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Introduction

Scrub typhus is mainly diagnosed by serological testing. For patients in the acute phase of scrub typhus, the condition must be diagnosed prior to laboratory confirmation on the basis of clinical presentation and patient history because antibody titres increase several days after illness onset. PCT can be used as a rapid diagnostic biomarker to differentiate between bacterial sepsis and systemic inflammatory response syndrome. The level of PCT associated with *O. tsutsugamushi* infection is rarely investigated. To the best of our knowledge, no study has focused on the usefulness of PCT for the diagnosis of acute scrub typhus.

Methods

In this study, we compared serum PCT levels of acute scrub typhus with that of *Escherichia coli* bacteraemia on the day of admission. In addition, we determined the optimal cutoff value of serum PCT levels for diagnosing acute scrub typhus. *E. coli* bacteraemia was defined as *E. coli* grown from blood culture taken on the day of admission. Acute scrub typhus was defined as an increased titre in the indirect immunofluorescence antibody (IFA) test against *O. tsutsugamushi* \geq 4-fold increased titre in the follow-up. Serum PCT levels were assessed within the first 24 hours following admission. This retrospective study was conducted in Wonkwang University Hospital and Chonbuk National University Hospital in Korea between July and December 2011.

Results

A total of 106 patients (\geq 18 years old) with acute scrub typhus and 82 patients (\geq 18 years old) with *E. coli* bacteraemia were included in the study. The mean ages of the patients with acute scrub typhus and with *E. coli* bacteraemia were 64.9 years and 73.3 years, respectively. The mean serum PCT levels in patients with acute scrub typhus and with *E. coli* bacteraemia were 0.90 ng/ml and 43.7 ng/ml, respectively.

Receiver operating characteristic (ROC) curve analysis determined the optimal cutoff value of serum PCT to be 1.3 ng/ml with a sensitivity of 87.7% and a specificity of 78.0%. Patients with PCT levels lower than 1.3 ng/ml had a 25.4 times higher risk for having acute scrub typhus than for having *E. coli* bacteraemia

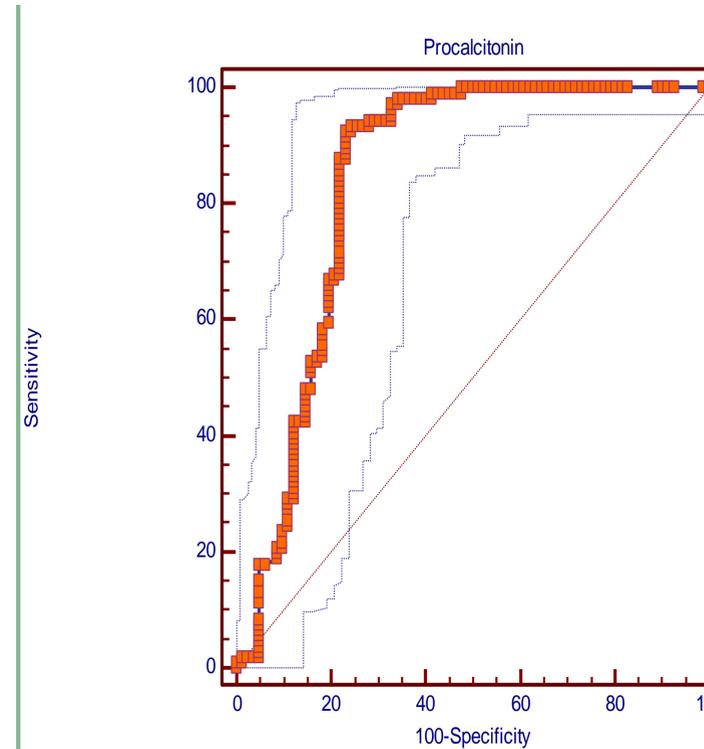


Figure 1. ROC analysis of PCT in acute scrub typhus patients. With a cutoff of 1.3 ng/ml, a sensitivity of 87.7%, a specificity of 78.0%, and an area under curve of 0.84.

Cutoff value of PCT (ng/ml)	Sensitivity (%)	Specificity (%)	Odds ratio	95% Confidence interval
\leq 0.98	80.2	78.0	14.4	7.088 - 29.220
\leq 1.2	84.9	78.0	20.0	9.487 - 42.162
\leq 1.27	87.7	78.0	25.4	11.646 - 55.553

Table 1. Sensitivity, specificity, and odds ratio for acute scrub typhus according to cutoff value of PCT levels.

Conclusions

serum PCT (\leq 1.3 ng/ml) may be useful as a supplementary test for diagnosis of acute scrub typhus.