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Mini Review

Severe COVID-19 Infection and Hypercoagulation. A Narrative Review

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Received: June 28, 2020; **Published:** July 29, 2020

Abstract

Severe forms of COVID-19 infection are associated frequently with disseminated intravascular coagulation (DIC) and consumptive coagulopathy. This was found to affect the pulmonary circulation of the respiratory system and other vital organs including the liver kidney and brain. The development of intravascular thrombi, elevated D-dimer blood levels increase the risk of mortality. Anticoagulation should be administered prophylactically in mild conditions but higher therapeutic doses are required in severe forms. The early identification of coagulopathy and the continuous monitoring of the coagulation status is necessary to evaluate the effect of therapy and could improve outcome and reduce mortality. The role of thromboelastometry in the management and monitoring of this coagulopathy states remains to be evaluated.

Keywords: *COVID 19; Coagulopathy; Treatment; Survival*

Introduction

The coronavirus disease 2019 (COVID-19) is from the family of the coronaviruses which appeared first in Wuhan city China towards the end of 2019 before it became a pandemic claiming thousands of lives. It is highly contagious and the clinically presentation varies from asymptomatic to severe acute respiratory failure [1,2].

In this recent pandemic one of the important findings observed during the last few month particularly among the very sick patients was the significant increase in blood D-dimers representing coagulopathy and cytokines representing inflammation [3].

In these severe forms infection, it was noted that the clinical condition rapidly proceed towards disseminated intravascular coagulation (DIC) and consumptive coagulopathy which not only affects the respiratory system but other vital organs as well. The development of intravascular macrothrombi, elevated D-dimer and prolonged prothrombin time were frequently present among non-survivors [4].

Aim of the Study

The aim of this review is to discuss recent publications related to COVID 19 and hypercoagulation.

Methods

A literature review to identify published and ongoing research investigating the relationship between COVID-19 and hypercoagulation. The search utilized the main online available databases Medline, Scopus, PubMed and Google Scholar databases between February and June 2020. This included limited current peer-reviewed publications with low quality of evidence as a result of the short duration since the start of this pandemic. Only 14 related publications were retrieved. The keyword used: COVID 19, coagulopathy, treatment, survival.

Discussion

The association between inflammation and coagulation during COVID 19 can exacerbate the pro-thrombotic mechanisms [3,5]. Critically ill COVID-19 patients suffer from a significant increase in pro-inflammatory cytokines as IL-2 and TNF-α,4 (Cytokine storm) and these cytokines potentially can up regulate the coagulation system causing serious changes in D-dimer blood levels (above 1 μg/mL) and platelet functions. This can lead to micro- or macro-circulatory thrombosis and in critically ill patients to pulmonary embolism and disseminated intravascular coagulation (DIC) [5,6]. The potential uses of heparin with its anticoagulant and anti-inflammatory properties is currently being tested. Heparin anti-inflammatory function binds to inflammatory cytokines and can inhibit neutrophil chemotaxis and neutralize complement inflammatory factors [7]. Other anticoagulation drugs as direct thrombin inhibitors (Bivalirudin) could be of benefit particularly with heparin resistance. Tissue plasminogen activator (tPA) and aspirin are currently under investigation among COVID 19 critically patients [8-10].

Klok., *et al*. reported a 31% incidence of thrombotic complications among critically ill patients with COVID 19 and recommended a thrombotic pharmacological prophylactic regime [11]. Guan., *et al*. and Lipp., *et al*. observed that high blood D-dimer levels on admission can predict the severity of illness and mortality [12,13]. Tang., *et al*. [8] advised that the routine administration of prophylactic doses of heparin can reduce mortality in severe forms with a sepsis induced coagulopathy (SIC) score ≥ 4 or D-dimer > 3.0 mg/L. This marked increase in coagulation was also noted with thromboelastometry traces in the form of shorter clot formation time and an increase in maximum clot [14].

Conclusion

In conclusion, this current review literature recommends that patients with COVID-19 should undergo coagulation studies (Dimer, Prothrombin time, and Platelet count) on admission and in follow up. Anticoagulation should be administered prophylactically in mild conditions and therapeutic doses for severe forms. The early identification of coagulopathy and the continuous monitoring of the coagulation status is necessary to evaluate the effect of the therapy. Anticoagulation could improve outcome and reduce mortality. The role of viscoelastic tests as thromboelastometry need to be investigated in this specific disease.

Conflict of Interest

All authors declare that there is no conflict of interest.

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Volume 6 Issue 8 August 2020