
سورة البقرة الآية: ٣٢

# Renal Replacement therapy for Septic Shock Patients in Intensive Care Unit

Thesis
Submitted for the Partial Fulfillment of
Master Degree
In Intensive Care Medicine

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2013

# العلاج الكلوي التعويضي لمرضي الصدمة التسممية بوحدة الرعاية المركزة

رسالة

توطئة للحصول عل/ى درجة الماجستير
فى الرعاية المركزة

**مقدمة من**

طبيب / رامي فاروق بسالي سلمون

*بكالوريوس الطب والجراحة- جامعه مصر للعلوم والتكنولوجيا 2009*

**تحت إشراف**

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٢٠١3

# Acknowledgement

*First thanks to ALLAH to whom I relate any success in achieving any work in my life.*

*I wish to express my deepest thanks, gratitude and appreciation to Prof. Dr. Sherif Wadie Nashed, Professor of Anesthesia and Intensive Care for his meticulous supervision, kind guidance, valuable instructions and generous help.*

*Special thanks are due to Dr. Mayar Hassan El-Sersi, Lecturer of Anesthesia and Intensive Care for her sincere efforts, fruitful encouragement.*

*I am deeply thankful to Dr. Milad Ragaey Zekry, Lecturer of Anesthesia and Intensive Care for his great help, outstanding support, active participation and guidance.*

*Finally, I would like to thank, my beloved Mother and my great Father to whom I owe everything I ever did in my life and will achieve.*

*Ramy Farouk*

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# List of Abbreviations

| Abb. | Full term |
|---|---|
| *ACEI* | *: Angiotensin converting enzyme inhibitor.* |
| *ADH* | *: Antidiuretic hormone.* |
| *ADQI* | *: Acute Dialysis Quality Initiative.* |
| *AII* | *: Angiotensin II* |
| *AKI* | *: Acute kidney injury.* |
| *AKIN* | *: Acute Kidney Injury Network.* |
| *ANP* | *: Atrial natriuretic peptide.* |
| *APACHE II* | *: Acute physiology and chronic health evaluation II.* |
| *aPTT* | *: Activated Partial Thromboplastin Time* |
| *ARF* | *: Acute renal failure* |
| *ATN* | *: Acute tubular necrosis.* |
| *ATP* | *: Adenosine triphosphate.* |
| *BUN* | *: Blood urea nitrogen.* |
| $C_3$ | *: Complement component.* |
| *CARS* | *: Counter snit-inflammatory response.* |
| *CAVH* | *: Continousarteriovenous hemofiltration.* |
| *CAVHD* | *: Continuous arteriovenoushaemodialysis.* |
| *CAVHDF* | *: Continuous arteriovenoushaemodiafiltration.* |
| *CDA* | *: Cellulose diacetate.* |
| *CGMP* | *: Cyclic guanosine monophosphate.* |
| *CPFA* | *: Coupled plasmafiltration adsorption.* |
| *CRRT* | *: Continous renal replacement therapy.* |

# List of Abbreviations (Cont...)

| Abb. | Full term |
|---|---|
| *CSS* | *: Churg strauss syndrome.* |
| *CT* | *: Computed tomography.* |
| *CTA* | *: Cellulose triacetate.* |
| *CVA* | *: Costovertebral angle.* |
| *CVP* | *: Central venous pressue.* |
| *CVVH* | *: Continousvenovenous hemofiltration.* |
| *CVVHD* | *: Continuous venovenoushaemodialysis.* |
| *CVVHDF* | *: Continuous venovenoushaemodiafiltration.* |
| *DAMP* | *: Damage-associated molecular patterns.* |
| *DCT* | *: Distal convoluted tubule.* |
| *DEAE* | *: Diethylaminoethyl.* |
| *DIC* | *: Disseminated intravascular coagulation.* |
| *ECF* | *: ECF* |
| *ESKD* | *: End stage kidney disease.* |
| *EVAL* | *: Ethylene vinyl alcohol.* |
| *GFR* | *: Glomerular filtration rate.* |
| *HCO* | *: High cut- offhemofiltration* |
| *HFHF* | *: High flux hemofiltration.* |
| *HPHF* | *: High permeability hemofiltration.* |
| *HUS* | *: Hemolytic-uremic syndrome.* |
| *HVHF* | *: High volume haemofiltration.* |
| *ICAM* | *: Intercellular Adhesion Molecule.* |

# List of Abbreviations (Cont...)

| Abb. | Full term |
|---|---|
| *ICU* | *: Intensive care unit.* |
| *IHD* | *: Intermittent hemodialysis.* |
| *IL* | *: Interleukin.* |
| *INOS* | *: InducibleNitric Oxide synthase.* |
| *JGA* | *: Juxtaglomerular apparatus.* |
| *KDIGO* | *: Kidney Disease Improving Global Outcomes.* |
| *Kt/V* | *: Clearance of the solute multiplied by time (t) / volume of distribution of the solute.* |
| *LDH* | *: Lactate dehydrogenase.* |
| *LMW* | *: Low-molecular-weight* |
| *LPB* | *: Lipo-polysaccharidebinding protein.* |
| *LPS* | *: Lipo-polysaccharide.* |
| *MAC* | *: Membrane attack complex.* |
| *MAMP* | *: Microbial-associated molecular patterns.* |
| *MODS* | *: Multiple organ dysfunction syndrome.* |
| *NADPH* | *: Nicotinamide adenine dinucleotide phosphate.* |
| *NO* | *: Nitrous oxide.* |
| *NOD-LRR* | *: Nucleotide oligomerization domain leucine-rich repeat.* |
| *NSAIDs* | *: Non-steroidal anti-inflammatory drugs.* |
| *PAF* | *: Platelet activating factor.* |
| *PAI* | *: Plasminogen activator inhibitors.* |
| *PCT* | *: Proximal convoluted tubule.* |
| *PD* | *: Peritoneal dialysis.* |
| *PPR* | *: Pattern recognition receptors.* |

# List of Abbreviations (Cont...)

| Abb. | Full term |
|---|---|
| *PVP* | *: Polyvinylpyrrolidone.* |
| *RAAS* | *: Renin-angiotensin-aldosterone axis.* |
| *RBF* | *: Renal blood flow.* |
| *RIFLE* | *: Risk, Injury, Failure, Loss and End stage kidney disease.* |
| *RIG-I* | *: Retinoicacid-Inducible gene.* |
| *RLHs* | *: Retinoicacid--like helicases.* |
| *RNOS* | *: Reactive Nitric Oxide species.* |
| *RNS* | *: Reactive Nitric species* |
| *ROS* | *: Reactive Oxide species* |
| *RRT* | *: Renal replacement therapy.* |
| *SCUF* | *: Slow continuous ultrafiltration.* |
| *SIRS* | *: Systemic inflammatory response syndrome.* |
| *SLED* | *: Sustained low efficiency dialysis.* |
| *SMC* | *: Synthetically modifyed cellulose.* |
| *TCR* | *: T-cell receptor.* |
| *TH-CELL* | *: T Helper cell.* |
| *TLR* | *: Tolllikereceptor.* |
| *TNF-α* | *: Tumor necrosis factor.* |
| *TPA* | *: Tissue plasminogen activator.* |
| *TTP* | *: Thrombotic thrombocytopenic purpura.* |
| *UF* | *: Ultrafiltration.* |
| *UO* | *: Urine output.* |
| *VA/NIH* | *: Veterans Affairs and National Institutes of Health.* |
| *VACM* | *: Vascular cell adhesion molecule.* |
| *VO2* | *: Volume of oxygen consumption.* |

# Introduction

The kidney is a common "victim organ" of various insults in critically ill patients. Sepsis and septic shock are the dominant causes of acute kidney injury, accounting for nearly 50 % of episodes of acute renal failure ***(Schrier and Wang, 2004).***

The epidemiology of severe acute renal failure has dramatically changed in the past decade. Its leading cause is sepsis and the syndrome develops mostly in the intensive care unit as part of multiple organ dysfunction syndromes ***(Ronco, 2006).***

Acute kidney injury (AKI), formerly known as "acute renal failure," has been traditionally described as a rapid (ranging from hours to weeks, to less than 3 months) decrease in kidney function as measured by increases in serum creatinine. While Acute Kidney Injury Network (AKIN) defined it more precisely as "An abrupt (within 48 hours) reduction in kidney function, It is usually associated with a decrease in glomerular filtration rate (GFR), a marked decrease in urine output or anuria and azotemia ***(Joseph et al., 2011).***

Clinical syndrome of acute kidney injury (AKI) encompasses the entire spectrum of renal function alterations, ranging from minor modifications to the requirement of renal replacement therapy (RRT) ***(Kellum et al., 2008).***

Sepsis is complex syndrome resulting from the response of an organism to overwhelming infection with cytokine release, activation of pro- and anti-inflammatory pathways, immunological dysregulation, coagulation and endothelial activation and usually leads to multiorgan dysfunction which is condition characterized by simultaneous renal, cardiovascular and pulmonary dysfunction, and an independent predictor of mortality ***(Chvojka et al., 2010).***

There is no doubt that the best measure for preventing (ARF) in patient at the risk of developing (MOF) is timely and adequate resuscitation. The introduction of hemodialysis for the treatment of severe (ARF) lowered the mortality rate from greater than 90% to approximately 50%. The widespread availability of continuous renal replacement therapies (CRRT) has led to a growing interest in its use for the possible removal of pro inflammatory cytokines in sepsis, in addition to its use in volume and urea clearance, Delivered dose of (RRT) may have an impact on survival ***(Jennifer and Jonathan, 2005).***

During the Acute stage of sepsis – induced (ARF), Renal replacement therapy (RRT) is the mainstay of therapy. Adequacy of dialysis is likely to be linked to better outcome. Various modalities of (RRT) are available. Continuous (RRT) using convective methods are preferred in sepsis-induced (ARF), especially in