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To compare the "efficacy of pneumatic compression therapy (PCT), lymphatic drainage exercises (LDE) and control group in patient with upper limb lymphoedema

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Abstract
Introduction: Lymphoedema is a common, chronic, progressive and often debilitating disease caused by the accumulation of protein-rich fluid in the interstitial spaces. Lymphoedema most frequently affects the extremities, but may occur in the head, neck, torso, abdomen, and genitalia [1].
Aim and Objective: To compare the "efficacy of pneumatic compression therapy (PCT), lymphatic drainage exercises and control group in patient with upper limb lymph edema."
Methodology: It is an experimental study design. A convenience sample of 45 subjects with lymphoedema was solicited from the OPD physiotherapy department of SGRRIMHS & SMIH Patel Nagar Dehradun. Subject randomly assigned into three groups viz group A, B and C. Group A patients given Pneumatic Compression Therapy (PCT) and Manual Lymphatic Drainage (MLD). Group B given Lymphatic Drainage Exercises (LDE) and Manual lymphatic drainage (MLD) and Group C given Manual lymphatic drainage (MLD) for upper limb lymph edema. All three groups were treated for four weeks.
Results: The age, weight and height of subjects in groups A, B and C were compared by using analysis of variance. There was no significant difference found in age, weight and height in all 3 groups ($P>0.05$). But significant difference found at 3 to 4 weeks in all 3 groups. ($P<0.05$)
Conclusion: The present study concluded that group A (Pneumatic Compression Therapy and Lymphatic Drainage Exercises) showed significant improvement as Group B (Manual lymphatic drainage (MLD) and control group (lymphatic drainage exercises) for upper limb in lymphoedema.

Keywords: pneumatic compression therapy (PCT) and manual lymphatic drainage (MLD), lymphatic drainage exercises (LDE) and measure tape

Introduction
Lymphoedema is a common, chronic, progressive and often debilitating disease caused by the accumulation of protein-rich fluid in the interstitial spaces. Lymph stasis induces an inflammatory reaction that leads to the proliferation of adipose tissue and to fibrosis, resulting in mild to severe, and permanent swelling of the affected body parts [1].
Lymphoedema is related to congenital lymphatic abnormalities (primary forms) or acquired (secondary forms) lesions of the lymphatic system. Primary lymphoedema is a lymphoedema without any cause to explain lymphatic impairment, due to abnormal lymph angiogenesis in utero [2, 3].
Early diagnosis of lymphoedema is very important as it significantly increases the success of the treatment [4].
Lymphatic drainage exercises, often referred to as pumping exercises, move fluids through lymphatic channels. Active, repetitive ROM exercises are performed throughout each session. The exercises follow a specific sequence to move away from congested areas. It is similar to the sequence of massage applied during manual lymph drainage [6].
Intermittent pneumatic compression (IPC) is a mechanical Therapeutic modality that include an air pump that intermittently inflates supportive sleeves, gloves or boots around an edematous part to improve venous and lymphatic circulation [11].

Pneumatic compression devices have been utilized in the medical management of swelling since the early 1950s [14, 15]
Manual lymphatic drainage (MLD) is a type of massage based on preliminary evidence which is hypothesized to encourage the natural drainage of the lymph, which carries waste products away from the tissues back toward the heart. The lymph system depends on intrinsic contractions of the smooth muscle cells in the walls of lymph vessels (peristalsis) and the movement of skeletal muscles to propel lymph through the vessels to lymph nodes and then to the lymph ducts which return lymph to the cardiovascular system. Manual lymph drainage uses a specific amount of pressure (less than 9 ounces per square inch or about 4 kPa) and rhythmic circular movements to stimulate lymph flow [19, 20].

Aims and Objectives
To compare the "efficacy of pneumatic compression therapy (PCT), lymphatic drainage exercises and control group in patient with upper limb lymph edema."

Hypothesis
Null Hypothesis
There is no significant difference between pneumatic compression therapy (PCT), lymphatic drainage exercises (LDE) and control group in patient with upper limb lymph edema.

Experimental Hypothesis
There is a significant difference between pneumatic compression therapy (PCT), lymphatic drainage exercises (LDE) and control group in patient with upper limb lymph edema.

Operational Definitions
Lymphoedema
Lymphoedema has been defined as one of the most significant survivorship issues after the surgical treatment of breast cancer, and in this population has been documented to have significant physical, functional, economic consequences, and impairment of quality of life. (1)

Pneumatic compression therapy (PCT)
Intermittent pneumatic compression is a therapeutic technique used in medical devices that include an air pump and inflatable auxiliary sleeves, gloves or boots in a system designed to improve venous circulation in the limbs of patients who suffer edema or the risk of deep vein thrombosis (DVT) or pulmonary embolism (PE). When activated, the pump fills the air chambers of the jacket in order to pressurize the tissues in the limb, thereby forcing fluids, such as blood and lymph, out of the pressurized area. A short time later, the pressure is reduced, allowing increased blood flow back into the limb. (1)

Manual lymphatic drainage (MLD)
Manual lymphatic drainage is not the same as massage; it consists of intermittent, gentle pressure applied directly on the skin to stretch the very small initial lymphatics, increasing lymphatic vessel contraction, and lymph drainage of the affected field. It has four essential hand strokes which must be circular or spiral in character and with a slow frequency. The central fields are treated first, and then the drainage continues peripherally. A session of MLD begins centrally at the neck and the trunk to clear out the main lymphatic pathways. MLD takes 45 – 60 minutes and is applied in a descending manner to facilitate the flow of lymph from affected areas to those that are not affected. It has been shown to stimulate lympholymphatic and lymphovenous anastomoses [5, 17, 18].

Lymphatic Drainage Exercises
Lymphatic drainage exercises, often referred to as pumping exercises, move fluids through lymphatic channels. Active, repetitive ROM exercises are performed throughout each session. The exercises follow a specific sequence to move away from congested areas. It is similar to the sequence of massage applied during manual lymph drainage [5].

Measure Tape
A flexible, non-stretch, woven fabric tape measure was used to measure arm circumferences. It consists of a ribbon of cloth, plastic, fiber glass, or metal strip with linear-measurement marking. It is a common measuring tool. To assure consistent tension over soft tissue, muscle, and bony prominences registered nurses with previous training and extensive experience in circumferential arm measurement techniques completed the measurements the tape measure was calibrated in meter and inch (150 meter/60 inches) [6].

Pitting Edema
Observable swelling of body tissues due to fluid accumulation that may be demonstrated by applying pressure to the swollen area (such as by depressing the skin with a finger). If the pressing causes an indentation that persists for some time after the release of the pressure, the edema is referred to as pitting edema.

Degrees of pitting edema
- +1 pitting edema = trace = barely perceptible depression
- +2 pitting edema = mild = 0.6 cm depression with rebound in less than 15 seconds
- +3 pitting edema = moderate = 0.6 to 1.3 cm depression with rebound in 15 to 30 seconds
- +4 pitting edema = severe = 1.3 to 2.5 cm depression with rebound of greater than 30 seconds [21].

Review of Literature
Anatomy of Lymphatic System
The lymphatic system is a one-way transport system composed of lymphatic vessels and lymphoid organs. The lymphatic vessels carry fluid and plasma proteins that have leaked into the interstitial from tissues back to the cardiovascular system, while the lymphoid organs including the bone-marrow, thymus, lymph nodes, spleen and tonsils each function to produce, maintain and distribute lymphocytes. Thus, essential functions of the lymphatic system include assisting in the regulation of tissue volume and pressure, and aiding immune system function [7].

Components of Lymphatic System
The lymphatic system comprises: (1) lymph vessels; (2) central lymphoid tissues; (3) peripheral lymphoid organs and circulating lymphocytes. (Fig. 2.1)

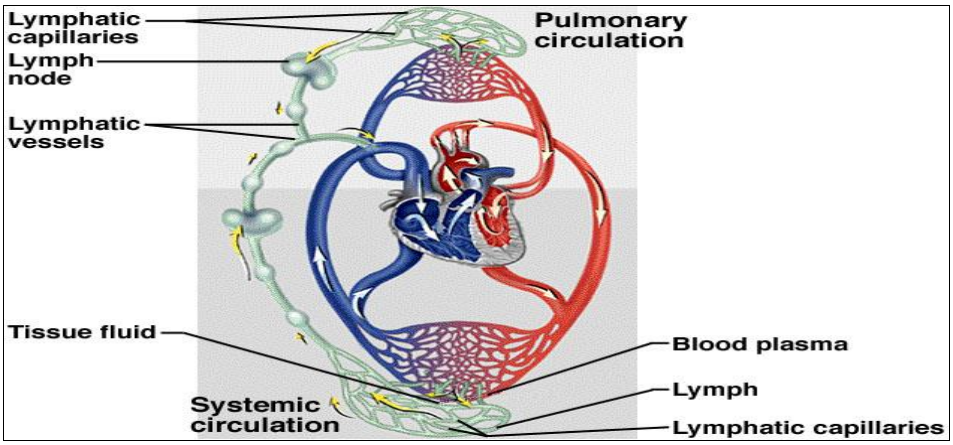


Fig 2.1: Lymphatic System

Physiology of Lymphatic System

The lymphatic system represents an accessory route through which fluid can flow from the interstitial spaces into the blood. Most important, the lymphatics can carry proteins and large particulate matter away from the tissue spaces, neither of which can be removed by absorption directly into the blood capillaries. This return of proteins to the blood from the interstitial spaces is an essential function without which we would die within about 24 hours.

Lymphatic system is a closed system of lymph channels or lymph vessels, through which lymph flows. It has a one- way system and allows the lymph flow from tissue spaces towards the blood.

Functions of Lymph Nodes

Lymph nodes serve as filters which filter bacteria and toxic substances from the lymph.

Functions of the lymph nodes are:

1. when lymph passes through the lymph nodes, it is filtered that is the water and electrolytes are removed. But the proteins and lipids are retained in the lymph.
2. Bacteria and other toxic substances are destroyed by macrophages of lymph nodes. Because of this, lymph nodes are called defense barriers [10].

Functions of Lymph

1. Important function of lymph is to return the proteins from tissue spaces into blood.
2. It is responsible for redistribution of fluid in the body.
3. Bacteria, toxins and other foreign bodies are removed from tissue via lymph.
4. Lymph flow is responsible for the maintenance of structural and functional integrity of tissue. Obstruction to lymph flow affects various tissues, particularly myocardium, nephrons, and hepatic cells.
5. Lymph flow serves as an important route for intestinal fat absorption. This is why lymph appears milky after a fatty meal.
6. It plays an important role in immunity by transport of lymphocytes [10].

Freire de Oliveira MM, *et al*. 2017 A study "Manual lymphatic drainage and active exercise effects on lymphatic function do not translate into morbidities in women who underwent breast cancer surgery. [11]

Zhang L, *et al*. 2016 A studies on "Combining Manual Lymph Drainage with Physical Exercise after modified radical mastectomy effectively prevents upper limb lymphedema [16].

Amanda L. Moseley, *et al*. 2008A study on "Exercises for limb lymphoedema" found exercise is of some benefit to those with this condition as it is likely to result in sustained limb volume reductions, changes in truncal fluid, subjective limb improvements and make a positive impact on quality of life and general health [12].

Credeur Dp1, Vana LM1, Stoner L2, Dolbow Dr1, *et al* l, 2017.

Effects of Intermittent Pneumatic Compression on Leg Vascular Function in People with Spinal Cord Injury. The purpose of this pilot study was to determine whether 60 mins of intermittent pneumatic compression therapy (IPC) could acutely increase leg blood flow-induced shear stress and enhance vascular endothelial function in persons with spinal cord injury (SCI).

Methodology

Sample

It is an experimental study design. A convenience sample of 45 subjects with lymphoedema was solicited from the OPD physiotherapy department surgery ward of Shri Guru Ram Rai Institute of medical & Health Sciences / Shri Mahant Indiresh Hospital Patel Nagar Dehradun. 15 subjects each in three groups were selected according to inclusion and exclusion criteria. Inclusion criteria Inclusion Criteria- Patient with lymph edema, Age Group - 25-50 years. and Weight -50to 80 kg. Exclusion Criteria- Subjects with a history of severe trauma such as fracture, Congenital disorder, Patient with neurological deficit, Spondylolysthesis, Pott's spine, Rheumatoid Arthritis Disorder, Ankylosing Spondylosis. Vertebro-Basilar Insufficiency, Cardiac Problem. Instrumentation for Data Collection-Measure tape and Pitting Edema:

Procedure

The 45 subjects were randomly taken and assigned into group A, B and C. Prior to participation all subjects were informed about the study and an informed consent was taken.

Group A patients given Pneumatic Compression Therapy (PCT) and Manual Lymphatic Drainage (MLD). Group B given Lymphatic Drainage Exercises (LDE) and Manual lymphatic drainage (MLD) and Group C given Manual lymphatic drainage (MLD) for upper limb lymph edema. All three groups were treated for four weeks.

Lymphatic drainage exercises for upper extremities

The selection and sequences of exercises described in this section are designed to assist in the drainage of upper limb lymphedema.

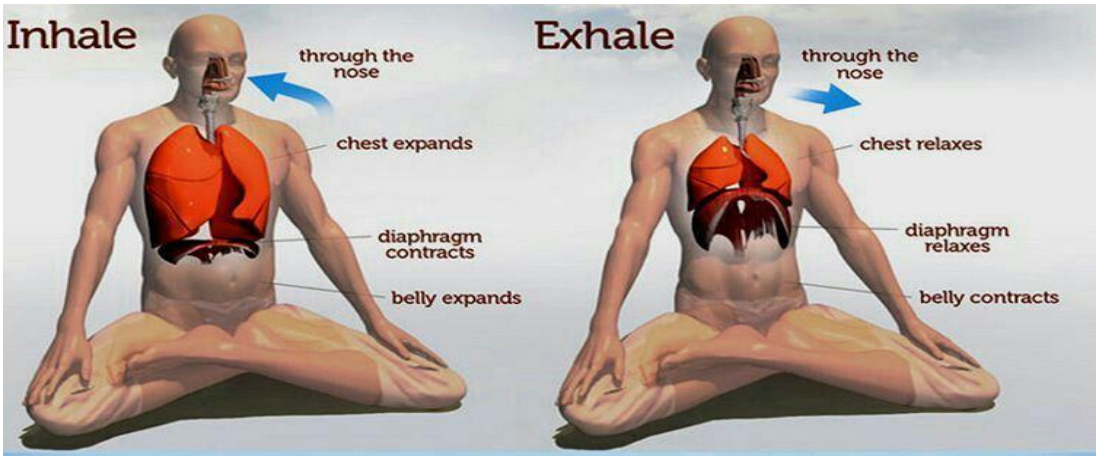
Upper extremity exercises

We have started following exercise before upper limb lymphatic drainage exercises. All these exercise given 15 repetitions for two sets.

- Deep breathing and total body relaxation exercises
- Cervical ROM
- Bilateral scapular movements

Exercises common to upper extremity sequences

"Deep breathing involves slow and deep inhalation through the nose, usually to a count of 10, followed by slow and complete exhalation for a similar count. The process may be repeated 5 to 10 times.



- Total body relaxation has the patient assume a comfortable supine position and begin deep breathing. Then, isometrically then contract and relax the muscles of the upper back, shoulders, upper arms, forearms, wrist, and fingers.
- These initial exercises should be included in programs for unilateral or bilateral upper extremity lymphedema. They are designed to help the patient relax and then to clear the central channels and nodes.
- Cervical ROM.(Fig. 8.3 A and B)

Perform each motion for a count of 5 for five repetitions.

- Rotation
- Lateral flexion
  - Scapular exercises

Perform exercise for a count of 5 for five repetitions.

- Active elevation and depression (shoulder shrugs) (Fig.8.4)
- Active shoulder rolls
- Active scapular retraction and protraction. With arms at sides and elbows flexed, bilaterally retract the scapulae, pointing elbows posteriorly and medially. Then protract the scapulae.

Note: Be sure to shrug the shoulders as high as possible and then actively pull down the shoulders (depress the scapulae) as far as possible

(A). (B).

Fig 8.3: Cervical ROM: A. Rotation; B. Side flexion

Problem	Inflation/Deflat in time in seconds (ratio)	Inflation pressure (mm Hg)	Treatment time (Hour)
Lymph Edema	80-100/25-35 (3:1)	30-60 Upper Limb	2 Hours
Residual limb Reduction	40-60/10-15 (4:1)	30-60 Upper Limb	2 Hours

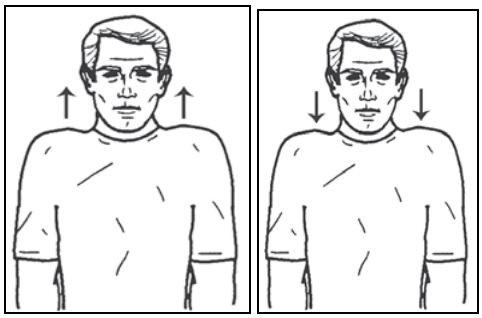


Fig 8.4: Shoulder shrug

Intermittent pneumatic compression therapy (IPCT)
Recommended parameters for the application of Intermittent Pneumatic Compression Therapy (IPCT)

Total treatment time
Total treatment time recommended vary 2 hours per treatment, with treatment frequency should be 6 times per week is recommended. The frequency and duration of treatment should be the minimum necessary to maintain good edema control or satisfactory progress towards the goals of treatment. (48)

Lymphatic drainage exercises for upper extremities
1. Active circumduction with the involved arm elevated while lying supine
2. Bilateral active movements of the arms while lying supine or on a foam roll
3. Bilateral hand press while lying supine or sitting
4. Shoulder stretches (with wand, doorway, or towel) while standing
5. Active elbow, forearm, wrist, and finger exercises of the involved arm
6. Bilateral horizontal abduction and adduction of the shoulders
7. Rest with involved upper extremity elevated
8. Overhead wall press while standing
9. Finger exercises
10. Partial curl-ups

1. Active circumduction with the involved arm elevated while lying supine.
1. Active circumduction of the arm (Fig. 8.5)
While lying supine, flex the involved arm to 90 degree (reach toward the ceiling) and perform active circular movements of the arm about 6 to 12 inches in diameter.
Do this clockwise and counterclockwise, five repetitions in each direction.

Precaution: Avoid pendular motions or circumduction of the edematous upper extremity with the arm in a dependent position.

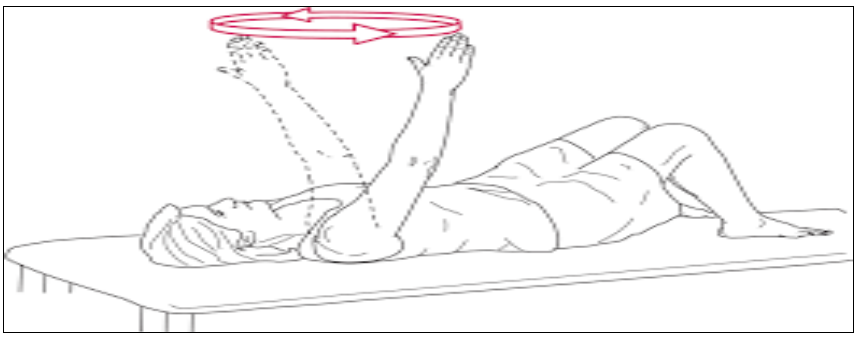


Fig 8.5: Active circumduction of arm

2. Bilateral active movements of the arms while lying supine or on a foam roll:
While lying supine on a firm foam roll (approximately 6 inches in diameter), perform horizontal abduction and adduction as well as flexion and extension of the shoulder.
These movements target congested axillary nodes and are done unilaterally.
For home exercises, if special equipment such as an Ethyfoam® roller is not available, have the patient perform these exercises on a foam pool "noodle." Although the diameter is smaller, a towel or folded sheet can be wrapped around the foam "noodle" to increase the diameter of the roll.

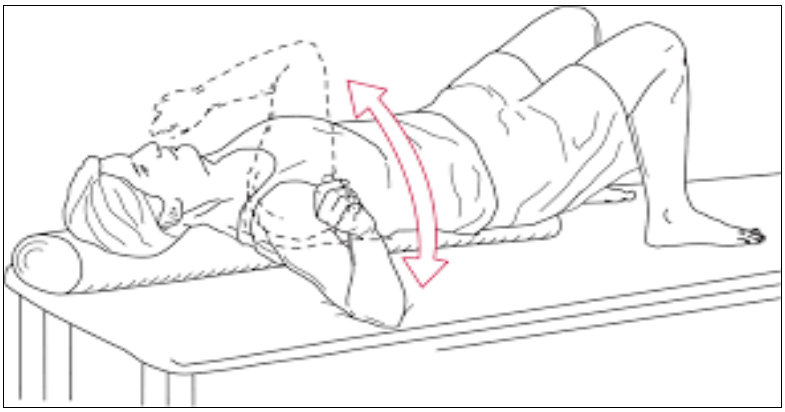


Fig 8.6: exercise on a forearm roll

3. Bilateral hand press. (Fig.8.7)
With arms elevated to shoulder level or higher and the elbows flexed, place the palms of the hands together in front of the chest or head.
Press the palms together (for an isometric contraction of the pectoralis major muscles) while breathing in for a count of 5. Relax and then repeat up to five times

Fig 8.7: Bilateral hand press.

4. Shoulder stretches (with wand, doorway, or towel) while standing

Wand exercise, doorway or corner stretch, and towel stretch. Incorporate several exercises to increase shoulder mobility and to decrease congestion and assist lymph flow in the upper extremity. Hold the position of stretch for several seconds with each repetition.

Wand exercise (Fig.8.8)

Active assisted range of motion using wand, cane, or T- bar in the supine position to provide stabilization and control of the scapula. Motions typically performed are flexion, abduction, elevation, in the plane of the scapula, internal or external rotation [33].

Fig 8.8: Wand exercises in supine lying

5. Active elbow, forearm, wrist, and finger exercises of the involved arm

Unilateral arm exercises with the arm elevated:

The following exercises are done with the patient seated and the arm supported at shoulder level on a tabletop or countertop or with the patient supine and the arm supported on a wedge or elevated overhead.

- Shoulder rotation with the elbow extended. Turn the palm up, then down, by rotating the shoulder, not simply pronating and supinating the forearm. (Fig.8.9)
- Elbow flexion and extension.
- Circumduction of the wrist.

• Hand opening and closing.

6. Bilateral, horizontal abduction and adduction.

While standing or sitting, place both hands behind the head. Horizontally adduct and abduct the shoulders by bringing the elbows together and then pointing them laterally.

Fig 8.9: Shoulder rotation with elbow extended

A) Overhead wall press. (Fig. 8.10 A and B)
Face a wall; place one or both palms on the wall with the hands above shoulder level. Gently press the palms into the wall for several seconds without moving the body. Relax and repeat approximately five times

Fig 8.10: (A and B): Overhead wall press

9. Wrist and finger exercises.
If swelling is present in the wrist and hand, repetitive active finger movements are indicated with the arm elevated.

10. After performing the overhead wall press as just described, keep the heel of the hand on the wall and alternatively move all of the fingers away from and back to the wall (Fig: 8.4)
11. In the same position as just described, alternately press individual fingers into the wall, as if playing a piano, while keeping the heel of the hand in contact with the wall.

- Place the palms of both hands together with the hands overhead or at least above shoulder level. One finger at a time, press matching fingers together and then pull them away from each other.

10. Partial curl-ups.
To complete the exercise sequence, perform additional curl-ups (about five repetitions) with hands sliding on the thighs.
10. Rest
Rest in a supine position with the involved arm elevated on pillows for about 30 minutes after completing the exercise sequence.

Fig 4.1: Secondary lymphoedema related to comprehensive management of breast cancer

Partial curl-ups (Fig.8.2)
To start, lie on your back with your knees bent and feet flat on the floor. Don't press your neck or lower back to the floor. Breathe deeply. You should feel comfortable and relaxed in this position:

- Cross your arms loosely.

- Tighten your abdomen and curl halfway up, keeping your head in line with your shoulders.
- Hold for 5 seconds. Uncurl to lie down [31].

Fig 8.2: Partial curl- ups

Chapter 7
Guidelines to The Patient
Guidelines for Lymphatic Drainage Exercises

The patient should follow these guidelines when performing a sequence of lymphatic drainage exercises. These guidelines apply to management of upper or lower extremity lymphedema and reflect the combined opinions of several authors and experts in the field.

Preparation for Lymphatic Drainage exercises

- Set aside approximately 20 to 30 minutes for each exercise session.
- Perform exercises twice daily every day.
- Have needed equipment at hand, such as a foam roll, wedge, or exercise wand. During Lymphatic Drainage Exercises
- Wear compression bandages or a customized compression garment.
- Precede lymphatic drainage exercises with total body relaxation activities. Follow a specified order of exercises.
- Perform active, repetitive movements slowly, about 1 to 2 seconds per repetition.
- Elevate the involved limb above the heart during distal pumping exercises.
- Combine deep breathing exercises with active movements of the head, neck, trunk, and limbs. Initially, perform a low number of repetitions.
- Increase repetitions gradually to avoid excessive fatigue.
- Do not exercise to the point where the edematous limb aches.
- Incorporate self-massage into the exercise sequence to further enhance lymph drainage.
- Maintain good posture during exercises.

11. When strengthening exercises are added to the lymph drainage sequence, use light resistance and avoid excessive muscle fatigue.

After Lymphatic Drainage Exercises

- If possible, rest with the involved extremity elevated for 30 minutes.
- Set aside time several times per week for low-intensity aerobic exercise activities, such as walking or bicycling for 30 minutes
- Carefully check for signs of redness or increased swelling in the edematous limb, either of which could indicate that the level of exercise was excessive [28]

Chapter -4
Data Analysis

Data was analyzed using SPSS software 12.0 version. Variable i.e. age weight and height of group A, B and C were analyzed by using one way ANOVA. One way ANOVA was used to analyze the variable i.e measure tape at 0,1,2,3 and 4 week. Post hoc analysis using Tukey HSD was used for pair wise compression of measure tape at 0,1,2,3 and 4 weeks. The significant level of this study was 0.05.

Chapter -5
Results

The age, weight and height of subjects in groups A, B and C were compared by using analysis of variance. There was no significant difference found in age, weight and height in all 3 groups ($P>0.05$) (Table 5.1)

Comparison of measure tape between groups was done by using ANOVA. No significant difference was found from 0 to 1 week ($P>0.05$). But significant difference found at 2 to 4 weeks in all 3 groups. ($P<0.05$) (Table 5.2)

Comparison of pitting edema between groups was done by using ANOVA. There was no significant difference found at 0 and 1 weeks ($P<0.05$). But significant difference was found at 2 to 4 weeks in all 3 groups. ($P<0.05$) (Table 5.2)

Comparison of measure tape between the 3 groups i. e. groups A,B and C was done by Post Hoc test using Tukey HSD at 0 to 1st week. There was insignificant difference between the groups. Also there was no significant difference was found at 2 and 4 weeks between A & B and B & C ($P>0.05$) but significant difference was found between A & C at 2 to 4 weeks ($P<0.05$) (Table 5.3)

Comparison of pitting edema between the 3 groups i.e groups A, B and C was done by using Post Hoc test (Tukey HSD) at 0 to 1 week. No significant difference was found between the groups ($P>0.05$). Also no significant difference was found at 2 to 4 week between A & B and B & C.($P>0.05$) But significant difference was found between A & c at 2 to 4 weeks.($P<0.05$) (Table 5.4).

Table 5.1: Demographic data

Variable	f- value	p-value
Age	1.776	0.491
Weight	1.165	0.322
Height	2.687	0.080

Table 5.2: Comparison of Measure Tape and Pitting Edema between groups 0 to 4 weeks.

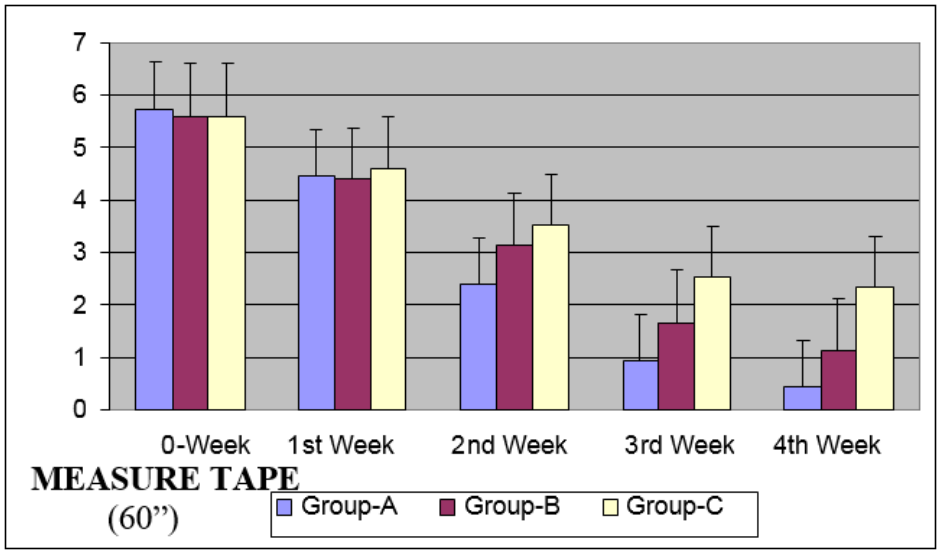
Variable	Week	f- value	p-value
Measure Tape	0	0.024	0.976
	1	0.160	0.853
	2	5.615	0.007
	3	10.635	0.000
	4	12.860	0.000
Pitting Edema	0	0.209	0.812
	1	0.929	0.403
	2	9.086	0.001
	3	13.899	0.000
	4	12.293	0.000

Table 5.3: post Hoc Tests for measure tape between groups A, B and C from 0 to 4 weeks.

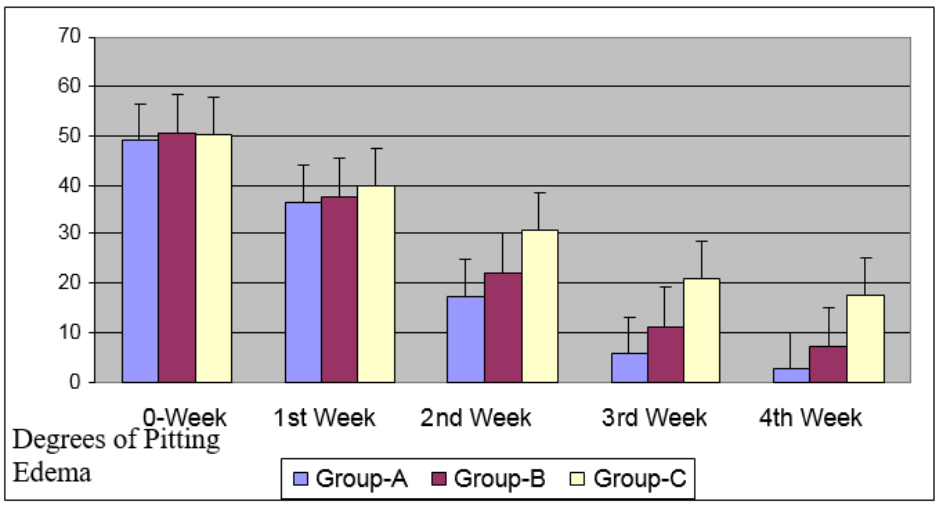
Variable	Group (i)	Group (j)	Mean Difference (i-j)	Std. Error	Signification (p-value)
Measure Tape 0 Week	1	2	0.06667	0.34975	0.980
	1	3	0.06667	0.34975	0.980
	2	3	-0.06667	0.34975	0.980
Measure Tape 1 Week	1	2	0.06667	0.36048	0.981
	1	3	-0.13333	0.36048	0.927
	2	3	-0.06667	0.36048	0.981
Measure Tape 2 Week	1	2	-0.73333	0.34303	0.094
	1	3	-01.13333	0.34303	0.005
	2	3	0.73333	0.34303	0.094
Measure Tape 3 Week	1	2	-0.73333	0.34733	0.100
	1	3	-1.60000	0.34733	0.000
	2	3	0.73333	0.34733	0.100
Measure Tape 4 Week	1	2	-0.73333	0.38490	0.150
	1	3	-1.93333	0.38490	0.000
	2	3	0.73333	0.38490	0.15

Table 5.4: Post Hoc Tests for Pitting Edema between groups A, B and C from 0 to 4 weeks.

Variable	Group (i)	Group (j)	Mean Difference (i-j)	Std. Error	Signification (p-value)
Pitting Edema 0 week	1	2	-1.73333	2.80461	0.811
	1	3	-1.33333	2.80461	0.883
	2	3	1.73333	2.80461	0.811
Pitting Edema 1 week	1	2	-0.86667	2.59197	0.940
	1	3	-3.40000	2.59197	0.379
	2	3	0.86667	2.59197	0.940
Pitting Edema 2 week	1	2	-4.66667	3.14052	0.308
	1	3	-13.20000	3.14052	0.000
	2	3	4.66667	3.14052	0.308
Pitting Edema 3 week	1	2	-5.66667	2.94104	0.144
	1	3	-15.33333	2.94104	0.000
	2	3	5.66667	2.94104	0.144
Pitting Edema 4 week	1	2	-4.73333	3.12254	0.294
	1	3	-15.13333	3.12254	0.000
	2	3	4.73333	3.12254	0.294



6.1 Mean and standard deviation of Measure Tape between groups A, B and C



6.2 Mean and standard deviation of Pitting Edema between groups A, B and C

Discussion

The Pneumatic Compression Therapy (PCT) and Lymphatic Drainage Exercises (LDE) was more effective than Manual lymphatic drainage (MLD) exercises with a more rapid improvement in lymph edema during third and fourth week.

The purpose of this study was to find-out whether any clinically observable improvement in upper limb lymph edema occurs after performance of Pneumatic Compression Therapy and Manual lymphatic drainage (MLD) in comparison to Manual lymphatic drainage (MLD) and Previous studies found that self MLD in combination with physical exercises is beneficial for breast cancer patients in

preventing post mastectomy scar formation, upper limb lymphedema and shoulder joint dysfunction [9].

Few studies indicated that CDT program is effective in reducing lymphoedema volume and pain in women with moderate post breast surgery lymphedema [8].

Some studies shows that both resistance and upper body exercises have not been shown to lead to significant changes in arm volume; however further research is needed using lymphoscintigraphy to better understand the effect of short and long term exercises on lymphatic function [12].

In present study we have discussed about significant reduction of upper extremity lymph edema ($P>0.05$). The group A (Pneumatic Compression Therapy and Lymphatic Drainage Exercises) showed more improvement than group B (Manual lymphatic drainage (MLD) and lymphatic drainage exercises).

Conclusion

The present study concluded that group A (Pneumatic Compression Therapy and Lymphatic Drainage Exercises) showed significant improvement as Group B (Manual lymphatic drainage (MLD) and control group (lymphatic drainage exercises) for upper limb in lymphoedema.

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