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Comparison of effects of Mckenzie techniques versus conventional physiotherapy on shoulder pain, range ofmotion and function in subjects with modified radical mastectomy

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Abstract

Background and Objective: Breast cancer is one of the most common malignancies occur in women. Modified radical mastectomy is a frequent surgery employed as a therapeutic procedure in patients with breast carcinoma. Early physiotherapy intervention helps the patient to improve treatment outcomes. The objective of the study is to compare the effectiveness of McKenzie techniques and conventional therapy in subjects with modified radical mastectomy patients with shoulder pain, decreased range of motion and functional activities.

Methods: A total of 76 subjects with modified radical mastectomy with pain, decreased range of motion and function were included in the study. They were allocated into two groups by using convenience sampling method. In Group-A (n=38) subjects were treated with Mckenzie techniques with conventional physiotherapy, whereas in Group-B (n=38) subjects were treated with conventional physiotherapy alone. Pain was evaluated by using visual analogue scale. Range of motion was evaluated by using universal goniometer. Shoulder function was evaluated by using shoulder pain and disability Index.

Results: Independent "t" test was used to compare the mean significance difference between continuous variables. Paired "t" test was used to assess the statistical significance between pre and post-test scores. Statistical analysis of this data revealed that both groups showed significant improvement in parameters when compared within groups, whereas in between groups comparison Mckenzie technique with conventional physiotherapy showed better improvement compared to the conventional physiotherapy alone.

Conclusion: Therefore, McKenzie techniques along with conventional physiotherapy are more effective when compared to conventional physiotherapy alone, in subjects with modified radical mastectomy.

Keywords: Breast cancer, McKenzie techniques, Modified radical mastectomy, Shoulder pain and Disability Index.

Introduction

Cancer is a disease in which abnormal cells grow and divide without any control and are able to spread to the other tissues in the body. Breast cancer is one of the most common malignancies occurs in women. Breast cancer is also principal cause of death among female globally. It can be life-threatening disease for women worldwide[1]. As per the Globocan data 2020, in India, breast cancer accounted for 13.5% of all cancer cases and 10.6% of all deaths[2].

Risk factors can genetic mutations of brca1 and 4 brca 2 genes, family history of breast cancer, increased breast density, early menarche, late pregnancy, delayed menopause, sedentary lifestyle, smoking, alcohol intake, or a l contraceptive use and hormone replacement 5 therapy. Breast cancer can be invasive ductal carcinoma and lobular carcinoma, Invasive ductal 6 carcinoma being the most common type[3].

The prognosis of breast cancer has greatly improved during recent decades because of advances in early detection and treatment. Despite the efficiency of intervention in improving survival, women with breast cancer who have undergone treatment, face both acute and chronic impairments in various aspects of physical function as result of their treatment, which may involve a combination of surgery, chemotherapy, radiation therapy, hormonal therapy or other targeted biological therapies[4,5].

Modified radical mastectomy is a frequent surgery employed as a therapeutic procedure in patients with breast carcinoma, in this the entire breast is removed along with the breast tissue, skin, areola, nipple and most of axillary lymph nodes but pectoralis muscle is spared[6,7]. Most of patients suffer from shoulder pain and dysfunction following modified radical mastectomy[8]. Decrease in aerobic capacity has been observed during breast cancer treatment which is likely a combination of the direct and indirect effects itself and associated reduction in physical activity leading to deconditioning[9,10].

Limitations in motion, pain and tightness of tissues around the shoulder, including the skin, muscles and tendons, caused by restricted movement are major dysfunctions that can lead to difficulties in the activities of daily living. Considering the kinematics of shoulder movement, shoulder tightness after modified radical mastectomy affects glenohumeral translation and scapulohumeral rhythm, followed by changes in scapular motion[11].

The muscles that are located anteriorly to the shoulder and chest, in particularly, shortened pectoralis major and minor can cause restrictions in shoulder range of motion and function. Flexion, abduction and external rotation range of motion are affected after the breast cancer surgery. The loss of a breast produces soft tissues asymmetry and mass distribution through the chest wall, affecting upper-limb movements and resulting in shoulder discomforts[12].

During and following breast cancer treatment Physiotherapists have an important role and have the potential to identify and monitor changes in physical function and prescribing interventions to address deficits in physical function. Physiotherapy treatments has been proven to reduce incidence of post cancer musculoskeletal disorders[13]. Early physiotherapy intervention for treatment is perceived to improve treatment outcomes[14]. Accordingly, post mastectomy, shoulder ROM exercises lasting 6–12 months have improvement in shoulder mobility and alleviate pain[15,16].

McKenzie is a comprehensive evidence-based system of assessment, diagnosis, treatment and prevention strategies. It utilizes a mechanical evaluation that involves single and repeated active, passive and resisted movements that are performed at the available end range. The effects of repeated end-range movements are used to classify patients into mutually exclusive mechanical syndromes such as: derangement, dysfunction, postural syndrome, or other category. Treatment is then provided based on the diagnostic classification[17].

A derangement syndrome is caused by displacement of tissue that disrupts the normal resting position of the joint surfaces; it can present as constant or intermittent pain. The presentation is inconsistent and rapid changes in symptomatic and mechanical baselines are often observed during the examination. Pain from the dysfunction syndrome is intermittent and caused by stretch or loading of structurally impaired tissues (e.g., scarring, adherence, imperfect repair, and tendinopathy)

The presentation is consistent and no rapid changes occur during the examination. Pain from posture syndrome is caused by mechanical deformation of normal soft tissues

arising from prolonged end-range loading affecting the involved structure, pathology is not present in posture syndrome. The other categories for conditions that do not fit the three mechanical syndromes (e.g., acute trauma, post-surgical, frozen shoulder, and sinister pathology). One common examination finding that has been studied as criteria for classifying patients with spinal pain is directional preference.

Directional preference has been defined as either (1) a specific direction of movement or posture noted during physical examination or either (2) a specific aggravating and easing factorreported by the patient that alleviated or decreased patient's pain, with or without the pain having changed location and/or increased the patient's range of motion. Recent literature reports its reliability and effectiveness with specific regards to extremities[18,19].

As there are limited studies in the literature which compared the effectiveness of McKenzie techniques and conventional therapy in subjects with Modified radical mastectomy, hence the present study is to compare and find out the effectiveness of McKenzie techniques and conventional physiotherapy on improvement of pain, range of motion and function in subjects with modified radical mastectomy.

Materials and methods

Study design: Quasi experimental study

Ethical clearance and informed consent: The study protocol was approved by the Ethical Committee of GSL Medical college and General Hospital (Annexure-I). The investigator explained the purpose of the study and given the patient information sheet. The participants were requested to provide their consent to participate in the study (Annexure- II). All the participants signed the informed consent and the rights of the included participantshave been secured.

Study population: Subjects with Modified Radical Mastectomy.

Study setting: Department of Physiotherapy, GSL Cancer hospital, Rajahmundry,Andhra Pradesh.

Study duration: Study was conducted for a period of One Year.

Intervention duration: 5 sessions per week for 4 weeks, 45 minutes per each session.

Study method: Convenience sampling

Sample size: A total number of 85 subjects were screened, in that 76 subjects were recruited who are willing to participate in the study. All the recruited participants were explained about the study after obtaining informed consent form and meeting the criteria. All the eligible participants are allocated by convenience sampling and randomized into two groups with 38 subjects in each group.

Inclusion Criteria: Female subjects with Unilateral modified radical mastectomy (6-9 months post-surgery), Completed all Chemotherapy and Radiation Therapy treatment, Diagnosed as stage 1-3 Breast Cancer.

Exclusion Criteria: Subjects with lymphoedema, Any previous history of trauma to neck and shoulder,Fractures, dislocations, ligament injuries less than 6 months , Rheumatoid arthritis, polyarthritis, Subjects with Cardiac conditions, infections and coagulation disorders.

Outcome measures: Visual Analog scale (VAS)[20]: To measure pain in subjects with shoulder Pain atthe baseline and at the end of 4 weeks. Universal goniometer21: To measure the shoulder range of motion in subjects with Modified Radical Mastectomy at the baseline and at the end of 4 weeks. Shoulder pain and disability index (SPADI)22: To measure pain and function in subjectswith Modified Radical Mastectomy at the baseline and at the end of 4 weeks.

Procedure: This is a 4-week study which includes McKenzie technique with conventional physiotherapy for Group A and Conventional Physiotherapy for Group B. The study is explained individually to the subjects who met the inclusion and informed consent were taken from them. The basic physiotherapy assessment like shoulder Pain by using VAS, range of motion by using universal goniometer and shoulder pain and disability index were taken from the subjects before they are included into the study. Total samples of 76 subjects were included in the study. The total subjects are divided into two groups. Group A (n=38) and Group B (n=38), pre-test was taken before the intervention by Visual analogue scale, universal goniometer and shoulder pain and disability index (SPADI). Group A received McKenzie techniques with conventional physiotherapy. Group B received conventional therapy alone. Post measurements were taken after the intervention by VAS, Universal Goniometer and SPADI.

Group A: McKenzie techniques (MDT)[23] with conventional therapy: Techniques were applied in each session according to the following predefined sequence:

Hand behind back with overpressure: The subject in standing position was instructed to take the affected shoulder at the back and then the therapist applies over pressure in an upward direction in the available end ranges. Dosage: Minimum of 10- 12 repetitions.

Repeated shoulder extension with overpressure: The subject in standing position was instructed to do repeated shoulder extension movements till the end range and then over pressure will be applied by the therapist at the end ranges. Dosage: Minimum of 10-12 repetitions.

Shoulder flexion overpressure: The subject in standing or sitting position was asked to do flexion till end range repeatedly until it is a pain free movement, at the end range therapist applies overpressure at the end ranges. Dosage**:** Minimum of 10-12 repetitions.

Group B: Conventional therapy[24]: Subjects in this group received Shoulder exercises. The cervical stabilization protocol applied in this study was identical to that published in earlier studies. It is a 4 weeks program. The exercise program consists of pendular exercises, finger ladder exercises, chest wall stretching's and cross body reach.

Pendular Exercises: Subject was asked to be in standing position and instructed to relax the shoulders and slightly lean forward with the affected arm hanging down. small circular movements will be advised in clock and anti-clock wise direction. Dosage: 10 repetitions with 10 second's hold.

Finger ladder exercises: subject will be asked to be in standing position and instructed to reach out and touch the wall at waist level with fingertips of the affected arm with elbow bent slightly, and then instructed to walk the fingers up the wall and hold for 10 seconds. Then slowly lower down. Dosage**:** 10-20 repetitions with 10 second's hold.

Chest wall stretching's: subject will be asked to be in standing position, gently affected arm will be lifted and placed on the shelf about breast -high and asked to bent knee joint, which will gently stretch the armpit. Dosage: 10-20 repetitions with 10 second's hold.

Cross body reach: subject will be asked to sit or stand, instructed will be given to the subject to use the unaffected arm to support the affected arm at the elbow and to get the arm towards the body exerting gentle pressure on shoulder to hold it for 15-20 seconds.

Dosage: 10-20 repetitions with 10 second's hold.

Results

The results of this study were analyzed in terms of reduction of Pain on Visual Analogue Scale, Improved shoulder range of motion on Universal goniometer and improved function on Shoulder pain and Disability Index Questionnaire (SPADI). The consort flow chart of the study showed the study organization in terms of subjects screening, random allocation and analysis following the intervention. Total 85 subjects with Modified Radical Mastectomy were screened for eligibility, all of them who met inclusion criteria (n=76) have undergone baseline test and randomized into 2 groups through convenience sampling method and each group has 38 subjects and Group A was given McKenzie techniques with conventional Therapy and Group B was given Conventional Physiotherapy alone. After dropouts 35 participants from both groups were analyzed. Comparison was done both within the group as well as in between the two groups. So as to evaluate the intra group and inter group effectiveness of McKenzie techniques with Conventional Therapy and conventional physiotherapy which are under consideration in the present study. The results showed that there is a statistical difference in two groups.

Discussion

The aim of our present study was to evaluate the effectiveness of McKenzie techniques with conventional therapy and Conventional Physiotherapy on Pain, shoulder Range of Motion and Function in subjects with Modified Radical Mastectomy. In this study, subjects were assessed for Pain, shoulder Range of Motion and Function. The following outcome measures Visual Analogue Scale (VAS), Universal Goniometer and Shoulder pain and Disability Index (SPADI) Questionnaire were used to measure the intensity of Pain, Range of Motion and Function.

The results showed significant improvement in all three outcome measures i.e., VAS, Universal goniometer and Shoulder pain and Disability Index (SPADI) Questionnaire in both the groups. Both Group A and Group B are effective in decreasing Pain and improving Shoulder range of motion and Function in subjects with Modified Radical Mastectomy.

Both the groups showed statistically significant differences, but the McKenzie techniques with conventional therapy group (VAS mean- 2.51429,

shoulder flexion mean-163.229, shoulder abduction mean-168.771, shoulder external rotation mean-66, SPADI mean-49.6857) showed clinically effective slightly when compared to Conventional Physiotherapy group (VAS mean-4.25714, shoulder flexion mean- 143.857, shoulder abduction mean- 143.486, shoulder external rotation mean- 56.9429,SPADI mean-70.0857).

Chin Jung Wong, et.al. 2021, found that there was a high prevalence of adhesive capsulitis even though a significant proportion of our patients were assessed at more than 1 year after breast surgery. Although shoulder dysfunction has been widely reported in the first year after breast surgery, late shoulder morbidity has not been widely reported. Our study adds to the growing consensus that late onset of shoulder morbidity beyond the first year can occur and has been than 1 year after breast surgery. Although shoulder dysfunction has been widely reported in the first year after breast surgery, late shoulder morbidity has not been widely reported. Our study adds to the growing consensus that late onset of shoulder morbidity beyond the first year can occur and has been found to range between 12% and 51%. Moreover, patients have been reported to have residual pain and limited ROM for several years after the onset of adhesive capsulitis. Although complete symptom resolution may not be achievable, improvement in function and mobility can still be realistic goals even if commencement of physiotherapy is delayed for as long as 6 months postoperatively. Early identification through a survivorship and rehabilitative program is important, and timely intervention can reduce long-term shoulder morbidity[25].

Yang S, Park DH, et.al 2017, found that Pain, scar formation, and pectoralis tightness are common after mastectomy, especially when compared with breast conserving surgery. Breast reconstruction has also been reported to increase the risk of adhesive capsulitis, which corroborated with our findings. The biomechanical derangements after surgery lead to stress of the joint capsule, pre- disposing the patient toward the development of secondary adhesive capsulitis[26].

Betty Smoot, et.al 2016, found that when Compared to Breast Conservative Surgery (BCS), receipt of mastectomy was associated with significant decrements in shoulder abduction at one month, as well as across the 12-month trajectories for abduction, flexion, and breast pain interference with function. At the one-month assessment, women who had a mastectomy demonstrated markedly less abduction compared to women who had BCS, but by 12 months abduction was similar between groups. Reductions of >20 degrees are associated with loss of UE function22 and reductions inQOL[27].

Shamely DR, et.al 2007 found that the muscles close to the shoulder may have an impact on post-treatment arm/shoulder morbidity if they are in the field of surgery/RT. found that the pectoralis major and minor muscles decreased in size on the affected sidein a series of 57 breast cancer patients from six months to six years post-surgery. Theseauthors concluded that patients treated for breast cancer had altered muscle activity in three key muscles that act on the shoulder (upper trapezius, pectoralis major and rhomboid), despite of the fact that two of the key muscles (upper trapezius and rhomboid) were not in the field of surgery/RT. In our study the delineation of the shoulder joint included the bony humeroscapular joint linked to muscles, tendons, ligaments and adjoining soft tissue structures[28].

Ludwig et al. 1996, suggested that fibrosis in the pectoralis major and minor muscles could be a factor in restricted shoulder mobility[29].

Karki et al., 2005 suggested that these surgical interventions cause tethering of the fascia, also known as cording, and musculature within the axilla and surrounding shoulder musculature is damaged leading to the inability to perform daily tasks such asbrushing one's hair or teeth. Cording, or Axillary Web Syndrome, is a term used to describe any residual scarring within the axilla following invasive breast cancer surgery. O'Toole et al. 2013 found that 31% of women reported cording at 6 months post-surgery and 36% at 24 months post-surgery and found that cording occurred as a direct result of axillary lymph dissection and coincided with an increase in shoulder functional impairment. They, along with other studies suggest that the timing of an active exercise intervention following surgery could attenuate the effects of cording (Wingate, 1985; Cinar et al., 2008, Galantino et al., 2013, Courneya et al., 2003)[30].

Chopp et al., 2010 found that biomechanical changes result in an anterior typology whereby a shortened pectoralis minor muscle, elevates the scapula anteriorly with a higher migration of the superior border of the scapula and results in a rounded position of the shoulder.

When the shoulder whereby a shortened pectoralis minor muscle, elevates the scapula anteriorly with a higher migration of the superior border of the scapula and results in a rounded positionof the shoulder. When the shoulder is rounded forward, there is an unnatural immediate superior humeral head migration of the greater tuberosity as well as the inability of the humeral head to externally rotate during arm/shoulder abduction to clear the greater tuberosity from the coraco-acromial arch. This motion of external rotation may not occur with an anterior typology due to the muscular imbalances, pectoralis minor, deltoid and supraspinatus, within the force couples[31]

Abhay Kumar et.al.,2012 found that according to literature, the conventional exercises in patients with adhesive capsulitis proved effective in reduction of pain and increasingthe range of motion in the shoulder joint. It is noted that exercises within the pain free range of motion stimulate the mechanoreceptors and hence reduces the pain in the joint and also help in movement of the synovial fluid and thus decreases the inflammation and decreases the pain. These exercises use the effects of gravity to distract the humerus from the glenoid fossa which helps to relieve pain by gentle traction and oscillations. The pain reduction is also noted through the mechanical and neurophysiological effect. Hence proved that conventional exercises help in improving ROM and pain reduction. In the present study conventional exercise therapy have helped in improving ROM, pain reduction and better shoulder functions[32].Thus, McKenzie technique with conventional therapy is more effective in reducing pain, improving Range of motion and function in subjects with Modified radical mastectomy. This study experiences suggests that even though conventional physiotherapy is effective in improving pain, ROM and function but lacking in end range of motion which can be achieved by the McKenzie techniques.

Conclusion

After 4 weeks of the intervention, both the groups are effective in decreasing shoulder pain and improving in shoulder range of motion and function in subjects with modified radical mastectomy. Therefore, McKenzie techniques along with conventional physiotherapy are more beneficial than conventional physiotherapy alone in subjects with modified radical mastectomy during their recovery period (6-9 months).

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