



ORIGINAL ARTICLE

Effects of a combined strength and high-intensity aerobic exercise program in breast cancer survivors: A pilot study



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Received 4 August 2015; accepted 27 October 2015

Available online 21 December 2015

KEYWORDS

IGF-I;
Breast cancer survivors;
Quality of life;
Fatigue;
Strength exercise training;
Physical activity

Abstract

Introduction: The purpose of this study was to determine the effects of a combined strength and high-intensity aerobic exercise program on the quality of life (QOL), fatigue, peak oxygen consumption, strength and IGF-I in breast cancer survivors (BCSs) who had undergone surgery, chemotherapy and/or radiation therapy and were being treated with tamoxifen.

Methods: Eight BCSs followed the exercise program three times per week for 22 weeks at an intensity of 80%. Heart rate reserve (HRR), strength, QOL, fatigue and insulin-like growth factor-I were evaluated.

Results: The eight participants had a 97.8% adherence rate to the training program. Increased peak oxygen consumption (20%), increased strength (56.9%) in the arm without lymphadenectomy (AWL), and increased strength (104%) in the lymphadenectomy arm (AL) were observed. QOL was improved (24%) according to the SF36 and the FACT-B scales. Both general and mood fatigue decreased (67.7%), as did the plasma IGF-I levels (22.8%).

Conclusions: A program of incremental strength and aerobic exercise at 80% of the HRR may be effective in improving QOL, maximum oxygen consumption, and strength and in decreasing fatigue and plasma levels of IGF-I in BCSs and does not generate or exacerbate lymphedema.

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PALABRAS CLAVE

IGF-I;
 Supervivientes al
 cáncer de mama;
 Calidad de vida;
 Fatiga;
 Ejercicios de fuerza;
 Actividad física

Efectos de un programa combinado de ejercicios de fuerza y aeróbicos de alta intensidad en personas supervivientes al cáncer de mama: estudio piloto

Resumen

Introducción: El objetivo de este estudio fue determinar los efectos de un programa combinado de ejercicios de fuerza y aeróbicos de alta intensidad sobre la calidad de vida, la fatiga, el consumo máximo de oxígeno, la fuerza y el IGF-I en personas supervivientes al cáncer de mama que habían sido sometidas a cirugía, quimioterapia y/o radioterapia y tratadas con tamoxifeno. **Métodos:** Ocho supervivientes al cáncer de mama siguieron el programa de ejercicios, 3 veces por semana durante un periodo de 22 semanas, con una intensidad del 80%. Se evaluaron la reserva del ritmo cardíaco (HRR), la fuerza, la calidad de vida, la fatiga y el factor de crecimiento insulínico tipo 1 (IGF-I).

Resultados: Los 8 participantes reflejaron un índice de adherencia del 97,8% al programa de entrenamiento. Se observaron el incremento del consumo máximo de oxígeno (20%), el incremento de fuerza (56,9%) en el brazo sin linfadenectomía y el incremento de fuerza (104%) en el brazo con linfadenectomía. Se produjo una mejoría de la calidad de vida (24%) con arreglo a las escalas SF36 y FACT-B. Disminuyeron la fatiga general y el desánimo (67,7%), al igual que los niveles plasmáticos del IGF-I (22,8%).

Conclusiones: Un programa en el que se incremente la fuerza y el ejercicio aeróbico al 80% del HRR puede resultar eficaz para mejorar la calidad de vida, el consumo máximo de oxígeno y la fuerza, y disminuir la fatiga y los niveles plasmáticos de IGF-I, en las personas supervivientes al cáncer de mama, no generando ni exacerbando el linfedema.

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Introduction

Breast cancer is a neoplasia that requires intense and prolonged treatment with coadjuvant treatments, generating various psychological and physiological effects. These effects negatively affect the quality of life (QOL) of breast cancer survivors (BCSs) and can last for many years.

The severity and duration of symptoms depend on the type of treatment. The effects of radiation therapy, chemotherapy, and surgery are not limited to tumor cells. These treatments damage previously healthy tissues, and their effects have been correlated with fatigue, sleepiness, anxiety, and emotional stress in BCSs. Fatigue has been estimated to affect 96% of patients who receive chemotherapy treatment and 78–100% of those who have undergone radiotherapy.¹ Approximately 48% of these patients present symptoms of depression and anxiety.² Some studies have indicated that radiotherapy may be involved in myocardial interstitial fibrosis and atherosclerosis in the coronary and carotid arteries.³ Chemotherapy and radiotherapy can be linked to left ventricular function disorders due to alterations in ventricular morphology, an abnormal relationship between pressure and volume, and a decreased left ventricular ejection fraction.³ Additionally, surgery can be accompanied by axillary dissection, which together with radiotherapy, leads to a higher risk of lymphedema development.

The effects of insulin-like growth factor (IGF) on the stimulation of cell proliferation, mitosis, and apoptosis have been demonstrated and can induce the transformation of normal cells into cancerous cells and promote tumor development.³ Experiments on transgenic mice have shown that the over-expression of IGF-I leads to increased rates of

mammary tumors.⁴ High IGF-I plasma levels are associated with increased mammographic density and tumors that carry BRCA1 mutations.

Epidemiological studies, systematic reviews, and meta-analyses of randomized controlled trials have revealed a direct association between IGF-I plasma levels and the risk of breast cancer,⁵ suggesting that women with high IGF-I levels or low IGF-BP-3 plasma levels have higher relative risks (1.5–1.6 times) of developing breast cancer compared with women with lower levels. Pre-menopausal women with IGF-I levels in the highest quartile may have twice the risk of developing breast cancer as those in the lowest quartile. Conversely, low IGF-I levels are associated with decreased cancer risk.⁶ Several studies have demonstrated a relationship between high concentrations of IGF-I and the risk of recurrence and death in BCSs.⁷

There is now ample epidemiological and experimental evidence for the role played by physical activity in the rehabilitation of female BCSs. Meta-analyses and systematic reviews of randomized clinical trials have confirmed the positive effects of physical exercise on biological and cardiopulmonary function and the reduction of sex hormones, body fat mass, insulin, IGFs, adipocytokines, and mammographic density, as well as increased immune function and improved antioxidant defense systems and QOL in BCSs.^{8,9}

Studies conducted in rats¹⁰ and in humans have shown that physical exercise during and after chemotherapy sessions protects the cardiovascular system from the cardiotoxic agents contained in chemotherapeutic agents (e.g., cyclophosphamide, methotrexate, 5-fluorouracil, anthracycline-based drugs, and taxanes) by increasing endothelial nitric oxide synthesis and attenuating chemotherapy-induced lipid peroxidation in the myocardium.

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