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The effects of regular physical exercise on the values of the physical properties and body compositions of breast cancer patients in remission

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Abstract

The aim of this study is to determine the effect of regular physical exercises (step aerobics and resistance exercises) on physical properties and body compositions values of breast cancer patients in remission. In this study; sampling was formed three groups by 30 breast cancer female patients in remission that mean aged 53,13±6,45; step aerobics (n=11), resistance (n=10) and control (n=9); which completed anti-cancer cure in Akdeniz University Medical Faculty Hospital in the Medical Oncology Clinic. They were conducted as randomized controlled selection and homogeneous property. For patients in exercise groups, particular exercise programs (step aerobics and resistance) which take an hour in a day, three days in a week, 12 weeks were applied, but control group were not included in exercise program. Physical properties; height, weight and body mass index (BMI) and body compositions; body fat percentage (BF%), body fat mass (BFM), fat-free mass (FFM), skinfold measurements (SF triceps, SF suprailiac, SF thigh, SF body fat percentage) were conducted to all patient groups before and after this study. Statistical analysis of the difference between pre-post test measurements of physical characteristics and body composition values of patients; Wilcoxon Test was used for nonparametric tests ($p < 0.05$). Statistical significance was also assessed by MannWhitney U test ($p < 0.05$) by comparing Kruskal Wallis test with the percentage of difference between the physical characteristics and body composition of the whole group and the difference between the pre-end test values of the groups. The results of the study, positive results were appeared on regular physical exercise on patients' physical properties and body compositions values of breast cancer patients in remission. Our study was demonstrated similar results as actual literature. Positive results that decreases in BMI, % Fat, SF thigh in step aerobics exercise group, % Fat, SF thigh and SF % Fat values, increases in FFM values in resistance exercise group. However, negative results that increases in BMI, SF suprailiac values, decreases in FFM in control group.

Keywords: Body composition, breast cancer, physical properties, regular exercise

INTRODUCTION

Cancer, which is considered among the chronic diseases, is seen as one of the most important health problems of our time because of its high frequency, often lead to a high rate of death, and the increased environmental carcinogenic factors. Cancer makes the individual's lifespan, and quality of life be adversely affected by the physical, psychological, and socio-economic problems it creates (Aydın Bektas ve Akdemir, 2006). The duration of survival of patients with cancer has been increased with the drug therapies, radiation, and surgical procedures applied in cancer treatment. Typically, a decrease has been seen in physical and psychosocial well-being of patients after the operations. Sports and exercise play an important role as being one of the adjuvant therapies in solving or at least minimizing such problems.

Exercise prevents or reduces the general response of the side effects with regard to the treatment of cancer patients (ACSM's, 2000; Zhou, 2007). Benefits of physical activity to patients with cancer are decreasing the risk of cancer by reducing the fatigue, nausea, body fat ratio, anxiety and depression, developing muscle strength, lean body mass, aerobic capacity and immune system, and increasing the quality of life (Apozgen Zengin, 2013). While most researchers conducted their studies on pro-treatment period of cancer patients, a very small number of research was conducted during their treatment. Exercise programs with cancer patients have positive effects on the physical performance, fatigue, emotional status, and the quality of life. However, such an important topic couldn't get the desired importance in both clinical practice and the literature (Eyigör et al., 2010).

It has been reported that exercise may be beneficial to prevention and reduction of fatigue and the quality of life of the patients in the early phase of breast cancer (Mock et al., 1997). In addition, exercise is a method that provides positive developments in terms of the quality of life, cardiorespiratory fitness, physical function and fatigue for the patients with breast cancer (Fong et al., 2012; McNeely et al., 2006). Prospective studies have been made on women with breast cancer illustrates that regular exercise during the disease diagnosis, treatment and pro-treatment periods reduces the mortality by 50% (Irwin et al.,2008; Mutrie et al., 2007). Regular exercise is a factor that has positive effects on pain, movement restriction, and lymphedema. The women who were treated for breast cancer are in need of sport rehabilitation. It must include postoperative arm exercises and appropriate exercises to prevent lymphedema. According to the researches, it is possible to eliminate the detrimental effects when the exercise is done right and guided. In order to avoid the decrease in shoulder mobility, it is important to do active arm exercise (Galva'o and Newton, 2005; Giuliano, 2004). While there are some studies that illustrates the positive effect of physical activity on cancer patients, there are not a lot of studies that demonstrates the effects of strength and endurance exercise. It has been found in a few study that there are positive effects of resistance exercise on the physical capacity, fatigue, and the quality of life of cancer patients (Zopf et al.,2013; Wehrle et al., 2013). In the light of the literature review above, exercise has been found to be a key factor in the development of physical fitness parameters for breast cancer patients.

In our study; The effects of aerobic and resistance exercises on patients with remission breast cancer were similar to the literature and showed positive results in physical characteristics and body composition. In recent studies similar exercises have generally been applied. In our study, exercise groups were composed of aerobic and resistance exercise groups. Also, unlike other studies, the control group was included in the study.

The aim of the study is to determine the influence of different 12-week exercises programs (step aerobic and resistance exercises) applied to patients with breast cancer on their physical characteristics and body composition.

METHOD

Participants of the Study

The participants of the study are formed by 30 women patients with breast cancer (an average age of 53,13 ± 6.45 years) in remission in Medical Oncology Clinic of Akdeniz University Medical Faculty Hospital carrying the following features; not having physical disabilities at a level that prevents the person from doing exercise, acknowledging to work, not having problems related to communication and transport to the place of the exercise, not having the medical history of metastatic, cerebrovascular accident (CVA), cardiac, neurological and psychiatric disease. The participants are identified as the first group step aerobics (n=11), the second group resistance exercise (n=10), and the third group control (n=9) as a result of a randomized controlled trial. Exercise groups consists of female patients living in Antalya that volunteer for regular physical exercise application for a period of 12 weeks. The approval for the research was received by the Ethical Comittee for Clinical Trials of Akdeniz University Faculty of Medicine.

Materials and Procedures

Physical properties; height, weight, body mass index (BMI) and body composition; body fat percentage (BF%), body fat mass (BFM), fat-free mass (FFM), skinfold measurements (SF Triceps, SF Suprailiac, SF thigh, SF body fat percentage) were examined in all the patients participating in the study groups before and after 12 weeks of study. Pre-test and post-test of the participants were performed in a lab environment while different types of workouts were carried out in the gym and walking track. The exercise groups who participated in the study were scheduled for indoor and outdoor activities for an hour a day and three days a week for a period of 12-week exercise program. The control group were chosen from the patients who couldn't attend to the exercise programs for certain reasons and they didn't involve in the program. Considering the operations that the patients had, a variety of exercises that will allow the expansion of the movement areas were done against the physical challenges and difficulties in providing their self-care. With the program implemented, waiting for development in physical characteristics and body composition, it also had a rehabilitation feature that will support the immune system and reduce the side effects of the treatment received. Step aerobic exercises and resistance exercises were specified according to their level of patients by doctors' control and applied to patients as supported by the literature (Fong et al., 2012; Knols et al., 2005; Schneider et al., 2003).

Exercise program

Both groups (step aerobics and resistance) participating in the study were given specific exercise programs (indoor and outdoor activities) for one week, three days a week for 12 weeks. The control group was selected from patients who could not participate in exercise programs due to certain reasons and was not included in the exercise program. The exercise program consists of static and dynamic exercises to reduce movement restriction and weakness, especially in the shoulder and arm region. Improvement of physical fitness with physical training program, improvement of muscle fatigue, improvement of muscular endurance, development of aerobic endurance, improvement of flexibility and balance parameters have been promoted to increase the body resistance and to support the immune system and reduce the side effects of the treatment. Step aerobic and resistance exercises were determined by the physician according to the patient's level and status. Aerobic exercises include simple

mattress movements, upper and lower extremity exercises, and a stepper with aerobics on music accompaniment. The exercises included low-intensity activities directed at music accompanied by large muscle groups. The intensity of the exercise did not exceed 50% of the heart rate of the patients and increased by 5% every two weeks, but never exceeded 70% of the intensity. Individual programs were applied within the group exercises considering the loss of the average age of the patients participating in the grub and the losses in the shoulder functions caused by the disease. The resistance exercise group was initially assessed and the key elements of the supine, prone, lateral-lying and standing postures were taught before the exercise program. These key elements are: respiration (diaphragmatic), focus (neutral position), chest wall placement, shoulder placement, head-neck placement (neutral position). The intensity of the exercise did not exceed 50% of the heart rate of the patients and increased by 5% every two weeks, but never exceeded 70% of the intensity. In this program, upper and lower extremity exercises were performed for strength development with elastic bands (thera-band), elastic tubes (thera-tube) and balance balls (pilates ball). Starting with the simple level, the exercise levels were increased to moderate according to the patients' development. During the first weeks, active hand and elbow exercises were performed. It was followed by isometric hand and forearm exercises. Subsequently, pain in the shoulder joint (flexion, abduction, internal and external rotation) was done. Stretching exercises, pendulum exercises, strengthening of the chest and back muscles and posture exercises were added to the resistance exercise program in the following days. Within this program, static, dynamic exercises and pilates movements were made to restrict movement and weakness in the shoulder and arm region. Thus, strengthening of the trunk muscles is aimed at joint mobility, balance and coordination.

Data collection protocol

"Voluntary informed consent form" and "there's no harm in doing sports" document has been requested by the participants. From the physical properties and body composition parameters, height was measured with Stadiometre (Holtain), weight and body composition were measured with TANITA, and skin fold thickness was measured with skinfold callipers.

Statistical Analyzes

In the evaluation of data; by producing the descriptive statistics of physical properties and body composition parameters, the average (X) and standard deviation (Sd), the pre-post test measurements differences between non-parametric Wilcoxon tests, and the level of significance among those was tested. In addition, the level of significance was tested in all groups with Kruskal-Wallis Test by comparing the physical properties and body composition values of the groups in between the percentage of pre-post test and by Mann-Whitney U test to find which group is the source of the gap between the groups.

RESULTS

Descriptive statistics and the pre-post test comparisons Participant's physical characteristics and body composition values are shown in Table 1. There had been positive results in the values of BMI, BF %, and SF thigh in the step aerobics group, in BF%, FFM, SF thigh and SF body fat mass percent age in the resistance group. In the control group, there had been a significant difference between the values of BMI and SF supra; however, this has occurred results in a negative way ($p<0,05$).

Table 1. Descriptive statistics and the pre-post test comparisons of participant's physical characteristics and body composition values

	Step Aerobics (n=11)		**Resistance (n=10)**		**Control (n=9)**	
	Pre test X±Sd	**Post test X±Sd**	**Pre test X±Sd**	**Post test X±Sd**	**Pre test X±Sd**	**Post test X±Sd**
Weight (kg)	75,3±8,0	74,9±6,2	68,7±10,3	69,5±10,6	77,7±10,6	79,5±10,6
	z=-1,511	p=0,131	z=-,296	p=0,767	z=-,593	p=0,553
BMI (kg/m^2)	31,8±3,0	30,4±3,1	27,1±3,6	27,1±3,7	29,9±4,2	31,4±4,3
	z=-2,847	**p=0,004***	z=,280	p=0,779	**z=-1,958**	**p=0,050***
BF (%)	40,6±2,9	38,9±3,1	37,1±6,1	35,6±5,4	39,6±4,1	40,7±4,7
	z= -2,581	**p=0,010***	**z=-2,243**	**p=0,025***	z=-1,126	p=0,260
BFM(kg)	31,2±4,6	29,1±4,6	26,3±7,4	25,3±6,8	31,6±6,5	32,5±7,2
	z=-2,803	p=0,005*	z=-1,584	p=0,113	z=-1,051	p=0,293
FFM (kg)	45,3±2,5	45,4±2,9	42,6±3,1	43,7±3,7	46,9±3,5	44,8±2,5
	z=-,356	p=0,722	**z=-2,397**	**p=0,017***	**z=-2,028**	**p=0,043***
SF Triceps (mm)	33,2±7,1	30,0±6,7	28,0±4,5	26,0±5,7	31,1±3,5	31,4±3,2
	z=-,889	p=0,374	z=1,479	p=0,139	z=-,479	p=0,632
SF Supra(mm)	29,1±4,5	26,8±9,3	25,5±6,5	24,1±7,5	31,5±6,4	36,6±6,4
	z=-,979	p=0,328	z=-,612	p=0,541	**z=-2,018**	**p=0,044***
SF thigh (mm)	36,7±12,8	32,7±12,5	39,2±3,4	29,8±8,8	38,5±3,5	39,4±4,4
	z=-2,240	**p=0,025***	**z=-2,547**	**p=0,011***	z=-,987	p=0,323
SF body fat mass (%)	37,9±2,7	35,2±5,3	35,4±3,0	31,6±5,1	37,3±2,5	38,8±3,0
	z=-1,778	p=0,075	**z=-2,191**	**p=0,028***	z=1,836	p=0,066

***p<0,05**

The results of the comparison of differences among the physical properties (weight, BMI) and body composition (BF%, BFM, FFM, SF triceps, SF suprailiac, SF thigh, SF body fat mass) measurements of step aerobics, resistance and control groups before and after the exercises are shown in percentages (%) in Table-2. Significant differences in statistical values among BMI, BF%, BFM, FFM, SF thigh and SF body fat mass as a result of the comparison of the difference in pre-post test of the physical characteristics and body composition analysis of the patients among the groups (p<0,05). The difference in the BMI parameter was derived from step aerobics-resistance and step aerobics-control groups. This difference stems from the fact that the BMI values of step aerobic exercises are significantly and positively changed compared to the other two groups. The difference in the BF% parameter was derived from the resistance-control and step aerobic-control groups. This difference is due to the significant and

positive change of the BF% values of the step aerobic and resistance exercisers according to the control group. The difference in the BFM parameter was derived from step aerobic-control groups. This difference is due to the significant and positive change in the BFM scores of the step aerobic exercise group compared to the control group. The difference in the FFM parameter was derived from the resistance-control and step aerobic-control groups. This difference stems from the fact that the FFM of the resistance exercise changed significantly and positively against the control group. The difference in the SF thigh parameter was due to the resistance-control and step aerobic-control groups. This difference is due to the significant and positive change of the SF Thigh values of those who exercise step aerobics and resistance compared to the control group. The difference in the SF BFM parameters is due to the resistance-control and step aerobic-control groups. This difference is due to the significant and positive change of SF BFM values according to the control group in those who exercise step aerobics and resistance. In addition, a statistically significant difference between step aerobic-control groups in terms of SF Suprailiac although there is no difference when that parameter is compared in general ($p < 0,05$).

Table 2. The pre-post test comparison of physical characteristics and physical composition of the patients in percentage (%) difference between groups

Variables	**Step Aero – Resistance (n=11)**		**Resistance – Control (n=11)**		**Step Aero-Control (n=11)**		**General (n=30)**	
Differences in pre-post test	**U**	**p**	**U**	**p**	**U**	**p**	**x^2**	**p**
Weight (kg)	29,00	0,07	41,00	0,74	25,00	0,06	4,78	0,09
BMI (kg)	**27,50**	**0,05***	26,00	0,12	**11,00**	**0,00***	**9,95**	**0,01***
BF (%)	55,00	1,00	**12,00**	**0,01***	**14,00**	**0,01***	**9,62**	**0,01***
BFM(kg)	46,00	0,53	22,00	0,06	**15,50**	**0,01***	**7,08**	**0,03***
FFM (kg)	31,00	0,09	**8,00**	**0,00***	**21,00**	**0,03***	**10,98**	**0,00***
SF Triceps (mm)	54,00	0,94	32,00	0,29	34,00	0,24	1,67	0,43
SF Suprailiac (mm)	53,00	0,89	27,00	0,14	**23,00**	**0,04***	4,12	0,13
SF thigh (mm)	37,00	0,20	**9,50**	**0,00***	**16,00**	**0,01***	**10,83**	**0,00***
SF body fat mass (%)	48,00	0,62	**9,00**	**0,00***	**23,00**	**0,04***	**8,43**	**0,01***

***p<0,05**

DISCUSSION and CONCLUSION

The process which starts by learning the disease cancer continues with the process of treatment and post treatment of the disease. Along with this process, some problems such as physical, social, emotional and psychological problems occur in cancer patients. The problems occurred by cancer can be minimalized by supporting it during and post treatment with adjuvant therapies and a multidisciplinary structure. By the end of the treatment process, the role of doctors and hospital ends, and the patients are alone with the problems that occur with the disease. Sports and exercise plays an important role in solving or minimizing the problems as being an adjuvant therapy. Implemented for the patients in the program, while applying the aerobic exercises to aerobic stepper group, the resistance group is mainly engaged in static, dynamic exercises and pilates movements to avoid restricted mobility and weakness in the shoulders and arms. The movements in the exercise program, are intended to be a guide to apply what

type of exercise program to the cancer patients in accordance with their changes, will help reducing fat with mass movements, improving the physical properties and body composition, strengthening and stretching the muscles, increasing the resistance of the body to support the immune system and carrying the feature of reducing the side effects of the cancer treatment.

There are published systematic reviews and meta-analysis available with regard to exercise (aerobic, strengthening, etc.) in cancer patients, as in many other chronic diseases, both decreases the risk of developing the disease and decreases the physical, physiological, psychological and emotional symptoms occur among diagnosed patients as well as increasing the power of the individual to deal with the disease itself and being at peace with the environment in addition to its positive results within a more powerful communications infrastructure (ACSM's, 2005; Becker et al.,2013, Fong et al., 2012; Knols et al., 2005; McCaughan and Arzola, 2007; McNeely et al., 2006; Mutrie et al., 2007). Over the past 20 years, exercise started to play an important role in cancer prevention and its control. Courneya and Friedenrich said that physical activity and exercise is important in controlling cancer in all the periods defined as prevention in pre-diagnosis, preparation for the treatment after diagnosis, post-treatment preparation/rehabilitation, improving disease prevention/health and survival of the patient (Courneya and Friedenrich, 1999). It has been concluded that the physical activity that is done after treatment by breast cancer patients have positive effects on their body composition, physical function, physiological output, and the quality of life (Fong et al., 2012). There is no enough evidence that shows which type of exercise is more effective for breast cancer patients in postoperative period (McCaughan and Arzola, 2007). The most commonly used exercises are aerobic exercises, empowerment and resistance exercises, joint range of motion exercises and stretching exercises (Harris et al., 2012; McNeely et al., 2006). Exercise programs in patients with breast cancer in the literature are applied in the form of 6, 8, 10 or 12 weeks (Fong et al., 2012; McKenzie and Kalda, 2003; Schmitz and Speck, 2010).

In the light of the literature, it can be said that the exercise program should be included because there is a decrease in muscle mass and increase in the fat mass when the values of the body composition values of the cancer patients after treatment are analysed. Segal and his friends have made a research on the effects of 24-week aerobic and resistance exercise on the physical fitness, body composition, some hormone and blood values of the patients undergoing radiotherapy. As a result, it has been found that resistance exercise prevents the increase of body fat and aerobic exercise develops physical suitability (Segal et al., 2009). 242 breast cancer patient has participated to the study of Courneya and his friends, the patients have worked in aerobic and resistance exercise groups for 18 weeks, no significant difference quality of life has been observed as a result of the exercises while some significant improvements have been found in their self-esteem, physical fitness and body composition (Courneya et al., 2007). In a study done in the USA, aerobic exercise has been applied to 60 breast cancer patients and their body composition has been compared with the control groups; it has been found out that there is a significant decrease in BMI, FFM and SF values (Drouin, 2002). As a result of the meta analyses with regard to the participation of breast cancer patients to the physical activity and its comparison with the control group, a decrease in some body composition parameters as BMI and body weight has occurred (Fong et al., 2012).

In our study, the physical properties and body composition values of 12-week step aerobic and resistance groups gave positive and meaningful results by showing similarity with the literature. In the light of these results, we believe that as step aerobic exercise and resistance exercise will contribute to the body composition of breast cancer patients, in particular, a reduction in body fat percentage will occur, the decrease of the weight gained after the treatment is important for the physical and psychological health as well as it they will reduce the risk of the catching the disease and will make positive impact on breast

cancer patients in remission getting back in shape. It has been clearly found out that there are beneficial effects of exercise when the two groups in which the participants do exercise and don't exercise are compared.

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