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ORIGINAL ARTICLE

Effect of pilates exercises on shoulder range of motion after breast cancer surgery

Efeito dos exercícios de pilates na amplitude de movimento do ombro após cirurgia de câncer de mama

Sabrina Cristina Ribeiro[1], Samanta Dias de Souza[1,2], Bruna Luiza Thesolim[1], Regiane Luz Carvalho[1], Anita Belloto Leme Nagib[1,3], Vanessa Fonseca Vilas Boas[1,4], Laura Ferreira de Rezende[1,5,6]

ABSTRACT

Introduction: Breast cancer surgery can potentially impair shoulder function by decreasing muscle strength and range of motion and, consequently, limiting activities of daily living. Advances in cancer diagnosis and treatment have increased patient survival, and functional rehabilitation is crucial to enhance quality of life. Studies show that Pilates exercises may improve functional capacity and shoulder range of motion. **Objective:** To evaluate the effectiveness of Pilates exercises on shoulder range of motion (flexion, extension, abduction, adduction, and internal and external rotation) in women who underwent breast cancer surgery. **Methods:** This prospective quantitative study evaluated 42 women who underwent breast cancer surgery. Participants were assessed on admission and after 30 and 90 days of Pilates exercises program. The shoulder range of motion was measured using a goniometer. The study was approved by the Research Ethics Committee of UNIFAE, under Opinion No. 2.727.717. **Results:** There was a statistically significant increase in shoulder flexion (p=0.034), abduction (p=0.027), and external rotation (p=0.044) after the 30-day Pilates program, as well as after 90 days, and a non-significant increase (p=0.06) in internal rotation after the 90-day program. There was still a significant increase (p=0.018) in shoulder extension between 30 and 90 days of Pilates exercises. There were no significant differences in shoulder adduction range of motion between the three time points. **Conclusion:** The 90-day Pilates exercise program increased shoulder flexion, abduction, extension, and external and internal rotation after breast cancer surgery and was effective for shoulder rehabilitation, thus enhancing patients' daily life activities.

Keywords: breast neoplasms, exercise movement techniques, shoulder; rehabilitation.

RESUMO

Introdução: A cirurgia de câncer de mama pode potencialmente prejudicar a função do ombro, diminuindo a força muscular e a amplitude de movimento e, consequentemente, limitando as atividades da vida diária do paciente. Os avanços no diagnóstico e tratamento do câncer aumentaram a sobrevida dos pacientes, e a reabilitação funcional é crucial para melhorar a qualidade de vida. Estudos demonstram que os exercícios de Pilates podem aumentar a capacidade funcional e a amplitude de movimento do ombro. **Objetivo:** Avaliar a eficácia dos exercícios de Pilates na amplitude de movimento do ombro (flexão, extensão, abdução, adução e rotação interna e externa) em mulheres submetidas à cirurgia de câncer de mama. **Métodos:** Este estudo quantitativo prospectivo avaliou 42 mulheres submetidas à cirurgia de câncer de mama. As participantes foram avaliadas na admissão e após 30 e 90 dias de um programa de exercícios de Pilates. A amplitude de movimento do ombro foi medida usando um goniômetro. O estudo foi aprovado pelo Comitê de Ética em Pesquisa da UNIFAE, sob o parecer nº 2.727.717. **Resultados:** Houve aumento estatisticamente significativo na flexão do ombro (p=0,034), abdução (p=0,027) e rotação externa (p=0,044) após 30 dias de exercícios de Pilates, bem como após 90 dias, e aumento não estatisticamente significativo (p=0,06) na rotação interna após o programa de 90 dias. Houve ainda aumento significativo (p=0,018) na extensão de ombro entre 30 dias e 90 dias de exercícios de Pilates. Não houve diferença significativa na amplitude de movimento de adução do ombro entre os três momentos. **Conclusão:** O programa de exercícios de Pilates de 90 dias melhorou a flexão, abdução, extensão e rotação externa e interna do ombro após a cirurgia de câncer de mama e foi eficaz para a reabilitação do ombro, otimizando as atividades de vida diária das pacientes.

Palavras-chave: neoplasias da mama, técnicas de exercício e de movimento, ombro, reabilitação.

[1]Centro Universitário das Faculdades Associadas de Ensino – São João da Boa Vista (SP), Brazil.
[2]Universidade Federal de Itajubá – Itajubá (MG), Brazil.
[3]Universidade Metodista de Piracicaba – Piracicaba (SP), Brazil.
[4]Universidade de São Paulo – São Paulo (SP), Brazil.
[5]Universidade Estadual Paulista "Júlio de Mesquita Filho" – São Paulo (SP), Brazil.
[6]Universidade Estadual de Campinas, Medical Sciences College – Campinas (SP), Brazil.
*Corresponding author: sabrinacribeiro1@fae.br
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INTRODUCTION

Advancements in surgical techniques and complementary and alternative medicine for breast cancer (BC) have reduced the risk of recurrence and metastases and increased disease-free survival. However, surgical therapeutic strategy may cause pain and motor impairment, limiting the shoulder range of motion (ROM) on the operated side, and reducing the quality of life[1].

Reduced shoulder ROM is the most common complication after BC surgery and affects more than 50% of women in the immediate and late postoperative period, limiting upper limb function and activities of daily living (ADLs)[2]. Physical training is the gold standard method for enhancing motor function after BC surgery[3].

Pilates exercises (PE) faciliate the return to ADLs, physical and psychological sequelae of BC surgery, shoulder function and ROM, and consequent quality of life.

PE principles include centralization, concentration, control, precision, flow, and breathing, and the exercises increase muscle strength and flexibility. Mild stretching exercises can help maintain and increase the ROM[3]. PE involve multiple coordinated muscle contractions using an integrated approach and can be adapted to each patient's characteristics and skills[4].

OBJECTIVE

Thus, this study aimed to evaluate shoulder ROM (flexion, extension, abduction, adduction, and internal and external rotation) in women treated for BC surgery after 30 and 90 days of PE.

METHODS

This prospective, quantitative, longitudinal study was performed at the Clinical School of Physical Therapy of the Centro Universitário das Faculdades Associadas de Ensino (UNIFAE), where other extension services are provided to the community of São João da Boa Vista, São Paulo, Brazil. Forty-two women who underwent BC surgery were assessed on admission and after a 30-day and 90-day PE program.

The inclusion criteria were women, aged 40 to 65 years, who had undergone BC surgery at least 1 year before the study began. The exclusion criterion was women with contraindications to physical exercise. Women who did not attend over 25% of the total scheduled classes were excluded from the analysis.

The shoulder ROM on the operated side was measured using a goniometer[5,6]. The participants performed exercises for the upper and lower limbs, trunk, and abdomen using four pieces of equipment—Cadillac, Reformer, Step Chair (Wunda Chair), and Barrel—according to the Pilates Expanded manual. ROM exercises in 50-minute sessions with ten repetitions were performed individually twice a week for 90 days under the supervision of a physical therapist.

The study was approved by the Research Ethics Committee of UNIFAE, under Opinion No. 2,702,640. All participants signed an informed consent form.

The equipment used in Pilates activities was purchased with a grant from the National Council for Scientific and Technological Development (CNPq) — Ministry of Science, Technology, and Innovation's public call for proposals No. 01/2016, and process No. 428926/2016-9.

Data were transferred to Microsoft Excel spreadsheets and analyzed using the Statistical Package for the Social Sciences (SPSS), version 22.0. Comparisons between groups were performed using repeated-measures analysis of variance[7]. A two-tailed p-value of less than 0.05 was considered statistically significant.

RESULTS

The average time elapsed since BC surgery in our cohort was 7 years, with a standard deviation (±) of 5 years. Average age was 57.62±12.91 years and body mass index was 28.18±4.67 kg/m^2. A total of 40.48% of patients completed higher education, and 30.95% did not complete elementary school.

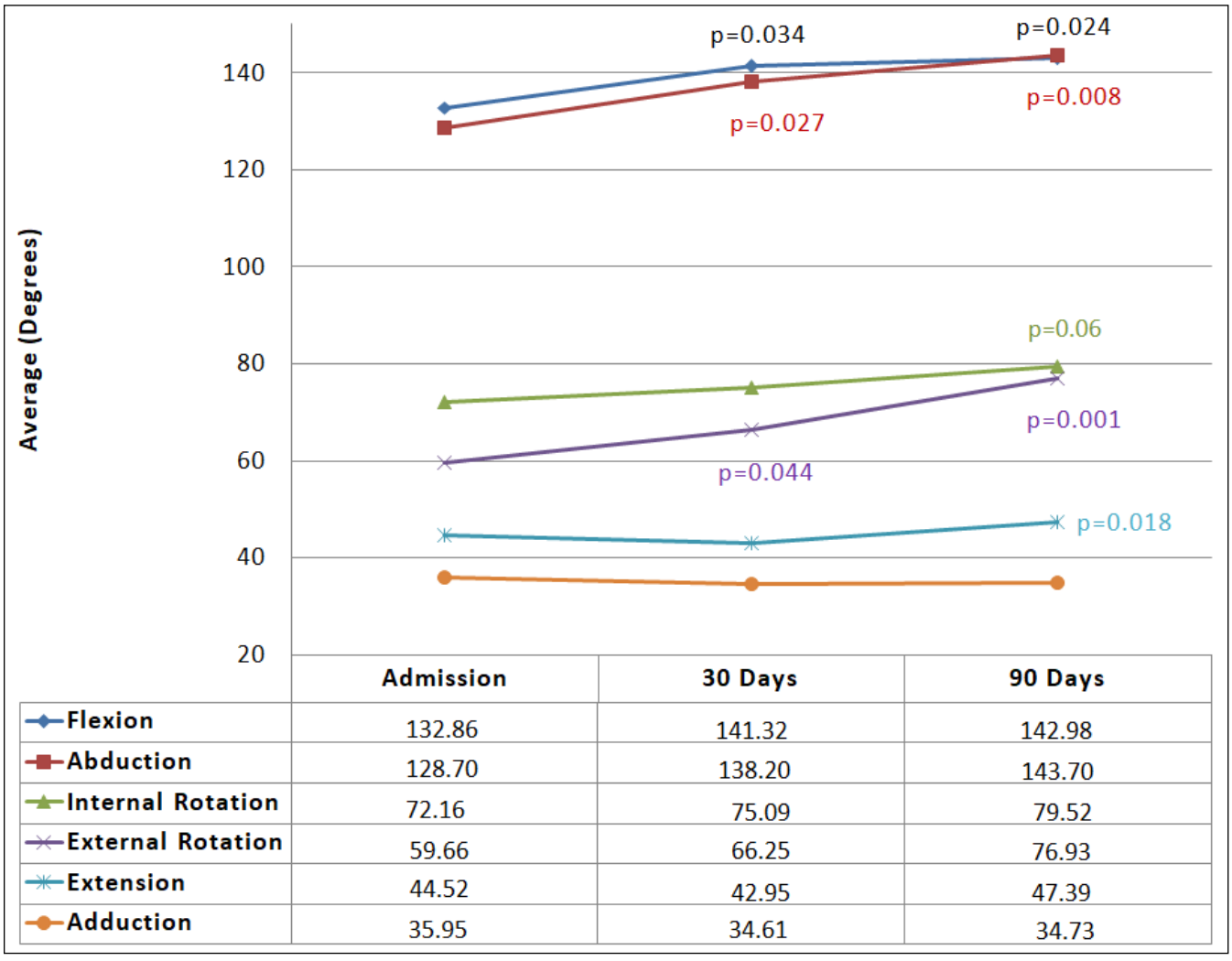
The mean increase in shoulder ROM in the 30- and 90-day PE program was 8.3 and 10 degrees, respectively. The 30- and 90-day program increased shoulder abduction ROM by 9.2 and 15 degrees, respectively, and shoulder internal rotation by 3 and 8 degrees, and external rotation by 6.2 and 17 degrees, correspondingly. The improvement in ROM over the 90-day study period is shown in Figure 1. There was a significant increase in shoulder flexion (p=0.034), abduction (p=0.027), and external rotation (p=0.044) after the 30-day PE program, as well as after 90 days, and a non-significant increase (p=0.06) in internal rotation after the 90-day program. There was a significant increase (p=0.018) in shoulder extension between 30 and 90 days of PE. There were no significant differences in shoulder adduction ROM between the three time points.

DISCUSSION

BC surgery impairs upper limps motor function and limits shoulder mobility[1]. Developing strategies for preventing and treating functional impairment[2] is crucial to improve functional recovery and quality of life in the affected population[8].

Keays et al. found that three one-hour PE sessions per week for 12 weeks increased shoulder flexion and external rotation in four women[9].

Alpozgen et al. observed that three PE sessions per week for eight weeks, including shoulder stretching, ROM exercises, breathing, and strengthening reduced shoulder pain, and improved strength, flexion, abduction, and internal and external rotation in 55 female patients[3].



	Admission	30 Days	90 Days
Flexion	132.86	141.32	142.98
Abduction	128.70	138.20	143.70
Internal Rotation	72.16	75.09	79.52
External Rotation	59.66	66.25	76.93
Extension	44.52	42.95	47.39
Adduction	35.95	34.61	34.73

Figure 1. Improvement in ROM over the 90-day study period.

Stan et al. reported that thirty-six 45-minute PE sessions significantly increased shoulder abduction ROM and internal rotation and elevated psychological parameters, quality of life, mood, and body image in 15 female participants[10].

The studies cited above demonstrated that PE programs improve shoulder ROM in all planes of movement (flexion, abduction, and internal and external rotation)[5,6,9]. In our cohort, PE improved shoulder flexion, abduction, extension, and internal and external rotation.

Strengths

To show that shoulder ROM can be increased with PE in women after breast cancer surgery, improving activities of daily living.

Limitation

Unblinded longitudinal study, which may have presented bias.

CONCLUSION

A 90-day PE program after BC surgery increased shoulder flexion, abduction, extension, and internal and external rotation and was effective in improving shoulder ROM, which enhanced patients' activities of daily living.

PARTICIPATION OF EACH AUTHOR

SCR: Concept, design, data collection, bibliographic review, article writing and critical review of the article. SDS: Data interpretation, statistical analysis, article writing and critical review of the article. BLT: Design and methodology. RLC: Concept, design, data collection, critical review of the article. ABLN: Concept, design, data collection, critical review of the article. VFVB: Concept, design, data collection, critical review of the article. LFR: Concept, design, data collection, critical review of the article, final approval of the manuscript.

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