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**Research Article**

# Procalcitonin as a marker for the diagnosis of sepsis

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## ABSTRACT

**Background:** Quick diagnosis of sepsis in intensive care unit patients is challenging for physicians.
**Methods:** The prospective study was conducted at our hospital. We studied the efficacy of procalcitonin as a marker of sepsis in 87 adults admitted to our intensive care unit with symptoms of systemic infection. The study samples included all patients aged above 18 years with acute sepsis. Statistical analyses were done using SPSS. PCT and various other relevant factors were measured in all study subjects. PCT levels of less than 0.1 ng/ml were considered negative; all other levels were considered positive.
**Results:** PCT proved to be an excellent indicator of sepsis. Serum PCT levels predicts mortality in the present study.
**Conclusions:** PCT is among the most promising sepsis markers capable of completing clinical signs and routine lab parameters suggestive of severe infection.

**Keywords:** Procalcitonin, Sepsis

## INTRODUCTION

Sepsis is to be the most common cause of death in intensive care unit. It is common in elderly, immune compromised and critically ill patients. Identifying whether the cause of inflammation in patients is of bacterial origin has been an important area of development in the clinical laboratory.[1,2] Systemic infection and organ dysfunction or shock are often difficult to distinguish from patients with similar clinical signs and laboratory findings but without infection. The conventional biological markers of inflammation may often be influenced by parameters other than infection and may only be slowly released during progression of an infection[3]. Positive bacteriological results may be caused by contamination or may not be available before 24 to 48 hours and negative results do not exclude sepsis. In view of the fact that these routine clinical and laboratory measurements lack sensitivity and specificity, other tests are needed to give an early marker of the infections cause of generalized inflammatory response to allow early diagnosis and for the use of specific treatment[4]. Procalcitonin (PCT) has been newly proposed indicator of presence of infection and as a useful marker of the severity sepsis. Procalcitonin is a precursor of the hormone Calcitonin and it is synthesized physiologically by thyroid 'C' cells. In normal physiological condition, PCT levels in the serum are low (<0.1 ng/ml). However in bacterial infection PCT is synthesized in various extra thyroidal neuroendocrine tissues. Systemic PCT secretion is a component of the inflammatory response that appears to be relatively specific to systemic bacterial infections. Bacteraemic infection appears to cause the highest rises of PCT and with lower or negligible rises in localized viral and intracellular bacterial infection. This study was done to evaluate the diagnostic value of serum PCT and its prognostic value in sepsis.[5-8]

## METHODS

The cross sectional study was conducted on patients of suspected or established sepsis who were admitted in the hospital. The present study was carried out in BVDUMC and H Sangli. The study samples included all patients aged above 18 years presenting with acute sepsis as diagnosed by clinical presentation. Patients with history of anaphylaxis, adrenal insufficiency, low blood volume, congestive cardiac failure, and pulmonary embolism, history of malignancy and trauma or recent surgery were excluded from the study. In present study 85 patients were included. Blood samples were drawn from all patients within 24 hrs of admission to the ICU for complete blood count, ESR, PT, APTT, LFT,RFT, Blood culture and estimation of PCT, X- ray and ultrasound were done for all patients. Serum PCT was measured by using chemiluminiscence technique, Maglumi 600. The kit has been designed for the quantitative determination of PCT in human serum.[9] The method can be used for samples over the range of 0.01- 100 ng / ml. The test has to be performed on the fully- auto chemiluminiscence immune assay (CLIA) analyzer Maglumi 600. Statistical analysis was performed using statistical package for social survey (SPSS). Student't' test was used to find the strength of association between PCT & sepsis. 'P' values below 0.05 were considered significant.

## RESULTS

The study included 87 ICU patients with suspected sepsis. Patients age ranged 18 to 84 years. Out of 87, 48 patients were male & 39 female. Among these, patients PCT above 100 ng/ml were seen in 16 patients, 30- 60 ng/ml in 8 patients, 10- 30 ng/ml in 12 patients, 2- 10 ng/ml in 25 patients & less than 0.5 ng/ml in 26 patients (Table 1). There was a statistically significant correlation with the presence of sepsis determined using either PCT ≥05 ng/ml or ≥2 ng/ml ($p<0.001$).

**Table 1: Serum procalcitonin in no sepsis, sepsis and severe sepsis patients.**

| | Serum PCT concentrations (ng/ml) | | | | | |
|---|---|---|---|---|---|---|
| n = 87 | <0.5 | 0.5-2 | 2-10 | 10-30 | 30-60 | 50-100 & above |
| No sepsis | 26 | 0 | 0 | 0 | 0 | 0 |
| Sepsis | 0 | 0 | 16 | 0 | 0 | 0 |
| Severe sepsis | 0 | 0 | 0 | 12 | 8 | 16 |
| Total | 26 | 0 | 25 | 12 | 8 | 16 |

## DISCUSSION

The purpose of this study was to evaluate the utility of serum PCT as a marker of sepsis in critically ill patients in our hospital. Early diagnosis of infection & sepsis in critically ill patients is a difficult task for clinician. Serum PCT has been found to be a very good marker of sepsis. We assessed combined role of serum PCT & other clinical signs of inflammation as predictors of sepsis. The prevalence was more in patients aged over 60 yrs. The other studies reported a higher prevalence of sepsis in patients aged 57 years.[12] We found a slightly higher percentage of males affected with sepsis compared to females in the present study. Other studies also indicated a higher incidence in male. Respiratory tract infection was the most common source of sepsis in our study. Urinary tract infection was the second most common focus which may partly due to more number of elderly patients with risk factor like diabetes.[13]

We observed in present study, that common sites in the causation of sepsis were pneumonia, blood stream infections, intra-abdominal infection, urosepsis & surgical wound infections. Serum PCT has 96% sensitivity in present study.

Mortality was seen in 27 patients (30%) in the present study. An additional risk factor for increased mortality would be diabetes mellitus.[10,11]

Serum PCT is not a marker of localized infections or infections with no systemic manifestations. Although elevated serum PCT values during rigorous infections may decrease to very low levels with appropriate therapy, does not always designate complete control of the infection but only that generalization of the infection or the systemic response is under control.[14]

Patients after major trauma or surgery may present with increased serum PCT levels without any evidence of severe infection. However, the median values under these conditions are usually lesser than those found during severe sepsis and septic shock.[4,15]

In our study have several outcomes for clinicians. It definitely indicates that serum PCT may be help in the management of sepsis in critical care. First as, a new test to diagnose sepsis on ICU admission, serum PCT offers a high level precision that other tests cannot provide. It may direct physicians in their clinical decision making and their stepwise approach to the complex management of critically ill patients with sepsis requiring several interventions in a short period of time. The test can be performed within 45 minutes and gives valuable information long before cultural results are available.

## CONCLUSION

PCT evaluation seems to be better predictor to differentiate patients with sepsis and patients without sepsis. The addition of serum PCT to the standard work up of critically ill patients with suspected sepsis might assist in avoiding unwanted antibiotic usage in patients who presents with symptoms similar to those in infective conditions. It may increase diagnostic certainty & improve patient management.

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