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**Effects of early rehabilitation treatment on the functional recovery and quality of life in patients three months after breast cancer surgery**

Ефекти раног рехабилитационог третмана на функционални опоравак и квалитет живота пацијената три месеца након операције карцинома дојке

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## Effects of early rehabilitation treatment on the functional recovery and quality of life in patients three months after breast cancer surgery

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### SUMMARY

**Introduction/Objective** Breast cancer surgery is associated with the risk of developing functional constraints that may negatively affect the quality of patients' life. The aim of the study was to determine the impact of early postoperative exercises 3 months after surgery on functional recovery and quality of life of operated patients.

**Methods** A group of 149 patients was tested, divided by the type of surgery into two groups. The assessment of quality of life was done by the SF-36 questionnaire and functional testing were done 3 months after surgery, the volume of the movement in the shoulder joint and the extent of the limbs was measured too.

**Results** On basic measurements of quality of life, the average results of SF-36 showed the highest values in the domain of physical functioning, while the lowest value was the vitality and energy domain. After the realized rehabilitation activities, the results of the SF-36 questionnaire indicate the increase in all domains and components at the significance level of  $p = 0.001$ , except for the general health domain ( $p = 0.04$ ). Preoperatively, a moderate negative association of mobility and the SF-36 questionnaire component with the overall health parameter was determined, whereby the lower value of the SF-36 questionnaire was followed by a larger deviation in the flexion movements and abduction of the shoulder joint.

**Conclusion** The results of our study support the concept of early-initiated rehabilitation interventions and confirm the positive impact on the quality of life operated for breast cancer in the three-month follow-up period.

**Keywords:** breast cancer, surgery; quality of life; Questionnaires SF-36; early rehabilitation

### САЖЕТАК

**Увод/Циљ** Хируршке интервенције карцинома дојке повезане су са ризиком развоја функционалних ограничења која могу негативно утицати на квалитет живота оперисаних.

Циљ студије био је да се утврди утицај раног рехабилитационог третмана на функционални опоравак и квалитет живота оперисаних пацијенткиња три месеца након операције карцинома дојке.

**Метод** Испитивану групу чинило је 149 пацијенткиња, подељених према врсти хируршке интервенције у две групе. Процена квалитета живота извршена је упитником SF-36, а функционалним тестирањем мерен је обим покрета у раменом зглобу и обим екстремитета пре и 3 месеца након операције.

**Резултати** На базном мерењу квалитета живота, просечни резултати SF-36 показали су највеће вредности у домену физичког функционисања а најнижу вредност имао је домен виталност и енергија. Након реализованих рехабилитационих активности резултати упитника SF-36 указују на пораст свих домена и компоненти на нивоу значајности од  $p = 0,001$  осим домена опште здравље ( $p = 0,04$ ). Преоперативно је утврђена умерена негативна повезаност покретљивости и компоненти упитника SF-36 са параметром укупно здравље при чему ниже вредности упитника SF-36 прати веће одступање у покретима флексије и абдукције раменог зглоба.

**Закључак** Резултати наше студије подржавају концепт рано започетих рехабилитационих интервенција и потврђују позитиван утицај на квалитет живота оперисаних због карцинома дојке у тромесечном период праћења.

**Кључне речи:** карцином дојке, хирургија, квалитет живота, упитник SF-36, рана рехабилитација

## INTRODUCTION

Breast cancer is one of the most common malignancies that affects both women in the world and in the territory of the Republic of Serbia and of the Autonomous Province of Vojvodina [1].

Despite its great prevalence and the increase in new cases, advances in early detection, therapy and follow up modalities have made this group of patients one of the largest within the oncological population with a five-year survival period [2, 3].

Breast cancer is classified by the Tumor, Nodal and Metastases (TNM) classification and the medical treatment requires a multidisciplinary approach – surgery, chemotherapy, hormonal, biological (immunotherapy), and most commonly combined treatment. Within medical modalities of breast cancer treatment there is a wide variety of treatments with similar and positive effects, but with differences in regards to their effects on the patient quality of life [4–7]. One of the most important aspects of breast cancer treatment is surgery. Its extent depends on the size and spread of the tumor, its mobility with regards to the underlying chest muscles, skin infiltration and the tumor breast size ratio. Although all surgical methods are invasive and can lead to soft tissue injury leading to scarring and contributing to the development of contractures of breast muscles and those located around the shoulder joint [4].

Dysfunction of the shoulder joint manifests itself as a decreased/limited movement range of the shoulder joint with decreased muscle strength often followed by pain and fatigue [4–8]. Facts of the available literature show that in most of the patients that underwent surgery there are one or two functional disorders. The limitation of the shoulder joint movement is one of the most common complication [9, 10, 11].

The early rehabilitation program after breast cancer surgery at the Institute for Oncology of Vojvodina in Sremska Kamenica (IOV) promotes a multidisciplinary approach and the all interventions that we apply to in or out hospital patients are individualized in order to accommodate a new changed need of our operated patients. Importance of range of motion exercises (ROM) in the prevention and preservation of shoulder function, including the improvement of synovial drainage and lymph flow by activating physiological mechanisms (trans-synovial pump), loaded early rehabilitation to start two days after surgery [12].

Personalized approach to patients is based on the evidence of previous research, whose results prove that individually adjusted exercise programs in patients recovering from breast cancer surgery increase movement range and muscle strength and can significantly improve the function of the shoulder joint without risk of lymphedema [12, 13].

The aim of this study is to estimate the effect of early rehabilitation on the quality of life of patients that have undergone breast cancer surgery.

## METHODS

Breast cancer patients who started oncology treatment with a surgical procedure at the Clinic for Surgical Oncology IOV in the period March- November 2015 participated in this prospective, repeated trans-sectional, descriptive study. Participation in this research was on a voluntary basis. The patients were given and have signed an informed consent form. The exclusion criteria were the return of tumor, repeated surgery, use of chemotherapy before surgery, existence of contractures and/or lymphedema on the affected arm.

An early postoperative rehabilitation treatment consisted of active and / or assisted ROM exercises (five to six exercises) with repetition twice a day under the supervision of a physiotherapist for 30 minutes. The average number of days of hospitalization was 6. Education on early signs of secondary lymphoma (self-monitoring), introduction to preventable risk factors for the emergence of functional complications and recommendations for the hygienic and dietary regime were carried out during hospitalization.

The evaluation of the functional status included the measurement of both upper extremity movements and lymphedema screening. Lymphedema was determined by measuring the circumference of the affected arm in seven points and also measuring the contra-lateral side. The size of the lymphedema expressed as the ratio between the circumference of the healthy and the affected arm and is calculated by the following formula:  $[(\text{total diameter of the affected arm} - \text{total diameter of the affected arm}) / \text{total circumference of the healthy arm}] \times 100$ .

The evaluation of the range of motion upper extremity has been performed by using a goniometer, and the mobility of the shoulder joint in terms of flexion, extension, abduction, internal and external rotation were also measured.

During the last day of hospitalization, the measurements were repeated (basal measurement) and again three months after patient discharge (follow up). The validity of the functional estimation test was verified by five specialist clinical nurses and physiotherapists.

In order to determine the quality of life (QOL) we used The Medical Outcomes Study Short Form Health Survey SF-36. It is a theoretically grounded and empirically tested operationalization of two health concepts – physical and mental health and their two manifestations: functioning and wellbeing [14].

The score registered in each domain of the questionnaire is transformed into standard values on a unified scale that has a theoretical minimum of 0, and a maximum of 100 points. Higher scores pointed to a better quality of life.

This way of scoring enabled quantitative comparison of different manifestations of health within the domains that were measured by the questionnaire, and the interpretation of the total value expressed through the Total Health (TH) parameter and the differentiation of eight domains and two components. Domains of SF- 36 test are: PF- physical functioning; RP – limitations according to physical difficulties; RE- limitations because of emotional difficulties; VT- vitality and energy; MH- emotional well-being; SF- social functioning; BP- pain; GH- general health perception, and components of the SF- 36 are: PCS- physical health; MCS- mental health.

The reliability of the short form of the SF-36 scale has been analyzed by determining the Cronbach alpha coefficient ( $\alpha = 0.71-0.92$ ).

For statistical analysis the sample was stratified with regards to the type of the surgical intervention (group 1 – mastectomy; group 2 – breast-conserving surgery). Data analysis estimated the effectiveness of the intervention after 3 months by using the Student's

t-test and Leven test, while the correlation between the functional status, socio-demographic variables and life quality was presented by using the Spearman coefficient.

For analysis the differences in frequency distribution for attributive variables we used the nonparametric Chi-square test, Cronbach alpha coefficient – to determine the reliability of the questionnaire in its entirety and its various subscales and components. All statistical data were input into StatSoft software (Statistica 10.0, StatSoft, Inc., Dell, Round Rock, TX, USA) for all inferential statistical analysis, significance was defined as  $p \leq 0.05$ .

Study protocol has been approved by the Ethical Council of the Institute for Oncology of Vojvodina in Sremska Kamenica and by the Ethical Committee of the Faculty of Medicine, University of Novi Sad.

## RESULTS

A total of 187 participants were enrolled into the research, and a certain number of patients did not come to the follow up examination three months after surgery, some of the patients incorrectly filled questionnaires and they were excluded from the study.

The final sample consisted out of 149 appropriately filled questionnaires (response 79.67%). The average age of the surveyed participants was  $58 \pm 13$  (min = 20; max = 80; median = 60). Mastectomy were performed in 67 patients therefore they were sorted in group 1, while those patients in group 2, totaling 82, had breast-conserving surgery.

The patients divided into two groups according to the type of surgery and did not show differences with regards to demographic variables (Table 1).

At the base quality of life measurement, the average SF-36 scores showed that both groups of patients scored as highest in the domain of physical functioning (group 1  $157.46 \pm 30.88$  vs. group 2  $66.28 \pm 25.88$ ).

The most common drop in scores was in the domains of vitality and energy (group 1  $37.31 \pm 21.89$  vs group 2  $41.23 \pm 23.42$ ). Significant differences among the groups have been shown in physical functioning, limitation due to emotional difficulties, components of physical abnormalities and overall health ( $p \leq 0.05$ ).

Postoperative evaluation of the quality of life three months after discharge and after performing rehabilitation activities at home pointed to an increase average scores of all components and domains of the SF-36 questionnaire for both groups.

Significant differences are expressed in a limitation of emotional difficulties, emotional well-being, social functioning, and mental health components ( $p \leq 0.05$ ).

The evaluation of SF - 36 questionnaires using the Student's T - test for repeated measurements examined the differences in domains, the total parameter, and the components

for the whole sample. A statistically significant difference existed in all domains and questionnaire components ( $p \leq 0.05$ ).

The results of functional testing by measuring the circumference of the movement indicated that the greatest deviation for the abduction and flexion movements of the shoulder joint in both measurement periods without statistically significant differences among groups

(Table 5). The measurement of the extremities in both groups of patients did not show any deviation either before or after surgery, and the results are not shown.

By calculating correlations we have determined the a mild negative connection between lower score of mental health on the base measurement and higher deviation in abduction and flexion of the shoulder joint in patients after mastectomy ( $\rho = -0.353$   $p = 0.01$  vs  $\rho = -0.368$   $p = 0.02$ ), as well as in the group of patients with breast conserving surgery ( $\rho = -0.338$   $p = 0.04$  vs  $\rho = -0.409$   $p = 0.02$ ).

After three months in group one we did not detect a connection between the quality of life and functional status, while in group 2 there is a mild negative connection, namely the greater the deviation in shoulder joint flexion the lower the scores in the physical and mental health components and the total health of the SF-36 questionnaire ( $\rho = -0.333$   $p = 0.04$ ;  $\rho = -0.324$   $p = 0.05$ ;  $\rho = -0.323$   $p = 0.04$ ) (Table 6).

## DISCUSSION

A heterogeneous rehabilitation approach with specific rehabilitation interventions and different methodological approaches are described in numerous studies [5–10, 12, 13]. Most authors reported their positive influence on the QOL of those suffering from and being treated of breast cancer [15–24].

The advantages and disadvantages of rehabilitation in different times from the moment of diagnosing the disease, applying medical treatment and during recovery period still causes confusion. Most authors have been determined that active and/or assisted ROM started from 1 to 3 days after surgery compared to ROM started 4 days after surgery has more positive effects on shoulder flexion and abduction. The benefits of an early started exercises (24-72h after surgery) without increased risk from seroma and difficulties in treatment complications

like postoperative pain and lymphedema are well documented [3, 6, 8, 10, 12]. ROM as a safe, efficient and feasible intervention for breast cancer surgery patients with includes reduction of pain, fatigue, depression [3, 12, 15–18, 21, 22] were the reason that we chose the early start intervention program.

In our study by assessing the QOL by at base point, we detected distinctly low levels of vitality and energy. A total of 105 (70.5%) patients reported that they were unsettled throughout the last 4 weeks and more than half of them were discouraged and depressed. Such data did not differ significantly depending on the type of planned surgical intervention. Strong emotional reactions such as fear, uneasiness, sadness and uncertainty with regards to possible outcomes have been described in other studies [5–8].

By analyzing the responses within domain limitation according to physical difficulties, we have noticed that more than a half of the patients have avoided or have not realized their usual activities mostly related to housework (ironing, vacuuming, meal preparation and to forth) out of fear of potential postoperative complications. Consequentially patients that displayed such behavior reported more limitations regarding to the type of jobs and activities and spent less time working.

In our study effects of the early rehabilitation program three months after surgery point to an increase in average summation scores in all domains and components in both patient groups. These results are also supported by studies realized in Denmark, Poland and Spain [2, 17, 19, 20, 25].

The greatest difference ( $-20.93 \pm 1.20$ ) in favor of the repeated measurement was detected in the domain of pain without any difference according to the type of surgical procedure. In comparison with the results of our study, many other papers point that after fatigue, pain is the most common reported symptom presented in about 27% to 79% of women in the first months after surgery [3–11]. It would be expected that prevalence rate has to decrease with the process of healing, but a systemic review of about thirty studies done by L. Wang shows that 12% to 82% of women report pain even one year after surgery [26].

High scores in the BP domain 3 months after surgery in our study pointed to the fact that both patient groups 3 months after surgery have had fewer limitations induced by body pain. Such results of our research can be explained by regular post-surgical recovery and the effects of rehabilitation. Among patients from our study there were no early or late post-



operative complications. Standard personalized physiotherapeutic approach in guiding and controlling pain after a surgical intervention of breast cancer encompasses a specter of exercises, myofascial stretching, non-pharmacological methods and educating patients so that they can identify positions and activities that could free them of pain. A personalized approach makes sure that planned therapeutic exercises are realized up to individually determined pain and discomfort limits. During repeated measurement the patients reported that exercises with daily supervision by physiotherapists and nurses helped them get rid of fear and ignorance regarding to the healing process and allow them all the activities of the affected arm at home. Such accounts of our patients support the findings of other authors who claim that appropriate pain guidance in early stages of breast cancer treatment is necessary in prevention of long-term related pain invalidity [3, 4, 17, 21, 22].

After surgery a significant increase has been reported in the domain o of emotional difficulties, emotional well-being, social functioning, and mental health components in both groups.

Significant differences in relation to the type of surgery indicate that patients from group 1 were less depressed and/or discouraged than those in group 2 ( $\chi^2 = 10.56$ ;  $df = 2$ ;  $p = 0.03$ ). They have indicated that because of the physical health or mental problems they neglected their usual social activities with family and friends ( $\chi^2 = 8.50$ ;  $df = 2$ ;  $p = 0.03$ ).

Unlike ours, the results of the study by M. Kamińska et al. [27] indicate that the level of depression and anxiety is more pronounced in the patient group after mastectomy.

Before the admission, all the patients from our study received recommendations for continuing the exercise program in home conditions with education aimed at preventing possible complications. We cannot say with certainty that all the patients acted by the given recommendations when they have done exercise at home, but the results of a functional assessment of the mobility of the shoulder joint indicate that they were. However, shoulder joint flexion and abduction of the affected arm shown the greatest deviation from the normal motion range during the first three months and this is matched with the results of other research [4, 6, 8, 13, 22, 25]. Beside that the patients achieved high scores in the domain of physical functioning. Reported discrepancies in the motility of the shoulder joint of the affected arm, compared to the other one, do not have a negative effect on physical functioning and decreasing of the independence in daily life activities.

Furthermore, our research shows that there is a mild negative connection between the MCS component and shoulder motility in the affected arm in both groups of patients during base measurement. We did not find any connection between the quality of life and functional status in group 1 after three months. In group 2 there was a moderate negative connection. As the patients had higher deviations in the flexion movement of the shoulder joint, lower scores on PCS and MCS components and total health followed ( $\rho = -0.333$   $p = 0.04$ ;  $\rho = -0.324$   $p = 0.05$ ;  $\rho = -0.323$   $p = 0.04$ ).

The influence of social and demographic variables of the participants on the quality of life in our study manifested only in the case of age and existence of a hobby. Namely as the age of the patients increases and if they have a hobby, the limitations caused by emotional difficulties decreased ( $\rho = -0.311$   $p = 0.001$ ;  $t = 4.47$ ;  $p = 0.001$ ) regardless to the type of surgery.

Regarding “total health” and physical functioning, the quality of life of women in the early post-operative period was similar after breast mastectomy and those who underwent breast-conserving surgery.

## CONCLUSION

The early rehabilitation contributes to the functional recovery of the affected arm while promoting independence in daily life activities and doing have an impact on the increase of the quality of life. The findings of our study have shown that the early rehabilitation program did not influence the risk and incidence of early and/or late complications caused by breast cancer surgery.

**Conflict of interest:** None declared.

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**Table 1.** Demographic and clinical characteristic of breast cancer patients

Variables	Total (n = 149) Mean ± SD	Group 1 (n = 67) Mean ± SD	Group 2 (n = 82) Mean ± SD	t/ $\chi^2$	p
Age		57.13 ± 13.720	58.34 ± 11.590	0.584*	0.56
Education levels				2.644**	0.61
Grade school	31 (20.3%)	15 (22.4%)	16 (18.5%)		
High school	82 (55.4%)	33 (49.3%)	49 (65%)		
Under graduate	17 (11.5%)	10 (14.9%)	7 (8.6%)		
Graduate	19 (12.8%)	9 (13.4%)	10 (12.3%)		
Vocation				9.510**	0.14
Worker	46 (16.9%)	23 (36.0%)	23 (28.4%)		
Official	41 (27.7%)	22 (32.8%)	19 (23.5%)		
Housewife	16 (10.8%)	7 (10.4%)	9 (11.1%)		
Retiree	45 (30.4%)	15 (22.4%)	30 (37.0%)		
Marital status				4.12**	0.39
Married	95 (63.8%)	39 (58.2%)	56 (68.3%)		
Divorced	31 (20.8%)	16 (23.9%)	15 (18.3%)		
Not married	9 (6.0%)	5 (7.5%)	4 (4.9%)		
Widow	14 (9.4%)	7 (0.4%)	7 (8.5%)		
Hobby				0.001**	0.93
No	105 (70.5%)	47 (70.1%)	58 (70.7%)		
Yes	44 (29.5%)	20 (29.9%)	24 (29.3%)		

\*t-test; \*\* $\chi^2$  – chi-squared test

**Table 2.** Baseline scores of the SF-36 questionnaire items among study groups

SF-36 domains	Baseline			t-test	
	Total (n = 149) Mean ± SD	Group 1 (n = 67) Mean ± SD	Group 2 (n = 82) Mean ± SD	t	p
PF	62.19 ± 28.54	57.46 ± 30.88	66.28 ± 25.88	-1.86	0.05
RP	46.19 ± 27.72	43.47 ± 28.02	48.39 ± 27.28	-1.08	0.28
RE	56.19 ± 27.39	51.24 ± 26.48	60.16 ± 27.46	-2.00	0.04
VT	39.52 ± 22.82	37.31 ± 21.89	41.23 ± 23.42	-1.04	0.29
MH	60.13 ± 21.62	57.53 ± 22.70	62.37 ± 20.47	-1.36	0.17
SF	52.95 ± 22.93	49.62 ± 23.53	55.64 ± 22.06	-1.60	0.11
BP	55.23 ± 27.58	50.37 ± 26.46	59.35 ± 27.83	-2.00	0.07
GH	50.23 ± 16.66	49.55 ± 17.60	50.97 ± 16.30	-0.51	0.60
TH	51.62 ± 17.51	48.60 ± 18.41	54.08 ± 16.44	-1.91	0.05
PCS	53.54 ± 18.68	50.21 ± 19.32	56.25 ± 17.79	-1.98	0.04
MCS	49.70 ± 18.16	46.98 ± 19.15	51.59 ± 17.10	-1.65	0.10

Group 1 – mastectomy; Group 2 – breast-conserving surgery; PF – physical functioning; RP – limitations because physical difficulties; RE – limitations because of emotional difficulties; VT – vitality and energy; MH – emotional well-being; SF – social functioning; BP – pain; GH – general health perception; TH – total health; PCS – physical health; MCS – mental health

**Table 3.** Postoperative scores of the SF-36 questionnaire items among study groups

SF-36 domains	Follow-up			t-test	
	Total (n = 149)	Group 1 (n = 67)	Group 2 (n = 82)	t	p
PF	75.67 ± 21.45	73.25 ± 23.91	77.62 ± 19.16	-1.63	0.06
RP	64.27 ± 21.10	62.59 ± 21.44	65.62 ± 20.72	-1.08	0.28
RE	68.18 ± 22.16	64.80 ± 21.16	70.83 ± 22.61	-2.00	0.04
VT	57.81 ± 19.16	56.25 ± 18.59	59.22 ± 19.54	-0.94	0.06
MH	62.63 ± 20.18	58.80 ± 20.43	65.48 ± 19.62	-2.03	0.04
SF	70.27 ± 18.35	67.16 ± 18.82	72.71 ± 17.58	-1.85	0.05
BP	76.23 ± 20.46	73.28 ± 20.82	78.68 ± 19.84	-2.00	0.06
GH	51.79 ± 15.29	51.79 ± 15.06	51.58 ± 15.59	0.08	0.90
TH	65.37 ± 13.64	63.25 ± 14.33	67.07 ± 12.89	-1.70	0.09
PCS	66.99 ± 14.23	65.26 ± 15.10	68.38 ± 13.41	-1.32	0.18
MCS	63.71 ± 14.53	61.20 ± 14.75	65.76 ± 14.11	-1.92	0.05

Group 1 – mastectomy; Group 2 – breast-conserving surgery; PF – physical functioning; RP – limitations because of physical difficulties; RE – limitations because of emotional difficulties; VT – vitality and energy; MH – emotional well-being; SF – social functioning; BP – pain; GH – general health perception; TH – total health; PCS – physical health; MCS – mental health

**Table 4.** Differences in mean values of SF-36 scores between the baseline and follow-up measurements for the complete sample

SF-36 domains	Scoring Mean $\pm$ SD; n = 149			t	p
	Baseline	Follow-up	Difference		
PF	62.19 $\pm$ 28.54	75.67 $\pm$ 21.45	-13.47 $\pm$ 1.11	-12.11	0.001
RP	46.19 $\pm$ 27.72	64.27 $\pm$ 21.10	-18.07 $\pm$ 1.67	-10.78	0.001
RE	56.19 $\pm$ 27.39	68.18 $\pm$ 22.16	-11.96 $\pm$ 1.17	-10.16	0.001
VT	39.52 $\pm$ 22.82	57.81 $\pm$ 19.16	-18.41 $\pm$ 1.22	-15.08	0.001
MH	60.13 $\pm$ 21.62	62.63 $\pm$ 20.18	-2.28 $\pm$ 0.84	-2.68	0.001
SF	52.95 $\pm$ 22.93	70.27 $\pm$ 18.35	-17.28 $\pm$ 1.22	-14.12	0.001
BP	55.23 $\pm$ 27.58	76.23 $\pm$ 20.46	-20.93 $\pm$ 1.20	-17.36	0.001
GH	50.23 $\pm$ 16.66	51.79 $\pm$ 15.29	-1.34 $\pm$ 0.66	-2.02	0.04
TH	51.58 $\pm$ 17.56	65.37 $\pm$ 14.34	-13.78 $\pm$ 0.69	-19.77	0.001
PCS	53.46 $\pm$ 18.72	66.99 $\pm$ 14.22	-13.52 $\pm$ 0.75	-17.82	0.001
MCS	49.70 $\pm$ 18.21	63.74 $\pm$ 14.57	-14.01 $\pm$ 0.74	-18.82	0.001

Group 1 – mastectomy; Group 2 – breast-conserving surgery; PF – physical functioning; RP – limitations because physical difficulties; RE – limitations because of emotional difficulties; VT – vitality and energy; MH – emotional well-being; SF – social functioning; BP – pain; GH – general health perception; TH – total health; PCS – physical health; MCS – mental health



**Table 5.** Descriptive indicators of average movement range grouped by type of surgery

Type of movement	Baseline		Follow-up	
	Group 1 (n = 67) Mean ± SD	Group 2 (n = 82) Mean ± SD	Group 1 (n = 67) Mean ± SD	Group 2 (n = 82) Mean ± SD
Abduction	118.28 ± 8.41	119.45 ± 8.18	158.28 ± 8.46	159.45 ± 6.18
Flexion	118.43 ± 8.78	119.51 ± 8.26	158.43 ± 8.88	159.51 ± 6.26
Extension	25.40 ± 2.45	25.70 ± 1.91	39.40 ± 2.54	39.70 ± 1.81
Internal rotation	49.25 ± 3.16	49.63 ± 1.88	69.25 ± 3.04	69.63 ± 1.88
External rotation	69.18 ± 3.76	69.33 ± 2.85	79.18 ± 3.67	79.33 ± 2.65

Group 1 – mastectomy; Group 2 – breast-conserving surgery

**Table 6.** Correlation of quality of life (total score of SF-36 components) and movement range in the shoulder joint

Type of surgery	Type of movement		Components of SF-36					
			Baseline			Follow-up		
			PCS	MCS	TH	PCS	MCS	TH
Mastectomy	Abduction	$\rho$	-0.17	-0.35	-0.26	-0.22	-0.26	-0.25
		p	0.30	0.03	0.12	0.18	0.12	0.14
	Flexion	$\rho$	-0.22	-0.36	-0.30	-0.27	-0.26	-0.28
		p	0.18	0.02	0.07	0.10	0.11	0.10
Breast-conserving surgery	Abduction	$\rho$	-0.25	-0.33	-0.27	-0.28	-0.26	-0.26
		p	0.12	0.04	0.10	0.09	0.10	0.12
	Flexion	$\rho$	-0.26	-0.40	-0.30	-0.33	-0.32	-0.33
		p	0.10	0.01	0.06	0.04	0.05	0.04

$\rho$  – Spearman coefficient; PCS – physical health; MCS – mental health; TH – total health;

$p \leq 0.05$