

## Dealing with Hypercoagulability Problem in COVID-19 Cases

Raden Suhartono<sup>a</sup>, Nyityasmono Tri Nugroho<sup>b</sup>

<sup>a</sup>M.D. Vascular and Endovascular Division, Department of Surgery, Cipto Mangunkusumo Hospital - Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

<sup>b</sup>M.D., Ph.D., Vascular and Endovascular Division, Department of Surgery, Cipto Mangunkusumo Hospital - Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

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“The incidence of hypercoagulation and thrombosis in COVID-19 are varies, and with a high margin of severity. The knowledge of COVID-19 disease and the pathophysiology of the hypercoagulation problem could lead to the proper treatment to make a better outcome during this pandemic.”

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COVID-19 disease has emerged worldwide, and recently COVID-19 vaccination has become the most powerful weapon to overcome this pandemic. Indonesia has begun their COVID-19 vaccination program since this January 13, 2021, with President Joko Widodo as the first participant in this program. However, the cumulative COVID-19 cases in Indonesia is still increasing, with the 939,948 confirmed cases per January 21, 2021, with 8,000 – 14,000 cases in single day within last week report.<sup>1</sup> This issue will lead to higher morbidity and mortality rates, if the moderate to severe COVID-19 cases are not properly treated. One morbidity in vascular problem in COVID-19 is the hypercoagulability issue.

Hypercoagulability issue in COVID-19 may caused by disruption of the Virchow's triad. An endothelial injury, blood stasis, and hypercoagulable state itself could induce hypercoagulation in COVID-19 patients.<sup>2-3</sup> A microvascular inflammation, endotheliitis, and/or endothelial exocytosis in COVID-19 may play role in endothelial injury that can lead to acute respiratory distress syndrome and towards to a hypercoagulation status, although the direct mechanism is still poorly understood.<sup>2</sup> The blood stasis has strong correlation with the bed-ridden and immobility condition in critically ill COVID-19 patient. The last disruption in Virchow's triad is hypercoagulable, which can be emerged from elevated factor VIII, elevated fibrinogen, circulating prothrombotic microparticles, neutrophil extracellular traps (NETs), and/or hyperviscosity.<sup>4</sup>

As 14.8-17.3% patient has incidence of thrombosis during their COVID-19 treatment, and most of them were in critically ill condition.<sup>5</sup> Most of them with deep vein thrombosis (DVT), pulmonary embolism (PE), and stroke ischemic. According to the hypercoagulation problem in arterial vessel, acute limb ischemia (ALI) is also increasing during this pandemic, and most of studies reported due to hypercoagulable state.<sup>6</sup> Use of LMWH (low molecular weight heparin) as a prophylactic is stated in the International Society on Thrombosis and Haemostasis (ISTH) guidance for treating coagulopathy in COVID-19 cases.<sup>5-6</sup> In the precautions, due to usage of antiviral agents, warfarin, oral anticoagulant, direct thrombin inhibitor, and factor Xa inhibitor may cause interaction, and that is the reason to avoid this medications in COVID-19 patient with hypercoagulation problem.<sup>5</sup> This thrombosis event has not been recorded yet as a side effect of the COVID-19 vaccination. This can be rationalized due to the vaccine (inactivated virus, non-replicating viral vector, protein subunit, or RNA based vaccine) triggers only the antibody responses, not developing the endothelial injury response.

However, the incidence of hypercoagulation and thrombosis in COVID-19 are varies, and with a high margin of severity. The knowledge of COVID-19 disease and the pathophysiology of the hypercoagulation problem could lead to the proper treatment to make a better outcome during this pandemic.

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