SHORT REPORT

Effects of complex decongestive physical therapy on upper limb circumference and sensory function in post-mastectomy lymph oedema, A quasi-experimental study

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Abstract

The quasi-experimental study was conducted at the Allied Hospital, Faisalabad to investigate the effect of complex decongestive physical therapy on sensory testing in post-mastectomy-related lymphoedema patients. The sample comprised 18 participants enrolled using convenience sampling technique. All the participants received complex decongestive physical therapy during 5 sessions per week for 3 weeks. The intervention comprised manual lymphatic drainage, multi-layered compression bandages, skin care and patient-oriented exercises for breast cancer-related lymphoedema. Upper limb circumference of the subjects was measured, while two-point discrimination test, pressure pain threshold test and tactile localisation test were also conducted. Complex decongestive physical therapy showed a significant difference in pre- and post-intervention values ($p<0.05$). Complex decongestive physical therapy was found to be effective in improving sensory perceptions, like discrimination, tactile and pain pressure threshold, as well as oedema.

Key Words: Compression bandages, Mastectomy, Quality of life, Range of motion, Breast cancer lymphoedema.

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Introduction

Lymphoedema (LE) is a distressing breast cancer complication that can have a catastrophic impact on a patient's quality of life (QOL). Most cases of breast cancer-related lymphoedema (BCRL) are mild, although LE is a progressive immedicable disorder.[1,2] Over 20 million women globally suffer from upper limb lymphoedema (LE), a persistent and disabling illness that affects about 30% of women undergoing BC treatment.[2,3] In most cases, conservative therapy is sufficient to minimise LE, but patients often require social and psychological support.[4] Aside from arm swelling, BCRL can cause altered sensory function, pain and changes in body perception.[5-7] BC patients frequently experience LE after mastectomy which leads to chronic disability, inadequate functional recovery, and diminished QOL. Psychological anguish, such as depression and anxiety, physical activity and substantial role impairment, and QOL disturbances may affect women with upper limb oedema due to BC treatment.[2]

Post-operative complications, like haematoma, seroma, infection, an axillary band (axillary web syndrome) and LE, can occur through aggressive treatment. Other symptoms include pain, tightness, fatigue, heaviness, tingling, weakness and a restricted range of motion (ROM)[8] Conservative therapy is usually effective in reducing limb swelling caused by LE, but it should be given to the patient concurrently with psychosocial care for the duration of their life. A reduction in the volume of an extremity may be the outcome of all conservative therapies, with more extensive treatments producing greater improvement.[4] Complete decongestive therapy (CDT) is a multimodal therapeutic approach used to treat LE, maintain the health of the skin and supporting structures, and enhance the patient's QOL.[5]

Although there are several treatment options for this crippling and distressing condition, CDT is the gold standard for treating LE, but there is a lack of evidence to prove the impact of CDT on sensory management.[2,4] CDT is an option regarded as the foundation of LE treatment. It comprises four parts; manual lymphatic drainage (MLD), compression bandaging, exercises, and skin care.[2,7]

MLD is a unique massage skill that uses gentle hand motions to pump the skin. The massage is very light, rhythmic and stimulating; the movements follow the lymph flow and have an immediate effect.[9] MLD is a safe procedure that may complement compression bandaging regarding swelling reduction. Adding MLD to an intensive course of treatment with compression bandaging may benefit those with mild to moderate BCRL more than those with moderate to severe BCRL. The

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oedematous areas should be clean, dry and moisturised using an appropriate bland emollient.[7,10] Post-surgical pain, sensory disturbances, musculoskeletal pain, and LE are major clinical issues that arise following BC treatment, and LE is primarily to blame for these issues.

Although there are several studies on the psychological, functional and physical issues that women with BCRL face, the effects of LE on sensory parameters have not been deeply investigated.[2] The current study was planned to investigate the effect of CDT on sensory testing in post-mastectomy-related LE patients.

Methods and Results

The quasi-experimental study was conducted from February 20 to December 12, 2022 in breast cancer unit of Allied hospital Faisalabad. The sample size was calculated using Epitool software with 10% attrition rate.[11] The sample was raised using convenience sampling technique. Those included were patients aged ≥18 years having unilateral breast involvement, post-mastectomy-related LE stages I and II, upper limb circumference 2cm or more, with intense pressure pitting oedema that was not reduced with elevation.[1] Participants with diabetes-related neuropathy, current BC recurrence, cardiac oedema, active infection, bilateral breast involvement and pre-existing neuromusculoskeletal condition were excluded.

After taking written informed consent, the patients were subjected to initial evaluation. Subsequently, they received phase I CDT. The circumference measurement and sensory test readings were taken before and after the intervention. Sensory tests included 2-point discrimination, tactile localisation and pain pressure threshold (PPT) tests, and both affected and unaffected limbs were evaluated. The participants were seated comfortably with their elbows and forearms extended and supinated on the table. The participants rotated their heads away from the non-examining arm, while their eyes were closed. The upper limb circumference was measured using flexible tape at the ulnar styloid level until the axilla at each 5cm segment. All the measurements were taken horizontally by applying some pressure.[2]

A 2-point discrimination test involved regions 10cm distant to the midpoint of the lateral and medial epicondyles on the forearm, and the gap between the tips of the 2-point discriminator was set at 5mm. Both tips were tapped with care, and equal and simultaneous pressure was applied with a break of 2sec between each application. The outcome was considered correct when 7 out of 10 responses were correct. In case of wrong answers, the distance was expanded by 5mm till the correct answers were received.[2] PPT was measured using the sphygmomanometer cuff pressure. A circular bottle cap with smooth edges and 2mm height on the arm's medial side was used and the sphygmomanometer cuff was wrapped around the arm. The manometer cuff was inflated until the participant perceived pain at the arm's medial side at the cap placement site.[12] The arithmetic mean of the three replicating measurements was the PPT value.[2] Tactile localisation was administered in the forearm 10-12cm distal to the midpoint of the lateral and medial humeral epicondyles using a pen and scale. The participants' eyes were closed during the process, and the pen was placed on the body's volar region. The participants opened their eyes and showed the point connected with the skin. The gap between the point touched by the therapist with a pen and the point identified by the subject with a scale was noted.[2] The test was conducted thrice, and the arithmetic mean of the 3 measurements was noted.

All the participants received CDT for 40-50min sessions 5 times a week for 3 weeks. The intervention comprised MLD, multi-layered compression bandages, skin care, and patient-oriented exercises for BCRL. MLD was performed using the Vodder method, and compression bandaging was used. Exercises included upper limb ROM, pectoralis muscle and trapezius muscle stretching, active mobilisation of joints of the upper limb, and abdominal breathing exercises. Each exercise comprised 3 sets of 10 repetitions. All exercises were performed under the supervision of a therapist.[1,2] The elastic/compression garment/bandages were removed on the last CTD session. Before the sensory evaluation post-treatment, the participants were instructed to wash their arms, rest for 30min and lie down to minimise the effect of compression bandages on sensory perception.[1]

Data was analysed using SPSS 25. Shaphiro-Wilk test was used to check data normality. The differences between baseline and post-treatment readings were calculated using a paired sample t-test for parametric data. $P<0.05$ was considered statistically significant.

The mean age of the 18 female subjects was 51.72±10.53

Table-1: Demographic characteristics.

	N	Minimum	Maximum	Mean±SD
Age in years	18	31	65	51.72±10.53
Weight (kg)	18	55	90	74.2±10.64
Height (meter)	18	1.42	1.80	1.59±0.10
BMI (kg/m^2)	18	23.66	34.72	29.32±3.5

SD: Standard deviation, LVT: Left ventricle thickness, RVT: Right ventricle thickness.

Table-2: Baseline and post-intervention comparison of outcome measures on the affected and non-affected sides.

		Pre-values	Post-values	Mean Difference	P-value	Cohen's d
Circumference (cm)	Affected	33.88±4.65	29.33±3.83	4.55	0.00	5.54
	Non-Affected	28.05±3.71	27.22±3.75	0.33	0.010	8.25
Two-point discrimination (mm)	Affected	18.94±10.25	12.11±8.16	6.83	0.001	3.26
	Non-Affected	9.72±5.72	8.05±3.55	1.66	0.012	0.51
Pain Pressure Threshold (mmHg)	Affected	248.38±24.18	235.00±25.27	13.38	0.001	12.27
	Non-Affected	231.82±30.04	218.22±31.18	13.60	0.123	11.92
Tactile Location (cm)	Affected	5.68±2.52	4.25±2.42	1.42	0.000	14.2
	Non-Affected	3.43±0.40	2.90±0.35	0.52	0.007	10.4

years (Table 1). Baseline and post-intervention values of all outcome measures of affected and non-affected upper limbs showed significant differences ($p<0.05$) (Table 2).

Conclusion

Post-mastectomy-related LE reduced sensory perceptions of discrimination, PPT and tactile localisation. The patients were treated with CDT to reduce oedema and facilitate their sensory perceptions. CDT significantly improved sensory perceptions and oedema.

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Authors' Contribution:
MN: Data collection and final approval.
MSB, RN: Concept, design and final approval.
MI: Data analysis, interpretation, writing and final approval.