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Title:

COVID19 and the role of the haemostasis laboratory

Abstract:

No doubts remain that coronavirus disease 2019 (COVID-19) must be considered a vascular disease, since severe/critical COVID-19 illness is accompanied by different forms of thrombosis, both venous and arterial, either localized (i.e., in the pulmonary vasculature) or disseminated, in a large number of affected patients. Notably, all the three essential elements that compose the Virchow's triad (i.e., stasis, endothelial injury and hypercoagulability) are hallmarks of COVID-19. The leading pathway linking COVID-19 and thrombosis is represented by immunothrombosis, which can be defined as the active participation of the innate immune system in fostering thrombus generation through different and almost distinct cellular and molecular pathways, originally triggered by recognition of pathogens and damaged cells. This immune response has been proposed as a conserved evolutionary defence for preventing or inhibiting pathogen dissemination. The cascade of events linking severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection with thromboinflammation involves a combination of multiple - almost concomitant - events, which include direct endothelial injury and consequent release of tissue factor, inflammation-dependent activation of macrophages and enhancement of pro-coagulant proteins such as tissue factor, fibrinogen and von Willebrand factor compounded by consumption of anti-coagulant and anti-aggregant proteins, release of pro-thrombotic neutrophil extracellular traps by activated neutrophils, fibrinolysis shutdown along with the contribution of additional predisposing factors often found in patients with SARS-CoV-2 infection, such as antiphospholipid antibodies and prolonged immobilization. All these mechanisms would then contribute to foster platelet hyper-activation and thrombin generation. As then concerns the role of the hemostasis laboratory, a vast array of parameters were found to be important determinants of unfavourable disease progression. These basically involve platelets, D-dimer, prothrombin time, activated partial thromboplastin time, fibrinogen, neutrophil extracellular traps, lipoprotein(a), along with other rheological abnormalities mirrored by abnormal platelet and red blood cell distribution width which, alone or in combination, are now essential parameters in longitudinal patient monitoring and risk stratification. Laboratory testing is also essential for monitoring prophylactic antiplatelet and/or anticoagulant treatment in COVID-19, in order to lower the likelihood of developing thrombosis and prevent the risk of bleeding.