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# ГИСТОПАТОЛОГИЧЕСКИЕ И УЛЬТРАСТРУКТУРНЫЕ ИЗМЕНЕНИЯ В ЛЕГКИХ ПАЦИЕНТОВ С COVID-19

**Резюме:** При COVID-19 основным поражаемым органом являются легкие, поскольку это мультисистемное заболевание. Было проведено очень мало аутопсий умерших пациентов. В настоящем исследовании изучались клинический спектр, лабораторные данные и морфологический спектр изменений в легких у пациентов с COVID-19 с использованием гистологии, иммуногистохимии и электронной микроскопии.

**Ключевые слова:** COVID-19, мультисистемное заболевание, аутопсия, легкие, гистология, иммуногистохимия, электронная микроскопия.

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# HISTOPATHOLOGICAL AND ULTRASTRUCTURAL CHANGES IN THE LUNGS OF COVID-19 PATIENTS

**Resume:** The lungs are the main organ affected by a COVID-19 infection, which is a multi-systemic disease. Very few autopsies of the deceased patients have been performed. The current investigation examined the clinical spectrum, laboratory data, and morphological spectrum of lung changes in COVID-19 patients using histology, immunohistochemistry, and electron microscopy.

**Keywords:** COVID-19, multi-systemic disease, autopsy, lung, histology, immunohistochemistry, electron microscopy.

**Abstract:**

A COVID-19 infection is a multi-systemic illness that primarily affects the lungs. Autopsies of the deceased patients have been conducted very infrequently. The

current study used histology, immunohistochemistry, and electron microscopy to examine the morphological spectrum of lung alterations in COVID-19 patients as well as their clinical spectrum and laboratory data. Additionally, we evaluated the histological stage of the lung involvement with the clinical severity and laboratory data.

## Introduction

The Chinese Center for Disease Control and Prevention (CDC) discovered a new corona virus in a patient's throat swab sample on January 7, 2020. On February 11, 2020, the International Committee on Taxonomy of Viruses (ICTV) named the virus respiratory syndrome coronavirus-2 (SARS-CoV-2) based on phylogenetic analysis. As of April 28, 2024, it had killed over 7 million people worldwide and impacted over 775 million patients.One

Angiotensin-converting enzyme 2 (ACE2) receptors, which are widely distributed in the respiratory tract (including bronchial transient secretory cells), endothelial cells, and other cell types, are how SARS-CoV-2 accesses human cells.

The severity of clinical presentations also varies; more severe forms are frequently linked to risk factors like advanced age and the existence of comorbidities like obesity, type II diabetes, hypertension, coronary artery disease, and chronic kidney disease.5 COVID-19 patients frequently show abnormal hematological parameters, such as lymphopenia, neutrophilia, and elevated levels of fibrinogen and D-dimer.6

The majority of reports on lung autopsies in COVID-19 have shown either acute lung injury or diffuse alveolar damage (DAD).7 New research shows a wider range of histological lesions involving both vascular and epithelial components in the lungs and other organs, underscoring the disease's intrinsic complexity.8

In order to identify and study coronaviruses based on their ultrastructural features, transmission electron microscopy (TEM) is essential.9 The term "corona," which means "crown" in Latin, refers to the crown-like spike peplomers that surround viral particles, as seen in electron microscope negative stain preparations.10 However, due to the complexity of the technique and the limited routine availability of the necessary facilities, few studies have attempted to characterize the ultrastructure features of SARS-CoV-2.

## Materials and Methods

The investigation included radiologic signs of viral pneumonia, clinical symptoms for SARS-COV-2, and fatal COVID-19 patients identified by RT-PCR testing of nasopharyngeal secretion or bronchoalveolar lavage fluids.

## Results

We have included 24 patients with ante mortem RT-PCR-confirmed COVID-19 infection in our investigation. Based on clinical severity and histological staging, the cases were split into two groups for correlation purposes: group 1 consisted of patients with moderately severe COVID (SpO2≥90, n = 5) and group 2 consisted of patients with severe COVID (SpO2<90, n = 19). The age range of the 24 patients in the research was 44–88 years (mean 65.9 years), with a male:female ratio of 2:1.

**Discussion**

Through needle necropsy, the current study aims to provide a detailed description of the numerous lung alterations that occur in the fatal instances of COVID-19 patients. In addition to the clinical and laboratory results in COVID-19 patients, autopsy results provide insight into the etiology, morphology, and consequences. Only a few facilities conducted autopsies on COVID-19 patients in the early stages of the pandemic.

**Conclusion**

The current study, which examined the clinical, hematological, and biochemical characteristics of patients with severe COVID-19 infections, stands out in light of the lack of literature on autopsy-based studies in COVID-19-infected patients.

Clinically, individuals who were fat and those who were older showed a quick decline. Our research has demonstrated that severe COVID-19 instances are linked to a shorter interval between hospital admission and mortality, as has been observed in other studies.

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