



## Physiotherapeutic approach and functional performance after breast cancer surgery

### *Abordagem fisioterapêutica e desempenho funcional no pós-operatório de câncer de mama*

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#### Abstract

**Introduction:** Surgery for breast cancer can impair range of motion (ROM) and functionality of upper limb (UL). **Objective:** To compare ROM and functional performance of homolateral UL after physiotherapeutic approach and to correlate these variables. **Methods:** A non-randomized clinical trial study enrolled 33 women who were submitted to mastectomy or quadrantectomy associated with axillary lymphadenectomy. ROM was assessed by homolateral UL and contralateral limb (control) goniometry. Functional performance was assessed by “Disability of arm, shoulder and hand” (DASH) questionnaire. The protocol consisted in 10 sessions (3 sessions per week during 60 minutes), involving passive mobilization of glenohumeral and scapulothoracic joint, soft tissue mobilization, neck muscles and upper limb muscles stretching, exercises in all planes of motion, applied alone or in combination. Weight bearing exercise with elastic bands and dumbbells from 0.5 to 1.0 kilograms were also applied. **Results:** There was a meaningful increase in ROM of all movements after physiotherapy; however, flexion, abduction and lateral rotation remained lower than

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control limb. DASH score decreased significantly from  $28.06 \pm 16.1$  to  $15.71 \pm 10.7$  ( $p = 0.001$ ) meaning an improvement in functional performance of UL. No correlation was observed between ROM and DASH. **Conclusion:** Functional performance and ROM, after 10 physiotherapy sessions, improved significantly, however, a long-term follow-up can contribute to further improvement.

**Keywords:** Breast Neoplasms. Physical Therapy. Range of Motion. Mastectomy. Exercise Therapy.

## Resumo

**Introdução:** A cirurgia para câncer de mama pode prejudicar a amplitude de movimento (ADM) e causar impacto negativo na funcionalidade do membro superior (MS). **Objetivo:** Comparar a ADM e desempenho funcional do MS homolateral à cirurgia após a abordagem fisioterapêutica, além de correlacionar estas variáveis. **Métodos:** Foi conduzido um ensaio clínico não randomizado, envolvendo 33 mulheres submetidas à mastectomia ou quadrantectomia associada à linfonodectomia axilar. A ADM foi avaliada pela goniometria do MS homolateral à cirurgia e do membro contralateral (controle). O desempenho funcional foi avaliado pelo questionário "Deficiência do ombro, braço e mão" (DASH). Foram realizadas 10 sessões (3 sessões semanais com duração de 60 minutos), envolvendo mobilização passiva da articulação glenoumeral e escapulotorácica; mobilização cicatricial; alongamento da musculatura cervical e MMSS; exercícios ativos-livres em todos os planos de movimento, aplicados isoladamente ou combinados. Para os exercícios resistidos, utilizaram-se faixas elásticas e halteres de 0,5 a 1,0 kg. **Resultados:** Encontrou-se aumento significativo da ADM de todos os movimentos após a fisioterapia, mas a flexão, abdução e rotação lateral ainda estavam inferiores em relação ao membro controle. O escore total do DASH diminuiu significativamente de  $28,06 \pm 16,1$  para  $15,71 \pm 10,7$  ( $p=0,001$ ) indicando melhora do desempenho funcional do MS. Nenhuma correlação foi observada entre a ADM e o DASH. **Conclusão:** A realização de 10 sessões de fisioterapia melhorou a ADM e o desempenho funcional do MS homolateral à cirurgia, mas acompanhamentos em um prazo mais longo podem contribuir para ganhos adicionais.

**Palavras-chave:** Neoplasias da Mama. Amplitude de Movimento Articular. Fisioterapia. Mastectomia. Terapia por Exercício.

## Introduction

The breast cancer is the most common type of cancer among women and the second most frequent cancer in the world (1). Even with diagnostic and treatment evolution like the availability of sentinel lymph node (SLN) procedure, surgical techniques are also prevalent (2). The most common surgeries are lumpectomy, quadrantectomy and mastectomy that may be associated to axillary lymphadenectomy (AL) (3 - 5). In addition, complementary therapies neoadjuvant or adjuvant as chemotherapy (CT), radiotherapy (RT) and hormone therapy (HT) may be used.

Besides the range of motion (ROM) depletion another complications may appeared after the surgery procedure as scar retractions, fibrosis, seroma, lymphedema, muscular weakness, pain, postural

deviations and intercostobrachial nerve paresthesia (3 - 12). ROM limitation is the most common complication after surgery and affects more than half of women both in immediate and late postoperative (6, 13). ROM limitation may also cause a negative impact on upper limb (UL) function affecting quality of life (QOL) (14, 15). The impact on upper limb function is related to frequent complaints as difficulty to perform work, domestic and daily life activities (5, 8, 9, 12, 16).

In this context, physiotherapy approach plays a fundamental role in the rehabilitation after breast cancer surgery, acting in functional recovering, preventing complications, and enhancing QOL of these women (17). As a result, physiotherapy might contribute to a rapidly reintegration to occupational and life activities and consequently to society, avoiding function limitation (18 -22). Therefore, the knowledge of women functional performance after breast

cancer surgery enables healthcare professionals, especially physiotherapists, to collect useful information that will help them to develop treatment strategies both preventive and therapeutic.

Thus, the aims of this study were to compare articular range of motion (ROM) and functional performance of homolateral UL submitted to surgery after physiotherapeutic approach and to correlate these variables.

**Methods**

The study was a non-randomized clinical trial that included women who were submitted to mastectomy or quadrantectomy associated to AL of three levels and received physiotherapeutic treatment at Physiotherapy Department of *OncoHematos* at Foundation of Beneficence of *Cirurgia* Hospital in *Aracaju, Sergipe*. This study followed the guidelines of National Health Council and the rules of 466/12 Resolution about biomedical research involved humans, with approval of Review Board of Federal University of Sergipe (UFS) (number 39816, CAAE 02201312.2.20000.0058). Participants have assigned informed consent.

Exclusion criteria of this study were women without shoulder ROM limitation (23), those were submitted to bilateral mastectomy and immediate or late mammary reconstruction, women with active infection process, previous dysfunction of homolateral UL to surgery, difference of length of 4 centimeters or more between upper limbs, previous history of physiotherapy treatment and incapacity of questionnaires comprehension.

First, personal data as age, height, weight, occupation, scholarship level and marital status, also clinical and surgical data as type, side and time of post-surgical, complementary treatments, and number of dissected and compromised lymph nodes both were collected on clinical record available in local. Second, at physical examination, ROM of homolateral UL after surgery and contralateral UL after surgery, which was considered control limb, were evaluated by goniometry measurement. The goniometer used was from Carci® brand and was comprised by a circular plastic that ranges from 0° to 360° degrees and have two plastic moveable arms. The movements measured were flexion, extension, abduction, adution, medial (MR) and lateral rotation (LR) (23) of both homolateral and contralateral

shoulders to surgery. Values were registered in degrees and measurements were repeated three times, the average was adopted.

Functional performance was evaluated by “Disability of shoulder, arm and hand” questionnaire (DASH) (24), which comprises upper limb as a whole. Dash is composed by 30 questions that evaluate physical function and symptoms. Its items are about difficulty in performing physical activities; severity of each symptoms as pain, tingling, weakness, and stiffness; and the problems effect on social activities, work, and sleep, and its psychologic impact. DASH score is based in a scale from 0 to 5 points and raw score ranges from 0 (without disability) to 100 (several disability). In this study the optional modules to athletes/ musicians/ workers were not applied because do not match with the patient’s profile evaluated.

The physiotherapy protocol consisted in 10 sessions, distributed in 3 sessions of 60 minutes weekly and is described on Table 1.

**Table 1** - Physiotherapy Protocol

Physiotherapy Protocol - 10 sessions (3 sessions per week with 60min each one)	Parameters
Glenohumeral and scapulothoracic passive mobilization	3 sets of 60 seconds
Soft tissue mobilization	
Passive stretching of upper limbs muscles and neck muscles	1 set of 30 to 60 seconds
Free active exercises to flexion, extension, abduction, aduction, lateral and medial rotation movements	3 sets of 8 to 12 repetitions
Free active exercises to different muscular groups in all planes of motion and combination planes	3 sets of 8 to 12 repetitions
Weight-bearing exercises using elastic band or dumbbells from 0,5 to 1,0 kg according to patient evolution	3 sets of 8 to 12 repetitions
Recommendations about arm management as general care and skin care	Daily

One investigator applied goniometry measurement and DASH questionnaire before and after the performance of physiotherapy sessions, while another independent investigator applied the physiotherapy protocol. Data were analyzed by BioEstat 5.0 and included descriptive analysis, measurement of central

tendency (average), dispersion (standard deviation), relative and absolute frequency. Follow normality of data, to compare DASH scores and ROM before and after 10 session was used t- Student dependent test. To compare ROM homolateral and contralateral was used t-Student independent test. To correlate DASH and ROM variables was used Pearson correlation test. The significance level was  $p < 0.05$  for all analyses.

## Results

The study select 39 patients, those 33 matched with inclusions criteria. During the study 2 patients dropped out of treatment, 2 did not comprehend the questionnaires and 1 died before the study ending. The personal and clinical-surgical characteristics are described on Table 2.

**Table 2** - Sample clinical and surgery characteristics (n = 33)

Personal and surgical characteristics		
Age (years)		50.9 ± 10.8
Body mass index (kg/m <sup>2</sup> )		26.3 ± 5.2
Marital status	single	11(33)
	married	15(46)
	widow	7 (21)
Skin color	brown	16 (49)
	black	10 (30)
	white	7 (21)
Occupation	housewife	14 (43)
	farmer	6 (18)
	others (e.g.: teacher, seller)	13 (39)
Surgery type	mastectomy	26 (78.9)
	quadrantectomy	7 (21.3)
Surgery side	right	14 (42.4)
	left	19 (57.6)
Post-surgical time	among 4 weeks (1 month)	8 (24.3)
	between 4 and 8 weeks (1-2 months)	17 (51.5)
	after 8 weeks	8 (24.3)
Radiotherapy	adjuvant	11 (35.5)
	neoadjuvant	1 (3.2)
Chemotherapy	adjuvant	24 (82.7)
	neoadjuvant	9 (31.0)
Hormonotherapy		10 (32.2)
Dissected lymph nodes		14.0 ± 6.8
Compromised lymph nodes		3.4 ± 4.1

Note: Average values ± standard deviation; n(%); kg=kilogram; m= meter.

The ROM values of all movements are significantly lower in homolateral UL to surgery compared to contralateral UL as seen on Table 3, demonstrating the ROM limitation at physiotherapy admission. After 10 sessions of physiotherapy, ROM of homolateral UL

increased significantly in all movements, demonstrating an important improvement. However, in compare to control UL, the movements of flexion, abduction and lateral rotation remained lower.

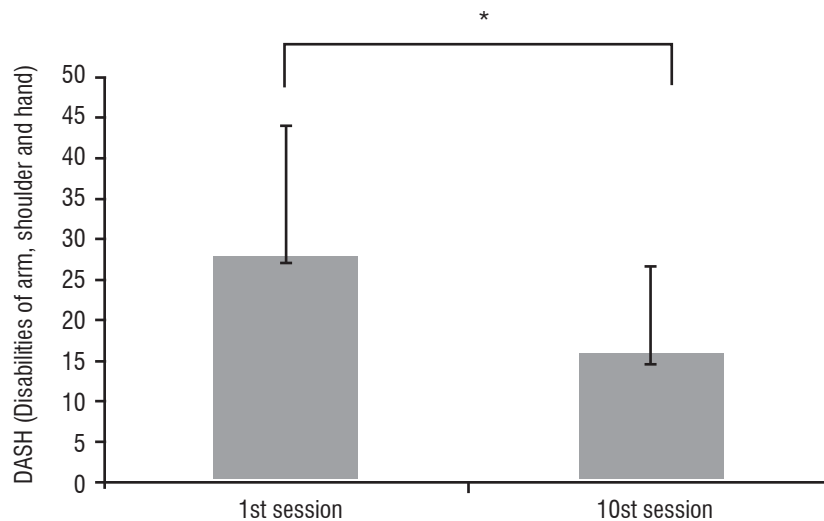
**Table 3** - Comparison of range of motion (ROM) after 1st and 10th session of physiotherapy (n = 33)

ROM	Contralateral UL (control)	Homolateral UL		p1*	p2*	p3**
		1 <sup>st</sup> session	10 <sup>th</sup> session			
Flexion	161.3 ± 19.8	110.1 ± 35.6	143.9 ± 24.1	0.001	0.002	0.001
Extension	61.2 ± 14	51.8 ± 13.1	59.3 ± 10.3	0.007	0.551	0.001
Abdction	156.9 ± 23.4	112.9 ± 30.8	140.8 ± 26.4	0.001	0.010	0.001
Aduction	42.9 ± 12.3	33.2 ± 12.1	40.3 ± 10.8	0.002	0.371	0.001
MR	81.9 ± 11.3	75.3 ± 15.5	82.0 ± 8.4	0.027	0.970	0.006
LR	84.4 ± 8.8	65.1 ± 23.7	74.6 ± 17.9	0.001	0.007	0.001

Note: Average values (±standard deviation); MR = medial rotation, LR = lateral rotation; p1: contralateral UL x homolateral UL 1st session; p2: contralateral UL x homolateral UL 10th session; p3: homolateral UL 1st session x homolateral UL 10th session; \* t- Student dependent test; \*\*t- Student independent test.

DASH score reduced significantly from 28.06 ± 16.1 to 15.71 ± 10.7 (p = 0.001), concluding improvement of functional performance of homolateral UL to surgery (Figure 1).

In addition, no meaningful correlation between ROM and DASH was found, except a weak and negative one about extension movement and total score of DASH after 10 sessions (Table 4).



**Figure 1** - Comparison of DASH score after 1st session and 10th session of physiotherapy (n = 33); \*p= 0,001; T- Student test.

**Table 4** - Correlation between DASH score and ROM of homolateral UL to surgery at 1st session and 10th session of physiotherapy

ROM	DASH			
	1 <sup>st</sup> session		10 <sup>th</sup> session	
	r	p	r	p
Flexion	-0.2648	0.1363	-0.2944	0.0962
Extension	-0.1786	0.3199	-0.4339	0.0116
Abduction	-0.125	0.4883	-0.2223	0.2137
Aduction	-0.2648	0.1364	-0.3011	0.0886
MR	0.1034	0.5673	-0.2204	0.2176
LR	-0.011	0.9515	-0.2008	0.2625

Note: MR = medial rotation, LR= lateral rotation; r = Pearson correlation, p < 0,05.

## Discussion

Before sessions of physiotherapy, at first evaluation, ROM of homolateral UL was lower than control, besides DASH score was elevated what indicated a damage in functional performance. Clinically, this finds are common in most of women submitted to mastectomy. They occur due to surgical scar dimension, to AL, and to both presence of pain and fear of moving the arm (3 - 5, 7, 8, 26). This affirmation may be confirmed by the answers to DASH questionnaire at our study, where most patients answer: "very difficult to do" or "unable to do" to questions about "place an object on a shelf above your head", "wash your backs" and "carry a heavy object". An study of Rietman et al. (7) found evidences that 20% of women referred difficult to pull a sweater overhead, 18% to fasten a bra, 72% to do up back zipper, 16% to reach overhead and 29% to carry heavy bag in immediate post-surgical, that corroborate with our study.

Nowadays, the SLN procedure brings less complications and morbidity after surgery (4, 5) than AL technique, as confirmed to Velloso et al. (5), that found a lower impairment in ROM and DASH scores in 45 patients submitted to SLN procedure. Despite of these finds, all of women in our study were submitted to AL technique, what may justify ROM reduction and impair of functional performance after surgery.

It is a consensus that early rehabilitation after breast cancer is highly recommended since promote an adequate functional recovery (21, 27 - 29). Unfortunately, in our study a small number of women begun rehabilitation before 4 weeks post-surgical, though, the women recovered ROM and enhanced functionality. Similarly, Lauridsen et al. (10) randomized 139 women in two groups to rehabilitation, group one received treatment before eight weeks post-surgical and group 2 after 26 weeks post-surgical, and they found improvement of functions in both groups. An earlier approach in our study was difficulty due to the outset of physiotherapy to women in post-surgical period depends of public transportation availability and this physiotherapy service is the unique of public health system (SUS) available in the State.

It is also a consensus that kinesiotherapy is the first choice to rehabilitation after breast cancer surgery, and it is also indispensable to preventing and treating physical and functional impairments after surgery (18 - 22). Randomized controlled trials have

demonstrated an important improvement of shoulder functional capacity after practice of active free ROM exercises. However, there is no consensus about the number of sessions necessary to restore ROM and functionality (18, 20 - 22).

In our study, 10 sessions of physiotherapy resulted in significant improvement of ROM and reduction of DASH score, leading to enhancement of functional performance (27, 30). The patient's complaint had an intensity reduction. Some patients reported no more difficulty to perform tasks as "washing your back, putting on a sweater, preparing a meal, enjoying recreational activities, making a bed, carrying heavy objects, washing and drying your hair". As well, patients reported less symptoms as pain, weakness, and difficult to move arm, shoulder and hand.

Nevertheless, 10 sessions could not be sufficient to entire returning to activities and entire enhancement of clinical-functional impairments in post-operative of breast cancer, since that remained a deficit in movements as flexion, abduction and lateral rotation in compare to control limb. Thus, the literature believes that a long-term follow-up could help in additional improvement of ROM and functionality (20, 28, 29).

The women who depends of public health system (SUS) or even those with private health plans could face different realities of follow-up after surgery, many times with a limited number of physiotherapy sessions with a specialist. Therefore, physiotherapists should offer a good treatment to achieve satisfactory results even in a short time frame. As suggestion, exercises with movements of flexion, abduction and lateral rotation should be emphasized.

No meaningful correlation between ROM and DASH was found, except a weak and negative one about extension movement and total score of DASH after 10 sessions. Clinically, this is an irrelevant result, since the movement of extension is barely impaired in these patients. Conversely, Thomas-Maclean (12) in an study with 357 women that evaluated ROM, pain, lymphedema and this variables correlation with DASH, 6 and 12 months after surgery, observed a meaningful correlation of ROM limitation and pain with functional performance. Although no correlation between these variables in our sample size was found, the women in our study have a better performance and few limitations to execute daily life activities.

In Brazil, 57.960 new cases of breast cancer are estimated per year, thus many women will be submitted

to surgery and complementary treatments that may result in impairments, demonstrating the importance of this study and its results (1). Furthermore, women after breast cancer surgery have led a more active lifestyle with more QOL, demonstrating the importance of functional recovery of UL to perform work, domestic and daily life activities. Evaluation of ROM and functional performance in clinical practice is an important tool to develop strategies and actions of prevention and treatment of physical and functional impairments caused by breast cancer treatment.

Presence of a control group was not possible in this study due to local routine, which all patients are admitted and referral to physiotherapy, avoiding a delay in treatment that may prejudice functional recovery. Thereby, contralateral UL was adopted as a control measurement to compare ROM, but it is unable to be a DASH control. No long-term results can be obtained, as patients were evaluated after 10 sessions of physiotherapy. ROM and functional performance improve after physiotherapy; however, abduction, lateral rotation and flexion exercises should be intensified.

Studies with a long-term follow-up and a greater sample size may offer more information to health professionals involved with breast cancer rehabilitation, as well, to oncologic services and mainly to these women.

## Conclusion

Ten sessions of physiotherapy improve ROM and functional performance of homolateral UL to surgery; however, no correlation was found between these variables. A long-term follow-up may corroborate to additional improvement.

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