







Musculoskeletal, cardiorespiratory, anthropometric and sensorial changes following breast cancer surgery

Alterações musculoesquelética, cardiorrespiratória, antropométrica e sensorial após cirurgia de câncer de mama

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Abstract

Introduction: Breast cancer is the second most common malignant neoplasm in women. Surgical intervention is one of the recommended treatments, which can lead to significant physical and sensorial sequelae. **Objective:** To analyze the musculoskeletal, cardiorespiratory, anthropometric and sensorial functions of women who underwent breast cancer surgery. **Methods:** An observational, cross-sectional study with women who underwent surgical resection of breast tumors at Amaral Carvalho, a reference hospital in the countryside of the São Paulo State, Jaú/SP, Brazil. Three assessments were obtained: pre-surgery (Ass1), one day after the surgery (Ass2) and 15 days after surgery (Ass3). Sociodemographic and gynecological data were collected, and anthropometric, cardiovascular, dermal sensitivity, range of motion (ROM) of the upper limbs, peripheral oxygen saturation (SpO₂), inspiratory muscle strength (PImax), peak expiratory flow (PEF) and thoraco-abdominal mobility assessments were performed. Data were evaluated by repeated measures ANOVA and Wilcoxon statistical test with a Bonferroni correction ($p < 0.05$). **Results:** Eighteen women, with a mean age of 57.44 ± 9.35 years, mainly with the left side affected (61.1%) and lymphadenectomy performed in 50% of the cases. Differences were found in systolic and diastolic blood pressure, PEF and SpO₂, axillary ROM index (Ass1>Ass2), PImax (Ass3>Ass2), perimetry (Ass2>Ass3), ROM in all axes of shoulder motion and wrist flexion (Ass2<Ass1), and sensitivity alteration close to the surgical wound (Ass3>Ass2 and Ass1). **Conclusion:** The surgery for breast cancer excision resulted in hemodynamic and respiratory changes, especially on the first day after the procedure, returning to baseline values approximately 15 days later.

Keywords: Breast neoplasms. Physical examination. Segmental mastectomy.

Resumo

Introdução: O câncer de mama é a segunda neoplasia maligna mais encontrada entre as mulheres, sendo a intervenção cirúrgica um dos tratamentos preconizados, o que pode acarretar sequelas físicas e sensoriais importantes. **Objetivo:** Analisar as funções musculoesqueléticas, cardiorrespiratórias, antropométricas e sensoriais de mulheres submetidas ao procedimento cirúrgico para neoplasia mamária. **Métodos:** Estudo observacional e transversal com mulheres que realizaram procedimento cirúrgico para ressecção de neoplasia mamária assistidas no interior paulista, Jaú/SP. Foram realizadas três avaliações: pré-cirurgia (AV1), um dia (AV2) e 15 dias após a cirurgia (AV3). Foram coletadas informações sociodemográficas e ginecológicas e realizadas avaliações antropométrica, cardiovascular, sensibilidade dérmica, amplitude de movimento (ADM) dos membros superiores, saturação periférica de oxigênio (SpO_2), força muscular inspiratória (Pl_{max}), pico de fluxo expiratório (PFE) e mobilidade toracoabdominal. Os dados foram avaliados pelo teste estatístico ANOVA de medidas repetidas e Wilcoxon com correção de Bonferroni ($p < 0,05$). **Resultados:** Dezoito mulheres, de $57,44 \pm 9,35$ anos, tiveram o lado esquerdo mais acometido (61,1%) e a linfonodectomia foi realizada em 50% dos casos. Houve diferenças nas variáveis pressão arterial sistólica e diastólica, PFE e SpO_2 , índice de amplitude axilar ($AV1 > AV2$), Pl_{max} ($AV3 > AV2$), perimetria ($AV2 > AV3$), ADM em todos os eixos de movimento do ombro e em flexão de punho ($AV2 < AV1$) e alteração de sensibilidade próxima à cicatriz ($AV3 > AV2$ e $AV1$). **Conclusão:** A cirurgia para exereses de neoplasia mamária acarretou alterações principalmente hemodinâmicas e respiratórias, sobremaneira no primeiro dia após a cirurgia, retornando aos valores basais aproximadamente 15 dias após o procedimento.

Palavras-chave: Câncer de mama. Exame físico. Mastectomia segmentar.

Introduction

Breast cancer (BC) is a disease caused by the anarchic multiplication of abnormal cells in the breast, constituting a tumor with a metastatic potential. Women are most frequently affected and it is the second most common and lethal malignant neoplasm. The National Cancer Institute (INCA) estimates that the number of new cases of cancer tends to increase in Brazil.¹ The treatment is

very expensive, often inaccessible to many women living in developing countries. In addition, survival rates depend on factors such as the quality of treatment.² Several treatment options with a potential risk of adverse effects are available. One of the interventions for BC is the surgical treatment, which can be aggressive, depending on the disease staging, biological characteristics of the tumor and clinical conditions (age, menopause, pre-existing diseases).^{1,3} This type of intervention can result in changes in the biological systems, and postoperative complications may appear early or late, varying in degrees of severity. The development of lymphedema (the most prevalent complication), for example, caused by partial or complete removal of the lymph nodes, arises from compromised lymph circulation and results in limited range of motion (ROM) of the homolateral shoulder.⁴ The extensive network of blood vessels and nerves in the area, increases the risk of injury during the surgical procedure, which can result in sensory and/or motor alterations. Furthermore, the more tissue that is removed, the greater the likelihood of pain, muscle weakness, axillary cord formation, and consequent reduced functionality and sensitivity alterations.^{5,6} On the other hand, less invasive surgeries are associated with greater preservation of sensitivity in the chest wall up to two years following surgery when compared to the more invasive ones.⁶

Another aspect of interest is that the greater the proximity of the surgery to the diaphragm, the greater the tendency for pulmonary alterations, consistent with those seen in restrictive breathing patterns, which may reach their peak 24 to 48 hours after the procedure. The variables usually subject to alterations are the forced expiratory volume, vital capacity, tidal volume, and respiratory rate.⁷

In the experience of BC diagnosis and treatment, the assessment of body image is essential to understand the stress generated by changes arising from the disease itself and the entire therapeutic process.⁸ Specifically, these changes are related to appearance, psychosocial problems, and physical limitations, causing clinical manifestations in the cardiovascular, respiratory, musculoskeletal, and lymphatic systems.⁹

The perception of the impact of surgical procedures for removal of breast tumor must be individualized, and depends on various aspects, including the biological one. Therefore, it is assumed that the surgery causes musculoskeletal changes that persist after the

intervention, requiring early detection and assessment of musculoskeletal, cardiorespiratory, anthropometric and sensorial functions.

Methods

This was an observational, cross-sectional study, with convenience sampling, conducted at Hospital Amaral Carvalho (HCA) in Jaú, São Paulo, Brazil, and approved by the Research Ethics Committee of the Universidade do Sagrado Coração (protocol no. 1.909.841).

The inclusion criteria were: female gender; age 18 years or older; medical diagnosis of BC; requirement for surgical for breast cancer excision; physical and cognitive conditions to complete the assessment tests; and hemodynamic stability. Women weren't included when they were in terminal stage of the disease; had a history of diagnosis of disabling chronic cardiac and respiratory diseases; or had a history of treatment with radiotherapy and/or chemotherapy; reported cardiothoracic surgical procedures in the previous three months. Data from women who withdrew or were absent at one of the assessment times were excluded. Figure 1 shows the sequence of the study stages and the number of women involved.

Personal, clinical, anthropometric, cardiorespiratory, musculoskeletal, and sensorial data were collected. The assessment techniques are presented below, according to the order of execution at the time of collection. They performed by the same evaluator, with the consent of the physician.

The body mass index (BMI) was calculated using the body weight (Kg) and height, obtained by means of a digital anthropometric scale, BKH 200F, with coupling of the stadiometer (Balmak®, Brazil).¹⁰

The blood pressure was obtained by the auscultatory method, using a calibrated sphygmomanometer, P.A.MED®, with the patient in a sitting position and after a five-minute rest.¹¹ Heart rate (HR) and peripheral oxygen saturation (SpO₂) were measured with a pulse oximeter, PM100, NewTech®.¹² Subsequently, the women were positioned standing for dynamic chest cytometry. A Coats Corrente®, an inelastic tape measure, positioned horizontally and parallel to the ground in the axillary, xiphoid, and abdominal regions, was used to obtain two measurements of maximum inspiration and expiration per region assessed.¹³

The assessment of the global strength of the respiratory muscles was performed using the Comercial Médica® manovacuometer, measurement level of 0 to 120 cmH₂O, in a sitting position.¹⁴ The peak expiratory flow (PEF) was obtained by means of a maximum inspiration followed by a short, explosive, maximum forced expiration, through the measuring device - Mini-Wright Peak flow meter.¹⁵ Three repetitions were required and the mean of the values obtained was accepted. Then, in the same position, the perimeter of the upper limbs was measured using a tape measure (Coats Corrente®) at the pre-established points: 7 and 14 cm from the articular axis of the elbow towards the shoulder; 7, 14, and 21 cm from the articular axis of the elbow towards the hand.¹⁶

The sensorial assessment was performed using the Semmes-Weinstein monofilaments, Sorri®, on the dermatome corresponding to the intercostobrachial nerve, with the patient in the sitting position, arms in 90° abduction, external rotation, and forearm in 90° flexion.¹⁷

The medium goniometer (Futura®), with 0.5-degree accuracy, was used to assess the ROM in the axes of joint movement of the shoulder (flexion, extension, abduction, and adduction) and the wrist (flexion and extension).¹⁸

The Brief Pain Inventory, composed of a 0-10 scale, was used to grade the intensity, interference of pain in the ability to walk, perform daily work and social activities, mood, and sleep.¹⁹

The Shapiro-Wilk test was used to assess for normal distribution of quantitative variables. The descriptive analyses were presented by absolute and relative frequencies for nominal variables [n (%)], and by mean ± standard deviation (data with normal distribution), and median (interquartile range) (data with non-normal distribution) for continuous variables. The behaviors of variables in the three moments were analyzed by means of repeated measures ANOVA test (data with normal distribution) or Wilcoxon test (data with non-normal distribution), with Bonferroni adjustment for multiple comparisons (p < 0.05).

Results

Eighteen women with a mean age of 57.44 ± 9.35 years participated in this study. The sociodemographic data indicated that the majority was Caucasian, with incomplete elementary school, married, and Catholicism was the predominant religion.

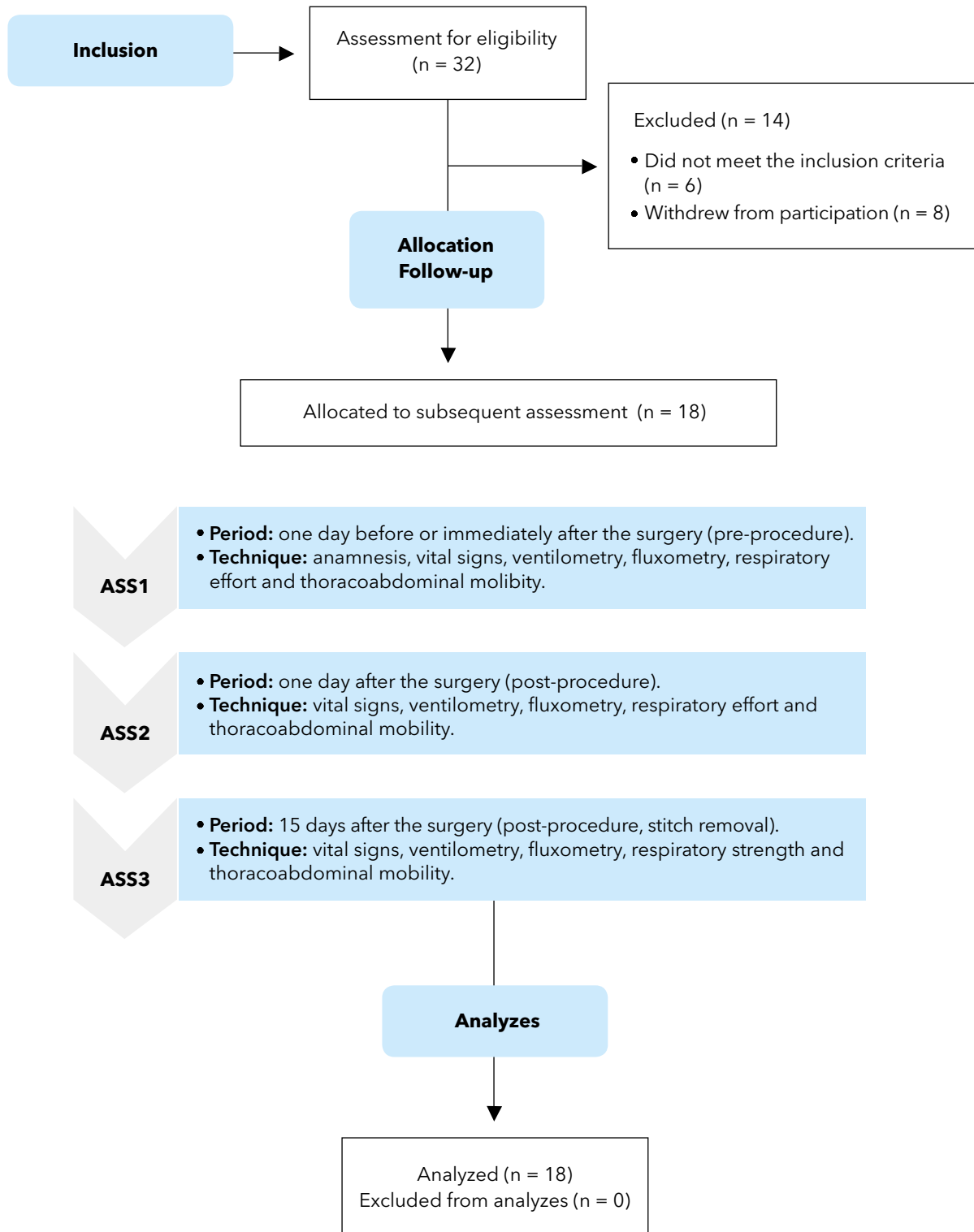


Figure 1 - Sequence of the selection and assessment (ASS) process for women requiring breast tumor excision surgery.

The gynecological history showed menarche with a mean age of 13.2 years, the menopausal phase was found in the majority, and 14 women (77.8%) reported the habit of breast self-examination. The diagnosis of BC was confirmed by biopsy in 16 women (88.9%) and after routine tests (mammography and ultrasonography) in two. Regarding laterality, 15 (83.3%) were right-handed, and most of the surgeries were performed on the left side. The surgical procedures performed were quadrantectomy (22%), mastectomy (28%), lymphadenectomy (28%) and quadrantectomy with lymphadenectomy (22%).

Six women (33.3%) had hypertension, two (11.1%) had diabetes mellitus, and three (16.7%) reported other diseases, with one case (5.6%) of hypertension, diabetes, and obesity.

Table 1 shows the baseline and predicted values of anthropometric and respiratory measurements of the women in the pre-surgical period (Ass1). The sample was classified as being overweight¹⁰ and having expiratory muscle strength below the predicted.¹⁴

Table 2 shows the cardiorespiratory measurements obtained in the three assessments. There was a reduction in PEF, SBP, and DBP at Ass2 compared to Ass1, and increased SBP, DBP, PEF, PImax, SpO₂ at Ass3 compared to Ass2. The values obtained in Ass3, 15 days after the intervention, were similar to the baseline values (Ass1). A reduction in axillary amplitude index (AI) was noticed in Ass2 compared to Ass1.

Table 1 - Anthropometric and respiratory measurements of patients in the pre-surgical assessment

Variable	Value
Weight (Kg)	72.86 ± 14.32
Height (m)	1.58 ± 0.05
BMI (Kg/m ²)	28.06 ± 5.22
Predicted PImax (cmH ₂ O)	82.25 ± 4.52
PImax (% predicted)	99.74 ± 29.76
Predicted PEmax (cmH ₂ O)	96.00 ± 69.92
PEmax (% predicted)	62.65 ± 22.60
PEF (L/min)	333.33 ± 73.91
PEF (% predicted)	85.65 ± 18.34

Note: BMI = body mass index; Predicted PImax = predicted maximal inspiratory pressure; Predicted PEmax = predicted maximal expiratory pressure; PEF = peak forced expiratory flow.

The measurements of the upper limbs circumference, as well as the identification of the filament by means of sensitivity in the surgical wound area are shown in Table 3.

The range of motion of the shoulder, elbow, and wrist segments are presented in Table 4. No statistical difference was found when comparing the ROM between the homo and contralateral shoulders after surgery. Also, the findings did not show pain and its relationships with activities and perceptions (Table 5).

Table 2 - Cardiorespiratory measurements obtained in the consecutive assessments

Variables	Moments		
	ASS1	ASS2	ASS3
PEF (L/min)	333.33 ± 73.91	267.22 ± 64.60*	332.77 ± 70.27**
PImax (cmH ₂ O)	81.77 ± 23.85	68.44 ± 22.98	82.44 ± 28.71**
PEmax (cmH ₂ O)	50.11 ± 17.51	43.88 ± 19.04	51.11 ± 20.28
Axilar AI	4.43 ± 1.76	3.10 ± 1.13*	3.43 ± 1.39
SpO ₂ (%)	96.55 ± 1.54	95.16 ± 2.40*	97.33 ± 1.45**
HR (bpm)	78.16 ± 10.35	80.44 ± 17.01	79.94 ± 12.30
SBP (mmHg)	129.33 ± 14.61	110.00 ± 13.12*	112.61 ± 10.31**
DBP (mmHg)	82.44 ± 6.19	74.11 ± 8.28*	80.22 ± 8.28**

Note: Ass1 = pre-surgery; Ass2 = one day after surgery; Ass3 = 15 days after surgery; PEF = peak expiratory flow; PImax = maximal inspiratory pressure; PEmax = maximal expiratory pressure; axillary AI = axillary amplitude index; SpO₂ = peripheral oxygen saturation; HR = heart rate; SBP = systolic blood pressure; DBP = diastolic blood pressure. *Comparison between Ass1 and Ass2; **Comparison between Ass2 and Ass3.

Table 3 - Perimeter of the hand-arm segment and sensitivity in the surgical wound area in the three assessments

Perimetry	Moments					
	ASS1		ASS2		ASS3	
	R	L	R	L	R	L
14 cm above elbow	32.26 ± 4.30	32.36 ± 4.00	32.48 ± 4.20	32.42 ± 4.11	31.42 ± 3.86†	31.65 ± 3.98
Elbow	26.05 ± 2.60	25.85 ± 2.70	26.29 ± 2.60	26.41 ± 2.72*	25.87 ± 2.54	25.93 ± 2.49†
7 cm below elbow	25.85 ± 2.50	25.37 ± 2.30	25.99 ± 2.30	25.71 ± 2.29	25.55 ± 2.43**†	25.28 ± 2.37†
Hand	16.98 ± 1.40	16.75 ± 1.40	17.28 ± 1.80	7.03 ± 1.24	16.83 ± 1.69†	16.62 ± 1.39
Sensitivity	0.20 (0.2-2.0)	0.20 (0.2-2.0)	1.10 (0.2-2.0)	0.20 (0.2-2.0)	2.00 (0.2-4.0)**†	2.00 (0.2-4.0)**†

Note: Ass1 = pre-surgery; Ass2 = one day after surgery; Ass3 = 15 days after surgery; R = right; L = left. *Comparison between Ass1 and Ass2; **Comparison between Ass1 and Ass3; † Comparison between Ass2 and Ass3.

Table 4 - Range of motion of the shoulder girdle and wrist in the consecutive assessments

Range of motion	Moments						
	ASS1		ASS2		ASS3		
	R	L	R	L	R	L	
Shoulder	Flex	162.00 (152.0-170.25)	159.50 (153.75-170.0)	90.00 (85.75-130.50)*	92.00 (70.75-133.0)*	135.00 (97.50-151.25)**†	116.00 (90.0-142.50)**†
	Ext	40.00 (31.50-45.0)	34.00 (30.0-41.25)	31.00 (25.0-39.25)*	28.00 (20.0-36.0)*	41.00 (32.25-45.0)†	39.00 (31.50-42.75)†
	Ab	155.27 ± 19.02	155.05 ± 22.55	106.88 ± 26.85*	96.66 ± 30.51*	131.72 ± 29.34**†	119.33 ± 34.57**†
	Ad	10.27 ± 4.49	10.05 ± 5.39	7.50 ± 4.70	5.05 ± 4.39*	13.00 ± 7.44	10.33 ± 6.43†
	Int R	75.52 ± 16.11	72.23 ± 18.46	66.62 ± 12.71*	59.25 ± 19.90*	59.33 ± 11.26**	55.28 ± 12.60**
	Ext R	75.94 ± 14.85	79.23 ± 9.09	58.50 ± 22.46*	61.56 ± 20.55*	77.17 ± 11.46†	68.22 ± 13.13**
Wrist	Flex	72.94 ± 10.83	70.77 ± 11.30	65.94 ± 17.00	66.11 ± 12.05	64.50 ± 13.56	66.50 ± 11.32
	Ext	69.11 ± 12.14	65.77 ± 16.26	62.22 ± 15.10*	63.55 ± 15.07	68.33 ± 11.78†	68.83 ± 11.87

Note: Ass1 = pre-surgery; Ass 2 = one day after surgery; Ass3 = 15 days after surgery; R = right; L = left; F = flexion; Ext = extension; Ab = abduction; Ad = adduction; Int R = internal rotation; Ext R = external rotation. *Comparison between Ass1 and Ass2; **Comparison between Ass1 and Ass3; †Comparison between Ass2 and Ass3.

Table 5 - Brief Pain Inventory in the three assessments, considering the 24 hours prior to the questioning

Questions	Moments		
	ASS1	ASS2	ASS3
Worst pain	0.88 ± 2.73	0.00 ± 0.00	1.77 ± 3.59
Low pain	0.61 ± 1.30	1.11 ± 2.72	1.00 ± 2.33
Mean pain	1.00 ± 2.21	0.83 ± 1.87	1.55 ± 3.23
Pain now	0.55 ± 2.02	0.33 ± 0.88	0.72 ± 2.28
Pain relief by medication (%)	11.11 ± 28.86	15.55 ± 37.68	9.44 ± 29.54
General activities	0.38 ± 1.20	0.00 ± 0.00	0.22 ± 1.00
Mood	0.50 ± 1.78	0.27 ± 1.25	0.33 ± 1.50
Walking	0.22 ± 1.00	0.38 ± 1.75	0.44 ± 2.00
Working	0.22 ± 0.77	0.00 ± 0.00	0.27 ± 1.25
Relationships	0.44 ± 1.75	0.16 ± 0.75	0.00 ± 0.00
Sleeping	1.05 ± 3.25	0.61 ± 1.95	1.77 ± 3.70
Enjoying Life	0.72 ± 2.28	0.27 ± 1.25	0.00 ± 0.00

Note: Ass1 = pre-surgery; Ass2 = one day after surgery; Ass3 = 15 days after surgery; 0 = no pain; 10 = worst possible pain.

Discussion

This study aimed to identify possible cardiorespiratory, sensorial, and musculoskeletal alterations in women who underwent excision of BC. An exploratory search of studies related to the our subject did not retrieve similarities in terms of techniques, studied variables, and sample profile, which indicate the originality of this study. Thus, studies with certain similarities will be compared.

The sample had an anthropometric classification of overweight, which is associated with BC. The prevalence of overweight in BC is identified in up to 40 to 50% of cases, and contributes to increased cardiovascular risk, associated comorbidities, and postoperative complications. Thus, weight management should receive attention in the evaluative and therapeutic process of BC.²⁰

Compared to the basal status, a reduction in PEmax was found (values less than 80% of the predicted value), similarly to what was found in a study with 20 women aged 57 ± 15.2 years, who had undergone conservative surgery (quadrantectomy) or mastectomy, whose predicted values for respiratory muscle strength [PImax (43.14%), PEmax (40.09%)] and lung function [PEF (49.86%)] were reduced in the preoperative period.²¹ The authors did not address this finding, however, in the current study, this may be related to the condition of vulnerability to the diagnosis, apprehension about the surgical procedure to be performed and overweight, as weight and sex may influence the generation of expiratory muscle strength.²²

Reduction in PEF (66.11 l/min), axillary AI (1.33 cm) and SpO₂ (1.39%) was found in Ass2 when compared to Ass1. Although the SpO₂ values were within normal limits, a reduction of 2.17% was also identified in the immediate postoperative period when compared to Ass3. The values of PImax and PEF obtained in the Ass3 almost returned to those found in Ass1, indicating a re-establishment of these variables in a short period of time.

Consistent with the current finding, Abreu et al.²¹, evaluated the pulmonary function and respiratory muscle strength of women who underwent oncologic surgery and identified a decrease in inspiratory muscle strength and pulmonary function (forced vital capacity and expiratory volume) after surgery; 12 to 24 hours after surgery, a reduction in PImax (20.2 cmH₂O) and PEmax (10.4 cmH₂O) was found, which were higher than those identified in the our study. Also, PEF did not change,

unlike the present study, in which a reduction of 66.11L/min was identified. A relative degree of respiratory dysfunction was found in the postoperative period, which may be associated with the surgical procedure.²¹

The return to baseline values after a certain period of time following surgery, 15 days later in our study, was also identified in other studies, differing only on the period. Patients diagnosed with BC (n = 41) and surgically treated showed no change in thoracoabdominal expansibility and respiratory muscle strength when comparing the pre-and late postoperative values at 40 days.²³ Therefore, the respiratory occurrences found in this study can be justified by an interference in physical aspects (surgical act and related techniques) and emotional aspects (fear of pain and compromising the surgery, in addition to the attitude of self-protection), which can restrict the breathing pattern.²¹

No changes in pain were observed in any of the activities and assessments. The absence of pain observed in Ass2 was probably due to the use of post-surgical medications. In addition, these medications used in BC surgical procedures may decrease blood pressure, as observed in Ass2 (systolic blood pressure: 19.33 mmHg; diastolic blood pressure: 8.33 mmHg),²⁴ and sensorial changes after surgery were evident, both due to the healing process and to the use of analgesic medications. Notably, breast sensitivity is altered and sensorial loss is partial in most women.²⁵ The sensitivity level of 21 women diagnosed with BC and surgically treated was altered on the homolateral side of the surgery (76.19%), the area surrounding the surgery (57.14%), the axillary region (61.9%), the lateral region of the chest (33.3%), and in the medial region of the arm (42.86%).²⁶ Alteration in tactile sensitivity only in the healing region was identified in our study, with an incidence of 44.44% and more accentuated in the Ass3, a lower value when compared to the aforementioned study. In mastectomized women, the report of pain varied from 54.5% to 36.4% according to the region assessed, and was more intense in the arm.²⁷ Sitting time, quality of life and body image in women who underwent radical mastectomy were also situations that alter mainly the sensation of pain, generating a decrease in quality of life.²⁸ The clinical phenomenon pain exists in cancer, and it is difficult to evaluate and treat, because it involves several mechanisms of manifestations and rating levels. The medication approach contributes to alleviate it, but not to reduce the severity of pain or improve quality of life.²⁹

Musculoskeletal changes were found, especially in the Ass2 when compared to the other evaluations, with reduced ROM and increased perimeter of the arm and hand. In contrast, a study that assessed the circumferences of the upper limb, hand and arm, compared between the preoperative period and the 42nd postoperative day did not find differences, most likely due to the long period of reassessment.³⁰

The perimeter found was lower 15 days after surgery with reduction of ROM in the Ass2; i.e., only in the immediate postoperative period. This is explained by the fact that 78% of the surgical techniques were not composed of more than one procedure, which preserves the area with temporary limitations. Literature data show that 28 women were assessed in the postoperative period of at least two months and the shoulder ROM was globally reduced.³¹ Also, another study showed that 30 mastectomized women, 54.7 ± 9.2 years old, with a mean time between the surgery and the assessment of 10.43 ± 15.61 months, presented a ROM reduction, evaluated by biophotometry, in all shoulder movements, 130.3 degrees for abduction and 149.4 degrees for flexion, which are similar to the values found in Ass3, but below the normal range.³² The surgical intervention on the BC alters the ROM of these movements, and the restriction to movement occurs due to dermal adhesion and pain, especially in cases with greater impairment, resulting in functional reduction.³² However, muscle dysfunction is present in patients with BC, mainly related to sarcopenia and the type of treatment used. The reduction in upper limb muscle strength may be reduced by up to 12-16%, without substantial difference in shoulder muscle strength, but flexibility appears reduced when the procedure was radical mastectomy.³³

This study presented some limitations, such as a reduced sample due to the clinical condition of the inpatients, and a limited access to the patients and to the procedures to be performed. The collection period was limited to the morning period, according to the department's availability and the unit's requirements.

Conclusion

This study aimed to analyze the musculoskeletal, cardiorespiratory, anthropometric and sensory functions of women who underwent surgical procedure for BC.

The findings showed hemodynamic repercussions evidenced by the reduction in arterial blood pressure levels and respiratory repercussions. The reestablishment of these repercussions occurred in approximately 15 days. Musculoskeletal and sensory alterations also occurred in the recent postoperative period, evidenced by the reduction of the ROM of the scapular girdle and in the sensitivity threshold, mainly in the wound area. These findings from this specific sample are important for health professionals that deliver cares for this type of patient to be aware of and grounded on these repercussions, in order to avoid or minimize them and propose specific rehabilitation.

Authors' contributions

All the authors contributed substantially to the design of this manuscript and all approved the final version. IMOS, SRB, CG, MHDC e BM participated in the design, methodology, data analysis and interpretation, and writing of the article, while TTDB contributed to its critical review.

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