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Impact of COVID-19 "Stay at home!" Restrictions on the Prevalence of Deep Vein Thrombosis in the Geriatric Population: A Retrospective Controlled Study

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ABSTRACT

Objective: The restrictions during the coronavirus disease 2019 (COVID-19) pandemic period may have caused an increase in the incidence of deep vein thrombosis (DVT) in the elderly population. We aimed to evaluate whether the frequency of DVT increased in the geriatric population due to the restrictions of COVID-19 pandemic period and to emphasize the importance of exercise in this population.

Materials and Methods: Patients over the age of 65 who applied to our hospital, who underwent lower extremity venous doppler ultrasonography in the last year before the pandemic and in the first year with pandemic restrictions, were retrospectively analyzed from the database. The records of a total of 1531 patients were scanned. Patients with DVT were recorded.

Results: Forty-nine DVT cases in the last year before the pandemic, and 53 DVT cases in the first year of the restrictions were detected. The incidence of DVT in the elderly was found to be higher in the restrictions period.

Conclusion: Although the "Stay at home!" restrictions reduced the rate of spread of the disease, it may also have prepared the ground for serious conditions such as DVT in this population. Home exercise programs are important especially for the elderly population during the pandemic period.

Keywords: COVID-19, geriatrics, deep vein thrombosis, exercise

INTRODUCTION

Venous thrombosis (VT) is the general definition for thrombosis occurring in the venous system and is most commonly detected in the deep veins of the lower extremities. The most important life-threatening clinical finding of VT is the pulmonary embolism (PE) (1). VT development is based on blood-flow stasis, hypercoagulability, and endothelial damage as the components of the Virchow Triad (2). Factors such as age, genetic factors, immobilization, sedentary life, obesity, malignancy, and smoking are blamed as risk factors, and age increases the risk of VT independently of other risk factors (3-9).

The coronavirus disease 2019 (COVID-19) pandemic has become a global problem since the end of January 2020 and the spread of the virus is affecting public, economic, and private life rapidly and strongly all around the world. Comprehensive government restriction policies were implemented all over the world to keep the pandemic under control. The slogan "Stay at home!" was conveyed to everyone all around the world. Strict measures have led to social isolation as well as restriction of movement in vulnerable groups, such as the geriatric population (10, 11). This is important because the effects of an immobile lifestyle may be lower risk for children and young adults but much higher risk for elderly adults, who should stay at home. Elderly

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adults should stay at home but avoid a completely sedentary lifestyle as they are at higher risk of contracting COVID-19 infection and death. Physical activity is particularly important for the elderly population to maintain levels of independence, mental health, and well-being (12, 13). Physical inactivity is one of the major risk factors for mortality worldwide and a significant contributor to disability in elderly adults (14). People who do not engage in regular physical activity have higher risks of functional decline (15). Therefore, it is necessary to maintain mobility in old age as loss of independence can be predicted in elderly adults (16,17). Inadequate physical activity in quarantine period might also have detrimental effects on the mental and emotional health of elderly adults (17).

In this study, it was aimed to examine whether the restrictions during the pandemic period caused an increase in the incidence of deep vein thrombosis (DVT) in the elderly population and to emphasize the importance of mobility in this age group.

MATERIALS AND METHODS

Ethical approval was obtained from Adıyaman University Non-Invasive Clinical Research Ethics Committee before starting the study (19.01.2021/01-23). All patients over the age of 65 who applied to any outpatient clinic in the last year before the pandemic and within the first year of the pandemic period and who were requested lower extremity venous doppler ultrasonography (US) with a preliminary diagnosis of DVT were scanned from the database of our hospital. Patients over the age of 65 and who were diagnosed with DVT by doppler US were included in the study. Patients diagnosed with COVID-19 serologically, radiologically, or clinically; who were hospitalized for any other reason; who had a surgical operation with the diagnosis of hip fracture; who had a history of cerebrovascular disease and/or a history of malignancy; who had had severe heart and/or kidney failure; or who had any inflammatory disease were not included in the study.

The data of a total of 970 patients who applied to outpatient clinics between 01.03.2019 and 29.02.2020 and had undergone lower extremity venous doppler US before the start of the pandemic in our country were scanned. Forty-nine patients who met the inclusion criteria and who had thrombus on doppler US were included in the study. The data of 561 patients, who underwent lower extremity venous doppler US with outpatient admission between 01.03.2020 and 28.02.2021, when the pandemic started in our country and restrictions were placed, were also scanned. For this period, 53 patients who met the inclusion criteria and were diagnosed with DVT by doppler US were identified.

Statistical Analyses

The SPSS version 22.0 package software (SPSS Inc., Chicago, Il USA) was used for the analysis of the data. Mean and standard deviation (SD) values were used in descriptive statistics, the Chi-square test was used to compare categorical variables, and the Mann Whitney U test was used to compare the DVT numbers according to gender.

RESULTS

It was determined that 970 of the 1531 patients included in our study were requested to do lower extremity venous doppler US with a preliminary diagnosis of DVT when they applied to our hospital's outpatient clinics in the last one-year period before the pandemic, and for 508 in the first year of the pandemic. The mean age of patients with DVT in the pandemic period was 76.5±12.6, and the mean age of patients with DVT in the pre-pandemic period was 77.6±11.6 (p>0.05). The numbers of patients are shown in Table 1.

Table 1. DVT in the pre-restriction period and during the restriction period.

		DVT			
		Yes	**No**	**Total**	**p**
Restrictions	Yes	53	508	561	<0.001
	No	49	921	970	
Total		102	1429	1531	

p<0.05, statistically significant; DVT, Deep vein thrombosis

Whether the detection of DVT in the pre-restriction period and during the restriction period was independent of each other was tested with the Chi-square test. According to the test results, the number of patients with DVT was not independent of the pandemic process (χ^2=11.045; p<0.001). Also, the difference between DVT rates in the pre-restriction period and during the restriction period was tested with the Z-test. Accordingly, the rate of DVT development increased at significant levels during the pandemic process (p<0.001).

The distribution of DVT count according to gender in the pre-restriction period and during the restriction is given in Table 2.

Table 2. Distribution of patients with DVT according to gender.

		Gender			
		Female	**Male**	**Total**	**p**
Restrictions	Yes	21	32	53	>0.05
	No	25	24	49	
Total		46	56	102	

p<0.05, statistically significant

Whether the distribution of DVT according to gender in the pre-restriction period and during the restriction period was independent of each other was tested with the Chi-square test. According to the test results, DVT and gender were independent of each other (χ^2=1.336; p>0.05). Also, although the rate

of men who had DVT during the restriction period compared to the pre-pandemic period increased from 0.49 to 0.60, the rate of women decreased from 0.51 to 0.40. The difference between these rates was tested with the Z-test. In this respect, the rate of men and women who had DVT in the pre-pandemic period and during the pandemic period did not change at significant levels ($p>0.05$).

DISCUSSION

Based on our review of the subject, this is the first study to investigate the prevalence of DVT in the geriatric patient population without any other risk factors of "Stay at home!" directives and social isolation. This study is important in that it shows how important the problem of immobility is in geriatric patients and how immobility increases the rates of DVT, which can result in life-threatening problems for this age group. Although all causes other than limitation of motion, which might cause DVT, were excluded in our study, it was found that "Stay at home!" restrictions were higher in the geriatric patient population at significant levels during the pandemic period compared to the last year before the pandemic.

Since the COVID-19 pandemic is more lethal for the geriatric population, it caused some restrictions to be applied by governments all over the world, especially for people who are over the age of 65 (18). Schools, public places, and workplaces were closed as part of the curfew and quarantines in many countries to ensure social distance and reduce infection. Although this strategy was reported to be effective in controlling the COVID-19 outbreak, quarantine might be associated with some undesirable effects because of changing social habits. The "Stay at home!" practices might have also caused negative changes, such as obesity, diabetes mellitus, cardiovascular diseases, muscle atrophy, bone loss, impaired immune system, and decreased aerobic capacity as well as psychological effects, such as anxiety, posttraumatic stress symptoms, and confusion (17,19). In the study conducted by Mauger et al. in Italy, it was reported that physical activity decreased at significant levels during the pandemic compared to the pre-pandemic period, which caused psychological problems, such as depression and anxiety (20). The literature described the positive roles of physical activity in improving overall health to have effects on the heart, circulation, and respiration as well as immune function at a great deal (21,22). Therefore, establishing or maintaining regular physical activity habits has the potential to reduce the effects of the pandemic on a personal and societal level. It was proven to be difficult to form and maintain regular physical activity habits. It was reported by the Department of Health and Human Services that only 24% of adults meet the guidelines defined for them (23). The effects of restrictions on human psychology were evaluated in the literature, and it was reported that the importance of exercise in preventing this must be emphasized (20,24). A small number of case reports were detected in which DVT developed only with inactivity during the pandemic period. Blum et al. reported that a completely healthy 84-year-old woman developed DVT because of inactivity in the quarantine period (25). In our study, a significant difference was found in terms of DVT development when other risk factors were excluded and when patients who developed DVT in the last year before the pandemic and the first year of the pandemic were compared. This shows the negative outcomes of the "Stay at home!" restriction. When it is considered that our hospital was the only one other than private ones in our city, these results were found to be important in terms of showing how much the risks increased on a provincial basis. Therefore, prevention and protection methods are important to avoid these problems in the COVID-19 epidemic, especially in geriatric patients who are at great risk in this respect (26,27). If necessary, this negative situation must be prevented by home exercise instructions, viable mobility programs on public television or digital health applications, information to be provided in the form of public announcements, brochures to emphasize the importance of exercise, and the media. Exercise can prevent metabolic disorders, bone, muscle, joint pathologies and neurodegenerative diseases. Also, regarding the respiratory tract infection caused by COVID-19, regular exercise was shown to prevent the development of pathological consequences that cause cell necrosis and damage by inducing the secretion of stress hormones and anti-inflammatory cytokines responsible for decreasing excessive local inflammation in the airways (28,29). Thus, exercise can also avoid COVID-19 infection from becoming more severe in geriatric patients by strengthening the immune system. The opportunity for physical activity outdoors is limited, and it is recommended that people stay active by exercising at home in the current pandemic. For this purpose, various exercises can be recommended, including aerobic exercises, which can be performed by using a stationary bike, arm ergometer, or treadmill, bodyweight strengthening exercises, dance-based exercises, and active video games. Aerobic exercise training is defined as the exercises producing light, moderate, or high cardiovascular loads, which can be performed with a stationary bike, arm ergometer, treadmill, or various types of dance and gymnastics. The World Health Organization recommends 75-minute vigorous-intensity physical activity per week or 150 minutes of moderate-intensity physical activity per week to be combined with muscle-strengthening training twice a week for adults and the elderly (30). While there is no significant increase in the total number of patients with DVT, the statistical difference might have arisen from the lower number of admissions to the hospitals during the pandemic. In the early times of the pandemic, there was a serious decrease in the number of applications to hospitals, due to the fear of transmission of the virus, potential risks in hospitals and general public restrictions. It has been reported that there has been a serious decrease in hospital admissions with the emergence of the pandemic in the United States and that most hospitals are operating below 50 percent of capacity. In March 2022, it was reported that there was a serious decrease in the number of admissions to hospitals, even due to serious health problems such as myocardial infarction and stroke (31-33). In a study conducted in Norway, it was reported that there were significant decreases in the number of admissions to hospitals

in the first months of the pandemic and that these decreases were not different in terms of age and gender (34). In our study, although the number of hospital admissions decreased during the pandemic period, the incidence of DVT was found to be higher than in the pre-pandemic period.

The limitations of our study are that the study design was retrospective, the number of patients was small, the physical activity levels of the patients were not known, and the lower extremity venous doppler US evaluation was performed by different radiologists.

CONCLUSION

In conclusion, it can be said that the quarantine and "Stay at home!" practices applied to prevent the pandemic might cause negative consequences such as DVT, especially in the geriatric population, and it can be said that programs that emphasize the importance of exercise in the scope of public health practices should be increased to prevent this situation.

Ethics Committee Approval: The Adıyaman University's Ethics Committee gave approval to the study's procedures (2021/01-23).

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