

COVID19 - 3D imaging for deciphering the pathology of a global pandemic

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However, while COVID-19 typically begins as an infection of the upper aerodigestive tract, it may progress to other visceral organs, including the lungs, the heart, the kidneys and the brain, with corresponding, albeit non-uniform clinical presentations. Pulmonary involvement therefore presents the leading manifestation of COVID-19 and acute respiratory distress syndrome (ARDS), its more severe form. COVID-19 ARDS shares common histological hallmarks with other infectious / non-infectious ARDS, like diffuse alveolar damage (DAD) with edema, hemorrhage and intra-alveolar fibrin deposition. SARS-CoV-2 leads to angiocentric inflammation, endothelial damage, platelet activation, elevated D-dimer and fibrinogen, thrombosis and anomalous vascular architecture, suggesting microangiopathy. This manifests with alterations of the laminar blood flow and vasoconstriction and is apparently the result of a special form of vascularization, the so-called intussusceptive neoangiogenesis, which is thought to act as an aberrant reaction-to-injury mechanism. We are using multi-scale phase contrast x-ray tomography, microCT, microvascular corrosion casting, and molecular analyses as a tool to unravel the pathophysiology of COVID-19 in different organ samples of patients succumbed to COVID-19.