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CHANGES IN THE CHEST COMPUTED TOMOGRAPHY SCAN OF COVID-19 PATIENTS: A RETROSPECTIVE STUDY

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ABSTRACT

Introduction : Coronavirus disease 2019 (COVID-19) is caused by SARS-CoV-2 virus (severe acute respiratory syndrome–related coronavirus). COVID-19 causes mild to severe respiratory illness commonly characterized by fever, cough, shortness of breath etc. currently COVID-19 case fatality rate in india is 1.45% with cumulative deaths of 154 274. **Methods :** This was a retrospective study conducted in Radiology department. All the CT chest scan reports of RT-PCR confirmed COVID-19 cases were included and any changes were noted. **Results :** All the CT scan reports are positive for radiological changes. Bilateral lung involvement was seen in 77.96% , all the lobes were equally affected, peripheral involvement was seen in 70%, posterior involvement was seen in 57.1%. the CT findings found in the CT scan reports were ground glass opacities with consolidation, pure ground glass opacities and ground glass opacities with crazy paving pattern. **Conclusion:** CT chest scan of COVID-19 patients show radiological changes predominantly ground glass opacities and less commonly consolidation which carries a prognostic importance, helps guide the treatment and better management protocol.

KEY WORDS : COVID-19, CT, RT-PCR, SARS-CoV-2

INTRODUCTION:

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first appeared in Wuhan, China at the end of 2019. Later it spread quickly worldwide and on 30 January 2020, the Director-General of the World Health Organization (WHO) declared the outbreak of COVID-19 to be a Public Health Emergency of International Concern and later declared a pandemic on 11 March 2020. (WHO). According to the World Health Organisation (WHO) weekly report on 31st Jan 2021, more than 102 million people have confirmed positive globally with 2.2 million deaths.

SARS-CoV-2 is a virus of the species severe acute respiratory syndrome–related coronavirus (SARSr-CoV) (Y. Chen, MARCH 2020). SARS-CoV-2 is a single stranded RNA virus. The disease is characterized by respiratory illness that may present as asymptomatic, mildly symptomatic to severely symptomatic. (W.H. Kong, April 2020) Most common symptoms include fever, cough and shortness of breath. Human to human transmission of SARS-CoV2 is primarily through respiratory droplets of coughing and sneezing. Lesser but potential other modes of transmission are droplets of speaking and closed spaces with little air flow may increase the chances of transmission. Indirect transmission from contaminated surfaces certainly poses a greater risk.

CT chest scan findings depends on the stage of the disease. Findings include ground glass opacities , located at peripheral and basal areas or consolidations. These CT findings are prominent around 9-13 days of symptom onset. Once the recovery sets in, these opacities undergo resorption and gradually are replaced with sub-pleural lines, reticulations, fibrous stripes and perilobular opacities. Some individuals may present with complications like acute respiratory distress syndrome(ARDS) or pulmonary embolism. (A.H. Parry, MAY 2020) Severe cases presents with pleural effusion, pericardial effusion and mediastinal lymphadenopathy. (A. Bernheim, 2020)

This study was done to evaluate the CT chest changes in the COVID-19 patients.

METHODOLOGY:

This study was done in a retrospective fashion at radiology department, government general hospital, Anantapur; from April to December 2020. A total of 100 CT chest scans were studied. The reports were read and confirmed by Assistant Professor and later by professor and HOD of Radiology.

Inclusion criteria: all the CT chest scans of RT-PCR confirmed COVID-19 patients.

The CT chest scan was done by the instrument with these settings.
The CT chest scan findings that were taken into account were; presence or absence of lesions/ opacities, unilateral or bilateral, type of opacities, location of opacities- anterior or posterior and peripheral or central, number of lobes involved, presence or absence of consolidations.

All the reports were scrutinized properly and data was analyzed using appropriate statistical test.

RESULTS:

Demographic details

A total of 667 CT chest scans of RT-PCR positive COVID-19 patients were studied. The demographic details included 69.8% males and 30.2% females; with a mean age of 40.5 ± 15.6.

Gender	Total no of patients(n=667)	percentage
Male	466	69.8%
Female	201	30.2%
Mean age ± SD	40.5 ± 15.6	

CT findings

Lung parenchymal abnormalities on CT	Number of patients (n=667)	Percentage of patients
Present	667	100%
Absent	0	0%
Bilateral lung involvement	520	77.96%

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Right lung	73	10.9%
Left lung	74	11.09
Right upper lobe	574	86%
Right middle lobe	478	71.6%
Right lower lobe	497	74.5%
Left upper lobe	549	82.3%
Left lower lobe	508	76.2%
Central and peripheral involvement	152	22.8%
Peripheral involvement	467	70%
Anteroposterior involvement	339	50.8%
Posterior involvement	381	57.1%

All the reports studied were positive for lung parenchymal changes on CT scan. Both the lungs affected in 77.96% while unilateral involvement seen in 10.9% and 11.09% of the reports on the right and left side respectively. There was not much difference in the lobar involvement; all the lobes were affected and the minor difference is not statistically significant. The peripheral part of lungs is more commonly affected, nearly 70%. 22.8% of the reports showed both central and peripheral involvement. Not a single CT reported with central lesion alone without peripheral lesions. Similarly, only anterior part of lung was not affected but anteroposterior lesions noted in 50.8% scans and only posterior lesions noted in 57.1%.

Type of lesion	No of reports	Percentage
PURE GGO	213	31.9%
GGO WITH CRAZY PAVING PATTERN	198	29.7%
GGO WITH CONSOLIDATION	256	38.3%

The predominant CT findings are ground glass opacities with consolidation (38.3%), followed by pure ground glass opacities(31.9%) and ground glass opacities with crazy paving pattern (29.7%).

DISCUSSION:

More than a year had passed since the beginning of the COVID-19 pandemic, lot of information had been gathered like the symptoms, severity, risk factors, fatality, laboratory findings; while only little is known of the radiological findings, in particular for Indian patients. Majority of the data linked to radiological findings came from other countries like China and Europe. India has recorded a total of 10 746 183 cases and cumulative deaths of 154 274; while data from other countries include; the united states of America total cases 25 676 612 and total deaths 433 173, the United Kingdom total cases 3 796 092 and total deaths 105 571, France total cases 3 126 351 and total deaths 75 466 Spain total cases 2705 001 and total deaths 57 806 as of 31st of January 2021. (WHO)Incidence of the disease is gradually decreasing throughout the world owing to better understanding of the disease and hygienic practices followed by people.

This study was conducted to better understand the disease in the context of radiological findings and to guide initiate the treatment appropriately.

Caruso D et.al (D. Caruso, APRIL 2020)reported positive CT chest pulmonary findings in 96.6 % of symptomatic cases. The presenting symptoms were fever (61 %), cough (56 %) and dyspnea (33 %).

Yu M et.al (M. Yu, APRIL 2 2020) reported positive CT chest findings in 100 % of the study Cohort. Two third of the cases were having mild symptoms with fever in 86 % and dyspnea in 10 %.

Inui S et.al (S. Inui, MARCH(2) 2020) conducted a study in an environmentally homogenous cohort (Diamond Princess Cruise ship). Study reported a normal chest CT in 21 % of symptomatic COVID-19 cases with cough (20 %), fever (11 %) and dyspnea (3%). Nearly half (54 %) of the asymptomatic cases of the cohort had an abnormal CT.

A study conducted by Ai T et.al (T. Ai, febrauary 2020)reported CT findings in 888 (88.7 %) among the total study population of 1014 COVID-19 patients. 3% of RT-PCR positive cases with clinical symptoms reported a normal CT scan.

A meta-analysis of 13 studies conducted by Bao C et.al (C. Bao, march 2020)included 2378 COVID- 19 cases found a pooled positive rate of 89.7 % for CT.

Our study was conducted in a retrospective observational pattern, taking into consideration all the CT chest scans available; to understand and gain insight of the CT changes of RT-PCR confirmed COVID-19 patients. The results of our study indicate 100% positive changes in CT chest scans; this could be in part because, only symptomatic patients were advised CT chest scan. The findings of our study states that the CT changes could be pure ground glass opacities , ground glass opacity with crazy paving pattern or ground glass opacity with consolidation.

Conclusion:

Our study found that majority of the COVID-19 patients have positive CT chest findings, which include GGO, GGO WITH CRAZY paving pattern and GGO with consolidation. Hence it is imperative that all the symptomatic patients should undergo CT chest scan, to better understand the disease and help guide the treatment.

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