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Upsurge of deep venous thrombosis in patients affected by COVID-19: Preliminary data and possible explanations



It is known that hospitalized, bedridden patients are particularly prone to development of deep venous thrombosis (DVT); in the absence of adequate prophylaxis, its overall incidence among in-hospital patients is 0.9%, rising up to 15% to 32% among intensive care unit (ICU) patients.^{1,2} However, during the last month, a remarkable increase in the diagnosis of DVT has been noticed among non-ICU hospitalized patients as well due to the numerous cases of DVT observed among patients infected by coronavirus disease 2019 (COVID-19). In the last month, the Unit of Vascular Surgery of the teaching hospital S. Matteo, in Pavia, one of the hub centers for COVID-19 in Lombardy, the Italian region most affected by the pandemic, was requested to perform 30 compression ultrasound scans of the venous system, of both lower and upper limbs, of COVID-19 non-ICU patients with signs or symptoms suggestive of DVT, and 16 of them had positive results; 6 more had no DVT but superficial thrombophlebitis or upper limb lymphedema. The most frequent localization of the thrombus was the iliac-femoral-popliteal axis, followed by the brachial-axillary veins and the calf veins (Table). Four cases developed from a central vein catheter placed in the femoral vein. Although the numbers are too small to perform statistical analysis, the same period in 2019 could provide a term of comparison: in March 2019, the same unit performed 24 compression ultrasound scans on the whole hospital and found only 5 cases of DVT.

Currently, no literature exists about the pathogenetic mechanism of DVT in COVID-19 patients. A relationship was found between DVT and acute respiratory distress syndrome in influenza A H1N1, for which an enhanced leukocyte adhesion to the vein walls due to the production of inflammatory molecules was hypothesized, and empirical anticoagulation was proposed in all patients with severe acute respiratory distress syndrome.³ Production of procoagulant factors, such as D-dimer and tissue factor, is another possible mechanism that has been well outlined in other community-acquired pneumonias, although no relationship with DVT has been established; a similar procoagulant stimulation can also occur in

COVID-19 infection.⁴ A third possible favoring element that could also explain the upper limb involvement is the use of a continuous positive airway pressure ventilator, which is often tied in a way that can compress the superficial or deep vessels of the upper limbs; all patients with involvement of the upper limbs, in fact, were receiving continuous positive airway pressure therapy.

Unfortunately, no data are yet available on the prognosis of patients developing DVT during a COVID-19 infection, so further research should inquire as to how the two conditions interact with each other and whether they affect the chance of recovery. However, considering these preliminary data, our institution is starting to administer anticoagulant doses of low-molecular-weight heparin in hospitalized COVID-19 patients, after monitoring of coagulation test results and kidney and liver function.

In conclusion, DVT can be considered a frequent and potentially lethal complication of COVID-19. It deserves further attention to establish incidence, mortality rate, and the opportunity of a screening program and prophylactic therapy in these patients.

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Table. Baseline clinical characteristics of COVID-19 patients with deep venous thrombosis (DVT)

DVT location	No.	M:F	Age, years, mean (range)	Main risk factors for DVT ^a	c-PAP bearers
Femoropopliteal veins	7	3:4	64.3 (57-70)	4 CVC bearers	5/7
Axillary-brachial veins	5	3:2	69 (65-77)	1 Breast cancer	5/5
Calf and tibial veins	4	2:2	62.7 (65-71)	0	2/4

c-PAP, Continuous positive airway pressure; CVC, central vein catheter.

^aThe main risk factors for DVT are active cancer, surgery or major trauma in the past 12 weeks, known thrombophilia, pregnancy, oral contraception, and intravenous catheters.

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Caring for patients with venous insufficiency during the COVID-19 pandemic at a tertiary care center



In December 2019, coronavirus disease 2019 (COVID-19) was identified as the cause of a cluster of pneumonia cases in Wuhan, China. It rapidly spread and has resulted in a global pandemic.

With the current recommendations of social distancing and stay-at-home orders, the pandemic has significantly affected medical practice. Although most venous insufficiency cases will be considered elective, delaying care can result in complications such as deep vein thrombosis or stasis ulcer. Furthermore, it has been confirmed that early endovenous ablation of superficial venous reflux will result in faster wound healing.¹ Consequently, it is crucial to weigh the risk of delaying these cases to reduce viral transmission with the benefit of reducing venous disease-related complications. In accordance with state, federal, and medical society recommendations, our institution has instituted drastic practice changes. These involved rescheduling of all elective procedures, including venous cases, and postponing all venous insufficiency ultrasound studies. Patients with suspected venous stasis ulcers or deep vein thrombosis are allowed to undergo appropriate testing and, in some cases, to be seen in the clinic. All postponed office visits, vascular laboratory studies, and procedures have been recorded in a database to allow for rescheduling once the COVID-19–related restrictions have been lifted. In accordance with the recent modifications of the Health Insurance Portability and Accountability Act rules to accommodate the COVID-19–related healthcare changes,² we have instituted additional steps to accommodate nonurgent venous cases. First, patients are asked to e-mail us photographs showing their area of concern. Second, for a select group of patients with access to compatible social media services, we have allowed for video calls to providers. Third, we began incorporating secured video conference call services provided by EPIC, which has facilitated live evaluation of patients'

concerns. All nonurgent patients are treated conservatively with compression, elevation, and exercise. Since the peak in Minnesota is projected to be in July 2020, our leadership has asked proceduralists to review all rescheduled and pending cases and provide insight regarding their urgency.² Cases with venous insufficiency–related intractable stasis ulcers will be considered on a case-by-case basis.

During the first month of the COVID-19–related practice changes, 29 vein procedures were rescheduled and 15 new consultations were performed using telehealth methods. Four patients with stasis ulcers have been monitored for progression, three of whom have been approved for procedures. Although venous insufficiency is not an immediately limb-threatening disease, the COVID-19–related delay in care will certainly affect patients' quality of life. We believe that our measures will help mitigate the effects of COVID-19 on the care of patients with venous disease.

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Problems related with anticoagulant usage during COVID-19 outbreak



The current COVID-19 pandemic has led to many countries asking or requiring their citizens to stay home to