

## Chest CT Findings in 1048 COVID-19 Patients

Alsawi Y.A. Yusuf<sup>1</sup>, Mohamed M. Althubaiti<sup>2</sup>

(<sup>1</sup>Dept. of Radiology, University of Kordofan, ElObeid, Sudan)

(<sup>2</sup>Dept. of Radiology, King Faisal Hospital, Taif, Saudi Arabia)

### Abstract

**Background:** The 2019 Coronavirus disease (COVID-19) is a pandemic caused by the novel Severe Acute Respiratory Syndrome coronavirus (SARS nCoV-2). The disease spread rapidly to almost all countries affecting millions of people and killing almost two million people. Computerized Tomography (CT) is an essential imaging tool in diagnosis of the disease. Patterns of lung findings are well reported. This study aims to report on the chest CT findings in confirmed COVID-19 patients in an isolation center in Taif, Saudi Arabia.

**Methods:** Confirmed COVID-19 patients with positive reverse transcriptase polymerase chain reaction (RT-PCR) test, referred for chest CT between June and October 2020 were included in the study. Imaging findings were retrieved and reviewed retrospectively by two radiologists. Findings were tabulated and analyzed using Excel.

**Results:** 1048 patients were included in the study, 68% males. Mean age is 61.1 years (19-105). Initially 23% were not confirmed by RT-PCR test. The commonest findings were ground glass opacities (91%), bilateral multifocal disease (93%), in peripheral distribution (79%), mixed patchy consolidation and ground glass opacities (67%), interlobular septal thickening (43%), consolidation with air bronchogram (39%), pleural thickening (31%), crazy paving (11%), bronchiectasis (7%), pleural effusion (4%) and mediastinal lymphadenopathy and pulmonary embolism (3% each).

**Conclusion:** Chest CT findings in our COVID-19 cohort of patients are similar to those reported in the literature. CT is a sensitive tool for triage and diagnosis in clinically suspected symptomatic COVID-19 patients.

**Keywords:** COVID-19, Chest CT, viral pneumonia.

Date of Submission: 03-01-2021

Date of Acceptance: 16-01-2021

### I. Introduction

The Coronavirus disease 2019 (COVID-19), caused by the Severe Acute Respiratory Syndrome novel coronavirus-2 (SARS nCoV-2) is a pandemic that rapidly spread to almost all countries in the world. The disease affected, as of January 3, 2021, more than 87 million people, with more than 1,899,000 deaths (1). Imaging studies, and Computerized Tomography (CT) in particular, played an essential role in diagnosis, triage, follow up and management of the disease (2, 3,4). Although the reverse transcriptase polymerase chain reaction (RT-PCR) test is the standard diagnostic test for the disease, CT proved worthy in cases where rapid triage is needed, being a swift, sensitive and accessible test, while RT-PCR may not be immediately available, or sometimes is falsely negative in patients that are clinically diagnosed as COVID-19 pneumonia (2,5,6). Typical common CT findings in COVID-19 patients are ground glass opacities (GGO), consolidations, interlobular septal thickening, "crazy paving" pattern, bronchiectasis and pleural effusion, usually in a peripheral bilateral multifocal distribution (7,8,9).

The aim of this study is to investigate the chest CT findings in confirmed COVID-19 patients in an isolation center in Taif, Saudi Arabia.

### II. Methods

Chest CT scans were retrospectively reviewed from COVID-19 patients, confirmed by RT-PCR test for the SARS nCoV-19 virus. Patients referred for chest CT between June 1 and October 31, 2020 were included in the study. Patients were referred for plain chest CT or CT pulmonary angiography, which essentially includes an initial plain chest scan in the standard protocol. CT images were interpreted by two experienced radiologists. Simple analysis was done using a spreadsheet application (Excel).

### III. Results

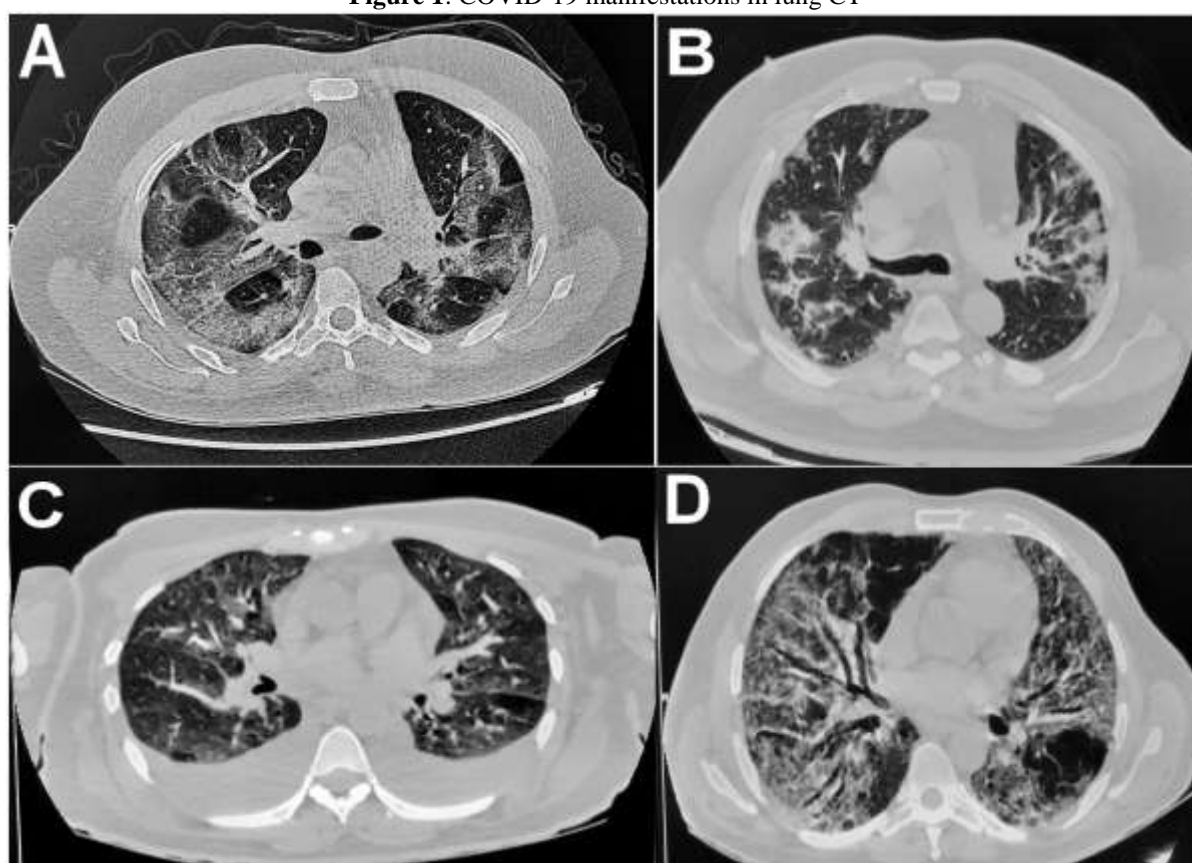
In total 1048 patients were included in the study, 713 (68%) were males. Mean age is 61.1 years ( $\pm$  17.4), (range 19-105). Initially, 241 patients (23%) were non-confirmed cases (RT-PCR test result not known or

negative). The most common findings were patches of GGO, patchy consolidation and thickening of the interlobular lines, in peripheral, basal and posterior distribution (Table 1), (Figure 1).

**Table 1:** CT Findings in COVID-19 patients:

Finding	Number	Percentage
Ground glass opacities	954	91
Patchy Consolidation with ground glass opacification	702	67
Bilateral findings	975	93
Consolidation with air bronchogram	409	39
Interlobular septal thickening	493	43
“Crazy Paving”	115	11
Bronchiectasis	73	7
Pleural effusion	42	4
Pleural thickening	325	31
Mediastinal lymphadenopathy	31	3
Predominantly peripheral distribution	828	79
Pulmonary embolism	29	3

**Figure 1:** COVID-19 manifestations in lung CT



A. Patchy bilateral GGO. B. Peripheral patches of GGO and consolidation. C. Bilateral GGO and pleural effusion. D. Bilateral consolidation with air bronchogram.

#### IV. Discussion

This study demonstrated the most common chest CT findings in COVID-19 patients in Taif. The findings are similar to those reported by other investigators in other places (10, 11, 12), namely, bilateral multifocal patches of GGO and consolidation. They are similar to previously described CT patterns of viral pneumonias in general (13).

CT can be successfully used for the diagnosis of COVID-19 in patients with clinically suggestive symptoms but a false-negative RT-PCR swab (14, 15), or in cases where the test result is not immediately available, as CT has a comparable sensitivity to RT-PCR or higher, but lacks specificity (14, 16). Some investigators, however, reported a high sensitivity of 90.7 and a specificity of 78.8 (16). CT findings also correlate well with the symptoms of the patients, and can be effectively used for triage in symptomatic patients using a Coronavirus disease Reporting and Data System CO-RADS (11). Some authors suggested a CT scoring

system that can predict the outcome of COVID-19 patients (17). In a pandemic setting, and in early stages of the disease when RT-PCR is still negative, typical CT findings of peripheral patches of consolidation and GGO can help in early recognition and rapid diagnosis of the disease, as CT signs appear 2.6 days earlier than RT-PCR (12, 18) and can be used for monitoring the disease course (18). Distinct stages were noted in the sequential CT scans of COVID-19 patients, ranging from early subpleural patches of GGO, to the late (>14 days) extensive GGO and subpleural bands (19, 20).

The Multinational Consensus Statement from the Fleischner Society recommends the use of CT for medical triage in moderate-to-severe cases in a high pre-test probability setting and in patients with worsening respiratory status, but not in mild cases with no risk of disease progression (21) nor as a screening tool in asymptomatic patients.

Further studies are needed to document the post-COVID residual lung manifestations in follow-up CT scans, as well as studies to investigate CT findings in patients infected by the new emerging strains of the virus.

## V. Conclusion

CT lung findings in COVID patients are fairly consistent and readily recognizable; typically peripheral patches of ground glass opacification and consolidative shadows. CT is sensitive enough to justify using the modality for triage and diagnosis particularly in early stages of the disease in symptomatic patients, where RT-PCR is negative or unavailable.

## References

- [1]. WHO Coronavirus disease (COVID-19) Dashboard website, <https://covid19.who.int/> Accessed 09-01-2021.
- [2]. Tenda ED, Yulianti M, Asaf MM, et al. The Importance of Chest CT Scan in COVID-19. *Acta Med Indones.* 2020 Jan;52(1):68-73.
- [3]. Jalaber C, Lapotre T, Morcet-Delattre T, et al. Chest CT in COVID-19 pneumonia: A review of current knowledge. *Diagn Interv Imaging.* Jul-Aug 2020;101(7-8):431-437.
- [4]. Vernuccio F, Giambelluca D, Cannella R, et al. Radiographic and chest CT imaging presentation and follow-up of COVID-19 pneumonia: a multicenter experience from an endemic area. *Emerg Radiol.* 2020 Dec;27(6):623-632.
- [5]. Jeong CM, Xu X, Kong SC, et al. Evaluation of chest CT and clinical features of COVID-19 patient in Macao. *Eur J Radiol Open.* 2020;7:100275.
- [6]. De Smet K, De Smet D, Ryckaert T, et al. Diagnostic Performance of Chest CT for SARS-CoV-2 Infection in Individuals with or without COVID-19 Symptoms. *Radiology.* 2021 Jan;298(1):E30-E37.
- [7]. Cellina M, Orsi M, Pittino CV, et al. Chest computed tomography findings of COVID-19 pneumonia: pictorial essay with literature review. *Jpn J Radiol.* 2020 Nov;38(11):1012-1019.
- [8]. Salehi S, Abedi A, Radmard AR, et al. Chest Computed Tomography Manifestation of Coronavirus Disease 2019 (COVID-19) in Patients With Cardiothoracic Conditions. *J Thorac Imaging.* 2020 Jul;35(4):W90-W96.
- [9]. Bao C, Liu X, Zhang H, et al. Coronavirus Disease 2019 (COVID-19) CT Findings: A Systematic Review and Meta-analysis. *J Am Coll Radiol.* 2020 Jun;17(6):701-709.
- [10]. Song L, Zeng Y, Gong X, et al. CT features of coronavirus disease 2019 (COVID-19) in the original district of this disease (Wuhan): a pictorial review. *Radiol Infect Dis.* 2020 Sep;7(3):91-96.
- [11]. Hu S, Li Z, Chen X, et al. Computed tomography manifestations in super early stage 2019 novel coronavirus pneumonia. *Acta Radiol.* 2020 May 21;284185120924806.
- [12]. Zhou H, Xu K, Shen Y, et al. Coronavirus disease 2019 (COVID-19): chest CT characteristics benefit to early disease recognition and patient classification—a single center experience. *Ann Transl Med.* 2020 Jun;8(11):679.
- [13]. Koo HJ, Lim S, Choe J, et al. Radiographic and CT Features of Viral Pneumonia. *RadioGraphics.* 2018;Vol. 38, No. 3
- [14]. Marando M, Tamburello A, Gianella P. False-Negative Nasopharyngeal Swab RT-PCR Assays in Typical COVID-19: Role of Ultra-low-dose Chest CT and Bronchoscopy in Diagnosis. *Eur J Case Rep Intern Med.* 2020 Apr 24;7(7):001680.
- [15]. Pakdimirli E, Mandalia U, Monib S. Positive Chest CT Features in Patients With COVID-19 Pneumonia and Negative Real-Time Polymerase Chain Reaction Test. *Cureus.* 2020 Aug 22;12(8):e9942.
- [16]. Falaschi Z, Danna PSC, Arioli R, et al. Chest CT accuracy in diagnosing COVID-19 during the peak of the Italian epidemic: A retrospective correlation with RT-PCR testing and analysis of discordant cases. *Eur J Radiol.* 2020 Sep;130:109192.
- [17]. Franconi M, Iafrate F, Masci GM, et al. Chest CT score in COVID-19 patients: correlation with disease severity and short-term prognosis. *Eur Radiol.* 2020 Dec;30(12):6808-6817.
- [18]. Gu J, Yang L, Tao Li T, et al. Temporal relationship between serial RT-PCR results and serial chest CT imaging, and serial CT changes in coronavirus 2019 (COVID-19) pneumonia: a descriptive study of 155 cases in China. *Eur Radiol.* 2020 Sep 15;1-10.
- [19]. Pan F, Ye T, Sun P, et al. Time Course of Lung Changes at Chest CT during Recovery from Coronavirus Disease 2019 (COVID-19). *Radiology* 2020 Vol. 295, No. 3.
- [20]. Bernheim A, Mei X, Huang M, et al. Chest CT Findings in Coronavirus Disease-19 (COVID-19): Relationship to Duration of Infection. *Radiology* 2020 Vol. 295, No. 3.
- [21]. Rubin GD, Ryerson CJ, Haramati LB, et al. The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society. *Radiology* Vol. 296, No. 1.

Alsawi Y.A. Yusuf, et. al. "Chest CT Findings in 1048 COVID-19 Patients." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(01), 2021, pp. 06-08.