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Comparing COVID-19 RT-PCR results, thorax computed tomography findings, and laboratory results of patients admitted to emergency medicine clinic with clinical symptoms of COVID-19 disease

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Abstract

In December 2019, cases of pneumonia of unknown origin were detected in Wuhan, Hubei Province, China. It was later determined that the pathogen SARS-CoV, which causes these cases of pneumonia, has been identified as the new enveloped RNA Betacoronavirus 2, now called severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2). In Turkey, the first case was detected on March 10, 2020. This study aimed to evaluate the factors that will enable rapid diagnosis of the disease through comparison of COVID-19 RT PCR results, thorax computed tomography (CT) findings, and laboratory results of patients suspected with COVID-19 who visited Başkent University Ankara Hospital Emergency Medicine Clinic. In our sample of 515 patients (280 female and 235 male patients), infiltration was detected in 113 patients (21.9%) The ratio of females to males increased with age. When the sex distribution of the thoracic CT findings was examined, the incidence of infiltration was higher in male patients. Conversely, no statistically significant dependence was found between the two categories using the chi-squared test. Shortness of breath was observed in 32.7% of patients with positive thoracic CT findings. Other common complaints were chest pain, 12.4%; fever, 10.6%; and weakness, 9.7%, respectively. The other category, which covered unclassified arrival complaints, had the highest percentage in the entire sample. When the thoracic CT distribution of comorbidities was examined (hypertension, 29.2% and diabetes, 25.2%) were more common than the other comorbidities in terms of the presence of infiltration. Thoracic CT results with RT-PCR, which were analyzed using the chi-square test, showed a statistically significant dependence between them. Conversely, COVID-compatible thorax CT findings were detected in 80 of 260 patients who tested negative in the PCR test. No complaints of fever, cough, weakness, shortness of breath, or chest pain associated with COVID were found in 48.6% of patients who were thoracic CT positive. PCR showed a low sensitivity rate. Therefore, thoracic CT is a better choice than PCR for the detection of asymptomatic cases in emergency patients. Because its selectivity rate is high, using PCR as a diagnostic test is more significant.

Keywords: 2019 novel coronavirus disease, pandemic, COVID-19 nucleic acid testing

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Introduction

In December 2019, cases of pneumonia of unknown origin were detected in Wuhan, Hubei Province, China [1]. The pathogen SARS-CoV, which caused these cases of pneumonia, has been identified as the new enveloped RNA Betacoronavirus 2, now called severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) [2].

In Turkey, the first case was detected on March 10, 2020 [3]. SARS-CoV-2 virus causes ARDS. The virus manifests as a combination of ARDS and pneumonia. This virus causes diffuse alveolar damage. Lung thrombosis is an important marker in ARDS with respiratory distress syndrome caused by coronaviruses [4].

In a study conducted in China, men and women were determined to have different risks of developing the disease at different rates for the SARS-CoV-2 virus. As the immune system is stronger in women than in men, men have a higher frequency of developing the disease than women. In that study, the percentage of men who died from the COVID-19 infection was 71%, while that of women was 29% [5].

The most common symptom of the COVID-19 infection is fever. In a study conducted in 51 patients with COVID-19 in Wuhan, high fever was detected in 47 patients [6].

The second most common symptom of the COVID-19 infection is cough. In a study of 51 patients with COVID-19 in Wuhan, cough was detected in 24 [6].

Thoracic computed tomography (CT) results showed iced glass opacity, which was usually bilaterally and peripherally distributed [7]. Molecular tests detect viral genetic material using RT-PCR, which is a nuclear amplification (NAAT) method. Molecular tests are widely used for diagnosis because of their specialty and ease of application [8,9].

Conversely, questions remain regarding the sensitivity of this test [10]. Wang et al. determined the sensitivity of different samples: bronchoalveolar lavage (93%), sputum (72%), nasal swabs (63%), and pharyngeal swabs (32%). As can be observed, the sensitivity varies among the samples [11].

Molecular tests are performed in laboratories, and the reporting time of the results ranges from 1 day to 1 week [12]. Similar to molecular tests, sensitivity varies according to the sample used in rapid antigen tests [13].

The most effective way to combat a pandemic is to develop an effective vaccine, which is accepted by the scientific world. The coronavirus disease (COVID-19) pandemic offers an important opportunity to develop new vaccine production methods [14].

Material and Methods

Demographic characteristics of the patients at the time of application, their comorbidities, laboratory results, CT findings for the thorax, PCR swab sample results, hospitalization periods if hospitalization occurred, epicrisis of the department where they are hospitalized, whether noninvasive/invasive mechanical ventilation is required, and morbidity and mortality information were analyzed. This study was approved by Başkent University Medical and Health Sciences Research Board (Project no: KA21/213) and supported by Başkent University Research Fund.

Data were analyzed using 'SPSS for Windows 17.

Results

In our sample of 515 people, infiltration was detected in 113 patients (21.9%) (Figure 1).

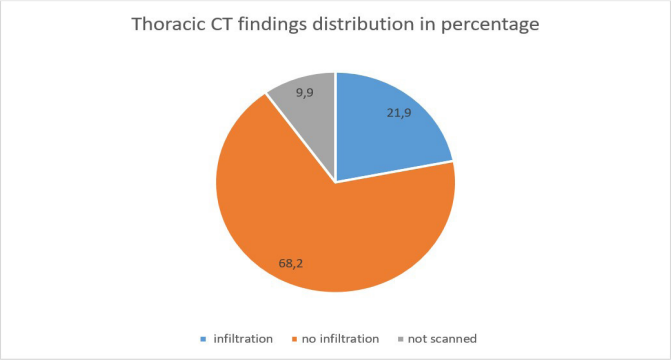

Figure 1. In our sample of 515 people, infiltration was detected in 113 patients (21.9%)

In the gender age distribution graph, 280 female and 235 male patients were studied. The ratio of the number of female patients to that of males increases with age (Graphic 1).

When the gender distribution of thorax CT findings is examined, the incidence of infiltration is higher in male patients. Conversely, no statistically significant dependence was found between the two categories in the analysis made using the chi-square test (Graphic 2).

Presence of infiltration in thorax CT increased in patients in the advanced age group (Graphic 3).

When the complaints of patients were examined, shortness of breath was seen in 32.7% of patients with positive thoracic CT results. Other common incidence complaints were chest pain, 12.4%; fever, 10.6%, and weakness, 9.7%. The other category, which covers unclassified arrival complaints, had the highest percentage in the entire sample (Graphic 4).

When the thoracic CT distribution of comorbidities is examined, hypertension with 29.2% and diabetes with 25.2% are more common compared with other comorbidities in terms of the presence of infiltration (Graphic 5).

Thoracic CT results with RT-PCR, which are analyzed using chi-square test, resulting in a statistically significant dependence

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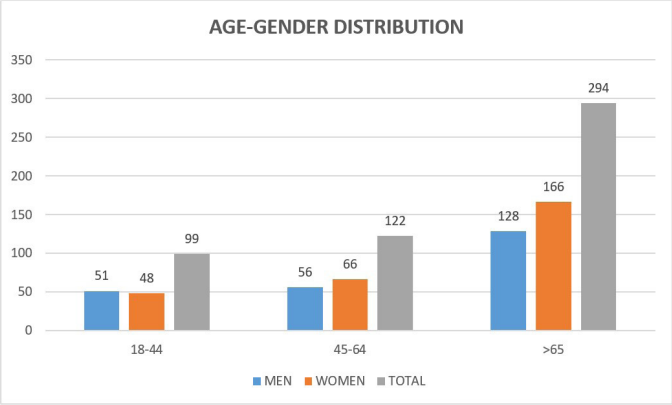
between them. Conversely, COVID-compatible thorax CT findings were detected in 80 of the 260 patients who were negative in the PCR test (Graphic 6).

The difference between the same laboratory groups in different thorax CT categories was examined using the Kruskal–Wallis test (Table 1).



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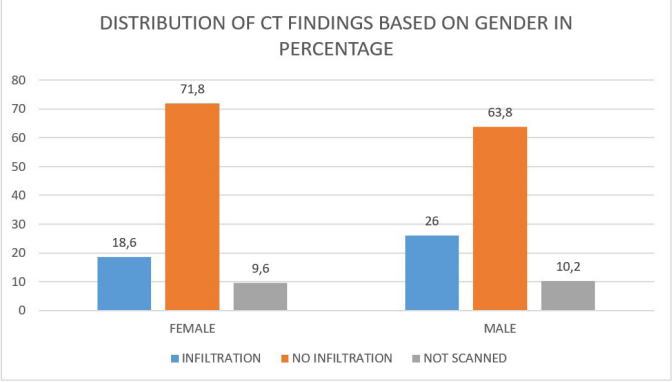
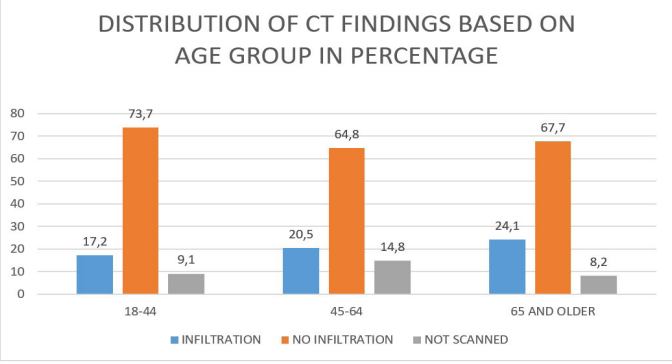
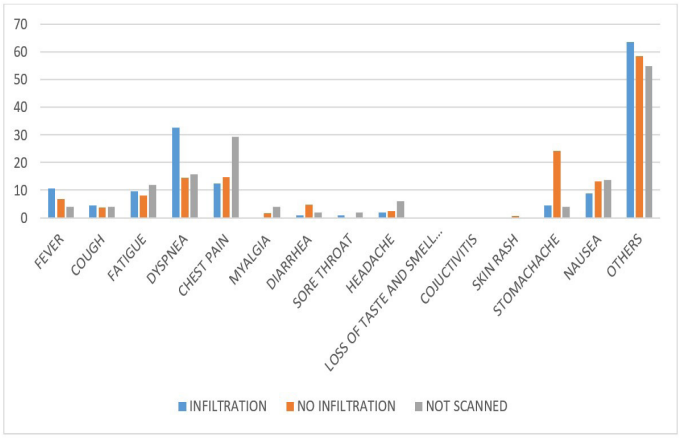


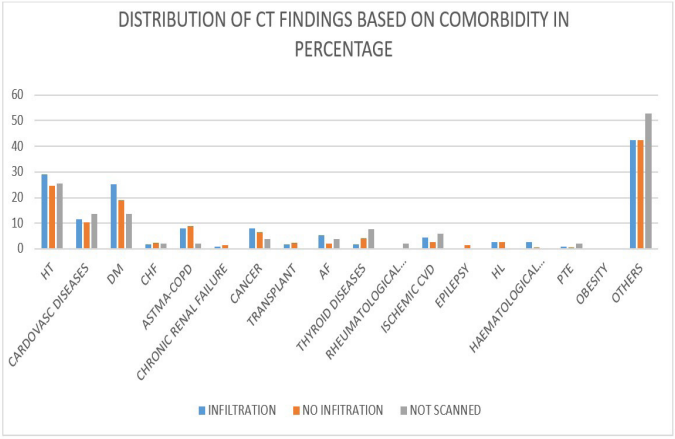
Graphic 2. When the gender distribution of thorax CT findings is examined, the incidence of infiltration is higher in male patients. Conversely, no statistically significant dependence was found between the two categories in the analysis made using the chi-square test



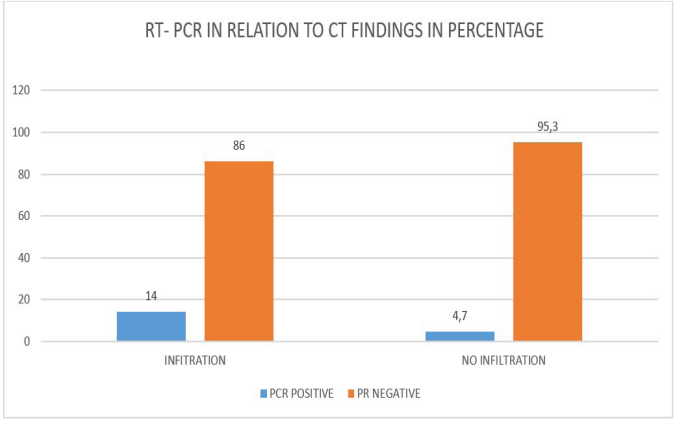
Graphic 3. Presence of infiltration in thorax CT increased in patients in the advanced age group



Graphic 4. When the complaints of patients were examined, shortness of breath was seen in 32.7% of patients with positive thoracic CT results. Other common incidence complaints were chest pain, 12.4%; fever, 10.6%, and weakness, 9.7%. The other category, which covers unclassified arrival complaints, had the highest percentage in the entire sample



Graphic 5. When the thoracic CT distribution of comorbidities is examined, hypertension with 29.2% and diabetes with 25.2% are more common compared with other comorbidities in terms of the presence of infiltration



Graphic 6. Thoracic CT results with RT-PCR, which are analyzed using chi-square test, resulting in a statistically significant dependence between them. Conversely, COVID-compatible thorax CT findings were detected in 80 of the 260 patients who were negative in the PCR test. Chi-square test $p<0.001$

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Table 1. Thoracic CT findings

	Infiltration		No infiltration		Not scanned		
	Mean	**Standard deviation**	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**	**Sig.a,b**
Haemoglobin	12.94	3.69	13.19	2.41	13.44	2.32	0.076
Plateletes	218.12	87.80	232.06	88.59	220.90	81.31	0.116
Pit/lympoct	23.12	24.35	21.87	20.55	22.46	15.24	0.041
Leucocytes	10,18	5.12	10.26	6.60	10.54	7.52	0.882
Neutrophile	7.92	7.48	10.07	49.46	6.61	4.78	0.246
Lymphocyte	2.01	1.86	3.20	17.09	3.32	6.32	0.040
CRP	61.39	74.05	41.37	68.78	27.99	57.79	<0.001
D-dimer	2.60	3.42	3.38	13.12	1.42	2.87	0.003
LDH	345	212	306	299	287	114	<0.001
CK	109.13	161.98	88.00	84.22	111.71	124.76	0.635
CK-MB	1.91	2.74	1.31	1.30	1.60	1.94	0.111
HS-trop	179.58	903.11	54.58	383.84	156.05	751.06	<0.001
K	4.31	0.67	4.24	0.55	4.37	1.35	0.368
Na	137.28	5.81	137.51	4.34	138.35	3.96	0.655
AST	35.47	41.87	37.43	83.54	29.71	33.65	0.105
ALT	34.58	41.33	33.01	74.98	26.25	26.18	0.191
T. Bil	1.03	1.09	0.96	1.97	0.95	1.11	0.080
D. Bil	1.75	12.71	0.91	9.07	0.44	0.68	0.126
Glu	160.36	111.14	137.45	72.79	136.14	57.32	0.097
Cre	10.35	90.56	1.19	1.20	1.37	2.07	<0.001
BUN	29.86	23.89	23.44	20.85	21.14	17.43	0.001
GFR	62.03	30.86	74.95	31.18	78.6	29.41	<0.001
Lactate	2.65	2.05	2.19	1.47	4.09	4.08	0.081
P«1	6.50	1.00	6.31	0.93	6.37	0.98	0.435
HCO3	24.22	5.45	25.01	4.63	25.02	4.26	0.412
PCO2	43.03	19.49	42.28	10.16	40.77	10.29	0.418

The difference between the same laboratory groups in different thorax CT categories was examined using the Kruskal–Wallis test

Discussion

In a meta-analysis by Wang et al., the worst results were three to four times higher in patients with COVID-19 with a history of cardiovascular disease. Therefore, particular attention should be paid to protecting patients with cardiovascular disease during COVID-19 treatment [15].

In our sample, thorax CT findings compatible with COVID-19 were observed in 28.1% of men and 20.7% of women. The results analyzed using the chi-square test were not statistically significant.

In our study, COVID-19 findings were found in 17.2% participants in the 18-44 year age group, 20.5% in the 44-65 age group, and in 24.1% participants aged over 65 years. The rate of thoracic CT positivity increases with age. Similar results were found in the study of ŞAO et al. on 301 cases [16].

Based on the guidelines published by the World Health Organization for COVID 19, the most common symptoms are fever, cough, and weakness, whereas the symptoms seen in patients with severe COVID-19 are shortness of breath and cough. When our sample was examined for comorbidities, high blood pressure, diabetes, coronary artery disease, chronic lung disease, and atrial fibrillation emerged. Similar rates were reported in the study conducted by Yang et al. in 1576 cases [17].

In our study, 284 patients (n=515) were tested using PCR. When analyzed using the chi-square test, a statistically significant

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dependence was detected between the PCR and thoracic CT results. In a similar study conducted by Ai et al. with 1014 cases, thoracic CT findings were detected in 308 patients with negative PCR test results [18].

In this study, we aimed to evaluate the factors that will provide rapid recognition of the disease by comparing the COVID-19 RT PCR results, thoracic CT findings, and laboratory results of patients suspected with COVID-19 admitted to Başkent University Ankara Hospital Emergency Medicine Clinic during the pandemic and share our clinical experiences that will guide Emergency Service physicians during possible pandemic periods.

Conclusions

No complaints of fever, cough, weakness, shortness of breath, or chest pain associated with COVID were found in 48.6% of patients with thoracic CT-positive results. PCR showed a low sensitivity rate. Therefore, thoracic CT is a better choice than PCR for the detection of asymptomatic cases in emergency patients.

Because its selectivity rate is high, using PCR as a diagnostic test is significant. Laboratory results indicating infection, cardiac damage, and kidney damage are useful in assessing emergency patients as a COVID suspect.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
This study was supported by Başkent University Research Fund.

Ethical Approval
This study was approved by Başkent University Medical and Health Sciences Research Board (Project no: KA21/213).

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