

ORIGINAL ARTICLE

Advantages of Stretching Before Surgery on the Functionality of the Shoulder after the Surgery in Patients Undergoing Mastectomy

MUHAMMAD MUBASHIR AHMED CHANDIO¹, MUHAMMAD ABID OWAIS², MASOOD AHMED³, SYED MOIN ISLAM SHAH⁴, RAFIA UNAR⁵, RAMSHA KHAN⁶

¹Assistant Professor of Surgery, Bibi Asifa Bhutto Dental College SMBB Medical University CMC Teaching Hospital Larkana Pakistan

²Associate Professor of Surgery, Baqai Medical University Karachi Pakistan

³Associate Professor of Surgery, Peoples University of Medical and Health Sciences for Women (PUMHS) Nawabshah Shaheed Benazirabad Pakistan

⁴Assistant Professor of Surgery, Sulaiman Roshan Medical College Hospital Tandoodam Pakistan

^{5,6}Women Medical officer General Surgery, Liaquat University of Medical and Health Sciences Jamshoro / Hyderabad Pakistan

Corresponding author: Muhammad Mubashir Ahmed Chandio, Email: mubashirchandio@gmail.com

ABSTRACT

Objective: To analyse the effects of stretching the muscles of the shoulder before surgery on the functionality of the shoulder after the surgery of mastectomy

Study design: An analytical cross-sectional study

Place and Duration: This study was conducted at Bibi Asifa Bhutto Dental College SMBB Medical University CMC Teaching Hospital Larkana from January 2022 to June 2022.

Methodology: All the patients included in the study had mastectomy. The participants were randomized to control groups and treatment groups. The participants in the treatment group were gone through static stretching with a range of motion. The control group did not undergo any stretching preoperatively and was given standard postoperative care. The Numeric Pain Rating Scale (NPRS), Groningen Activity Restriction Scale (GARS), and Universal Goniometer (UG) were used for the collection of the data on the first and third postoperative days. The data was analyzed in the IBM SPSS version 26.

Results: A total of 20 patients were included in the study. Overall 10 patients were allocated to the treatment group and 10 were allocated to the control group. The mean age of the patients was 47±11.86 years. A significant difference in the functionality, range of motion, pain, and Groningen Activity Restriction Scale scores for daily activities was seen in the treatment group ($p < 0.05$) compared to the control group ($p > 0.05$). However, the difference was not significant in external rotation and Groningen Activity Restriction Scale scores ($p > 0.05$).

Conclusion: Shoulder stretching before surgery is not only safe, but it is also effective in the reduction of functional restriction and pain after the mastectomy surgery.

Keywords: Shoulder stretching, Pre-operative stretching, Mastectomy, Post-op shoulder function

INTRODUCTION

Carcinoma of the breast is known to be the most commonly observed cancer followed by skin cancer, and the second leading cause of death because of cancer after lung cancer [1]. The incidence of breast cancer in the women of Pakistan has a higher rate compared to the countries in rest of the Asia and it accounts for 23% of cancer worldwide [2]. According to the figures given by WHO, about 1.2 million individuals are diagnosed with this disease on a global level every year [3]. It is a rare condition in males, although men may also be diagnosed with it [4]. According to a study by Shaukat Khanam Memorial Cancer Hospital, 21.5% out of all the patients and 45.9% of the female patients have been reported to have breast cancer [5].

The flexion of the shoulder, grip stretch, and abduction range of motion (ROM) can efficiently predict the abduction ROM and flexion of the shoulder postoperatively along with the level of recovery. The patients who have restricted abduction ROM and flexion before the surgery are most likely to have a higher degree of restriction after the surgery. It sometimes does not recover even after one year of the surgery [6]. The level of activity before the surgery depicts the level of mobility after the surgery [7]. Dysfunction of the upper link is a common side effect of breast cancer treatment. This dysfunction is seen in the form of exaggerated pain, weakened strength, lymphedema, and decreased ROM of the shoulder [8]. The morbidities related to the upper limb are commonly observed as caused by breast cancer which hinders the daily activities performed manually or utilizing any instrument. Breast cancer also affects the social, emotional, and physical functioning of the patients, eventually affecting their quality of life [9]. Hence, the exercises done in the preoperative phase are also advantageous in this manner that they leave positive impacts on the physical functioning of the patient. Many oncologists agree that preoperative exercises help to gain normal functions back after the surgery [10]. The strength and stability of the shoulder mainly depend on the scapula as most of the muscles of the shoulder have attachments with it. For this reason, the first joint to be affected by breast cancer is the shoulder joint and its

mobility. Hence, the exercises of this joint are quite helpful in gaining mobility and strength even after the surgery [11]. A study has suggested that stretching proved to be effective in boosting the flexibility of extensibility of muscle, especially static stretching [12].

The present study aims at analyzing the effects of stretching of the shoulder done preoperatively on the functions of the muscles postoperatively. It is also intended to find out the impact of the exercises on the activities of female patients in daily life followed by mastectomy.

METHODOLOGY

The present study is an analytical cross-sectional study and a total of 20 patients have been added to the present study by following this formula [13]:

$$n = 2[(a + b)^2 \sigma^2] / (\mu^1 - \mu^2)^2$$

The ages of the patients ranged from 35 years to 65 years. A unilateral modified radical mastectomy was performed on all the patients along with axillary clearance. According to the exclusion criteria, the patients with recurrence of the tumor, a previous history of cancer, any pre-existing deformity or abnormality in the shoulder joint such as rheumatoid arthritis, history of distant metastasis, diabetes, any previous surgery with involvement of chest wall or shoulder region, and patients with any psychiatric condition, were not included in the study. All the patients were screened for the inclusion criteria before they were included in the study. Written informed consent was taken from all the participants of the research. After that, the patients were randomly allocated to treatment and control groups.

The Numeric Pain Rating Scale (NPRS) was used for the assessment of pain, Universal Goniometer (UG) was used for the assessment of ROM of the shoulder, and Groningen Activity Restriction Scale (GARS) was used for the measurement of normality on daily activities. The primary outcome measures were the range of movement (ROM) and pain, whereas, activity was set as a secondary outcome. The number of analgesics given to the participants of both the groups was same. The rest of the medications were also given equally to both groups.

Before the surgery was performed, the participants of the treatment group used to come for their exercise sessions 2 to 5 times a week. Active ROMs were performed for 5 minutes as a warm-up. About 10 to 12 reps of should ROM were done in 2 to 3 sets in a day. Passive static stretching was done for 15-30 seconds in 8 to 10 reps. Two or three sessions of static stretching withholding were conducted. Shoulder extensors, adductors, rotators, and pectorals were stretched for improvement in the abduction, external rotation, and flexion in the supine position as well as in the sitting position. Both active and passive ROM was performed and the patients were guided about the movements of the shoulder. Codeman's exercise was performed by the patients as a cool-down session. At the end of the session, static stretching was done. The normal standard care was given to all of the participants after the surgery. The ROM scores, GARS scores, and pain scores were measured on the first and third postoperative days in both control and treatment groups. The data were analyzed using IBM SPSS version 26.

RESULTS

A total of 20 patients were included in the present study with the allocation of 10 (50%) of the participants to the control group and 10(50%) to the treatment group. The mean age of the patients was 47 ± 11.86 years. The difference between the pain, activity, and ROM of both groups was significant ($p < 0.05$). This significant difference was seen on the third postoperative day. (As shown in Table 1)

The value of NPRS in the treatment group on the first postoperative day was 3.67 ± 1.761 , whereas it was 4.65 ± 1.646 in the control group, which was greater than the treatment group. Similarly, NPRS was 1.13 ± 1.097 in the treatment group on the third postoperative day which was lesser compared to 2.49 ± 1.438 in the control group. (As shown in Table 2)

Table 2 also shows the values of the GARS score on the first postoperative day and the third postoperative day. A significant difference can be seen in the values of the treatment and control groups.

Table 3 shows the ROM in different directions on the first and third days after the mastectomy. It is obvious from the figures given in the table that the ROM was significantly better in the patients in the treatment group, especially on the third postoperative day.

Table 1: Assessment of pain (NPRS) done on the first and third postoperative days

Outcomes	Groups (Treatment or control)	N	Mean±Standard Deviation	P-value
First postoperative day	Control	10	4.65 ± 1.646	0.032
	Treatment	10	3.67 ± 1.761	
Third postoperative day	Control	10	2.49 ± 1.438	0.006
	Treatment	10	1.13 ± 1.097	

Table 2: GARS score on the first and third postoperative days in the control and treatment group

Outcomes	Groups (Treatment or control)	N	Mean±Standard Deviation	P-value
First postoperative day	Control	10	55.66 ± 4.643	0.132
	Treatment	10	53.19 ± 3.765	
Third postoperative day	Control	10	39.53 ± 2.831	0.001
	Treatment	10	34.81 ± 3.765	

Table 3: ROM on the first and third postoperative days

Outcomes	Groups (Treatment or control)	N	Mean±Standard Deviation	P-value
Flexion ROM on the first	Control	10	111.64 ± 27.062	0.046
	Treatment	10	130.15 ± 24.632	

post-op day				
Flexion ROM on the third post-op day	Control	10	121.68 ± 22.676	0.037
	Treatment	10	136.98 ± 18.181	
Abduction ROM on the first post-op day	Control	10	109.56 ± 21.176	0.026
	Treatment	10	128.12 ± 21.275	
Abduction ROM on the third post-op day	Control	10	120.54 ± 17.642	0.019
	Treatment	10	137.00 ± 16.452	
External rotation ROM on the first post-op day	Control	10	51.45 ± 13.756	0.096
	Treatment	10	60.18 ± 10.108	
External Rotation on the third post-op day	Control	10	57.54 ± 14.198	0.043
	Treatment	10	68.24 ± 11.652	

DISCUSSION

The current study contained patients with an age ranging from 35 years to 65 years. The study of Suurmeijer et al suggests that the age at which breast cancer is common is 35-65 years. The most common and influential complication followed by radical mastectomy is a limitation of ROM in the shoulder and a decrease in the capacity of functioning. The rehabilitation program is not favourable right after the surgery for various reasons. Furthermore, the results regarding the formation of seroma, shoulder mobility, and wound exudate are controversial. It has also been noticed that the exercises introduced after the surgery give rise to more production of lymphoid fluid than normal [14]. Excess of this fluid can give rise to a seroma. Inadequate drainage of this seroma can cause infection, discomfort, longer stay at the hospital, and pain [15]. Singh et al compared the condition of the patients in two groups. One group was introduced to a rehabilitation program before and after the surgery, while the other group was only given rehabilitation after the surgery. They concluded that using a multimodal approach, giving rehabilitation is favourable for the physiological mobility of the patients [16]. Another similar study conducted by Baima et al also suggests that lightweight lifting and enrolling in a rehabilitation program before the surgery has been proven to decrease the pain significantly in the first and third months after the surgery [17]. Their result is suggestive of positive outcomes of exercise before and even after the surgery.

Lokapavani et al conducted research on the rehabilitation program before the surgery and concluded that the patients who had received rehabilitation including scapulothoracic joint and glenohumeral joint exercises related to ROM such as walking, stretching, posture training, and diaphragmatic breathing, are less likely to lose the ROM and develop pain after the surgery. Also, they are more potent to gain shoulder ROM rapidly compared to those who did not get involved in rehabilitation before surgery [18]. Smooth et al demonstrated that preoperative shoulder abduction ROM, grip strength, and flexion were potential and reliable factors to predict the recovery of ROM after the surgery. Likewise, the patients who had limited ROM before the surgery had even weaker ROM after the surgery [19]. Springer et al conducted a study on retired military members and some civilians. The study was focused on the ROM before and after the surgery. They concluded in their study that the patients undergoing breast cancer surgery, those who were involved in stretching and rehabilitation activities before the surgery were able to reach their baseline shoulder ROM, flexion, abduction, and external rotation in three months [20].

CONCLUSION

The patients that were treated with physical therapy before undergoing modified radical mastectomy had a better range of movement of the shoulder after the surgery and they also complained of lesser pain development in the breast and shoulder.

Source of funding: There was no specific source of funding for the present study.

Interest confliction: There was no conflict of interest in the present study.

Permission: Permission was acquired and received from the ethical committee before the conduct of the study.

REFERENCES

1. Ma J, Jemal A. Breast cancer statistics. Breast cancer metastasis and drug resistance. 2013;1-8.
2. Asif HM, Sultana S, Akhtar N, Rehman JU, Rehman RU. Prevalence, risk factors and disease knowledge of breast cancer in Pakistan. Asian Pacific journal of cancer prevention. 2014; 15(11):4411-6.
3. ZAHRA F, HUMAYOUN F, YOUSAF T, KHAN NA. Evaluation of risk factors for carcinoma breast in Pakistani women. Journal of Fatima Jinnah Medical University. 2013; 7(1).
4. McPherson K, Steel C, Dixon JM. Breast cancer—epidemiology, risk factors, and genetics. *Bmj*. 2000 Sep 9; 321(7261):624-8.
5. McPherson K, Steel C, Dixon JM. Breast cancer—epidemiology, risk factors, and genetics. *Bmj*. 2000 Sep 9; 321(7261):624-8.
6. Blomqvist L, Stark B, Engler N, Malm M. Evaluation of arm and shoulder mobility and strength after modified radical mastectomy and radiotherapy. *Acta oncologica*. 2004 Apr 1; 43(3):280-3.
7. Smoot, B., Paul, S.M., Aouizerat, B.E., Dunn, L., Elboim, C., Schmidt, B., Hamolsky, D., Levine, J.D., Abrams, G., Mastick, J. and Topp, K., 2016. Predictors of altered upper extremity function during the first year after breast cancer treatment. *American journal of physical medicine & rehabilitation/Association of Academic Physiatrists*, 95(9), p.639.
8. Mohammed SA. Effects of Exercise Intervention on Pain, Shoulder Movement, and Functional Status in Women after Breast Cancer Surgery: A Randomized Controlled Trial. *Journal of Education and Practice*. 2016; 7(8):97-108.
9. Hewitt KJ, Agarwal R, Morin PJ. The claudin gene family: expression in normal and neoplastic tissues. *BMC cancer*. 2006 Dec; 6(1):1-8.
10. Singh F, Newton RU. Galv£ o DA, Spry N, Baker MK. A systematic review of pre-surgical exercise intervention studies with cancer patients. *Surg Oncol*. 2013; 22(92):104.den Herder-van der Eerden, M., Hasselaar, J., Payne, S., Varey, S., Schwabe, S., Radbruch, L., Van Beek, K., Menten, J., Busa, C., Csikos, A. and Vissers, K., 2017. How continuity of care is experienced within the context of integrated palliative care: a qualitative study with patients and family caregivers in five European countries. *Palliative medicine*, 31(10), pp.946-955.
11. Page P. Current concepts in muscle stretching for exercise and rehabilitation. *International journal of sports physical therapy*. 2012 Feb; 7(1):109.
12. Noordzij M, Tripepi G, Dekker FW, Zoccali C, Tanck MW, Jager KJ. Sample size calculations: basic principles and common pitfalls. *Nephrology dialysis transplantation*. 2010 May 1; 25(5):1388-93.
13. Suurmeijer TP, Doeglas DM, Moum T, Briançon S, Krol B, Sanderman R, Guillemin F, Bjelle A, Van den Heuvel WJ. The Groningen Activity Restriction Scale for measuring disability: its utility in international comparisons. *American journal of public health*. 1994 Aug; 84(8):1270-3.
14. Gong Y, Xu J, Shao J, Cheng H, Wu X, Zhao D, Xiong B. Prevention of seroma formation after mastectomy and axillary dissection by lymph vessel ligation and dead space closure: a randomized trial. *The American journal of surgery*. 2010 Sep 1; 200(3):352-6.
15. Cinar N, Seckin U, Keskin D, Bodur H, Bozkurt B, Cengiz Ö. The effectiveness of early rehabilitation in patients with modified radical mastectomy. *Cancer nursing*. 2008 Mar 1; 31(2):160-5.
16. JK S, Baima J. Cancer prehabilitation: an opportunity to decrease treatment-related morbidity, increase cancer treatment options, and improve physical and psychological health outcomes. *Am J Phys Med Rehabil*. 2013; 92:715-27.
17. Baima J, Reynolds SG, Edmiston K, Larkin A, Ward BM, O'Connor A. Teaching of independent exercises for prehabilitation in breast cancer. *Journal of Cancer Education*. 2017 Jun; 32(2):252-6.
18. Yang A, Sokolof J, Gulati A. The effect of preoperative exercise on upper extremity recovery following breast cancer surgery: a systematic review. *International Journal of Rehabilitation Research*. 2018 Sep 1; 41(3):189-96.
19. Smoot, B., Paul, S.M., Aouizerat, B.E., Dunn, L., Elboim, C., Schmidt, B., Hamolsky, D., Levine, J.D., Abrams, G., Mastick, J. and Topp, K., 2016. Predictors of altered upper extremity function during the first year after breast cancer treatment. *American journal of physical medicine & rehabilitation/Association of Academic Physiatrists*, 95(9), p.639.
20. Springer BA, Levy E, McGarvey C, Pfalzer LA, Stout NL, Gerber LH, Soballe PW, Danoff J. Pre-operative assessment enables early diagnosis and recovery of shoulder function in patients with breast cancer. *Breast cancer research and treatment*. 2010 Feb; 120(1):135-47.