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Comparison of CO-RADS, RT-PCR and chest CT score; a report of 519 cases

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Abstract

Aim: Analysing the efficancy of The Dutch COVID-19 Reporting and Data System (CO-RADS) classification to evaluate the severity of the disease of patients with COVID-19 infection and investigating its diagnostic performance with the correlation between reverse transcriptase-polymerase chain reaction (RT-PCR) test results and severity of the disease.

Materials and Methods: Retrospective evaluation of the RT-PCR and the Computed Tomography (CT) imaging results of 519 patients who were clinically accepted and threated as Covid-19. Inclusion criteria: All patients over the age of 18 who underwent CT with a pre-diagnosis of covid were included. The study excluded patients who were under the age of 18, pregnant, in poor general health but unable to undergo a CT scan, whose data could not be retrieved, or whose data were input insufficiently. Three radiologists evaluated the Chest CT images by using the CO-RADS and the CT Score classifications. Relationship between CORADS, Chest CT Score and RT-PCR results were demonstrated. Demographic data, clinical features, comorbidities, hospitalization rates and intensive care unit admission were recorded and correlated with CORADS and CT Score classification.

Results: The average age was 46.41±17.37 (range 18-95). 232 cases were women, while 287 cases were men. 278 (53.5%) of 519 patients had positive RT-PCR results. According to kappa results; there is no agreement between CORADS and RT-PCR, CORADS and CT Score. 278 (53.6%) of 519 patients had positive RT-PCR results. According to kappa results; there is no agreement between CO-RADS and RT-PCR, CORADS and CT Score. There was correlation between CT score and man population ($p < 0.037$). According to the clinical symptoms; only sore throat was correlated with CORADS while fever, cough and dsypnea were not. Hospitalization and ICU admission were higher in CORADS 2-5 group. 84 of 165 patients with CORADS 1 had RT PCR positive results; while160 of 354 patients with lung involvement (CORADS 2-5 group) on CT images were RT-PCR negative.

Conclusion: Using CO-RADS classification with RT-PCR improves more accurate diagnosis. Using CT Score and CORADS classification with clinical features, enpowers the triage options during the peak of pandemic wave.

Introduction

The first suspected patient with novel coronavirus (nCoV) infection was reported in a seafood wholesale market in Wuhan, Hubei Province, China and the disease was officially named as coronavirus disease 2019 (COVID-19) by the World Health Organization at the end of 2019 [1,2].

The gold standard method in the diagnosis of COVID-19 is real-time reverse transcriptase-polymerase chain reaction (rRT-PCR) test [3]. However, rRT-PCR takes hours, before the results are available, putting strain on the units where patients are kept before being admitted to a non-covid or a pandemic ward. The severity of the COVID-19 disease is not correlated with the RT-PCR value [4]. Chest Computed Tomography (CT) is a reliable imaging toot that could predict the diagnosis and the prognosis of the disease [5].

Characteristic CT findings of COVID-19 pneumonia have

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already been reported before; the most common of which are bilateral, posterior or peripheral/subpleural, ground-glass opacities with or without consolidations [6]. These CT findings partially overlap with those of of viral peumonia, caused frequently by influenza viruses, parainfluenza virus, adenovirus, respiratory syncytial virus, rhinovirus, human metapneumovirus [7,8]. To resolve this uncertainty, in March 2020, The Dutch Radiological Society developed COVID-19 Reporting and Data System (CORADS) based on other efforts for standardization [6]. Their aim was to communicate with clinicians and collect scientific evidence from different institutions and populations. CORADS assesses pulmonary involvement of COVID-19 on a scale from 1 (very low) to 5 (very high). The system is a useful tool to guide clinicians in diagnosis of COVID-19. The degree of suspicion ranged from very low to very high (CO-RADS categories 1–5). CORADS 1; patients with normal CT scan, CORADS 2; cases with radiological findings consistent with infectious diseases that are not compatible with COVID-19, CORADS 3; Radiological findings associated with COVID-19 lung involvement, but also seen in other viral pneumonias and non-infectious lung diseases, CORADS 4; probably COVID-19 typical findings, CORADS 5; a high level of suspicion for COVID-19 involvement. However, CORADS 0 reflects negative infection and CORADS 6 establishes RT-PCR-positive SARS-Cov-2 infection at time of examination.

In this study, our goal was to examine the correlation between CORADS classification, RT-PCR results, the degree of pulmonary infiltration identified by a chest CT scoring system. The relationship between CORADS and patient symptoms, comorbidities, hospitalization, the requirement for intensive care unit (ICU) admission, and fatality rate is also examined.

Materials and Methods

Study design and patient characteristics

The RT-PCR test results, chest CT findings and clinical features of the patients with suspected COVID-19, who were admitted in Acibadem University Atakent Hospital in Istanbul between the dates of 11 March 2020 and 1 June 2020, were retrospectively analyzed. This study was approved by the Institutional Review Board of Acibadem University with the decree number 2020-08/20. Data on patient demographics and clinical follow up was retrospectively recorded from the data entry software within our hospital. Inclusion criteria of the study: all patients over the age of 18 who underwent CT with a pre-diagnosis of covid were included. The study excluded patients who were under the age of 18, pregnant, in poor general health but unable to undergo a CT scan, whose data could not be retrieved, or whose data were input insufficiently.

Chest CT imaging and image analysis

All CT examinations were performed using a multidetector CT scanner with 256 channels (Siemens Definition Flash CT, Siemens Healthineers, Erlangen, Germany). CT images were obtained with the patient in the supine position; head first at full inspiration to minimize motion artefact and without contrast medium. The acquisition parameters were as follows: tube voltage, 100- 120 kVp; tube current, low-dose (reference mAs, 30) with automatic exposure control; slice thickness, 1.0 mm; pitch 0,75-1.5 and collimation 0.625-5 mm; reconstruction interval, 1.0–3.0 mm.

Three expert radiologists (AAK, CBK, EK) who were aware of that patients were suspicious of Covid-19 infection (either by exposure history or symptoms) but were not aware of the symptoms, any other laboratory or RT-PCR data. They (with 30 and 10 years of experience in chest imaging, respectively) reviewed the Chest CT images by consensus on a picture archiving and communication system (PACS, General Electric Healthcare) retrospectively. Disaggrements were resolved with discussion and consensus. The radiologists identified CORADS classification and Chest CT involvement score. The following criteria were used for ct scoring: CT score 0; no involvement, 1; mild involvement (unilober unisegmenter ground glass opacities), 2; moderate involvement (more than unilobar unisegmenter involvement not more than three segment involvement, only ground glass opacity but not consolidation), 3; diffuse involvement (bilober more than three segment involvement but not diffuse with ground glass or consolidation), 4; extensive – severe involvement (diffuse multilober involvement with consolidation, crazy paving patern, pleural retraction or pleural effusion). The CORADS classification was defined in the introduction section.

Statistical analysis

Statistical analyses were done by using SPSS for Windows version 24 (IBM SPSS Inc., Chicago, IL, USA). Measurement data expressionwas made by mean value ± standard deviation. The Kolmogorov-Smirnov test was used for the distribution of each variable. The nonparametric test of Kruskal–Wallis was carried out to evaluate the difference in CORADS classification between patients with different ages. Variables were analyzed by using Chi-square or Fisher exact tests. The kappa tests and marginal homogeneity tests were performed for the compliance between the RT-PCR test, CORADS and CT scores. P value <0.05 was considered statistically significant.

Results

Demographic and patient characteristics

This retrospective study was enrolled 519 patients diagnosed and treated as COVID 19 pneumonia in our instution. All patients were symptomatic, presented with

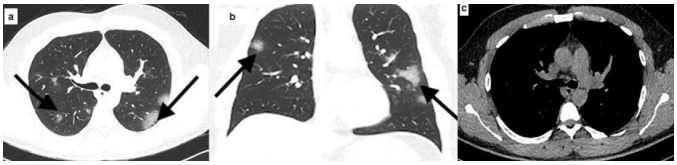

Figure 1. A-29-year old male patient with cough and fewer. After the onset of symptoms; bilaterally peripheral ground-glass opacities are seen (a), (b) with black arrow in lung window of Thorax CT. There in no consolidation that has been seen in mediastinum window.

Table 1. Distribution of PCR, CORADS and CT Score according to the gender.

		Male (n=287)		Female (n=232)			
		n	%*	n	%*	Total	p
RT-PCR	Negative	124	43.2	117	50.4	241	0.101
	Positive	163	56.8	115	49.6	278	
CO-RADS	1	83	28.9	82	35.3	165	0.522
	2	10	3.5	10	4.3	20	
	3	27	9,4	17	7.3	44	
	4	62	21.6	44	19.0	106	
	5	105	36.6	79	34.1	184	
CT Score	0	87	30.3	92	39.7	179	0.037
	1	31	10.8	32	13.8	63	
	2	49	17.1	41	17.7	90	
	3	71	24.7	41	17.7	112	
	4	49	17.1	26	11.2	75	

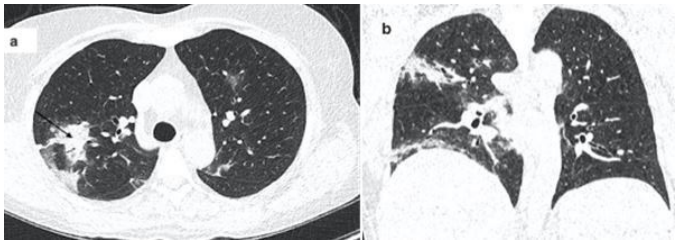

Figure 2. A-35-year old female patient with focal consolidatian (a with black arrow and b) in the posterior segment of right upper lobe and ground-glass opacity in the anterior segment of left upper lobe in the axial window and coronal lung window (b) of Thorax CT .

cough, fewer, dyspnea. 232 cases (44.8%) were women and 287 cases (55.2 %) were men. Mean age was 49.3±17.5 (range 18-95). Among the patients with a positive PCR test, 163 (56.8%) were men while 115 (49.6%) were women. Table 1. shows PCR results, CORADS groups and CT scores of 519 patients between female and male patients. The positivity of RT-PCR test with nasopharngeal swab was 24.5% (278 patients). A total of 301 of our patients were (57.9%) hospitalized.

CORADS and CT score classification

When subcategorised according to CORADS score, 165 (31.9%) patients were classified as CORADS 1, 20 (3.8%) were classified as CORADS 2, 44 (8.5%) were classified as CORADS 3, 106 (20.4%) were classified as CORADS 4 and 184 (35.4%) were classified as CORADS 5.

The mean age between the groups were statistically significant ($p<0.0005$) and this was probably due to the noteworthy lower age of the CORADS Group 1.

A significant difference between genders regarding RT-PCR results and the CORADS Groups was not detected. However, the CT scores between female and male patients were statistically significant ($p <0.037$). Post-hoc analysis revealed that in the CT Score 1 Group, there were significantly more women than men. The gender difference among the rest of the CT Score (2,3,4) groups was insignificant.

When RT-PCR results were matched with CORADS classification; the percentage of RT-PCR positive cases was 30.2%, 1.8%, 6.1%, 24.5% ve 37.4% in CORADS 1, 2, 3, 4 and 5 respectively. RT PCR was negative in 15 (6.2%) patients with CORADS 2, 27 (11.2%) patients with CORADS 3, 38 (15.8%) patients with CORADS 4 and 80 (33.2) with CORADS 5 classification. A totally of 160 patients of CORADS 2-5 groups have RT-PCR negative results.

According to CT Score classification 35 patients in CT Score 4 (n=75) group (46.7%); have RT-PCR negative results. Of these 35 patients with negative test results, 17 were in CORADS 5 group. 28 of CT Score 1 group (44.4%), 47 of CT Score 2 (52.2%), 47 of CT Score 3 (36.6%) have PCR negative results respectively.

Table 2, Table 3 and Table 4 demonstrate the correction of RT PCR, CORADS and CT Score according to Marginal homogeneity test. Table 5 summarises the Marginal homogeneity test results; there was no accordance among RT-PCR CORADS and CT Score. According to clinical symptoms; there was a significant correlation between sore throat and CORADS Classification demonstrated with Chi-Squared Test. Table 6 demonstrates the distribution of clinical symptoms according to CO-RADS groups. Figure 1 demonstrates the CT imaging of the patient with COVID-19 pneumonia.

Overall, 218 patients (42%) required hospitalization while 53 patients (10.2%) were admitted to the intensive care unit (ICU). Thirthy five patients (0.7%) died. The hospitalization rate was lower in the CORADS 1 Group (17.6%) compared to the remaining CO-RADS 2-5 (53.4%). When each CO-RADS group was analysed, from the total of 214 patients who were hospitalised, 104 were in CORADS group 5, 47 were in CO-RADS Group 4, 25 were in CO-RADS Group 3, 13 were in CO-RADS Group 2 and 29 were in CORADS Group 1. Hospitalization and ICU admission are significantly correlated with CO-RADS classification ($p<0.0005$, 0.001 respectively) despite mortality rate was not correlated ($p=0.82$).

Hypertension was the most common comorbidity with a prevalance of 19.2% (n =100) followed by diabetes melitus 13.6% (n=71) and cardiac disease 10.4% (n=54) .in our study group When the comorbidities were evaluated, 100 (CORADS 2-5; 86 %) patients had hypertension, 71 (CORADS 2-5; 83.1%) had diabetes mellitus, 54 (CORADS 2-5; 85.2%) had cardiac disease, 41(CORADS 2-5; 80.5%) had lung disease, 40 (CORADS 2-5; 77.5%) had solid cancer, 27 (CORADS 2-5; 88.9%) had hematologic disease, 23 (CORADS 2-5; 78.3%) had renal disease and 10 (CORADS 2-5; 80%) had neurological disease in our study. Hypertension, diabetes mellitus, cardiac disease, solid organ cancers, lung diseases, hematalogic cancer, neurological diseases were correlated with CORADS ($p<0.0005$, 0.001, 0.001, 0.001, 0.0005, 0.046, and 0.009 respectively); while renal disease was not correlated ($p = 0.554$).

Table 2. Marginal Homogeneity test of RT-PCR, CT Score and CO-RADS.

		CO-RADS											
		1		2		3		4		5		Total	Kappa value**
		n	%*	n	%*	n	%*	n	n%*	n	%*		
RT-PCR	Negative	81	33.6	15	6.2	27	11.2	38	15.8	80	33.2	241	-0.010
	Positive	84	30.2	5	1.8	17	6.1	68	24.5	104	37.4	278	
CT Score	0	164	91.6	7	3.9	8	4.5	0	0.0	0	0.0	179	-0.026
	1	1	1.6	1	1.6	11	17.5	26	41.3	24	38.1	63	
	2	0	0.0	5	5.6	5	5.6	23	25.6	57	63.3	90	
	3	0	0.0	1	0.9	10	8.9	37	33.0	64	57.1	112	
	4	0	0.0	6	8.0	10	13.3	20	26.7	39	52.0	75	

CO-RADS: COVID-19 Reporting and Data System.
RT-PCR: Reverse transcription Polymerase chain reaction.

Table 3. Marginal Homogeneity test of RT-PCR and CT Score according to CO-RADS groups.

			CORADS 1 (n=165)		CORADS 2-5 (n=354)		Total (n=519)		Kappa value***
			n	%*	n	%*	n	%*	
RT-PCR	Negative	n	81	33.6	160	66.4	241	100.0	-0.010
		%**	49.1		45.2		46.4		
	Positive	n	84	30.2	194	69.8	278	100.0	
		%**	50.9		54.8		53.6		
CT Score	0	n	164	91,6	15	8,4	179	100.0	
		%**	99,4		4,2		34.5		-0.261
	1-4	n	1	0,3	339	99,7	340	100.0	
		%**	0,6		95,8		65.5		

Table 4. Marginal Homogeneity test of CT Score groups according to RT-PCR results.

		RT-PCR					
		Positive		Negative		Total	Kappa
		n	%*	n	%*		
CT Score	0	89	49.7	90	50.3	179	0.020
	1	35	55.6	28	44,4	63	
	2	43	47.8	47	52.2	90	
	3	71	63.4	41	36.6	112	
	4	40	53.3	35	46.7	75	
CT Score	0	89	49.7	90	50.3	179	0.054
	1-4	189	55.6	151	44.4	340	
Total		278	53.6	241	46.4		

Discussion

The present study examined the association between CO-RADS classification, PCR test results and the degree of chest involvement with CT score. The reationship between CO-RADS and gender, clinical symptoms, comorbidities, hospitalization rate and admission to the intensive care unit were also studied. In our study group; positive PCR test was observed in 53.6 %, Chest CT involvement was reported in 65.5 %. Among the patients with negative PCR results, based on CORADS classification 15.8 % of the patients were in the CO-RADS 4 group and 33.2% were in the CO-RADS 5 group. This data revelaed that the patients in CORADS groups 4 and 5, with a high suspicion of COVID-19 pneumonia, had substantially high positive PCR test results. The patients in 5 categories of CORADS and PCR possibility did not show significantly different sex, while CT Score showed significantly different sex ($p< 0.037$). This can be explain with women in our study had less CT Score 0, than men.

Within the CO-RADS 1 Group (normal Chest CT scan), patients who presented with sore throat as a symptom were significantly higher (47.3%) compared to CORADS 2-5. Sore throat is a symptom that indicates the upper airway system and is not a clinical marker of lung involvement of COVID-19. CT imaging is not neccecerary for patients who have only sore throat; CT could be used in cases that do not response to medical threatment and rule out bacterial superinfection. According to our study; fewer, cough and dsypnea are clinical markers of lung involvement. We demonstated that panic CT scans ordered for sore throat did not deliver critical inormation on the probability of COVID-19 infection and therefore Chest CT is unnecessary for this group. However in the presence of other symptoms especially fever, cough and dyspnoe, CT is required to see severity of pnemonia.

The comorbidities accosiated with more frequent lung involvement were determined as hypertension, diabetes mel-

Table 5. Marginal homogeneity test results.

Marginal Homogeneity Test				
	Mean	Std. Deviation	Minimum	Maximum
RT-PCR	0.5	0.5	0.0	1.0
CT Score	1.7	1.5	0.0	4.0
CO-RADS	3.2	1.7	1.0	5.0
	RT-PCR & CT Score	RT-PCR & CO-RADS	CT Score & CO-RADS	
Distinct values	5	6	6	
Off-diagonal cases	394	435	483	
Observed MH statistic	243.0	194.0	758.0	
Mean MH statistic	543.5	895.5	1159.0	
Std. Deviation of MH statistic	21.9	36.5	21.8	
Std. MH statistic	-13.7	-19,2	-18.4	
Asymp. Sig. (2-tailed)	<0.0005	<0.0005	<0.0005	

Table 6. Distribution of clinical symptoms according to CO-RADS groups.

		CO-RADS 1 (n=165)		CO-RADS 2-5 (n=354)			
		n	%*	n	%*	Total	p
Any symptom	No	26	28.0	67	72.0	93	0.803
	Yes	139	32.6	287	67.4	426	
Cough	No	72	29.5	172	70.5	244	0.492
	Yes	93	33.8	182	66.2	275	
Fever	No	103	36.5	179	63.5	282	0.073
	Yes	62	26.2	175	73.8	237	
Dyspnoea	No	135	33.8	265	66.2	400	0.092
	Yes	30	25.2	89	74.8	119	
Sore Throat	No	121	28.4	305	71.6	426	0.001
	Yes	44	47.3	49	52.7	93	
Myalgia	No	144	31.4	314	68.6	458	0.929
	Yes	21	34.4	40	65.6	61	
Nasal congestion	No	143	30.7	323	69.3	466	0.099
	Yes	22	41.5	31	58.5	53	
Diarrhea	No	153	31.4	335	68.6	488	0.194
	Yes	12	38.7	19	61.3	31	
Headache	No	151	30.9	337	69.1	488	0.098
	Yes	14	45.2	17	54.8	31	
Anosmia	No	157	32	334	68	491	0.132
	Yes	8	28.6	20	71.4	28	

litus, and cardiac disease ve hematalogic diseases.

Even though the post hoc analysis did not deliver statistically significant difference between genders with CT Score 3 and 4, male patients were more frequent in the group with CT Scores 3 and 4. While the distrubution of COVID- 19 in men and women is equal according to PCR test results, the prognosis of men is worse than women as reported in the current litherature. Gender difference in mortality rate and prognosis is a clinical issue in Covid pandemic.

CO-RADS classification is a non contrast CT based scoring sysem that assesses suspected lung involvement of COVID-19 infection from very low (category 1) to very high (category 5). The results of our study revealed that in CO-RADS 5 Group, the negative PCR test rate was 33.2%. This highlights the rationale to not rely on PCR test results entirely and utilize CT results in conjunction, when evaluating suspected COVID-19 patients. These patients in the CORADS 5 group received standard COVID-19 treatment however; non-compliance to treatment or resistance to admittion into our COVID-19 ward was often encountered due to patient reactions to negative test results. Perhaps for this particular patient group, repeating tests or obtaining specimens from tracheal aspirate or

sputum rather than nasophrangeal mucosa could have revealed higher test positivity.

Chest imaging helps to assess the severity of the disease in the diagnosis of COVID-19 and plays an important role in follow-up [9,10]. Recent studies have demonstrated that chest CT is sensitive for diagnosis of COVID-19 pneumonia [6,11]. In our study, 80 (30.2 %) patients in the CO-RADS 1 Group had a positive PCR test result. However, as CT may be negative in the first few days of infection, interpretation of CT findings should be combined with clinical symptoms and duration of symptoms. Low dose Chest CT protocol is sufficient to effectively identify COVID-19 pneumonia with a dose about 0.2 milisivert (mSv) while standard dose is in the range of 1.8 mSv [12].

We performed our CT Scoring on the segmental distribution or degree of lung involvement and the features of infiltration. Hu and colleagues reported that half of the CT-positive patients never developed any symptoms. In contrast to them; our study showed that only 17,9 % of our patients had no any symptoms. Consistent with other studies; some of our patients had shown negative CT involvement at initial presentation [13].

RT-PCR is insufficient in ruling out the disease as it cannot detect infection in the early stage of the disease. Many studies reviewed that chest CT has a high sensitivity to detect COVID-19. Therefore, low-dose Chest CT can be used in in cases of symptomatic and PCR negativity. Many studies reported that patients with negative rRT-PCR results may have positive chest CT findings. Similar to these studies 160 of our patients had RT-PCR negative results while lung involvement was demonstrated with Chest CT. Therewithal 85 of our patients have RT-PCR positive results while they have no lung involvement detected with Chest CT. When the marginal homogeneity test was used, the PCR test, CO-RADS, and CT Score were not consistent with each other. Combining the RT-PCR test and the CORADS classification improves the rate of early and accurate diagnosis. Our study showed that combining CT imaging with RT-PCR is expected to improve the diagnosis of COVID-19 in similar to those indicated by Ai and al and Fang and al [14].

Fujioka and al reported that 7.9 % of their patients had no CT findings of pneumonia despite in this study 31.8 % of patients had no findings. To our opinion these patients were evaluated with Chest CT within 24 hours of the onset of symptoms before involvement of lung parenchyma. Additionally, Bernheim et al. described that 56 % of the Chest CT examinations of patients were normal 0-2 days after symptom onset and 6-12 days after symptom onset is the optimal date for CT examination [15]. Of our patients, 30,2% were symptomatic and had positive PCR results while lung involvement was not detected in CT scans. These patients could have been evaluated within the first 24 hours. It is crucial to decide the appropriate time for CT scanning evaluation.

In CORADS 1 group 50 (9 %) patients were PCR positive while 54,8% of RT-PCR positive group were in CO-RADS 2-5. The percentage of PCR-positive cases was 30.2%, 1.8%, 6.1%, 24.5% and 37.4% in CO-RADS 1 to CO-RADS 5 respectively in our study. Low PCR possibility of CORADS 2-5 Group could be explained by viral load or quality of test sample. In contrast to our study; Fujioka and al found 69.2%, 75%, 90.9% PCR possitively in CO-RADS 1 CORADS 2 and CO-RADS 3, respectively [16]. However, according to the findings of our study, combining the PCR test and Chest CT is beneficial in the early diagnosis of patients. When compared to other imaging modalities, conventional chest radiography is insensitive in early-stage disease but may be useful in the follow-up of patients in the intensive care unit (ICU).

When we compared CO-RADS to hospitalization, ICU admission, and mortality rate, we found that CORADS classification was associated with hospitalization and ICU admission but not with death. 301 of our patients were hospitalized and 53 of them were followed up in ICU. In this study hospitalization rate was 42% while ICU admission was 10.2%.

CO-RADS 1 was greater in young patients than elders and this is smilar to the research of Fujioka and al. [17] who demontrate that young people without comorbidities are often asymptomatic or mildly symptomatic, even if they were infected with COVID-19.

The diagnostic performance of CO-RADS for COVID-19 through the interpretation of chest CT images has been shown to be excellent in recent meta-analysis [17]. It is necessary to verify whether the CO-RADS findings from Europe can be applied in Turkey because of incidence, severity, and mortality of COVID-19 pneumonia vary between races and countries [18].

Therefore, we investigated the usefulness of CO-RADS using our wide CT data. Early diagnosis of COVID-19 is crucial for the isolation of patients and prevention of the spread of infection, as well as early patient intervention. The use of CO-RADS may reduce observer variation [8].

Our study had several limitations. First of all this retrospective study was conducted at a single institution. Multicenter studies are needed to validate the findings of this research. Comprehensive data are required to understand the clinical use and standardization of this classification. The timing of Chest CT examination after the onset of symptoms was not reported.

As the patients were asked to declare their symptoms, there might be recollection issues regarding common symtoms like sora throat, cough or dypnea. Another limitation of this study was the specimen site for the RT-PCR tests was the nasopharygneal mucosa and obtaining swab samples from alternative sites could have yielded higher RT-PCR test results. Additionally, we could have tested and analyzsed the COVID-19 antibody level of this patient group to comment on the diagnostic perfomance of CO-RADS and PCR combined. This study was conducted in an epidemic area where COVID-19 positive patients were mostly symptomatic. Validation is needed as to whether CO-RADS is useful for diagnosing COVID-19 in non-endemic area because of it has been reported that specificity and positive predictive value of CT imaging is lower in non epidemic areas.

Conclusion

CORADS is a useful diagnostic tool, that supports the application for patient triage. In our study CORADS was

consistent with the clinical correlation of the cases. Using RT-PCR and CO-RADS classification together enables patients to diagnose more accurately and without wasting time. Interpretation Chest CT images using this classification may contribute to the management of COVID-19 pneumonia. This was the primary study in our institute, we will also compare the complication rates at follow up with a comprehensive data.

Ethical approval

Ethical approval was obtained for this study by Acıbadem University, Acıbadem Healthcare Institutions Medical Research Ethics Committee (ATADEK) with decision number 2020-08/20.

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