Short Communication

The status of serum procalcitonin in sepsis and non-infectious systemic inflammatory response syndrome

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Procalcitonin (PCT) is a marker of the inflammatory response to infection and not released in viral disease. The aim of the present study was to determine the level of PCT in sepsis and non-infectious systemic inflammatory response syndrome (SIRS). We determined the level of serum PCT in 50 sepsis and 50 non-infectious SIRS cases, using semiquantitative PCT-Q kit. The frequency of PCT positivity was significantly higher in sepsis than non-infectious SIRS (P < 0.001). Using cut off value of 2 ng/ml for PCT, the sensitivity, specificity, positive predictive value and negative predictive value for serum PCT in distinguishing sepsis from non-infectious SIRS were 88.0, 90.0, 89.8 and 88.2%, respectively. The serum PCT is a reliable marker for distinguishing sepsis from non-infectious SIRS in association with clinical judgment and other paraclinical findings.

Key words: Sepsis, SIRS, procalcitonin.

INTRODUCTION

Sepsis is a complex clinical syndrome resulting from the damaging effects of a dysregulated host response to infection, including uncontrolled inflammation and immune suppression (Hotchkiss and Karl, 2003). Sepsis is one of the most common reasons for admission to intensive care units (ICU) throughout the world (Vincent et al., 1995).

Procalcitonin (PCT) is a propeptide of calcitonin produced by the thyroid gland (Jacobs et al., 1981). Usually undetectable in healthy subjects, it was described as a marker of infection in critically ill patients (Assicot et al., 1993; Ugarte et al., 1999). PCT is an acute phase reactant protein and consists of 116 amino acids with 13 KDa, has been reported as a sensitive marker of severe bacterial infection (Assicot et al., 1993; Karzai et al., 1997).

The aim of the present study was to determine the sensitivity and specificity of serum PCT test in distinguishing sepsis from non-infectious systemic inflammatory response syndrome (SIRS).

PATIENTS AND METHODS

This case-control study was conducted from February 2007 to May 2008 in the university Hospitals of Zahedan University of Medical Sciences, Zahedan, Iran. The project was approved by local ethics committee of Zahedan University of Medical Sciences and informed consent was taken from all patients. Blood samples were obtained from 50 sepsis and 50 non-infectious SIRS.

We determined the serum PCT concentration categorically (< 0.5 ng/ml (normal), 0.5 to < 2 ng/ml, 2 to 10 ng/ml and ≥ 10 ng/ml) using semiquantitative PCT-Q kit (B.R.A.H.M.S. Diagnostica GmbH, Berlin, Germany) according to the manufacturer's procedure using 200 μl of fresh plasma (Naderi et al., 2009). The PCT-Q is an immune-chromatographic assay in which an immune complex sandwich is formed, generating a colorimetric endpoint that is determined by visual inspection of test cards compared with a standard card. Statistical analysis was performed by commercial software (SPSS for Windows, V 17). The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were determined.
Table 1. The status of procalcitonin (PCT) in sepsis and non-infectious SIRS. The frequency of PCT positivity (≥ 2 ng/ml) was significantly higher in sepsis than non-infectious SIRS (p < 0.0001).

<table>
<thead>
<tr>
<th></th>
<th>PCT positive (%) (≥ 2 ng/ml)</th>
<th>PCT negative (%) (&lt; 2 ng/ml)</th>
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<tbody>
<tr>
<td>Sepsis</td>
<td>88.0 (44/50)</td>
<td>12 (6/50)</td>
</tr>
<tr>
<td>Non-infectious SIRS</td>
<td>10.0 (5/50)</td>
<td>90.0 (45/50)</td>
</tr>
</tbody>
</table>

Table 2. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value of PCT level for distinguishing sepsis from non-infectious SIRS.

<table>
<thead>
<tr>
<th>PCT cut-off value</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ng/ml</td>
<td>88.0</td>
<td>90.0</td>
<td>89.8</td>
<td>88.2</td>
</tr>
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</table>

RESULTS

Of 50 sepsis patients included in the study, 25 were male (50.0%) and 25 (50.0%) female with mean age of 45.5 years (range 8 to 86). Among non-infectious SIRS, 41 (82.0%) were male and 9 (18.0%) were female with mean age of 35 years (range 6 to 110). We found that none of the sepsis patients (0%) and 34% (17/50) of non-infectious SIRS, had PCT levels less than 0.5 ng/ml. We used levels of ≥ 2 ng/ml as PCT positive for sepsis. The results showed that 88.0% (44/50) of sepsis and 10% (5/50) of non-infectious SIRS were PCT positive (Table 1). The frequency of PCT positivity in sepsis was significantly higher in sepsis than non-infectious SIRS (Fisher’s exact test, p < 0.0001).

We determined the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of PCT, for distinguishing sepsis from non-infectious SIRS. The sensitivity, specificity, positive predictive value and negative predictive value for serum PCT in distinguishing sepsis from non-infectious SIRS were 88.0, 90.0, 89.8 and 88.2%, respectively (Table 2).

DISCUSSION

In the present study, we found that serum PCT is a good marker in distinguishing sepsis from non-infectious SIRS. We found that serum PCT has a sensitivity of 88.0% and specificity of 90.0%, in distinguishing sepsis from non-infectious SIRS. Our results are in accordance with results of other studies in a wide range of patient populations which have found that, PCT levels ≥ 2 ng/ml have 90% and 100% specificity for the diagnosis of bacterial sepsis (Castelli et al., 2004; Dorizzi et al., 2006; Meisner, 2002; Reinhart and Carlet, 2000; Uzzan et al., 2006). In systemic infections, PCT is a powerful marker to predict poor prognosis (Christ-Crain et al., 2004; Hausfater et al., 2002).

It has been reported that PCT levels increase within 2 to 3 h of the onset of sepsis. Sepsis still represents the main cause of morbidity and mortality in intensive care unit (Engel et al., 2007). Early and goal-directed treatment is necessary in case of sepsis. Therefore, instant and accurate diagnosis of sepsis is of high importance for clinicians. PCT is a reliable marker for diagnosis of bacterial infection and sepsis, than any clinical sign or routine laboratory tests (Harbarth et al., 2001; Oberhoffer et al., 1999). Due to high sensitivity and specificity of PCT, it can be used for diagnosis of sepsis. In addition, a semi-quantitative PCT test kit which is commercially available, is easy to use at the bedside and provides rapid results and it requires a very small amount of blood (Meisner et al., 2000).

In conclusion, according to our results determination of serum PCT using semi-quantitative PCT test kit is a reliable marker for distinguishing sepsis from non-infectious SIRS, in association with clinical judgment and other paraclinical data.

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REFERENCES


