

THE AUTOPSY PATHOLOGY OF ORGANS CHANGES

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INTRODUCTION

Coronal virus disease-2019(COVID-19) is a viral disease caused by a novel coronal virus called Severe Acute Respiratory Symptoms-Coronal virus 2(SAR-COV-2). It was first detected in Wuhan China in December 2019 with subsequent rapid global spread resulting in pandemic. The world health organization (WHO) declared it a pandemic in March 2020 following its spread to several countries across the globe. It is considered a zoonotic disease with subsequent spread from person to person through respiratory droplets or aerosol transmission and has resulted in high morbidity and mortality, thereby causing major changes in economic and travelling activities across the globe necessitating what is now tagged as the "new normal"

EPIDEMIOLOGY

Currently, there are about 547,901,157 confirmed cases worldwide with over 6million deaths and over 12billion vaccines administered. Europe has the highest no of cases while Africa has the lowest no of cases and this has been attributed to the lower screening and detection of cases in Africa. Majority of cases occur in adults and severe cases are relatively uncommon in paediatric population. The key to slowing down the spread of the virus is via widespread testing for timely case identification, isolation and management.

PATHOGENESIS

COVID-19 is caused by an enveloped single stranded RNA virus which is structurally made up of spikes, envelope, matrix and nucleocapsid proteins. The spikes have receptor binding domain for human cell surface proteins such as Angiotensin converting enzyme-2(ACE-2) and (Transmembrane protease serine-2) TMPRSS2 which help with recognition and internalization of the virus into the cells. These proteins are expressed in various tissue of the body including the lungs, kidney, digestive tracts, heart, pancreas, liver and blood vessels. The entrance of the virus in to the cells will stimulate the host immune system to produce several cytokines and chemokines which invariably will cause damage to organs. This process is responsible for the severe respiratory symptoms and the features of multi-organ damage in the affected patients. The clinical manifestations range from sore throat, cough, respiratory difficulty, renal failure to coma. These manifestations have been found to be worse in individuals with background comorbidities such as Diabetes, Hypertension, Asthma,

Chronic obstructive pulmonary disease, Cancers e.t.c. Postmortem examination that have been carried out on cases of patients who have died of corona virus has revealed several organ changes that could explain the clinical symptomatology and progression of the disease process thereby helping with case management. Some of the organ changes seen in COVID-19 cases are described below.

ORGAN CHANGES

• Respiratory System

This is the most commonly affected organ system which is characterized grossly by hypereamia of the trachea, heavy and congested lungs and some times can sometimes have features of consolidation.

Microscopically, there are features of diffuse alveolar damage, alveolitis with vacuolar degeneration, desquamation and hyperplasia of the type 2 pneumocytes in areas. There can also be intra-alveolar fibrinous exudate that is rich in monocytes and macrophages and some of the epithelial cells may fuse to form syncytial giant cells and some of which may have viral inclusion bodies. The alveolar wall capillaries are usually congested and there may be presence of microthrombi in some the arterioles. There may also be features of any comorbidity that may be present in the patient.

• Nervous System

Even though, there have been few reports of postmortem findings in the central nervous system of patients with COVID-19, the neurological clinical manifestations have been widely documented. Few of the documented autopsy findings have generally described features of acute hypoxic

ischaemic brain injury evidenced by oedema, hypereamia and neuronal degeneration.

- **Cardiovascular System**

Grossly, there is mild pericardial oedema and some serosanguinous pericardial effusion and microscopically, there will be low grade interstitial infiltration of mononuclear cells and endothelialitis as well as widespread systemic vasculitis with associated thromboembolism.

- **Gastrointestinal System**

Partial autolytic changes with areas of ulceration, oedema, thrombi, and congested blood vessels in the stomach have been documented.

- **Hepatobiliary**

The liver may be grossly congested and yellowish due to fatty changes. Histology will show steatosis, patchy hepatic necrosis, Kupffer cell hyperplasia, increased no lymphocytes in the portal tracts and sinusoids as well endothelialitis.

- **Genitourinary System**

Kidneys are grossly swollen and may have features suggestive of any other kidney pathologies ranging from chronic glomerulonephritis, chronic pyelonephritis, diabetic nephropathy to benign nephrosclerosis. On microscopy, there will be features of varying degrees of acute tubular necrosis, lymphocytic tubular and interstitial inflammation, endothelialitis, fibrin or hyaline thrombi in renal blood vessels as well as glomerular endotheliosis. There may also be characteristic lesion of other background pathologies in the kidney such nodular glomerulosclerosis in Diabetic Nephropathy.

All cases of COVID-19 display widespread germ cell destruction and decline of the spermatogenic series in the seminiferous tubules in the affected patients. Some also showed thickened basement membrane of the tubules with relative Leydig hyperplasia and swelling and vacuolation of the Sertoli cell cytoplasm.

- **Skin**

Findings in the skin of the affected patients could manifest in form of exanthematous, papular, Maculo-papular, livedo reticularis lesions, petechiae and so on. There may be infiltration of the dermis by inflammatory cells with an accompanying vasculitis.

Conclusively, COVID-19 is a novel multisystemic disease with arrays of clinical and pathological features, the knowledge of the disease process and identification of pertinent organ changes is very key to improving on the diagnosis and management of the disease.

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