

The effect of an individual muscle strengthening program and dietary assessment in the quality of life in women with osteoporotic hip fracture.

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Abstract

The purpose of this study was to evaluate the influence that a personal training program and dietary assessment have on quality of life in women with osteoporotic hip fracture.

Fifty women with osteoporotic hip fracture, aged 57-89 years old, randomized in two groups, experimental (n=25) and control group (n=25). The experimental group participated in a 12 week muscle strengthening training program. The controls were instructed to continue with their ordinary daily activities. Pre and post hip surgery specific questionnaires (osteoporotic and dietary) performed to assess quality of life of both groups.

For the data statistical analysis were used both the descriptive and logical statistics. According to descriptive statistics estimated and presented mean values, standard deviations and occurrence frequencies. The main researching hypothesis was analyzed with 2-way ANOVA repeated measures.

The results indicated that the muscle strengthening program effected positively the experimental group with osteoporotic hip fracture providing the tools to further improve their quality of life

Knowing that women with osteoporotic fractures have a tendency towards a deterioration of their locomotion and ambulatory capabilities from about the middle of the fourth decade due to either the natural aging process (decreased strength, endurance), or to the changes related to osteoporosis (fractures, reduced mobility, confidence, independence, social life, pain), participation in similar programs will provide them with enormous help to undertake daily life activities and prevent deterioration in body composition.

Diet had a positive effect on these women using specific dietary instructions.

Key words: osteoporotic fractures, women, exercise, quality of life, diet, muscle training program.

Introduction

In osteoporosis bone density is decreased under a critical limit and a number of various problems appear such as reduction of stature and back pain increasing bone fragility and fracture danger¹

Osteoporotic fractures are involved in reduction of mobility, social life, sentimental and mental status of the individual, pain, disability, depression, reduction of independence, essential and basic elements that characterize the quality of our life²

This reduction is observed commonly in individuals after vertebral or hip fractures comparatively with other regions of the body and they never restored completely³

Although physical activity and normal diet have positive effectiveness on body function there are few researches that assess both parameters.

The current research use specific questionnaires of quality of life before the appearance of any fracture constitutes factor of growth of future prevention strategies of illness, decisive and important improvement of health status in third age⁴

Methodology

50 women aged 57-89 years old participated in this study. All participants were diagnosed with osteoporotic hip fracture after their admission at the Orthopaedic Department of the Hippokratia General Hospital of Thessaloniki. Subjects were separated in 2 groups (experimental and control), randomly with the raffle method. The experimental group (n=25) had mean age 77.04 years and mean weight 78.36 Kgrs, while the controls (n=25) had 80.56 years and 78.64 kgrs. All participated voluntarily in this study.

Their quality of life was assessed using specifically designed questionnaires (osteoporotic and dietary) before the surgical intervention and post surgical. The osteoporotic questionnaire consisted of 41 items and it was based on global original articles of specific scientists that create it. For easier use its elements are grouped in 7 sectors (pain, activities of daily life, domestic work, mobility, free time, health perception and intellectual operation). Each activity is marked with a scale of three, four or five points (1-2-3-4-5) using Likert Scale^{5,6,7,8}

The specific questionnaire has been used widely and has been evaluated for its reliability and validity by the International Osteoporosis Foundation. The dietary questionnaire consists of 55 subjects grouped in 6 sectors (meat consumption, breakfast consumption, fruits, vegetables, and various other foods and cereals consumption including bread). Each food category is marked with a scale of eight points (0-1-2-3-4-5-6-7) using Likert Scale, where the frequency consumption of each food per week also appears (From Aston University)^{9,10,11}

An individual muscle strengthening program was implemented initially to both groups and after their discharge from hospital (15 days) to only the experimental group. The program included both resistance and aerobic exercises (dance, vigorous walking, and climbing stairs), while the control group continued with daily usual activities with application of low intensity exercises (mild walking, washing dishes, cooking).

The muscle strengthening program based on various studies and directives from international organisms^{12,13,14,15,16,17,18,19}

It includes the recording of the exercise type that was applied (Weight-bearing, resistance, warm up and full recovery) the frequency in days per week, the duration of each exercise in minutes, the intensity that was medium and also the sets, the repetitions and relax time in a specific type of exercise. In the end of total duration of the program is recorded the progress after the increase of the exercise as much in frequency as in duration. The program of the experimental group was completed case by case in 8-12 weeks with the active participation of all women. It was earlier interrupted in certain cases (before the completion of 12 weeks) because of the pain intensity and the fatigue of women during the program exercises.

It consisted of weight-bearing exercises (stairs climbing, vigorous walking) and resistance exercises (lifts or light weight, use of flexible bandage for body elevation of the individual). The frequency was initially 4-5 days/week with progressive increase in 6-7 days/week per case or remained constant initially. The duration of exercises oscillated from 10-15' per exercise with progressive increase in 15-30' per exercise and case by case. The intensity of exercises was medium in every case and exercise because of the osteoporosis itself while the resistance exercises included 2 sets with 6-8 repetitions per case with rest of 2-3'. The warm up and full recovery period before and afterwards the implementation program, included circles with the hands from seated place initially and standing up finally. The duration was 10-15'' with progressive increase in 20-25'' and the intensity included 5 repetitions with progressive increase in 10-15. Finally, it was recorded also the intensity of pain in three measurements during the program duration (start-middle-end). The control group program included usual daily activities (shopping, sweeping, washing dishes and clothes, ironing, gardening) with exercises of low intensity (slow walking, stairs climbing and descending 2-3 times/week, physiotherapy with passive mainly exercises of lower body).

Statistical Analysis

For the data statistical analysis were used both the descriptive and logical statistics. According to descriptive statistics estimated and presented mean values, standard deviations and occurrence frequencies. The main researching hypothesis was assessed with 2-way ANOVA repeated measures. Dependent variables were the seven sectors of osteoporotic questionnaire and the six sectors of dietary questionnaire. Independent variables were the 'groups' with two levels, experimental and control group. The second factor was the 'measurement' with two levels, initial and final measurement. Differences in level .05 were considered statistically significant. In the case where it was presented statistically important interaction the analysis continued with the simple main effect analysis. The advantage of this analysis is that we have all the possible comparisons maintaining the type I fault constant

Results

Effectiveness of the intervention program

From the 2-way Anova repeated measures appeared that all parameters of the exercise program were considerably improved. These changes had to do with the duration of weight-bearing exercises as well as the duration and intensity of resistance exercises. In table 1 are presented mean values and standard deviations of variables above.

Table 1: Mean values and standard deviations of variables of weight-bearing (WB) and resistance (RE) exercises

	Before	Afterwards
Duration WB	25.00 (2.04)	38.40 (3.74) ^{1*}
Frequency WB	2.60 (.58)	3.24 (.43) ^{2*}
Duration RE	17.60 (2.55)	27.60 (2.54) ^{1*}
Intensity RE	13.12 (1.83)	14.56 (1.96) ^{1*}
Frequency RE	2.12 (.33)	2.96 (.20) ^{2*}

Note: ¹the comparison is based on the paired t-test observations, ²the test is based on Wilcoxon Singed Ranks test, *p<.01

The Wilcoxon Singed Ranks test revealed that the frequency of the weight-bearing exercises as well as the frequency of resistance exercises was increased statistically considerably (p<.05) (table 1).

Osteoporotic Questionnaire

Table 2. Mean values and standard deviations of groups and measurements

	Experimental group		Control group	
	1 st measurement	2 nd measurement	1 st measurement	2 nd measurement
Pain	17.24 (1.64)	13.84 (1.34)	18.76 (1.87)	18.04 (.93)
Activities	12.28 (1.99)	10.24 (1.92)	14.64 (1.29)	12.76 (1.01)
Domestic work	17.84 (2.62)	15.04 (2.37)	20.40 (2.02)	18.68 (1.21)
Mobility	31.88 (3.87)	27.52 (2.96)	32.64 (3.01)	30.60 (2.02)
Free time	21.24 (1.94)	18.40 (2.16)	21.23 (1.74)	20.28 (1.54)
Health perception	12.28 (.84)	11.12 (1.27)	12.54 (.88)	11.72 (1.06)
Intellectual operation	29.16 (2.44)	30.20 (1.50)	30.32 (1.55)	30.44 (1.56)

Table 3. Effect of dietary directions in participated subjects

Meat consumption – Proteins	Increase in both groups
Breakfast consumption	No essential change in both groups
Vegetables consumption	Tendency to increase in the experimental group
Fruits consumption	Tendency to increase in the experimental group
Other foods consumption	Tendency to increase in the experimental group
Cereals consumption and bread	Fall in the end of intervention in the experimental group

Table 4 Intervention Program

Type of Exercise	Frequency	Duration	Intensity	Progress
Weight-bearing exercises (climbing – descending stairs, vigorous walking)	Days per week			Increase days per week
Resistance exercises	Days per week		Sets Repetitions Rest	
Warm up/Full recovery (circles with the hands from seated place)				

ACSM's position stand on osteoporosis and exercise. Med Sc Sp Ex,1998, 27: 4.

Discussion

Results of the present research reveal that an individual muscle strengthening program improved strength and resistance in women with osteoporotic hip fractures. This improvement is very important because of the tendency of these women to worsen progressively their kinetic situation and the ability of walking because of lack of sufficient mobilisation and physical activity. As a result of this situation it was noticed that complications lead to hospitalization and social isolation.²⁰ The role of exercise is important in the increasing of bone mass maintaining bone strength via specific exercises (weight-bearing or strengthening). There are profits through exercising not only in muscular strengthening but also in normal social come back and de-hospitalization.²¹ According to women with hip fractures studies showed that the role of exercise post surgical is very important in regard to the degree of rehabilitation.²²The present study confirms the benefit of exercise and certifies the positive effectiveness of a well-planned personal training program in women with osteoporotic hip fracture. All women showed improvement in both groups but statistically significant showed in the experimental group.The combination of exercise and appropriate diet in children and adolescent constitutes the base for better later quality of life.^{23,24} Results were also very encouraging and they confirm all other studies they also dealt with the parameter of diet. They revealed explicit improvement as much bodily as intellectually-mental with the increase of the sample energy, quick healing of surgical traumas without

serious complications and further health burden. The improvement that was achieved is a result of many factors such as good planning of the intervention program, non-stop attendance of the sample, staying and exercising at home, keeping a pleasant atmosphere, attention and responsibility of all members of the scientific team, right behaviour and understanding the specific problems of osteoporotic women with precise fitting of dietary orders.

Conclusions

A muscle strengthening program in osteoporotic women can improve both their strength and resistance and in combination with appropriate dietary directions their quality of life. Knowing the contribution of daily physical activity from early ages and comprehending characteristics that should have the ideal type of exercise for the increase of bone density; we can plan prevention programs, improving substantially the quality of life in menopause women.

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Π Ε Ρ Ι Λ Η Ψ Η

Σκοπός της έρευνας αυτής ήταν να εκτιμήσει την επίδραση ενός εξατομικευμένου προγράμματος μυϊκής ενδυνάμωσης και αξιολόγησης της διατροφικής κατάστασης στην ποιότητα ζωής γυναικών με οστεοπορωτικό κάταγμα κάτω άκρων.

Το δείγμα αποτέλεσαν 50 γυναίκες με οστεοπορωτικό κάταγμα ισχίου ηλικίας 57-89 ετών χωρισμένες σε δύο ομάδες: πειραματική (n=25) και ελέγχου (n=25).

Στην πειραματική ομάδα εφαρμόστηκε πρόγραμμα μυϊκής ενδυνάμωσης το οποίο διήρκεσε 12 εβδομάδες, ενώ η ομάδα ελέγχου ακολούθησε τις συνηθισμένες καθημερινές δραστηριότητες με ελαφριά μορφής άσκηση.

Πριν και μετά την εφαρμογή του προγράμματος φυσικής αγωγής αξιολογήθηκε η ποιότητα ζωής των γυναικών με οστεοπορωτικό κάταγμα ισχίου. Χρησιμοποιήθηκαν δύο τύποι ερωτηματολογίου: οστεοπορωτικό και διατροφής.

Για την στατιστική ανάλυση των δεδομένων χρησιμοποιήθηκαν τόσο η περιγραφική όσο και η επαγωγική στατιστική. Όσον αφορά στην περιγραφική στατιστική, υπολογίστηκαν και παρουσιάστηκαν οι μέσες τιμές, τυπικές αποκλίσεις και συχνότητες εμφάνισης. Η κύρια ερευνητική υπόθεση εξετάστηκε με την ανάλυση διακύμανσης δύο παραγόντων με επαναλαμβανόμενες μετρήσεις (2-way ANOVA with repeated measures).

Από τα αποτελέσματα φάνηκε ότι, το πρόγραμμα φυσικής αγωγής επέδρασε θετικά στην πειραματική ομάδα των γυναικών με οστεοπορωτικό κάταγμα ισχίου και βελτίωσε την ποιότητα ζωής τους. Μικρή βελτίωση παρατηρήθηκε και στην ομάδα ελέγχου.

Συμπεραίνεται ότι, οι γυναίκες με οστεοπορωτικό κάταγμα ισχίου έχουν πολλά περιθώρια βελτίωσης της ποιότητας ζωής τους τόσο σε επίπεδο κίνησης και φυσικής κατάστασης όσο και σε επίπεδο διατροφής. Άλλωστε, η μυϊκή ενδυνάμωση αποτελεί μια ιδιαίτερα αποτελεσματική μέθοδο παρέμβασης αφού βελτιώνει τη λειτουργικότητα των άκρων στα άτομα αυτά με θετικό αντίκτυπο και στις δραστηριότητες της καθημερινής τους ζωής.

Λέξεις κλειδιά: οστεοπορωτικά κατάγματα, γυναίκες, άσκηση, ποιότητα ζωής, διατροφή, μυϊκή ενδυνάμωση.