Viscoelastic testing in COVID-19: a possible screening tool for severe disease?

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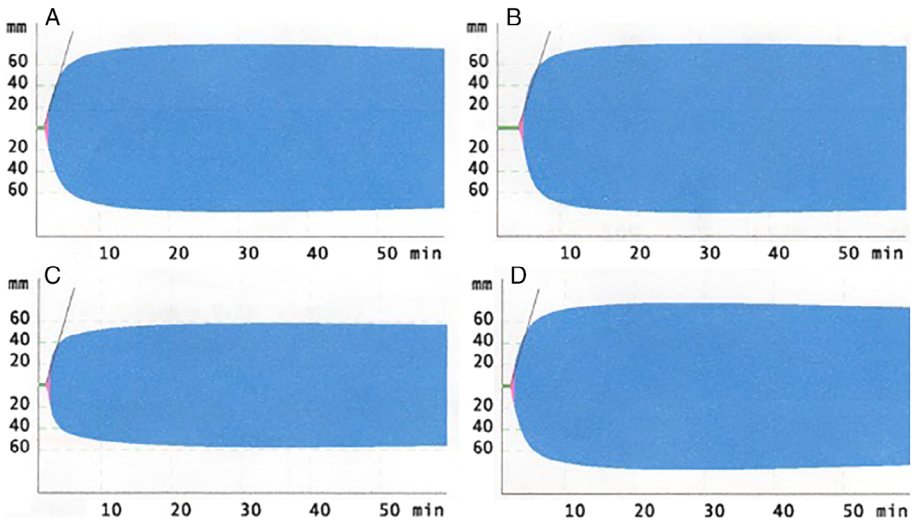

Fig 1 Viscoelastic testing tracings from an intensive care unit patient with severe COVID-19. (A) EXTEM tracing; (B) INTEM tracing; (C) FIBTEM tracing; (D) APTEM tracing.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes coronavirus disease 2019 (COVID-19) that manifests with variable severity.[1] A subset of symptomatic individuals develop proinflammatory or prothrombotic profiles requiring additional testing and interventions.[2-5] It is unclear which COVID-19 patients will ultimately develop severe disease that would have benefitted from early and aggressive interventions.

A 63-year-old man was admitted with rapidly progressive COVID-19 pneumonia with hypoxia. Given the patient's worsening clinical status, laboratory coagulation analysis, including viscoelastic testing by rotational thromboelastometry (ROTEM delta, Instrumentation Laboratory Co., Bedford, MA), was performed immediately upon hospital admission. He subsequently developed acute respiratory distress syndrome and shock that required mechanical ventilation and vasopressor support.

Routine coagulation testing demonstrated a prothrombin time (PT) of 12.2 seconds (normal 9.4-15.4 seconds), a partial thromboplastin time (PTT) of 30 seconds (normal 26-38 seconds), and D-dimers of 2143 ng/mL fibrinogen equivalent units (FEU; normal <600 ng/mL FEU), the last associated with severe COVID-19.[6] Viscoelastic testing demonstrated a hypercoagulable profile (see Fig. 1).[7] In particular, there was elevated maximum clot firmness observed on EXTEM (78 mm), INTEM

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(79 mm), and FIBTEM (58 mm) tracings (normal 52-70 mm, 51-72 mm, and 10-24 mm, respectively), and clot formation time was shortened on the EXTEM tracing (39 seconds, normal 48-127 seconds) with an increased α angle (82°, normal 65-80°). The patient was placed on 7500 units of subcutaneous unfractionated heparin every 8 hours for thrombosis prevention based on his critical illness and viscoelastic testing results. The patient still requires mechanical ventilation and vasopressor support; he has not developed any overt thrombotic or bleeding events, and D-dimers have decreased (1294 ng/mL FEU).

These preliminary findings suggest that viscoelastic testing may have a role in rapidly identifying patients with severe COVID-19. Other viscoelastic methods of assessing clot firmness could also be used in COVID-19, such as thromboelastography and resonance sonorheometry.[8,9] Measuring D-dimer or fibrinogen concentrations could assess this pathologic phenomenon if viscoelastic testing was unavailable.[10,11] The utility of viscoelastic testing in COVID-19 needs to be further assessed to better understand the usefulness and limitations of this technology in these critically ill patients with a hypercoagulable state.[12]

CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

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