Hematological finding in Covid-19

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Introduction

* It is well documented that COVID-19 is primarily manifested as a respiratory tract infection
* Emerging data indicate that it should be regarded as a systemic disease involving multiple systems including cardiovascular, respiratory, gastrointestinal, neurological, hematopoietic and immune system.
* The possible mechanisms could be systemic inflammatory response, stasis, and SARSCoV- 2 – Angiotensin converting enzyme (ACE2) binding and direct endothelial cell damage

Introduction

* Endothelial cell injury induced by viral infection activates a multitude of pro-inflammatory cytokines such as interleukin IL-1, IL-6, and TNF-alpha
* Hyper-cytokinemia that often lead to multi-organ dysfunctional syndrome COVID-19 has a high rate of hospitalization and mortality.
* Multiple hematologic parameters in COVID-19 patients can predict prognosis as well as severity of illness thus may help with proper triage of patients within the hospital.
* Herein, we summarize some hematologic findings and complications of COVID-19 and we provide guidance for early prevention and management of the latter.

Thrombosis and hemostasis and COVID-19

* **Coagulation disorders** are relatively frequently encountered among COVID-19 patients, especially among those with severe diseases.
* The up-regulation of tissue factor (TF) - activated VIIa complex is associated with thrombin generation and fibrin deposition in various organs including the bronco-alveolar system.
* Thrombotic complications have thus emerged in COVID-19 patients as an important aspect of their clinical presentation
* some form of anticoagulation is being used in many COVID-19 treatment protocols.

D-Dimer
(Thrombosis and hemostasis and COVID-19)

* **S**tudies so far have suggested that coagulopathy associated with COVID-19 (CAC) is predominantly a pro-thrombotic DIC with elevation in D-dimer levels, and fibrinogen levels, and a decrease in anti-thrombin levels.
* The clinical implications of these coagulopathy perturbations are pulmonary congestion with microvascular thrombosis and micro occlusion with an increased rate of thromboembolic events, central line thrombosis, and strokes
* Guan et al. in their study on 1099 hospitalized COVID-19 patients found **elevated D-dimers (≥0.5 mg/L) as an indicator of severe illness.**
* Tang et al. reported D-dimers as a mortality predictor with the **median value of 2.12 μg/ml (range 0.77–5.27 μg/ml) in the non-survivors patients, compared to 0.61 μg/ml (range 0.35–1.29 μg/ml) in the survivors**
* Huang et al. was that a **higher at admission median d-dimers was associated with an increased chance of requiring critical care**
* Based on these findings, D-dimer has become a reliable marker of prognosis, hospital mortality, and need for ICU level care

Anti-phospholipid antibodies
(Thrombosis and hemostasis and COVID-19)

* These antibodies are well known to rise transiently in various infections (tuberculosis, syphilis, Human immunodeficiency virus, hepatitis C) or other auto-immune disorders
* in a study in France reported that out of 56 patients with COVID-19, 25 cases (45%) had lupus anticoagulant (LAC) positive
* Zhang et al. reported three patients with COVID- 19 who were evaluated for cerebral infarctions and peripheral limb ischemia with digit discoloration.
* Mao et al. reported 4 cases of ischemic stroke in their 214 patient's data
* Li et al. reported an incidence of stroke as 5% among hospitalized patients
* Large vessel stroke in 5 COVID-19 patients younger than 50 yrs was recently reported by Oxley et al.
* Hence, so far significance of antiphospholipid antibodies in precipitating ischemic/thrombotic events in COVID-19 patients is unknown and needs further evaluation.

Thrombocytopenia
(Thrombosis and hemostasis and COVID-19)

* Thrombocytopenia is a marker of poor clinical outcome and was associated with a three-fold enhanced risk of worsening disease.
* The platelet count was lower in patients with very severe COVID-19. Twenty percent of COVID-19 patients who died had a platelet count <100 x 10 9/l, compared with 1% of survivors.
* Very low platelet counts of <20 x 109/l, or a sudden fall in the platelet count >50% over 24-48 hours can occur in the pre-terminal stages of COVID-19
* Underlying liver issues, drug side effects, heparin-related thrombocytopenia (HIT), primary hematological disease (Immune thrombocytopenia, Thrombotic thrombocytopenic purpura etc.), impending DIC, viral infection and overt inflammatory response are few of the many such causes

Thrombocytopenia
(Thrombosis and hemostasis and COVID-19)

Few of the potential mechanisms proposed are:

* Consumptive thrombocytopenia.
* Reduced release in the peripheral circulation.
* Robust auto-immune response against platelets and platelet destruction.
* Virus directly infecting the hematopoietic stem cells, megakaryocytes, and platelets (via CD13 or CD66a) and apoptosis.

Leukocyte in Covid-19

* Several studies demonstrated that neutrophilia that might be related to the cytokine storm (absolute neutrophil count above the normal range; 3–7.5 × 109/L)
* lymphocytopenia (lymphocyte count < 1.5 × 109/L) were present in severe cases of COVID-19 pneumonia and were associated with poor prognosis.
* Neutrophil to lymphocyte ratio (NLR) has also been found to predict disease severity in the early stages of SARS CoV-2 infection.
* In contrast, small studies reported a significant reduction in granulocytes in severe as compared to non-severe patients.

* Lymphocytopenia is a reliable indicator of early SARS CoV-2 infection and helps in tracing of contacts besides assessment of disease progression along the course of COVID-19 pneumonia.
* In the clinical practice of treating patients with COVID-19, we have observed that the NLR of severe patients is higher than that in mild patients
* When NLR was ≥ 4.21, and the patient's age was < 50, the sensitivity and specificity were 70.3% and 93.7%, respectively
* strong correlation between NLR and CRP might suggest the use of NLR to differentiate between non-severe and severe cases, especially in a remote healthcare facility.

Thanks for attention