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PHYSICAL ACTIVITY IN PATIENTS WITH CHRONIC VENOUS INSUFFICIENCY: ITS RELATION WITH DISEASE SEVERITY, PAIN, FATIQUE, AND FUNCTIONALITY

ORIGINAL ARTICLE

ABSTRACT

Purpose: Chronic venous insufficiency (CVI) is a progressive disease of the venous system caused by a variety of factors that impair the return of venous blood to the heart. The aim of the study was to evaluate the physical activity level in patients with CVI and its relation with disease severity, pain, fatigue, functionality.

Methods: In all, 105 CVI patients (28.6% male, 71.4% female, mean age was 44.91±10.74 years) were enrolled in this study. Physical activity was evaluated with the International Physical Activity Questionnaire-Short Form (IPAQ-SF); disease severity, by Venous Clinical Severity Score (VCSS); the intensity of pain was determined by the Visual Analog Scale (VAS); fatigue level with the Fatigue Severity Scale (FSS); functionality was assessed with the Lower Extremity Function Scale (LEFS).

Results: There was a significant negative correlation between IPAQ-SF-vigorous and VCSS, VASrest, VASactivity, VASnight (r: -0.818, p<0.001; r:0.-445, p:0.007; r:-0.392, p:0.020; r:-0.363, p:0.032, respectively). A negative correlation was found between IPAQ-SF-moderate and VCSS, VASactivity (r:-0.473, p:0.004; r:-0.553, p:0.001, respectively). In addition, there was a negative correlation between IPAQ-SF total score and VCSS, VASrest, VASactivity, and a positive correlation with LEFS (r:-0.945, p<0.001; r:-0.368, p:0.030; r: -0.568, p<0.001; r:0.438, p: 0.009, respectively).

Conclusion: An increased level of physical activity was found to be associated with disease severity, pain, and functionality in patients with CVI.

Keywords: disease severity; fatigue; pain; physical activity; venous insufficiency

KRONİK VENÖZ YETMEZLİĞİ OLAN HASTALARDA FİZİKSEL AKTİVİTE: HASTALIK ŞİDDETİ, AĞRI, YORGUNLUK VE FONKSİYONELLİK İLE İLİŞKİSİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Kronik venöz yetmezlik (KVY), venöz kanın kalbe dönüşünü bozan çeşitli faktörlerin neden olduğu, venöz sistemin ilerleyici bir hastalığıdır. Çalışmanın amacı, KVY hastalarında fiziksel aktivite düzeyinin hastalık şiddeti, ağrı, yorgunluk ve fonksiyonellik ile ilişkisinin değerlendirilmesidir.

Yöntem: Çalışmaya KVY' li toplam 105 hasta (%28,6'ı erkek, %71,4' ü kadın, ortalama yaşları 44,91±10,74 yıl) alındı. Katılımcıların fiziksel aktivite düzeyi, Uluslararası Fiziksel Aktivite Anketi-Kısa Formu (IPAQ-SF) ile; hastalık şiddeti, Venöz Klinik Şiddet Skoru (VKŞS) ile; istirahat, aktivite ve gece ağrılarının şiddeti Görsel Analog Skala (GAS) ile; yorgunluk düzeyi, Yorgunluk Şiddeti Ölçeği (FSS) ile; fonksiyonellik, Alt Ekstremite Fonksiyon Ölçeği (AEFÖ) ile değerlendirildi.

Sonuçlar: IPAQ-SF-şiddetli ile VKŞS, GAS-dinlenme, GAS-aktivite, GAS-gece arasında negatif korelasyon bulundu (r:-0,818, p<0,001; r:-0,445, p:0,007; r:-0,392, p:0,020; r:-0,363, p:0,032, sırasıyla). IPAQ-SF-orta ile VKŞS ve GAS-aktivite arasında negatif korelasyon mevcuttu (r:-0,473, p:0,004; r:-0,553, p:0,001, sırasıyla). Ayrıca IPAQ-SF toplam puanı ile VKŞS, GAS-dinlenme, GAS-aktivite arasında negatif, AEFÖ ile pozitif korelasyon vardı (r:-0,945, p<0,001; r:-0,368, p:0,030; r: -0,568, p<0,001; r:0,438, p:0,009, sırasıyla).

Tartışma: KVY'li hastalarda artmış fiziksel aktivite düzeyi ile hastalık şiddeti, ağrı ve fonksiyonellik arasında ilişki olduğu görüldü.

Anahtar Kelimeler: hastalık şiddeti, yorgunluk, ağrı, fiziksel aktivite, venöz yetmezlik

INTRODUCTION

Chronic venous insufficiency (CVI) is a progressive condition of the venous system, resulting from various factors that impair the return of venous blood to the heart (1). Dysfunction of the venous system leads to blood accumulation in the extremities, causing venous hypertension, pain, edema, heaviness, itching, cramps, and varicose veins in the lower limbs. In advanced stages, venous ulcers may develop (2). As the severity and duration of the disease progress, the impaired venous return may no longer be compensated, leading to a reduction in cardiac output (3). In the presence of venous hypertension in the lower extremities, elevated intravascular pressure exerts force on the venous walls, resulting in vascular dilation and tortuosity, which ultimately leads to the formation of varicose veins. The inability of the smooth muscle in the venous walls to contract effectively prevents the veins from narrowing sufficiently to direct blood back to the heart, and the function of the venous valves is also compromised. Dysfunction of these valves can further exacerbate the condition (4). This creates a vicious cycle that worsens the symptoms. Both the lower extremity symptoms and reduced cardiac output are often associated with decreased physical activity (PA), reduced functional capacity, increased fatigue and exercise intolerance. In CVI patients, pain and increased edema are the most common complaints, especially with prolonged standing or sitting with the feet dangling. These symptoms may limit functionality and participation in daily activities (5). Additionally, pain can make prolonged walking, heavy lifting, stair climbing, and other activities difficult, with many patients reporting an inability or difficulty in performing activities such as jogging, jumping, and running (6). Consequently, a decrease in daily PA levels may be an inevitable outcome.

The primary factor negatively affecting PA in CVI patients is the pain associated with swollen legs, which can lead to a fear of movement (7). Literature also reports decreased ankle joint range of motion, reduced calf muscle strength and pumping function, and slowed walking in these patients, all of which further impair overall mobility and PA levels (8, 9). Previous studies have documented low PA levels and the associated factors in patients with venous ulcers (6, 10, 11). Patients with venous ulcers often struggle to maintain an active lifestyle due to concerns about the wound being irritated or leaking, the need to wear specialized footwear, or the inability to wear shoes at all (12). Evaluating the PA levels and related factors in patients without venous ulcers is crucial for implementing preventive measures and encouraging patient engagement in PA before the development of wounds.

The aim of this study is to evaluate PA in patients with CVI and examine the associations between PA and disease severity, pain, fatigue, and functionality.

METHODS

Participants

It was a cross-sectional study. Patients with CVI who met the inclusion criteria were referred the Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, from the Department of Cardiovascular Surgery at University Hospital between January and June 2022. The University Ethics Committee granted ethical permission for this investigation under decision number (08.9.2021/ No:142). The principles of the Declaration of Helsinki were adhered to in the conduct of this investigation. Two informed consent forms were sent to each participant in the study, with one copy being retained by the individual, and their signed consent was acquired.

The study's inclusion requirements included having a duplex ultrasound diagnosis of CVI between the ages of 18 and 65, falling into CEAP (Clinical, Etiological, Anatomical, Pathophysiological) categorization system class C2-C3-C4-C5, and having written and spoken communication skills. Acute deep vein thrombosis, ulceration, classification as C1 or C6, chemotherapy for any cancer, a diagnosed mental illness requiring prescription medication, and treatment for a neurological, orthopaedic, or rheumatological condition affecting the lower limb were among the exclusion criteria.

Assessments of PA, pain severity, fatigue and functionality were carried out by a physiotherapist, while a cardiovascular surgeon performed assessments of clinical class and disease severity. All of

the assessments were completed on the same day, in separate rooms, and without any interaction between the assessors because they were blind to one another. A face-to-face interview method was used for data collection. The researchers provided advice if the patients had any questions. It took around 20 minutes to finish all assessment.

For this study, 105 patients, 75 of whom were female and ranging in age from 18 to 65 years, were included.

Sample Size

We used the Raosoft Sample Size Calculator application to determine the appropriate sample size for our investigation with an 80% confidence interval, 5% margin of error, 50000 general population and 20% (10%-30%) prevalence. The result of the calculation was that a total of 105 participants should be included (13).

Assessments

Using an assessment form, demographic and clinical features were noted. The participants' age, gender, height, weight, length of time since CVI onset, and clinical classification were all given on the assessment form.

The CEAP classification system was used to categorize the patients. This system defines clinical signs (C), etiology (E), anatomical features (A) and underlying pathophysiological event (P). Six degrees of clinical data are categorized based on how severe the event was: Normal is C0; spider/reticular veins are C1; varicose veins are C2; oedema is C3; skin alterations are C4; healed ulcers are C5, and active ulcers are C6 (14).

PA levels were assessed using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). The questionnaire consists of seven questions that ask about the total time of light, moderate, and vigorous activity during the past seven days. The equivalents of 3.3 metabolic equivalents (METs) for light activity, 4.0 METs for moderate activity and 8.0 METs for vigorous activity were taken, and activity levels were calculated by multiplying the METs of the activities by the durations reported by the individuals, and the PA level of the individuals was recorded in MET-min/week as a result of the calculation (15). The Turkish validity and reliability study of the questionnaire was conducted by Saglam et al. (16).

Disease severity was evaluated by the VCSS. VCSS assesses pain caused by venous insufficiency, varicose veins, oedema, skin pigmentation, inflammation, induration, number of active ulcers, duration and diameter of active ulcers, need of using compression stockings. Every item has a score ranging from 0 to 3. '3' denotes severe, and '0' denotes none. Poor clinical condition is indicated by a high score, and excellent clinical condition is indicated by a low score. On the VCSS, 0 is the lowest possible score and 30 is the highest (17).

The pain intensity were assessed using the Visual Analogue Scale (VAS). They were asked to rate their pain on a 10 cm scale from 0 to 10, with 0 indicating no pain and 10 indicating excruciating agony. They were asked about the pain they experienced at night, during activity, and at rest (18).

The level of fatigue was evaluated using the Fatigue Severity Scale (FSS). The questionnaire contains nine items, each with a score ranging from one to seven. A score of one indicates significant disagreement with the statement, while a score of seven shows strong agreement with it. The overall score is calculated by adding all the scores and dividing by nine. The higher the total score, the more intense the tiredness (19). The Turkish validity and reliability study of the questionnaire was conducted by Gencay-Can et al. (20).

The functionality was evaluated by the Lower Extremity Functional Scale (LEFS). The LEFS is a questionnaire with 20 items that evaluates difficulty carrying out daily tasks. Each activity is scored from 0 to 4. '0' indicates excessive difficulty or inability to perform the activity and '4' indicates no difficulty. The score obtained from the questionnaire ranges from 0 to 80. High scores indicate good functionality, low scores indicate poor functionality (21). The Turkish validity and reliability study of the questionnaire was conducted by Citaker et al. (22).

Statistical analysis

All analyses were carried out using SPSS (IBM Corp., Armonk, New York, USA Statistical Package for Social Sciences) for Windows 22. The data's

normality was evaluated using histograms and the Kolmogorov-Smirnov test. The mean and standard deviation were used to define the variables. Data that did not fit into a normal distribution were subjected to correlation analysis using the Spearman correlation test. The Kruskal-Wallis test was used to compare PA, disease severity, pain, fatigue and functionality between groups according to clinical classes. $p<0.05$ was considered statistically significant (23).

RESULTS

113 consecutive patients were screened for possible eligibility criteria. Three participants were withdrawn from the study for some personal reasons, and five of these were unable to complete the assessments correctly. 105 patients who satisfied the requirements for participation decided to take part. Their mean age was 44.91±10.74 years and BMI was 33.28±7.51 kg/m2. The demographic and clinical features of the patients are shown in Table 1.

Correlation between PA and disease severity, pain, fatigue, functionality were shown in Table 2. A neg-

Table 1. Demographic and Clinical Features of Patients with CVI

Variables	Patients (n=105) Mean ± SD
Age (years)	44.91±10.74
BMI (kg/m^2)	33.28±7.51
Time since CVI onset (years)	12.34±7.74
VCSS (0-30)	13.66±5.13
VAS-rest (0-10)	4.79±3.01
VAS-activity (0-10)	5.23±2.78
VAS-night (0-10)	3.71±2.84
FSS	4.60±1.48
LEFS	44.49±17.75
IPAQ-SF-vigorous	286.86±352.13
IPAQ-SF-moderate	248.00±238.18
IPAQ-SF-light	524.23±222.49
IPAQ-SF-total	1059.09±411.20
Gender	n (%)
Female	75 (71.4)
Male	30 (28.6)
CEAP classification (Clinical)	n (%)
C2	12 (11.4)
C3	45 (42.9)
C4	30 (28.6)
C5	18 (17.1)

SD: Standard Deviation, BMI: Body Mass Index, VCSS: Venous Clinical Severity Score, VAS: Visual Analog Scale, FSS: Fatigue Severity Scale, LEFS: Lower Extremity Functional Scale, IPAQ-SF: International Physical Activity Questionnaire-Short Form.

Table 2. The Relationship Between Physical Activity and Disease Severity, Clinical Class, Pain, Fatigue, Functionalitiy Assessments in Patients with CVI

Variables		IPAQ-SF-vigorous	IPAQ-SF-moderate	IPAQ-SF-light	IPAQ-SF-total	VCSS	CEAP	VAS-rest	VAS-activity	VAS-night	FSS	LEFS
IPAQ-SF-vigorous	rh_o	1.000	0.236	-0.494	0.777	-0.818	-0.627	-0.445	-0.392	-0.363	-0.259	0.296
	p	.	0.173	0.003*	0.000*	0.000*	0.000*	0.007*	0.020*	0.032*	0.134	0.084
IPAQ-SF-moderate	rh_o	0.236	1.000	-0.218	0.580	-0.473	-0.294	-0.206	-0.553	-0.094	0.029	0.264
	p	0.173	.	0.208	0.000*	0.004*	0.086	0.236	0.001*	0.592	0.867	0.126
IPAQ-SF-light	rh_o	-0.494	-0.218	1.000	-0.104	0.203	0.161	0.279	0.134	0.058	0.056	0.034
	p	0.003*	0.208	.	0.554	0.241	0.357	0.105	0.444	0.739	0.750	0.846
IPAQ-SF-total	rh_o	0.777	0.580	-0.104	1.000	-0.945	-0.726	-0.368	-0.568	-0.326	-0.268	0.438
	p	0.000*	0.000*	0.554	.	0.000*	0.000*	0.030*	0.000*	0.056	0.119	0.009*
VCSS	rh_o	-0.818	-.0473	0.203	-0.945	1.000	0.742	0.424	0.492	0.381	0.355	-0.487
	p	0.000*	0.004*	0.241	0.000*	.	0.000*	0.011*	0.003*	0.024*	0.036*	0.003*
CEAP	rh_o	-0.627	-0.294	0.161	-0.726	0.0742	1.000	0.286	0.395	0.385	0.280	-0.311
	p	0.000	0.086	0.357	0.000	0.000	.	0.096	0.019	0.023	0.103	0.069
VAS-rest	rh_o	-0.445	-0.206	0.279	-0.368	0.424	0.286	1.000	0.654	0.369	-0.268	-0.332
	p	0.007*	0.236	0.105	0.030*	0.011*	0.096	.	0.000*	0.029*	0.119	0.052
VAS-activity	rh_o	-0.392	-0.553	0.134	-0.568	0.492	0.395	0.654	1.000	0.276	.246	-0.383
	p	0.020*	0.001	0.444	0.000	0.003*	0.019*	0.000*	.	0.108	.154	0.023
VAS-night	rh_o	-0.363	-0.094	0.058	-0.326	0.381	0.385	0.369	0.276	1.000	0.389	-0.386
	p	0.032*	0.592	0.739	0.056	0.024*	0.023*	0.029*	0.108	.	0.021*	0.022*
FSS	rh_o	-0.259	0.029	-0.056	-0.268	0.355	0.280	0.278	0.246	0.389	1.000	-0.851
	p	0.134	0.867	0.750	0.119	0.036*	0.103	0.105	0.154	0.021*	.	0.000*
LEFS	rh_o	0.296	0.264	0.034	0.438	-.487	-0.311	-0.332	-0.383	-0.386	-0.851	1.000
	p	0.084	0.126	0.846	0.009*	0.003*	0.069	0.052	0.023*	0.022*	0.000*	.

rh_o: Spearman correlation test; (Negative values show reverse relation) IPAQ-SF: International Physical Activity Questionnaire-Short Form, VCSS: Venous Clinical Severity Score, CEAP: Clinical, Etiological, Anatomical, Pathophysiological Classification System, VAS: Visual Analog Scale, FSS: Fatigue Severity Scale, LEFS: Lower Extremity Functional Scale.

Table 3. Comparison of Physical Activity, Disease Severity, Pain, Fatigue, Functionality According to CEAP (clinical)

Variables	IPAQ-SF-vigorous	IPAQ-SF-moderate	IPAQ-SF-light	IPAQ-SF-total	VCSS	VAS-rest	VAS-activity	VAS-night	FSS	LEFS
C2	960.00±257.54	240.00±265.87	371.25±85.73	1571.25±111.99	7.50±1.16	4.25±1.35	5.75±0.86	2.00±1.65	3.63±1.74	46.75±22.67
C3	298.67±261.27	328.00±200.47	561.00±262.77	1187.67±309.98	11.87±2.76	3.00±3.13	3.93±2.29	3.13±2.73	4.56±1.26	46.87±12.10
C4	172.00±234.45	268.00±260.53	534.60±175.56	974.60±343.41	12.75±3.13	4.40±2.62	5.30±3.15	3.90±2.42	4.32±1.52	49.90±21.52
C5	0.00±0.00	20.00±46.01	517.00±201.52	537.00±162.55	22.33±1.94	6.17±2.87	8.00±1.68	6.00±2.97	5.81±0.87	28.00±5.66
p	0.000*	0.000*	0.018*	0.000*	0.000*	0.002*	0.000*	0.001*	0.000*	0.000*

p: Kruskal Wallis Test, SD: Standard Deviation, IPAQ-SF: International Physical Activity Questionnaire-Short Form, VCSS: Venous Clinical Severity Score, CEAP: Clinical, Etiological, Anatomical, Pathophysiological Classification System, VAS: Visual Analog Scale, FSS: Fatigue Severity Scale, LEFS: Lower Extremity Functional Scale.

ative correlation was found between IPAQ-SF-vigorous and VCSS, VASrest, VASactivity, VASnight (r:-0.818 p<0.001; r:-0.445 p<0.007, r:-0.392 p<0.020, r:-0.363 p<0.032, respectively). A negative correlation was found between IPAQ-SF-moderate and VCSS, VASactivity (r:-0.473 p:0.004; r:-0.553 p<0.001, respectively). There was a negative correlation between IPAQ-SF total value and VCSS, VASrest, VASactivity and a positive correlation with LEFS (r:-0.945 p<0.001, r:-0.368 p:0.030, r:-0.568 p<0.001, r:0.438 p:0.009, respectively).

Comparison of PA, disease severity, pain, fatigue, functionality according to CEAP (clinical) were shown in Table 3. Patients were in C2 had the highest level of IPAQ-SFvigorous and IPAQ-SFtotal, while patients were in C3 had highest level of IPAQ-SFmoderate and IPAQ-SFlight (p<0.05).

DISCUSSION

This study demonstrated that as the time and energy dedicated to PA increased, both disease severity and pain (at rest and during activity) decreased, while functionality improved. As the vigorous PA increased, disease severity and pain (at rest, during activity, and at night) were reduced. Increasing moderate PA also led to a reduction in both disease severity and the intensity of pain experienced during activity. However, light PA had no significant effect on disease severity, pain, fatigue, or functionality.

Heinen et al., found that moderate-intensity PA was low compared with healthy controls using an accelerometer, and 35% of patients who have venous ulcers did not walk for 10 minutes even once a week (11). Kiloatar et al., assessed that patients with early-stage CVI (C2-C3 class) exhibited low levels of quality of life (QoL) and PA, along with moderate pain intensity. They concluded that low levels of PA in the early stages of the disease could contribute to disease progression (24). Keser et al., investigated differences in pain, fatigue, and QoL in patients with CVI based on PA level and demonstrated that the moderate-intensity PA group (n:32) had lower pain intensity, lower fatigue severity and higher points in QoL scores than the light-intensity PA group (n:17) and the vigorous-intensity PA group (n:20). Their results showed that a moderate-intensity PA could significantly decrease pain during activity and fatigue in patients with CVI (7). Erdal et al., showed that the IPAQ total score was significantly lower in patients with CVI than in healthy controls. Low PA scores were associated with higher pain intensity during activity and lower functional capacity (25). Espeit et al., investigated the relationship between PA and both fatigue and QoL in people with self-reported symptoms of chronic venous disease (CVD). Their results demonstrated that a higher levels of PA is associated with less fatigue and a tendency toward improved QoL in this population (26). However, Alberti et al., divided patients with CVD into two groups: those who participated in regular PA for more than two years and those who were sedentary. According to this study, there was no relationship between the practice of PA and the occurrence of CVI of the lower limbs, but PA prevented the development of this disease to more severe stages (27). Patients in C2 had the highest level of vigorous PA and total PA, while patients in C3 had the highest level of moderate and light PA in our study. As levels of vigorous and total PA increased, clinical class, disease severity and pain intensity decreased. Increasing the total time and energy spent on PA improved their

functionality. These improvements may be due to increased venous return, decreased calf muscle dysfunction, increased foot-ankle mobility and improved cardiovascular fitness as time and intensity of PA increase. The results of our study emphasise that as participation and intensity of PA increase, symptoms of the disease improve. One of the results of our study, which is different from the studies in the literature, is that activities at the level of light PA are not effective on disease severity, pain, fatigue and functionality. The importance of the activity level and the activity performed should be explained to patients, and physiotherapists should take these results into account when determining the appropriate and effective activity intensity for their patients.

In addition, Tauragingskii et al., examine the immediate effect of PA on venous reflux and according to their results venous reflux decreases within 1 minute after the end of PA. These objective conclusions suggest that PA is essential and crucial in patients with CVI (28).

The strong correlation between PA levels and disease severity in our study may play a key role in the rehabilitation of patients. Aydin et al., reported that there was a negative correlation between disease severity and both venous return and functional capacity in patients with CVI (29). Decreased functional capacity, which is associated with increasing disease severity, may limit participation in activities and may lead to rapid fatigue. Yeldan et al., investigated disease severity and its relationship with clinical outcomes such as pain, oedema and functional capacity in patients with CVI. According to their results, high disease severity is associated with high pain (assessed by VAS) and oedema and low functionality (assessed by LEFS) in patients with CVI without leg ulcers. However, there was no relationship between disease severity and functional capacity. They added that the fact that disease severity increased the severity of pain and oedema, but did not affect functional capacity, may be due to the young age of most patients (30). In our study, vigorous and moderate PA had a positive effect on disease severity, whereas light PA had no effect. In parallel with the literature, our study showed that VCSS increased in a strong linear relationship with higher CEAP clinical class. In addition, in our study, as disease severity increased, patients' pain intensity and fatigue increased and their functionality decreased. In this population, it is possible to improve disease severity and related symptoms by physiotherapists encouraging patients to participate in PA and increasing the intensity of activity with patient-specific planning. Increased pain intensity and, in parallel, decreased patient function and functionality are the main symptoms of CVI that patients have to cope with. In our study, increasing levels of vigorous PA reduced the intensity of pain at rest, during activity and at night. This may be because the pumping effect of the calf muscle increases and lasts longer as activity increases. It was also observed that activity and nocturnal pain levels increased as the clinical class of our patients increased. In addition, as the pain felt at night increased, so did the severity of fatigue increased and functionality decreased. This may be explained by the fact that pain experienced during sleep may disrupt sleep quality and that starting the day without rest may increase fatigue levels during the daytime. As a result, both activity participation and functionality may be negatively affected.

Fatigue is a common symptom of many chronic diseases and is often assessed using self-report scales. Espeit et al., showed an relationship between PA and fatigue levels in both participants with symptoms of CVD and participants at risk of chronic venous disease. In these groups, those who were insufficiently active had higher fatigue scores than those who were moderately active or active (26). Keser et al., in a small sample of CVI patients, reported a positive correlation between moderate-intensity PA level and fatigue severity and QoL, so it seemed from their results that the level of PA could have a positive impact on QoL by limiting fatigue (7). In our study, although there was no relationship between the PA levels of and the fatigue severity of the patients, as the fatigue severity decreased, disease severity, night-time pain decreased and functionality increased. Therefore, the relationship between FA and fatigue should be analysed in future studies with a larger sample size.

Limitations of this study include the fact that kinesiophobia, which may affect participation of patients in PA, was not assessed, and objective

assessment methods such as accelerometry could not be used to assess PA because of the current clinical conditions. Future studies could include objective measures of PA and the effects of different levels of PA on symptoms of patients.

In conclusion, more time and energy spent on total PA is associated with lower disease severity, pain intensity and increased functionality in patients with CVI. Therefore, PA is a crucial factor in preventing its adverse effects on disease severity, pain, and functionality in patients with CVI.

Competing interest statement: None. With regard to the work, no conflict of interest exists.

Ethical approval was received from Social and Non-Interventional Health Sciences Research Ethics Committee of Istanbul Okan University (IRB study protocol: 08.09.2021-142).

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REFERENCES

1. Youn YJ, Lee J. Chronic venous insufficiency and varicose veins of the lower extremities. Korean J Intern Med. 2019;34(2):269-283.
2. Kılınç F, Akbaş A, Şener S, Hayran Y, Aktaş A. Cutaneous findings in patients with chronic venous insufficiency. J Cosmet Dermatol. 2022;21(5):2106-2112.
3. Rothe CF. Physiology of venous return. An unappreciated boost to the heart. Arch Intern Med. 1986;146(5):977-982.
4. Raffetto JD. Pathophysiology of Chronic Venous Disease and Venous Ulcers. Surg Clin North Am. 2018;98(2):337-347.
5. Roaldsen KS, Biguet G, Elfving B. Physical activity in patients with venous leg ulcer--between engagement and avoidance. A patient perspective. Clin Rehabil. 2011;25(3):275-286. doi:10.1177/0269215510371424
6. Roaldsen KS, Elfving B, Stanghelle JK, Talme T, Mattsson E. Fear-avoidance beliefs and pain as predictors for low physical activity in patients with leg ulcer. Physiother Res Int. 2009;14(3):167-180.
7. Keser İ, Özdemir K, Erer D, Onurlu İ, Bezgin S. Differences in pain, fatigue, and QoL in patients with chronic venous insufficiency based on physical activity level. Turk J Thorac Cardiovasc Surg. 2020;28(1):76-83.
8. Aydin G, Yeldan I, Akgul A, Ipek G. Effects of inspiratory muscle training versus calf muscle training on QoL, pain, venous function and activity in patients with chronic venous insufficiency. J Vasc Surg Venous Lymphat Disord. 2022;10(5):1137-1146.
9. Nepomuceno de Souza I, Fernandes de Oliveira LF, Geraldo Izalino de Almeida IL, et al. Impairments in ankle range of motion, dorsi and plantar flexors muscle strength and gait speed in patients with chronic venous disorders: A systematic review and meta-analysis. Phlebology. 2022;37(7):496-506.
10. Qiu Y, Team V, Osadnik CR, Weller CD. Barriers and enablers to physical activity in people with venous leg ulcers: A systematic review of qualitative studies. Int J Nurs Stud. 2022;135:104329.
11. Heinen MM, van der Vleuten C, de Rooij MJM, Uden CJT, Rvers AWM, van Achterberg T. Physical activity and adherence to compression therapy in patients with venous leg ulcer. Arch Dermatol. 2007; 143: 1283–88.
12. Persoon A, Heinen MM, van der Vleuten CJ, de Rooij MJ, van de Kerkhof PC, van Achterberg T. Leg ulcers: a review of their impact on daily life. J Clin Nurs. 2004; 13: 341–54.
13. Eberhardt RT, Raffetto JD. Chronic venous insufficiency. Circulation. 2014;130(4):333-346.
14. Lurie F, Passman M, Meisner M, et al. The 2020 update of the CEAP classification system and reporting standards. J Vasc Surg Venous Lymphat Disord. 2020; 8(3): 342–352.
15. Lee PH, Macfarlane DJ, Lam TH, Stewart SM. Validity of the International Physical Activity Questionnaire Short Form (IPAQ-SF): a systematic review. Int J Behav Nutr Phys Act. 2011;8:115.
16. Saglam M, Arikan H, Savci S, et al. International physical activity questionnaire: reliability and validity of the Turkish version. Percept Mot Skills. 2010;111(1):278-284. doi:10.2466/06.08. PMS.111.4.278-284.
17. Vasquez MA, Rabe E, McLafferty RB, et al. Revision of the venous clinical severity score: venous outcomes consensus statement: special communication of the American Venous Forum Ad Hoc Outcomes Working Group. J Vasc Surg. 2010; 52(5): 1387–1396.
18. Katz J, Melzack R. Measurement of pain. Surg Clin North Am. 1999;79: 231-52.
19. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. Arch Neurol. 1989;46(10):1121-1123.
20. Gencay-Can A, Can SS. Validation of the Turkish version of the fatigue severity scale in patients with fibromyalgia. Rheumatol Int. 2012;32(1):27-31. doi:10.1007/s00296-010-1558-3.
21. Binkley JM, Stratford PW, Lott SA, Riddle DL. The lower extremity functional scale (LEFS): scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. Phys Ther. 1999;79:371-83.
22. Çıtaker S, Kafa N, Kanik Z, Uğurlu M, Kafa B, Tuna Z. Translation, cross-cultural adaptation and validation of the Turkish version of the Lower Extremity Functional Scale on patients with knee injuries. Arch Orthop Trauma Surg. 2016;136:389-95.
23. Cohen J. Statistical power analysis for the behavioral Sciences. Psychology Press; 1988.
24. Kiloatar H, Aras O, Korkmaz M, Vural AH. An evaluation of QoL, physical activity level and symptoms in patients with early stages of chronic venous disease. J Vasc Nurs. 2021;39(4):108-113.
25. Erdal ES, Demirgüç A, Kabalcı M, Demirtaş H. Evaluation of physical activity level and exercise capacity in patients with varicose veins and chronic venous insufficiency. Phlebology. 2021;36(8):636-643.
26. Espeit L, Rimaud D, Le Mat F, et al. Fatigue, physical activity, and QoL in people self-reporting symptoms of chronic venous disease. J Vasc Surg Venous Lymphat Disord. 2022;10(5):1147-1154.e1.
27. Alberti LR, Petroianu A, Corrêa D, Franco Silva T. The influence of physical activity on chronic venous insufficiency of the lower limbs. Acta Med Port. 2008;21(3):215-220.
28. Tauraginskii RA, Simakov S, Borsuk D, Mazayshvili K, Lurie F. The immediate effect of physical activity on ultrasound-derived venous reflux parameters. J Vasc Surg Venous Lymphat Disord. 2020;8(4):640-645.
29. Aydin G, Yeldan I, Akgul A. The relationship between inspiratory muscle strength, venous refilling time, disease severity, and functional capacity in patients with chronic venous insufficiency. Phlebology. 2023;2683555231194419.
30. Yeldan I, Karakelle GS, Aydın GT, Mustafaoglu R, Ozalhas T, Alpagut U. The relationship between clinical severity and outcome measures in patients with chronic venous insufficiency with or without leg ulcer. J Tissue Viability. 2021;30(3):310-316.