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Maitland Mobilisations on Shoulder Dysfunction Postmastectomy

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Abstract

Following breast cancer, mastectomy often leads to shoulder dysfunction, which limits the patients' ability to perform daily activities and results in physical and psychological difficulties. the study was carried out to evaluate the impact of Maitland mobilizations on shoulder dysfunction post mastectomy. A single blinded randomized controlled trial. Outpatient clinic. A total of forty-two female patients, aged between 40 and 60 years, who were experiencing post-mastectomy shoulder dysfunction, were randomly assigned to two comparable groups: the study group (group A), were given Maitland mobilizations as well their conventional physical therapy protocol while the control group (group B), were given conventional physical therapy protocol solely. A one-month trial period was conducted with three sessions per week. Shoulder range of motion and function were measured by Goniometer and DASH pre and post 1 month of intervention. after 1 month of treatment, the percent of change in DASH, shoulder flexion, Abduction, internal and external rotation of group A was 68.22, 44.97, 43.32, 65.02 and 56.59% respectively and that in group B was 44.38, 28.71, 31.45, 38.19 and 34.57% respectively. The Maitland group demonstrated a substantial statistical difference in all measures ($p< 0.001$), ($p< 0.003$). Adding Maitland mobilizations appears to be more efficacious than solely utilizing a conventional physical therapy program in enhancing shoulder dysfunction in terms of range of motion, pain, along with function following mastectomy.

Keywords: Maitland mobilizations, Shoulder dysfunction, Mastectomy.

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1. Introduction

In 2012, breast cancer was the most often diagnosed cancer and the main cause of cancer-related deaths in women globally. It affected around 1.7 million individuals and resulted in 521,900 deaths. Exclusively, breast cancer constitutes a quarter of all incidences of cancer and 15% of all cancer-related fatalities in females [1]. Mastectomy refers to a range of surgical treatments used to treat breast cancer, which entail the partial or full removal of breast tissue. It is a viable choice for surgically treating breast cancer and the sole surgical choice for reducing the risk of breast cancer [2]. Dysfunction affecting the shoulders and arms are common among breast cancer survivors [3]. Common complaints include shoulder and arm pain, limited range of motion (ROM), weakness and sensory changes in the upper limb, as well as edema [4]. One month following surgery, 60% of breast cancer cases notice a reduction in shoulder flexion and abduction. Additionally, 10% of survivors continue to have a decreased ROM even after one year [5]. Upper-limb dysfunction is frequently cited as a consequential effect of breast cancer treatment in addition may encompass one or more of the subsequent impairments: The individual experiences a reduction in the ability to move the shoulder joint (ROM), as well as a decrease in strength. Additionally, they may feel pain and develop lymphedema, which is the buildup of lymphatic fluid in the tissue of the hand, arm, breast, and/or trunk [6]. Fibrosis resulting from radiation and surgical scars can affect the mechanics of the shoulder joint by restricting the movement of soft tissues or reducing mobility due to pain [7]. Traditional Physical therapy program for shoulder dysfunction post mastectomy includes different modalities that work on improving shoulder active ROM, pain, muscle strength and functional activities such as transcutaneous electrical nerve stimulation (TENS) in addition joint mobilization technique as well as hold relax technique [8].

There are also accessory joint and neural mobilizations for treating nociceptive pain, and Rhythmic chopping and lifting PNF exercises for improving shoulder ROM and functional activities [9-10]. Maitland mobilizations technique is Graded Oscillations Technique: The grade of glide was determined based on the symptoms reported by patients during therapy. Grade I and II were used to alleviate pain in the loose pack position and spasm, while grade III and IV were used in the close position to stretch and enhance ROM [11]. Maitland mobilizations technique had more significant effect in improving shoulder dysfunction in post mastectomy patients as Grades I and II of Maitland mobilization techniques have been demonstrated to reduce pain by activating peripheral mechanoreceptors and inhibiting nociceptors. Furthermore, the improved ROM can be attributed to the impact of Grades III and IV Maitland mobilization techniques on shoulder ROM, which enhance the extensibility of the joint capsule and lengthen the soft tissues that limit joint movement. Due to the increased flexibility of the joint capsule, the glenohumeral joint may have exhibited a larger ROM [12]. The purpose of the study was to evaluate the effect of adding Maitland mobilizations to conventional physical therapy on shoulder dysfunction post mastectomy.

2. Patients and Methods

2.1. Subjects

Forty-two female patients who have done modified radical mastectomy and experiencing post-mastectomy shoulder dysfunction, they were recruited from national cancer institute, Cairo, Egypt. Their ages varied from 40 to 60. They were divided into two equal groups, A and B, at random. Group A were given Maitland's Graded Oscillations Technique as well conventional physical therapy protocol**,** for a month, with three sessions weekly. Group B were given conventional physical therapy protocol only (Ultrasound, ROM exercises and capsular stretching exercises) which were given three sessions per week, for one month**.** Shoulder ROM as well as function were measured by Goniometer and DASH pre and post one month of intervention. The inclusion criteria were; Patients who were female and aged 40 to 60, all patients have done modified radical mastectomy and experiencing post-mastectomy shoulder dysfunction, three to six months had passed since the mastectomy, Patients gave their informed consent before participating in the trial. The current study not included the following patients; Individuals diagnosed with rotator cuff tears or other lesions to the shoulder ligaments, Adhesive capsulitis secondary to Diabetes mellitus or fractures, Dislocation and Neuromusculoskeletal disorders. After approval of the Ethical Committee of Cairo University's Faculty of Physical Therapy, Giza, Egypt (P.T.REC/012/004390), Forty-two female patients were recruited from national cancer institute, Cairo, Egypt.

2.2. Materials

Maitland mobilizations technique; ultrasound therapy device; The universal goniometer was used for shoulder ROM measurement; The Disabilities of the Arm, Shoulder as well as Hand questionnaire was used for pain and function measurement; plinth for the patient; pillows to support the patients; disposable clean plastic gloves; and the treatment performed in a quiet room.

2.3. Procedures

2.3.1. Maitland mobilizations techniques (For Group A)

Maitland graded oscillation technique was applied to the glenohumeral **(**GH**)** joint in form of A-P (Anteroposterior), P-A (Posteroanterior) and Longitudinal Caudal glides:

2.3.1.1. Antero-posterior glide for gleno humeral joint

- The patient was instructed to lie down in a supine position.
- The therapist held the patient's lower humerus posteriorly from the medial side with one hand and put his forearm on the therapist's forearm while facing across their body.
- The therapist elevated the patient's upper arm about 20 degrees forward from the coronal plane towards the trunk, in order to prevent the head of the humerus from limping against the inferior surface of the acromion process posteriorly.
- As shown in figure (1), anterior-posterior oscillation was done while the therapist was on their knees and put the cupped heel of another hand over the head of the humerus. The fingers were then stretched out above and below the acromion process."
- The therapist's fingers were lightly cupped around the acromion process. They didn't put any pressure on it, but they did help the person feel the movement [13].

2.3.1.2. Postero-anterior glide for gleno humeral joint

- The patient was told to lie on their back.
- The therapist held the patient's lower humerus anteriorly from the volar side with one hand and also rested his forearm on the therapist's forearm while facing across their body.
- As shown in figure (2), the therapist got down on their knees and put the cupped heel of another hand behind the head of the humerus. They then stretched out their fingers above and in front of the acromion process and Postero-anterior oscillation was carried out [13].

2.3.1.3. Longitudinal Caudal glide for gleno humeral joint

- The patient was instructed to lie down in a supine position.
- While standing beside the patient's upper arm, facing across his body, the therapist held the lower end of the patient's humerus inferiorly from the medial side with one hand. After that, the patient placed his forearm on the therapist's forearm.
- As shown in figure (3), the therapist kneeled and placed the cupped heel of another hand superiorly over the head of the humerus with the fingers extended posteriorly and caudal oscillation was performed.
- Frequency of oscillatory glides: 2–3 oscillations per second for a duration of 1–2 minutes. Three or four times were given for each direction [15].

- The oscillating movements were performed by the arm, not the flexors in the wrist [13].
- Grade of oscillatory glides: Grades I and II were applied to alleviate pain and irritability, while grades III and IV were applied to lengthen the capsule of the joint and the passive tissues that anchor and support it, thus increasing the joint's range of motion [11].

2.3.2. Conventional physical therapy program for both groups

2.3.2.1. Range of motion exercises in form of Codman/ pendulum exercise

Codman exercises are self-mobilization techniques which uses the effect of gravity to distract the humerus from the glenoid fossa. Through the use of light traction and oscillating motions, they alleviate pain and promote early motion of the synovial fluid and joint structures. The scapula was stabilized against the thorax manually, to direct the stretch force to GH joint [14]. The pendulum oscillatory exercises were performed in side-to-side direction for 2 minutes, forward-backward direction for 2 minutes and circular motion for 2 minutes. In a single session each direction was repeated twice [16].

2.3.2.2. Posterior capsule stretching

The patients were lying on their sides. With the arm in a 90° flexion, the scapula was fixed at the lateral side. Stretching was performed at the elbow with a downward force. Each stretch was performed in sets of ten, with each stretch lasting 20 seconds. A 30-second rest period was given between each round of stretches [17].

2.3.2.3. Ultrasound therapy (US)

The procedure began with each patient sitting in a chair, and then the ultrasound treatment began. With the elbow flexed at a 90° angle, the patient's shoulder was positioned on the table adjacent to the body. A probe featuring a rounded head was positioned in direct proximity to the the skin of the patient at the shoulder joint. In order to facilitate the transmission of ultrasonic waves and minimize friction, ultrasound gel was consistently applied to every surface of the head. An intensity of approximately 1.5W/cm^2 and a frequency of 3 MHz were utilized to administer pulsed therapeutic US. The US treatment duration was 8 minutes [18].

2.4. Statistical analysis

An unpaired t-test was performed to compare the ages of the groups. The Shapiro-Wilk test was performed to assess the normal distribution of the data. A Levene's test was performed to assess the homogeneity of variances among groups. To examine the treatment effect on DASH as well as shoulder ROM, a mixed MANOVA was performed. For the following multiple comparison, post hoc tests were performed with the Bonferroni correction. All statistical tests were set to have a significance level of $p < 0.05$. All statistical analysis was carried out through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

3. Results and Discussion

3.1. Subject characteristics

Forty-two patients experiencing shoulder dysfunction post mastectomy participated in this study. Their ages varied from 40 to 60. The mean ± SD age of group A and B were 49.47 ± 6.06 and 51.62 ± 5.83 years respectively. There was no significance difference among groups in the mean age values ($p = 0.25$) (Table 1).

3.2. Effect of treatment on DASH and shoulder ROM

The results of the mixed MANOVA showed that the treatment and time interacted significantly ($F = 29.75$, $p = 0.001$). There was a significant main effect of treatment ($F = 20.75$, $p = 0.001$). There was a significant main effect time ($F = 690.98$, $p = 0.001$).

3.2.1. Within group comparison

There was a substantial reduction in DASH as well as a substantial improvement in shoulder ROM post treatment in both groups contrasted with that pretreatment ($p < 0.001$). The percent of change in DASH, flexion. Abduction, internal as well as external rotation of group A was 68.22, 44.97, 43.32, 65.02 and 56.59% respectively while in group B was 44.38, 28.71, 31.45, 38.19 and 34.57% respectively (Table 2 & 3).

3.2.2. Between group comparison

There was no substantial difference among groups pretreatment ($p > 0.05$). Comparison among groups post treatment showed a substantial reduction in DASH of group A contrasted with that of group B ($p < 0.001$) (Table 2). There was a substantial improvement in flexion, abduction, internal as well as external rotation of group A contrasted with that of group B post treatment ($p < 0.01$) (Table 3). Mastectomy, a common surgical procedure for breast cancer, often causes restricted shoulder movement, resulting in arm and shoulder pain as well as stiffness [19]. Connective tissue fibrosis in the shoulder joint occurs frequently in patients who have had mastectomy [20]. Women who have undergone mastectomy have reported a substantially greater occurrence of shoulder morbidity (17%) [21]. A prevalent symptom of upper extremity morbidities is the limitation of shoulder joint range of motion (ROM), which is associated with a decreased quality of life (QoL) [22]. Breast cancer patients experience shoulder dysfunction with the majority of this dysfunction treated with appropriate rehabilitation programs, it is crucial to develop evidence-based therapy programs that focus on rehabilitation. These programs aim to avoid shoulder pain as well as impairment in breast cancer patients [23]. The present study was carried out to assess the therapeutic impact of Maitland mobilizations technique on shoulder dysfunction post mastectomy. All patients in this trial experienced pain reduction and increased ROM in their shoulder joint. This was achieved through the use of Maitland mobilization techniques, specifically Grades I and II. These techniques work by activating peripheral mechanoreceptors and inhibiting nociceptors, resulting in pain relief. Additionally, Grades III and IV Maitland mobilization techniques were used to improve shoulder ROM.

Antero-posterior glide was employed to enhance shoulder flexion as well as internal rotation ROM, while postero-anterior glide was used to improve external rotation ROM. Lastly, caudal glide was chosen to enhance abduction. Maitland mobilizations on the GH joint may have enhanced the extensibility of the joint capsule and elongated the soft tissues that were limiting joint movement. Due to the increased extensibility of the joint capsule, the glenohumeral joint likely had an increased ROM. Another possible benefit of these therapies is that they increase kinesthetic and proprioceptive sensations in the affected joint, which in turn improves the patient's ability to use their newly restored ROM for everyday activities. People can only keep moving their joints if they do activities that fall inside their newly learned ROM. Comparison among groups post-treatment revealed a substantial decline in DASH of study group when contrasted with that of control group (*p*-value 0.001). The percent of change in DASH of group A was 68.22% while in group B was 44.38% respectively. The reduction of pain and increased mobility can be attributed to the oscillations might inhibit the perception of painful stimuli by repeatedly stimulating mechanoreceptors, which obstruct nociceptive pathways at the spinal cord or brain stem levels. These movements facilitate the flow of synovial fluid, enhancing the supply of nutrients to the cartilage [11]. Moreover, the analysis of the findings of the present study showed a substantial improvement in shoulder flexion, abduction, internal rotation as well as external rotation post treatment in the study group when contrasted with that of control group (*p*- value 0.001) (*p*- value 0.003). The percent of change in shoulder flexion, Abduction, internal as well as external rotation of group A was 44.97, 43.32, 65.02 and 56.59% respectively while that in group B was 28.71, 31.45, 38.19 and 34.57% respectively. The Maitland mobilizations approach increases the ROM by predominantly utilizing Grades III and IV as stretching maneuvers. These maneuvers result in the reorganization of connective tissues, extracellular matrix, and collagen tissues. Thus, they breakdown the adhesions. These effects ultimately result in an increase in ROM as well as improvement in total shoulder functionality [11]. The findings of this study came in accordance with previous studies conducted a RCT to evaluate the impact of Maitland mobilization, compared to conventional physiotherapy, on pain levels, ROM (specifically flexion, abduction, external rotation, as well as internal rotation), in addition shoulder pain and disability index (SPADI) in patients diagnosed with adhesive capsulitis [24-28]. The study determined that Maitland mobilization therapy, in addition to conventional therapy, resulted in a more substantial improvement in ROM, SPADI score, and a substantial reduction in pain measured by NPRS, in contrast to conventional physiotherapy alone. Also, the findings of this study came in line with Zahoor et al., (2021)**,** who reported in a RCT that the Maitland manual therapy approach was helpful in treating idiopathic adhesive capsulitis of the shoulder [26]. The results of this study indicated that Maitland Mobilization helped individuals with frozen shoulder experience less pain and disability. Ali et al., (2022), who conducted a study to investigate the efficacy of Muscle Energy Technique as well as Maitland Mobilization Technique in reducing pain, improving ROM, and reducing disability index among patients experiencing adhesive capsulitis [25]. The findings indicated that Maitland Mobilization is superior in alleviating pain and improving function and disability in individuals with Adhesive Capsulitis, compared to MET in terms of Pain, ROM as well as shoulder functions. Al Shehri et al., (2018), performed a RCT to examine the effectiveness of Maitland Mobilization in treating Frozen shoulder [28]. The study demonstrated that both Maitland Mobilization as well as US effectively alleviate the symptoms of frozen shoulder. Maitland's group had superior progress compared to the US group. These results indicate that Maitland mobilization with exercise is the preferred treatment for frozen shoulder, as opposed to US with exercises. Anwar et al., (2023), carried out research Examining the potential benefits of combining Mulligan's mobilization techniques with Maitland's technique for treating frozen shoulder, including early ROM gain and pain management, is the goal of this study [24]. According to the research, the Maitland mobilization approach is superior to the Mulligan technique for treating frozen shoulder. The study demonstrated the significance of employing the Maitland mobilizations technique for managing shoulder pain, while not documenting any detrimental effects. This study is the first to examine the immediate impact of the Maitland mobilizations technique on shoulder dysfunction following mastectomy. It provides initial evidence supporting the inclusion of the Maitland mobilizations technique as a crucial component in shoulder dysfunction rehabilitation. However, it is important to acknowledge certain limitations when interpreting these findings. The most notable limitations of this study include the lack of assessment of the long-term effects of treatment, which was challenging to conduct due to difficulties in follow-up after the trial, as well as the small sample size. Future trials involving a large sample size along with follow-up with patients are recommended to minimize human suffering and financial expenses. It is crucial to raise awareness about the protection, early diagnosis, and appropriate therapy of shoulder difficulties in post-mastectomy patients. Therefore, additional trials should be conducted to assess the effectiveness of early physical therapy intervention in preventing shoulder morbidity after mastectomy. Furthermore, the impact of different exercise therapy approaches with longer durations should be evaluated.

Table 1: Comparison of subject characteristics among group A and B.

	Group A	Group B	p-value
	Mean ±SD	Mean ±SD	
Age (years)	49.47 ± 6.06	51.62 ± 5.83	0.25
Weight (kg)	74.66 ± 7.08	75.35 ± 7.06	0.84
Height (cm)	160.71 ± 5.67	160.55 ± 5.66	0.93
BMI (kg/m²)	28.64 ± 4.22	28.54 ± 3.96	0.86
Number of radiation therapy	15.43 ± 3.55	14.56 ± 3.46	0.62
Number of chemotherapies	4.32 ± 2.36	5.18 ± 2.22	0.77

SD: Standard deviation; p-value: Probability value

Table 2: Mean DASH pre as well as post treatment of group A and B.

DASH	Pre treatment	Post treatment	MD	% of change	p value
	Mean ±SD	Mean ±SD			
Group A	71.65 ± 6.32	22.77 ± 8.38	48.88	68.22	0.001
Group B	68.91 ± 9.18	38.33 ± 10.39	30.58	44.38	0.001
MD	2.74	-15.56			
	p = 0.26	***p = 0.001***			

SD: Standard deviation; MD: Mean difference; p-value: Probability value.

Table 3: Mean flexion, abduction, internal as well as external rotation ROM pre and post treatment of group A and B.

ROM (degrees)	Pre treatment	Post treatment	MD	% of change	p value
	Mean ±SD	Mean ±SD			
Flexion					
Group A	112.14 ± 7.05	162.57 ± 11.83	-50.43	44.97	0.001
Group B	113.95 ± 5.71	146.67 ± 14.62	-32.72	28.71	0.001
MD	-1.81	15.9			
p value	***p = 0.36***	***p = 0.001***			
Abduction					
Group A	91.14 ± 5.95	130.62 ± 7.91	-39.48	43.32	0.001
Group B	92.81 ± 7.87	122 ± 9.53	-29.19	31.45	0.001
MD	-1.67	8.62			
p value	***p = 0.44***	***p = 0.003***			
Internal rotation					
Group A	46.57 ± 3.55	76.85 ± 4.38	-30.28	65.02	0.001
Group B	45.38 ± 5.44	62.71 ± 4.63	-17.33	38.19	0.001
MD	1.19	14.14			
p value	***p = 0.41***	***p = 0.001***			
External rotation					
Group A	49.57 ± 5.78	77.62 ± 7.33	-28.05	56.59	0.001
Group B	47.52 ± 4.29	63.95 ± 7.77	-16.43	34.57	0.001
MD	2.05	13.67			
p value	***p = 0.20***	***p = 0.001***			

SD: Standard deviation; MD: Mean difference; p-value: Probability value

Figure 1: Shows Antero-posterior glides for gleno humeral joint.

Figure 2: Shows Postero-anterior glides for gleno humeral joint.

Figure 3: Shows Longitudinal Caudal glides for gleno humeral joint.

4. Conclusions

In view of the findings revealed by this study, it could be concluded that: Incorporation of Maitland mobilizations is beneficial in improving post mastectomy shoulder dysfunction regarding ROM, pain and function post mastectomy when it was added to the conventional physical therapy program.

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