

Comparison between N-terminal pro-B-type Natriuretic Peptide and C-Reactive Protein as Prognostic Markers in Severe Sepsis and Septic Shock

Thesis

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Abbr. Full-term

ABG : Arterial blood gases

ACS : Acute coronary syndrome

AF : Atrial fibrillation

AIS : Acute ischemic stroke
AKI : Acute kidney injury

AKIN : Acute Kidney injury network

ALI : Acute lung injery

ALT : Alanine aminotransferaseANP : A-type natriuretic peptide

APACHE : Acute physiology and chronic health evaluation

APS : Acute Physiology Score

ARDS : Adult respiratory distress syndrome

ARF : Acute renal failure
AS : Aortic stenosis

ASE : American Society of Echocardiography

AST : Aspartate aminotransferase

AUC : Area under curve

BNP : Beta naturetric peptide

bpm : Beat per minuteBUN : Blood urea nitrogen

CABGCoronary artery bypass graftCAPCommunity-acquired pneumonia

CHF : Congestive heart faluireCKD : Chronic kidney diseaseCNS : Central nervous system

CO : Cardiac output CO : Carbon monoxide

COP : Colloid osmotic pressure

COPD : Chronic obstructive pulmonary disease

CP : Constrictive pericarditis

Cr : Creatinine

CRP : C-reactive proteinCT : Computed tomography

cTn : Cardiac troponin

CVD : Cardiovascular disease

CVP : Central venous pressureDBP : Diastolic blood pressure

DIC : Disseminated intravascular coagulopathy

DM : Diabetes mellitusDO₂ : Oxygen delivery

DVT
EAA
Endotoxin activity assay
ECG
Electrocardiogram
ED
Emergency department

EF : Ejection fraction

EGDT : Early goal directed therapy
 ESRD : End stage renal diseases
 FAC : Fractional area contraction
 FiO₂ : Fraction of inspired oxygen

Fmol/l : Ficomole/l

FS% : Fraction Shortening
GCS : Glasgow coma scale
GFR : Glomerular filtration rate
GIT : Gastrointestinal tract

HD : Hemodialysis

HES: Hydroxyethylstarch

HF : Heart failure

HMGB : High mobility group box

HMW HA: High molecular weight hyaluronan

HR : Heart rate

ICP : Intracranial pressure ICU : Intensive care unit

IL: Interleukin

iNOS : Inducible nitric oxide synthase

kDa
LA
Left atrium
LOS
Length of stay
LV
Left ventricle

LVEDD : Left ventricular end diastolic diameter
 LVEDV : Left ventricular end diastolic volume
 LVEF : Left ventricular ejection fraction
 LVESD : Left ventricular end systolic diameter
 LVESV : Left ventricular end systolic volume

MAP : Mean arterial blood pressure

MDR
 mg/dL
 Multiple drug resistant
 Milligram per dicilitre
 Myocardial infarction

MIF : Macrophage inhibitory factor

mL/kg : Milliliter per killogram

μL : Micro liter

mm Hgmillimeter mercurymmol/LMillimole per litre

MODS : Multiple organ dysfunction syndrome

MR : Mitral regurge

mRNA : Messenger ribonucleic acid

MS : Mitral stenosis

MV : Mechanical ventilation

NF : Nuclear factor

nNOS : Neuronal nitric oxide synthase

NOS : Nitric oxide synthase NP : Natriuretic peptide

NPV : Negative predictive value

NTproBNP: N terminal pro beta naturetric peptide

NYHA : New York Heart Association
 PAC : Pulmonary artery catheterization
 PaCO₂ : Arterial carbon dioxide tension

PaO₂ : Arterial oxygen tension

PCI : Percutaneous cardiac intervention

PCT: Procalcitonin

PDA : Patent ductus arteriosus
PE : Pulmonary embolism

Pmol/l: Picomole/l

PRBC: Packed red blood cell transfusion

PSI : Pneumonia severity index
RCM : Restrictive cardiomyopathy
RCT : Randomized controlled trial

RIFLE : Risk/Injury/Failure/Loss/End stage
ROC : Receiver operating characteristic

RR : Respiratory rate

RRT : Renal replacement therapy

RV : Right ventricle

SAH : Subarachnoid hemorrhageSBP : Systolic blood pressure

SBT : Spontaneous breathing trial

SCCM: The Society of Critical Care Medicine

ScvO2 : Central venous O2 saturationSvO2 : Mixed venous O2 saturation.

SIRS : Systemic inflammatory response syndrome

SOFA : Sequential organ failure assessment

SR : Sinus rhythm

SSI : Surgical site infection

STREM-1: Soluble Triggering Receptor On Myyeloid Cells-1

SVR : Systemic vascular resistance

TIMI score: Thromolytic in myocardial infarction score

TLC : Total leukocyte countTNF : Tumor necrosis factor

TnI: Troponin I

TnT : Cardiac troponin T

TTE : Transethroracic echocardiogram VAP : Ventilator associated pneumonia

VHD : Valvular heart disease

VS : Versus

WBC: White blood cell

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Introduction

Sepsis is a leading cause of death in critically ill patients despite the use of modern antibiotics and resuscitation therapies, (*Angus et. al., 2001*). The septic response is a complex chain of events involving inflammatory and anti-inflammatory processes, humeral and cellular reactions and circulatory abnormalities (*Gullo et. al., 2006*).

Sepsis is defined as the presence or presumed presence of an infection accompanied by evidence of a systemic response called the systemic inflammatory response syndrome (SIRS) which is defined as the presence of 2 or more of the following: (1) temperature greater than 38°C (100.4°F) or less than 36°C (96.8°F); (2) pulse rate greater than 90 beats/min; (3) respiratory rate greater than 20 breaths/min (or PaCO₂ less than 32 torr); and (4) WBC count greater than 12,000/mm or less than 4,000/mm, or greater than 10% immature band forms (*ACCP and SCCM*, 2001).

Severe sepsis is defined as the presence of sepsis and one or more organ dysfunctions. Organ dysfunction could be defined as acute lung injury; coagulation abnormalities; thrombocytopenia; altered mental status, renal, liver, cardiac failure, or hypoperfusion with lactic acidosis. Septic shock is defined as the presence of sepsis and refractory hypotension, i.e. systolic blood pressure less than 90 mm Hg, mean arterial

pressure less than 65 mm Hg, or a decrease of 40 mm Hg in systolic blood pressure compared to baseline unresponsive to a crystalloid fluid challenge of 20 to 40 mL/kg (*Levy et. al.*, 2001).

The diagnosis of sepsis and evaluation of its severity is complicated by the highly variable and non-specific nature of the signs and symptoms of sepsis (*Lever et. al., 2007*). However, the early diagnosis and stratification of the severity of sepsis is very important, increasing the possibility of starting timely and specific treatment. Biomarkers can play an important role in this process and their use in the intensive care setting is gaining increasing popularity (*Zambon et. al., 2008*).

Amino-terminal pro-B type Natriuretic peptide (NT-proBNP) is a promising cardiac biomarker that has recently been shown to be of diagnostic value in decompensated heart failure, acute coronary syndromes and other conditions resulting in myocardial stretch and volume overload. The diagnostic and prognostic use of natriuretic peptides in the intensive care setting for patients with various forms of shock could be an attractive alternative as noninvasive markers of cardiac dysfunction that could obviate the need for invasive monitoring such as pulmonary artery catheterization (*Hoffmann et. al., 2006*).

C-reactive protein is thought to represent a measure of cytokine-induced protein synthesis. The relatively short half-life of approximately 19 hours makes it a useful monitor for follow-up of inflammatory response, infection and antibiotic treatment. In addition, laboratory tests for CRP are easily available and less costly than cytokine tests (*Dong et. al.*, 1996).