

CORRELATION OF CHRONIC VENOUS INSUFFICIENCY WITH THE QUALITY OF GAIT AMONG PEOPLE AGED 65-75 YEARS

Korelacja przewlekłej niewydolności żylniej z jakością chodu wśród osób w wieku 65–75 lat



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Summary

Introduction: Common venous leg ulcers (VLUs) are often associated with chronic pain and permanent reduction of activity, which means that it is useful to analyse gait disturbances to determine the effect of venous ulcers on the quality of this ability.

Aim of the study: The aim of the study was to evaluate gait disturbances in patients with VLU aged 65-75 years.

Material and methods: The study was conducted in a group of 45 patients with chronic venous insufficiency (CVI) aged 65-75 years. The inclusion criteria were the presence of VLU and clinical stage of chronic venous insufficiency CEAP-C6. The control group was recruited from among geriatric patients. The gait evaluation test was carried out using the Tinetti scale. The analysis of locomotion is in the second part of this questionnaire, in which particular aspects of gait are assessed.

Results: The results showed that the biggest problem of patients with venous ulcers is a broad walk, no symmetry of steps, and abnormal trunk work. The average results from the gait test in the case of the study group were significantly lower than in the control group.

Conclusions: 1. VLU results in deterioration of gait quality, in particular its aspects such as: trunk motion, step symmetry, position during gait. 2. Due to the decreased quality of gait in the case of people with VLU, the risk of falling increases. 3. Most people with VLU adopt an abnormal position while walking, moving with widely spaced heels.

Key words: geriatrics, venous leg ulcers, Tinetti test, chronic venous insufficiency.

Streszczenie

Wstęp: Powszechnie występujące owrzodzenia żyłne łożyska (VLU) niejednokrotnie wiążą się z chronicznymi, uporczywymi dolegliwościami bólowymi oraz stałym obniżeniem aktywności. W takim przypadku przydatne jest dokonanie analizy zaburzeń chodu w celu określenia wpływu owrzodzeń na jego jakość.

Cel pracy: Celem badań była ocena zaburzeń chodu u chorych w wieku 65–75 lat z VLU.

Materiał i metody: Badanie prowadzono w grupie 45 chorych z przewlekłą niewydolnością żylną (CVI) w wieku 65–75 lat. Kryteriami włączenia do badania były obecność owrzodzenia żylnego oraz stadium kliniczne przewlekłej niewydolności żylniej CEAP-C6. Grupę kontrolną równoletków rekrutowano spośród pacjentów oddziału geriatrycznego. Badanie oceniające chód przeprowadzono za pomocą skali Tinetti. Drugą część tego kwestionariusza obejmuje analizę lokomocji, w ramach której oceniane są poszczególne aspekty chodu.

Wyniki: Badanie wykazało, że największymi problemami pacjentów z owrzodzeniami żylnymi są: chód na szerokiej podstawie, brak symetrii kroków oraz nieprawidłowa praca tułowia. Średnie wyniki z testu chodu w grupie badanej były istotnie statystycznie niższe niż w grupie kontrolnej.

Wnioski: 1. Owrzodzenie żyłne podudzi skutkuje pogorszeniem jakości chodu, a w szczególności takich jego aspektów, jak ruch tułowia, symetria kroku i pozycja podczas chodu. 2. W związku z obniżeniem jakości chodu u osób z VLU wzrasta ryzyko niekontrolowanego upadku. 3. Większość osób z VLU przyjmuje nieprawidłową pozycję podczas chodu, poruszając się z szeroko rozstawionymi piętami.

Słowa kluczowe: geriatryka, owrzodzenia żyłne podudzi, test Tinetti, przewlekła niewydolność żylna.

Introduction

Chronic venous system disorders mainly affect developed countries, and their increase is noticeable with increasing age. The genetic basis of the disease is also suspected. The incidence of venous disorders increases in the case of people who have at least one parent diagnosed with chronic venous disorders. An important factor predisposing to the development of pathology within the venous system is lifestyle and the nature of their performed work [1]. For reaching the stage of late adulthood, the age of 65 years is assumed to be convention. This is the time in which the effects of involuntional changes taking place in the body are most often revealed. During this period, a high percentage of the population is diagnosed with chronic venous insufficiency, which in the case of most of the patients begins in the period between 50 and 80 years old [2]. Improper functioning of the venous system and ignoring symptoms of the disease can result in venous ulcers in the lower leg. The trophic changes that occur, in particular those located in the area of the ankle joint, are associated with chronic perception of persistent pain and often lead to abandonment and limitation of physical activity [3, 4]. Complications resulting from abnormal treatment of chronic venous insufficiency and loss of physical fitness contribute to the increase of involuntional processes in the body. Both pain and joint mobility, as well as low activity level, affect gait quality and efficiency [5, 6].

The clinical picture of chronic venous insufficiency includes a wide spectrum of symptoms, which depend largely on the severity of the disease [7]. The first disturbing symptoms of the disease are mainly the feeling of heaviness and swelling of the lower limbs, most felt in the evening hours. These types of symptoms are more clearly marked in the case of people with low levels of physical activity, which is related to the reduction of the so-called muscle pump [8, 9]. An effective solution to reduce the intensity of these symptoms are systematic walks and rest, during which it is recommended to lie down with legs arranged at a higher level. Over time, the disease develops, and other symptoms appear such as: telangiectasia, varicose veins, painful cramps, and swelling of the calves [10]. The occurrence of chronic hypertension in the venous system with coexisting active ulceration of the leg region is a picture of disease with a high degree of advancement. Downplaying disease symptoms, abnormal lifestyle can contribute to the formation of ulcers at a rapid pace, even after two years of disease. A venous ulcer takes a characteristic clinical picture; namely, it is located within the medial part of the shin, shallowly positioned and oval shaped [11]. In most cases, skin hemosiderosis is also visible in the form of brown discolorations caused by the accumulation of hemosiderin in the dermis layers. The extent of ulceration may concern either the whole

or both shins, or it can occur in the form of a single small change. The long-term course of the disease consequently leads to the reduction of active and passive ranges of motion in the joints of the lower limbs, and in particular the ankles [12, 13].

Aim of the study

Common venous leg ulcers (VLUs), which are often associated with chronic pain and permanent reduction of activity, mean it is useful to analyse gait disturbances to determine the effect of venous ulcers on the quality of this ability.

The aim of the conducted research was to obtain knowledge to assess gait in geriatric patients with diagnosed vascular diseases, and to assess which aspects of gait are most disturbed. The research problems concerned the determination of major gait disturbances among people diagnosed with leg ulcers. The aim of the study was to evaluate gait disturbances in patients aged 65-75 years with VLUs.

Material and methods

The study included 90 people (45 women and 45 men) aged 65-75 years. The average age of all subjects was 70.7 years. Patients qualified to the study group were treated at the Outpatient Chronic Wound Treatment Clinic at Antoni Jurasz University Hospital No. 1 in Bydgoszcz. The inclusion criteria was VLU and clinical stage of chronic venous insufficiency CEAP-C6. The study was conducted in a group of 45 patients with chronic venous insufficiency (CVI) aged 65-75 years. The control group was recruited from among geriatric patients. Patients included in the control group were examined in the Department of Geriatrics at Antoni Jurasz University Hospital No. 1 in Bydgoszcz. The study group consisted of patients diagnosed with chronic venous insufficiency complicated by leg ulcers. Patients diagnosed with comorbidities such as: neurological disorders, orthopaedic and rheumatic problems, and past lower limb amputations were excluded from the study. All patients examined declared the city as their place of residence. Prior to the research, the approval of the Bioethical Commission at the *Collegium Medicum* in Bydgoszcz was obtained. Before each examination, the patient was informed about its course and gave written consent to carry it out. The initial questionnaire study allowed for inclusion in the study and placement of the patient in the correct group.

The gait evaluation test was carried out using the Tinetti scale. The analysis of locomotion is in the second part of this questionnaire, in which particular aspects of gait are assessed [14]. During the examination,

the patient moved at a natural, free pace. The physiotherapist's evaluation covered the following activities: ability to initiate gait without a moment of hesitation, height and length of both lower limbs, step symmetry, continuity and walking path, determining whether the patient does not deviate more in one direction, assessment of torso movements, and position during gait. The maximum value that the examined person could receive in the test was 12 points. The lower the test result, the worse the quality of walking and therefore the greater the risk of falling [15, 16].

For descriptive analysis of the obtained results, tables were used in which the number and percentage were presented. In addition, the mean and standard deviation were calculated. The graphical interpretation of the received data was placed in the form of vertical bar charts and/or categorised frame – moustache charts. The relationship between the two variables was calculated using Spearman's correlation coefficient.

Results

The average results from the gait assessment test in the test and control groups are presented in Table 1, while a detailed analysis of individual aspects of locomotion is presented in Table 2. The average point value in both groups for the gait test was 9.87 points. The higher mean score was obtained in the control group, at 11.93 points, with the mean in the study group being 7.8 points. Minimal differential score was lower in the group with venous ulcer, at 2 points, and the maximum result was identical for both groups, at 12 points.

The highest percentage gait test rates were recorded in the following items: initiation of gait (10) – index 100%, gait continuity (13) – index 95.0%, and step length and height – right rate (11a) – index 89.2%. The lowest percentage indicators were recorded in the following positions: torso (15) – index 78.3%, step symmetry (12) – indicator 70.0%, and position while walking (16) – indicator 50.0% (Fig. 1).

In the study group, the highest rates of gait test were recorded in the following items: initiation of gait (10) – index 100%, gait continuity (13) – index 90.0%, and step length and height – right foot (11a) – index 78.3%. The lowest value was recorded in: torso (15) – index 58.3%, step symmetry (12) – indicator 40.0%, and position while walking (16) – indicator 3.3%.

In the control group, the highest rates of gait test were recorded in the following positions: walking initiation (10), step length and height – right foot (11a), step length and height – left foot (11b), step symmetry (12), gait continuity (13), and walking path (14) – indicators 100% each. The lowest indicator was recorded in the position while walking (16) – indicator 96.7%.

A comparison of the results of the test group test with the control group and the assessment of the statistical significance level are presented in Table 3. Due to the significance level ($p < 0.05$), there were statistically significant differences between the test group and the control group regarding the results of the gait test and its aspects: length and height of the step – right lower limb, length and height of the step – left lower limb, step symmetry, gait path, torso, and position during gait.

Table 1. Average point scores for the gait assessment test in the analysed groups

Group	n	Average	SD	T -95.0%	T +95.0%	Value min	Value max	Q25	Median	Q75
Study	45	7.8	2.37	6.92	8.68	2	12	6	8	9
Control	45	11.93	0.25	11.84	12.03	1	12	12	12	12
Together	90	9.87	2.67	9.18	10.56	2	12	8	11	12

Table 2. Average point results of individual aspects of gait

Group	n	Contents	Study			Control			Together		
			Average	SD	Ind. %	Average	SD	Ind. %	Average	SD	Ind. %
10		Initiation of gait	1	0	100	1	0	100	1	0	100
11a		Length and step height – right lower limb	1.57	0.82	78.3	2	0	100	1.78	0.61	89.2
11b		Length and step height – left lower limb	1.5	0.82	75	2	0	100	1.75	0.63	87.5
12		Step symmetry	0.4	0.5	40	1	0	100	0.7	0.46	70
13		Continuity of gait	0.9	0.31	90	1	0	100	0.95	0.22	95
14		Walk path	1.23	0.5	61.7	2	0	100	1.62	0.52	80.8
15		Work torso	1.17	0.75	58.3	1.97	0.18	98.3	1.57	0.67	78.3
16		Position while walking	0.03	0.18	3.3	0.97	0.18	96.7	0.5	0.5	50

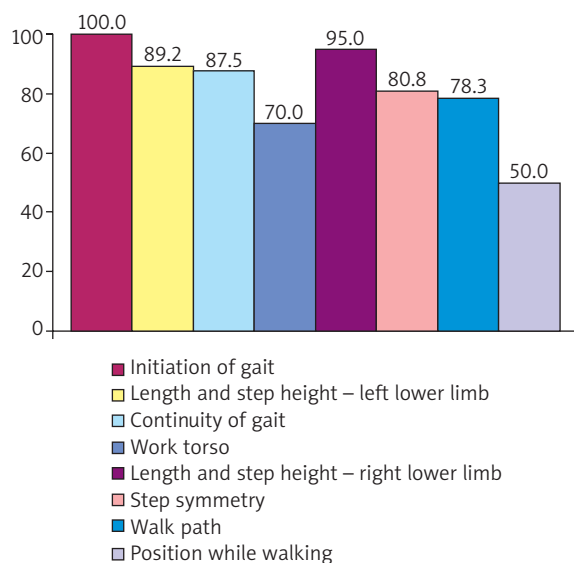


Fig. 1. Distribution of the percentages of gait test position index in the study group

Discussion

There are many studies in which the authors prove the correlation between VLU and the quality of gait. Results prepared by Evans *et al.* [17] describe data based on conducted questionnaires and clinical examination. In their research, they note that more numerous lesions associated with VLUs affect men more than women. The results of research carried out to date indicate that the presence of limited mobility of the ankle joint affects the deterioration of gait quality. This was described in the studies of Mecagni *et al.* [18] regarding the evaluation of the correlation between the range of ankle motion and the quality of balance among women in geriatric age. Limiting even one of the four basic movements in the ankle joint may be the cause of disturbances in balance and gait. Studies conducted by Shiman *et al.* [19] also support the

fact that there is a relationship between the mobility of the ankle and the quality of gait. It was noticed that in the case of people diagnosed with VLUs, there is a limitation of motion range in the ankle joint, which may be caused by severe pain or disorder of muscle function, in particular the gastrocnemius muscle, which plays an important role in the cushioning phase (loading response) while walking. Uden's [20] studies on calf muscle strength during walking in patients with chronic venous insufficiency and complications in the form of leg ulcers consisted of the analysis of walking speed carried out in 16 measurements during which gait parameters were recorded. In addition, the triceps of the calf muscle were assessed using the heel lift test. The results showed that, compared to the control group, the rate of gait was significantly reduced in people with chronic venous insufficiency. In addition, most patients had a broad support base during the walk, extended stride time, and the result of the test of muscle endurance in their case was much worse. Studies by Jawień *et al.* [21, 22] on functional limitations among patients with VLUs included analysis using the Tinetti scale. They demonstrated that chronic venous insufficiency and its complications significantly increase the risk of falling. People in the study group obtained statistically significantly lower values in the Tinetti test. Salcido [23] in his research reviewed the literature in terms of assessing the risk of falls among people with VLUs. He noted that people with chronic venous insufficiency had significantly worse results in the measurement of physical fitness and gait assessment tests. In addition, he concluded that patients with venous ulcers are at risk of falling, which is caused by the limitation of the mobility of the ankle [24-26]. Also, Szewczyk *et al.* [27] in their research proved that chronic venous insufficiency and its final stage in the form of ulceration significantly reduces activity functionality of patients in the field of basic activities in everyday life. In studies on the effectiveness of exercise in increasing the range

Table 3. Differences in gait test results between the studied groups

Aspects of gait	Sum. rang study	Sum. rang control	U	Z	Level p	Z correct.	Level p	p-value
Initiation of gait	915	915	450	0	1	-1.74	0.08	0.51
Length and step height – right lower limb	810	1020	345	-1.545	0.122	-2.776	0.006	0.123
Length and step height – left lower limb	780	1050	315	-1.989	0.047	-3.205	0.001	0.046
Step symmetry	645	1185	180	-3.984	0	-5.019	0	0
Continuity of gait	870	960	405	-0.658	0.511	-1.743	0.081	0.513
Walk path	585	1245	120	-4.871	0	-5.809	0	0
Work torso	642	1188	177	-4.029	0	-4.849	0	0
Position while walking	495	1335	30	-6.202	0	-7.161	0	0
Total gait test	482	1348	17	-6.394	0	-6.804	0	0

of motion in ankle joints, Szewczyk *et al.* [28] proved that physical exercises should be an integral part of the care of patients with venous ulcers. The results of the study clearly show that gait disturbances occur in both groups, due to age, but significantly more often in patients with VLU. This was also confirmed in the research by Szewczyk *et al.* [22] and Jawień and Grzela [4]. Białasik *et al.* [13] and Szewczyk *et al.* [27, 29] showed a negative effect of venous ulcers on various aspects of life, not only gait disturbances and ankle mobility, but also reduced functional capacity, mood depression, and risk of depression, as well as nutrition disorders. In many recommendations for the care of patients with VLU, there is a postulate of multi-directional, holistic care, taking into account physical as well as psychosocial aspects [30, 31].

Results

1. Venous leg ulcer results in deterioration of gait quality, in particular its aspects such as: trunk motion, step symmetry, and position during gait.
2. Due to the decreased quality of gait in the case of people with VLUs, the risk of falling increases.
3. Most people with VLUs adopt an abnormal position while walking, moving with widely spaced heels.

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