CRITICAL CARE

LETTER

In critically ill patients the procalcitonin level can be misleading

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See related research by Karlsson *et al.*, http://ccforum.com/content/14/6/R205, related research by van Nieuwkoop *et al.*, http://ccforum.com/content/14/6/R206, and related commentary by Wolff and Bouadma, http://ccforum.com/content/14/6/1007

Three recently published articles in *Critical Care* concerning the usefulness of procalcitonin (PCT) in critically ill patients elicited this cautionary comment of the present article's title [1-3]. PCT has been introduced as a test with high sensitivity and specificity for bacterial infection in patients in the emergency department. The test's negative predictive value is thought to be sufficient to withhold antibiotics in cases of low PCT [4,5]. PCT has also been evaluated as a diagnostic tool in critically ill patients. This would be of help because there is no immediately available test that proves or disproves a bacterial infection. Especially, the number of true and false negative patients cannot be estimated. We therefore cannot determine the test characteristics of PCT in these patients. We can determine with more certainty the true positive patients and measure their PCT level.

Between March 2007 and April 2008 we registered all patients presenting to the emergency department, the ICU or wards of internal medicine meeting the criteria of the Surviving Sepsis Campaign guidelines for severe sepsis or septic shock. In these patients we measured the PCT level with the PCT-Q test (Brahms, Henningsdorf, Germany) at presentation, and microbiological analysis (blood cultures, sputum cultures and urine cultures) was performed. Microbiological proven sepsis was defined by a positive blood culture result (except cultures with *Staphylococcus epidermidis*) or by positive culture results other than blood in the presence of two or more systemic inflammatory response syndrome criteria.

In the above-mentioned period we included 132 patients. Patient characteristics are displayed in Table 1. A total of 63 (47%) patients had proven sepsis or septic shock. Blood cultures were taken in 127 patients, of which 40 patients (30.3%) were positive. In 101 patients with blood cultures taken, the PCT level was measured at presentation (Table 2). Thirty-two patients had PCT levels <0.5 ng/ml, of which eight patients (25%) had positive blood cultures.

Based on these results we conclude that PCT levels can be misleading. It is unsafe to withhold antibiotics based

Table 1. Characteristics of the 132 patients included in the analysis

Number of patients (*n*)	132
Age (years)[a]	65.3 ± 1.3 (22.7 to 96.0)
Male (%)	64.4
Survival (%)	74.2
PCT analysis at presentation performed (*n*)	110
Number of patients with PCT <0.5 ng/ml (*n* (%))	34 (25.8)
Number of patients with PCT 0.5 to 2.0 ng/ml (*n* (%))	21 (21.2)
Number of patients with PCT 2.0 to 10.0 ng/ml (*n* (%))	27 (20.5)
Number of patients with PCT >10.0 ng/ml (*n* (%))	28 (21.2)
Number of blood cultures conducted (% positive findings)	127 (30.3)
Number of sputum cultures conducted (% positive findings)	24 (33.3)
Number of urine cultures conducted (% positive findings)	79 (25.3)
Number of pus cultures conducted (% positive findings)	26 (65.4)

PCT, procalcitonin. [a]Data presented as mean ± standard error of the mean (range).

Table 2. Procalcitonin results in negative and positive blood cultures

Procalcitonin at presentation	Blood cultures (*n*)		Total (*n*)
	Negative	Positive	
<0.5 ng/ml	24	8	32
0.5 to 2.0 ng/ml	16	5	21
2.0 to 10.0 ng/ml	13	10	23
>10.0 ng/ml	12	13	25
Total	65	36	101

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on a test with unknown test characteristics, such as PCT, in patients presenting with criteria meeting the Surviving Sepsis Campaign guidelines for severe sepsis or septic shock. Fortunately, the Surviving Sepsis Campaign bundle is clear on this point and these patients received appropriate antibiotics in accordance with this guideline.

Abbreviations
ICU, intensive care unit; PCT, procalcitonin.

Competing interests
The authors declare that they have no competing interests.

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