Platelet function associated with human coronavirus (HCoV-229E): A preliminary study

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ABSTRACT

Introduction: Thrombotic complications are well recognized in coronavirus infections, especially in SARS-CoV-2 infection heralding to coagulopathy and vascular events. Although SARS-CoV-2 has been extensively investigated, the extent of its mechanism remains poorly defined. HCoV-229E, a cause of seasonal respiratory illness, may similarly perturb platelet responses. This study aimed to investigate the effect of coronavirus exposure on platelet aggregation and adhesion to better understand virus-induced thrombotic risk. **Materials and Methods:** Platelet-rich plasma (PRP) and platelet-poor plasma (PPP) from healthy volunteers were prepared by centrifugation, with platelet counts confirmed within the normal physiological range (150–400 × 10^9/L). Platelet aggregation was assessed using modified light transmission aggregometry (LTA) in 96-well plate in response to ADP (0.1-30 µM), collagen (0.1-30 µg/ml), TRAP-6 (0.1-30 µM), and epinephrine (0.001-100 µM). PRP was incubated with HCoV-229E at multiplicities of infection (MOI) 0.1 or 1.0 for 30 minutes, with virus-free PRP serving as control. Following aggregation, platelet adhesion was evaluated using a p-nitrophenyl phosphate hydrolysis assay at 405 nm. Each experiment was performed in triplicate with samples from at least three independent donors. Statistical comparisons were performed using unpaired t-tests, with $p < 0.05$ considered significant. **Results:** At MOI 0.1, platelets exhibited enhanced aggregation responses, particularly to ADP and collagen at 1–10 µM ($p < 0.05$). Similar trend was observed in platelet adhesion assays in collagen-induced adhesion with slight increases observed with ADP, TRAP-6, and epinephrine. In contrast, MOI 1.0 exposure potentiate platelet aggregation and adhesion at low agonist concentrations ($p < 0.01$), but significant attenuation of maximal responses at higher doses ($p < 0.05$). This attenuation was evident in reduced aggregation amplitudes and suppressed adhesion across all agonists, indicating impaired platelet responsiveness under higher viral load. Overall, HCoV-229E shifted platelet responsiveness towards a dysregulated state, characterized by hyperreactivity at lower thresholds and impaired function at higher stimulation. **Conclusion:** HCoV-229E modulates platelet function in a viral concentration–dependent manner, enhancing platelet aggregation and adhesion at low exposure while inhibiting at higher exposure. Our findings suggested initial viral response promotes platelet hyperreactivity, but high-level viral exposure leads to functional platelet exhaustion. These findings extend the spectrum of coronavirus-induced platelet dysfunction beyond SARS-CoV-2 and underscore the importance of considering coronaviruses in thrombotic risk assessment. Further mechanistic studies are warranted to define the molecular pathways underlying these platelet–virus interactions.

Keywords: Platelet function, platelet aggregation, platelet adhesion, Coronavirus infection, HCoV-229E