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INFLUENCE OF PRE - OPERATIVE PHYSICAL THERAPY EDUCATION AND EXERCISE ON POST-OPERATIVE SHOULDER RANGE OF MOTION AND FUNCTIONAL ACTIVITIES IN SUBJECTS WITH MODIFIED RADICAL MASTECTOMY

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ABSTRACT

Background: Modified radical mastectomy is a frequent surgery employed as a therapeutic procedure in patients with breast carcinoma with involvement of axillary lymph nodes. Many patients suffer from severe shoulder complaints after axillary lymph node dissection even with postoperative rehabilitation. Pre-operative exercise and education are recommended to reduce the incidence of breast cancer related upper limb dysfunction; it will shorten the recovery time. The objectives of the study are to determine the influence of pre-operative physiotherapy on shoulder ROM using goniometer in subjects with modified radical mastectomy and to determine the influence of pre-operative physiotherapy on functional activities using shoulder pain and disability index (SPADI) in subjects with modified radical mastectomy.

Methods: 30 Subjects of adult women included in the study who met the inclusion criteria, divided into 2 groups. Experimental Group received preoperative physical therapy education and exercises 1-2 weeks before surgery and routine physical therapy protocol after surgery. Control Group received standard education brochure preoperatively and routine physical therapy post operatively. Measurements included shoulder ROM and functional evaluation using goniometer and SPADI. Measurements were taken at baseline i.e., pre operatively, post operatively at 4th day after removal of drains, and 1 month after surgery.

Results: All measures were significantly reduced after surgery, but most recovered after 1 month of surgery and attained functional level in experimental Group.

Conclusion: This study provides experimental evidence that preoperative education and exercise influence the postoperative shoulder ROM and functional activities after modified radical mastectomy.

Key words: Modified Radical mastectomy, Pre-op physiotherapy education and exercise, ALND, upper limb dysfunction, SPADI (Shoulder pain and disability index)

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INTRODUCTION

Breast cancer is one of the common malignant disease affecting women and it is the second most common cause of death from cancer in women. Approximately 60,000 cases of breast cancer diagnosed annually. According to WHO – 3% of rate increasing annually from 1980-2010., global burden rises to 14.1 million new cases and 8.2 million cancer deaths in 2012.^{1, 2}In India 90,659 cases estimated in 2010 by ICMR.

Mammary gland is the most important structure present in the pectoral region. It is a modified sweat gland, situated in the superficial fascia of the pectoral region. Deeply it is related to the pectoralis major. Lymph from the breast drains into axillary lymph nodes, internal mammary nodes, supraclavicular nodes.^{3, 4}Uncontrolled growth of cells in breast tissue can cause breast cancer. Etiology is exactly not known, but inherited changes in two genes that make a woman susceptible to breast cancer – the BRCA1 and BRCA2 gene.⁵ when breast cancer spreads, it usually spreads to axillary nodes. Risk factors include age, gender, family history, dense breast tissue, using hormonal therapy after menopause, usage of birth control pills, non-breast feeding women and alcohol intake. An increase in breast cancer incidence due to various modifiable risk factors was noted, especially in women over 40 years of age.^{6, 7}The stage of the breast cancer (TNM) is based upon the size of the tumor in the breast (T), status of lymph nodes (N), and metastatic spread to distant sites (M).⁸

Modified Radical mastectomy is a frequent surgery employed as a therapeutic procedure in patients with breast carcinoma with involvement of axillary lymph nodes. In this procedure excision of all the breast tissue, axillary dissection and pectoralis minor muscle. Survival rates have increased as Medical treatment for breast cancer has advanced, but leave survivors with complications which include reduced shoulder ROM (inability to raise arm overhead), inability to sleep on surgery side and all these limit Functional activities. In Subjects following RM with ALND 73% of women reported decreased shoulder range of motion, pain, lymphedema, limitations in functional activities.⁹ Upper limb (UL) dysfunction is frequently reported sequel of early stage breast cancer treatment.¹⁰

Physiotherapy has been proven to be effective and could play an important role in the post-operative treatment of patients with shoulder/arm complaints following breast cancer surgery.¹¹ Furthermore, Box et al.¹²concluded in their RCT

that a postoperative physiotherapeutic protocol is effective in facilitating and maintaining the recovery of shoulder movement. The early versus delayed effects (long term benefits) of these treatments have been reported in a few longitudinal studies.¹³

Pre-operative exercise and education are recommended to reduce the incidence of BC-related UL dysfunction¹⁴, but till now the number of patients referred for pre - operative physical therapy exercises are very small. Very few studies that tracked on preoperative physical therapy education and exercise on shoulder function in patients with MRM. A pre-operative exercise reduces the rehabilitation period by early regaining of ROM and also reduces the development of secondary complications. The times invest before surgery, will shorten the recovery time. Pre-operative education focus on post-operative presentation and exercise helps in maintaining and improving the shoulder ROM and strength.

The main purpose of the study is to determine the influence of preoperative physical therapy education and exercise on post-operative shoulder ROM & functional activities in subjects who have undergone modified radical mastectomy with ALND.

METHODS

A sample of 30 female subjects was selected by means of simple random sampling method. All subjects were screened for inclusion and exclusion criteria, after finding their suitability they signed an informed consent and divided into 2 groups experimental and control group. For all patients measurements were taken preoperatively, post-operatively i.e., at 4th or 5th day when the drain is < 100 ml and 1 month after surgery.

Sample Size: 30 subjects

Study Duration: 1-2 weeks before surgery, 4 weeks post - operatively

Subjects: Age group between 35 – 65 years who met with inclusion criteria.

Sample Setting: subjects from surgical oncology OP and ward in SVIMS, Tirupati.

Sample Technique: Simple random sampling

Study Design: Experimental design (pre-test and post-test design)

Out come Measures: Range of motion by using Universal Goniometer and Functional activities with SPADI.

CRITERIA FOR SELECTION

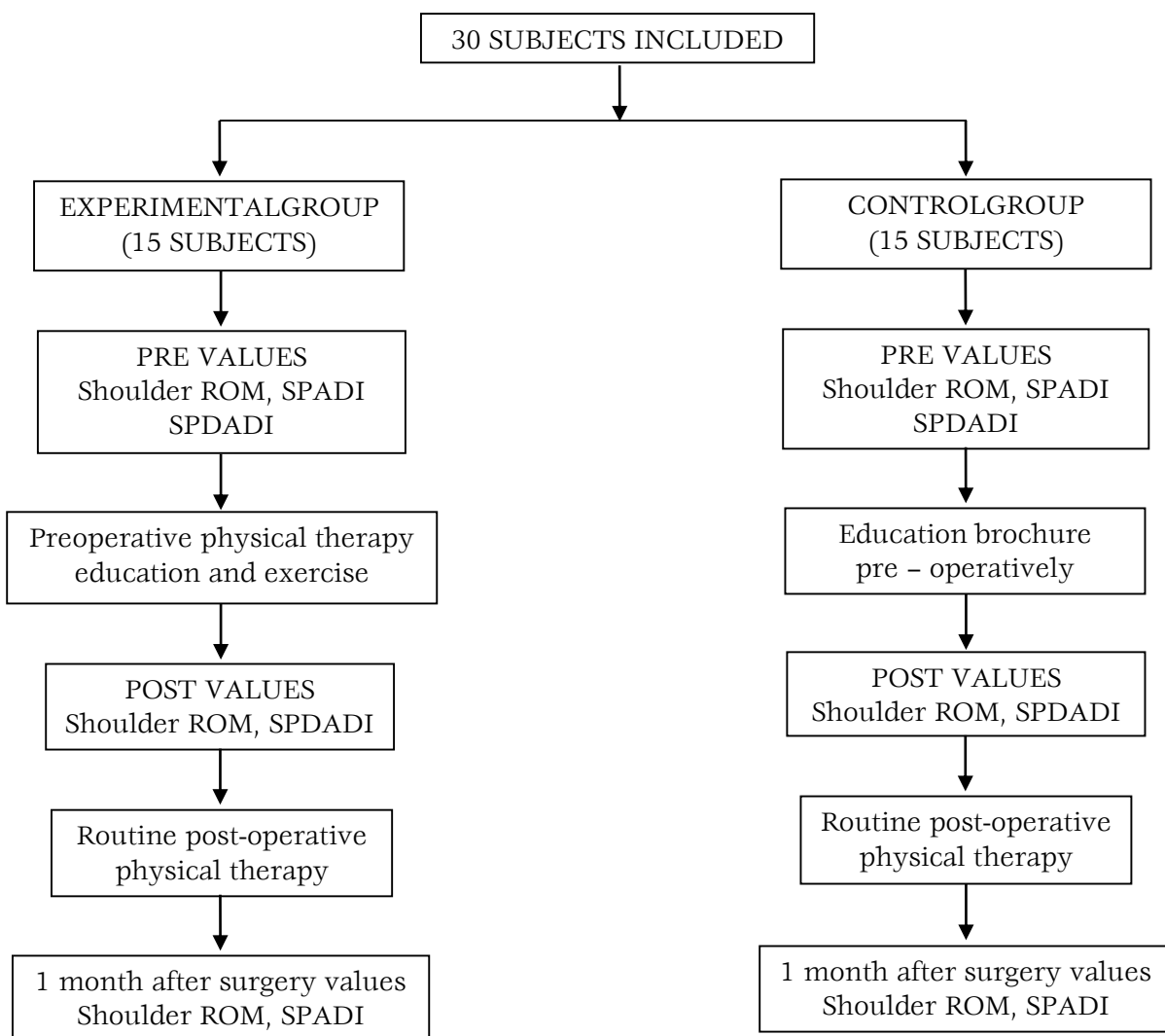
Inclusive Criteria: Age group between 35 – 65 years, Subjects who are planned for MRM with ALND, Subjects under chemotherapy other

shoulder tests should be positive like impingement tests, and instability tests.

Exclusive Criteria: Any previous history of trauma to neck and shoulder, breast conserving therapy, lumpectomy, contralateral surgery, exposure to radiation, and diabetes mellitus.

METHODOLOGY

CONSORT DIAGRAM



INTERVENTION:

GROUP	INTERVENTION
Experimental group	Live education and exercise instruction pre - operatively, Post op physical therapy exercises
Control group	Education brochure pre - operatively, post op physical therapy exercises

Experimental group: Subjects were received 3 physical therapy visits per week, 1-2 weeks prior to surgery Pre-operative protocol: Pre-operative exercise and education includes surgical procedure, drains; and post-operative presentation about decreased shoulder ROM, lymph oedema, pain and exercise to maintain and increase glenohumeral and scapulothoracic joint ROM (both pre and post-operative), diaphragmatic breathing

exercises, relaxation positions, self-stretching, walking programme.

Post-operatively: Routine physical therapy protocol which includes

- 1st week of treatment: deep breathing exercises elevation of limb (45 min, 2-3 times), free exercises to hand, wrist and elbow; self-assisted exercises up to pain free range, walking, and postural correction.

- II. 2nd week: self-massage, pendular exercises, self-stretching's (ant. Chest wall, hand behind back towel stretching's). Protraction and retraction exercises, wall climbing exercises (flexion, abduction). Meanwhile post-operative complications will be noted during this period.
- III. 3rd week same protocol followed with minimal assistance.
- IV. 4th week also same protocol with no assistance and regain the pre op ROM and functional status.

NOTE: Advice loose & comfort clothing when doing exercises.

Control group: Subjects received Education brochure preoperatively and routine physical therapy protocol post-operatively as in experimental group.

MEASUREMENTS

The primary outcome variable is shoulder mobility (flexion, abduction, and external rotation) measured by use of a universal goniometer under standardized conditions. Secondary outcome measure is functional evaluation using Shoulder Pain and Disability Index (SPADI) 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 the 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. The SPADI takes 5 to 10 minutes for a patient to complete and is the only reliable and valid region-specific measure for the shoulder. Minimum score 0 = no pain/ no disability and Maximum score 10 = worst pain/so difficult it requires help.

STATISTICAL ANALYSIS

The statistical analysis was done by using the statistical software "IBM" SPSS 20.0 version. The variables considered under study are shoulder ROM and functional activities. These two variables are measured pre-operatively, post-operatively at 4th day, and 1 month after surgery respectively. For primary outcome comparison made between the pre-op and post-op, pre-op and 1 month after surgery, post-op and 1 month after surgery values. But for SPADI comparison made between only post-op values and values of 1 month after surgery because for all the 30 subjects pre-op value is zero. To achieve this information, the suitable statistical technique is paired samples t-test is used for within the group, unpaired t-test for between groups.

RESULTS

Experimental group

Table-1

Analysis of pre-op, post-op and 1 month after surgery values of shoulder ROM's of Flexion, Abduction and External rotation with in the experimental group.

EXPERIMENTAL GROUP	Mean	Std. Deviation	t	Sig. (2-tailed)
Flexion Preop - Post op	114.667	7.898	56.229	0.000
Flexion Preop - 1 Month after surgery	39.000	7.368	20.501	0.000
Flexion Postop - 1 Month after surgery	75.667	10.499	27.912	0.000
Abduction Preop - Postop	118.000	5.278	86.588	0.000
Abduction Preop - 1Month after surgery	49.667	9.348	20.578	0.000
Abduction Postop - 1Month after surgery	68.333	9.386	28.197	0.000
ER Preop - Post op	52.000	7.746	26.000	0.000
ER Preop - 1 month after surgery	9.000	4.309	8.088	0.000
ER Post op - 1Month after surgery	43.000	7.020	23.722	0.000

Table 2

Analysis of post-op and 1 month after surgery values of SPADI with in the experimental group

Experimental Group	Mean	Std. Deviation	t - value	sig
SPADI Post	98.53	4.224	47.208	0.005
SPADI 1Month After Surgery	49.20	2.455		

Control group

Table -3

Analysis of pre-op, post-op and 1 month after surgery values of shoulder ROM's of Flexion, Abduction and External rotation with in the control group

Parameters	Mean	Std. Deviation	t	Sig. (2-tailed)
Flexion Pre op - Post op	126.667	5.563	88.178	.000
Flexion Pre op - 1 Month after surgery	72.667	6.230	45.176	.000
Flexion Post op - 1 Month after surgery	54.000	7.606	27.495	.000
Abduction Preop – Postop	127.333	7.037	70.078	.000
Abduction Pre op - 1Month after surgery	72.333	7.528	37.215	.000
Abduction Post op - 1Month after surgery	55.000	6.547	32.538	.000
ER Pre op - Post op	58.667	5.499	41.320	.000
ER Pre op - 1 month after surgery	22.667	4.169	21.057	.000
ER Post op - 1Month after surgery	36.000	5.732	24.324	.000

Table - 4

Analysis of post-op and 1 month after surgery values of SPADI with in the control group

CONTROL GROUP	Paired Differences		t - value	Sign
	Mean	Std. Deviation		
SPADI post	119.130	5.842	38.915	0.005
SPADI 1 month after surgery	63.73	3.972		

Table -5

Comparison of mean difference of pre-op, post-op and 1 month after surgery values of shoulder rom of flexion of experimental and control groups

Group Statistics

Flexion	Group	Mean	SD	t-val	p - val
Pre op – Postop[4 th day]	Control	126.67	5.56	4.811	0.00005
	Experimental	114.67	7.90		
Pre op – 1 month after surgery	Control	72.67	6.23	13.514	0.00000
	Experimental	39.00	7.37		
Post op - 1 month after surgery	Control	54.00	7.61	6.472	0.00000
	Experimental	75.67	10.50		

Table -6

Comparison of mean difference of pre-op, post-op and 1 month after surgery values of shoulder rom of abduction of experimental and control groups

Abduction	Group	Mean	SD	t-val	p - val
Pre op – Postop[4 th day]	Control	127.33	7.04	4.11	0.00031
	Experimental	118.00	5.28		
Pre op – 1 month after surgery	Control	72.33	7.53	7.31	0.00000
	Experimental	49.67	9.35		
Post op - 1 month after surgery	Control	55.00	6.55	4.51	0.00010
	Experimental	68.33	9.39		

Table - 7

Comparison of mean difference of pre-op, post-op and 1 month after surgery values of shoulder rom of external rotation of experimental and control groups

External rotation	Group	Mean	SD	t-val	p - val
Pre op – Postop[4 th day]	Control	58.67	5.50	2.72	0.01114
	Experimental	52.00	7.75		
Pre op – 1 month after surgery	Control	22.67	4.17	8.83	0.00000
	Experimental	9.00	4.31		
Post op - 1 month after surgery	Control	36.00	5.73	2.99	0.00574
	Experimental	43.00	7.02		

Table - 8

Comparison of mean difference of post-op and 1 month after surgery values of functional activites of spadi of experimental and control groups

SPADI	Group	Mean	Std. Deviation	t-val	p - val
SPADI Post - 1Month After Surgery	Control	55.40	5.514	3.435	0.001
	Experimental	49.33	4.047		

DISCUSSION

This study examined the influence of pre-operative physiotherapy education and exercise on post op shoulder ROM and functional activities after radical mastectomy. All subjects received a preoperative PT assessment with pre-operative education and exercises to experimental group and educational brochure alone for control group, but postoperatively all subjects followed routine physical therapy protocol.

Results of this focused on improvement in shoulder ROM and functional status at pre-operatively and postoperatively and after 1 month of surgery. After surgery all the 3 ROM's of shoulder i.e., flexion, abduction and external rotation and SPADI score i.e., functional level was significantly reduced in both groups, but more in control group. It was found that there was significant improvement of ROM was noted in both the groups from post-op to 1 month after surgery ($p < 0.05$). When comparison

was done between the groups statistically significant difference was found. Experimental group attained the functional ROM early which was needed for daily activities when compared to control group. In experimental group all the three ROM's of shoulder – flexion, abduction and external rotation was reached the functional levels but less in control group. SPADI score was also significantly improved in both groups. Mean difference of SPADI in experimental and control group was 49.33 and 55.40 respectively from postoperative to 1month after surgery.

The main goal of exercise for women with BC after surgery is returning to their former level of physical function. Programs should be designed to improve an overall level of fitness and prevent deconditioning; there should be an emphasis on improving aerobic fitness, increasing range of motion in the chest and shoulder. Flexibility exercises helps in improving range of motion in the

shoulder, chest and upper back. The exercise program should also include activities that improve balance and overall coordination and function to increase activities of daily living, facilitate a return to work and improve overall quality of life.¹⁵ Pre-operative education and exercises is different from preoperative assessment. Preoperative assessment enables early diagnosis and it helps in determine the extent and time course of recovery of shoulder or UL impairment in subjects being treated for breast cancer by means of comparing baseline value (Pre-operative) to the post-surgical value at different months.

But Preoperative education and exercise provides a clear picture about surgical procedure, drains and Postoperative presentation about pain, deficits of shoulder ROM, lymphedema, limitation of functional activities mainly overhead and complications like Wound infection and delayed wound healing, seroma development on the anterior chest or axilla after wound drains are removed, neural disorders including sensory disturbances in the medial upper arm due to dissection of intercostobrachial nerve, neuralgia; fibrosis of the skin and muscle of the chest wall after radiotherapy

By knowing all these information pre-operatively it shorten the recovery period after surgery, minimize the effect of development of secondary complications and it also prepares the subject for surgery both physically and mentally. In Previous studies physiotherapy technique used was kinesiotherapy, the patients who receive directed exercises achieve the averages of the flexion, abduction and external rotational movements of the shoulder at the end of 42 days of follow up showed better recovery better function and return to the premorbid ROM sooner than patients who do free exercises.

Barbara A. Springer et al have did a large observational IRB approved study, the main purpose of this study was to determine the extent and time course of UL dysfunction in subjects seen preoperatively and followed prospectively using a novel physical therapy surveillance model post BC and treatment. All subjects received preoperative education and exercise instruction and specific physical therapy protocol after surgery. They conclude that most women in this cohort undergoing surgery for BC who receive PT intervention may expect a return to baseline ROM by 3 months., preoperative and postoperative physiotherapy intervention reported to augment movement recovery after BC treatment, but this study was not controlled to test intervention i.e.,

they are unable to definitively conclude this in absence of a control group.

Michel T. Lotze, M.D., Mary A. Duncan et al concludes the early institution of flexion and abduction exercises following axillary dissection thus appears to have a deleterious effect on wound healing and drainage. Adequate functional ROM is attained in all patients with a minimum of complications when active motion exercises are delayed for up to 7 days after axillary dissection. According to his allowed flexion and abduction at 14th day were 140 and 120 degrees respectively.

In present study results had clearly shown that the experimental group treated by preoperative education and exercise gave better results in shoulder ROM and functional activities when measured with universal goniometer and SPADI respectively, when compared to the control group which received only educational brochure preoperatively.

CONCLUSION

This study had shown that the group treated with preoperative physical therapy education and exercise had shown significant improvement in shoulder ROM and functional activities. Hence it can be concluded that preoperative physical therapy education and exercise influence the post-operative shoulder ROM and functional activities after modified radical mastectomy.

Limitations of The Study: Sample size is too small and study focus only on ROM and functional activities, generalizability of the findings is limited by the short-term follow up. Further studies can be focused on evaluating on lymphoedema and need comparison with different surgical treatments of breast cancer.

REFERENCES

1. Ferlay J, Shin HR, Bray F, et al. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int J Cancer* 2010; 127(12): 2893-917.
2. Bray F, Ren JS, Masuyer E, Ferlay J. Estimates of global cancer prevalence for 27 sites in the adult population in 2008. *Int J Cancer*. 2013 Mar 1; 132(5):1133-45.
3. D Chaurasia's. *Human Anatomy*. Volume 1. 4th ed; 2005.
4. Giridhara Rathnaiah Babu ,Srikanthi Bodapati Lakshmi, Jotheeswaran Amuthavalli Thiyagarajan. *Epidemiological Correlates of Breast Cancer in South India*. *Asian Pac J Cancer Prev*.2013; 14 (9): 5077-5083.
5. Lord SJ, Bernstein L, Johnson KA, Malone KE, McDonald JA, Marchbanks PA, Simon MS,

- Strom BL, Press MF, Folger SG, Burkman RT, Deapen D, Spirtas R, Ursin G. Breast cancer risk and hormone receptor status in older women by parity, age of first birth, and breastfeeding: a case-control study. *Cancer Epidemiol Biomarkers Prev.* 2008; 17(7):1723-1730.
6. Hussein A. Assi, Katia E. Khoury, Haifa Dbouk, Lana E. Khalil, Tarek H. Mouhieddine, Nagi S. El Saghir. Epidemiology and prognosis of breast cancer in young women. *J Thorac Dis.* 2013; 5(Suppl 1): S2-S8
 7. Colditz GA, Rosner BA, Chen WY, Holmes MD, Hankinson SE. Risk factors for breast cancer according to estrogen and progesterone receptor status. *J Natl Cancer Inst.* 2004; 96(3):218-228.
 8. American Cancer Society. How is breast Cancer staged. The American Joint Committee on Cancer (AJCC) TNM system Last Medical Review: 09/11/2013 Last Revised: 01/31/2014. Available from <http://www.cancer.org/cancer/breastcancer/detailedguide/breast-cancer-staging>.
 9. Bendz I, Fagervik Olsèn M. Evaluation of immediate versus delayed shoulder exercises after breast cancer surgery including lymph node dissection – A randomised controlled trial. *Breast* 2002, 11(3):241-248.
 10. Beurskens, C. H., Van Uden, C. J., Strobbe, L. J., Oostendorp, R. A. & Wobbes, T. The efficacy of physiotherapy upon shoulder function following axillary dissection in breast cancer, a randomized controlled study. *BMC Canc.* 2007; 7(1): 166.
 11. Warmuth MA, Bowen G, Prosnitz LR, Chu L, Broadwater G, Peterson B, *et al.* Complications of axillary lymph node dissection for carcinoma of the breast: a report based on a patient survey. *Cancer.* 1998, 83(7):1362-1368.
 12. Wingate L. Efficacy of physical therapy for patients who have undergone mastectomies. A prospective study. *Phys Ther.* 1985; 65(6): 896–900.
 13. Box, R. C., Reul-Hirche, H. M., Bullock-Saxton, J. E. & Furnival, C. M. Shoulder movement after breast cancer surgery: results of a randomised controlled study of postoperative physiotherapy. *Breast Cancer Res Treat.* 2002; 75(1): 35-50.
 14. Barbara A. springer, Ellen Levy, Charles McGravey. Preoperative assessment enables early diagnosis and recovery of shoulder function in patients with breast cancer. *Breast Cancer Res Treat.* 2010; 120(1): 135-147.
 15. National Institute for Health and Care excellence. Early and locally advanced breast cancer: Diagnosis and treatment. NICE Clinical Guideline 80; 2009.

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