Accuracy of HRCT thorax in diagnosing COVID-19 in suspected patients with initial negative RT-PCR: A Retrospective analysis of discordant cases.

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Abstract

Background: During the Covid -19 pandemic, there was a need to diagnose the infection at an earlier stage for better treatment and containment of the disease.The standard method of detection was by the real-time reverse-transcription polymerase chain reaction (RT-PCR) tests. However in some cases when the initial PCR tests was negative, HRCT thorax played an important role for earlier detection.

Aim: To test the accuracy of HRCT thorax in diagnosing COVID-19 infection in suspected patients with initial negative RT-PCR.

Materials and methods: Retrospective analysis of patients with a negative RT PCR but with clinical suspicion of COVID who were referred for HRCT thorax during the initial phase of the disease, were included in the study. HRCT thorax images were categorized as per CORADS scoring system. Those patients with score of 4 or 5 were subjected to repeat RT-PCR test and results were analysed.

Results: Total of 52 (33 (63%) males and 19 (37%)females) patients in age group from 36-62yrs,who had clinical suspicion of COVID and underwent HRCT were included.The CT was performed within 10 days of the illness. All these patients had a negative RT-PCR result when CT was performed.22 patients had a CORADS score of 4 and 30 patients had a score of 5. Follow up RT-PCR done within a week after the CT came out to be positive in 45(82.3%) patients. In rest of the 7 (13.4%) patients it was negative. The sensitivity of CT came out to be 84.8% which was statistically significant.

Conclusion: HRCT appears to be more accurate in detection of the disease whereas RT-PCR test may produce false-negative results in the initial phase of the disease.

Key words: COVID-19, RT-PCR, HRCT

Introduction

As the pandemic of coronavirus disease 2019 (COVID-19) still prevails, diagnosing the infection plays an important role for containing the disease[1]. The standard method of detection is by the real-time reverse-transcription polymerase chain reaction (RT-PCR) tests[2]. However, some patients may present with negative results of RT-PCR tests even though they have high clinical suspicion[3]. Such patients can have positive results on HRCT showing typical imaging findings of COVID-19[4]. After isolation, these patients were eventually confirmed to have COVID-19 infection by means of repeat RT-PCR within a week after CT. Therefore a combination of repeat swab tests and HRCT may be helpful for diagnosing COVID-19 infection in patients with a high clinical suspicion in the initial phase of the disease[5].

Materials And Methods:

Retrospective study including was performed in Yenepoya Medical College Hospital, Department of Radiodiagnosis for a period of 3 months from August 2020 to October 2020

Patients

Patients with a negative RT PCR but with clinical suspicion of COVID who were referred for HRCT thorax during the initial phase of the disease, patients having a CORADS score of 4 and 5, in patients where repeat RT-PCR tests were done within a week after the CT were included in the study.

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Image acquisition

All CT examinations were obtained with General Electric Medical System Brightspeed Light 16 slice MDCT machine with 1.25 mm collimation, 10 mm reconstruction interval, gantry rotation speed of 0.8 seconds, pitch of 1.375:1. 120k V and automated tube current adaptation (100- 700 mA). Routine anteroposterior tomogram of thorax was initially taken in all patients in supine position with breath hold. Axial sections of 1.25mm thickness were taken from the level of lung apices to posterior costophrenic angles.

Image analysis

The CT findings were evaluated by experienced radiologists in the department.

The typical CT imaging features as established by previously published reports were taken as reference [6]:

* Multifocal ground-glass opacities (GGO; defined as hazy increased lung attenuation with no obscuration of the underlying bronchial or vessels)

* Peripheral and basal distribution

* GGO with consolidation (defined as opacification obscuring the underlying vessels)

* Vascular, Interstitial thickening and crazy paving pattern

Finally a probability score based on the COVID-19 reporting and data system i,e CORADS score was given for each of these patients. A score of 4 was given for abnormalities "suspicious" for COVID-19 and a score of 5 for abnormalities "typical" of COVID-19[7]
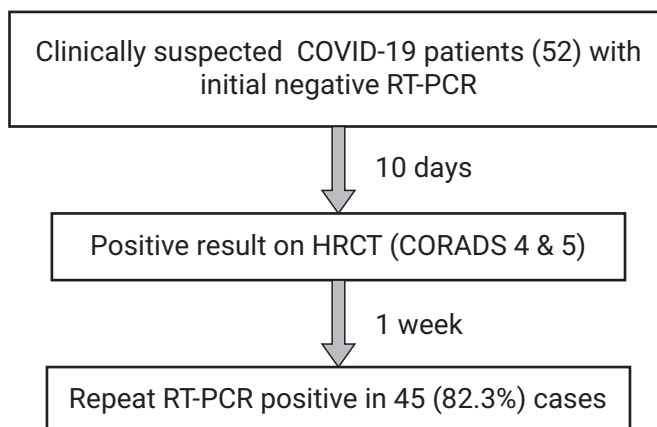
Paired T test was applied for statistical analysis.
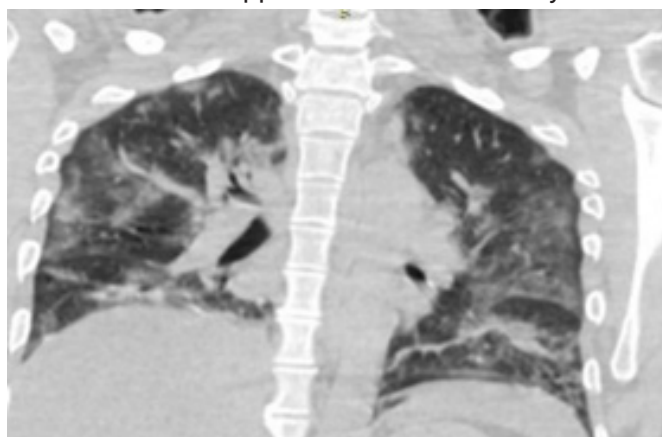
Axial and Coronal reformatted CT of thorax showing ground glass opacities in peripheral subpleural distribution. CORADS 4 and 5

Results:

Total of 52(33 (63%)males and 19(37%)females) patients in age group from 36-62yrs,who had clinical suspicion of COVID and underwent HRCT were included.The CT was performed within 10 days of the illness.All these patients had a negative RT-PCR result when CT was performed.22 patients had a CORADS score of 4 and 30 patients had a score of 5. Follow up RT-PCR done within a week after the CT came out to be positive in 45(82.3%) patients. In Rest of the 7 (13.4%) patients it was negative. The sensitivity of CT came out to be 84.8% which was statistically significant.

Clinically suspected COVID-19 patients (52) with initial negative RT-PCR

↓ 10 days

Positive result on HRCT (CORADS 4 & 5)

↓ 1 week

Repeat RT-PCR positive in 45 (82.3%) cases

Discussion

The RT-PCR testing accuracy may be affected by many factors like viral load, source of specimens, sampling procedures and timing, quality control of the test, etc[8.] Therefore, the RT-PCR is unlikely to be a reliable and independent tool for COVID-19 screening. On the other hand, the ease of access to CT makes it an efficient modality in the management of respiratory transmitted diseases like SARS and H1N1 flu outbreak[9]. Chest CT has played an important role

in early detection, evaluation, and treatment response monitoring of COVID-19 infection. However, chest CT manifestation of COVID-19 pneumonia overlaps with other types of viral pneumonia, bringing potential impact on its specificity[10].

Consistent with most of the literatures, our study results show that patients who had characteristic chest CT features with negative initial RT-PCR had confirmed to have COVID-19 by repeat RT-PCR test within 10days. As mentioned before, COVID-19 patient may have false negative initial RT-PCR result caused by different factors. Hence the combined strategy of initial RT-PCR following with CT yield a improved sensitivity.

Conclusion

In patients who have high clinical suspicion of COVID-19 infection, HRCT Chest along with repeat RT-PCR will aid in the diagnosis of the infection. HRCT appears to be more accurate in detection of the disease whereas RT-PCR test may produce false-negative results in the initial phase of the disease.

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