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CHEST RADIOGRAPHY ROLE IN DIAGNOSIS AND SEVERITY OF COVID-19 INFECTION

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ABSTRACT

CoVid-19 infection has been main cause of increased number of patients to all the medical colleges including ours for last six months. The reason can be varied like fear in patients to severity of the symptoms. It was observed that around 80 percent of patients reporting to the registration suspected or had the infection. Avoiding the infection spread is the only way to keep it in control as no vaccine is in site as of today. The main task before the medical practitioner is to diagnose the infection as soon as possible, know the severity of it and treat the infection at the earliest. Radiology plays an important role in diagnosing and knowing the severity of the infection. Much of the literature available as of today has focused on chest CT manifestations of COVID-19 (Zhou et al.[1] Chung et al.[2]). In countries like us due to infection control issues related to patient transport to CT centers, the inefficiencies introduced in CT room decontamination, and lack of CT availability, chest radiography will likely be the most commonly utilized modality for identification and follow up of lung abnormalities due to the CoVid-19 infection. The American College of Radiology notes that CT decontamination required after scanning COVID-19 infected patients does disrupt radiological service availability and it suggests that chest radiography may be considered to minimize the risk of cross-infection (American College of Radiology[3]).

The objective of my study is to diagnose and evaluate the severity of CoVid-19 patients using Chest radiograph. This is a retrospective study in which 200 patients attending outdoor facility of our hospital were examined.
The findings concluded that -

- A normal chest radiograph does not exclude covid-19 infection.
- There are variety of radiographic patterns in which the infection can manifest. The most common is multifocal peripheral lung changes of ground glass opacity bilaterally.
- Abnormal chest radiograph points to severe disease and thus acts as one of the indicator to start more aggressive treatment. RALE {Radiographic Assessment of Lung Edema} score proved to be helpful in knowing the severity of the infection.

KEYWORDS: COVID-19, Chest radiograph, Ground glass opacities, Pneumonia.

INTRODUCTION

In early 2020 a novel virus, named SARS-CoV-2, expanded globally from China and pandemic was declared. First case was diagnosed in India in March 2020. This new corona virus causes lung infection as one of the major complication and can lead to severe pneumonia and even acute respiratory distress syndrome.[4,5] In China CT is used as a first-line diagnostic method for COVID-19[6,7] infection. However there are many negatives in using CT scan in our set-up. They are - Excessive radiation exposure/ Disinfection procedures which reduces the number of patients scanned and also limited number of scanners available as compared to the population. Most of the hospitals in Italy are using Chest Radiograph as the first-line modality for diagnosing the infection as results are faster as compared to those of RT-PCR.[8] The purpose of our study is to better understand the main radiographic features of COVID-19 infection and also correlate the radiological appearance with patient's outcome.

MATERIALS AND METHODS

Chest radiograph of patients with clinical suspicion of COVID-19 infection was performed at our Medical College from May 1 to August 31, 2020. All the radiographs were retrospectively reviewed. Inclusion criteria were: patient's age {between 18 and 80 years} {Chart1}/ having one or more of following symptoms - fever, cough, dyspnea, diarrhea, loss of taste and myalgia. A repeat chest radiograph was obtained 30 days

after the previous one to look for the changes if any. All the radiographs were acquired as digital ones and stored in a picture archiving and communication system. Radiographs were performed in the postero-anterior projection. Radiographic features {Chart2} including consolidation, ground-glass opacities, pulmonary nodules and reticular–nodular opacities were diagnosed according to the Fleischer Society glossary of terms.[9] To quantify the extent of COVID-19 lung involvement, a severity score was applied (Radiographic Assessment of Lung Edema—RALE).[10] Following RALE indications, each radiograph was given a score between 0 and 48, ranging from the absence of any pathological sign (score 0) to the complete pathological involvement of lung parenchyma (score 48). Each lung was divided into 2 quadrants and the scores were {density and involvement} were multiplied to get a score of that particular quadrant. The scores of all the four quadrants were added to get the final score {Chart 3,4}.

Chart 1 – Age and Sex wise distribution.

Age group	Total	Male	Female
18-30 years	30	20	10
31-50years	70	40	30
51-80 years	100	80	20

Chart 2 – Distribution according to radiological features.

Findings	Total	Male	Female
Normal study	20	15	5
Consolidation	120	90	30
Ground glass opacities	147	107	40
Nodules	45	41	4
Reticulo-nodular densities	106	86	20

Chart 3 - RALE Score – Density of opacity.

Density Score	Density of the opacities
1	Hazy
2	Moderate
3	Dense

Chart 4 – RALE Score – Extent of lung involvement.

Consolidation Score	Extent of involvement
0	None
1	<25 percent
2	25-50 percent
3	>50 percent
4	>75 percent

RESULTS

A total of 200 participants were included in the study group. They had 140 males (70%) and 60 females (30%). 20 radiographs showed no abnormal features suggestive of infection (10%). Most of them were from individuals below 40 years of age while one was that of 65 years of age. Radiographs with positive findings showed a mix of two or more features. The following abnormal features were observed: 120 patients showed lung consolidations (60%) {Image 1}, 147 (73.5%) had ground glass opacities, 45 (22.5%) with nodules and 106 (53%) with reticular–nodular opacities {Image 2}. Peripheral (57.7%) and lower zone distribution (58.5%) were the most common predominance. Moreover, bilateral involvement (75%) was most frequent than unilateral one. The most affected patients were especially males in the age group 60–79 years old (42%). RALE score was slightly higher in males than in female patients.

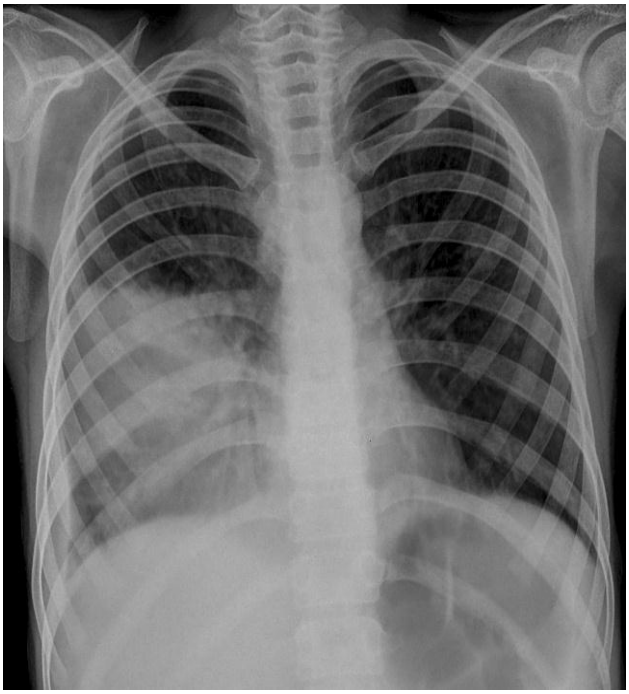

Image 1 – Right mid and lower zone Consolidation.

Image 2 – Reticulo-nodular densities at all the zones of both the lungs.

DISCUSSION

Main role of Radiology department should be to help in early diagnosis and severity of the CoVid-19 infection. In the context of a global pandemic, the radiological approach should be aimed at a rapid diagnosis and identifying the severity of disease in patients with suspected COVID-19 infection. The Italian Society of Radiology recommends using Chest radiograph as a first-line imaging tool and reserves chest CT scan for later help if needed in selected cases.[11,12, 13] Multiple studies indicate that radiography of Chest may not have the diagnostic power of that of CT, but it still has a role in managing the CoVid – 19 pandemic.[11,14,15] Although CT has a high sensitivity (around 97%), it has a very low specificity in detecting SARS-CoV-2 pneumonia.[14] Our study reveals that sensitivity of chest radiography in accordance with the most recent literature (90%) for those who had clinical symptoms during pandemic, where variability between 69 and 90% is described.[14,15] Considering various factors like – limited resources / limited CT scanners/ increased number of patients and disinfection of the CT scan set-up - CT examination is performed after a Chest radiograph only in specific situations like – highly suspected on clinical findings with negative chest radiograph/ in case of acute exacerbation of symptoms with possibility of pulmonary embolism or severe respiratory failure. Advantages of use of X-ray machine is its inexpensiveness, fast results, low radiation and less chances of cross infection.

Our study confirms the main radiological characteristics in COVID-19 patients described in previous studies: In most cases, chest radiograph shows patchy or diffuse reticular–nodular opacities and consolidation, with basal, peripheral and bilateral predominance. In case of mono-lateral involvement, right lung is affected more frequently than the left one. In our study radiograph was performed when the patient presented in the outdoor patient unit {between 2-7 days of start of symptoms}. A repeat radiograph was performed after 30 days of previous one in all the patients. Thus we obtained two radiographs for all the 200 patients. We applied the RALE score to first set of radiograps {one which were obtained once patient presented in the hospital}. It helped us to quantify the lung involvement. We found with a RALE score of 15 points or higher the chances of patient needing ICU admission increased. So, the above data confirmed RALE score as a valid standardized prognostic score.

Our work has several limitations:

1. No control group was kept thus limiting evaluation of sensitivity and specificity of Chest radiograph in diagnosis of CoVid-19 infection.
2. Co-morbid conditions which may affect the chest were not considered while taking in to account RALE score.

Further studies are needed to validate the method and evaluate how the RALE score is helpful in diagnosing the severity of the infection.

CONCLUSIONS

In our study we found out that the chest radiograph had a sensitivity of 90%. The RALE score can be used as a quantitative method of CoVid-19 infection and can be used to treat the patient more efficiently with timely initiation of the treatment.

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REFERENCES

1. Zhou S., Wang Y., Zhu T., Xia L. CT features of coronavirus disease 2019 (COVID-19) pneumonia in 62 patients in Wuhan, China. Am J Roentgenol, 2020; 1–8.
2. Chung M., Bernheim A., Mei X. CT imaging features of 2019 novel coronavirus (2019-nCoV) Radiology, 2020; 200230 doi: 10.1148/radiol.2020200230. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
3. ACR recommendations for the use of chest radiography and computed tomography (CT) for suspected COVID-19 infection|American College of Radiology. https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection. Accessed, 2020. Google Scholar.
4. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. Lancet, 2020; 395(10223): 470–473. doi: 10.1016/S0140-6736(20)30185-9. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
5. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet, 2020; 395(10223): 507–513. doi: 10.1016/S0140-6736(20)30211-7. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
6. Yang W, Sirajuddin A, Zhang X, et al. The role of imaging in 2019 novel coronavirus pneumonia (COVID-19) Eur Radiol, 2020. doi: 10.1007/s00330-020-06827-4. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
7. Zhou A, Wang Y, Zhu T, Xia L. CT features of Coronavirus disease 2019 (COVID-19) pneumonia in 62 patients in Wuhan, China. Am J Roentgenol, 2020; 214: 1–8. doi: 10.2214/AJR.20.23154. [PubMed] [CrossRef] [Google Scholar]
8. ACR recommendations for the use of chest radiography and computed tomography (CT) for suspected COVID-19 infection. American College of Radiology. https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-

Radiography-and-CT-for-Suspected-COVID-19-infection. Updated, 2020.
9. Hansell DM, Bankier AA, MacMahon H, et al. Fleischner Society: glossary of terms for thoracic imaging. Radiology, 2008; 246(3): 697–722. doi: 10.1148/radiol.2462070712. [PubMed] [CrossRef] [Google Scholar]
10. Warren MA, Zhao Z, Koyama T, et al. Severity scoring of lung edema on the chest radiograph is associated with clinical outcomes in ARDS. Thorax, 2018. doi: 10.1136/thoraxjnl-2017-211280. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
11. Giovagnoni A. Facing the COVID-19 emergency: we can and we do. Radiol Med, 2020; 125(4): 337–338. doi: 10.1007/s11547-020-01178-y. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
12. ACR recommendations for the use of chest radiography and computed tomography (CT) for suspected COVID-19 infection. American College of Radiology. https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID-19-infection. Updated, 2020.
13. .https://www.sirm.org/wp-content/uploads/2020/03/DI-COVID-19-documento-intersocietario.pdf. Accessed, 2020. (documentinItalian)
14. Choi H, Qi X, Yoon SH, et al. Extension of coronavirus disease 2019 (CVID-19) on chest CT and implications for chest radiograph interpretation. Radiology, 2020. doi: 10.1148/ryct.2020200107. [CrossRef] [Google Scholar]
15. Wong HYF, Lam HYS, Fong AHT, et al. Frequency and distribution of chest radiographic findings in COVID-19 positive patients. Radiology, 2020. doi: 10.1148/radiol.2020201160. [PMC free article] [PubMed] [CrossRef] [Google Scholar]