Asian Journal of Pharmaceutical and Clinical Research
Innovare Academic Sciences
Knowledge to Innovation
Vol 15, Issue 11, 2022
Online - 2455-3891
Print - 0974-2441
Research Article

ASSESSMENT OF THE CORRELATION BETWEEN COVID-19 PNEUMONIA SEVERITY AND PULMONARY ARTERY DIAMETER MEASUREMENT WITH COMPUTED TOMOGRAPHY SCAN

SHUBHANSHI RANI, NIRAJ KUMAR SAH, RAUSHAN KUMAR, NAVREET BOORA

Department of Radiology, College of Paramedical Sciences, Teerthanker Mahaveer University Moradabad, Bagadpur, Uttar Pradesh, India. Email: shubhanshikomal@gmail.com

Received: 11 June 2022, Revised and Accepted: 23 August 2022

ABSTRACT

Objective: This consideration used the computed tomography scan to investigate and evaluate relationship between COVID-19 pneumonia severity and pulmonary artery diameter, ascending aorta diameter (AAD), right and left pulmonary artery diameter (LPAD), and ratio of main pulmonary artery diameter (MPAD) to AAD in COVID-19 patients.

Methods: This retrospective and cross-sectional consideration was done on 90 confirmed COVID-19 patients. Diameter of MPAD, AAD, LPAD, and right pulmonary artery diameter was calculated on a solitary transverse section designated at extent of main pulmonic arterial trunk separation. Ratio of MPAD TO AAD was calculated by division of the values of MPAD and AAD in manual mode.

Result: In this retrospective consideration, population was divided into groups of mild (43 patients with 42.6% males), moderate (30 patients with 36% males), and severe (17 patients with 21.3% males) pneumonia patients. Diameter of MPA in mild COVID pneumonia group had 23.8±3.4, moderate group had 26.7±4.3, and severe group had 29.9±3.6 ($p<0.001$). Diameter of AA in mild group had 28.1±3.7, moderate group had 31.0±4.2, and severe group had 34.0±4.2 ($p < 0.001$). Diameter of LPA in mild group had 16.1±2.0, moderate group had 17.5±2.1, and severe group had 19.1±2.0 ($p < 0.001$).

Conclusion: Pneumonia severity of COVID-19 patients in severe group showed greater MPAD as compared to moderate group and then mild group patients, respectively. A chest computed tomography (CT) scan/high-resolution CT can be useful to determine the pneumonia extension evaluation, by measuring the MPAD which can provide extraprognostic information and aid doctors inpatient treatment.

Keywords: COVID 19; Pneumonia; Computed tomography; Pulmonary artery.

 DOI: http://dx.doi.org/10.22159/ajpcr.2022v15i11.45212. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Now-a-days, the most common cause of death worldwide is "2019-Novel Coronavirus disease" which is a common type of Sever Acute Respiratory Syndrome, firstly originated from Hubei, China's, Wuhan City [1]. Coronaviruses are seen with respiratory symptoms. People who are infected may be symptomatic and asymptomatic. The clinical symptoms may be mild, moderate, and leading to severe such as temperature, whoop, tiredness, inflamed throat, loss of smell and taste, acute respiratory distress syndrome, increased lung infection to pneumonitis, sepsis, and septic shock. Reverse Transcriptase-polymerase chain reaction (PCR) is accurate and reliable for testing COVID-19 [2]. However, computed tomography (CT) scan/high-resolution CT (HRCT) can be useful instead of PCR to determine the pneumonia extension evaluation in emergency condition especially when RT-PCR tests are in short supply during an outbreak [3,4].

Knowledge of diameter of pulmonary artery in COVID-19 patients would be valuable in administration of patients presenting with COVID-related lung pneumonia and lung problems [5]. There we can collect the data on pulmonary artery diameter conforming to which medical commitments concerning administration of lung pneumonia of COVID patients, that is, whether to investigate the patients, administration of disease in-hospital patients, or to go for emergency treatment can be made. Most of the data available in consideration is based on COVID-19 positive patient's data and estimation of disease confirmation can be guided by the pulmonary artery diameter mentioned in them [6].

Informal consideration and demonstration made at different previous studies and radiological observations made it manifest that the diameter of Pulmonary Artery in the COVID infected patients is greater than that of the non-COVID lung diseases population and therefore treatment procedures for administration of COVID infection are likely to be different [6]. Criteria for management decisions would change if pulmonary artery diameter varies significantly in COVID patients as opposed to elsewhere.

Our study is an observational consideration using computed tomography, calculating varies diameter of pulmonary artery in COVID pneumonia patients and to study the variation in pulmonary artery diameter according to age, sex, ascending aorta diameter (AAD), right and left pulmonary artery diameter (LPAD), and ratio of main pulmonary artery diameter (MPAD) to AAD.

METHODS

Study population

In this retrospective and observation-based study, a total 90 patients, infected with COVID-19, were included in the study. Patients infected with COVID-19 with positive RT-PCR report, having symptoms of lung pneumonia and referred to Radiology Department for Chest CT were included in this consideration. Patients with pneumonia sources other than COVID-19 and patients with negative RT-PCR report were excluded from consideration. The hospital information was used to collect foundation demographic and medical data. The Paramedical Research Committee was approved this study. First, we collected data from DICOM viewer for seeing the presence of lung tissue participation mark. Then, select the axial slice of mediastinal window in the HRCT thorax and select the line measurement tool RULER for measuring the diameter. Main pulmonary trunk diameter, ascending aorta diameter, right and left pulmonary artery diameter were calculated on a solitary transverse section designated at the extent of MPA trunk separation

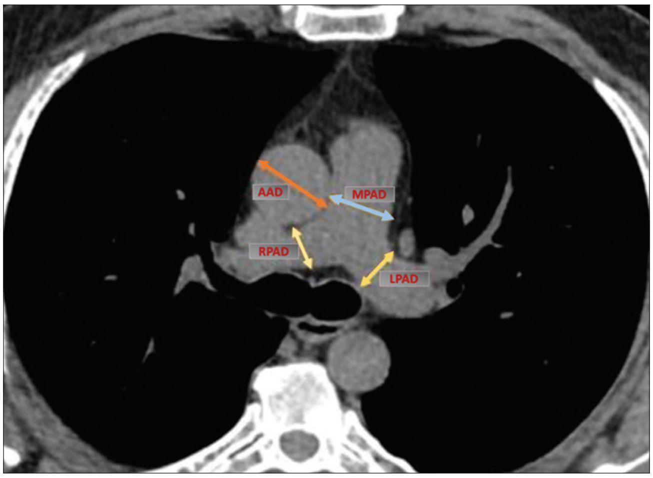

Fig. 1: Measurement of main pulmonary artery, ascending aorta, right pulmonary artery, and left pulmonary artery diameter

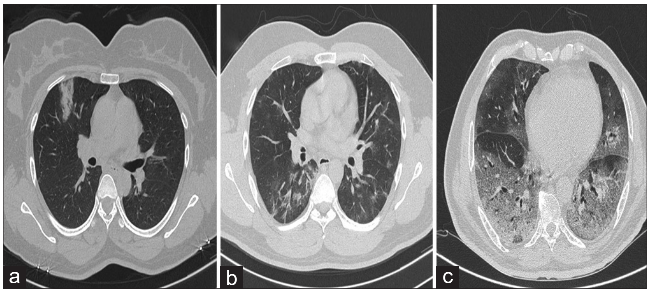

Fig. 2: Lung involvement in COVID-19 patients (a) mild, (b) moderate, and (c) severe pneumonia

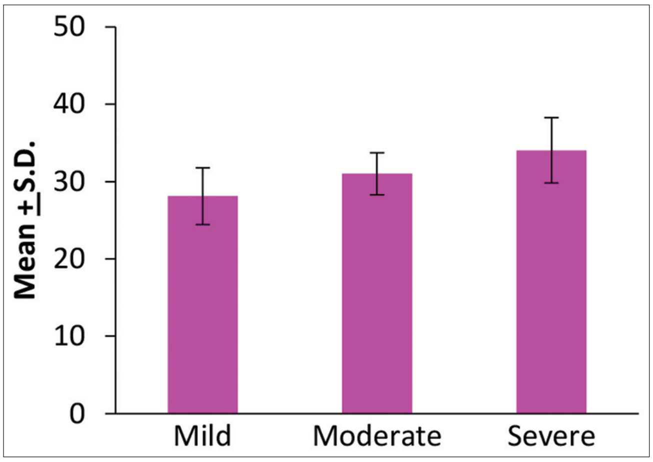

Fig. 3: Comparison of ascending aorta diameter

shown in Fig. 1. Then, classify data according to the severity of pneumonia, reported by the radiologist on the basis of CORAD scoring and ratio MPAD to AAD was calculated by division of the values of MPAD and AAD in manual mode.

CT imaging and assessment

One hundred and twenty-eihgt slice multidetector Philips ingenuity core computed tomography system was used to acquire all images. Patients with COVID-19 lung pneumonia showed severity of COVID infection and categories were described in the previous research. In early and first stage of lung pneumonia, Small confined ground glass opacities beginning from the lung margin, stage second and moderate pneumonia with Opacity over more lung lobes, dispersed, tricky "crazy-paving" design and stiffen septa, little solidification. In stage third and severe type pneumonia showed the presence of Bulky opaque solidification casing a remarkable part of the lungs, more noticeable stiffen septa shown in Fig. 2 [7]. Our consideration was categories also in three classes as seen above like mild pneumonia with 43 patients, moderate pneumonia with 30 patients, and severe type of pneumonia with 17 patients. We calculated MPAD in addition with diameter of ascending aorta, right, and LPAD. These all were observed and calculated on a solitary transverse section designated at the extent of MPA trunk separation by the help of line measurement tool where all images were displayed on CT scan display monitor [8].

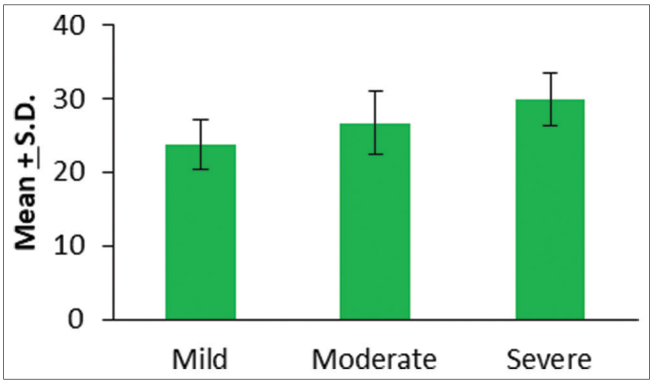

Fig. 4: Comparison of main pulmonary artery diameter

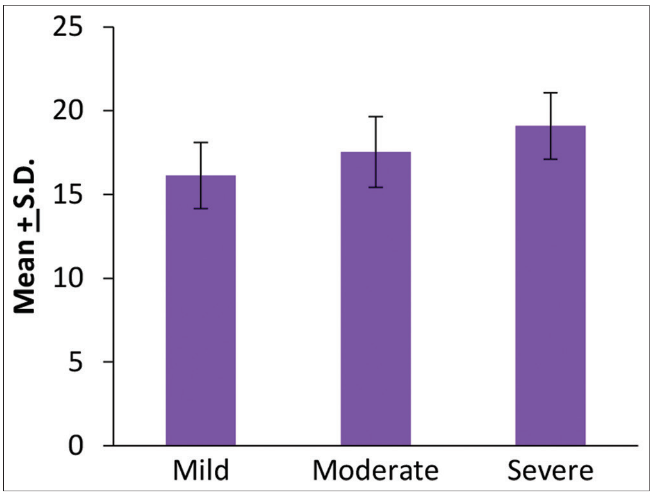

Fig. 5: Comparison of left pulmonary artery diameter

Statistical analysis

The statistical information was examined in SPSS software (SPSS Inc; Chicago, IL), version 26.0. For variables, data were denoted as mean±SD. Here, a Chi-square test was used to compare gender according to severity, Kruskal–Wallis test, and Mann–Whitney test was used to compare AAD, MPAD, right pulmonary artery diameter (RPAD), LPAD, Ratio MPA to AA according to severity, and also by applying ANOVA and Tukey test. Pearson correlation coefficient was used to study the relation among AAD, MPAD, RPAD, LPAD, and Ratio MPA to AA.

RESULTS

In our study population, 61 male patients (67.8%) and 29 female patients (32.2%) were present. This study population was divided into three groups in which mild group includes 43 patients with 47.8%, moderate group includes 30 patients with 33.3%, and severe group followed 17 patients with 18.9%. Here, male patients were 26 with 60.5% in mild group, 22 patients with 73.3% in moderate group, and 13 patients with 76.5% in severe group, with $p > 0.05$

Table 1: Diagnostic demographical variables of consideration population

Study variables	Mild lung pneumonia group (n=43)	Moderate lung pneumonia group (n=30)	Severe lung pneumonia group (n=17)	p-value
Age (in years)	45.1±16.4	44.8±17.0	53.1±16.3	0.192
Gender (male), n with %	26 (60.5%)	22 (77.3%)	13 (76.5%)	0.356
Ascending aorta diameter (in mm)	28.1±3.7	31.0±2.7	34.0±4.2	<0.001*
Pulmonary artery diameter (in mm)	23.8±3.4	26.7±4.3	29.9±3.6	<0.001*
Left Pulmonary artery diameter (in mm)	16.1±2.0	17.5±2.1	19.1±2.0	<0.001*
Right pulmonary artery diameter (in mm)	17.2±2.4	17.7±2.3	18.9±2.7	0.055
Ratio of MPA to AA	0.9±0.1	0.9±0.1	0.9±0.1	0.731

Table 2: Relation between AAD, MPAD, RPAD, LPAD, and Ratio of MPA to AA in mild, moderate and severe groups

Mild	AAD	MPAD	RPAD	LPAD
AAD				
K. correlation	1			
p-value				
MPAD				
K. correlation	0.351	1		
p-value	0.021*			
RPAD				
K. correlation	0.133	0.541	1	
p-value	0.396	<0.001*		
LPAD				
K. correlation	0.448	0.631	0.574	1
p-value	0.003*	<0.001*	<0.001*	
Ratio MPA to AA				
K. correlation	−0.416	0.666	0.34	0.272
p-value	0.006*	<0.001*	0.026*	0.078
Moderate	**AAD**	**MPAD**	**RPAD**	**LPAD**
AAD				
K. correlation	1			
p-value				
MPAD				
K. correlation	0.255	1		
p-value	0.174			
RPAD				
K. correlation	0.072	0.188	1	
p-value	0.705	0.319		
LPAD				
K. correlation	0.234	0.401	0.693	1
p-value	0.213	0.028*	<0.001*	
Ratio MPA to AA				
K. correlation	−0.228	0.882	0.156	0.303
p-value	0.225	<0.001*	0.409	0.104
Severe	**AAD**	**MPAD**	**RPAD**	**LPAD**
AAD				
K. correlation	1			
p-value				
MPAD				
K. correlation	0.374	1		
p-value	0.139			
RPAD				
K. correlation	0.395	0.1	1	
p-value	0.117	0.703		
LPAD				
K. correlation	0.254	0.029	0.289	1
p-value	0.325	0.911	0.26	
Ratio MPA to AA				
K. correlation	−0.517	0.595	−0.269	−0.213
p-value	0.034*	0.012*	0.296	0.411

*Significant

(insignificant). Diagnostic demographical and clinical variables of consideration population of our consideration groups are shown in Table 1.

The "F" analysis of variance (ANOVA) and Kruskal–Wallis H test was used to differentiate age, AAD, MPAD, RPAD, LPAD, and Ratio MPA to AA according to severity. There was an important change with $p < 0.05$ in AAD, MPAD, and LPAD according to severity. The Tukey test and Whitney U test were used for the multiple comparisons of AAD shown in Fig. 3, MPAD shown in Fig. 4, and LPAD shown in Fig. 5 according to severity. There was a difference ($p < 0.05$) in AAD, MPAD, and LPAD for all the comparisons (mild vs. moderate group, mild vs. severe group, and moderate vs. severe group).

Correlation between AAD, MPAD, RPAD, LPAD, and Ratio MPA to AA according to severity of lung pneumonia in COVID-19 patients revealed in Table 2. In which, K. Pearson correlation coefficient was used to find relation between AAD, MPAD, RPAD, LPAD, and Ratio MPA to AA. There was a decisive relation ($p<0.05$) between MPAD and AAD, RPAD and AAD, LPAD and AAD, RPAD and MPAD, LPAD and MPAD, Ratio MPA to AA and MPAD, LPAD and RPAD, and Ratio MPA to AA and LPAD irrespective of the severity. Furthermore, there was a negative correlation ($p<0.05$) between Ratio MPA to AA and AAD. Pearson correlation coefficient was used to find relation between AAD, MPAD, RPAD, LPAD, and RATIO MPA to AA in mild group. There was a decisive relation ($p<0.05$) between MPAD and AAD, LPAD and AAD, RPAD and MPAD, LPAD and MPAD, Ratio MPA to AA and MPAD, LPAD and RPAD, and Ratio MPA to AA and RPAD in mild group. Furthermore, the mild group exhibited a negative correlation ($p<0.05$) between RATIO MPA to AA and AAD. Pearson correlation coefficient was used to find relation between AAD, MPAD, RPAD, LPAD, and Ratio MPA to AA in moderate group. There was a decisive relation ($p<0.05$) between LPAD and MPAD, LPAD and RPAD, and Ratio MPA to AA and MPAD in moderate group. Pearson correlation coefficient was used to find relation between AAD, MPAD, RPAD, LPAD, and Ratio MPA to AA in the severe group. There was a correlation ($p<0.05$) between Ratio MPA to AA and AAD (negative), and Ratio MPA to AA and MPAD (positive) in severe group.

DISCUSSION

Here we discus about the result of other authors with our study results according to the severity of lung pneumonia for the variables of Age (in years), Ascending Aorta Diameter (in mm), Pulmonary Artery Diameter (in mm), Left Pulmonary Artery Diameter (in mm), Right Pulmonary Artery Diameter (in mm), Ratio of MPA to AA in Table 3.

Study limitation

Because our research was limited to a specific hospitalized patient population, it cannot be extended to the total geographic population. Our study was not related to laboratory findings. During active disease, we established a link between MPAD, AAD, Right PAD, Left PAD and fraction of MPA to AA, and COVID-19 pneumonia severity. Earlier to COVID-19, we had no information about the diameter of MPA, AAD, RPAD, LPAD, and fraction of MPA to AA and we did not check out on the broadness of these all after the disease had been treated. We have not selected our study population based on specialized diseases such as pulmonary embolism, pulmonary thromboembolism, pulmonary hypertension, diabetes mellitus, and heart diseases which can impact

Table 3: Discussion between other authors study results and our study results relatively

Variables	Author's Name	Measurements of Variables in Different Groups	p-value
Age (in years)	Yildiz *et al.* [9]	Mild group=49.17±17.89, moderate group=56.79±16.0, and severe group=51.86±16.04	0.129
	Erdoğan et.al. [5]	Survivor group=50±17 and non-survivor group=75±10	<0.001
	Zhu *et al.* [6]	Survivor group=46.99±14.95 and non-survivor=60.36±15.05	<0.001
	Cao *et al.* [3]	Survivor group=51.1±14.2 and non-survivor=66.8±10.9	<0.001
	Eslami *et al.* [10]	Discharged group=54.55±15.63 and decreased patients=54.54±13.85	0.99
	In Our Study	Mild group=45.1±16.4, moderate group=44.8±17.0 and severe group=53.1±16.3	0.192
Ascending Aorta Diameter (in mm)	Yildiz *et al.* [9]	Mild group=33.94±4.42, moderate group=34.63±3.98 and severe group=34.43±4.18	0.759
	Erdoğan *et al.* [5]	Survivor group=32.2±5.1, and non-survivor group=35.3±4.8	<0.001
	H. Wang *et al.* [11]	Pulmonary hypertension group=35.9±4.0 and non-pulmonary hypertension group=34.4±4.1	0.03
	Li *et al.* [12]	Survivor group=30.25±0.49, and decreased patient group=31.63±0.84	0.1492
	Schiaffino *et al.* [8]	Discharged group=34.0 (IQR 31.0-36.0), and decreased group=36.6 (IQR 34.0–39.0)	<0.001
	Eslami *et al.* [10]	Discharged group=33.74±4.35, and decreased group=33.92±5.42	0.89
	In our study	Mild group=28.1±3.7, moderate group=31.0±4.2 and severe group=34.0±4.2	<0.001
Pulmonary Artery Diameter (in mm)	Esposito et al. [13]	Survivor group=27 (IQR 24–29), and non-survivor group=28(IQR 26–31)	<0.001
	Erdoğan *et al.* [5]	Survivor group=24.9±3.8, and non-survivor group=30.8±3.3	<0.001
	Zhu *et al.* [6]	Survivor group=33.2±3.76, and non-survivor group=25.2±310	<0.001
	Raoufi et al. [14]	Survivor group=26.54±3.29, and non-survivor group=28.93±3.99	<0.001
	Schiaffino *et al.* [8]	Discharged group=27.0 (IQR 25.0–30.0), and decreased group=29.0 (IQR 26.0–32.0)	<0.001
	Yildiz *et al.* [9]	Mild group=26.11±3.72, moderate group=26.65±2.95 and severe group=28.59±3.63	0.027
	In our study	Mild group=23.8±3.4, moderate group=26.7±4.3 and severe group=29.9±3.6	<0.001
Left Pulmonary Artery Diameter (in mm)	Yildiz *et al.* [9]	Mild group=19.59 (17.8–20.98), moderate group=19.4 (17.87–21.91) and severe group=20.16 (18.91–22.03)	0.356
	Chen *et al.*[11]	Pulmonary hypertension group=22.4±3.4 and non-pulmonary hypertension group=20.3±2.7	<0.001
	Esposito *et al.* [13]	Survivor group=20 (IQR 18–22), and non-survivor group=21.3 (IQR 20–24)	<0.001
	Li *et al.* [12]	Survivor group=18.46±0.34, and decreased patient group=20.36±0.57	0.0065
	Raoufi *et al* [14]	Survivor group=17.61±2.86, and non-survivor group=19.61±2.58	<0.001
	In our study	Mild group=16.1±2.0, moderate group=17.5±2.1 and severe group=19.1±2.0	<0.001
Right Pulmonary Artery Diameter (in mm)	Yildiz *et al.* [9]	Mild group=18.31±2.83, moderate group=18.98±2.9 and severe group=19.61±3.1	0.239
	H. Wang *et al.* [11]	Pulmonary hypertension group=24.9±3.7 and non-pulmonary hypertension group=21.6±3.4	<0.001
	Esposito *et al* [13]	Survivor group=20 (IQR 18–23), and non-survivor group=22 (IQR 20–25)	<0.001
	Li *et al.* [12]	Survivor group=23.23±0.36, and decreased patient group=24.76±0.60	0.0268
	Raoufi *et al.* [14]	Survivor group=17.84±3.23, and non-survivor group=19.61±4.11	0.007
	In our study	Mild group=17.2±2.4, moderate group=17.7±2.3, and severe group=18.9±2.7	0.055
Ratio of MPA to AA	Yildiz *et al.* [9]	Mild group=0.78±0.12, moderate group=0.78±0.10, and severe group=0.84±0.11	0.104
	H. Wang *et al.* [11]	Pulmonary hypertension group=0.90±0.19 and non-pulmonary hypertension group=0.81±0.13	0.001
	Erdoğan *et al.* [5]	Survivor group=0.78±0.10, and non-survivor group=0.88±0.14	<0.001
	Li *et al.* [12]	Survivor group=1.18±0.02, and decreased patient group=1.20±0.03	0.565
	In our study	Mild group=0.9±0.1, moderate group=0.1±0.9, and severe group=0.1±0.31	0.731

the broadness of MPAD, AAD, Right PAD, Left PAD, and fraction of MPA to AA.

CONCLUSION

Pneumonia severity with COVID-19 patients of severe group showed greater MPAD as compared to moderate group and then to mild group patients, respectively. Our study also showed that the comparison of AAD and LPAD between mild, moderate, and severe groups is greater in moderate and then in severe groups, respectively. A chest CT scan/HRCT can be useful to determine pneumonia extension evaluation, by measuring MPAD which can provide extraprognostic information and aid doctors inpatient treatment. The CO-RADS score system is sensitive and specific approach for diagnosing COVID-19, especially when RT-PCR tests are in short supply during an outbreak [3,4]. CT reports of COVID-19 patients must include an estimate of disease development when patients are generally asymptomatic or have a minor expression, this may also help the doctors to change their treatment for this specific group of patients.

AUTHORS CONTRIBUTION

Shubhanshi Rani – Study conception and design, whole study, and manuscript writing about research.

Shubhanshi Rani and Niraj Kumar Sah – Data Analysis and interpretation of results of research.
Raushan Kumar and Navreet Boora – Data collection.

CONFLICTS OF INTERESTS

The authors declares that there is no conflicts of interest.

AUTHORS FUNDING

This research received no specific funding from any author's side.

REFERENCES

1. Fong SJ, Dey N, Chaki J. An Introduction to COVID-19. Berlin, Germany: SpringerBriefs in Applied Sciences and Technology; 2021. p. 1-22. doi: 10.1007/978-981-15-5936-5_1.
2. Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R, Jerome KR, Nalla AK, *et al*. Covid-19 in critically ill patients in the Seattle region-case series. N Engl J Med 2020;382:2012-22. doi: 10.1056/NEJMoa2004500, PMID 32227758
3. Cao Y, Han X, Gu J, Li Y, Liu J, Alwalid O, *et al*. Prognostic value of baseline clinical and HRCT findings in 101 patients with severe COVID-19 in Wuhan, China. Sci Rep 2020;10:17543. doi: 10.1038/s41598-020-74497-9, PMID 33067524
4. Hermans JJ, Groen J, Zwets E, Boxma-De Klerk BM, Van Werkhoven JM, Ong DS, *et al*. Chest CT for triage during COVID-19 on the emergency department: Myth or truth? Emerg Radiol 2020;27:641-51. doi: 10.1007/s10140-020-01821-1, PMID 32691211
5. Erdoğan M, Öztürk S, Erdöl MA, Kasapkara A, Beşler MS, Kayaaslan B, *et al*. Prognostic utility of pulmonary artery and ascending aorta diameters derived from computed tomography in COVID-19 patients. Echocardiography 2021;38:1543-51. doi: 10.1111/echo.15170, PMID 34355824
6. Zhu QQ, Gong T, Huang GQ, Niu ZF, Yue T, Xu FY, *et al*. Pulmonary artery trunk enlargement on admission as a predictor of mortality in-hospital patients with COVID-19. Jpn J Radiol 2021;39:589-97. doi: 10.1007/s11604-021-01094-9, PMID 33751417
7. Dai M, Liu X, Zhu X, Liu T, Xu C, Ye F, *et al*. Temporal changes of CT findings between non-severe and severe cases of COVID-19 pneumonia: A multi-center, retrospective, longitudinal Study. Int J Med Sci 2020;17:2653-62. doi: 10.7150/ijms.51159, PMID 33162793
8. Schiaffino S, Codari M, Cozzi A, Albano D, Alì M, Arioli R, *et al*. Machine learning to predict in-hospital mortality in covid-19 patients using computed tomography-derived pulmonary and vascular features. J Pers Med 2021;11:501. doi: 10.3390/jpm11060501, PMID 34204911
9. Yildiz M, Yadigar S, Yildiz BŞ, Aladag NB, Keskin O, Ozer RS, *et al*. Evaluation of the relationship between COVID-19 pneumonia severity and pulmonary artery diameter measurement. Herz 2021;46:56-62. doi: 10.1007/s00059-020-05014-x, PMID 33433652
10. Eslami V, Abrishami A, Zarei E, Khalili N, Baharvand Z, Sanei-Taheri M. The association of CT-measured cardiac indices with lung involvement and clinical outcome in patients with COVID-19. Acad Radiol 2021;28:8-17. doi: 10.1016/j.acra.2020.09.012, PMID 33041195
11. Wang H, Liu K, Wang Z, Zhu Y, Zhao Y, Kong H, *et al*. Computed tomography measurement of pulmonary artery for diagnosis of COPD and its comorbidity pulmonary hypertension. Int J COPD 2015;10:2525-33. doi: 10.2147/COPD.S94211
12. Li X, Zhang C, Sun X, Yang X, Zhang M, Wang Q, *et al*. Prognostic factors of pulmonary hypertension associated with connective tissue disease: Pulmonary artery size measured by chest CT. Rheumatology (Oxford) 2020;59:3221-8. doi: 10.1093/rheumatology/keaa100, PMID 32221604
13. Esposito A, Palmisano A, Toselli M, Vignale D, Cereda A, Rancoita PM, *et al*. Chest CT-derived pulmonary artery enlargement at the admission predicts overall survival in COVID-19 patients: Insight from 1461 consecutive patients in Italy. Eur Radiol 2021;31:4031-41. doi: 10.1007/s00330-020-07622-x, PMID 33355697
14. Raoufi M, Safavi Naini SA, Azizan Z, Jafar Zade F, Shojaeian F, Ghanbari Boroujeni M, *et al*. Correlation between chest computed tomography scan findings and mortality of COVID-19 cases; a cross sec-tional study. Arch Acad Emerg Med 2020;8:e57. PMID 32613199