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Parameters of Physical Performance and Quality of Life in Postmenopausal Women with Vertebral Fractures Depending on their Quantity and Localization

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Abstract

Objectives: The purpose was to measure features of Physical Performance (PP) and quality of life in women of older age with Vertebral Fractures (VFs) depending on their quantity and localization.

Materials and Methods: We examined 230 postmenopausal women aged 50-89 years old, which divided into 2 groups:

1st: stone-without any previous fractures.

2nd: with VF sin thoracic or lumbar spine.

Females from 2nd group were divided into subgroups:

2a: with one VF

2b: with two or more VFs; 2nd-females with thoracic VFs; 2l-women with lumbar VFs;

2c: patients with combined VFs (thoracic and lumbar spine).

The PP was assessed using the following tests: 3-, 4-and 15-meter gait speed tests, hand grip strength, five-repetition sit-to-stand test, measurement of chest excursion, lateral trunk lean, respiratory rates, breath holding and Schober and Thomayer tests. Quality of life was assessed by EuroQol-5D questionnaire, disability-using Roland-Morris questionnaire.

Results: It was shown that lateral trunk lean, chest excursion, 15-metre test, five-repetition sit-to-stand test and hand grip strength changed only in women with 2 or more VFs compared to parameters in control group, whereas index of Schober test, breath holding are worse both in women with one or two or more VFs. The females with thoracic VFs had their indexes of breath holding and 15-metre tests changed compared to control group, whereas women with lumbar VFs had worse indexes of hand grip strength, Schober test, lateral trunk lean and five-repetition sit-to-stand test compared to control group. The index of lateral trunk lean, chest excursion, 15-metretest and hand grip strength in females with combined VFs are reliably worse compared to control group.

Conclusion: The parameters of PP depend on VFs quantity and localization that should be accounted in assessment of physical performance and development of rehabilitation programs for females with VFs.

Keywords: Vertebral fractures; Osteoporosis; Physical performance; Quality of life; Postmenopausal women

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Introduction

Current literature review demonstrates that Vertebral Fractures (VFs) are ones of the most frequent and dangerous complications of systemic osteoporosis, that lead to vertebral pain, restriction of physical activity and increased disability [1] but also to enlargement of mortality rate [2,3]. It was shown that women with at least one new VF had 32% increased risk of mortality (RH=1.32; 95% CI=1.10-1.58, p=0.003) compared to those without an incident of VFs [2]. Another study demonstrated that females with previous VFs compared to those without an incident of VFs, 12 years after the diagnosis, had back pain during the year preceding the follow-up (72% *vs.* 33%, p<0.001), current back pain (42% *vs.* 19%, p=0.006), and an impaired health status (44% *vs.* 17%, p<0.001) [3].

Table 1: Indices of physical performance in PMP women depending on the presence and quantity of VFs.

Index/Group	Control group	2[a] group			2[b] group			Differences between 2[a] and 2[b] groups	
	M ± m	M ± m	t*	p*	M ± m	t*	p*	t	p
Tomayer test, cm	7.7 ± 12.0	6.0 ± 8.8	0.6	0.5	10.7 ± 16.9	1.3	0.18	1.2	0.2
Schober test, cm	4.6 ± 2.5	3.1 ± 2.3	2.7	0.008	3.5 ± 3.1	2.6	0.009	0.5	0.6
Lateral trunk lean, cm	14.3 ± 4.6	12.7 ± 4.6	1.5	0.1	12.4 ± 5.2	2.4	0.02	0.2	0.8
Chest excursion, cm	107.1 ± 11.7	103.3 ± 9.5	1.5	0.1	102.2 ± 10.5	2.5	0.01	0.4	0.7
Chest excursion (on the inhalation), cm	109.5 ± 12.0	105.6 ± 9.5	1.5	0.1	103.8 ± 10.7	2.9	0.004	0.7	0.5
Chest excursion (on the exhalation), cm	105.1 ± 11.6	101.5 ± 9.8	1.4	0.2	100.6 ± 10.4	2.4	0.02	0.3	0.8
Breath holding, sec	23.1 ± 11.3	17.7 ± 9.0	2.1	0.03	19.6 ± 10.2	1.9	0.05	0.7	0.5
Respiratory rate, frequency (n) in 1 minute	17.6 ± 2.8	17.4 ± 2.5	0.4	0.6	17.5 ± 3.7	0.3	0.8	0.2	0.9
Hand grip strength, kg	17.4 ± 9.8	14.2 ± 8.2	1.4	0.2	13.1 ± 8.5	2.7	0.007	0.5	0.6
3-metre test, m/sec	9.7 ± 3.9	10.2 ± 3.3	0.6	0.5	9.9 ± 3.7	0.4	0.7	0.3	0.8
4-metre, m/sec	5.5 ± 1.8	5.4 ± 2.0	0.1	0.9	5.8 ± 2.0	0.8	0.4	0.6	0.5
15-metre test, m/sec	13.7 ± 4.5	15.3 ± 4.7	1.5	0.1	16.9 ± 6.3	3.8	0.0002	1	0.3
Five-repetition sit-to-stand test, sec	13.9 ± 6.8	16.2 ± 7.4	1.5	0.1	15.9 ± 8.4	1.7	0.09	0.2	0.9

*- significant differences (p<0.01) compared to women of control group.

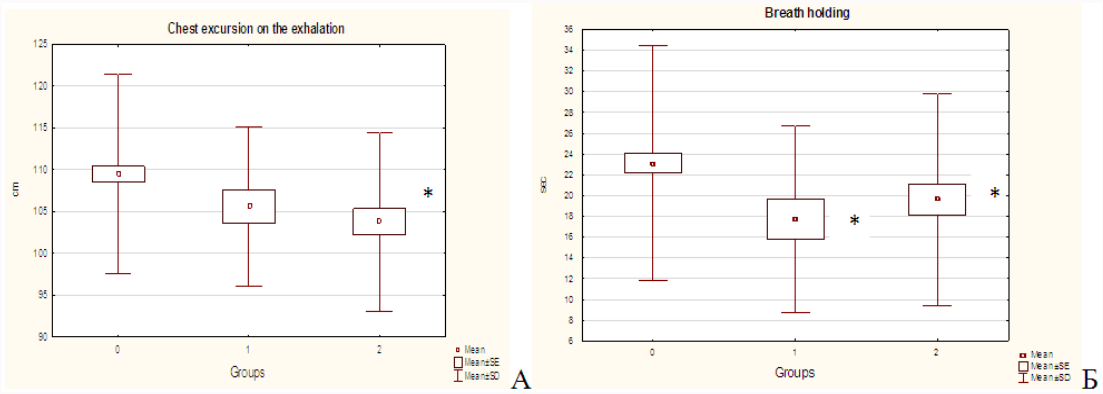

Figure 1: Indexes of chest excursion on the exhalation (A) and breath holding (B) in patients depending on the presence and number of VFs.
Notes: 0-control group; 1-patients with one VF; 2-females with 2 or more VFs; *-reliable differences (p<0.01) compared to parameters in females without any previous fractures.

Various conducted researches also confirmed that VFs increase the risk of new fractures (vertebral and non-vertebral) in Postmenopausal (PMP) women [4,5]. Moreover, the risk of future VFs is also associated with the number of previous VFs and the severity of vertebral deformities [6,7].

Vertebral fractures are frequently asymptomatic, they are often diagnosed not on time and patients do not receive anti-osteoporotic treatment. Vertebral pain leads to restriction of physical activity and it negatively affects the disease progression and life expectancy [8-12]. It is important concerning to the fact that low level of physical activity and immobilization are independent risk factors of osteoporosis and further fractures.

Some studies demonstrate that parameters of Physical Performance (PP) are worsened in patients after VFs [9,12]; however, the information about these changes depending on number and localization of VFs is limited. The existing controversial data about quality of life of patients with VFs can be explained by various quantities of previous fractures, age of patients, time from the moment of fracture, level of physical activity, etc [13,14].

The aim of the research was to study the parameters of PP and quality of life in women of older age with VFs depending on their quantity and localization.

Material and Methods

Our research was conducted at the DF Chebotarev Institute of Gerontology NAMS Ukraine (Kyiv) and approved by Ethics Committee of the Institute. All patients signed informed consent for participation in this study. We used a cross-sectional design of the research and examined 230 PMP women aged 50-89 years old. Females were divided into some groups: 1st one (control)-females without any previous fractures (n=151), 2nd group-patients with VFs in thoracic and/or lumbar spine (n=79). Subsequently, the females from 2nd group were divided into 2 subgroups: 2[a]: with one VF (n=25); 2[b]: with two or more VFs (n=54). In addition, the analysis was performed depending on the VFs localization. For this, patients of 2nd group were divided into the following subgroups: 2th-persons with VFs at thoracic spine (n=24); 2[l]-women with VPs at lumbar spine (n=26); 2[c]-patients with combined VFs at the thoracic and lumbar spine (n=29).

It was established that patients form 1st and 2nd groups did not differ reliably in parameters of age, age of menarche menopause and

Table 2: Indices of physical performance in PMP women depending on the presence and localization of VFs.

Index/Group	Control group	2[a] group			2[b] group			Differences between 2[a] and 2[b] groups		
	M ± m	M ± m	t*	p*	M ± m	t*	p*	M ± m	t*	p*
Tomayer test, cm	7.8 ± 12.0	7.1 ± 13.7	0.2	0.8	11.5 ± 18.1	1.2	0.2	9.3 ± 13.6	0.6	0.6
Schober test, cm	4.6 ± 2.5	3.5 ± 2.4	1.9	0.1	2.5 ± 2.3	3.8	0.0002	4.0 ± 3.4	1.1	0.3
Lateral trunk lean, cm	14.3 ± 4.6	13.7 ± 4.4	0.6	0.6	11.8 ± 4.4	2.4	0.02	12.1 ± 5.8	2.2	0.03
Chest excursion, cm	107.1 ± 11.7	102.0 ± 12.4	1.9	0.1	104.6 ± 9.2	0.9	0.3	101.3 ± 8.9	2.4	0.02
Chest excursion (on the inhalation), cm	109.5 ± 12.0	104.0 ± 12.4	2	0.1	106.4 ± 9.6	1.1	0.3	102.9 ± 9.0	2.7	0.009
Chest excursion(on the exhalation), cm	105.1 ± 11.6	100.6 ± 12.6	1.7	0.1	103.0 ± 9.0	0.8	0.4	99.3 ± 8.7	2.4	0.02
Breath holding, sec	23.1 ± 11.4	16.7 ± 9.0	2.6	0.01	18.7 ± 8.8	1.8	0.1	21.3 ± 11.1	0.8	0.4
Respiratory rate, frequency (n) in 1 minute	17.7 ± 2.8	18.1 ± 3.4	0.7	0.5	16.7 ± 2.6	1.5	0.1	17.5 ± 3.8	0.2	0.8
Hand grip strength, kg	17.3 ± 9.8	14.9 ± 9.5	1.1	0.3	12.7 ± 8.4	2.1	0.04	13.0 ± 7.3	2.2	0.03
3-metretest, m/sec	9.6 ± 3.9	9.5 ± 3.6	0.2	0.8	10.6 ± 3.6	1.1	0.3	10.1 ± 3.5	0.5	0.6
4-metretest, m/sec	5.5 ± 1.8	5.6 ± 2.3	0.3	0.8	5.4 ± 2.2	0.3	0.7	5.9 ± 1.5	1.1	0.3
15-metre test, m/sec	13.7 ± 4.5	16.0 ± 4.6	2.1	0.03	15.5 ± 4.2	1.8	0.1	17.3 ± 7.8	3.3	0.001
Five-repetition sit-to-stand test, sec	13.9 ± 6.8	13.1 ± 5.3	0.5	0.6	17.9 ± 7.3	2.6	0.01	16.9 ± 9.9	1.9	0.1

*- significant differences (p<0.01) compared to women of control group.

duration of the PMP period. However, performed analysis depending on the VFs number established that females of 2[a] group (with one fracture) had reliably lower parameters of weight (68.4 kg ± 11.7 kg and 80.4 kg ± 15.7 kg, respectively, t=3.6, p=0.0004) and Body Mass Index (BMI, 28.0 kg/cm^2 ± 4.9 kg/cm^2 and 32.2 kg/cm^2 ± 5.9 kg/cm^2, t=3.3, p=0.001) compared to the parameters of control group, although they did not differ from the 1st group in height (t=1.4, p=0.17). Women with two or more VFs (2[b] group) had significantly lower parameters of height (155.7 cm ± 6.5 cm and 158.0 cm ± 5.6 cm, respectively, t=2.5, p=0.01); weight (70.3 kg ± 14.2 kg, t=4.1, p=0.00006) and BMI (28.8 kg/cm^2 ± 4.7 kg/cm^2, t=3.7, p=0.0003) compared to the control group. Furthermore, we did not establish any significant differences of the main anthropometric indices (Height, Weight and BMI) between women of 2nd group in subgroups (2[a] and 2[b]).

Analysis, which was performed according to the VFs localization, found that parameter of height in females with thoracic and lumbar VFs did not differ reliably from similar in control group. Only in patients with combined VFs (2[c] group) it was reliably lower than the corresponding index in the 1st group (155.4 cm ± 7.5 cm, t=2.0, p=0.04). The assessment of parameters of weight and BMI in women depending on the VFs localization established that they were significantly lower in patients with VFs. Thus, the parameter of weight in women of the control group was 80.4 kg ± 15.8 kg, in females with VFs at the thoracic spine-69.6 kg ± 13.3 kg (t=3.2, p=0.001), lumbar spine- 69.7 kg ± 12.4 kg (t=3.2, p=0.001), combined VFs-69.6 kg ± 14.7 kg (t=3.3, p=0.001). The corresponding indexes of BMI were 32.2 kg/cm^2 ± 5.9 kg/cm^2 and 28.5 kg/cm^2 ± 4.9 kg/cm^2 (t=3.0; p=0.003), 28.6 kg/cm^2 ± 4.9 kg/cm^2 (t=2.9; p=0.005) and 28.7 kg/cm^2 ± 4.6 kg/cm^2 (t=2.9; p=0.004).

The presence, type, number and localization of VFs were confirmed by Dual-energy X-ray Absorptiometry (DXA) method (Prodigy, GEHC Lunar and Madison, WI, USA) using Vertebral Fracture Assessment (VFA) program.

For assessment of PP we used the following tests. Gait speed was assessed by 3, 4 and 15-meter tests. The results of best performance achieved in two walks at the patient's usual pace along a distance 3-, 4- or 15 meters long (was recorded in meters/sec) [15,16]. Coordination and strength was assessed by five timed chair stands test (was recorded in sec). Women were asked to stand up and sit down five times as quickly as possible (their hands were across their chest) [15,16]. Chest excursion (mean and at maximal inhalation and exhalation) was measured on the level of 4th ribs [17,18]. Schober test was performed for studying the degree of movement limitation in the lumbar spine [18]. Thomayer test assesses the overall mobility of spine [18]. Hand grip strength was studied by measurement of the amount of static force that hand can squeeze around a dynamometer (was recorded in kg) [19].

In addition the measurement of arterial systolic/diastolic pressure (mm Hg), heart and respiratory rates (n/sec), breath holding (sec), chest excursion (mean and on the inhalation and the exhalation, lateral trunk lean, cm) were performed as part of physical examination.

Quality of life was assessed by EuroQul-5D questionnaire [20]. Also, we used Roland Morris [21] Disability Questionnaire that assesses the influence of acute/sub acute back pain on daily disability. All females completed the questionnaires themselves after a preliminary instruction by the researcher.

The statistical analysis was performed using the methods of descriptive statistics, Student's t-test for independent variables and one-way Analysis of Variance (ANOVA). The distribution of all variables was tested using the Kolmogorov-Smirnov test. All results are represented at mean and Standard Deviation (M ± SD). Software's packages of "Statistica 6.0" Copyright© StatSoft, Inc. 1984-2001 were used.

Results

Results of our analysis depending on the presence and number of VFs in the PMP women did not show the significant differences in Thomayer test, which assesses the overall spine mobility, however, demonstrated the reliably lower parameters of Schober test, which assesses the mobility of its lumbar part in females with one (3.1 cm ± 2.3 cm; t=2.7; p=0.008) or two or more VFs (3.5 cm ± 3.1 cm, t=2.6, p=0.009) (Table 1).

Assessment of other tests that characterize patient's mobility (lateral trunk lean, chest excursion) in patients with 1 VFs also did

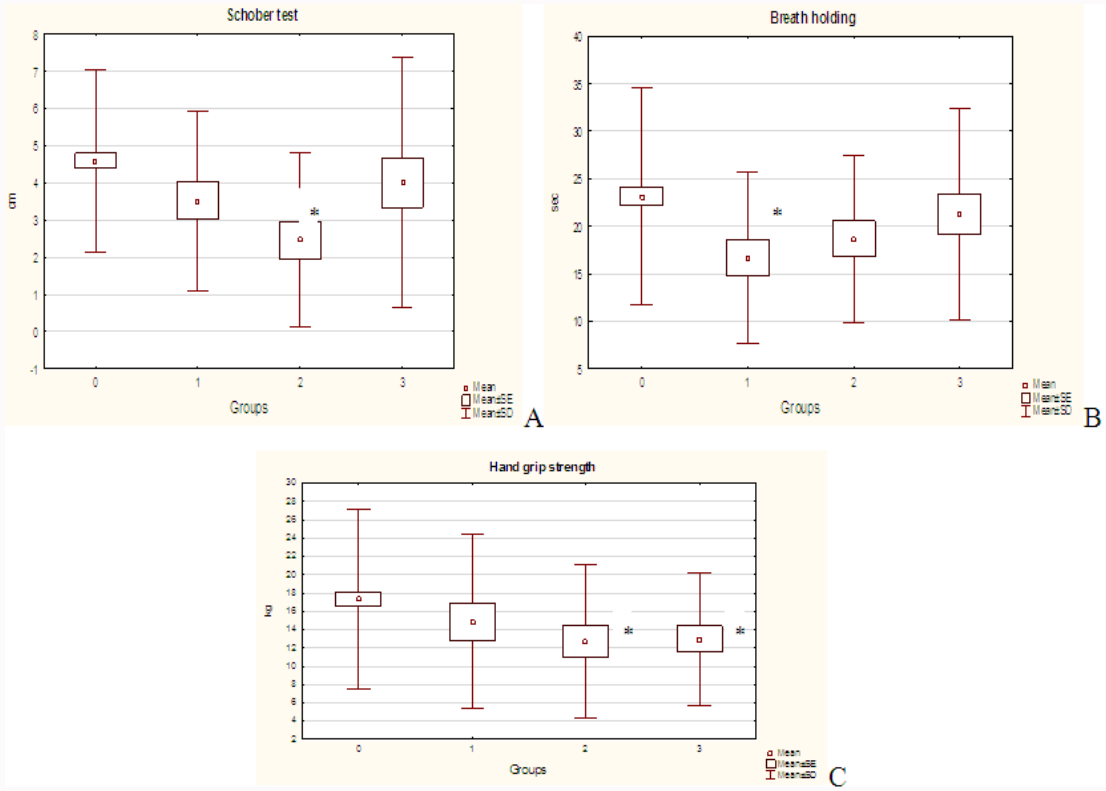

Figure 2: Indexes of Schober Test (A), Breath holding (B) and Hand grip strength (C) in patients depends on the presence and localization of VFs.
Notes: 0-control group; 1-patients with thoracic VFs; 2-women with lumbar VFs; 3-females with combined VFs.

not establish any reliable differences compared to the similar indexes of patients from the control group. In contrast, females with 2 or more VFs had significantly lower index of lateral trunk lean that indicates the limitation of their functional capabilities. Also, we found the reliably lower parameters of chest excursion (average parameter, at inhalation and exhalation) and breath holding in patients with 2 or more VFs compared to same indexes of control group (Figure 1). Additionally, breath holding index in females with one VF also was lower compared to control group. However, we did not reveal any reliable differences in these parameters in females with VFs depending on their subgroup (2^a or 2^b group).

Analysis of parameters of blood pressure and heart rate (data not provided) in patients depending on the presence and number of VFs did not reveal any reliable differences. However, parameters of respiratory rate in females with one VF were significantly lower than in control group (17.7 sec ± 9.0 sec and 23.1 sec ± 11.3 sec, respectively, t=2.1, p=0.03). In addition, same differences were observed in females with two or more VFs (19.6 sec ± 10.2 sec, t=1.9, p=0.05).

Moreover, we found the significantly worse index of hand grip strength in females with 2 or more VFs (13.1 kg ± 8.5 kg, respectively, t=2.7, p=0.007) compared to similar parameter in the control group (17.4 kg ± 9.8 kg), however, we did not reveal the reliable differences of this index in women with one VF (14.2 kg ± 8.2 kg, t=1.4, p=0.2) compared to parameter of the control group (Table 1).

Assessment of gait speed tests depending on the presence and number of VFs in PMP women did not find any significant difference in the results of the 3 and 4-meter tests in females with VFs. Nevertheless, the parameter of 15-meter test was reliably higher in women with 2 and more VFs (16.9 sec ± 6.3 sec) compared to the control group (13.7 sec ± 4.5 sec, t=3.8, p=0.0002). However, this index in patients with one VF did not differ from the corresponding parameter of the control group (t=1.5, p=0.1) and amounted 15.3 sec ± 4.7 sec. Also, we did not establish any reliable differences in five-repetition sit-to-stand test depending on the VFs number (Table 1).

Furthermore, the analysis of the parameters of PP in patients depending on the number of VFs in subgroups (2^a or 2^b group) did not reveal any significant differences between them (Table 1).

Analysis of quality of life parameters according to the EuroQol-5D Questionnaire depending on the VFs number did not reveal any reliable differences between the groups. This index consisted of 4.5 μn ± 1.7 μn in patients of the control group, 4.9 μn ± 1.8 μn in women with one VF and 4.7 μn ± 1.7 μn in females with two and more VFs. However, according to the Roland-Morris Questionnaire, we established the significant differences of this index in patients depending on the number of VFs. Thus, this parameter in females with 2 or more VFs was reliably higher compared to the index in control group (respectively, 9.3 μn ± 3.8 μn and 7.4 μn ± 4.9 μn, p=0.03), however, it did not differ for females with one VF (6.9 μn ± 3.6 μn) compared to the similar index in control group.

Analysis of PP parameters in patients depending on the VFs localization did not demonstrate any reliable differences in Tomayer test, which reflects the general, spin mobility. In addition, we did not find the significant differences in Schober test in females with thoracic VFs compared to the index in control group (3.5 cm ± 2.4 cm and 4.6 cm ± 2.5 cm, respectively, t=1.9; p=0.1), in contrast to the index of patients with VFs at the lumbar spine, which was significantly lower as similar index in control group (2.5 cm ± 2.3 cm, respectively, t=3.8; p=0.0002) (Figure 2A). Similar differences were also obtained

in lateral trunk lean parameters depending on VFs localization. We did not establish any significant differences of these parameters in females with thoracic VFs compared to control group (13.7 cm ± 4.4 cm and 14.3 cm ± 4.6 cm, t=0.6; p=0.6) in contrast to data in group with lumbar spine and combined VFs, which were reliably lower than the corresponding indexes in control group (respectively, 11.8 cm ± 4.4 cm, t=2.4, p=0.02 and 12.1 cm ± 5.8 cm, t=2.2, p=0.03) (Table 2).

Assessment of chest excursion parameters demonstrated that its indexes (average parameter, during inhalation and exhalation) did not differ compared to control group in females with VFs at thoracic or lumbar spine. In contrast to the above, in women with combined VFs, the indexes of chest excursion were significantly lower than similar in control group (average: 101.3 cm ± 8.9 cm, t=2.4, p=0.02; at the inhalation: 102.9 cm ± 9.0 cm, t=2.7, p=0.009; on the exhalation: 99.3 cm ± 8.7 cm, t=2.4, p=0.02) (Table 2).

Moreover, we did not establish any significant differences of parameters of respiratory rate in PMP women depending on VFs presence and localization. However, index of breath holding in females with thoracic VFs was significantly lower comparing to similar one in control group (16.7 sec ± 9.0 sec and 23.1 sec ± 11.4 sec, respectively, t=2.6; p=0.01) on the background of no reliable differences in females with lumbar spine and combined VFs (Figure 2B).

The analysis of the hand grip strength depending on VFs presence and localization revealed significantly lower parameters in females with lumbar VFs (12.7 kg ± 8.4 kg and 17.3 kg ± 9.8 kg, respectively, t=2.1, p=0.04) and combined VFs (13.0 kg ± 7.3 kg, respectively, t=2.2, p=0.03) compared to parameters in control group (Figure 2C).

Furthermore, the assessment of gait speed tests depending on the presence and localization of VFs did not reveal any significant difference between the results of 3 and 4-meter tests in PMP women with VFs, in contrast to the 15-meter test parameter, which was significantly higher in females with thoracic VFs (16.0 sec ± 4.6 sec and 13.7 sec ± 4.5 sec, t=2.1, p=0.03) and females with combined VFs (17.3 sec ± 7.8 sec, respectively, t=3.3, p=0.001) compared to parameters of control group. Nevertheless, we did not obtain any reliable differences in the parameter of Five-repetition sit-to-stand test in females with thoracic VFs and combined (thoracic and lumbar) VFs. Significant difference was revealed only in females with lumbar VFs compared to the control group (17.9 sec ± 7.3 sec and 13.9 sec ± 6.8 sec, respectively, t=2.6, p=0.01).

Assessment of parameters of quality of life and disability depending on VFs presence and localization did not establish any reliable differences between the groups. Thus, the corresponding index of EQ-5D questionnaire in the control group composed 4.5 μn ± 1.7 μn. In patients with thoracic VFs- 4.4 μn ± 1.7 μn, lumbar VFs- 4.7 μn ± 1.7 μn, combined VFs- 4.8 μn ± 1.6 μn. The indexes of the Roland-Morris questionnaire, which characterizes the disruption of life-related activity associated with osteoporosis and its complications, in the corresponding groups were 7.4 μn ± 5.0 μn; 8.2 μn ± 4.3 μn; 8.2 μn ± 4.0 μn and 9.2 μn ± 3.5 μn, respectively (p>0.05).

Discussion and Conclusion

Nowadays, VFs are important and dangerous complications of systemic osteoporosis. Current the literature data shows that their prevalence in the adult population consists is 6.2% to 20.7% and their frequency exponentially increased with age. WHO data confirms that about 25% of females under 65 already have VFs; however, they are often asymptomatic [1,2]. Taking into account the important medical and social consequences of VFs and their crucial role in the development of the "cascade of osteoporotic fractures", in latest American and European guidelines for managing PMP osteoporosis in females, VFs are an independent indication for induction of osteoporotic treatment [22,23].

Thoracic or lumbar pain is one of the most frequent clinical features of VFs [24]. It is frequently accompanied by deteriorations in physical activity and quality of life. Furthermore, the PP worsening is also associated with the quantity of previous VFs and their severity. Thus, it was shown that walking speed in females with two or more VFs was significantly slower than similar parameter in control group (correspondingly, 1.17 m/sec and 1.24 m/sec, p=0.03) [25]. Females who had 2 or more VFs had reliably higher (p=0.01) index of the "chair stand time" test (assessment of lower extremity strength) and significantly lower (p=0.01) index of functional reach (measure of balance and posture which was calculated as the difference between two measurements (average of three trials) as follows: subjects first stood comfortably upright, facing forward, hand in a fist, with their arm extended next to a yardstick mounted on a wall) [25], compared to the corresponding parameters of females without any previous fractures. However, the authors did not establish reliable differences of these tests in women with one VF compared to females with persons without fractures.

Nowadays, literature data have shown that low bone mineral density [24,26] and increased risk of fall [27] are connected with impaired PP, and both of them increase the risk of future VFs. In addition, it was shown, that regular exercises are effective non-pharmacological measures in prevention of bone loss and osteoporotic fractures [27-29].

Thus, the current literatures data show that VFs are associated with restriction of physical activity in patients with osteoporosis that adversely affects the disease progression and life expectancy as immobilization or low level of physical activity are independent factors of the risk of accelerated bone loss, falls and further fractures.

Many studies confirm that parameters of PP are worsened in patients after VFs [9,12]. Our previous research also demonstrated that the intensity of vertebral pain and some PP tests (lateral trunk lean and chest excursion (mean index, during the inhalation and exhalation), hand grip strength, 15-metre gait speed test and five-repetition sit-to-stand test) are significantly worse in women with VFs than corresponding parameters in persons without fractures [30]. However, information about these changes depending on number and localization of VFs is limited. In addition, the data about quality of life of patients with VFs are arguable [13,14], that can be explained by various quantities of previous fractures, age of patients, BMI, time from the moment of fracture, level of physical activity, treatment method, etc.

The present study sought out to establish features of parameters of PP and quality of life in PMP women with VFs depending on their quantity and localization.

Our results demonstrated that lateral trunk lean, chest excursion (average parameter, during the inhalation and exhalation), 15-metre test, five-repetition sit-to-stand test and hand grip strength are changed only in PMP women with two or more VFs compared to the similar parameters in control group, whereas parameters of Schober test, breath holding are worse both in women with one or two or more VFs.

Moreover, we did not reveal any significant differences in parameters of Tomayer test, respiratory rate, and 3 and 4-metre gait tests. Our results are consistent with the data of other authors that parameters of PP are connected number of previous VFs [25].

In addition, our study demonstrated that PMP women with thoracic VFs have lower index of breath holding and higher parameter of 15-metre test compared to healthy control, whereas female with lumbar VFs have lower index of Schober test, lateral trunk lean, hand grip strength and five-repetition sit-to-stand test in comparison with parameters of control group. Also, our results showed that lateral trunk lean, chest excursion (average parameter, during the inhalation and exhalation), 15-metre test and hand grip strength in females with combined (thoracic and lumbar) VFs were worse compared to parameters of control group.

We did not reveal any reliable differences in the indices of respiratory rate, Tomayer test, and 3 and 4-metre gait tests compared to indices in control group depending on VFs localization, which may indicate their low sensitivity in women with different localization of VFs.

Furthermore, our research demonstrated that indices of quality of life according to EuroQol-5D Questionnaire was not connected with number or localization of VFs, however indexes the Roland-Morris Questionnaire are significantly higher in females with 2 or more VFs compared to the index in control group. According to the existing data, Roland-Morris Disability Questionnaire is most sensitive for patients with mild to moderate disability due to acute, sub-acute or chronic low back pain, which connected with osteoporosis and VFs and objectively can reflect the level of disability in this group of patients [21]. These findings can also be connected with many reasons (BMI, time from incident of VFs, level of physical activity, etc.) and require further studies.

In conclusion, the results of this research revealed that lateral trunk lean, chest excursion, 15-metre gait speed test, five-repetition sit-to-stand test and hand grip strength are changed only in PMP women with two or more VFs compared to the similar parameters in control group, whereas parameters of Schober test, breath holding are worse both in females with 1 or 2 or more VFs. Postmenopausal women with thoracic VFs have changed indexes of breath holding and 15-metre gait speed test compared to healthy control, whereas female with lumbar VFs have worse indexes of Schober test, lateral trunk lean, hand grip strength and five-repetition sit-to-stand test compared to parameters in control group. In addition, indices of lateral trunk lean, chest excursion (average parameter, on the inhalation and exhalation), 15-metre gait speed test and hand grip strength in patients with combined (thoracic and lumbar) VFs are worse compared to control group. All of the above should be taken into account in assessment of PP and development of rehabilitation programs for females with VFs.

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Disclosure

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