	Thrombotic Microangiopathy
TTP	Thrombotic Thrombocytopenic Purpura
UO	Urine Output
WHO	World Health Organization
WSACS	World Society of the Abdominal Compartment Syndrome

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Dr. Hayam Mohamed Aref
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Faculty of Medicine – Ain Shams University

Faculty of Medicine
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2011

Introduction

Once considered mostly a post-surgical condition, intra-abdominal hypertension (IAH) and the abdominal compartment syndrome (ACS) are now thought to increase morbidity and mortality in many patients receiving medical or surgical intensive care. Animal data and human observational studies indicate that oliguria and acute kidney injury are early and frequent consequences of IAH/ACS and can be present at relatively low levels of IAP. Among medical patients at particular risk are those with septic shock and severe acute pancreatitis, but the adverse effects of IAH may also be seen in cardiorenal and hepatorenal syndromes. Factors predisposing to IAH/ACS include sepsis, large volume fluid resuscitation, polytransfusion, mechanical ventilation with high intrathoracic pressure, and acidosis, among others.(4)

Physical examination, with sensitivity of 40 to 60.9%, is unreliable for diagnosing IAH/ACS.(8)

Although a variety of direct and indirect techniques for measuring IAP have been developed and validated over the years,(9) transduction of urinary bladder pressure through an indwelling urinary catheter remains

the gold standard for measuring and monitoring IAP. The bladder pressure method has been shown when performed appropriately to strongly correlate with IAP measured directly, (1) while remaining cost-effective and safe, without any increased risk of catheter-associated urinary tract infection.(2)

In many institutions, screening patients at risk of developing IAH and serial monitoring of IAP every 4 to 6 hours is common practice.(3)

Several non-surgical methods can help reduce IAP. The role of renal replacement therapy for volume management is not well defined but may be beneficial in some cases. IAH/ACS is an important possible cause of acute renal failure in critically ill patients and screening may benefit those at increased risk.(4)

In recent years both IAH and ACS —the severe, advanced stage of IAH characterized by organ system failure— have increasingly been associated with morbidity and mortality in critically ill patients. (6)

Although multiorgan failure is also well recognized in ACS, what is much less appreciated and what some recent data suggest is that kidneys may be particularly at risk with much lower levels of IAP than would be seen in fully established ACS. These findings indicate that acute renal failure (ARF) resulting, at least in part, from lesser degrees of IAH may be present in a much larger population of critically ill patients than believed previously. (7)