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Effect of Massage Therapy With and Without Elastic Bandaging on Pain, Edema, and Shoulder Dysfunction After Modified Radical Mastectomy: A Clinical Trial

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Abstract

Objectives: Pain and shoulder dysfunction are among the adverse and prevalent conditions in post-mastectomy women. Therefore, the present study aimed to examine massage therapy with and without elastic bandaging on pain, edema, and shoulder dysfunction after modified radical mastectomy.

Materials and Methods: This was a clinical trial conducted at Imam Reza hospital, Tabriz, Iran, from December 22, 2018, to May 5, 2019. Ninety women participated in this study and were randomly divided into three groups of 30 (i.e., Manual lymph drainage, Manual lymph drainage plus reduced-compression bandaging, and control) based on a random number table. Patients and their companions were instructed on the intervention to be performed at home on a daily basis 24 hours after surgery with the help of a trained research assistant. Data were entered in the relevant forms before and after the intervention, including demographic information, shoulder pain and dysfunction index (SPDI), and edema checklist. Data were analyzed through descriptive statistics, one-way ANOVA, and the Kruskal-Wallis test in SPSS 19. $P<0.05$ was considered statistically significant.

Results: The comparison of the main variables between the three groups before and after the intervention showed no statistically significant difference ($P>0.0560$). The intervention could significantly change pain intensity and shoulder movement limitation ($P=0.001$). However, there was no difference in the edema variable before and after the intervention ($P=0.25$).

Conclusions: In general, massage therapy with and without elastic bandaging had a positive effect on shoulder movement limitation and pain whereas it had no such effect on edema drainage.

Keywords: Massage therapy, Elastic bandaging, Lymphedema, Mastectomy

Introduction

Lymphedema, with a postoperative incidence of 8% to 52% in the first 2 years, is an adverse complication of breast surgery, whose causes have not yet been well-established (1,2). Lymphatic edema affects the upper limbs and, consequently, a person's physio-psychological life. Given the lack of definitive treatment for lymphatic edema in the current existing science, therapeutic measures aim to reduce the increased edema and maintain limb at the smallest size to the possible extent. Such treatments reduce the amount of accumulated fluid in the tissue and thus prevent lymphatic edema or infections (3). Upper limb lymphedema can lead to numerous complications such as increased limb volume, increased risk for infection, psychological complications, decreased local immunity in the affected side, movement limitation, decreased self-confidence, serious social and emotional problems, severe, sometimes uncontrollable pain, skin-associated alterations, and ultimately, problems in activities of daily living (4,5).

Given the adverse effects of post-mastectomy lymphedema on various aspects of the treatment and life, it is imperative to manage this complication (5). Cancer-induced lymphedema is managed based on decongestant physiotherapy (6). In addition, manual lymph drainage and multilayer bandaging are the main therapeutic techniques for peripheral lymphedema (7). Although manual lymph drainage is an important part of lymphedema treatment, there is limited evidence for a clinical practice guideline (8). Various gentle massaging techniques are used to remove excess interstitial fluid and increase lymphatic transfer in manual lymph drainage (9). Bunce et al reported the positive effect of multidimensional massage therapy as a therapeutic intervention, pneumatic compression, bandaging, and self-care technique instruction on reducing post-mastectomy lymphedema (10). Despite numerous studies regarding the positive effects of massaging and bandaging on lymphedema enhancement and control (11-13), some others have not reported any advantage of this type of therapy (14,15). Therefore, the edema has specified points and the adverse effects such as pain and shoulder dysfunction in post-mastectomy women and surgical radical mastectomy can cause damage to the upper limb

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nerves and neuromuscular problems in the area, leading to these problems for several years after surgery (16-18). Considering the above-mentioned explanations, the present study aimed to examine the effect of massage therapy with and without elastic bandaging on pain, edema, and shoulder dysfunction after modified radical mastectomy.

Materials and Methods

This clinical trial was conducted on female patients who underwent a modified radical mastectomy and were hospitalized at the Thoracic Surgery Unit of Imam Reza Hospital, Tabriz, Iran. A sample size of 30 cases for each group was determined based on a similar study by Norouzzadeh et al (19), and a total of 90 patients entered the study. Participants were selected from December 22, 2018, to May 5, 2019. Based on a random number table, they were randomly assigned to three groups of 30, including the manual lymph drainage, the manual lymph drainage plus reduced-compression bandaging, and the control groups. The inclusion criteria were mastectomy with axillary lymph node dissection and the availability of a literate family member for massaging or bandaging. The exclusion criteria included a history of any type of surgery on the shoulder, as well as a history of previous lymphedema, shoulder dysfunction, and lymphatic system disorder.

Instruments

The data collection instruments consisted of a demographic information questionnaire, the Shoulder Pain and Dysfunction Index (SPADI), and an Edema Checklist. SPADI comprises two subscales of pain and shoulder useability assessment (20,21). The pain assessment subscale included four items encompassing the ability to lie on the involved side, reach for something on a high shelf, touch the back of the neck, and push with the involved arm. After each intervention, patients were asked to mark their responses on each item of the visual analogue scale ranging from zero to ten representing no problem to the worst state, respectively (22). The shoulder dysfunction assessment encompassed eight items. Patients were asked to apply their ability in using the shoulder joint on a scale of 0-10 (0 indicating no problem and 10 the greatest difficulty) for the following items: ability to wash the hair, reach the back, put on an undershirt or jumper, put on a shirt that buttons down the front, put on pants, place an object on a high shelf or rack, carry a heavy object of 10 pounds (4.5 kg), and pick something up from the back without turning. Arm edema was measured in two steps as circumferential and volumetric measurements. First, the limb circumference was measured using a tape measure in predetermined areas including the metacarpophalangeal joint, the first web space, the wrist joint, 15 cm below the elbow, and 7.5, 15, and 22.5 cm above the elbow in the elbow area. Patients assumed a sitting position with their elbows held straight and measurement was carried out on a single day for both sides. Then, the limb volume was measured using a volumeter through fluid transfer. For this measurement, patients were asked to drop their limbs slowly in the volumeter until the horizontal bar at its end was placed between the space of the second and third fingers. The transferred fluid rate was measured and the same procedure was repeated for the healthy side. Therefore, the volumes of both arms were measured, allowing for the difference between the transferred fluid in both arms, as well as the calculation of the volume of lymphedema in the involved limb.

The Intervention Process

For accurate interventions, a nurse who was a member of the research team learned the proper massaging technique and reduced-compression bandaging after 6 months of training under the supervision of the physiotherapy team of Tabriz University of Medical Sciences. Twenty-four hours after surgery and before the discharge, a training session was held for patients and one family member who always lived with them. The "manual lymph drainage" group was instructed on the proper massaging technique, and the "manual lymph drainage plus reduced-compression bandaging" group received instruction on the proper massaging and bandaging techniques. In addition to in-person instruction and practice, an instructional pictorial pamphlet with adequate descriptions was handed to patients and their companions in order to achieve greater accuracy in massaging and bandaging. In the "manual lymph drainage" group, the intervention was performed by instructing patients and their companions to massage the area each day for 20 minutes. This process was continued for one month. The manual lymph drainage method was based on the Vodder's technique. In addition, instructions on massaging with the specified technique by the patient are summarized as follows: Drawing 5 diaphragmatic breaths, massaging from under the auricle to the bottom of the neck, from the medullary cavity of the exterior clavicle to the interior, and from the side of surgery to the opposite arm's armpit and the armpit itself (23). The "manual lymph drainage plus reduced-compression bandaging" group received intervention in the form of elastic reduced-compression bandages wrapped around the limb on the side of the surgery in addition to massage therapy. Patients were instructed to keep the bandage around the limb on the side of the surgery for at least 6 hours a day (preferably during nighttime sleep or after each massage session at the patient's discretion). This process was continued for one month. In this bandaging technique, small bandages (Mollelast) would be first wrapped around the fingers. After covering the wrist to arm with an open-weave tubular bandage and Webril cotton bands, reduced-compression bandages would be placed in two layers on the wrist to the elbow and the elbow to the arm. Pain intensity and shoulder dysfunction were assessed on the

seventh day after operation in order to compare the pre- and post-intervention states given the extent of radical mastectomy, the associated pain with the incision area, and postoperative hematoma-induced edema. Further, the edemas were measured and recorded by the research nurse on two occasions, namely, 24 hours after the operation and one month after the initiation of intervention. In both intervention groups, the patient and a family member were asked to fill out the requested SPADI items of the checklist and questionnaire. The specified interventions were not performed for the control group although they received routine post-mastectomy interventions. The research nurse's contact number was provided to patients for follow-up regarding correct and timely interventions. Furthermore, interventions by patients or family members were regularly monitored in person or via phone calls. If required, necessary instructions would be given to patients upon visiting the oncology clinic. At the end of the one-month period, the questionnaires and checklists were collected by the research nurse. Eventually. The data were analyzed using descriptive statistics, one-way ANOVA, and the Kruskal-Wallis test in SPSS 19. The $P<0.05$ was considered statistically significant.

Results

Demographic Findings

The results of this section indicated that the mean age of the patients was 44.12±6.09, 43.29±6.55, and 45.81±7.01 years in the massage, massage plus bandage, and the control groups, respectively. Additionally, 18 (60%), 16 (52.23%), and 15 (50%) patients from the massage, massage plus bandage, and control groups undergo surgery on the left side of the body, respectively. There was no statistically significant difference between the hand circumference, pain intensity, and shoulder movement limitation of the three groups before intervention (Table 1).

Findings for Hand Circumference

Given the normality of the random sample in the dependent variable (mean hand circumference) based on the Kolmogorov-Smirnov test ($P>0.05$), the parametric one-way ANOVA test was used to compare the mean post-intervention hand circumferences on the side of operation between the three groups (control, massage, and massage plus bandage). According to the results, there was no significant reduction in the mean hand circumference difference (cm) between the three groups on the 30th day ($P=0.255$), the details of which are provided in Table 2.

Findings for Pain Assessment

Given the abnormality of the dependent variable of pain intensity ($P<0.05$), the non-parametric Kruskal-Wallis test was utilized to compare the mean post-intervention pain intensity (after 30 days) between the three groups (control, massage, and massage plus bandage). Based on the results (Table 2), a significant reduction was observed in the mean pain intensity difference between the three groups on the 30th day ($P=0.001$).

Findings for Shoulder Movement Limitation

Regarding the abnormalities of the musculoskeletal system of the upper extremity ($P<0.05$), a nonparametric Kruskal-Wallis statistical test was used at the end of the intervention (30th day) between the three groups (control, massage, massage + bandage). The results showed a significant decrease compared to the pre-intervention group in the

Table 1. Comparison of Hand Circumference, Pain Intensity, and Upper Limb Musculoskeletal System Tests Before Intervention

	Massage (n=30) Mean ±SD	Massage Plus Bandage (n=30) Mean ±SD	Control (n=30) Mean ±SD	*P* value
Edema	23.12±3.21	22.55±2.85	22.19±2.91	0.711
Pain intensity	4.25±1.65	4.15±1.15	4.51±1.11	0.851
Empty can, No. (%)	8 (26.66)	9 (30)	9 (30)	0.715
Neer impingement, No. (%)	9 (30)	8 (26.66)	7 (23.33)	0.711
Hawkins Kennedy impingement, No. (%)	5 (16.66)	5 (16.66)	4 (13.33)	0.803
Yergason, No. (%)	6 (20)	5 (16.66)	6 (20)	0.901
Compression, No. (%)	9 (30)	8 (26.66)	9 (30)	0.811
Cross over, No. (%)	6 (20)	5 (16.66)	6 (20)	0.903
Resistive tennis elbow, No. (%)	3 (10)	3 (10)	4 (13.33)	0.890
Cozens, No. (%)	5 (16.66)	6 (20)	5 (16.66)	0.889
Passive tennis elbow, No. (%)	9 (30)	10 (33.33)	8 (26.66)	0.703
Phalen test, No. (%)	3 (10)	4 (13.33)	3 (10)	0.515
Revers Phalen, No. (%)	6 (20)	7 (23.33)	8 (26.66)	0.690
Tinel's sign, No. (%)	3 (10)	3 (10)	5 (16.66)	0.503
Pronator teres, No. (%)	5 (13.33)	5 (13.33)	3 (10)	0.609
Finkelestein, No. (%)	11 (36.66)	10 (33.33)	12 (40)	0.706
Resisted isometric movement, No. (%)	3 (10)	3 (10)	2 (06.66)	0.801

Note. SD: Standard deviation.

Table 2. Comparison of Hand Circumference, Pain Intensity, and Upper Limb Musculoskeletal System Tests After Intervention

	Massage (n=30)	Massage Plus Bandage (n=30)	Control (n=30)	*P* Value
	Mean ±SD	Mean ±SD	Mean ±SD	
Edema	25.25±3.78	24.12±3.12	25.59±3.18	0.225
Pain intensity	2.11±1.39	2.19±1.25	3.81±1.60	0.001
Empty can, No. (%)	5 (16.66)	5 (16.66)	10 (33.33)	0.011
Neer impingement, No. (%)	7 (23.33)	5 (16.66)	9 (30)	0.041
Hawkins Kennedy impingement, No. (%)	1 (03.33)	0 (0)	6 (30)	0.001
Yorgason, No. (%)	2 (06.66)	1 (03.33)	8 (26.66)	0.001
Compression, No. (%)	3 (10)	2 (06.66)	11 (36.66)	0.003
Cross over, No. (%)	1 (03.33)	1 (03.33)	8 (26.66)	0.002
Resistive tennis elbow, No. (%)	0 (0)	0 (0)	5 (16.66)	0.001
Cozens, No. (%)	1 (03.33)	0 (0)	9 (30)	0.001
Passive tennis elbow, No. (%)	2 (06.66)	2 (06.66)	12 (40)	0.001
Phalen test, No. (%)	0 (0)	0 (0)	5 (16.66)	0.001
Revers Phalen, No. (%)	1 (03.33)	1 (03.33)	9 (30)	0.003
Tinel's sign, No. (%)	0 (0)	0 (0)	15 (50)	0/001
Pronator teres, No. (%)	1 (03.33)	0 (0)	6 (20)	0.001
Finkelestein, No. (%)	6 (20)	2 (06.66)	15 (50)	0.006
Resisted isometric movement, No. (%)	0 (0)	0 (0)	9 (30)	0.006

Note. SD: Standard deviation.

three groups on day 30 so that the pathological variables of the shoulder ($P=0.001$), tennis elbow ($P=0.001$), carpal tunnel syndrome ($P=0.001$), and De Quervain's tenosynovitis ($P=0.001$) were significantly associated with improvement.

Discussion

The present study aimed to examine massage therapy with and without elastic bandaging on pain, edema, and shoulder dysfunction after modified radical mastectomy. The results indicated that massage therapy with and without elastic bandaging had a positive effect on pain intensity and movement limitation whereas it did not contribute to edema drainage. The results of studies on the effects of massage therapy on edema reduction conducted in Iran suggested a decrease in edema volume compared to the control groups (30,31). In another study, Ghaderi et al reported that bandaging can result in lymph drainage through pressure on the tissue. Contrary to the present research, positive results were observed from massage therapy on decreased edema in other studies (32,33). Similarly, Karafa et al found the positive effects of elastic bandage on the reduction of lymphedema (34). In addition, Butt et al demonstrated the positive effects of bandage plus exercise on lymph reduction (35), which contradicts the findings of the current study.

Likewise, in numerous studies, bandaging and massage therapy have been reported to have beneficial effects on pain relief in patients with lymphedema (11,36). With the existing technique that alleviates nerves in the edematous area, massage therapy with and without elastic bandage appears to relieve pain.

Other studies, such as the study by Kim et al obtained similar results regarding improving the condition of the nervous system in the shoulder region after the massage therapy. Therapeutic massage seems to improve the function of the nerve of the shoulder region by creating relaxation in the shoulder region and having positive effects on the nerves. Massage therapies also release normal analgesics in the body and greatly reduces pain in that area (37).

Shoulder movement limitation in both intervention groups was lower than the control group, indicating the efficacy of the intervention in shoulder movement. In similar studies, massage therapy with and without elastic bandaging also had positive effects on shoulder movement (19,30,36).

Conclusions

In general, massage therapy with and without elastic bandaging demonstrated positive effects on shoulder movement limitation and pain whereas it did not contribute to edema drainage.

Limitations of the Study

The limitations or disadvantages of the study included the short duration of the study and the lack of attention to such treatments as radiotherapy or chemotherapy.

Suggestions for Future Studies

Further studies are recommended with an emphasis on removing the specified limitations.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

The observed ethical considerations in this study were similar to those of other studies (24-29), the most notable of which included obtaining an ethical code from the Regional Medical Ethics Committee (Ethics no. IR.TBZMED.REC.1397.1059) and registering the study in the Iranian Registry of Clinical Trials (identifier: IRCT20120605009948N6; https://www.irct.ir/trial/38485). Moreover, informed consent was obtained and the research objectives were explained in plain and comprehensible language to the participants, and they were ensured of voluntary participation in the study and were offered free-of-charge physiotherapy and bandaging services.

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