Covid-19: The Rollercoaster of Fibrin(Ogen), D-Dimer, Von Willebrand Factor, P-Selectin and Their Interactions with Endothelial Cells, Platelets and Erythrocytes

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Severe infection by the SARS-Cov-2 (COVID-19) coronavirus is strongly associated with several coagulopathies that can result in bleeding and thrombocytopenia or hypercoagulation and thrombosis. In this review article, the authors comment that thrombotic events and haemorrhages often occur in subjects with poor health, who also present with multiple risk factors and comorbidities. Of particular interest are the various circulating inflammatory biomarkers directly involved in coagulation, especially fibrin, fibrinogen, D-dimer, P-selectin, and von Willebrand factor (VWF). In addition, it is important to remember that the receptors for these biomarkers and signalling pathways on endothelial cells, platelets and erythrocytes play a central role in their activity.
In this review, the authors discuss the vascular implications of COVID-19 and assess this in relation to the circulating biomarkers and endothelial, erythrocyte and platelet dysfunction. During the progression of the disease, these markers may be within normal levels, upregulated, or eventually depleted. Most significantly, patients should be treated early in disease progression, when elevated levels of VWF, P-selectin, and fibrinogen are present, with normal or slightly increased levels of D-dimer; however, D-dimer levels will increase rapidly as the disease progresses. Over time, the progressive decrease in VWF and fibrinogen, with high levels of D-dimer and even higher levels of P-selectin, followed by the cytokine storm, will be indicative of poor prognosis. In conclusion, the authors recommend using coagulation control devices and methodologies at the bedside of the COVID-19 patient and suggest that a personalised medicine approach in the treatment of patients is needed.