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ORIGINAL RESEARCH

CORRELATION OF RTPCR AND HRCT CHEST FINDINGS IN COVID PATIENTS IN TERTIARY CARE CENTRE: AN ORIGINAL RESEARCH

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ABSTRACT

Aim: The purpose of the present research was to evaluate the co-relation of RTPCR and HRCT chest findings in COVID-19 patients in tertiary care centre.
Methodology: In our study, COVID-19 patients with positive RT-PCR results (RT-PCR (+) group) and patients with clinical suspicion of COVID-19 but negative RT-PCR results (RT-PCR (−) group) were compared in terms of CT findings. In CT images, ground-glass opacity and ground-glass opacity + patchy consolidation were the most common lesion patterns in both groups.
Results: No statistically significant differences in the rates and types of lesion patterns were observed between the two groups. In both groups, lesion distributions and distribution patterns were similarly frequent in the bilateral, peripheral, and lower lobe distributions. Among the 39 patients who underwent follow-up CT imaging in the first or second month, a regression in lesion number and density was detected in 18 patients from both groups.
Conclusion: Due to the false-negative rate of RT-PCR tests caused by various reasons, clinically suspected COVID19 patients with a contact history should be examined with CT scans, even if RT-PCR tests are negative. If the CT findings are positive, these patients should not be removed from isolation.
Keywords: Computed tomography, Polymerase chain reaction, Severe acute respiratory syndrome coronavirus.

INTRODUCTION

On December 31, 2019, the World Health Organization China Country Office reported cases of pneumonia of unknown etiology detected in Wuhan, China's Hubei province. In January 2020, the Chinese authorities identified a new kind of coronavirus.[1] In the week of 7–13 September, 1.8 million new cases and more than 40,600 additional deaths were reported, which was still slightly increased compared to the previous week.[2] With Coronavirus disease 2019 (COVID19) becoming a global threat, its clinical course and imaging findings are key aspects to identify affected patients.[3,4] Therefore, early and accurate diagnostic tools for this disease is important. Real-time polymerase chain reaction (RT-PCR) remains the standard test of COVID-19 pneumonia but standby time for viral detection with RT-PCR tests, incomplete sampling techniques, variations in viral load, and false-negative rates of a test depending on the kit sensitivity can delay the diagnosis. Chest computed tomography (Chest CT) is a rapid and easily available test that may aid in the diagnosis of COVID-19, especially in the current climate of overrun laboratories.[4] As recently reported in few studies, chest CT demonstrates typical radiologic features in majority of patients with COVID-19 disease, including bilateral GGOs in the lower lobes with a peripheral or posterior distribution, which further develops into the crazy-paving pattern and subsequent consolidation.[5,6] Also, severity and prognosis of the disease can be assessed by imaging findings which supports clinicians in timely management. CT scan findings are often used for diagnostic confirmation through protocols such as COVID-19 Reporting and Data System (CO-RADS), which classifies the image findings in CO-RADS categories in accordance with their characteristics, has a good application for triage in symptomatic individuals [7,8], and helps to monitor the progression of the disease.[9,10] COVID-19 needs a quick diagnosis, as the severe forms usually have a fast and aggressive progression. The results of the reverse transcriptase polymerase chain reaction (RT-PCR) test, the gold standard, take an average of 7 days to be released by the laboratories, and this time can be the difference between life and death for these patients. Hence, there is a need for a COVID-19 diagnostic method with faster results and good sensitivity.

AIM OF THE PRESENT STUDY

The purpose of the present research was to evaluate the co-relation of RTPCR and HRCT chest findings in COVID-19 patients in tertiary care centre.

METHODOLOGY

This retrospective study was approved by the local ethics committee. Patients suspected of having COVID-19 infection, who were treated at a tertiary care centre. RT-PCR was performed with nasal and nasopharyngeal sampling in patients whose clinical symptoms and laboratory findings (lymphopenia and C-reactive protein, ferritin, blood sedimentation rate, and D-dimer elevation) were indicative of COVID-19 infection, those who had contact with COVID-19 patients, and those who had recently returned from abroad. A total of 211 patients suspected of having COVID-19 were evaluated. Eighty-one patients with a pathology other than COVID-19 infection, a known lung disease, inaccessible CT images, and no history of contact were excluded from the study. As a result, the data of 130 patients were examined in terms of RT-PCR and CT findings. Patients whose initial RT-PCR test was positive or whose initial test was negative but became positive in subsequent tests were included in the RT-PCR (+) group, and these patients were considered as the COVID-19 patient group. Patients with negative initial RT-PCR tests underwent at least four more tests every 2 days, and if all RT-PCR tests were negative, these patients were included in the RT-PCR (−) group. Patients in

the RT-PCR (−) group either had a family member with COVID-19 disease or had direct contact with COVID-19 patients, or some had a recent travel history abroad. Thus, 85 RT-PCR (+) and 45 RT-PCR (−) patients were evaluated in terms of symptoms and CT findings. The thoracic CT scans of all patients were analysed. In addition, 26 RT-PCR (+) and 13 RT-PCR (−) patients treated according to the same protocol (favipiravir and/or chloroquine and supplemental anticoagulant agent) based on the treatment guidelines. The lesion patterns were classified as pure GGO, GGO, and consolidation combinations (GGO + nodular consolidation, GGO + patchy consolidation, GGO + segmental consolidation), consolidation, crazy-paving pattern, subpleural curvilinear line, air bubble sign, halo sign, reverse halo sign, air bronchogram, airway changes, or fibrous stripes. The distribution patterns of the lung tissue lesions were classified as peripheral (outer one-third of the lung), central (inner two-thirds of the lung), or peripheral + central localization. Images were also evaluated in terms of bilateral distribution and affected lung lobes. In patients who underwent follow-up CT imaging, changes in comparison to the first CT image were classified as increased, unchanged, regressed, or normal. SPSS 22.0 for Windows was used for statistical analysis. The mean ± standard deviation values are given for numerical variables. The frequency of radiological findings and the number of occurrences in each cluster are expressed as percentages. Lesion patterns, lesion distributions, and distribution patterns in the groups were compared using the chi-square test, and $p < 0.05$ was considered statistically significant.

RESULTS

Of the 130 patients included in the study, 48 (36.9%) were female, and 82 (63.1%) were male. The mean age of all patients was 49.8 ± 16.0 years (range, 18–92 years). A total of 94 of the 130 enrolled patients had clinical symptoms. Fever and cough were present in 43 patients (50.6%) in the RT-PCR (+) group and 31 patients (68.9%) in the RT-PCR (−) group. There were no clinical symptoms in a total of 36 patients. Of those, 25 (29.4%) were in the RT-PCR (+) group and 11 (24.4%) in the RT-PCR (−) group. There was no statistically significant difference between the rates and types of lesion patterns observed in individuals with positive and negative test results. GGO and GGO + consolidation (mixed) were the most common lesion patterns in both groups. In the RT-PCR (+) and RT-PCR (−) groups, bilateral (67.1% and 86.7%, respectively) and lower lobe (right 63.5% and 88.9%, left 74.1% and 88.9%, respectively) lesion distributions were most common. The most frequent distribution pattern was the peripheral distribution (61.2% and 55.6%, respectively). In these two groups, bilateral and lower lobe distributions were dominant. (Table 1) All 26 asymptomatic patients from both groups had a peripheral (61.5%, 16 patients) or a peripheral + central (38.5% of 10 patients) distribution as the distribution pattern; thus, an exclusively central distribution was not observed. (Table 2)

Table 1- CT imaging findings of patients

Group	RT-PCR (+) (n = 85)	RT-PCR (−) (n = 45)	P
Lesion patterns			
GGO	29 (34,1%)	22 (48.9%)	0.101
Consolidation	11 (12.9%)	10 (22.2%)	0.171
Reversed halo sign	3 (3.5%)	1 (2.2)	0.681
Crazy paving pattern	3 (3.5%)	1 (2.2%)	0.681
Distribution pattern			
Peripheral	52 (61.2%)	25 (55.6%)	0.535
Central	1 (1.2%)	0 (0.0%)	0.465
Peripheral + Central	15 (17.6%)	20 (44.4%)	0.001

*****_GGO; ground glass opacity, RT-PCR; reverse transcription polymerase chain reaction_

Table 2- CT imaging findings of asymptomatic patients

Group	RT-PCR (+) (n = 15)	RT-PCR (−) (n = 11)
Lesion patterns		
GGO	4 (26.7%)	2 (18.2%)
Consolidation	2 (13.3%)	1 (9.1%)
Reversed halo sign	1 (6.7%)	1 (9.1%)
Crazy paving pattern	1 (6.7%)	0 (0.0%)

DISCUSSION

Early diagnosis of 2019 novel coronavirus disease (COVID-19) is crucial for disease treatment and control. Compared to RT-PCR, chest CT imaging may be a more reliable, practical, and rapid method to diagnose and assess COVID-19. Chest CT is a conventional, non-invasive imaging modality with high accuracy and speed. Based on available data published in recent literature, almost all patients with COVID-19 had characteristic CT features in the disease process,[11] such as different degrees of ground-glass opacities with/without crazy-paving sign, multifocal organizing pneumonia, and architectural distortion in a peripheral distribution. Studies comparing the diagnostic accuracy of RT-PCR tests and CT findings in COVID-19 disease reported that the RT-PCR test may show false-negative results; the sensitivity of the test varies between 50 and 83%. Moreover, some studies suggest that the sensitivity of CT findings is higher than that of RT-PCRs.[12] In a study conducted by Xie et al. with 167 patients, it has been reported that all 5 patients with negative RT-PCR and positive CT at initial presentation were in direct contact with COVID-19 patients or that there were COVID-19 patients in their family. In the repeated RT-PCR tests, the positivity time varying between 2 and 8 days was detected in these patients.[13] In this retrospective study, we compared the clinical symptoms and CT findings of RT-PCR (+) and RT-PCR (N) patients. Both groups showed similar symptoms with fever and cough being the most frequent symptoms. In our study, 80% of patients confirmed to have COVID-19 with RT-PCR assays showed positive findings at chest CT and typical CT findings were present in all patients with negative RT-PCR tests. In their review of 45 studies involving 4410 patients, Ojha et al. reported that the most common lesion patterns were GGO, consolidation, and GGO + consolidation (mixed).[14] These findings were mostly observed in bilateral, peripheral, and lower lobe distributions. In this study, the laboratory findings, clinical symptoms, CT findings, and changes in CT findings after treatment were similar for COVID-19 patients and RTPCR (−) patients with clinically suspected severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Specifically, the frequencies, types, distributions, and distribution patterns of lesions on CT scans were similar in both groups.

CONCLUSION

In conclusion, RT-PCR test may show false negativity due to various reasons. Studies have shown that chest CT has a high sensitivity for the diagnosis of COVID-19. A patient with high clinical suspicion of COVID-19 infection with a history of contact should not be removed from isolation without a CT scan, even if RT-PCR tests are negative**.**

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