THE RISK FOR DEEP VEIN THROMBOSIS IN PATIENTS WITH COVID-19

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ABSTRACT

- The coronavirus disease of 2019 (COVID-19) is a very serious, often fatal viral illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), now declared as a pandemic by the World Health Organization. Since its inception in December 2019 in Wuhan, China, COVID-19 has spread rapidly through the 6 continents and over 100 countries despite social distancing measures, claiming thousands of lives and leaving millions more infected. The D-Dimer level within COVID-19 patients went up significantly and the platelet count of COVID-19 patients significantly dropped. Some patients also had an elevation of the CURB-65 score, and an elevation of PPS. The DVT caused by COVID-19 is very difficult to manage, and thromboprophylaxis is the best suggested technique which has been followed with good results. There is a direct correlation between COVID-19 and DVT.

INTRODUCTION

- We are members of the Global Thrombosis Forum (GTF, www.gtfonline.net). DVT appears to be one of the most common complications of COVID-19. Several studies to date have shown a high incidence of venous thromboembolic complications in patients with severe and critical COVID-19. This project represents our research in the area of the correlation between COVID-19 and DVT, since we have come across a large number of articles dealing with this subject.

COVID-19 AND THE WORLD

- The coronavirus disease of 2019 (COVID-19) is a very serious, often fatal viral illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), now declared as a pandemic by the World Health Organization.

HOW DID COVID-19 GET STARTED?

- Since its inception in December 2019 in Wuhan, China, COVID-19 has spread rapidly through the 6 continents and over 100 countries despite social distancing measures, claiming thousands of lives and leaving millions more infected.
- The first report of a coronavirus-related death in the United States came on Feb. 29 in the Seattle, WA area.
- The time from exposure to onset of symptoms is usually between two and 14 days, with an average of five days.
- As of September 29, 2020, over 7,230,000 cases of COVID-19 have appeared in the US, and over 208,000 deaths have occurred (these numbers will keep on changing on a daily basis).

HOW DOES COVID-19 CAUSE THROMBOSIS?

- The COVID-19 virus induces a hyper-inflammatory state, which induces endothelial injury.
- This process activates the coagulation cascade and impairs fibrinolysis with disruption of the endothelial barrier and loss of physiologic antithrombotic factors. This may significantly elevate the risk for DVT.
- Several studies suggest that hospitalized patients with COVID-19 may be at high risk for thromboembolic complications.

A LOOK AT SCIENTIFIC FACTS

- One of the potential complications of COVID-19 is deep vein thrombosis. Pain, swelling, and sometimes pulmonary embolism (or a sudden blockage in the lung) can occur, making deep vein thrombosis a life-threatening condition.
- Zhang and colleagues (2020) reported on 143 consecutive patients with COVID-19 (mean age, 63; 48% women) who were hospitalized and who underwent lower-extremity venous ultrasound scanning.
- Almost half of the patients (46%) developed a lower-extremity deep venous thrombosis (Figure 1)
- Patients who had a DVT were on average older than patients without DVT, were more likely to have adverse clinical events, and had higher mortality.

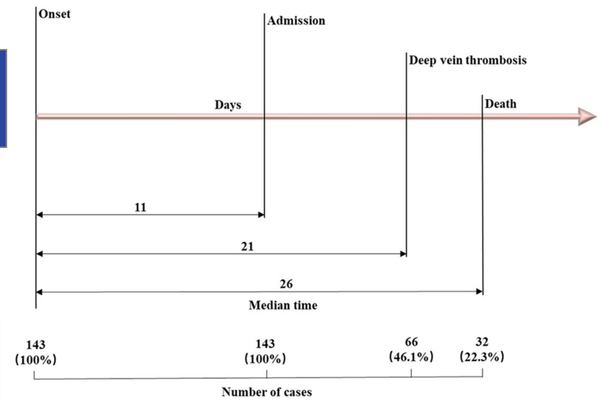

Figure 1: Timeline of COVID-19 after onset of illness

TIMELINE CHARTS FOR LABORATORY MARKERS

- Illness chart from the onset in patients with COVID-19 with and without deep vein thrombosis, changes in D-dimer (A), platelets (B), are shown in Figure 2.
- Patients with DVT had higher levels of D-dimer than patients without DVT, the D-dimer value was the highest on day 19 after illness onset and gradually decreased during hospitalization in the DVT group, whereas the patients without DVT had a relatively flat trend of D-dimer during the course of their hospitalization.
- The level of platelets first decreased and then tended to increase in the 2 groups during hospitalization.

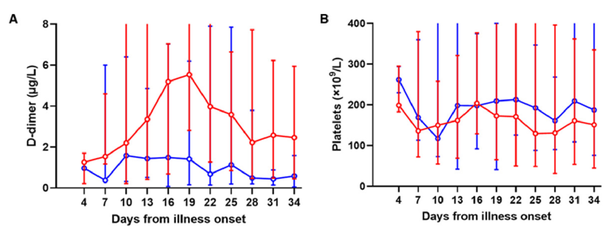

Figure 2: Timeline charts for laboratory markers from illness onset in patients with COVID-19 with (Red) and without deep vein thrombosis (Blue).

SCORES ELEVATED DUE TO COVID-19

CURB-65

- The CURB-65 calculator is used in the emergency department setting to risk stratify a patient's community acquired pneumonia.
- One point is given for the presence of each of the following:
- Confusion: Altered mental status
- Uremia: Blood urea nitrogen (BUN) level greater than 20 mg/dL
- Respiratory rate: 30 breaths or more per minute
- Blood pressure: Systolic pressure less than 90 mm Hg or diastolic pressure less than 60 mm Hg
- The CURB-65 score in COVID-19 patients was often elevated to between 3 to 5

Padua Prediction Score (PPS)

- PPS Determines anticoagulation need in hospitalized patients by risk of VTE.
- The PPS was elevated to 4 in most of the patients

The D-dimer

- D-dimer (or D dimer) is a fibrin degradation product, a small protein fragment present in the blood after a blood clot is degraded by fibrinolysis.
- D-dimer is the degradation product of crosslinked (by factor XIII) fibrin. It reflects ongoing activation of the hemostatic system.
- D-dimer in the COVID-19 patients showed a significant elevation, indicating possible DVT.
- In hospitalized patients with COVID-19, the prevalence of DVT was high and was associated with adverse outcomes.
- There was a clear association between DVT and multiple risk factors, especially a CURB-65 score 3 to 5, a Padua prediction score 4, and D-dimer >1.0 μg/mL.

Management of DVT in COVID Patients

- Based on clinical studies from various centers, scientists have recommended pharmacologic prophylaxis for venous thromboembolism in all hospitalized patients with COVID-19 who do not have a contraindication.
- One such algorithm has been suggested by Stephan Moll, MD at the UNC Medical Center (Figure 3).
- In a recent observational study of 184 patients, Klok and colleagues determined that the cumulative incidence of venous thrombotic complications was as high as 31 percent during ICU admissions for patients with COVID-19.

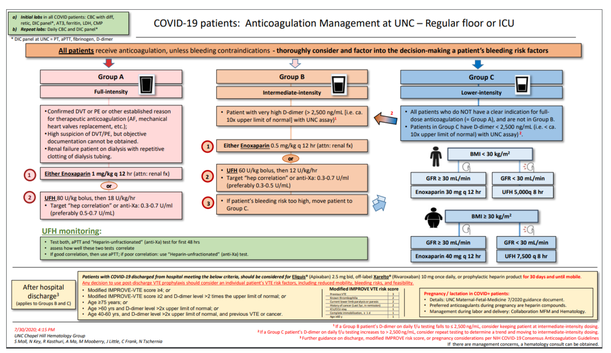

Figure 3: UNC algorithm for use of anticoagulants

SARS vs COVID-19

- In the 2002 severe acute respiratory syndrome (SARS) pandemic, the incidences of DVT/PE were roughly 20.5%, while during the COVID-19 pandemic, DVT occurred in 85.4%.

Reasons for the increased occurrences of DVT

1. Inflammatory response
2. Human error (bed rest, catheterization, or ventilation issues).
3. Old age
4. Inadequate anticoagulation

- There is thus most likely a distinct connection between COVID-19 patients contracting lower extremity DVT.

SUMMARY AND CONCLUSIONS

- Our research indicates that there appears to be a direct correlation between COVID-19 and DVT due to inflammatory responses, old age, inadequate anticoagulation, and human error which includes too much resting, catheterization, or ventilation issues.
- Until COVID-19 comes under complete control, prevention of COVID-19 should be considered as an individual responsibility.

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