Annals of Medicine and Surgery 35 (2018) 180–184

Contents lists available at ScienceDirect

Annals of Medicine and Surgery

journal homepage: www.elsevier.com/locate/amsu

Prospective evaluation of serum procalcitonin in critically ill patients with suspected sepsis- experience from a tertiary care hospital in Pakistan

Sibtain Ahmed, Imran Siddiqui, Lena Jafri, Madiha Hashmi, Aysha Habib Khan*, Farooq Ghani

Department of Pathology & Laboratory Medicine, Aga Khan University, Pakistan

ARTICLE INFO

Keywords:
Procalcitonin
Blood culture
Sepsis
Intensive care unit

ABSTRACT

Background: Sepsis is the leading cause of mortality in critically ill patients. Procalcitonin (PCT) is a promising marker for identification of bacterial sepsis. The aim of this study was to determine the diagnostic accuracy of serum PCT concentration in patients with suspected sepsis admitted to mixed medical-surgical Intensive care unit (ICU).

Material and methods: A cross-sectional study conducted at section of Chemical Pathology, Department of Pathology and Laboratory Medicine and ICU. Patients with suspected sepsis were included, serum PCT cut off ≥ 0.5 ng/ml was taken for diagnosing sepsis. Diagnostic accuracy was measured in terms of sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) taking blood culture as gold standard. Furthermore, different cut offs were compared by using receiver operating characteristic curves (ROC). Data analysis was done on SPSS version 20.

Results: Median age of the study group (n = 103) was 48 years (IQR: 22), 60% being males. Out of the 103 patients included 82 patients had PCT levels above the optimal cut off. At a serum PCT cutoff of 0.5 μg/L, the sensitivity and specificity for the diagnosis of sepsis was found to be 93.75% and 43.59% respectively. NPV was higher compared to PPV making PCT a reliable marker to for the screening out of sepsis patients. Furthermore, it was revealed that PCT having an AUC = 0.70 outperformed WBC (AUC = 0.5) and CRP (AUC = 0.6).

Conclusion: Elevated PCT concentration is a promising indicator of sepsis in newly admitted critically ill patients capable of complementing clinical signs and routine laboratory parameters.

1. Introduction

The past century has witnessed a rising trend in the incidence of infections, sepsis, and septic shock regardless of overwhelming development in treatment modalities [1]. Sepsis is a common condition that exists in patients admitted to intensive care units (ICU). Audits of ICU worldwide showed that 29.5% patients had sepsis on admission or during the ICU stay [2]. According to a study undertaken in 150 ICUs across 16 Asian countries; 28.3% of all admissions in participating units from Pakistan had sepsis [3].

Microbiological culture testing remains the traditional gold standard diagnostic modality for identification of sepsis with its own limitations. Prolong turnaround times for culture and the fact that blood cultures detect bacteraemia in only about 50% of patients with clinical suspicion of sepsis pose diagnostic challenge for septic patients in ICU [4]. Diagnosis is optimised by using biochemical tests for sepsis, such as C - reactive protein (CRP) or leukocyte count (WBC) which have reportedly low diagnostic accuracy and are at times ambiguous [5]. Search for new markers for providing early diagnosis with improved sensitivity and specificity continues. Procalcitonin (PCT) has developed as an ideal biomarker for sepsis and early detection of bacteraemia as it can be quantified and promptly interpreted in light of clinical context to aid decision making in patient care [6]. PCT has been used as marker of sepsis with sensitivity and specificity of 83% and 62% respectively with significantly high levels in the patients having sepsis and positive blood culture results than with culture negative results [7,8].

PCT is a glycoprotein present in C cells of thyroid gland. It belongs to the group of related peptide (C-GRP) encoded by the CALC-1 gene and is formed from the common precursor pre-calcitonin [9]. In healthy subjects, CALC-1 genes synthesize Calcitonin, but presence of microbial infection through endotoxin or pro-inflammatory cytokines increases calcitonin gene expression and PCT mRNA is mostly synthesised. This leads to release of PCT from all parenchymal tissue, exclusively in response to bacterial infection only and not viral or inflammatory disease [10]. This makes PCT to be a specific diagnostic marker to detect bacterial sepsis. On the other hand serum levels of PCT increase briskly

* Corresponding author. Department of Pathology & Laboratory Medicine, Aga Khan University, Stadium Road, Karachi, Pakistan.
E-mail address: aysha.habib@aku.edu (A.H. Khan).

https://doi.org/10.1016/j.amsu.2018.10.004
Received 10 April 2018; Received in revised form 26 September 2018; Accepted 1 October 2018
2049-0801/ © 2018 Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY license (http://creativecommons.org/licenses/BY/4.0/).

within 2–6 h after the stimulus making it a rapid diagnostic marker compared to culture [11,12].

As the expression of PCT depends upon the genetic framework of the population, therefore, it is important to assess its role and utility in Pakistani population with different metabolic and biochemical makeup. The aim of this study was to determine the diagnostic accuracy of PCT in diagnosis of bacterial sepsis in critically ill patients admitted at ICU of Aga Khan University Hospital Karachi (AKUH-K), by taking blood culture as gold standard.

2. Methods

This interdisciplinary cross sectional study was conducted in the Section of Chemical Pathology, Department of Pathology & Laboratory Medicine and mixed medical-surgical ICU of AKUH-K, Pakistan. The study was approved by the institutional Ethical Review Committee (1573-Pat-ERC-11). Our study was registered with NIH clinicaltrials.gov (Unique ID: NCT03506152). The work has been reported in line with the Strengthening the Reporting of Cohort Studies in Surgery (STROCSS) criteria [13].

2.1. Inclusion criteria

Adult male and female patients between 18 and 70 years of age with a clinical suspicion of sepsis as guided by the ICU physicians were recruited through non-probability purposive sampling, within 24 h of ICU admission during January to December 2014. The criteria of suspected sepsis was used for labelling the cases included the presence of any two or more of the following conditions at the time of admission: temperature $\geq 38\,^{\circ}C$ or $< 36\,^{\circ}C$, heart rate > 90 beats/min, respiratory rate > 20 breaths/min, white blood cell count $< 4 \times 10^9$/L ($< 4000/mm^3$), $> 12 \times 10^9$/L ($> 12{,}000/mm^3$). Sepsis was further confirmed by the presence of positive blood culture. Furthermore other markers of sepsis including CRP levels, WBC counts and blood culture undertaken at the time of admission as a part of routine care were also recorded.

2.2. Exclusion criteria

Patients above 70 years of age were excluded due to 'immune senescence' in elderly giving rise to different presentation of bacteraemia. Furthermore, patients discharged before 24 h, patients who had blood transfusion before ICU stay and those with organ failure were excluded from the study.

Data was collected on predesigned forms by the team of primary investigators. Patients were recruited after informed consent from immediate family members/care takers.

Seven ml of blood was drawn in gel separator tubes within 24 h of admission in ICU for PCT determination. Blood samples were centrifuged at 3000 rpm and serum was separated and stored at $-20\,^{\circ}C$ until assayed. Serum PCT was measured by Electro-Chemiluminescence immunoassay (ECLIA) on the Roche Elecsys E170 immunoassay analyser using manufacturer's recommendations. Results are expressed as micro gram of PCT per litre of serum (ug/L). For internal quality control 2 levels of manufacturer provided controls [low and high] were run with each batch of analyte while samples from College of American Pathologists (CAP, USA) were run for external quality control. PCT levels > 0.5 μg/L are considered positive for diagnosis of sepsis.

A sample size of 103 was calculated by using PASS 11 word home edition software by taking the sensitivity 83%, specificity 62%, Prevalence 37.4% [14] and precision 10%.

Data analysis was done on SPSS version 20. Shapiro Wilk test was used to check normality of data. As the data that was skewed; median values were reported along with interquartile ranges (IQR) for quantitative variables. Diagnostic accuracy of PCT was calculated on the basis of sensitivity, specificity, PPV and NPV taking blood culture as gold standard. For further analysis, Receiver operative characteristic (ROC) curve was plotted for PCT and area under the curve (AUC) calculated. Furthermore, association between CRP, WBC and PCT was done using ROC curve and respective AUC were compared.

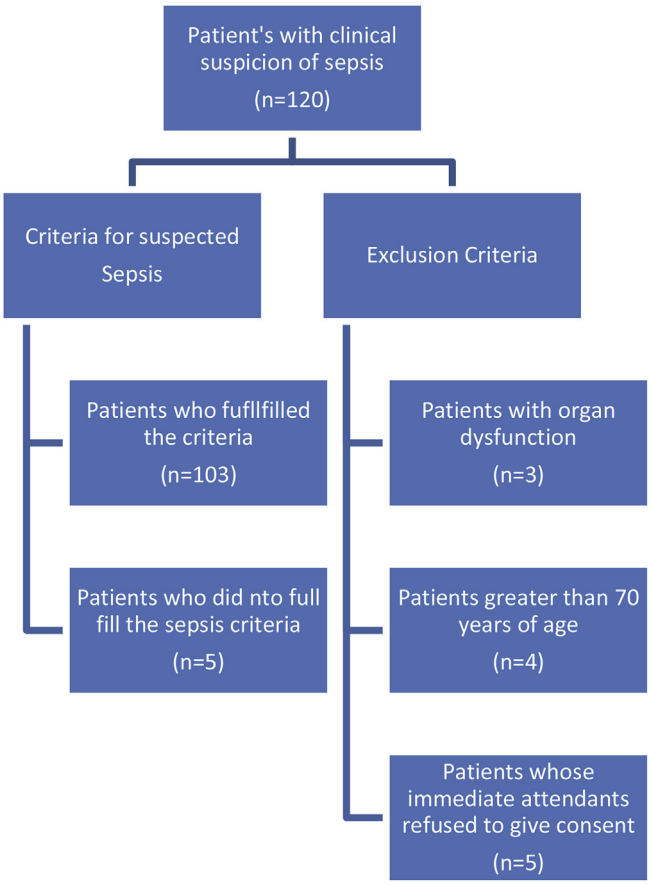

Fig. 1. Distribution of consort showing critically ill patients included in final analysis with suspected sepsis from medical and surgical ICU.

3. Results

One hundred and three patients met inclusion criteria and were included in the final study analysis as shown in Fig. 1. Sixty percent of the patients were males (n = 62). The median age of the group was 48 years (IQR: 22) and BMI was 25.4 kg/m^2 (IQR: 4.22). Out of the 103, 43.7% were obese and 8.7% were overweight according to Asian BMI classification [15]. Median PCT levels were 1.5 μg/L (IQR: 8.5 μg/L), 79% (n = 82) patients had PCT levels > 0.5 μg/L (median PCT 2.7 μg/L).

Sixty four patients had bacterial growth on blood culture while 39 samples did not show growth over a period of 5 days. Among the various organisms identified on culture *Escherichia coli* (E.Coli) (n = 21) and Staphylococcal infections (n = 22) were the most frequent as depicted in Fig. 2.

PCT levels with a median value of 2.14 μg/L in the culture positive group, were found to be significantly higher compared to culture negative group (p value < 0.01). Furthermore, median CRP levels and median WBC levels were also higher in the culture positive groups as shown in Table 1. The sensitivity and specificity for the diagnosis of sepsis compared to culture as gold standard was found to be 93.75% (95% CI: 84.76%–98.27%) and 43.59% (95% CI: 27.81%–60.38%) respectively. NPV was calculated to be 80.95% and was higher compared to PPV (73%) making PCT a better marker for screening of patients with sepsis.

Download English Version:

https://daneshyari.com/en/article/11025309

Download Persian Version:

https://daneshyari.com/article/11025309

Daneshyari.com