Comparison of CRP and Procalcitonin During the Course of Sepsis in ICU

Thesis

Submitted For Partial Fulfillment of Master Degree in

Intensive Care

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2017

﴿وَقُل رَّبِّ زِدْنِي عِلْماً﴾

سورة طـه الآيــه 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 **Dr. Mohammed Saeed Abd El-Aziz**, *Professor of Anesthesiology, 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. Wael Ahmed Abd El-Aal**, *Assistant Professor of Anesthesiology, 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. Diaa El-Din Shalaby Alawady,** *Lecturer of Anesthesiology, 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.

Contents

List of Abbreviations

ACCP	:	American College of Chest Physicians
ADM	:	During inflammation and infections. Adrenomedullin
ARDS	:	Acute respiratory distress syndrome
CDI	:	Clinically-documented infection
CO_2	:	Carbon dioxide
CRP	:	C-reactive protein
ED	:	Emergency department
HMGB1	:	High-mobility group box 1 protein
HMGB1	:	High-mobility group box 1
HR	:	Heart Rate
ICU	:	Intensive care unit
IFN-γ	:	Interferon-gamma
IL	:	Interleukin
LBP	:	Lipopolysaccharide-binding protein
MDI	:	Microbiologically documented infection
MIF	:	Macrophage migration inhibitory factor
MRSA	:	Methicillin-resistant S aureus
PAMP	:	Pathogen associated molecular patterns
PCT	:	Procalcitonin
PRR	:	Pattern recognition receptors
RR	:	Respiratory Rate

List of Abbreviations(Cont.)

SCCM	:	Society of Critical Care Medicine
SCLC	:	Small cell lung cancer
SIRS	:	Systemic inflammatory response syndrome
SIRS	:	Systemic inflammatory response syndrome
SOFA	:	Sequential Organ Failure Assessment
SOFA	:	Sequential Organ Failure Assessment
SOFA	:	Sequential organ failure assessment
TLC	:	Total leukocytic count
TNF	:	Including tumor necrosis factor
uPAR L	:	Urokinase plasminogen activator receptor
VRE	:	Vancomycin-resistant enterococci

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ABSTRACT

Comparison of CRP and Procalcitonin During the Course of Sepsis in ICU

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Introduction:

Severe sepsis is the most common cause of death for patients admitted to the critical care units. Sepsis is a multifaceted host response to an infecting pathogen that may be significantly amplified by endogenous factors. Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. This emphasizes the primacy of the non-homeostatic host-response to infection, the potential lethality that is considerably in excess of a straightforward infection, and the need for urgent recognition. **Patients and Methods:** ***Group A:*** Included 20 patients who have sepsis and the CRP level will be detected in those who have signs of clinical cure from sepsis. ***Group B:*** Included 20 patients who have sepsis and the Procalcitonin level will be detected in those who have signs of clinical cure from sepsis. Inclusion criteria: Criticaly ill patients aged 18-70 years old diagnosed to have sepsis, Patients staying one weak or more in the ICU Results: This is randomized controlled study conducted on 40 patients admitted to the intensive care unit of Ain Shams University Hospital with signs and symptoms of sepsis. Patients will be classified into two groups: Group A: Included 20 patients who have sepsis and the CRP levels were detected in those who have signs of clinical cure. Group B: Included 20 patients who have sepsis and the Procalcitonin levels were detected in those with signs of clinical cure. **Conclusion**: This study shows that the CRP and procalcitonin are highly sensitive markers for the diagnosis of sepsis but only procalcitonin can be used as prognostic marker in sepsis.

Key words: ACCP: American College of Chest Physicians; ADM: During inflammation and infections. Adrenomedullin; ARDS: Acute respiratory distress syndrome; CDI: Clinically-documented infection; CO_2: Carbon dioxide.

Introduction

Severe sepsis is the most common cause of death for patients admitted to the critical care units ***(Farag et al., 2013)***.

Sepsis is a multifaceted host response to an infecting pathogen that may be significantly amplified by endogenous factors ***(Wiersinga et al., 2014)***. Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. This emphasizes the primacy of the non-homeostatic host-response to infection, the potential lethality that is considerably in excess of a straightforward infection, and the need for urgent recognition ***(Singer et al., 2016)***.

Sepsis, the inflammatory response to infection, affects millions of patients worldwide. However, its effect on overall hospital mortality has not been measured ***(Liu et al., 2013)***.

Sepsis, a syndrome of physiologic, pathologic, and biochemical abnormalities induced by infection, is a major public health concern in USA. The reported incidence of sepsis is increasing ***(Gaieski et al., 2013)***, likely reflecting aging populations with more co-morbidities, greater recognition ***(Dellinger et al., 2013)***. Although the true incidence is unknown, conservative estimates indicate that

sepsis is a leading cause of mortality and critical illness worldwide ***(Fleischmann et al., 2015)***.

Severity of organ dysfunction has been assessed with various scoring systems that quantify abnormalities according to clinical findings, laboratory data, or therapeutic interventions. The predominant score in current use is the Sequential Organ Failure Assessment (SOFA) ***(Kaukonen et al., 2015)***.

Nonspecific SIRS criteria such as pyrexia or neutrophilia will continue to aid in the general diagnosis of infection. These findings complement features of specific infections (e.g.; rash, lung consolidation, dysuria, peritonitis) that focus attention toward the likely anatomical source and infecting organism. Sepsis involves organ dysfunction, indicating a pathobiology more complex than infection plus an accompanying inflammatory response alone ***(Cecconi et al., 2014)***.

Early recognition of sepsis is not always straightforward and clinical signs at presentation can be misleading and very heterogeneous due to frequent comorbidities. In the emergency setting therefore an urgent need for a reliable diagnostic procedure, allowing early discrimination between SIRS and sepsis, is mandatory. Biomarkers, such as C-reactive protein (CRP) and

procalcitonin (PCT), introduced among the diagnostic criteria of sepsis ***(Dellinger et al., 2013)***, could contribute to promptly identify patients affected by sepsis, severe sepsis and septic shock who could benefit from quick and appropriate therapy. C-reactive protein is one of the commonest biomarkers that are used during the management of sepsis. It was seen by some researchers to be significantly higher in sepsis patients compared to non-infectious SIRS ***(El-Shafie et al., 2017)***.

C-reactive protein production is a part of a larger picture of the acute phase response. This is principally regulated by the cytokines IL-6, Tumor necrosis factor alpha (TNF-α), and IL-1βare also regulatory mediators of CRP synthesis. C-reactive protein is directly involved in clearance of microorganisms. It causes activation of neutrophils and enhances NK cell activity ***(Farag et al., 2013)***.

Procalcitonin is a well-established biomarker for the identification of septic complications, with a sensitivity of approximately 77% and a specificity of approximately 79%. However, the results of clinical studies are heterogeneous, and the use of hemo-cultures as a gold standard for the diagnosis of sepsis may overestimate the role of procalcitonin due to the well-known false negativity

of the hemo-cultures. Therefore, guidelines recommend the cautious use of procalcitonin with regard to clinical and other laboratory data ***(Cohn, 2014)***.

Inflammatory biomarkers commonly used in clinical practice (CRP; PCT) are influenced by nonspecific systemic inflammatory responses, which are mediated by the innate immune response. Therefore, it is recommended that multiple biomarkers should be evaluated simultaneously (multimarker strategy) and that plasma concentrations of these biomarkers should be determined repeatedly. Many potential biomarkers have been tested as diagnostic and prognostic tools for the management of antimicrobial therapy in septic patients ***(Franeková et al., 2017)***.