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Evaluation of Cardiac Troponin I as a Predictor of Outcome of Sepsis in Critically Ill Patients

Thesis Submitted For Partial Fulfillment of Master Degree
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List of Abbreviations

Abb.	Full Term
ACS	Acute coronary syndromes
AKI	Acute kidney injury
APACHE	Acute Physiology and Chronic Health Evaluation
ARDS	Acute respiratory distress syndrome
ATP	Adenosine triphosphate
cTnI	Cardiac troponin I
ECG	Electrocardiogram
ESICM	European Society of Intensive Care Medicine
FiO_2	Fraction of inspired oxygen
GCS	Glasco-coma-scale
ICU	Intensive care unit
MAP	Mean arterial pressure
MEDS	The Mortality in Emergency Department Sepsis
MI	Myocardial infarction
PAMPs	Pathogen-associated molecular patterns
PRRs	Pattern recognition receptors
qSOFA	Quick Sequential Organ Failure Assessment
RR	Respiratory rate
SBP	Systolic blood pressure
SCCM	Society of Critical Care Medicine
SIMD	Sepsis-induced myocardial dysfunction
SIRS	Systemic inflammatory response syndrome
SOFA	Sequential organ failure assessment
TH1	T helper cell 1
TH2	T helper cell 2
TTE	Transthoracic echocardiography
WHO	World Health Organization

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ABSTRACT

Background: Sepsis and septic shock are the most common causes of morbidity and mortality in intensive care units in the United States. The cardiovascular abnormalities associated with septic shock, in large part, account for the life-threatening nature of the syndrome. Cardiac troponin I (cTnI) has been shown to be an indicator of myocardial injury and is an accepted prognostic factor of myocardial infarction (MI).

Aim of Study: To study the prognostic value of cTnI on mortality and adverse complications in patients with sepsis and septic shock.and to study the relation of cTnI with ICU scoring system (SOFA).

Patients and Methods: This is a comparative cross sectional study, was conducted at Intensive care unit (ICU) at Ain Shams University Hospitals and El Matria Teaching Hospital, on 70 patients with suspected infection who were aged between 18 and 70 years old, over the period of six months from November 2019 to April 2020.

Results: Finally, as regard relation between outcome and 1st sample cTnI in each group; the study on the hand revealed that there was no statistical significant difference between outcome and 1st sample cTnI in Group with positive cTnI, Group II with non-elevated cardiac troponin I.

Conclusion: Based on our results we recommend for further studies in larger patients and longer period of follow up to emphasize our conclusion. Sepsis patients with high cTnI levels are usually more critically ill while had the same chance to adverse outcome and less mortality and cTnI level is not a predicator of mortality, further studies in larger patient populations must establish whether elevated troponin may be used as an independent mortality risk factor for intensive care patients without ACS.

Keywords: Intensive care unit, myocardial infarction, Cardiac troponin I.

Introduction

Sepsis is a life-threatening condition that arises when the body's response to infection causes injury to its own tissues and organs **(Singer et al., 2016).**

"septicemia", also spelled "septicaemia", and "blood poisoning" referred to the microorganisms or their toxins in the blood and are no longer commonly used. The modern term for this is bacteremia **(Angus and van der Poll, 2013).**

Systemic inflammatory response syndrome (SIRS) (criteria had been used to define sepsis. If the SIRS criteria are negative, it is very unlikely the person has sepsis; if it is positive, there is just a moderate probability that the person has sepsis. According to SIRS, there were different levels of sepsis: sepsis, severe sepsis, and septic shock **(Kaukonen et al., 2015).**

SIRS is the presence of two or more of the following: abnormal body temperature, heart rate, respiratory rate, or blood gas, and white blood cell count.

Sepsis is defined as SIRS in response to an infectious process **(Soong & Soni, 2012).**

In 2016 a new consensus was reached to replace screening by systemic inflammatory response syndrome (SIRS) with the sequential organ failure assessment score (SOFA score). The sequential organ failure assessment score (SOFA score), previously known as the sepsis-related organ failure assessment score, is used to track a person's status during the stay in an intensive care unit (ICU) to determine the extent of a person's organ function or rate of failure. The score is based on six different scores, one each for the respiratory, cardiovascular, hepatic, coagulation, renal and neurological systems **(Singer et al., 2016).**

Sepsis is the leading cause of death in the non-coronary intensive care unit (ICU) and the10thleading cause of death overall **(Sands et al., 2007).**

Cardiac troponin I (cTnI) has been shown to be an indicator of myocardial injury and is an accepted prognostic factor of myocardial infarction (MI) **(Fromm, 2007).**

Although cTnI is cardiac-specific, its release seems not to be limited to cardiac-related events, but is also detectable in other critical clinical conditions, such as trauma, pulmonary embolism, and septic shock **(Mehta et al., 2004).**

Troponin release in this population occurs in the absence of flow-limiting coronary artery disease, suggesting the presence of mechanisms other than thrombotic coronary artery occlusion, probably a transient loss in membrane integrity with subsequent troponin release or microvascular thrombotic injury **(Minino et al., 2007).**

Aim of the Work

To study the prognostic value of cTnI on mortality and adverse complications in patients with sepsis and septic shock.and to study the relation of cTnI with ICU scoring system (SOFA).

Chapter: One

Sepsis

Definition

An international task force with 19 participants was convened by the Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM) to revise the current sepsis and septic shock definitions. Using an expert Delphi consensus process, this group developed the new Sepsis-3 definitions **(Singer et al., 2016).**

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. The clinical criteria for sepsis include suspected or documented infection and an acute increase of two or more Sequential Organ Failure Assessment (SOFA) points as a proxy for organ dysfunction. Septic shock is defined as a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to increase mortality substantially. Septic shock is defined by the clinical criteria of sepsis and vasopressor therapy needed to elevate mean arterial pressure ≥65 mm Hg and lactate >2 mmol/L (18 mg/dL) despite adequate fluid resuscitation **(Napolitano, 2018).**

- **Epidemiology**

Sepsis causes millions of deaths globally each year and is the most common cause of death in people who have been hospitalized **(Deutschman & Tracey, 2014).**

The worldwide incidence of sepsis is estimated to be 18 million cases per year. In the United States sepsis affects approximately 3 in 1,000 people, and severe sepsis contributes to more than 200,000 deaths per year.[Sepsis occurs in 1–2% of all hospitalizations and accounts for as much as 25% of ICU bed utilization. Due to it rarely being reported as a primary diagnosis (often being a complication of cancer or other illness), the incidence, mortality, and morbidity rates of sepsis are likely underestimated **(Lyle et al., 2014)**.

The incidence rate is particularly high among infants, with the incidence of 500 cases per 100,000 populations. Mortality related to sepsis increases with age, from less than 10% in the age group of 3 to 5 years to 60% by sixth decade of life. The increase in average age of the population, alongside the presence of more people with chronic diseases or on immunosuppressive medications, and also the increase in the number of invasive procedures