Diagnostic Imaging in COVID-19

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About the Study

The novel coronavirus that caused pandemic in 2020 started from a number of cases of unexplained pneumonia in the city of Wuhan in the December of 2019. Unlike the other human coronavirus previously reported, this new strain of coronavirus is much more contagious and rapidly spread in the city of Wuhan and subsequently various regions of Chia from the epicenter. At present, the origin of SARS-CoV-2 is still under investigation. The coronavirus is named after its coronal-like spinous spike glycoproteins protruding from the viral envelope, which can be seen under the electron microscope. Based on the genetic characteristics, different coronaviruses can be divided into four genera and SARS-CoV-2 belongs to the beta coronavirus. The genetic characteristics of SARS-CoV-2 infecting humans are significantly different from severe acute respiratory syndrome coronavirus and Middle Ease respiratory syndrome coronavirus, previously discovered in humans and unlike any known coronaviruses.

The latency of coronavirus disease 2019 is usually 1-14 days. Most patients show symptoms with 3-7 days based on the report from the current epidemiological survey. In the early stage of the disease, fever, dry cough and fatigue are the main manifestations. Some patients may also experience additional symptoms such as nasal congestion, runny nose, pharyngeal pain, myalgia and diarrhea. However, there are a significant number of individuals carrying SARS-CoV-2 who may not exhibit these symptoms. It is particularly important to identify these asymptomatic patients due to their potential close contact with healthy populations and possible transmission of SARS-CoV-2. COVID-19 patients in the severe condition often have dyspnea and/or hypoxemia one week after the disease onset. Sever patients can rapidly develop Acute Respiratory Distress Syndrome (ARDS), septic shock and multiple organ failure. It is worth noting that severe and critical patients may only present moderate and low fever or even no obvious fever. The symptoms of children are relatively mild. Some children and newborns may have atypical symptoms such as diarrhea and other abnormal digestive conditions or only show poor energy and shortness of breath. Overall, most patients have a good prognosis, while a few patients were in the critical condition. The prognosis of the elderly and those with chronic basic diseases is poor. The clinical progress of COVID-19 in maternal women is similar to that of the same age group.

In the progress stage of COVID-19, the main involvement is pulmonary alveoli, which becomes inflamed and infiltrated with serous fluid, red blood cells and macrophage. They are condensed and coagulated into a layer of red stained fibrin like membrane. In the severe stage, the epithelial cells in reactive hyperplasia alveolus become swelled or degenerated, necrotic and eventually falling off. The pathological changes from acute exudative pneumonia to desquamation pneumonia involve proliferation of local fibroblasts. The reticular fibers are found proliferated and broke like glomerular hyperplasia. the fibrin deposition resulted from alveolar exudation exhibits the pattern as in the organizing pneumonia. Simultaneously, hypersection of mucus in goblet cells of the respiratory tract, mucoprotein dilution, disintegration of degradation system and massive phlegm thrombus takes places. The correlation between imaging findings and pathology is the base of radiological diagnosis. Every sign of imaging has its pathological basis, while there has been a significant amount of reports from COVID-19 research since the start of the pandemic; the report on pathological findings is still limited. Thus, the pathological characteristics of COVID-19 are presented in this chapter are based on existing histopathological data collected from autopsy or biopsy.