



PRACTICAL DIAGNOSTIC LABORATORY TESTS FOR COVID-19 IN THE EMERGENCY DEPARTMENT

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Abstract:

COVID-19 is an infectious disease caused by the SARS-Cov-2, and it was first reported in Wuhan province of China. RT-PCR test for viral nucleic acids in the diagnosis of COVID-19 is the gold standard method. However, when the number of patients admitted to the emergency department is too high, it may take a long time to result in the PCR test. In areas where suspicious cases are followed in isolation, possible PCR negative cases are also at risk. In the study, the data of patients who were admitted to the emergency department of Samsun Training and Research Hospital with the suspicion of COVID-19 in the years 2020-2021 were analyzed retrospectively. Laboratory and chest CT images were examined through the hospital's information processing system. The C-Reactive Protein (CRP), D-dimer, White Blood Cell (WBC) count, and Eosinophil count of the patients admitted as suspicious cases were evaluated. Chest CT images were evaluated according to the CO-RADS classification. A statistically significant difference was found between PCR positive and negative patients in terms of eosinophil count, CRP, d-dimer and CO-RADS classification. In our study, tests were evaluated at the stage of making a faster and more accurate diagnosis. In addition, the patient group included in our study is a specific group of patients who did not receive any medical treatment that could affect the results of the examination. As a result, when our study and previous studies are evaluated, CRP, d-dimer, eosinophil count and computerized tomography are the tests that can be used in the diagnosis of COVID-19. And examinations can be used in units where rapid diagnosis is required, such as emergency services.

Keywords: COVID-19, diagnostic tests, emergency department

1. Introduction

COVID-19 is an infectious disease caused by the SARS-Cov-2, and it was first reported in Wuhan province of China (World Health Organization, 2019; Zhu, N. et al., 2020). COVID-19 has affected all the World despite precautions and restrictions. COVID-19 is

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impressed by different clinical situations. Patients with COVID-19 infections presented with fever, cough, sore throat, dyspnea, fatigue and myalgia frequently. Other less frequent symptoms of COVID-19 are dizziness, nausea, headache, vomiting and diarrhea (World Health Organization, 2020). In fact, all of the symptoms are not specific to COVID-19. Therefore, in emergency services, differential diagnosis of COVID-19 is difficult but important. Because a patient with COVID-19 must be isolated from other patients. A highly sensitive and quick diagnostic test is needed.

Polymerase Chain Reaction (PCR) test for viral nucleic acids in the diagnosis of COVID-19 is the gold standard method (Li, Y. et al., 2020). However, when a number of patients admitted to the emergency department is too high, it may take a long time to result in the PCR test. In areas where suspicious cases are followed in isolation, possible PCR negative cases are also at risk. Laboratory tests and chest computed tomography (CT) can help differentiate the suspected symptomatic patients before PCR test results. The goal of this study is to assess chest computed tomography (CT) and laboratory findings of patients with positive and negative PCR tests in suspected cases of COVID-19 who were admitted to the emergency department and to determine the findings that may help the diagnosis.

2. Material and Method

In the study, the data of patients who were admitted to the emergency department of Samsun Training and Research Hospital with the suspicion of COVID-19 in the years 2020-2021 were analyzed retrospectively.

Patients aged 18 years or more, presenting with any weakness, fever, dyspnea, cough, sore throat, fatigue, arthralgia, nausea, headache, abdominal pain, diarrhea and loss of appetite were considered as suspected patients for COVID-19.

Asymptomatic patients who used medication or received inpatient treatment in the last 1 month due to these symptoms, were referred to our hospital from another center, and whose PCR test results were incidentally positive before the intervention (for reasons such as surgery) were excluded from the study.

Information was collected from local and national databases. Laboratory and chest CT images were examined through the hospital's information processing system. The C-Reactive Protein (CRP), D-dimer, White Blood Cell (WBC) count, and Eosinophil count of the patients admitted as suspicious cases were evaluated. Chest CT images were evaluated according to the CO-RADS classification (An, J. Y. et al., 2019). (Figure 1)

It was investigated whether there was a significant difference between CRP, D-dimer, WBC, eosinophil and Thorax CT findings in patients with positive and negative PCR test results.

All statistical calculations were performed with SPSS 23.0. The continuous variables were expressed as mean \pm standard deviation. Categorical variables were defined as percentages (%). Mean values of continuous variables were compared between the groups using the Mann-Whitney U test. ROC analysis was performed as a diagnostic test.

CO-RADS		
Level of suspicion COVID-19 infection		
		CT Findings
CO-RADS 1	No	Normal or non-infectious abnormalities
CO-RADS 2	Low	Abnormalities consistent with infections other than COVID-19
CO-RADS 3	Indeterminate	Unclear whether COVID-19 is present
CO-RADS 4	High	Abnormalities suspicious for COVID-19
CO-RADS 5	Very High	Typical COVID-19

Figure 1: CO-RADS classification

3. Results

Patients were analyzed according to d-dimer, CRP, eosinophil levels and CO-RADS classification. A total of 600 patients were included in the study, of which 300 (50%) were PCR-negative and 300 (50%) were PCR- positive.

The mean CRP value of the patients with a positive PCR result was 100 mg/L. The mean CRP value of the patients with a negative PCR test was 38.5 mg/L ($p < 0.001$). There was a statistically significant difference in CRP value between PCR positive and negative patients. The positive predictive value of the CRP value in the diagnosis of COVID 19 was 96.6%, the sensitivity was 54.7%, and the specificity was 85.71%.

The mean d-dimer value of the patients with positive PCR results was 2.37 mg/L, and the mean d-dimer value of the patients with negative PCR test was 0.77 mg/L ($p < 0.001$). A statistically significant difference was found between PCR positive and negative patients in terms of d-dimer value. The positive predictive value of d-dimer value in the diagnosis of COVID 19 was determined as 96.9 %, sensitivity 56% and specificity 89.6%.

Eosinophil count of patients with positive PCR results was 26.6 / L, and the mean eosinophil count of patients with negative PCR results was 149.7/L ($p < 0.001$). A statistically significant difference was found between PCR positive and negative patients in terms of eosinophil count. Eosinophil count was found to be significantly lower in COVID 19 PCR positive patients.

The patients were evaluated according to the CORADS classification by performing radiological examinations of the patients. 47 patients (15.8%) detected as positive for COVID PCR CO-RADS 1, 20 patients (6.7%) CO-RADS 2, 17 patients (5.7%) CO-RADS 3, 21 patients (7%) CO-RADS 4, 193 patients (64.8%) were evaluated as CO-RADS 5.

148 (49.5%) patients with negative COVID PCR test CO-RADS 1, 72 (24.1%) patients CO-RADS 2, 53 (17.7%) patients CO-RADS 3, 13 patients (4%, 3) CO-RADS 4, 13 patients (4.3) were evaluated as CO-RADS -5.

4. Discussion

Molecular tests used in the diagnosis of COVID-19 disease may cause a delay in the diagnosis of the disease due to the lack of resources and this may cause a delay in the diagnosis of the disease. The aim of our study is to determine the parameters that we can use to make the diagnosis of COVID-19 quickly and accurately, with laboratory and radiological tests that are easy to reach and give rapid results.

In most of the studies, the effect of laboratory and radiological imaging methods on the prognosis of the disease was emphasized more (McInnes, M. D et al., 2018; Qian, G. Q. et al., 2020). In our study, tests were evaluated at the stage of making a faster and more accurate diagnosis. In addition, the patient group included in our study is a specific group of patients who did not receive any medical treatment that could affect the results of the examination and did not receive treatment in another center before.

Numerous studies have identified raised levels of several serums or plasma biochemical constituents, including inflammatory parameters in COVID-19 patients (Bai, Y. et al., 2020; Gao, Y. et al., 2020).

In our study, we evaluated whether it is a guide in the diagnosis of COVID-19 by using CRP, D-dimer, eosinophil count and CO-RADS classification. We found that all parameters we examined showed a statistically significant difference between patients with negative and positive PCR tests. It was observed that CRP and d-dimer levels were significantly higher in positive patients, and the eosinophil count was also significantly lower. CO-RADS was evaluated as 5 in 64.8% of positive patients in computed tomography imaging.

CRP, d-dimer, procalcitonin and lymphocyte counts were mostly evaluated in the diagnosis and prognosis of COVID-19. In addition to these, in our study, it was found that the number of eosinophils showed a statistically significant difference between positive and negative patients at the diagnosis stage. The eosinophil count was found to be lower in positive patients. However, while making this evaluation, it is necessary to confirm that no drug has been used to affect the eosinophil count before, as in our study.

As a result, when our study and previous studies are evaluated, CRP, d-dimer, eosinophil count and computerized tomography are the tests that can be used in the diagnosis of COVID-19. And examinations can be used in units where rapid diagnosis is required, such as emergency services.

5. Recommendations

In line with the results found in the study, it can be recommended that a combination of routine laboratory biomarkers (CRP, d-dimer, eosinophil count) and Chest CT can be used to predict the diagnosis of COVID-19 with an accepted sensitivity and specificity before proceeding to definitive diagnosis by PCR.

Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author

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