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BRIEF COMMUNICATION

Risk of venous thromboembolism in COVID-19 infection

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Abstract

The incidence of venous thromboembolism (VTE) for non-hospitalised patients with coronavirus disease-2019 infection has not been very widely studied. 13 019 persons with a positive SARS-CoV-2 nucleic acid amplification test were identified. In total, 447 (0.2%) VTEs were identified in the study population, 293 (66%) of these were pulmonary embolisms. A positive SARS-CoV-2 test did not increase the risk for VTE in the univariate analysis (odds ratio (OR): 1.0, 95% confidence interval (CI): 0.69–1.4) or multivariable analysis (OR: 1.36, 95% CI: 0.93–1.97).

Coronavirus disease-2019 (COVID-19) infection has been associated with an increased risk for venous thromboembolism (VTE), especially for hospitalised patients,[1] and a positive correlation with the severity of the infection has been found.[2,3] The incidence of VTE for hospitalised patients with COVID-19 infection has been reported to be 2–20%,[2,4–6] with even higher incidences for patients treated in the intensive care unit (ICU). The incidence of VTE for non-hospitalised patients with COVID-19 infection has not been so widely studied, but incidences of 0–0.8% have been reported.[2,4,7,8] The aim of this study was to assess whether COVID-19 infection increased the risk for VTE in a Finnish population-based setting.

All persons aged 18 years or older with a SARS-CoV-2 nucleic acid amplification test (NAAT) result in the Pirkanmaa Hospital District electronic records between 1 July 2020 and 31 December 2021 were identified. If more than one sample was taken from a single person during the study period, the first positive sample was included. If all taken samples were negative, the first sample was included. During the study period, everyone with respiratory symptoms was advised to be tested with SARS-CoV NAAT free of charge. More specific testing criteria during the study period were previously described.[9] All venous thromboembolic events of the study patients (ICD-10 diagnosis codes I26.0, I26.9, I80.0, I80.1, I80.2, I80.29, I80.3, I80.8, I80.9, I82.88 and I82.9) recorded 3 months after the test date in the Tampere University Hospital discharge records were identified. Incidences of VTE and pulmonary embolism (PE) were calculated for the whole study population and for persons with positive and negative SARS-CoV-2 test results separately. The risk for VTE associated with COVID-19 infection was assessed using logistic regression in a univariate model and a multivariable model that included age and sex. In addition, the annual number of PEs (ICD-10 diagnosis code I26.0 and I26.9) diagnosed between 2010 and 2021 was retrieved from Tampere University Hospital discharge records to assess possible changes in the incidence of PE during the COVID-19 pandemic.

During the study period, all patients hospitalised for COVID-19 infection received routine VTE prophylaxis, if there were no contraindications. This was mostly administered as low-molecular-weight heparin, but the dose may have varied from standard prophylaxis dosage to an intermediate dosage based on the evaluation of the clinician. Patients with anticoagulation therapy in use were generally continued with their previous treatment. Outpatients were not routinely prescribed VTE prophylaxis.

In total, 193 909 persons (over 40% of the adult population of the hospital district area) with a SARS-CoV-2 test performed during the study period were identified. Of these, 13 019 (6.7%) had a positive test result. Of those with a positive test result, 410 (3.1%) were hospitalised for COVID-19 infection, and of these, 30 (7.3%) required treatment in the ICU. In total,

Conflict of interest: None.

Table 1 Incidences of venous thromboembolism (VTE) and pulmonary embolism (PE) in different study population groups

Group	Group size, *n*	VTE		PE	
		n	%	*n*	%
Whole study population	193 909	447	0.2	293	0.2
SARS-CoV-2 test negative	180 890	417	0.2	275	0.2
SARS-CoV-2 test positive	13 019	30	0.2	18	0.1
Outpatient	12 609	13	0.1	4	0.03
Hospitalised (regular ward)	380	11	2.9	9	2.4
Intensive care unit	30	6	20	5	17

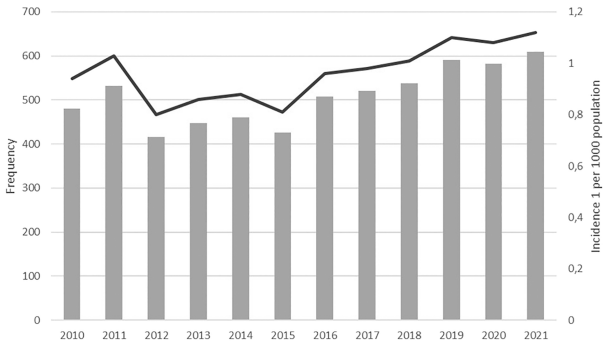

Figure 1 Yearly numbers and incidence of diagnosed pulmonary embolisms in Pirkanmaa Hospital District between 2010 and 2021. (▬) Yearly number of pulmonary embolisms; (—) incidence of pulmonary embolism.

447 (0.2%) VTEs were identified in the study population, 293 (66%) of these were PEs. There was no difference in the incidence of VTE and PE for people with positive and negative test results (Table 1). A positive SARS-CoV-2 test did not increase the risk for VTE in the univariate analysis (odds ratio (OR): 1.0, 95% confidence interval (CI): 0.69–1.4) or multivariable analysis (OR 1.36, 95% CI 0.93–1.97). The incidence of VTE did not change significantly over time during the study period (data not shown). In addition, there was no change in the incidence of PEs diagnosed in 2020–2021 when compared with previous years (Fig. 1).

Discussion

The incidence of VTE among people with COVID-19 infection was low, especially in the outpatient setting, and COVID-19 infection did not increase the risk for VTE when compared with negative controls. Similar VTE incidences were reported previously.[2,4,7,8] Most of the previous studies, however, did not include a cohort of people with a negative test result. In a study by Roubinian *et al.*, COVID-19 infection increased the risk for VTE at a statistically significant rate compared with people with negative test results, but the difference was deemed not to be clinically significant.[7] In a report from the large RECOVER registry, COVID-19 infection was not associated with an increased risk for VTE.[3]

Some limitations of the study must be acknowledged. First, because of the retrospective nature of the study, information, for example on the use of anticoagulation or possible risk factors for VTE of the study patients, was not available. Also, information on hospitalisation was available only for patients with COVID-19 infection. It is also possible that some milder non-hospitalised VTEs might have been missed, as information from the primary healthcare level was not available. Nevertheless, all PEs occurring in the hospital district are diagnosed in the university hospital, so they were all included in the study. Second, the study period did not extend to the period with newer Omicron variants, but on the other hand, criteria for SARS-CoV-2 testing and VTE prophylaxis remained uniform throughout the whole period, making the results more reliable.

In conclusion, COVID-19 infection was not associated with an increased risk for VTE or PE in this population-based cohort, especially in the outpatient setting. This result adds to the growing body of evidence that outpatients with COVID-19 infection are not at risk of developing VTEs and routine VTE prophylaxis is not needed, as recommended in recent guidelines as well.[10,11]

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