Manual Lymph Drainage: Its Influence on Lymphedema

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ABSTRACT

In an effort to investigate the effect of manual lymph drainage on lymphedema. 15 patients post mastectomy were selected randomly in this study. Patients post breast cancer surgery were admitted to Physical Therapy Department at Bedford Regional medical Center, Bedford, Indiana, USA. Patients were divided into two groups. Study Group (G1), received manual lymph drainage, therapeutic exercise and compression garments. The control group (G2), received therapeutic exercise, compression garments. Arm volume was determined by two methods for accuracy, by circumferential measurement and, water adjustment volume. Student t test was used to test the significant difference between the two groups. After 12 weeks of treatment, arm volume in G1 decreased (0.9 ± 0.2 cm, 181.5 ± 78 ml), but it was not significant ($p<0.06$). Arm volume in G2 decreased (0.6 ± 0.2 cm, 108 ± 65ml), but it was not significant ($p<0.25$). It was suggested that, the non significant results was due to small sample and short duration of treatment.
Key words: *manual lymph drainage, lymphedema, therapeutic exercise and compression Pump.*

INTRODUCTION

Cancer and its treatment can result in lymphedema of upper and lower extremites. People who are at risk for lymphedema are those who have undergone surgical resection of lymph channels (e.g. radical mastectomy, axillary node dissection, pelvic node dissection) and, people who receive radiation therapy to the lymphatic channels. Also at risk, are people with metastatic disease, prolonged immobilization, morbid obesity, and recurrent infections with lymphangitis[11].

One out of every 8 women in the United States is expected to develop breast cancer and, approximately 15 to 20% of the women who have axillary lymph nodes removed in breast cancer will develop lymphedema in the ipsilateral extremity[4,13]. Lymphedema is a condition in which there is an accumulation or insufficient transportation of water and, proteins in the affected tissues, causing an edema and inflammation within an extremity[9].

The initial swelling caused by the leakage of fluid, is known as the acute or latent stage of lymphedema and, is characterized by pitting edema without brawny skin changes. In the acute stage, the lymphedema resolves during the resting period at night or with position changes throughout the course of the day[6]. Brawny edema is identified by a decrease in the tissue s ability to pit when pressure is applied. The capillaries and collecting vessels dilate, and the one way valves become unable to function. Concomitant problems associated with acute and chronic lymphedema are weakness,

limited range of motion, stiffness, pain and, numbness of the extremity[15].

Lymphedema can lead to a feeling of heaviness and, discomfort in the involved upper extremity, impairment of function and, unsatisfactory appearance. Large amount of fluid can cause restrictions in range of motion. Delayed intervention to reduce lymphedema may result in poor functional outcomes, as well as increasing emotional distress[2].

Physical therapy interventions for lymphedema aims to reduce and control the amount of swelling in an affected limb, as well as to restore the function and cosmetics. The interventions for lymphedema have included the use of elastic garments, elevation, massage, isometric and resistive exercise and, ultrasound[19]. Similarly, Pappas and O Donnell reported that, conservative management is based on the principles of massage and exercise. Applying increased pressure on the affected extremity helps to mobilize the fluid in the tissues. Conservative management of lymphedema is successful in approximately 60%-80% of patients[18].

The purpose of this study was to study the effect of manual lymph drainage on lymphedema. Our hypothesis in this study was: there no significant difference between the study group and the control group in reduction of swelling, increasing range of motion and improving arm function.

MATERIAL AND METHODS

Subjects

15 female patients were diagnosed of acute lymphedema, post mastectomy. The mean age of subjects in the study group was 43±3 years and 45±4 years in the control group. Patients were selected randomly from the department of Oncology at Bedford regional Medical Center, Bedford, Indiana. Patients were assigned to both groups, the study group (n= 8)(G1) and the control group (n = 7)(G2).

Treatment and tests took place in September through December 1998. Water adjustment volume, circumferential measurements and range of motion were taken regularly every week. Patients were seen 6X/week for 12 weeks in Physical Therapy department. Analysis of water adjustment volume was carried at Exercise Physiology Lab at Indiana University (Bloomington). G1 received manual lymph drainage, exercise and pressure garment. G2 received therapeutic exercise and pressure garment. All patients indicated their approval to participate in this study by signing an informed consent form.

Procedure

I- Measurements

Circumferential measurement:

1- Olecranon process was used as a landmark, following Knopf protocol (1991)[12].
2- Circumference at 10 cm intervals starting from the olecranon process.
3- Measurement were taken 3 times for accuracy.
4- Sum mean was taken every week.

Water displacement volume:

1- Water volume for every subject was determined by using the non affected arm that can cause water to displace.
2- Then the affected arm was soaked in, and the displaced water was calculated at the Exercise Physiology Lab.
3- Water displaced volume was calculated every week.

Range of motion:

1- It was taken for both wrist and elbow joints.

2- Range of motion was taken 3 times for accuracy.
3- Sum mean was taken for each joint every week.

Jobst sleeve measurement:

Measurement for the compression garment was taken according to the manufactory guideline (circumference at 4 cm interval)

Statistics:

Mean, standard deviation, and student t test were used to test the significant difference between the two groups.

II- Treatment

Manual lymph drive:

Following the technique prescribed by Tappan (1988)[20]. This technique starts with the non affected side to produce dilation of vessels to assist in lymph drainage in G1.

1- Massage in a distal to proximal direction, so that proximal area is emptied to make room for the fluid flowing in from the distal end.
2- Move only the skin with a pressure intensity that, causes skin to snap back when it is released.
3- Repeat the massage five to seven times to allow time for the fluid to respond.
4- The pressure period should last longer than the relaxation period.
5- No erythema should occur.
6- No pain should occur.

The technique used by placing the fingers flatly on the skin and pushing the skin in the same place in a circular motion followed by a short period of relaxation. The circles are expanded in the direction of lymph drainage of the involved area.

7- Exercising the affected extremity promotes the development of collateral drainage.

Both groups received a therapeutic program of isometric exercise followed by resistive exercise using standard mechanical weights.

RESULTS

Table (1): Range of motion of wrist flexion.

Groups	Pre Treatment	Post treatment	t value	P value
G1	40±3 degrees	45±2 degrees	1.682	<0.08
G2	42±4 degrees	45±2 degrees	1.463	<0.1

In this study, range of motion of elbow flexion in G1 was increased from 95±4 degrees to 105±6 degrees, (P<0.05). In G2 range of motion of elbow flexion was increased from 90±6 degrees to 100±5 degrees, (P<0.05), as shown in fig (1). In G1 wrist flexion range of motion was increased from 40±3 degrees to 45±2 degrees, (P<0.08). In G2, range of motion of wrist increased from 42±4 degrees to 45±3 degrees, (P<0.1) as shown in table (1). There was no significant difference between the groups in both elbow flexion (P<0.1), and wrist flexion (P<0.5).

Table (2): Circumferential measurement in upper extremity.

Groups	Pre treatment	Post treatment	t value	P value
G1	2.5±0.91 cm	1.6±0.76 cm	1.35	<0.06
G2	2.4±0.87 cm	1.8±0.85 cm	1.26	<0.25

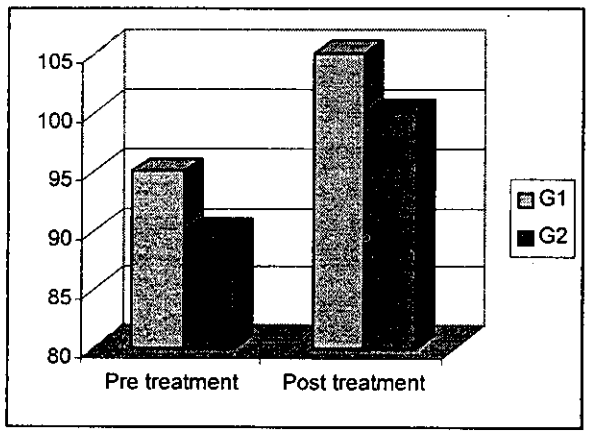

Fig. (1): Range of motion elbow

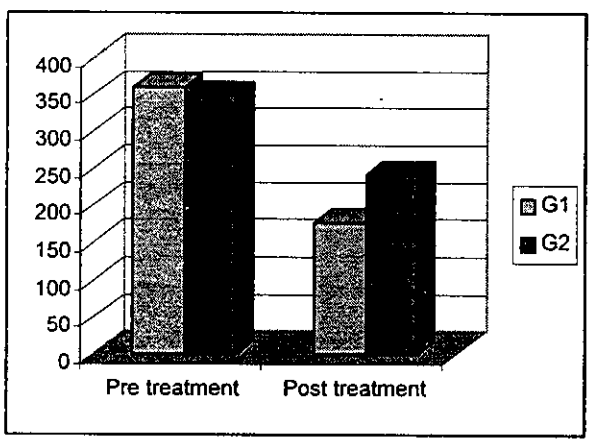

Fig. (2): Water displacement volume

In this study, the sum mean of circumferential measurement was changed in group (1) from 2.5±0.91 cm to 1.6±0.76 cm. The decrease in sum mean was not significant, 0.9±0.2 cm (P<0.06). In group (2), the circumferential measurement of the upper extremity decreased from 2.4±0.87 cm to 1.8±0.85 cm, with a difference of 0.6±0.2 cm (P<0.25) as shown in table (2). There was no significant difference between the groups in circumferential measurement (P<0.06). Water displacement volume in G (1) decreased from 359 ml ± 106ml to 177.5 ± 98 ml, with a difference of 181.5 ± 78 ml, (P<0.06). In G2, water displacement volume decreased from 349±119 ml to 241±87 ml, with a difference 0f 108±65 ml, (P <0.25). There was no significant difference between the groups in water displacement volume, (P<0.1).

DISCUSSION

In this study, the reduction in arm swelling of the study group was not significant either within the group nor between the groups. However, the reduction in arm swelling has its significant effect on improving joint range of motion in elbow flexion between the groups and within the group. Similarly, Foldi (1983), reported that, conservative management is based on the principles of massage and exercise. Applying increased pressure on the affected extremity helps to mobilize the fluid in tissue[7]. Pappas and O Donnell (1992), reported that conservative management of lymphedema is successful in approximately 60%-80% of patients[18].

In this study, Measurement was taken 10 cm below and above olecranon process. Similarly Knobf (1991) suggested that, measurement of upper extremities should be

taken 5-10 cm above and below the olecranon process, and in lower extremities measurements should begin at the metatarsophalangeal joint and, progress up to the instep, ankle, distal calf, calf, knee, lower thigh, upper thigh, and the gluteal fold[12].

In this study, the mean difference in arm swelling, compared to the opposite extremity was (2.4cm to 2.5 cm) in both groups. It was suggested that, a difference of 1-1.5 cm can establish a diagnosis of lymphedema, and a 3-5 cm discrepancy constitutes moderate lymphedema. Severe lymphedema is a difference greater than 5 cm[18].

The lymphatic system is made up of capillaries, vessels, and nodes. The fluid dynamics within the capillary bed are maintained by pressure gradients that are created by the capillary plasma hydrostatic and plasma colloid oncotic pressures and the interstitial fluid and colloidal oncotic pressures. The pressure gradient support filtration of serous fluid and proteins from intra vascular circulation to the interstitial space and reabsorption by the lymphatic capillaries, which drain into large vessels[17].

The reduction in arm size in the study group was greater than the control group. It was believed that, this marked reduction in arm size was due to vasodilation produced by the manual lymph drainage before the exercise. Similar results reported by Campisi et al., (1992) that, muscular vasodilation can improve lymph flow and smooth muscle contraction of deep lymphatic vessels; however, this technique is partially successful because lymphedema involves mostly subcutaneous tissue and superficial collecting lymphatic vessels[3]. Similarly Mason (1993) reported that, manual lymph drainage and, Foldi massage technique are used to stimulate residual lymphatic vessels to carry excess fluid from the affected extremity[14]. It was suggested that, massaging the skin surface is believed to stimulate skin receptors and result in lymph drainage[20].

In this study, there was a reduction in the arm size of the control group. It was suggested that, this reduction was due to the effect of exercise and the compression gradient. Similar results reported by Gan et al., that, exercise is thought to be beneficial due to skeletal muscle activity, aiding the extrinsic pumping mechanism of the lymphatic system[8]. It was suggested that, the variations in blood flow between distinct muscle fiber-type regions before, during, and after exercise that are attributed to the metabolic differences between the fiber types[1]. The muscle pump or venous pump activity produced during muscle contraction, dramatically reduces venous pressure in the feet of walking subjects. Muscle contractions causes compression of valved venous and lymphatic vessels. This compression forces fluids proximally, thereby encouraging venous and lymphatic return[10].

In this study, there was a significant difference in elbow flexion in both groups. However, there was a marked difference in wrist flexion in both groups, but was not significant neither between the groups nor within the groups. Exercising the affected extremity promotes the development of collateral drainage, thus preventing and reducing swelling. Exercise should be used to promote muscle contraction to put pressure against the lymph channels throughout the affected extremity.

These exercise also promotes recovery of strength and range of motion in the affected extremity[5].

The third component of the treatment in this study was the use of compression gradient. It was suggested that, compression, influences edema formation by increasing interstitial pressure. The increased pressure may reduce

efflux of fluid and plasma proteins from the micro-circulation, thereby inhibiting edema formation. Similarly, compression garments may be prefabricated and, are of varying degrees of elasticity. They act to lessen the amount of excess fluid that can enter an affected extremity by increasing interstitial hydrostatic pressure within the limb. External compression by pneumatic pump can either single chamber or multi-chamber. Multi-chamber pumps are sequential in nature, the chambers inflate beginning distally, then inflate proximally. This action serves to move the fluid proximally and out of the affected limb[16]. It was believed that, early treatment of lymphedema with external compression device (ECD) is essential because the degree of reduction because the degree of reduction achieved, is directly related to the degree of subcutaneous fibrosis[18].

CONCLUSION

Application of manual lymph drainage, before therapeutic exercise program, decreases the arm size in patients with lymphedema. Although the difference within the group was (0.9 cm), 181.5 ml, it was not significant ($P<0.06$). Range of motion of elbow flexion was increased significantly in both groups. Also wrist flexion increased in both groups, but it was not significant. Between the groups no significant differences were noticed in arm size, range of motion and, skin color. Further investigations and comparative studies are needed to study the effect of manual lymph drainage, exercise, and ECD on arm size in acute and chronic lymphedema.

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الملخص العربي

تأثير المعالجة اليدوية للسائل الليمفاوي على مرضى الورم الليمفاوي

أجريت هذه الدراسة لفحص اثر المعالجة اليدوية للسائل الليمفاوي على مرضى الورم الليمفاوي . اختير ١٥ مريض بعد إزالة ورم الثدي تم اختيارهم بطريقة عشوائية وقسموا إلى مجموعتين .
المجموعة الأولى ٨ أشخاص تلقوا معالجة يدوية للسائل الليمفاوي تمرينات علاجية وجوارب ضاغط . المجموعة الثانية ٧ أشخاص تلقوا تمرينات علاجية وجوارب ضاغط. تم قياس حجم الذراع بطريقتين الأولى بالمقياس الدائري (والسنتيمتر) والثانية بطريقة وزن السائل المزاح . تمت المعالجة الإحصائية لاختبار الدلالات الإحصائية بين المجموعتين .
بعد ١٢ أسبوع من العلاج نقص حجم الذراع للمجموعة الأولى بمقدار (٠,٩ سم ١٨١,٥ مل) ولكن لم تكن له دلاله إحصائية . ونقص حجم الذراع للمجموعة الثانية بمقدار (٠,٦ ١٠٨ ملى) يقترح عدم وجود دلاله إحصائية لصغر المجموعة العشوائية وقصر فترة العلاج.