COVID Coronary Vascular Thrombosis: Correlation with Neutrophil but not Endothelial Activation

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Introduction: Severe COVID-19 infection increases the risk of myocardial injury that contributes to mortality. Here, we investigated the potential causes of cardiac injury.
Methods: We used multiparameter immunofluorescence to examine extensively heart autopsy tissue of 7 patients who died of COVID-19 compared to 12 control specimens, some with and some without cardiovascular disease.
Results: Consistent with prior reports, we found no evidence of viral infection or lymphocytic infiltration indicative of myocarditis but did observe frequent and extensive thrombosis in large and small vessels in the hearts of the COVID cohort, findings that were infrequent in controls. The endothelial lining of thrombosed vessels typically lacked evidence of cytokine-mediated endothelial activation, assessed as nuclear expression of transcription factors p65 (RelA), pSTAT1, or pSTAT3 or evidence of inflammatory activation assessed by expression of intracellular adhesion molecule-1 (ICAM-1), tissue factor, or von Willebrand factor (VWF). Intimal EC lining was also generally preserved with little evidence of cell death or desquamation and these did not co-localize with thrombi. In contrast, there were frequent markers of neutrophil activation within myocardial thrombi of COVID-infected patients including neutrophil-platelet aggregates, neutrophil-rich clusters within macrothrombi, and evidence of neutrophil extracellular trap (NET) formation.
Conclusions: These findings point to alterations in circulating neutrophils rather than the endothelium as contributors to the increased thrombotic diathesis in the hearts of COVID-19 patients.