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ORIGINAL ARTICLE

Comparison of Chest Computed Tomography Differential Diagnosis of Ground Glass Opacities in the COVID-19 Patients

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ABSTRACT

Aim: To compare chest computed tomography (CT) diagnosis of ground glass opacities in the COVID-19 patients.
Study design: Retrospective study.
Place and duration of study: Department of Radiology, Ghulam Muhammad Mahar Medical College Sukkur from 1st July 2020 to 31 August 2021.
Methodology: Fifty patients on differential CT diagnosis of ground glass opacities seen in COVID 19 patients were enrolled. Thoracic CT images by applying auto exposure-control settings and ranges of scan were done. The noise-index was kept as 12.3. Using helical 16 slice Alexion CT-Toshiba. Keeping a comparison with viral infection CT images a list of 7 signs which were positive for Covid CT scan were recorded. Peripheral lesions meant any lesions which effects peripheral area up to 3 to 4 cm lung periphery with/without having central dispersal. A hazy-opacity was termed as ground glass.
Results: Mean age of the patients was 49.1±10.2 years with 27 (54%) males and 23(46%) females. Mix ground glass opacitites and consolidation were also the features of the CT imaging in coronavirus posisitve cases. Man-Whitney test results showed that combined-CT scoring had a SE value as 0.044 with a confidence interval between 0.756-0.927. Comparing the differential CT values within COVID and non COVID patients based on RT PCR results it was observed that posterior region lower lobe involvement was a feature of COVID-19 patients while crazy paving pattern and peripheral distribution was also seen in corona patients.
Conclusion: Present study highlights that chest CT helps in differentitaing corona virus from other causes of pneumonias and grond glass opacities.
Key words: Chest CT; Differential diagnosis; COVID-19; Ground glass opacities (GGO)

INTRODUCTION

Corona virus is declared as pandemic in year 2020 and caused major catastrophe worldwide. It affected millions of people and caused several hundred thousand deaths all over the globe.[1] It left patients with different ailments and life-threatening disorders and also badly influence mental health. It belongs to an important virus family known as human coronavirus and one of its virus already caused endemic in Saudi Arabia in year 2014. Common sign and symptoms of COVID-19 are severe myalgia, flu, cough, fever and dyspnea.[2,3] Polymerase chain reaction is considered as gold standard for the diagnosis and confirmation of COVID-19[4].

Few recent studies also proved that reverse transcription polymerase chain reaction test (RT-PCR) showed lesser sensitivity and specificity for different strains in number of patients for corona virus detection[2,5,6]. Further diagnostic tests claimed the possibility of laboratory error or low viral load on swab.[5,7] Additionally, chest computed tomography (CT) showed better sensitivity (upto 55-98%) results in the detection and confirmation of corona virus even at early stages but with low specificities.[5,6] Chest CT revealed interesting findings for corona virus pneumonia and suggested rounded morphology of ground glass opacity (GGO) that can be further linked with crazy paving patterns and consolidation. Traction bronchiectasis and vascular dilation are also the results of GGO confirmation in corona positive patients.[8] Few features only reports in peak stage of COVID such as formation of subpleural bands while indeterminate features and findings includes perihilar, diffuse, non specific distribution, unilateral GGO and non-rounded GGO[6].

Varied range of pulmonary conditions may be attributed to the low specificity of chest CT that can further mimic the findings particularly those which are related with GGO. Common reasons of GGO that can relate with corona virus are interstitial pneumonia, atypical bacterial pneumonia, hypersensitivity pneumonitis, viral pneumonia, drug-induced lung injury and diffuse alveolar hemorrhage. Therefore, present study is designed for the comparison of CT diagnostic outcomes for the evaluation of differentiating COVID-19 and non-COVID-19 reasons of ground glass opacity.

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MATERIALS AND METHODS

This retrospective study was performed at Department of Radiology, Ghulam Muhammad Mahar Medical College Sukkur from 1st July 2020 to 31st August 2021 on differential CT diagnosis of ground glass opacities seen in COVID 19 patients and approved by Ethical Committee of the hospital. The patients where CT was done within ≤7 days' post onset of symptoms were included in the study. Patients who were either negative on RT-PCR or did not undergo high resolution CT were excluded from this study. There were 50 cases enrolled as study participants. A complete clinical, demographic history of patients was documented on a proforma. Total leucocytes count, D dimers, CRP as well as serum ferritin levels, creatinine and other important laboratory tests were performed for keeping an update on status of COVID patient. Thoracic CT images by applying auto exposure-control settings and ranges of scan were done. The noise-index was kept as 12.3. Using helical 16 slice Alexion CT-Toshiba. Keeping a comparison with viral infection CT images a list of 7 signs which were positive for Covid CT scan were recorded. The list of signs focused on i) number lobes involved ii) lesion/distribution features iii) patterns of lesion such as either ground glass-opacification having consolidations or not, crazy paving-pattern as well as shape iv) other various lesion signs including bronchial thickening of walls. All these positive signs were compared with negative signs including i) Only single lobe involvement ii) only central-distribution iii) tree in bud sign iv) thickening of bronchial wall. Peripheral lesions meant any lesions which effects peripheral area upto 3 to 4 cm lung periphery with/without having central dispersal. A hazy-opacity was termed as ground glass. Patients who were clinically and by laboratory not confirmed for COVID were also placed in a

cohort where their CT imaging was also performed for better comparison. Data analysis was performed through SPSS volume 26.

RESULTS

Mean age of the patients was 49.1±10.2 years with 27(54%) males and 23(46%) females. The high resolution CT images of the patients showed pure ground glass opacities and ground glass opacities. Mix ground glass opacitites and consolidation were also the features of the CT imaging in coronavirus positive cases (Fig. 1).

Interquartile ranges were observed in the continuous variable present. Those variables which were present in form of categories were termed as percentages. Man-Whitney test results showed that combined-CT scoring had a SE value as 0.044 with a confidence interval between the range of 0.756-0.927 (Table 1).

Comparing the differential CT values within COVID and non COVID patients based on RT PCR results it was observed that posterior region lower lobe involvement was a feature of Covid 19 patients while crazy paving pattern and peripheral distribution was also seen in Covid 19 patients (Table 2).

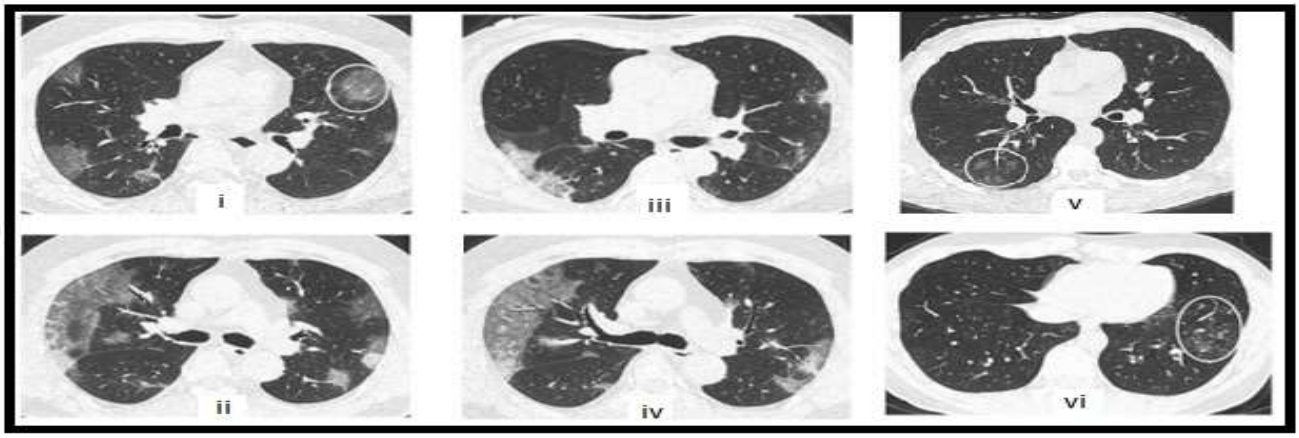
Table 1: Significance of combined CT scoring

	AUC	SE	P value	CI 95%
Combined-CT scoring	0.856	0.044	0.001	0.756-0.927

Table 2: Comparison of differential CT images

Variable	CT imaged patients (n=50)	RT-PCR confirmed (40)	Clinically conformed non-COVID	P value
Positive				
Posterior region or lower-lobe	90%	100%	83%	0.005
Bilateral involvement	45%	60%	35%	0.035
Round ground glass opacity	12%	26%	2.3%	0.001
Crazy paving pattern	51%	76%	32%	<0.001
Peripheral-distribution	79%	96%	46.7%	<0.001
Ground glass opacity with without consolidation	91%	90%	90%	0.002
Negative				
Single lobe involved	46%	30%	58%	0.008
Only centrally distributed	20%	3.3%	32%	0.0012
Centrilobular-nodules	8.2%	0%	14%	0.001
Thickening of bronchial wall	16.5%	3.3%	25%	0.007
Total IQR-median score	2(1-5)	4(2-6)	2(0-3)	<0.001

Figure 1: CT images of Covid 19 patients where i is pure and round ground glass opacities, ii is mix ground glass opacities, iii is crazy paving pattern, iv subpleural-band like region, v is central-distribution and vi is free-tree in bud signs



DISCUSSION

Corona virus pandemic raised serious health challenges and public health concerns from year 2019. Due to its rapid transmission, it spreads worldwide swiftly and affected millions of people and caused deadly consequences. RT-PCR is considered as gold considered initially due to its high sensitivity but later studies proved low specificity and leads to false negative results. To overcome the problem raised due to PCR, high-resolution computed tomography (HRCT) chest suggested as a better and more reliable method of diagnosis even in early stages of disease. It allows rapid detection and helps in combating the disease in early time and stops its further transmission[9,13].

Present study designed for the diagnostic comparisons of HRCT chest between COVID and non-COVID patients. In current study, chest CT showed pure ground glass opacities and ground glass opacities. Mix ground glass opacitites and consolidation were also the features of the CT imaging in coronavirus posisitve cases. Various other researches also reported the similar findings. Furthermore, it was observed that it was observed that posterior region lower lobe involvement was a feature of COVID-19 patients while crazy paving pattern and peripheral distribution was also seen in corona positive patients[14-19].

General radiologists showed responsible enough for differentitaing it from other underlying conditions for more accurate and relaible results. It is the responsibility of the radiologists for accurate and focued findings and they should chest imaging trainigs for better interpretations of results for confirmation of corona virus in suspected cases[20,21].

CONCLUSION

High-resolution computed tomography chest showed reasonable senstivity in suspected COVID-19 patients. This also helps in differentitaing corona virus from other causes of pneumonias and Ground glass opacities.

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