Effect of Unilateral and Bilateral Shoulder Rehabilitation Exercise Protocol in Patients Secondary to Radical Mastectomy

Jasleen Kaur Sohal[1], Poonam H. Patil[2]

[1]Intern, Krishna College of Physiotherapy, KIMS 'Deemed to be' university, Karad, Maharashtra, India, [2]Assistant Professor, Department of Cardiopulmonary Sciences, Faculty of Physiotherapy, Krishna Institute Of Medical Sciences 'Deemed to be' university Karad, Maharashtra, India

Abstract

Background: Mastectomy is an operation which causes many changes in a woman's body. Its consequence is, among other things, lymphatic edemas, limitation of movements and strength of the upper limb of the patient, experiences in the emotional sphere, difficulties related to the postoperative scar and the results of supplementing treatment such a radiotherapy or chemotherapy. Recent studies have shown the result of effective physiotherapy treatment postoperatively. There is a paucity of literature available showing the effect of bilateral approach rather than a unilateral one for the recovery

Objective: Objective of the study was to find out the effect of effect of unilateral and bilateral shoulder rehabilitation exercise protocol in patients secondary to radical mastectomy

Method: A total of 20 females who underwent mastectomy procedure along with chemotherapy were included in the study. Demographic data and consent form were taken from the patients. Group A was received treatment for the unilateral i.e. the affected side and group B received treatment bilaterally for five days per week for eight weeks and pre and post assessment was done with shoulder pain and disability index (SPADI), range of motion (ROM) and manual muscle testing (MMT)

Results: Statistics results within the group values for Group A SPADI (p=0.6385) and mean difference (MD) was

Conclusion: A proper knowledge regarding ergonomics is important to avoid the development of musculoskeletal disorders, taking stretch breaks in between long working hours can provide a healthier working environment for nursing staff and maximize human resource efficiency.

Keywords: *Shoulder rehabilitation, Mastectomy, Shoulder pain and disability index(SPADI), Range of motion (ROM), Manual muscle testing(MMT).*

Introduction

Cancer is an abnormal growth of cells which tend to proliferate in an uncontrolled way and in some cases, to metastasize.[1] When cancer cells metastasize to nearby tissues or to distant areas of the body it is known as malignant tumor.[2] When cancer grows but does not spread it is known as benign tumor.[3] prevalence of breast cancer in India is 25.8 per 100000.[4] due to alterations in dietary habits, reproductive risk factors and increasing life expectancy there is a rapid rise in incidence of breast cancer. Most breast cancers start in the duct cells and only some in cells of lobules and other tissues. Breast cancer can be invasive carcinoma (malignant) or non-invasive carcinoma (benign). Invasive carcinoma is further divided into invasive ductal carcinoma, invasive lobular carcinoma, tubular carcinoma, medullary carcinoma. Non-invasive carcinoma includes ductal

Corresponding author:
Dr Poonam H. Patil
Department of Cardiopulmonary Sciences,
Faculty of Physiotherapy, Krishna Institute of Medical Sciences "deemed to be university" Karad – 415110
Maharashtra, India, Email id: drppatil8383@gmail.com
jasleen260297@gmail.com

carcinoma and lobular carcinoma.[3]

Surgical mastectomy is the only curative treatment for the females with breast cancer. Among the other mastectomy procedures, radical mastectomy results in the removal of the breast tissue, axillary lymph nodes and the chest wall muscles. Mastectomy is an operation which causes many changes in a woman's body. Its consequence is, among other things, lymphatic edemas, limitation of movements and strength of the upper limb of the patient, experiences in the emotional sphere, difficulties related to the postoperative scar and the results of supplementing treatment such a radiotherapy or chemotherapy. Significant complications after mastectomy are changes in body posture caused both by disorders in body static as a result of amputation and limitation of movements and soreness of the spine. The problem of changes in body posture, as a result of mastectomy is not well known. It seldom appears in scientific literature. It is, however, an important problem, both from the point of view of medical and psychological rehabilitation. Incorrect body posture may cause other somatic anomalies. For the patients good-looks related to body posture is the basis for better well-being [1,2].

Lower mortality risk and a higher quality of life are associated with higher levels of muscle strength.[8] The increasing incidence of surgical mastectomy places breast cancer survivors at risk for development of upper extremity strength imbalances. Pectoralis major, serratus anterior, upper trapezius, rhomboid muscles, latissimus dorsi are involved in management of breast cancer that is these muscles are cut during surgery or exposed to radiation during radiotherapy) which causes difficulty in flexion, abduction, internal rotation, scapular elevation, protraction and retraction.[10] Anthracyclines used in chemotherapy cause oxidative stress by two mechanisms: interaction with mitochondrial respiratory chain and through a nonenzymatic reaction with ferric iron. Anthracyclines based chemotherapy negatively affects noncancerous tissue along with straited muscles, which causes muscle fatigue and weakness in patients.[11] It is seen that though the complications develop on the ipsilateral side, the contralateral side is also affected to a great extent. But the contralateral side is often neglected due to a greater number of complications on the ipsilateral side.

In healthy women, upper extremity strength should be equal bilaterally. However, compared to healthy women, breast cancer survivors have greater upper extremity loss of strength, leading to functional impairment. Side to side muscle imbalances increase the risk for acute and chronic injury and that bilateral shoulder rehabilitation can resolve these imbalances and decrease risk for injury.

Material and Methodology

Study Design

This study was an Interventional study.

Place of study

The study was conducted in the Oncology department in Krishna Hospital, Karad.

Sample size

The sample size was 20 subjects

Sampling method

The subjects were selected by simple random sampling technique.

Study duration

The duration of the study was 6 months

Treatment duration

The treatment was given for 1 hour per day and 5 days/ week.

Inclusion criteria were as follows: 1. Females between 30 to 50 years 2. Subjects who underwent modified radicle mastectomy procedure along with chemotherapy or radiotherapy for breast carcinoma 3. Subjects who are interested to participate in the study

Exclusion criteria were as follows: 1. Bilateral mastectomy 2. Pregnancy 3. Open Wounds 4. Previous history of trauma to shoulder, surgery, untreated pathology or dysfunction.

Material used were: 1. Weights 2. Wand 3. SPADI Questionnaire 4. Shoulder ladder 5. Shoulder wheel

Resistance exercises – Shoulder flexion, extension, abduction, adduction, internal rotation and external rotation. Exercises are started with 2-3 sets of 10-15 reps with half a kg weight. Gradual progression is made to 1kg when the individual is able to perform complete 3 sets of 10-15 reps.

Outcome Measures

1) Shoulder pain and disability index (SPADI) – It is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities. The pain dimension consists of five questions regarding severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper extremity use.

2) Manual Muscle Testing (MMT) – It is an integral part of physical examination as it provides information which is useful in differential prognosis and treatment of musculoskeletal and neuromuscular disorders. It is used to evaluate contractile units and their ability to generate forces. Muscle testing is an important evaluative tool to assess impairments and deficits in muscle performance, including strength, power and endurance. It is graded from 0 to 5 which is determined by the patient's ability to move he tested body depending on muscle contractility, gravity assisted and antigravity position.

3) Range of motion (ROM) – It is a measurement of movement around a specific joint or body part. It is used to evaluate the integrity of the particular joint. Both active as well as passive range of motion should be evaluated. It should be compared with the normal range of motion of the joint.

Procedure

This study was conducted to find the Effect of Unilateral and Bilateral shoulder rehabilitation exercise protocol in patients secondary to Radical Mastectomy. Protocol and ethical clearance were done. Ethical consent was taken from the Institutional ethics committee of Krishna Institute of Medical Sciences "Deemed To Be University", Karad. The subjects were divided into 2 groups based on the inclusion and exclusion criteria using simple random sampling. Informed consent was taken from the subjects. Subjects were assessed for shoulder pain and disability index, range of motion and strength prior intervening with the treatment. Subjects were explained about the procedure of the study.

Group A was conventional group and group B was experimental group.

Group A received treatment to the affected upper extremity. Shoulder flexion, extension, abduction, internal and external rotation was performed with weights, started with 2-3sets of 10-15 reps. Exercises were started with weight of 0.5kg and progressed to 1kg. Low load long duration stretch was performed using 0.5kg weight. Pectoralis muscle stretch over the wall was done. Shoulder range of motion exercises using shoulder wheel, shoulder ladder and wand was done. The treatment was done 5 times a week for 6 weeks.

Group B received treatment bilaterally. Both the upper extremity was given the same protocol as above.

After six weeks the post treatment assessment for disabilities, range of motion and strength using assessment tools (SPADI, ROM and MMT) were done. The interpretation of the study was done on the basis of comparing pre and post test assessment of SPADI, Shoulder ROM and MMT. The study was concluded by statistical analysis of all the outcome measures.

Results

SPADI

INTERPRETATION

The above table shows pre and post comparison within the group.

Group A

Parameters (Group A)	**Pre**	**Post**	**p value**
SPADI	77.800	53.600	0.0494

Shoulder ROM

Interpretation

The above table shows pre and post comparison within the group.

Group A

Parameters (Group B)	Pre	Post	Mean diff	t value	p value
SHD Flex	95.700	116.0	20.300	1.346	0.1949
SHD Ext	19.500	24.600	5.100	2.132	0.8823
SHD Abd	112.50	128.40	15.900	1.684	0.9269

Shoulder MMT

INTERPRETATION

The above table shows pre and post comparison within the group.

Group A

Parameters (Group B)	Pre	Post	Mean diff	t value	p value
SHD Flex	1.600	2.200	0.6000	2.012	0.7699
SHD Ext	1.700	2.400	0.7000	2.278	0.9179
SHD Abd	2.300	3.300	1.000	1.928	0.3207

SPADI

Interpretation

The above table shows pre and post comparison within the group. Post treatment there was significant improvement noted in shoulder and arm mobility.

Group B

Parameters (Group B)	Pre	Post	p value
SPADI	81.800	52.600	0.0039

Shoulder ROM

Interpretation

The above table shows the pre and post comparison within the group. Post treatment there was significant improvement in the flexion, extension and abduction range of motion.

Group B

Parameters (Group A)	Pre	Post	Mean diff	t value	p value
SHD Flex	106.90	117.60	10.700	5.802	0.0003
SHD Ext	19.500	21.700	2.200	5.659	0.0003
SHD Abduction	84.600	94.100	9.500	5.787	0.0003

Shoulder MMT

Interpretation

The above table shows the pre and post comparison within the group. Post treatment there was significant improvement in the strength of shoulder flexors, extensors and abductors.

Group B

Parameters (Group B)	Pre	Post	Mean diff	t value	p value
SHD Flex	1.700	2.800	1.100	11	<0.0001
SHD Ext	2.300	3.200	0.900	5.014	<0.0001
SHD Abd	2.200	2.900	0.700	4.583	0.0013

Discussion

This study on "Effect of Unilateral and Bilateral shoulder rehabilitation exercise protocol in patients secondary to Radical Mastectomy" was conducted to compare the effect of unilateral and bilateral shoulder rehabilitation protocol in post mastectomy status. Strengthening was conducted using weights and find the efficiency on shoulder muscle strength and shoulder pain and disability index, range of motion exercises using wand and shoulder wheel and stretching using low load. Breast cancer survivors are benefited using free exercises to shoulder and progression is made to resistance training as it is effective in reducing muscle fatigue, increasing muscle strength and flexibility.

Conventional group showed improvement in shoulder pain and disability index (p=0.0494) with mean difference (MD=2.42), but did not show a significant result in strength for all the shoulder muscles and increase in the shoulder ranges. ROM for shoulder flexion (p=0.1949), MD= 20.3, extension (p=0.8823) MD=5.1 and abduction (p=0.9269) MD=15.9. MMT for shoulder flexion (p=0.7699) MD=0.6, extension (p=0.9179) MD=0.7 and abduction (p=0.3207) MD=1.0. Experimental group showed improvement in SPADI score (p=0.0039) MD= 29.2 and also exhibited better improvement in shoulder muscle strength and ranges. ROM for shoulder flexion (p=0.0003) MD=10.7 extension (p=0.0003) MD=2.2 and abduction (p=0.0003) MD=9.5 MMT for shoulder flexion (p<0.0001) MD=1.1, extension (p<0.0001)

MD= 0.9 and abduction (p=0.0013) MD=0.7. The between group values for SPADI (p=0.2365), ROM for shoulder flexion (p=0.0606), extension (p=0.0171) and abduction (p=0.0098), MMT for shoulder flexion (p=0.0378), extension (p=0.0260) and abduction (p=0.0041). The result concluded that bilateral approach for treating the post mastectomy is more effective than a unilateral approach. Treatment of the affected side is commonly followed in the treatment of the breast cancer patients; the bilateral approach would provide an overall improvement in the quality of life of the patient. The patient would have a full functional independence and be able to perform activity of daily living. The recovery of the patient would be occurring at a faster rate, further disuse atrophy of the muscles and better range of motion can be achieved if a bilateral treatment is given

Conclusion

The present study with the statistical results that the group treated with a bilateral approach improved better than the group with unilateral approach with greater improvement in flexion, extension and abduction which promotes all the activities of daily life and that is confirmed again with the improvement of values in SPADI scores.

Acknowledgement: We acknowledge the guidance and constant support of Dean, Faculty of physiotherapy, KIMSDU Karad, Dr Poonam Patil, Dr SV Kakade for help in statistical analysis.

Conflict of Interest: Nil

Source of Funding: This study was funded was Krishna Institute of Medical Sciences Deemed To Be University Karad, Maharashtra.

Ethical Clearance: Taken from institutional ethical committee of Krishna Institute of Medical Sciences Deemed To Be University Karad, Maharashtra.

References

[1] Bemben MG, Murphy RE. Age related neural adaptation following short term resistance training in women. J Sports Med Phys Fitness 2001; 41: 291–299

[2] Benton MJ, Alexander JL. Validation of functional fitness tests as surrogates for strength measurement in frail, older adults with chronic obstructive pulmonary disease. Am J Phys Med Rehabil 2009; 88: 579–583

[3] Benton MJ, Schlairet MC, Gibson DR. Change in quality of life among breast cancer survivors after resistance training: Is there an effect of age? J Aging Phys Act 2014; 22: 178–185

[4] Burnham RS, May L, Nelson E, Steadward R, Reid DC. Shoulder pain in wheelchair athletes. The role of muscle imbalance. Am J Sports Med 1993; 21: 238–242

[5] Callaway CW, Chumlea WC, Bouchard C, Himes JH, Lohman TG, Martin AD, Mitchell CD. Circumferences. In: Lohman TG.ed. Anthropometric Standardization Reference Manual. Champaign, IL: Human Kinetics; 1988: 44–46

[6] Cheema BS, Kilbreath SL, Fahey PP, Delaney GP, Atlantis E. Safety and efficacy of progressive resistance training in breast cancer: A systematic review and meta-analysis. Breast Cancer Res Treat 2014; 148: 249–268

[7] Costa E, Moreira A, Cavalcanti B, Krinski K, Aoki M. Effect of unilateral and bilateral resistance exercise on maximal voluntary strength, total volume of load lifted, and perceptual and metabolic responses. Biol Sport 2015; 32: 35–40

[8] Courneya KS, Segal RJ, Mackey JR, Gelmon K, Reid RD, Friedenreich CM, Ladha AB, Proulx C, Vallance JK, Lane K, Yasui Y, McKenzie DC. Effects of aerobic and resistance exercise in breast cancer patients receiving adjuvant chemotherapy: A multicenter randomized controlled trial. J Clin Oncol 2007; 25: 4396–4404

[9] Croisier JL, Forthomme B, Namurois MH, Vanderthommen M, Crielaard JM. Hamstring muscle strain recurrence and strength performance disorders. Am J Sports Med 2002; 30: 199–203

[10] Dasgupta S, Sanyal S, Sengupta SP. Transpectoral anterior approach to the axilla for lymph node dissection in association with mastectomy preserving both pectoral muscles and their neurovascular bundles. Tumori 1999; 85: 498–502

[11] Dragun AE, Huang B, Tucker TC, Spanos WJ. Increasing mastectomy rates among all age groups for early stage breast cancer: A 10-year study of surgical choice. Breast J 2012; 18: 318–

325

[12] Edouard P, Degache F, Oullion R, Plessis JY, Gleizes-Cervera S, Calmels P. Shoulder strength imbalances as injury risk in handball. Int J Sports Med 2013; 34: 654–660

[13] Fritz CO, Morris PE, Richler JJ. Effect size estimates: Current use, calculations, and interpretation. J Exp Psychol Gen 2012; 141: 2–18

[14] Hagstrom AD, Shorter KA, Marshall PW. Changes in unilateral upper limb muscular strength and EMG activity following a 16 week strength training intervention survivors of breast cancer. J Strength Cond Res 2017, doi:10.1519/JSC.0000000000001890

[15] Harrington S, Padua D, Battaglini C, Michener LA, Giuliani C, Myers J, Groff D. Comparison of shoulder flexibility, strength, and function between breast cancer survivors and healthy participants. J Cancer Surviv 2011; 5: 167–174

[16] Harriss DJ, Atkinson G. Ethical standards in sport and exercise science research: 2016 update. Int J Sports Med 2015; 36: 1121–1124

[17] Hayes S, Battistutta D, Newman B. Objective and subjective upper body function six months following diagnosis of breast cancer. Breast Cancer Res Treat 2005; 94: 1–10

[18] Hayes SC, Battistutta D, Parker AW, Hirst C, Newman B. Assessing task "burden" of daily activities requiring upper body function among women following breast cancer treatment. Support Care Cancer 2005; 13: 255–265

[19] Hubal MJ, Gordish-Dressman H, Thompson PD, Price TB, Hoffman EP, Angelopoulos TJ, Gordon PM, Moyna NM, Pescatello LS, Visich PS, Zoeller RF, Seip RL, Clarkson PM. Variability in muscle size and strength gain after unilateral resistance training. Med Sci Sports Exerc 2005; 37: 964–972

[20] Jacobs C, Uhl TL, Seeley M, Sterling W, Goodrich L. Strength and fatigability of the dominant and nondominant hip abductors. J Athl Train 2005; 40: 203–206.