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Late morbidity in upper limb function and quality of life in women after breast cancer surgery

Márcia R. Assis¹, Angela G. Marx², Luis A. Magna³, Iracema S. V. Ferrigno⁴

ABSTRACT | Background: Breast cancer is the most common malignancy in Brazilian women. In recent years, there has been great progress in and an increasing number of breast-conserving surgical techniques; however, immediate or late morbidity after surgery, in the form of functional impairment and pain, remains a significant clinical problem. **Objective:** To investigate the relationship between late upper limb functional impairment and the quality of life in women subjected to breast cancer surgery. **Method:** A total of 81 women participated in the study, with the length of time since surgery ranging from one to five years. A survey of upper limb complaints reported by patients was conducted, and the questionnaires Disabilities of the Arm, Shoulder, and Hand (DASH) and the European Organization for Research and Treatment of Cancer (EORTC QLQC-30 and BR23) were applied. **Results:** The correlation between the DASH score and the length of time since surgery determined that the longer the time since surgery, the greater the difficulties in functionality of the upper limb ($r=0.459$; $p<0.0001$). A statistically significant correlation was observed between the DASH score and health-related quality of life. **Conclusion:** Late functional impairment had a significant impact on upper limb function in everyday life and health-related quality of life for women who underwent breast cancer surgery.

Keywords: breast cancer; upper limb; quality of life; rehabilitation.

HOW TO CITE THIS ARTICLE

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● INTRODUCTION

Breast cancer is the most common malignancy among women in Brazil, with an estimated 52,680 new cases in 2012 according to data from the National Cancer Institute (Instituto Nacional do Câncer - INCA)¹. Despite developments in surgical techniques and the increased number of breast-conserving surgeries, post-operative morbidity in the form of functional impairment and pain is a significant clinical problem². Sequelae and other health problems affecting the arm homolateral to the surgery are some of the worst complications resulting from breast cancer treatment and have a significant impact on the daily life of these patients^{3,4}.

Several studies have shown that major morbidity of the upper limb is related to axillary lymphadenectomy, such as lymphedema, pain, numbness, muscle weakness, stiffness, and a limitation of motion in the shoulder homolateral to surgery^{2,4-7}. Estimates of the incidence of all morbidities of the shoulder and arm homolateral to the surgery may vary considerably (7-80%) depending on the type of sequela to be examined, the evaluation period, and the choice of

measuring instruments⁸. Although the studies use different methodologies (length of observation, measurement instruments, sample size, and others), many claim that the functional impairment of the upper limb homolateral to the breast cancer surgery directly influences the psychosocial well-being and the quality of life of these women⁹⁻¹².

Although quality of life is a multidimensional concept with different meanings according to the diversity of life contexts, which includes the maintenance of functional capacity, general satisfaction, personal fulfillment, and social interaction, investigating the quality of life of breast cancer patients contributes to an increasingly better treatment. Studies on quality of life help to guide the directions necessary for effective monitoring that contributes to preventive interventions or short, medium, or long-term treatment of health problems^{13,14}.

In the clinical practice of the rehabilitation department of the Reference Center for Women's Health, it has been observed that a significant portion

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of the patients return for rehabilitation treatment after several months to even years after discharge, with several complaints of upper limb dysfunction that prevents the performance of daily tasks. Although this is an important issue to be analyzed and disseminated, it is still relatively unexplored in the literature. Thus, the present study aimed to determine the significant correlation between late upper limb functional impairment with quality of life and to observe the presence of dysfunction and morbidity of the upper limb.

● Method

Participants

This study included 81 patients undergoing treatment at the Reference Center of Women's Health. The study was approved by the Ethics in Research Committee of the Reference Center of Women's Health (Centro de Referência da Saúde da Mulher - CRSM/Pérola Byington Hospital) in the city of São Paulo, SP, Brazil - approval # 012/10. All participants signed a free and informed consent statement.

Procedures

Patient selection occurred randomly after reviewing the medical records of patients who underwent rehabilitation processes between 2005 and 2009 at the CRSM. Randomization was performed by a random selection of records observing the following inclusion criteria: patients subjected to breast-conserving surgery or not with sentinel node biopsy (SNB) and axillary lymphadenectomy (AL) with time elapsed since surgery between one and five years, and patients with functional impairment (motor or sensory) arising from sequelae of diseases or trauma to the upper limb prior to surgery and bilateral breast cancer surgery. In total, 137 patients were invited, of whom 81 agreed to participate in the study.

Data collection was conducted by the researcher and two collaborators using interviews and questionnaires that assessed quality of life and upper limb impairment. The initial interview consisted of a patient's characterization form containing identifying and socio-demographic data, the main complaints of patients in regards to the upper limb, and medical and surgical histories collected from the medical records.

Measuring instruments

The measuring instruments used in the study included the questionnaires Disabilities of the Arm,

Shoulder, and Hand (DASH) and the European Organization for Research and Treatment of Cancer (EORTC QLQ-C30 and QLQ-BR23). The DASH is a self-administered questionnaire that assesses impairment of the arm, shoulder, and hand due to musculoskeletal injuries. The DASH is composed of 30 questions that inquire about the health status of the individual over the past week. The questionnaire covers three domains: physical function, symptoms, and social and occupational function. The answers for each domain consist of five options. The total DASH score ranges from 0 to 100¹⁵.

The EORTC QLQ-C30 is a self-administered questionnaire consisting of 30 items that incorporates five functional scales: physical, functional, cognitive, emotional, and social performance; three symptoms scales: fatigue, pain, and nausea and vomiting, and the scales of quality of life and overall health status¹⁶. In conjunction with the EORTC QLQ-C30, the Breast Specific Module, BR23, was applied. The BR23 assesses specific aspects of breast cancer and comprises 23 items with two scales: functional and symptomatic¹⁷.

Statistical methods

The variables were analyzed using descriptive statistical methods. We calculated the median, mean, standard deviation, and standard error of the mean for the quantitative variables. These were assessed for normality of distribution using the Kolmogorov-Smirnov test. The qualitative variables (nominal or ordinal) were described by their frequency and proportion.

The comparison of the means of the quantitative variables under normal distribution was performed using the Student's *t* test or analysis of variance (ANOVA) followed by the least square difference (LSD) post-hoc test. LSD was preceded by Levene's test of homogeneity variances. In cases of non-normal distribution, the Mann-Whitney and Kruskal-Wallis tests were used, as appropriate.

Correlation analysis between quantitative variables was performed using Pearson's method when the dependent variable had an approximately normal distribution. Otherwise, the Spearman's method was employed. The relative importance of the independent variables correlated with upper limb impairment was evaluated using stepwise multiple linear regression, observing the coefficient of determination (r^2) for each set of independent variables, as well as its increase with the inclusion of each independent variable in the mathematical model. In all cases, a significance level of 5% ($p < 0.05$) was adopted.

● **Results**

The sample set consisted of 81 patients with a mean age of 52.9 years (standard deviation = 10.12 years). The mean length of time since surgery was 1.79 years. Patients’ characteristics with regards to the type of surgery, axillary approach, and complementary treatment are displayed in Table 1. Fifty-five percent of the patients reported needing help to perform domestic activities.

The main complaints reported by the patients during the interview were numbness (67.9%), muscle

weakness (49.4%), pain (45.7%), lymphedema (22.2%), cervical pain (9.9%), and limited range of motion (6.2%). All reported morbidities, except for the cervicalgia, were associated with the DASH instrument, as displayed in Table 2. The correlation between the DASH score and the length of time since surgery demonstrated that the longer the latter, the greater the difficulties in the functionality of the upper limb ($r=0.459$; $p<0.0001$).

The axillary approach was also determined to influence the level of impairment of the upper limb. The type of axillary dissection analyzed

Table 1. Clinical and surgical patient characteristics (N=81).

Type of Surgery	N	%
Non-breast-conserving	51	63.0
Breast-conserving	30	37.0
Complementary Treatment		
Chemotherapy	13	16.0
Radiotherapy	08	9.89
Chemotherapy and Radiotherapy	54	66.7
Hormone therapy or without complementary treatment	06	7.41
Axillary approach		
SNB	15	18.5
AL level I	01	1.23
AL level I and II	26	32.1
AL level I - III	39	48.2
Reconstruction		
Yes	64	79.0
No	17	21.0

SNB, Sentinel Node Biopsy; AL, Axillary lymphadenectomy.

Table 2. DASH values and their relation to the major reported morbidities.

Morbidity	Category	N	Mean	Standard Error	p*
Lymphedema	no	63	21.31	2.50	0.002
	yes	18	38.07	4.07	
Limitation of range of motion	no	76	23.62	2.30	0.014
	yes	5	46.55	5.80	
Cervical pain	no	73	24.01	2.42	0.175
	yes	8	34.38	5.83	
Pain	no	44	14.07	2.11	<0.001
	yes	37	38.07	3.17	
Numbness	no	26	13.93	2.58	<0.001
	yes	55	30.28	2.86	
Muscle Weakness	no	41	15.92	2.38	<0.001
	yes	40	34.38	3.32	

*p-value obtained using a t-test.

by ANOVA demonstrated significance with the DASH score ($p=0.038$). Upon performance of the post-hoc test (LSD), we observed that the axillary lymphadenectomy levels I, II, and III differed from the sentinel node biopsy ($p=0.013$) because AL I and II compared to AL I and III were similar ($p=0.171$), as was the sentinel lymph node biopsy compared to AL I and II ($p=0.185$). The type of surgery (breast-conserving or not), the complementary treatment, and breast reconstruction were not associated with the DASH score ($p=0.462$). The functionality of the upper limb, assessed using DASH, showed that 53.5% of the level of impairment depended on the variables pain, length of time since surgery, limitation

in the range of motion, lymphedema, and numbness, in descending order of importance (Table 3).

The relationship between late impairment, assessed using DASH, showed a statistically significant correlation with some scales of the instrument that assesses quality of life (EORTC QLQ-C30 and QLQ-BR23), indicating a correlation between delayed impairment and quality of life. The EORTC QLQ-C30 scales that correlated with late impairment of the upper limb were overall health and physical, functional, cognitive, emotional, and social functions (Figure 1). The QLQ-BR23 scales that showed a statistically significant correlation with DASH were body image, future perspective,

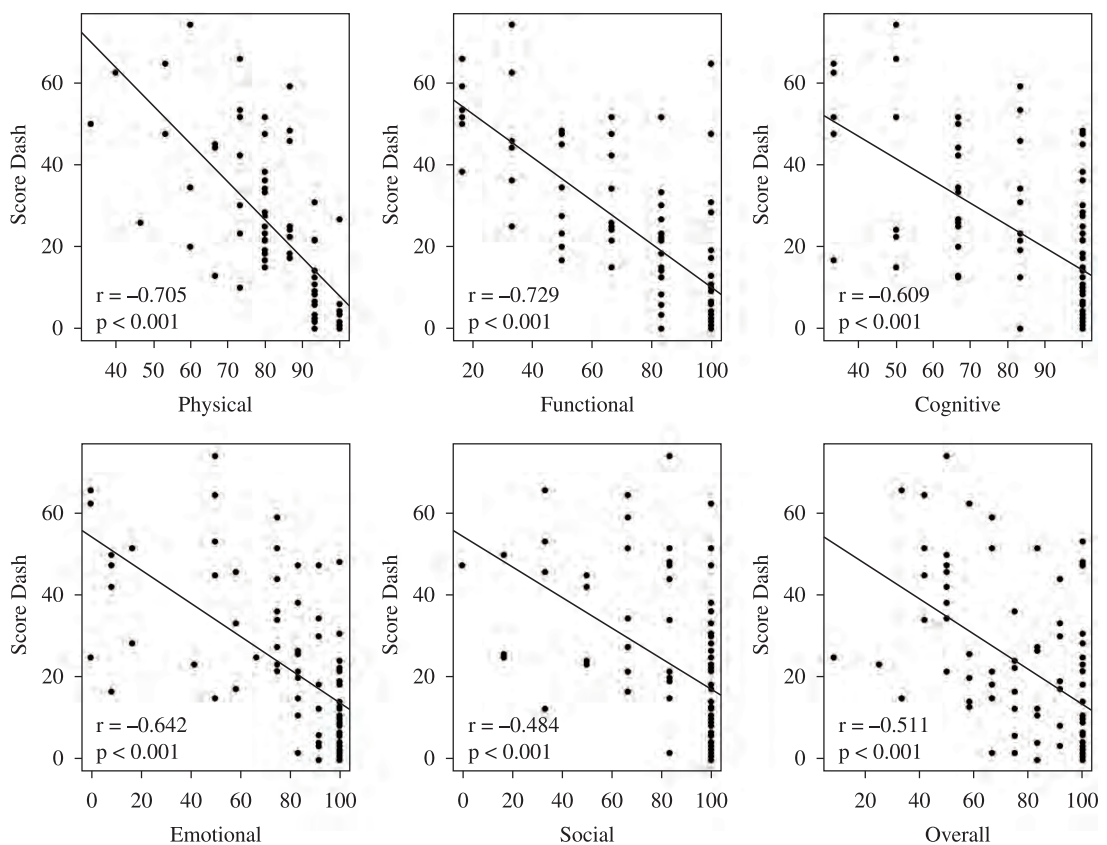


Figure 1. Correlation between the Dash and the scales of the EORTC QLQ-C30.

Table 3. Distribution of the main variables that influenced upper limb impairment.

Independent variables	R ² (%)	R ² increment
Pain	34.7	---
Pain and time elapsed since surgery	43.6	8.9
Pain, time elapsed since surgery, and ROM	47.7	4.1
Pain, time elapsed since surgery, ROM, and lymphedema	50.4	2.7
Pain, time elapsed since surgery, ROM, lymphedema, and numbness	53.5	3.1

ROM, range of motion.

upper limb symptoms, and breast symptoms. The sexual function and sexual pleasure scales were not correlated with DASH (Figure 2).

● Discussion

The results from this study demonstrate that late morbidity has a significant impact on upper limb function in patients subjected to breast cancer surgery and that this interferes with their quality of life. Although studies on the relationship between late morbidity of post-operative breast cancer and quality of life are scarce in the literature, the findings in our present study indicate that even after one or more years since surgery, functional capacity-related quality of life is compromised, a fact which has been corroborated by Lotti et al.¹², Rietman et al.¹⁸ and Nesvold et al.¹⁹.

Numbness was the type of morbidity reported as being more frequent among patients. Numbness is a symptom that expresses altered sensitivity in the axillary, lateral, and/or posterior region and in the lateral thoracic wall. However, when correlated

with upper limb impairment, numbness was the fifth leading cause of dysfunction.

Pain, which was the third most frequent complaint, was the main cause of upper limb impairment. In this study, pain was assessed subjectively using DASH and EORTC QLQ-C30; however, pain is a multidimensional construct that can be described by quality, intensity, and location²⁰. In all likelihood, pain was the main cause of impairment because it is directly linked to other morbidities such as cervical pain, lymphedema, and limited range of motion²¹. Other studies have also demonstrated an association between pain and impairment^{10,16,22}.

Another frequent complaint was lymphedema, which is widely studied in the literature. Twenty-two percent of patients presented lymphedema, a finding that is corroborated in the literature, with a prevalence ranging from 6 to 43%¹⁸. This wide variation is due to the variety of techniques that are used to measure lymphedema and depends on the measurement criteria adopted for lymphedema, including the time elapsed since surgery and the evaluation and the characteristics of the study population^{9,21,23}.

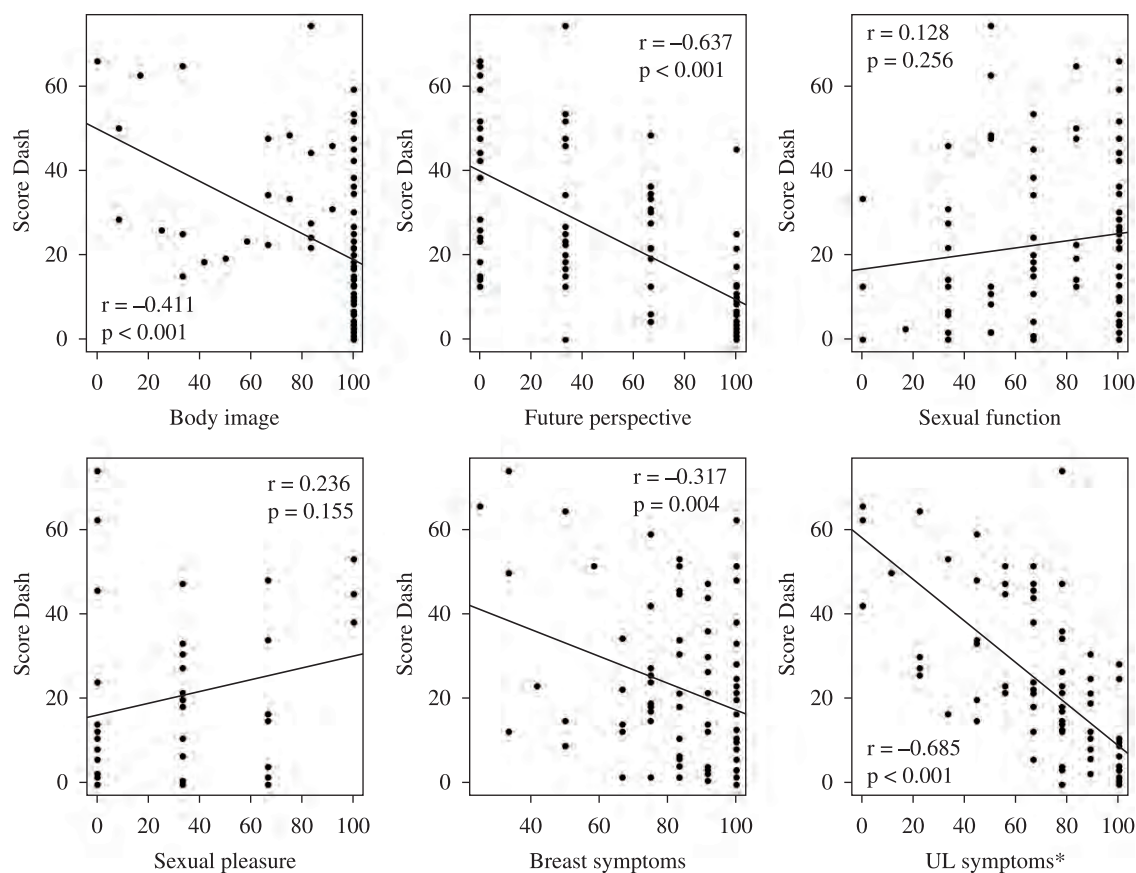


Figure 2. Correlation between the Dash and the scales of the EORTC QLQ- BR23. * UL, upper limb.

Upper limb lymphedema after axillary dissection is a disabling chronic and incurable condition, which represents one of the main sequelae after breast cancer treatment. If not treated early, it can lead to functional incapacity and social restriction of the patient²⁴. Lymphedema is a stigmatizing problem and can physically, emotionally, and socially affect the lives of the afflicted women.

The incidence of limited range of motion (ROM) was small (6.2%), most likely because the patients in the study attended functional rehabilitation groups soon after surgery to perform exercises to gain movement amplitude and stretching of the upper limbs. Group participants also received guidance on daily living activities and self-massage. This small percentage of ROM limitation reinforces the importance of the rehabilitation process during the immediate post-operative time period and its continuation over medium and long-term time post-surgery to reduce future complications or sequelae from the treatment, a fact corroborated by Engel et al.¹⁰.

The axillary lymphadenectomy, at the three levels, significantly correlated with upper limb impairment, confirming numerous studies that relate axillary dissection with major upper limb morbidities^{3,4,9-11,25,26}. However, contrary to the studies of Velloso et al.²⁰, Ferreira et al.²⁷, and Peintinger et al.²⁸, sentinel lymph node biopsy was not significantly correlated with impairment, perhaps due to the small number of patients (18.5%) who underwent SNB.

Patients with functional impairment of the upper limb are generally less able to perform daily activities such as carrying shopping bags and performing housework¹⁰. In the present study, 55% of the patients reported needing help to perform household chores. This large number reflects on the autonomy and independence of these women. Thus, there is a need for rehabilitation professionals to develop a plan of care for women undergoing breast cancer treatment that reduces or minimizes functional, social, and productive incapacity. Maintenance of the optimal function of the upper limb is essential for the maintenance of independent living and for performing tasks that require dexterity and physical strength²⁶. Upper limb function is the basis of both fine and gross motor skills, which are critical to daily activities.

Several EORTC QLQ-C30 scales that assess quality of life, such as overall physical and functional health, and the BR23 scales, such as body image, upper limb symptoms, and future prospect, were

significantly correlated with late impairment. This demonstrates that measuring health-related quality of life is important to understand how functional impairment interferes, in general, in the lives of women undergoing breast cancer treatment. Our results corroborate the studies by Kwan et al.³, Engel et al.¹⁰, and Rietman et al.²⁹. Each of these studies determined that late upper limb impairment may affect the future perspective and social life of patients and negatively affect their quality of life.

Limitations

A possible limitation of the present study is the lack of information on the preservation of the intercostobrachial nerve (ICB) during breast cancer surgery, which prevents us from claiming that all participants who presented complaints of numbness received ICB nerve injury during surgery. Another possible study limitation is the fact that the ROM restriction was not assessed objectively with the use of a goniometer, but rather through the patient's complaint when it interfered with the performance of daily activities and in health-related quality of life.

Conclusions

The correlation between the majority of the EORTC QLQ-C30 and BR23 scales with DASH demonstrated that the investment in rehabilitation and upper limb care in the short, medium, and long-term time period after surgery can improve not only the upper limb functionality but also the future perspective and social and emotional functions, which are important for health-related quality of life of women undergoing breast cancer treatment. The present study determined that even if belatedly, there are upper limb functional changes that could benefit from the monitoring of rehabilitation professionals on a regular basis to minimize and even eliminate these changes, thereby allowing for a better quality of life in patients undergoing breast cancer treatment.

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