

THE EFFECT OF HEPATOSTEATOSIS ON PULMONARY INVOLVEMENT AND DISEASE SEVERITY IN PATIENTS DIAGNOSED WITH COVID-19: A RETROSPECTIVE STUDY

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Abstract: Coronavirus disease (Covid-19) is a new type of infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was declared a pandemic by the WHO in 2020 [1]. Recent studies show that comorbidities are a risk factor for coronavirus disease (COVID-19) pneumonia. The aim of this study is to compare the pulmonary involvement and disease severity of patients with hepatosteatosi diagnosed with Covid-19 with a control group and evaluate whether hepatosteatosi (HS) plays a role in predicting the severity of the disease.

Keywords: Liver, Steatosis, COVID-19, Computed tomography, Pulmonary involvement

Introduction

Coronavirus disease 2019 (COVID-19) appeared in late 2019 and rapidly spread across the globe, eventually being declared a pandemic in nearly all countries. The full spectrum of its effects on the human body has not yet been completely clarified. While some individuals remain asymptomatic, those who develop symptoms can present with a wide range of clinical manifestations. Pneumonic infiltration is considered one of the key features of COVID-19. Shortly after the outbreak began, the radiological characteristics of COVID-19 pneumonia were identified, making imaging crucial for diagnosis. Thoracic computed tomography (CT) is a widely available and fast imaging modality that plays an important role in detecting the disease. The main radiological findings include bilateral, peripherally distributed ground-glass opacities, interlobular septal thickening, nodules with ground-glass density, a crazy paving pattern, and reversed halo signs.

With the onset of the pandemic, it became evident that certain comorbid conditions increase the risk of complications. Factors such as advanced age, metabolic syndrome, and obesity can influence disease severity and contribute to higher mortality rates. Hepatic steatosis (HS), also known as fatty liver disease, is not only a metabolic condition but also plays a role in regulating immune function and inflammatory processes. Recent clinical and experimental evidence suggests a strong association between hepatic steatosis and the severity of viral infections, particularly those caused by hepatitis B, hepatitis C, and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

In this study, our objective was to explore the potential association between hepatic steatosis and the severity of COVID-19 infection by assessing liver attenuation using computed tomography (CT), a non-invasive method that allows the detection of hepatic steatosis during pulmonary CT scans without requiring additional procedures.

Objectives: This study aims to compare the pulmonary involvement and disease severity of patients diagnosed with hepatosteatosi with a control group.

Experimental part

This retrospective study included 179 patients diagnosed with COVID-19 by RT-PCR test between July and September 2020 and who underwent chest CT examination with a standard diagnostic protocol. Of the 179 patients, 104 (58.1%) were female and 75 (41.9%) were male. Patients younger than 18 years, those with artifacts in their images, those who received intravenous contrast

for CT angiography, and those with chronic liver disease were excluded from the study. All patients underwent RT-PCR testing and chest CT on the same day.

CT image acquisition: The chest CT scan was performed in all patients with multi-slice CT device (Siemens Essenza). The CT room and scanner were sanitized using standard cleaning procedures and approved disinfectants after each procedure. CT images were obtained at end inspiration during a single breath-hold without using intravenous contrast material.

CT image evaluation: Several methods have been described in the literature to determine hepatic steatosis on noncontrast CT, including a liver attenuation value of 10 Hounsfield units (HU) that was less than the spleen attenuation, absolute liver attenuation of < 40 HU, and a liver-to-spleen attenuation ratio of < 1 . For steatosis, unenhanced CT has a sensitivity ranging from 43% to 95% and a specificity of 90%-100%.

Patients were divided into two groups: hepatosteatosis ($n=69$) and a control group ($n=110$), and lung involvement, liver, and spleen HU values were analyzed based on chest CT images. The mean age was 55 ± 11 in those with hepatosteatosis and 46 ± 15 in the control group. Chest CT images were used to analyze lung involvement, liver, and spleen HU values.

When density measurements were performed, circular regions of interest (ROI) of approximately 1 cm² were used in the right lobe of the liver and spleen. A liver density of 10 Hounsfield Units (HU) lower than the spleen density or a liver density of less than 40 HU was accepted as diagnostic criteria for hepatosteatosis [2, 3]. The measurements were made at the level of the porta hepatis, avoiding the right hepatic lobe (segments 6 and 7), as well as vessels, calcifications, and biliary structures when possible (Fig. 1).

All CT images were evaluated by two radiologists with 13 and 11 years of experience, respectively. Analysis of radiological and clinical data was performed using chi-square and multiple regression tests.

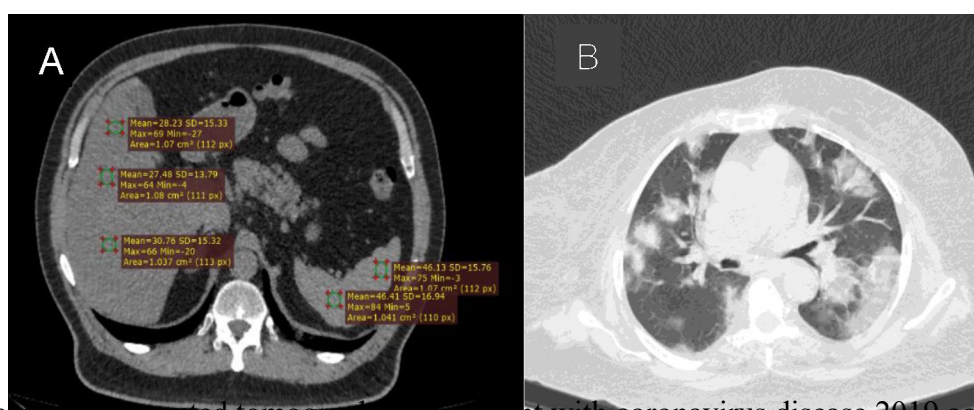


Fig. 1. Noncontrast computed tomography of a patient with coronavirus disease 2019 accompanied by hepatic steatosis. A: The abdominal window shows the determination of the attenuation value from the right liver lobe B: Lung window demonstrating lesions compatible with coronavirus disease 2019.

Results and discussion

Those with certain comorbidities are at risk for Covid-19. Studies have shown that there is a relationship between hepatosteatosis and the severity of the disease. In patients, the spread of the infectious process to more than one lobe of the lung, especially the upper lobes, was more common in patients with hepatosteatosis. Based on all this, it was concluded that hepatosteatosis is a poor prognostic factor for Covid 19 [4].

Patients with hepatosteatosis are associated with a higher risk of severe disease [5]. If hepatosteatosis is detected on chest CT scans in Covid-19 positive patients, the risk of progressive disease in this patient should be reported to the appropriate specialist treating the disease [4]. The

likelihood of severe disease was statistically significantly higher among patients with hepatosteatosi. (P=0.005, odds ratio (OR) 3.388) (Table 1).

Table 1. Comparison of pulmonary involvement in patients with hepatosteatosi and in the control group

Pulmonary involvement	Patients with hepatosteatosi	Control group	Total	P value	Odds ratio
1-25%	30	82	112		
26-49%	13	12	25	0.005	3.388
50-69%	11	5	16		
>70%	15	11	26		

Conclusion

Our results show that the L/S density ratio can be a valuable marker for predicting the severity of COVID-19 pneumonia. This article is not significant for only today in the context of COVID-19, but also for tomorrow it might be of importance in another viral outbreak. For such viral diseases, it is critical that a person's immune response is timely and adequate. Thus, obesity and fatty liver may be important predictors in forecasting this response. Moreover, long COVID has affected and continues to affect millions of people worldwide. Where the outcomes of long COVID will lead is still unknown. Long COVID is typically seen in cases that had severe COVID disease. This is not just a model for COVID; these groups may respond similarly to new viral diseases that may emerge in the future. Even though the COVID-19 pandemic may be over, the disease persists, and monitoring its long-term outcomes will provide guidance in preventing and preparing for future viral diseases.

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