



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Contents lists available at ScienceDirect

Asian Journal of Surgery

journal homepage: www.e-asianjournalsurgery.com

Letter to Editor

Application of multislice spiral computed tomography in the follow-up of patients with various clinical types of COVID-19



To the editor,

In order to provide a better understanding of dynamic outcome characteristics of COVID-19, the data of 95 patients with pathologically confirmed COVID-19 in the People's Hospital of Baoding, the Fourth People's Hospital of Nanning, and the Beijing You'an Hospital of Capital Medical University between January 20, 2020 to February 20, 2020, were retrospectively reviewed. All patients received MSCT scans during their hospitalization with intervals of seven days, and underwent a re-examination as their final follow-up visit on the 14th to 30th day after discharge. Chest CT scans were performed on all patients. Patients with COVID-19 have been categorized as mild (8 patients), moderate (63 patients), severe/critical (24 patients) according to their radiographic and clinical features.¹ The focus of the assessment was on the radiographic findings in the moderate group and the severe/critical group during the peak stage (the most severe disease in the lungs), early outcome stage (first improvement of the lesion), advanced outcome stage (7–14 days after the peak stage), and recovery stage (14–30 days after discharge). The location and range of lesions, lesion characteristics and pleural conditions, and dynamic lesion changes were all observed.

The patients of mild group weren't included in subsequent imaging evaluation because of negative chest MSCT results. Laboratory examinations revealed more patients of severe/critical group had decreased lymphocyte counts ($P < 0.001$) and increased C-

reactive proteins ($P = 0.019$). MSCT findings showed patients of severe/critical group had more lesion-involved pulmonary lobes than those of moderate group. In the recovery stage, there were more patients of severe/critical group with thickened lobular septa (37.50%) and thickened pleurae (29.17%) than in the moderate group (5.08% and 6.78%, respectively, $P = 0.043$), and fewer patients of severe/critical group had thickened vascular bundles (12.50%) than in the moderate group (5.08%, Table 1). 47 patients of moderate group had MSCT results suggesting that the lesions continued to absorb, while 20 patients of severe/critical group had this. Lesions in the two groups at the peak stage were mainly combinations of GGO and consolidation, but as the lesions improved, GGO could be observed as a demonstration of consolidation absorption in the recovery stage. In the recovery stage, there were more patients of severe/critical group (91.67%) with reduced lesion size than in the moderate group (40.68%, $P = 0.002$, Fig. 1A). In the recovery stage, lesions were completely absorbed in 16 patients of moderate group (Fig. 1B), and newly developed fibrotic changes were found in 9 patients of moderate group.

The present study suggests that MSCT is suitable for the follow-up examinations of patients with COVID-19. More severe peak-stage radiographic findings were identified in patients with severe/critical cases of COVID-19 than in those with moderate cases.^{2,3} Furthermore, in severe/critical patients, their lesions tended to absorb from the center to the periphery of the lungs more slowly and less completely; these patients also developed

Table 1
Analysis of Radiographic Characteristics and Dynamic Radiographic Transition Characteristics of Different Clinical Types at different stages [n (%)].

CT Characteristics	Radiographic Characteristics			Dynamic Radiographic Transition Characteristics						
	Moderate (n = 47)	Severe & Critical (n = 20)	χ^2	P	K	Moderate (n = 47)	Severe & critical (n = 17)	χ^2	P	K
Peak Stage										
Dominant distribution in pulmonary lobes										
Periphery	23 (48.94)	1 (5.00)	11.781	0.001	0.95	26 (55.32)	2 (11.76)	9.623	0.002	0.76
Center	1 (2.13)	0	0.432	1.000	1	1 (2.13)	0	0.367	1.000	0.75
Periphery & center	23 (48.94)	19 (95.00)	12.727	<0.001	0.87	17 (36.17)	15 (88.24)	13.537	<0.001	0.79
Density and internal characteristics										
GGO	11 (23.40)	3 (15.00)	0.600	0.528	0.89	18 (38.30)	8 (47.06)	0.190	0.663	0.79
Consolidation	0	0	–	–	1	0	0	–	–	1
Mixture of ground glass and consolidation	36 (76.60)	17 (85.00)	0.600	0.528	0.89	25 (53.19)	9 (52.94)	0.075	0.785	0.69
Thickened interlobular septa	36 (76.60)	9 (45.00)	6.351	0.012	0.90	15 (31.91)	5 (29.41)	0.122	0.727	0.79
Thickened lobular septa	12 (25.53)	13 (65.00)	9.343	0.002	0.81	7 (14.89)	8 (47.06)	6.416	0.019	0.83
Thickened pleurae	12 (25.53)	11 (55.00)	5.404	0.020	0.85	11 (23.40)	9 (52.94)	4.344	0.037	0.83
Thoracic effusion	2 (4.26)	5 (25.00)	6.453	0.021	0.95	2 (4.26)	0	0.799	1.000	1
Air bronchogram	22 (46.81)	6 (30.00)	1.629	0.202	0.82	5 (10.64)	3 (17.65)	0.425	0.674	0.66
Thickened vascular bundles	34 (72.34)	6 (30.00)	10.454	0.001	0.88	18 (38.30)	2 (11.76)	4.726	0.030	0.67
Lesion outcome										
Range narrowing						34 (72.34)	15 (88.24)	0.933	0.481	0.77
Quantity decrease						22 (46.81)	13 (76.47)	3.513	0.061	0.67
Density reduction						39 (82.98)	17 (100.00)	2.104	0.309	0.87
Fibrotic change						17 (36.17)	15 (88.24)	12.096	0.001	0.85
Bronchial cystic dilation						0	0	–	–	1
Completely absorbed						3 (6.38)	0	1.219	0.553	1
Early Stage of Outcome										
Dominant distribution in pulmonary lobes										
Periphery	22 (46.81)	1 (5.00)	10.878	0.001	0.88	27 (45.76)	6 (25.00)	3.071	0.080	1
Center	1 (2.13)	0	0.432	1.000	1	0	0	–	–	1
Periphery & center	23 (48.94)	19 (95.00)	12.727	<0.001	0.78	16 (27.12)	17 (70.83)	13.612	<0.001	0.98
Density and internal characteristics										
GGO	8 (17.02)	4 (20.00)	0.064	1.000	0.85	36 (61.02)	16 (66.67)	1.981	0.159	0.96
Consolidation	0	0	–	–	1	0	0	–	–	1
Mixture of ground glass and consolidation	39 (82.98)	16 (80.00)	0.230	0.723	0.81	5 (8.47)	7 (29.17)	3.387	0.066	0.97
Thickened interlobular septa	31 (65.96)	10 (50.00)	1.792	0.181	0.83	4 (6.78)	6 (25.00)	3.134	0.148	0.95
Thickened lobular septa	11 (23.40)	13 (65.00)	10.169	0.001	0.84	3 (5.08)	9 (37.50)	10.059	0.003	0.85
Thickened pleurae	11 (23.40)	12 (60.00)	7.995	0.005	0.87	4 (6.78)	7 (29.17)	4.616	0.043	0.93
Thoracic effusion	2 (4.26)	5 (25.00)	6.271	0.023	0.90	0	2 (8.33)	3.778	0.121	1
Air bronchogram	12 (25.53)	4 (20.00)	0.281	0.758	0.84	2 (3.39)	1 (4.17)	0.005	1.000	1
Thickened vascular bundles	28 (59.57)	3 (15.00)	11.775	0.001	0.66	3 (5.08)	3 (12.50)	0.623	0.658	1
Lesion outcome										
Reduced lesion size	36 (76.60)	18 (90.00)	1.291	0.319	0.77	24 (40.68)	22 (91.67)	9.778	0.002	0.85
Quantity decrease	7 (14.89)	13 (65.00)	16.357	<0.001	0.76	27 (45.76)	19 (79.17)	2.249	0.134	0.93
Density reduction	32 (65.09)	18 (90.00)	3.169	0.118	0.78	38 (64.41)	22 (91.67)	0.421	0.703	0.95
Fibrotic change	8 (17.02)	17 (85.00)	27.078	<0.001	0.73	9 (15.25)	19 (79.17)	22.101	<0.001	0.93
Bronchial cystic dilation	0	0	–	–	1	1 (1.69)	1 (4.17)	0.195	1.000	0.96
Completely absorbed	1 (2.13)	0	0.441	1.000	1	16 (27.12)	1 (4.17)	8.586	0.003	0.97

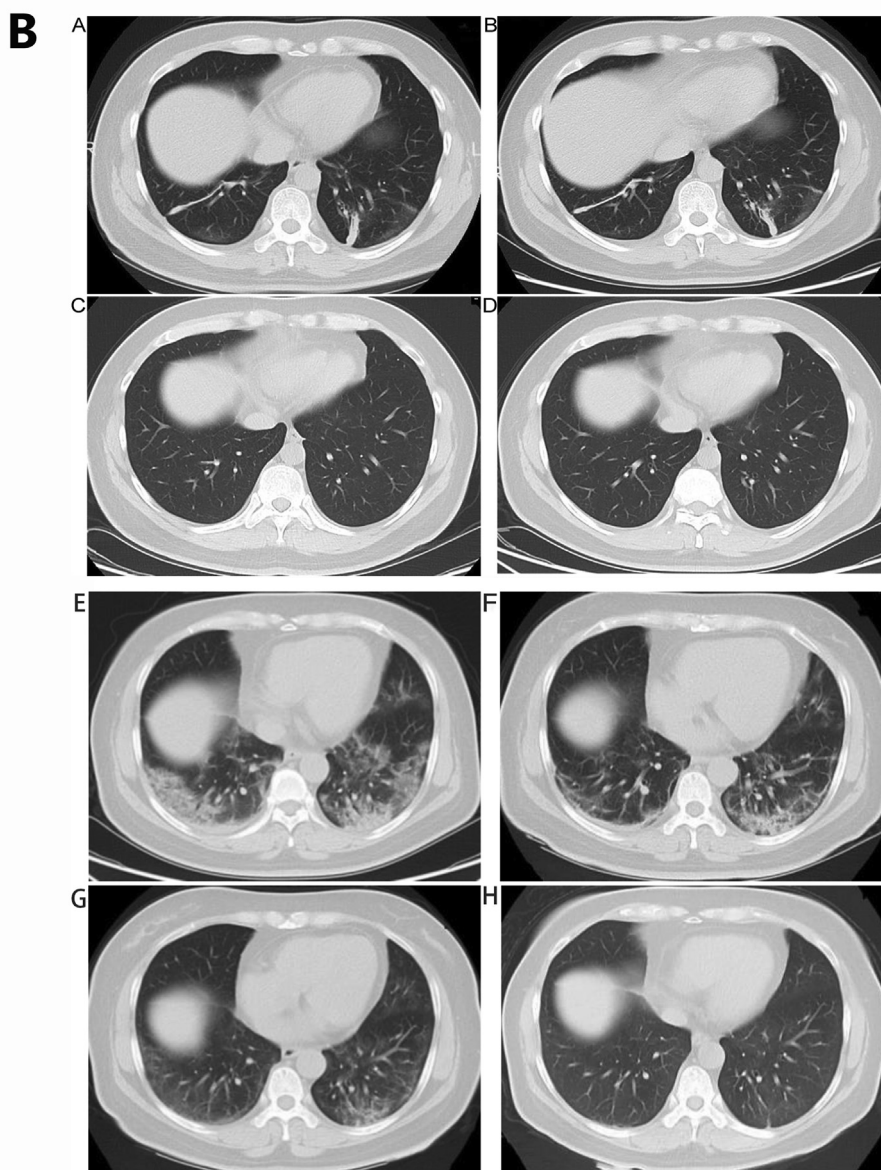
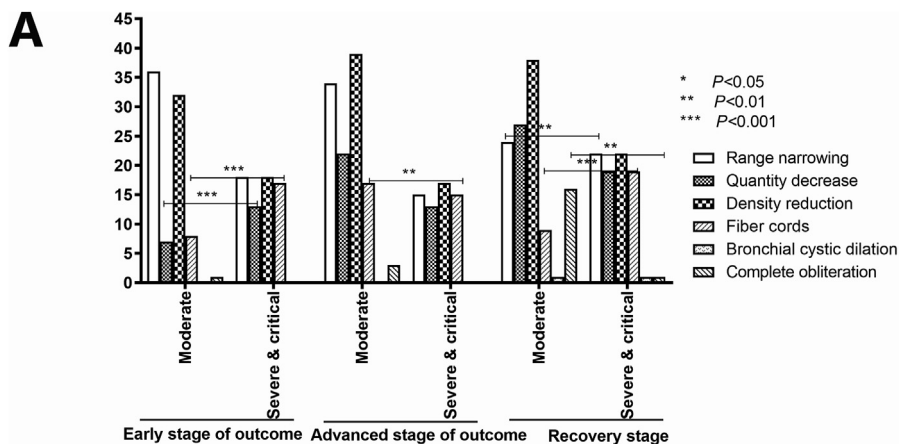


Fig. 1. A: Dynamic lesion outcome characteristics at different stages; B: moderate novel coronavirus pneumonia in a 46-year-old man who had completely absorbed the lesions (A, Peak Stage, B, Early Stage of Outcome, C, Advanced Stage of Outcome, D, Recovery Stage). Severe novel coronavirus pneumonia in a 50-year-old woman whose lesions had newly developed fibrosis (E, Peak Stage, F, Early Stage of Outcome, G, Advanced Stage of Outcome, H, Recovery Stage).

fibrotic changes more often and needed longer follow-up times.

Funding

This work was supported by the Key R&D Program of Hebei (No.20277716D).

Declaration of competing interest

None.

Acknowledgements

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.asjsur.2021.05.052>.

References

1. Jin YH, Zhan QY, Peng ZY, et al. Chemoprophylaxis, diagnosis, treatments, and discharge management of COVID-19: an evidence-based clinical practice guideline (updated version). *Mil Med Res.* 2020;7(1):41.

2. Xu Z, Shi L, Wang Y, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *The Lancet. Respiratory medicine.* 2020;8(4):420–422.
3. Liu KC, Xu P, Lv WF, et al. CT manifestations of coronavirus disease-2019: a retrospective analysis of 73 cases by disease severity. *Eur J Radiol.* 2020;126, 108941.

Yi-bo Lu¹

Department of Radiology, The Fourth People's Hospital of Nanning City, Nanning, Guangxi, 530023, China

Li-yong Zhuo¹, Xiao-ping Yin*

CT/MRI Room, Affiliated Hospital of Hebei University, Baoding, Hebei, 071000, China

Li Li

Department of Radiology, Beijing Youan Hospital, Capital Medical University, Beijing, 100069, China

* Corresponding author. Department of CT/MRI Room, Affiliated Hospital of Hebei University, 212 Eastern Yuhua Road, Baoding City, Hebei Province, 071000, China.

E-mail address: xiaoping_yin@outlook.com (X.-p. Yin).

23 May 2021

Available online 12 June 2021

¹ These authors contributed equally to this study.