

# THE IMPACT OF SENSORY ALTERATIONS ON UPPER LIMB FUNCTION AFTER A MASTECTOMY

## Impacto das alterações sensitivas pós-mastectomia na funcionalidade do membro superior

Lidiane Régia Pereira Braga de Britto<sup>1\*</sup>, Emanoella Carneiro de Souza<sup>1</sup>, Lucimila Teixeira Ribeiro<sup>1</sup>, Paulo Adriano Schwingel<sup>1</sup>, Auxiliadora Renê Amaral de Melo<sup>1</sup>, Paulo Loivo do Nascimento<sup>2</sup>, Gray Josland Simões Portela<sup>2</sup>

### ABSTRACT

**Objective:** To perform a descriptive analysis of the physical and clinical profile of women after a mastectomy, as well as to verify the functionality of the ipsilateral upper limb after surgery and to evaluate which quality of life questionnaire domains have repercussions on the functional capacity of this part of the body. **Methods:** Cross-sectional descriptive study, performed at the Centro de Oncologia Dr. Muccini, in Petrolina (Pernambuco, Brazil), with the participation of 53 patients. We used the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire to evaluate the functionality of the ipsilateral upper limb after surgery, and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ-C30) and its breast cancer specific module (EORTC-QLQ-BR23) to measure quality of life. **Results:** The symptoms had a significant impact on the function of the patients' upper limbs. Statistically significant correlations ( $p < 0.05$ ) were observed between the total DASH score and the symptoms ( $r = 0.451$  in the QLQ-C30 and  $r = 0.535$  in the QLQ-BR23) and the functionality ( $r = -0.488$  and  $r = -0.448$ ), which were negative. There was also a statistically significant association ( $p = 0.001$ ) between limitation in activities of daily living (ADLs) and the subjective presence of lymphedema. **Conclusion:** The sensory alterations resulting from a mastectomy are the main factors responsible for the development of modifications that affect the functionality of the ipsilateral upper limb after surgery. The subjective sensation of lymphedema was associated with limitations in the ADLs and with a decrease in the arm's functional capacity.

**KEYWORDS:** Breast neoplasms; quality of life; upper extremity; sensation; mastectomy.

### RESUMO

**Objetivo:** Realizar a análise descritiva do perfil físico e clínico de mulheres após mastectomia, além de verificar a funcionalidade do membro superior homolateral à cirurgia e avaliar quais os domínios do questionário de qualidade de vida têm repercussões na capacidade funcional desse segmento corporal. **Métodos:** Estudo descritivo de corte transversal, realizado no Centro de Oncologia Dr. Muccini, em Petrolina (PE), com a participação de 53 pacientes. A funcionalidade do membro superior homolateral à cirurgia foi mensurada por meio do questionário *Disability of the Arm, Shoulder and Hand* (DASH) e a qualidade de vida por meio do *European Organization for Research and Treatment of Cancer Quality of Life Questionnaire* (EORTC-QLQ-C30) e seu módulo específico para câncer de mama (EORTC-QLQ-BR23). **Resultados:** A sintomatologia teve impacto importante na função dos membros superiores das pacientes, uma vez que foram verificadas correlações estatisticamente significativas ( $p < 0,05$ ) entre o escore total do DASH com a sintomatologia ( $r = 0,451$  no QLQ-C30 e  $r = 0,535$  no QLQ-BR23) e a funcionalidade ( $r = -0,488$  e  $r = -0,448$ ), sendo estas negativas. Foi também verificada associação estatisticamente significativa ( $p = 0,001$ ) entre limitação nas atividades da vida diária (AVDs) e presença subjetiva de linfedema. **Conclusão:** As alterações sensitivas decorrentes da mastectomia são as principais responsáveis pelo desenvolvimento de modificações que afetam a funcionalidade do membro superior homolateral à cirurgia. A sensação subjetiva de linfedema teve associação com limitações nas AVDs e redução da capacidade funcional do braço.

**PALAVRAS-CHAVE:** Neoplasias da mama; qualidade de vida; extremidade superior; sensação; mastectomia.

Study carried out at the *Centro de Oncologia Dr. Muccini* in partnership with the Universidade de Pernambuco – Petrolina (PE), Brazil.

<sup>1</sup>Universidade de Pernambuco – Petrolina (PE), Brazil.

<sup>2</sup>Centro de Oncologia Dr. Muccini – Petrolina (PE), Brazil.

\*Corresponding author: lidiane.regia@upe.br

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## INTRODUCTION

Breast cancer is the most common type of malignant neoplasm in Brazil's female population. In 2016, estimates reported 57,960 new cases, of which 11,190 occurred in the Northeast, and of which 2,550 were in Pernambuco. The death rates are still high when compared with those from developed countries, with 14 deaths for every 100 thousand women<sup>1</sup>.

This situation may be attributed to the fact that the disease is diagnosed in advanced clinical stages (stages III and IV), which causes a worse prognosis and a lower survival rate due to the need for a more aggressive treatment<sup>2</sup>. The practices for tumor management depend on several factors, such as tumor staging, lesion size, and tumor histopathological heterogeneity<sup>3</sup>.

Therefore, a total or conservative mastectomy associated with axillary lymphadenectomy has been the standard surgical treatment in conjunction with other alternatives, such as chemotherapy, radiotherapy, and hormone therapy. However, this procedure may cause severe morbidity in the ipsilateral upper limb, especially when associated with postoperative radiotherapy<sup>4,5</sup>.

The morbidities presented during or after treatment include complications like lymphedema, sensory alterations, a decrease in muscle strength, and a reduction in movement amplitude (ADM) and of the functional capacity of the upper limb involved. These recurring complaints are mostly reported by women after a mastectomy and they are also indicated as implications due to the higher complexity of this treatment, considering they interfere in the patients' quality of life (QoL) and functionality<sup>6,7</sup>.

As such, it is important to know the repercussions of the surgical treatment with an emphasis on these two aspects. Considering that QoL is an important prognosis factor for survival<sup>8,9</sup>, the functional capacity constituted of motor, sensorial and cognitive skills, is directly associated with the possibility of performing activities of daily living (ADLs) in a dependent manner. Thus, functional capacity alterations may cause some disabling<sup>10</sup>.

Therefore, due to the relevance for both health professionals and for patients, this study aimed to perform a descriptive analysis of the clinical and physical profile of the women being evaluated, as well as to verify the functionality of the ipsilateral upper and to assess which domains of the QoL questionnaire have repercussions on the functional capacity of this body part.

## METHODS

This is a descriptive study with a cross-sectional approach that was carried out at the Centro de Oncologia Dr. Muccini (CEONCO) in Petrolina (Pernambuco, Brazil) with women who underwent a mastectomy as treatment for breast cancer. The CEONCO is a center of oncologic specialties of public service through the Brazilian Public Health System (*Sistema Único de Saúde*-SUS) and philanthropy, under the direction of the Maternity and Child

Support Association (*Associação de Amparo à Maternidade e à Infância*- APAMI).

Fifty-three patients were analyzed in this article. The inclusion criteria were that they should have performed a unilateral mastectomy and should be doing regular check-ups at CEONCO. Before the questionnaires were used, all subjects received explanations on the purpose of the research and about the Free Informed Consent (TCLE) form. Patients who had any previous orthopedic dysfunction (bursitis, impact syndrome), cognitive deficits that prevented them from understanding the study, the presence of another type of malignant tumor, and those who did not sign and/or did not agree with the TCLE, were excluded from the study.

Collection was performed between August 2015 and April 2016. Personal, socioeconomic and clinical-surgical data were obtained through electronic records. This analysis done beforehand enabled access to the day when the patient would have a medical appointment and, thus, could be informed on the research and the use of the questionnaires.

To assess the functionality of the ipsilateral upper limb after surgery, we used the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, which was validated in Portuguese by Orfale et al.<sup>11</sup>. This tool is comprised of 30 self-applicable questions and two optional modules: one for sports and music activities and another for work. The items are related to the intensity of the symptoms of pain, weakness, stiffness and paresthesia of the upper limb. They also quantify the level of difficulty to perform ADLs, the ability to participate in social activities, difficulty in sleeping and the psychological affects that limb alterations cause to the patient. The questionnaire uses as reference the week before the use of the instrument, and its score varies from 0 to 100. The higher the score, the lower the upper limb functionality<sup>11</sup>. It is noteworthy that the optional modules were not used in this research.

QoL was verified through the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ-C30), version 3.0, and its specific module for breast cancer (Breast Cancer Module [EORTC-QLQ-BR23]). The EORTC-QLQ-C30 is comprised of 30 items, which are divided into: 5 functional scales (physical, role/performance, cognitive, emotional, and social); 3 symptoms (fatigue, pain and nausea/vomiting); and 6 simple items (dyspnea, insomnia, loss of appetite, constipation, diarrhea, and financial difficulties). The EORTC-QLQ-BR23 specific questionnaire includes 23 questions, which are distributed into function and symptoms scales. The scores vary from 0 to 100. For the function scales, the higher the score the better the QoL. For the symptom scales, the higher the score the worse the QoL. As recommended, both questionnaires were applied by means of interviews<sup>12</sup>.

In the statistical analysis, the data were gathered through double typing performed using Microsoft Excel® (Microsoft Corporation, Redmond, WA, United States). The data were then

processed and analyzed through the Statistical Package for the Social Sciences for Windows, version 20.0 (SPSS Inc., Chicago, IL, United States). The Kolmogorov-Smirnov test was used to verify the normality of the data. The homogeneity was determined by means of a histogram. Data were presented through descriptive statistics with categorical variables presented as absolute and relative frequencies. Continuous variables were represented by the central tendency and dispersion measurements. The correlation level between the variables was established using Pearson's linear correlation coefficient. The chi-square test was used to verify the associations between the DASH result, which was categorized by the subjective presence of lymphedema and with limitations in ADLs. A 5% significance level was adopted for all tests.

The Research Ethics Committee from the Universidade de Pernambuco (CEP-UPE) approved this project according to Resolution n. 510 of April 7<sup>th</sup>, 2016, from the Brazilian National Council of Health, which determines the standards and guidelines for the performance of research involving human beings (CAAE: 46228115.8.0000.5207).

## RESULTS

Fifty-three women with an average age of 54.2 years old were included in the research. Data on the descriptive analysis of their socioeconomic profiles are found in Table 1. Among the participants, 34% were single and 39.6% did unpaid domestic activities. With regard to educational level, 24.5% of them were illiterate.

Concerning the physical-clinical profile of the participants, which is showed in Table 2, there was a higher prevalence of diagnoses in clinical staging IIA (28.3%). Considering the types of surgeries adopted, 54.8% women underwent surgeries with an axillary lymphadenectomy approach. Of the total patients, 47.2% had lymphedema and only 1 underwent breast reconstruction. When questioned about the limitations in ADLs, most of them reported some change. In addition, the mastectomy was performed within 5 years or less in 94.3% of the patients, and the mean time since the surgery was 2.8 years. Regarding the therapeutic modalities for breast cancer treatment, almost all of the patients underwent chemotherapy (92.5%), radiotherapy (88.7%), and hormone therapy (98.1%) treatments.

As to the overall assessment of upper limb functionality, the total mean exposed by the DASH was 25.52. When categorized, 79.2% (n=42) obtained a score lower than 50 and 20.8% (n=11) achieved a higher score than 50. Therefore, most of the study participants did not present severe damage to the ipsilateral limb's functions after surgery. However, there has been a statistically significant association between limitation in ADLs and subjective presence of lymphedema ( $p=0.001$ ), in addition to a tendency of association between the subjective presence of lymphedema with categorized DASH ( $p=0.08$ ).

In this sample, the symptoms had a significant impact on the function of the patients' upper limbs. The linear correlation between the DASH total score and the symptoms was positive and statistically significant ( $p<0.001$ ), which shows that the higher the result of the last variable, the higher the difficulties in function in the segments that are measured both by the EORTC-QLQ-C30 ( $r=0.451$ ) and by the EORTC-QLQ-BR23 ( $r=0.535$ ). Only overall health condition did not present a linear correlation with the total DASH score (Table 3).

## DISCUSSION

Regarding the socioeconomic profile of the patients included in the study, there were mostly single women aged between 50 to 60 years old that performed unpaid activities. This result is in agreement with data found in other studies carried out around the country<sup>9,10,13</sup>, in which most of the analyzed population was older than 50 years old (61.0%), was married or in a stable union (48.6%) and performed household chores as their main activity (60.0%)<sup>9</sup>.

**Table 1.** Descriptive analysis of the women's socioeconomic profile.

Variable	n	%
Age (years old)		
<50	24	45.3
>50	29	54.7
Time since surgery (years)		
<5	50	94.3
>5	3	5.7
Marital status		
Married	21	39.6
Single	18	34.0
Divorced	8	15.1
Widowed	6	11.3
Educational level		
Illiterate	13	24.5
Incomplete elementary school	16	30.2
Complete elementary school	2	3.8
Complete high school	16	30.2
Complete upper school	6	11.3
Occupation		
Unpaid house activities	21	39.6
Farmer	9	16.9
Autonomous	10	18.9
Teacher	3	5.7
Retired	10	18.9

The education level was lower than the one found in other studies, in which 32.4% of the involved subjects had completed high school<sup>9</sup> and 79.4% had more than 8 years of study<sup>13</sup>. This fact may be attributed to the characteristics of the Northeastern Brazilian population, especially in the countryside, where a

**Table 2.** Descriptive analysis of the physical and clinical profile.

Variable	n	%
Diagnostic staging		
I	13	24.5
IIA	15	28.3
IIB	11	20.8
IIIA	7	13.2
IIIB	7	13.2
Type of surgery and axillary approach		
Modified radical mastectomy + BLS	12	22.6
Modified radical mastectomy + LA	9	17.1
Quadrantectomy + BLS	12	22.6
Quadrantectomy + LA	20	37.7
Lymphedema subjective perception*		
Yes	25	47.2
No	28	52.8
Perception of limitation in activities of daily living**		
Yes	34	64.2
No	19	35.8
Dominant hand		
Left	6	11.3
Right	47	88.7
The dominant hand is ipsilateral to the breast undergoing surgery		
Yes	23	43.4
No	30	56.6
Breast reconstruction		
Yes	1	1.9
No	52	98.1
Adjuvant chemotherapy		
Yes	49	92.5
No	4	7.5
Adjuvant radiotherapy		
Yes	47	88.7
No	6	11.3
Adjuvant hormone therapy		
Yes	52	98.1
No	1	1.9

BLS: sentinel lymph node biopsy; LA: axillary lymphadenectomy; \*Reported feeling a heavy arm, tight clothes, a decrease in flexibility and stretched skin from the ipsilateral limb; \*\*Reported difficulties in performing tasks previously done before the surgery.

great number of people with the same age as the participants in this study did not have access to school or needed to drop out for some reason. In the National Household Survey carried out by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*—IBGE) in 2014, around 16.6% of Northeastern Brazilians aged older than 15 years old declared themselves as illiterate and represented the highest rate of functional illiteracy in the country (27.1%)<sup>13</sup>.

Regarding the clinical staging at diagnosis, most of the women were in the beginning stages of the disease (I, IIA and IIB). Sousa et al.<sup>9</sup> also obtained similar results. They reported the occurrence of 19, 25 and 20% of the diagnoses in stages I, IIA and IIB, respectively. Regarding the surgical approaches performed on patients in this study, 37.7% were quadrantectomies associated with axillary lymphadenectomy. This was also observed in the research of Fangel et al.<sup>10</sup>. The prevalence of conservative surgery was 77%, and 23% were radical mastectomies

Although patients who underwent immediate breast reconstruction had better scores on the QoL assessments<sup>14</sup> (this factor gives the mastectomized woman some physical, psychological and social<sup>15</sup> benefits), this procedure was performed on only one of the participants of the sample. Its practice is still not very common in public health services in countries of low and middle income<sup>16</sup>.

The practices for breast cancer treatment, especially surgery and radiotherapy<sup>5</sup>, cause physical and functional dysfunctions, such as alterations in upper limb functionality, considering that radiotherapy may influence the patients' appearance and the persistence of pain, causing chronic conditions that directly affect QoL<sup>5,17,18</sup>. Nevertheless, these data were not similar to the present research, considering that there was not a positive correlation between QoL and arm functionality.

**Table 3.** Correlation between the Disabilities of the Arm, Shoulder and Hand (DASH) and the domains of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ-C30) and its specific module for breast cancer (EORTC-QLQ-BR23).

Variables	DASH	
	r-value	p-value
QLQ-C30 Domains		
Functionality	-0.488	0.001*
Symptoms	0.451	0.001*
Overall health condition	-0.111	0.428
QLQ-BR23 Domains		
Functionality	-0.448	0.001*
Symptoms	0.535	<0.001*

\*Significant correlation to the 5% confidential limit.

Nevertheless, 47.2% of the women reported symptoms of lymphedema and 64.2% presented limitations in the ADLs. The main symptoms of lymphedema include pain, weight, stiffness and ADM decrease, which worsens daily function and negatively affects motor skills, causing negative impacts on labor, domestic and personal care function, as well as on recreational and social activities<sup>6,8,19</sup>.

The incidence of arm lymphedema seems to increase over time, for at least 24 months after the diagnosis of breast cancer or after surgery. It is noteworthy that 94.3% of the women studied herein had had their mastectomy within 5 years<sup>6</sup>. This high rate of complication is around four times more probable when the surgical procedure is associated with axillary lymphadenectomy<sup>6,19</sup>.

The results from the present study demonstrate that the higher the alterations in the symptoms of the patients analyzed through the QoL questionnaire, the worse the alterations in the functionality of the ipsilateral upper limb after surgery. This might occur due to the type of axillary approach performed in 54.8% of the participating women. Besides causing pain and reducing mobility in the upper limb after the mastectomy, the axillary lymphadenectomy is most responsible for these sensory alterations<sup>19,21</sup>.

The lesion from the intercostobrachial sensory nerve results in frequent complaints of sensory alteration in the medial and posterosuperior region of the arm and axilla. The occurrence of sensory alteration in the upper limb exposes the patient to serious risks of injury that may favor infectious or inflammatory processes, causing a negative impact on functional capacity and QoL<sup>20,21</sup>.

The study performed had some limitations regarding the reduced size of the sample. Furthermore, the investigated population is from a specific region in the countryside of Pernambuco state and a great number of them undergo treatment in other centers, with more complex services.

## CONCLUSION

It was inferred that, in this sample, the sensory alterations due to surgical treatment for breast cancer are the main causes responsible for affecting the functionality of the ipsilateral upper limb. It was also found that the subjective sensation of lymphedema was associated with limitations in ADLs and with reduction of the arm's functional capacity.

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