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STUDY OF THE DYNAMICS OF SPREAD OF DEEP VEIN THROMBOSIS OF THE LOWER EXTREMITIES BY ULTRASOUND DIAGNOSTICS METHODS

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Abstract

Actuality. Early detection and monitoring of such a serious pathology as deep vein thrombosis of the lower extremities (DVT) is critically important for reducing morbidity and improving the quality of life of patients.

Purpose of the study was to investigate the prevalence of DVT using ultrasound diagnostics in primary care settings.

Materials and methods. The study included the protocols of 4044 patients examined between 2018 and 2024. All patients underwent compression duplex ultrasound (CDUS) to diagnose venous thrombosis and assess blood flow. The protocols were divided into three groups: before the pandemic (2018-2019), during the pandemic (2020-2021), and after the pandemic (2023-2024).

Results. The results showed that during the pandemic, the detection rate of DVT significantly increased from 3.9% (before the pandemic) to 15.1% (during the pandemic), while after the pandemic, this figure again decreased to 3.8%. It has been established that the frequency of DVT depends on age, gender, and symptoms.

Conclusions. The COVID-19 pandemic had a significant impact on the prevalence of lower extremity deep vein thrombosis, confirming the need for regular monitoring of the state of the vessels in patients at risk of thrombosis (especially in patients with postoperative and traumatic, cardiovascular and oncological diseases). Duplex scanning remains the primary method for early detection of deep vein thrombosis in the lower extremities and improvement of clinical outcomes.

Keywords: Deep vein thrombosis, COVID-19, risk factors, ultrasound diagnosis, duplex scanning.

Introduction

Deep vein thrombosis (DVT) is a serious medical issue that can lead to complications such as pulmonary embolism (PE) and post-thrombotic syndrome (PTS). It is a common condition observed among millions of patients in various risk groups. In the general population, DVT prevalence is around 0.1–0.2%, but among hospitalized patients, this figure increases by up to 100

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times [2]. Early detection and monitoring of this disease are critically important for reducing morbidity and improving patients' quality of life. According to Karpovich and Varzin, clinical diagnosis is unreliable, as more than 50% of symptomatic patients do not have DVT, and approximately two-thirds of all DVT cases remain undiagnosed and untreated [5].

Compression ultrasound diagnostics, including compression duplex ultrasound (CDUS), is the main diagnostic standard for identifying DVT. It allows assessment of venous obstruction and the state of blood flow. According to recent European Society for Vascular Surgery recommendations, the use of CDUS as the diagnostic method of choice for DVT has been confirmed in many clinical studies [4].

Regarding the dynamics of distribution, recent studies have shown that the incidence of DVT varies depending on several factors, including age, sex, and comorbidities. According to a meta-analysis, the risk of developing DVT increases by 52% in patients over the age of 55 and by 30% in obese patients [10]. Approximately 90% of pulmonary embolism (PE) cases result from DVT [5], and 40–50% of patients with a history of DVT may develop post-thrombotic syndrome (PTS) [8]. These findings highlight the necessity of regular monitoring of deep vein status in patients belonging to high-risk groups.

Objective

To study the dynamics of the spread of lower extremity deep vein thrombosis using innovative ultrasound diagnostic methods in primary healthcare settings.

Materials and Methods

The study included 4044 patients referred for examination due to suspected DVT from 2018 to 2024. Patients who underwent duplex scanning of the lower extremities were analyzed in three phases: Pre-pandemic (2018–2019, Group 1, n=1492 (36.9%)), pandemic (2020–2021, Group 2, n=1710 (42.3%)), and post-pandemic (2023–2024, Group 3, n=842 (20.8%)). The main inclusion criterion was the availability of CDUS protocols and results for the deep veins of the legs.

All patients were examined by the same physician using the same ultrasound machine, with linear (7–10 MHz) and convex (3–5 MHz) probes (Logiq E9, GE Medical Systems, USA).

DVT diagnosis was based on compression of the veins and absence of venous collapse, echogenic structures in the lumen, absence of color flow, loss of phasic venous flow, and reduced augmentation during distal compression.

Statistical analysis was performed using SPSS with nonparametric methods. Significance was set at $p<0.05$. The age classification recommended by the WHO (2015) was used in the analysis of the results.

Results

In Group 1 (pre-pandemic), 58 of 1492 patients (3.9%) were diagnosed with DVT. Of these, 57 (98.2%) were symptomatic, and 1 (1.8%) was asymptomatic. In Group 2 (pandemic), 259 of 1710 patients (15.1%) had DVT. Among them, 253 (97.7%) were symptomatic, while 6 (2.3%) were diagnosed during preoperative screening. In Group 3 (post-pandemic), 32 of 842 patients (3.8%) were diagnosed with DVT, all of whom were symptomatic.

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The analysis of age and sex in patients diagnosed with DVT showed no statistically significant differences between the groups (Table 1).

Table 1. Analysis of DVT cases in the groups by age and sex.

	Group 1	Group 2	Group 3
Womens n (%)	31 (53,4)	136 (52,5)	19 (59,4)
Mens n (%)	27 (46,6)	123 (42,5)	13 (40,6)
18-44 years n (%)	16 (27,6)	81 (31,3)	8 (25,0)
45-59 years n (%)	28 (48,3)	93 (35,9)	9 (28,1)
60-74 years n (%)	14 (24,1)	85 (32,8)	11 (34,4)
75-89 years n (%)	-	-	4 (12,5)
>90 years n (%)	-	-	-

Statistical analysis showed no significant differences between age and sex groups across the three periods. Only Group 3 included patients over 75, of whom 4 were diagnosed with DVT, likely due to the lifting of movement restrictions after the pandemic.

Compared to the pre-pandemic period, the number of DVT cases detected by CDUS increased fourfold during the pandemic (χ^2=113.23, p<0.001). After the pandemic, the detection rate returned to baseline levels (3.8%, χ^2=71.9, p=0.00001) (Figure 1).

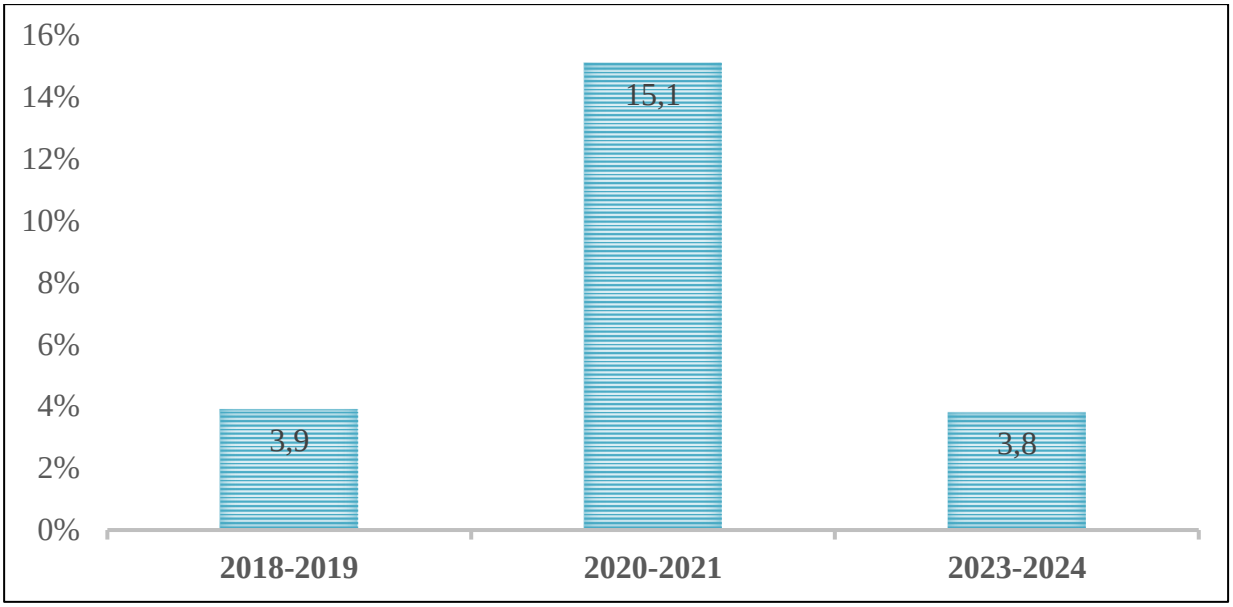

Figure 1. Diagnosis of DVT in different periods.

Discussion

The CDUS method stands out as the current gold standard diagnostic tool for early detection of DVT due to its high sensitivity (96%), specificity (98%), popularity, cost-effectiveness, and lack of adverse effects [7].

As a risk factor for DVT, the COVID-19 virus (SARS-CoV-2), which falls under the category of infectious and acute respiratory diseases, causes damage to the vascular endothelium, inflammation, and increased blood coagulation. This was highlighted in a study conducted by Levi and colleagues, which showed an increase in the number of coagulopathies during the COVID-19

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pandemic [6]. Even after recovering from COVID-19, the risk of developing DVT remains for up to 3 months. [3].

In our study, we used data not only from hospitals but also from outpatient medical institutions, which helps to increase the accuracy of research in this field [9]. Additionally, we compared the frequency of DVT cases before, during, and after the pandemic through a retrospective analysis of ultrasound examination data.

During the study, we found that the number of DVT diagnoses using duplex ultrasonography significantly increased during the pandemic, regardless of age, sex, and clinical signs, compared to previous years. However, in the post-pandemic period, the numbers returned to the initial levels.

Conclusions

The COVID-19 pandemic has significantly affected the prevalence of deep vein thrombosis, which confirms the need for regular monitoring of vein status in patients at high risk of thrombosis (especially those with a history of surgery and trauma, as well as cardiovascular and oncological diseases).

Duplex ultrasound remains the primary method in outpatient clinic settings for early detection of DVT in the lower extremities and for improving clinical outcomes.

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