COVID-19

Prognostic Role of Procalcitonin in Patients with Fever and Respiratory Complains During the COVID-19 Pandemic

Peiman Nazerian [1] · Manfredi Gagliano [1] · Alessandra Fanelli [2] · Stefano Grifoni [1]

Dear Editor,

Procalcitonin (PCT) is currently used in clinical practice to distinguish viral from bacterial infections, to guide antibiotic therapy, and to prognosticate bacterial sepsis or pneumonia [1]. Recent articles showed a prognostic role of PCT in patients with coronavirus disease 2019 (COVID-19), suggesting that PCT is a useful prognostic marker also in this viral infection [2, 3]. During the pandemic period, patients presenting to the emergency department (ED) with fever and respiratory complains are suspected of COVID-19 [4]. Laboratory test panels for suspected COVID-19 (COVID-19 panel) can help clinician not only for diagnosis but also for patients' prognostication. In our ED, during the COVID-19 pandemic, we included PCT in the COVID-19 panel. The aim of this prospective, observational study was to evaluate if a PCT ≥ 0.5 ng/mL, the cut-off currently used to diagnose bacterial infection, predicts hospital admission and death in patients with fever or respiratory complains irrespective from etiology.

Consecutive patients presenting to the ED from the 18th to the 27th of April 2020 were considered for the study. Inclusion criteria were referred fever or body temperature > 37.5°C, respiratory symptoms or signs (dyspnoea, cough, pharyngitis, oxygen saturation ≤ 94% in room air, respiratory rate ≥ 20 per minute), or need of oxygen administration or ventilation. The COVID-19 panel (including PCT) and reverse-transcription-polymerase chain reaction (RT-PCR) tests were performed in all enrolled patients. PCT was measured using an automated ElectroChemiLuminescent immunoassay (ECLIA Elecsys B.R.A.H.M.S. PCT^{TM}). Patients underwent a 30-day follow-up and the prognostic role of a PCT ≥ 0.5 ng/mL was evaluated in all patients considering the following outcomes: hospital admission, intensive care unit (ICU) admission, and death. The same outcomes were evaluated also for the subgroup of patients with a final diagnosis of "COVID-19 pneumonia," "infection not COVID-19 related," and "non-COVID-19 pneumonia". The final diagnosis was established by two expert physicians, one internal medicine specialist with 20 years of medical experience and one emergency medicine specialist with 13 years of medical experience. The experts, blinded to PCT result, independently assessed for each patient's ED, hospital and 30-day follow-up clinical data comprehensive of RT-PCR tests performed in any naso-pharyngeal swab and bronchoalveolar lavage and all diagnostic imaging tests. The experts establish if pneumonia was present based on abnormal findings on chest computed tomography or chest X-ray imaging. The "COVID-19 pneumonia" group included patients with a diagnosis of pneumonia and at least one positive RT-PCR test, the "infection not COVID-19 related" group included patients with a diagnosis of any type of infection (e.g., sepsis, urinary tract infection, intra-abdominal infection) and negative RT-PCR tests, and the "non-COVID-19 pneumonia" group included patients with a diagnosis of pneumonia and negative RT-PCR tests. In case of discordant adjudication, a third expert specialized in internal medicine and pulmonary medicine with 35 years of medical experience adjudicated the final diagnosis.

Patients enrolled in the study were 213. Considering all included patients presenting with fever and respiratory complains, hospital admissions, ICU admissions, and mortality were significantly higher in patients with PCT ≥ 0.5 ng/mL (Table 1). Odds ratios of a PCT ≥ 0.5 ng/mL for hospital admission and death were 8.1 (95% confidence interval, CI 2.8-23.6) and 5.5 (95% CI 2.2-13.7) respectively while for ICU admission among patients admitted to hospital was 2.1 (95% CI 0.7-7). In the group of patients with "infection non-COVID-19 related," those with PCT ≥ 0.5 ng/mL were hospitalized more frequently than patients with PCT < 0.5 ng/mL and in the group of patients with "non-COVID-19 pneumonia," deaths occurred more frequently

✉ Peiman Nazerian
pnazerian@hotmail.com

1 Department of Emergency Medicine, Careggi University Hospital, largo Brambilla 3, 50134 Firenze, Italy

2 Department of General Laboratory, Careggi University Hospital, Firenze, Italy

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Table 1 Thirty-day outcomes

	n = 213 (%)	PCT ≥ 0.5 ng/mL n = 53 (%)	PCT < 0.5 ng/mL n = 160 (%)	p value
All patients				
Hospital admissions	144 (67.6)	48 (90.6%)	96 (60%)	<0.01*
ICU admissions	12 (5.6%)	6 (11.3%)	6 (3.8%)	0.04*
Deaths	22 (10.3%)	13 (24.5%)	9 (5.6%)	<0.01*
COVID-19 pneumonia	n = 32 (%)	PCT ≥ 0.5 ng/mL n = 9 (%)	PCT < 0.5 ng/mL n = 23 (%)	p value
Hospital admissions	30 (93.8%)	9 (100%)	21 (91.3%)	0.37
ICU admissions	5 (15.6%)	3 (33.3%)	2 (8.7%)	0.09
Deaths	7 (21.9%)	4 (44.4%)	3 (13%)	0.06
Infection non-COVID-19 related	n = 45 (%)	PCT ≥ 0.5 ng/mL n = 16 (%)	PCT < 0.5 ng/mL n = 29 (%)	p value
Hospital admissions	26 (57.8%)	13 (81.3%)	13 (44.8%)	0.02*
ICU admissions	2 (4.4%)	2 (6.9%)	0	0.2
Deaths	3 (6.7%)	2 (12.5%)	1 (3.4%)	0.28
Non-COVID-19 pneumonia	n = 28 (%)	PCT ≥ 0.5 ng/mL n = 12 (%)	PCT < 0.5 ng/mL n = 16 (%)	p value
Hospital admissions	23 (82.1%)	11 (91.7%)	12 (75%)	0.26
ICU admissions	2 (7.1%)	2 (16.7%)	0	0.1
Deaths	6 (21.4%)	5 (41.7%)	1 (6.3%)	0.03*

Values are reported as absolute number and percent value within column in brackets

PCT procalcitonin; ICU intensive care unit

*p < 0.05

in patients with PCT ≥ 0.5 ng/mL (Table 1). As in the other subgroups, in patients with COVID-19 pneumonia, all outcomes were more frequent in patients with PCT ≥ 0.5 ng/mL but without reaching statistical significance probably because of small sample size (Table 1). Only one patient received a final diagnosis of COVID-19 pneumonia with a proved bacterial co-infection.

In conclusion, in this pilot study, PCT showed to be a prognostic marker in patients presenting with fever or respiratory complains during the COVID-19 pandemic independently from etiology and in patients with a PCT ≥ 0.5 ng/mL, the rate of hospital admissions, ICU admissions, and 30-day mortality was significantly higher.

Declarations

Ethics Approval The Tuscany Ethical Committee of Area Vasta Centro approved the study (N° 17104). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent for Publication Not applicable.

Conflict of Interest The authors declare no competing interests.

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