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RADIOLOGICAL RESOLUTION IN PATIENTS WITH COVID 19 PNEUMONIA

Medicine

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ABSTRACT

Chest X-Ray and CT scan shows characteristic changes in COVID-19 pneumonia. Chest x-ray can be used for diagnosis and follow up in patients with COVID-19 pneumonia.The study aims at describing the chest x-ray and CT scan findings in COVID-19 patients. Study was conducted at Al Azhar Medical College in 40 patients confirmed by RT-PCR between the periods of September 2020 to February 2021. In our study out of 40 patients GGO was the most common finding (45%) followed by consolidation, reticular and interstitial thickening. Most of the patients showed bilateral lung lesions with peripheral distribution and lower zone involvement. This study showed 31patients (77%) had complete radiological resolution at the end of 8th week. X ray and CT are very good predictors for assessing the course of COVID-19 disease and it could be used as a tool for long-term consequences monitoring.

KEYWORDS

COVID 19, Chest X –Ray, CT chest, GGO, Consolidation, Fibrosis.

INTRODUCTION

COVID-19 is an emerging infection caused by a novel coronavirus that is moving so rapidly that on 30 January 2020 the World Health Organization declared the outbreak a Public Health Emergency of International Concern and on 11 March 2020as a pandemic. Similar to COVID-19, SARS and MERS typically begin with an acute illness from which most patients recover after two weeks. Coronaviruses are enveloped, positive-sense, singlestrand, non-segmented, and ribonucleic acid viruses that belong to the coronaviridae family [1} The radiographic features were diagnosed according to the Fleischner society glossary. Ground glass opacity (GGO) was defined as an increase in opacification of the lung which does not obscure the blood vessels and airways. Consolidation was defined as a homogenous opacification that obscures the blood vessels and airway walls. Reticulation was defined as a collection of innumerable small opacities in a linear pattern [2]. Presence of nodular consolidation, and pleural effusion were also recorded. The distribution of the lung lesions was classified into: 1)right lung, left lung, or bilateral. 2) Peripheral predominant, central predominant, or diffuse. A severity score was determined for each lung using the Radiographic Assessment of Lung Edema (RALE)score proposed by Warren et al. [3]. The score is determined by the involvement of each lung by consolidation or ground glass opacity from 0 to 4 (0 = no involvement;1 = < 25%; 2 = 25–50%; 3 = 50–75%; 4 = > 75% involvement).The scores for each lung were summed to produce the final severity score.

An early diagnosis of COVID-19 is crucial for disease treatment and control of the disease spread. Real-time reverse-transcription polymerase chain reaction (RT-PCR) demonstrated a low sensibility, therefore chest computed tomography (CT) plays a pivotal role not only in the early detection and diagnosis, especially for false negative RT-PCR tests, but also in monitoring the clinical course and in evaluating the disease severity. This paper reports the CT findings with some hints on the temporal changes over the course of the disease: the CT hallmarks of COVID-19 are bilateral distribution of ground glass opacities with or without consolidation in the posterior and peripheral lung, but the predominant findings in later phases include consolidations, linear opacities, “crazy-paving” pattern, “reversed halo” sign and vascular enlargement. The CT findings of COVID-19 overlap with the CT findings of other diseases, in particular the viral pneumonia including influenza viruses, parainfluenza virus, adenovirus, respiratory syncytial virus, rhinovirus, human metapneumovirus, etc.There are differences as well as similarities in the CT features of COVID-19 compared with those of the severe acute respiratory(4)syndrome.COVID-19 demonstrated characteristic CT features during its course, so serial CT examinations may be helpful for monitoring disease course and to ensure a timely treatment. A semi-quantitative estimation of the disease extent was performed, based on the system proposed by Francone et al..[5] The CT-score is derived from extent of lobar involvement based on a 5 point scale (0%=0, < 5%=1, 5–25%= 2, 26–50%= 3, 51–75%= 4, > 75%=5 range 0–5; global score 0–25).

The hallmark of COVID-19 is the bilateral presence of patchy ground glass opacities (GGOs) that may coalesce into dense, consolidative lesions, with a predominantly peripheral distribution under the pleura and along the bronchovascular bundles [6,7]. As the disease progresses, the number of lesions may rapidly increase and extend to central areas with the left lower lobe being more often involved than the upper/middle and right lobes [8]. During the disease recovery, the lesions are gradually absorbed over a period of two weeks, leading to the formation of fibrotic stripes [9]. In addition to GGOs and consolidations, COVID-19 pneumonia may show other CT findings or patterns such as interstitial thickening, crazy-paving pattern, “reversed halo sign”, “halo sign”, and airway and vascular changes. These may help to differentiate COVID-19 pneumonia from other forms of pneumonia. On chest CT scans, acute COVID-19 typically presents with progressive ground glass opacities, alveolar consolidations, with a common subpleural and basal location, rounded lesions, crazy paving pattern, linear densities, parenchymal bands and architectural distortion perhaps representing organizing pneumonia and/or fibrotic changes. [10] This presents as an overall radiological picture that is distinct from other viral infections, such as influenza.[11, 12] Similar to the clinical evolution, the trajectory of radiological patterns is reported as heterogeneous. After a mean observation time of 10 days, lung parenchymal abnormalities seem to have improved in most cases, while some patients persistently show mild signs of pulmonary fibrosis.[13] At short-term follow up, the most frequent radiological abnormalities included ground glass opacities, consolidation, and parenchymal bands.[14]

MATERIAL AND METHODS

This prospective observational study was carried out on patients of Department of Pulmonary Medicine at AL Azhar Medical College and Super speciality Hospital, Kerala from September 2020 to February 2021. A total 40 patients were included in this study.

Study Design: Prospective observational study
Study Location: Department of Pulmonary Medicine at AL Azhar Medical College and Super speciality Hospital, Kerala
Study Duration: From September 2020 to February 2021
Sample size: 40 patients.

INCLUSION CRITERIA:

1. Age ≥ 20 years
2. Patient with co morbidities Hypertension, Diabetes mellitus and Coronary artery disease.
3. Patients with smoking history

EXCLUSION CRITERIA:

1. Age < 20 years

Procedure methodology

Forty patients diagnosed with COVID 19(RTPCR/Antigen) were

selected for the study. Patient's history, Age, Gender, body mass index (BMI), smoking habit, preexisting co morbidities were collected. Chest X-Ray and CT Chest was done in all patients included in this study.Follow up chest X ray and CT were done at 8th week.

STATISTICALANALYSIS

Statistical analysis was performed using IBM SPSS Statistics Software (version 24; IBM, New York, USA). The comparisons of counting data were evaluated using the Chi-square test. A p-value of less than 0.05 was defined as statistically significant.

RESULTS

In our study we evaluated 40 Patients with COVID 19, which included 24 Males and 16 Female patients and 75% patients were in age group of 20-40 years. Most of the patients had Fever, dry cough and breathlessness as predominant symptoms at the time of presentation.

Table 1

Patients	Age	Sex	BMI	DM	HTN	CAD	SMOKING
1	27	M	28.2	N	N	N	Y
2	36	M	26.4	N	N	N	N
3	29	F	23.7	N	N	N	N
4	38	M	31.2	N	N	N	Y
5	55	F	22.6	Y	Y	N	N
6	32	F	28.2	N	N	N	N
7	36	M	26.8	N	N	N	Y
8	25	F	30.7	N	N	N	N
9	36	M	23.0	N	N	N	N
10	31	M	27.5	N	N	N	N
11	67	M	20.3	Y	Y	Y	Y
12	35	M	24.6	N	N	N	N
13	22	F	26.2	N	N	N	N
14	69	M	25.8	Y	Y	Y	Y
15	33	F	22.1	N	N	N	N
16	37	F	28.9	N	N	N	N
17	34	M	30.6	N	N	N	N
18	30	F	23.6	N	N	N	N
19	54	M	29.7	Y	Y	N	Y
20	29	M	32.3	N	N	N	N
21	27	F	23.6	N	N	N	N
22	28	M	26.7	N	N	N	N
23	38	M	29.2	N	N	N	N
24	55	F	22.4	Y	Y	N	N
25	26	M	20.8	N	N	N	Y
26	56	M	26.3	Y	Y	N	Y
27	38	M	22.5	N	N	N	N
28	68	F	27.2	Y	Y	Y	N
29	29	M	24	N	N	N	Y
30	47	F	28.4	N	N	N	N
31	25	M	27.2	N	N	N	N
32	33	F	24.3	N	N	N	N
33	39	F	28.7	N	N	N	N
34	29	M	25.2	N	N	N	Y
35	36	M	26.3	N	N	N	N
36	53	F	23.5	Y	Y	N	N
37	42	M	26	N	N	N	N
38	59	M	27.8	Y	Y	Y	N
39	31	F	25.6	N	N	N	N
40	34	M	24	N	N	N	N

Table 2 Radiological findings at diagnosis

Radiological findings	Percentage
GGO	45%
Consolidation	30%
Reticular opacity	15%
Pulmonary nodule	8%
Pleural effusion	2%
Fibrosis	0%

Table 3 Zonal predominance

Zonal predominance	Percentage
Upper zone	5%
Mid zone	20%
Lower zone	75%

Table 4 radiological distribution

Distribution	Percentage
Perihilar	11%
Peripheral	55%
Diffuse	34%

Table 5 Radiological findings at 8 th week

Radiological findings	Percentage
Reticular opacity	2%
GGO	8%
fibrosis	90%

Table 6 Correlative factors with radiological resolution

	Complete radiological resolution		
Age	YES	NO	P value
>40 years	4	6	.001041
<40 years	27	3	

As shown in table 6 patients in age group <40 years had complete radiological resolution compared to age group > 40 years and is statistically significant.

Table 7

	Complete radiological resolution		
Gender	YES	NO	P value
Male	18	6	.642835.
female	13	3	

Table 7 Association between patients gender and complete radiological resolution was not statistically significant.

Table 8

	Complete radiological resolution		
BMI	YES	NO	P value
>_30	1	3	.008038.
<30	30	6	

Table 8 shows that patient with BMI <30 had complete radiological resolution and is statistically significant .

Table 9

	Complete radiological resolution		
SMOKING	YES	NO	P value
YES	3	7	.000044.
NO	28	2	

As shown in table 9 patients with no smoking history had complete radiological resolution which is statistically significant.

Table 10

	Complete radiological resolution		
Co morbidity	YES	NO	P value
YES	4	5	.006985.
NO	27	4	

Table 10 shows that patients with no co morbidities had complete radiological resolution and association is statistically significant.

Table 11

	Complete radiological resolution		
X ray score	YES	NO	P value
>2	14	8	.063236
<_2	17	1	

Table 11 shows that patients with low x ray severity score had complete radiological resolution and is not statistically significant.

Table 12

	Complete radiological resolution		
CT score	YES	NO	P value
>2	12	7	.038812
<_2	19	2	

Table 12 shows that patients with CT scoring <_2 had complete radiological resolution which is statistically significant.

DISCUSSION

The present study showed that COVID19 Pneumonia results in various

radiological patterns at diagnosis. The predominant patterns are GGO (Ground glass opacities), Consolidation, Reticular/ Interstitial opacities, Pulmonary Fibrosis, Pulmonary nodules and Pleural effusion. In addition to GGOs and consolidations, COVID-19 pneumonia may show other CT findings or patterns such as interstitial thickening, crazy-paving pattern, reversed Halo sign, Halo sign, and airway and vascular changes. The chest x-ray severity scores changed over time, peaking at day 5–10 of symptom onset with transformation of the GGO into focal areas of consolidations and into nodular consolidations. A phase of improvement of the findings with decrease in the size and number of the GGO/consolidation and lobes involved and regression of consolidations into GGO was observed in patients at day 10–15 from onset of symptoms. [15-18]. In our study radiological findings at diagnosis were GGO(45%),Consolidation(30%),reticular opacities(15%),pulmonary nodule (8%) and pleural effusion(2%).The zonal predominance of the lesions were classified as Upper, Middle and Lower zone. Most of the cases showed Lower zonal predominance(75%).In this study peripheral predominance (55%) were seen in most patients followed by diffuse(34%) involvement .Follow up study at 8th week showed fibrosis(90%) as predominant pattern followed by GGO(8%) and Reticular opacities (2%).

Our study included 30 patients under age 40 of which 27 had complete radiological resolution at the end of 8 th week and is found to be statistically significant. There were 24 males and 16 females but no statistical association was found between gender and radiological resolution. Obese patients with BMI >30 failed to show complete radiological resolution at the end of 8 th week and is found to be statistically significant .Patients with history of smoking showed delayed radiological resolution .Patients without any co morbidities showed complete radiological resolution at follow up which is statistically significant. Those with X-ray severity score >2 failed to show complete radiological resolution at 8 th week, similarly patients with CT severity score >2 showed delayed radiological resolution. Both these findings were proved to be statistically significant. The limitations of our study include small sample size of the patients and short follow up period. Almost half of the patients with COVID-19 had abnormal chest x-ray/CT findings with GGO in a peripheral distribution with lower lobe predilection being the most common findings. . This study showed 31(77%) patients had complete radiological resolution at the end of 8th week. Many factors were contributing for delayed resolution. A larger study group and long term follow up study may be helpful in COVID 19 patients for a better assessment of radiological resolution.

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