

Association between computed tomography emphysema score and severity in patients with COVID-19

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Background/Aims: No studies have examined on the prognostic impact of pre-existing emphysema as a comorbidity in patients with coronavirus disease 2019 (COVID-19). Therefore, we aimed to examine whether computed tomography (CT) emphysema score is associated with an increased risk of severe COVID-19.

Methods: We conducted a multicenter retrospective study of patients with confirmed COVID-19 at four tertiary referral hospitals in Daegu, South Korea. Patients who were admitted in these hospitals between February 18 and March 25, 2020 with COVID-19 were included and available CT were used. Volumetric quantitative analyses of CT images were performed.

Results: A total of 146 patients with confirmed COVID-19 were included. Using automated volumetric CT analysis, median pneumonia and emphysema scores were 3.0% (interquartile range [IQR], 0.4–12.7%) and 1.0% (IQR, 0.5–1.8%), respectively. Patients were classified into low pneumonia–low emphysema (n=49), low pneumonia–high emphysema (n=23), high pneumonia–low emphysema (n=58), and high pneumonia–high emphysema (n=16) groups, respectively. The high pneumonia–high emphysema group had the highest median age (78 years [IQR, 71–82], $p<0.001$) and the groups with emphysema had a higher proportion of males ($p=0.012$). There were 58 patients (40%) with severe COVID-19 requiring oxygen therapy. CT emphysema score was not a risk factor for severe COVID-19, but age, serum C-reactive protein levels, and CT pneumonia score were associated with severe COVID-19.

Conclusions: The present study found that CT emphysema score did not increase the risk of severity in patients with COVID-19. Further studies are needed with a larger number of COVID-19 patients with emphysema.

Table 1. Univariate and multivariate analyses for variables associated with severe COVID-19

Variable	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P value	OR (95% CI)	P value
Age, y	1.078 (1.045–1.112)	<0.001	1.071 (1.028–1.117)	0.001
Male sex	1.216 (0.627–2.357)	0.563		
BMI, kg/m ²	1.015 (0.913–1.128)	0.784		
Ever-smoker	1.769 (0.671–4.660)	0.249		
Comorbidities	2.030 (1.029–4.004)	0.041		
WBC counts, cells/ μ L (Log)	1.567 (0.544–4.513)	0.406		
Lymphocyte, %	1.001 (1.000–1.002)	0.220		
Albumin, g/dL	0.096 (0.040–0.230)	<0.001		
Lactate dehydrogenase, U/L	1.004 (1.002–1.006)	<0.001		
C-reactive protein, mg/dL	1.297 (1.183–1.423)	<0.001	1.110 (1.013–1.216)	0.025
NT-pro-brain natriuretic peptide, pg/mL (Log)	5.745 (2.376–13.894)	<0.001		
CT Pneumonia score, %	1.244 (1.158–1.337)	<0.001	1.192 (1.092–1.302)	0.001
CT Emphysema score, %	1.080 (0.967–1.205)	0.173		

Abbreviation: COVID-19, coronavirus disease 2019; OR, odds ratio; CI, confidence interval; BMI, body mass index; WBC, white blood cells; CT, computed tomography.