DOI Number: 10.37506/ijfmt.v14i4.11456

Effectiveness of Faradism Under Pressure Versus Complex Decongestive Therapy in Subjects with Peripheral Oedema

Chelcy S Jaju[1], Mandar Malawade[2]

[1]Intern, Faculty of Physiotherapy, [2]Department of Paediatrics, Krishna Institute of Medical Sciences "Deemed to be University" Karad, India

Abstract

Background: Oedema is defined as excessive accumulation of free fluid in interstitial tissue spaces and serous cavities. The oedema may be of 2 main types: Localized when a particular organ or limb is involved e.g. lymphatic oedema, inflammatory oedema, allergic oedema and generalized when it is systemic in distribution, particularly seen in the subcutaneous tissues. The gold standard therapy for lymphedema is complex decongestive therapy (CDT). The first stage of CDT includes manual lymphatic drainage (MLD), compression therapy, exercise, and good skin care. The second phase, consisting of self-managing lymphatic massage, daily use of compression garments, and self-directed continuation of the exercises, should be implemented only after the completion of the first phase. Also, Faradism under pressure (FUP) is beneficial in oedematous conditions. In FUP, the pumping action of the alternate muscle contraction and relaxation, brings about increased venous and lymphatic return. The fluid is propelled towards the heart by an inward pressure on the tissue spaces and veins caused by the contraction of the muscle.

Objectives: The objectives of the study were as follows: To determine effect of faradism under pressure in peripheral oedema. To determine effect of complex decongestive therapy. To compare the effect of faradism under pressure and complex decongestive therapy in peripheral oedematous conditions.

Methods: Ethical clearance was obtained from the institutional ethical committee. A total of 20 subjects were assessed and all were included in the study based on inclusion criteria. Oedema was diagnosed using volumetric and girth assessment. **Results**: Intra-group statistical analysis of intervention group, pre-post volumetric measurement score was 33.6 ±9.192 and was found to be extremely significant and pre-post girth assessment score was 2.540 ± 0.9513 which was extremely significant. **Conclusion**: We found that both FUP and CDT were significantly effective in reducing peripheral oedema but CDT was more effective compared to FUP. This treatment was effective by reducing the volumetric and girth measurements which improved quality of life of patients.

Keywords: *Oedema, Faradism under pressure, Complex decongestive therapy*

Introduction

Oedema is defined as excessive accumulation of free fluid in interstitial tissue spaces and serous cavities. When oedema is in the subcutaneous tissues, momentary pressure of finger produces depression which indicates pitting oedema. The other type is non-pitting oedema in which no pitting is produced on pressure e.g. in myxoedema, elephantiasis. The oedema may be of 2 main types: Localized when a particular organ or limb is involved e.g. lymphatic oedema, inflammatory oedema, allergic oedema and generalized when it is systemic in distribution, particularly seen in the subcutaneous tissues.[1,2] Chronic accumulation of oedema in both or single limb indicates venous insufficiency in case of

Corresponding Author:
Dr. Mandar Malawade
Associate Professor, Faculty of Physiotherapy,
Krishna Institute of Medical Sciences "Deemed to be University" Karad-415110, Maharashtra, India.
E- mail id: chelcyjaju@gmail.com

dependent oedema and hemosiderin deposition. Skin care is important to prevent skin breakdown and ulcers.[3] Pathogenesis of oedema is based on Starling's rule on capillary fluid dynamics. Starling's rule states that net filtration through capillary membrane is proportional to the hydrostatic pressure difference across the membrane minus the oncotic pressure difference. These pressures are called Starling's forces. These forces are maintained by enhanced sodium reabsorption from renal tubules.[4] Oedema is classified in 4 types depending upon mechanism causing edema : Increased capillary hydrostatic pressure, decreased plasma oncotic pressure, enhanced hydraulic permeability of capillary walls, lymphatic obstruction.[4,5] In increased capillary permeability, capillary endothelium is injured by capillary poisons such as toxins and their products, histamine, anoxia, venoms, certain drugs and chemicals and capillary permeability of plasma proteins is enhanced due to development of gaps in endothelial cells which leads to leakage of plasma proteins into interstitial fluid. So, it causes decrease in plasma oncotic pressure and increase in oncotic pressure of interstitial fluid which leads to formation of oedema.[5.6]

The gold standard therapy for lymphedema is CDT.[7] The quantity of physical pressure plays a vital role in CDT. Microcirculation takes place between blood vessels and tissue, as a function of pressure. In the context of the total lymphatic system, the lymphatic load is transported from the interstitial space to the blood stream through lymphatic vessels. The lymphatic vessel system, distinguished by particular anatomical conditions like initial lymphatic vessels, precollectors, collectors, and lymphatic strains, is the beneficial target of CDT.[8] The first stage of CDT includes MLD, compression therapy, exercise, and good skin care.[7,8] MLD is executed in an upward direction to support the lymphatic flow. It particularly involves the use of circular or spiral movements using small pressures directed towards the nearest groups of lymph nodes, proximal to the drainage area. It is important to start the drainage from the central part and then move to distal parts of the body. The MLD is carried out for 45–60 minutes. Compression therapy rises tissue pressure by encouraging external compressive pressure using bandaging or wearing compression garments. Multi-layer compression bandaging (MCB) uses bandages of alternating degree of compression, additional materials, and support materials, e.g. cotton-wool bandages. The second phase, consisting of self-managing lymphatic massage, daily use of compression garments, and self-directed continuation of the exercises, should be implemented only after the completion of the first phase.[7,9,10]

In FUP, the pumping action of the alternate muscle contraction and relaxation, brings about increased venous and lymphatic return. The fluid is propelled towards the heart by an inward pressure on the tissue spaces and veins caused by the contraction of the muscle.[11]

But there is no evidence regarding comparison of the effectiveness of faradism under pressure and complex decongestive therapy in subjects with peripheral oedema.

Materials and Methods

It is a conventional study which was carried out in Krishna hospital, Karad. The duration of the study was 6 months. A total of 20 subjects were included in the study and the sample size was calculated using formula. All the subjects were included in this study based on inclusion criteria. Inclusion criteria includes subjects with chronic oedema in feet, subjects with duration of oedema more than 6 weeks, age 25-50 years and both males and females are included in this study. Exclusion criteria includes subjects with acute oedema, active infection, peripheral artery disease and cardiac oedema. Subjects were assessed for oedema using volumetric and girth measurement.

Procedure

After getting ethical approval from institutional ethical committee, this study was carried out in Krishna hospital, Karad. Informed consent was taken from the subjects who fulfilled inclusion criteria. Subjects underwent oedema assessment which included volumetric and girth assessment. Assessment was carried out on both legs and their difference was noted.[12]

Group A was given CDT for 5 days/week for 3 weeks. Patients underwent CDT that included MLD, compression therapy with a short stretch bandage for 23 hours per day, MCB, exercises, and skin care. The CDT was performed for 1-hour a day. The MLD was performed in proximal to distal direction with light skin massage. 17 Nonelastic multilayer compression bandages were

applied and changed daily. All patients were educated on appropriate skin care, such as skin hygiene, applying moisturizer daily, and avoiding mechanical, thermal, and barotrauma. The patients also performed the exercise program, such as breathing exercise, flexibility exercises for helping facilitate lymphatic flow, gentle resistance exercises, isometric exercises.[7,8]

Group B was given faradism under pressure for 5days/week for 3 weeks. Pre and Post Volumetric and girth assessment tests were done and treatment scores were taken for statsitical analysis.

Statistical Analysis

- Within the groups, the data was analysed by **paired t** test.
- Between the groups, the data was analysed by **unpaired t** test.
- The p and t values were calculated.

Effectiveness of faradism under pressure versus complex decongestive therapy in subjects with peripheral oedema was analysed.

Results

Data Presentation

Table 1: Paired t-test between Pre and Post Volumetric Assessment of Group A and Group B

GROUP A								
Paired Samples Test								
Volumetric Assessment	**Paired Differences**					**T**	**Df**	**Sig. (2-tailed)**
	Mean	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**				
				Lower	**Upper**			
Pre volumetric – Post volumetric	33.600	9.192	2.907	27.025	40.175	11.560	9	<0.0001
GROUP B								
Paired Samples Test								
Volumetric Assessment	**Paired Differences**					**T**	**Df**	**Sig. (2-tailed)**
	Mean	**Std. Deviation**	**Std. Error Mean**	**95% Confidence Interval of the Difference**				
				Lower	**Upper**			
Pre - Post Volumetric	29.200	7.584	2.398	23.775	34.625	12.176	9	<0.0001

In Table No.1, the paired difference was calculated, the mean paired difference was 33.6 ±9.192 with standard error mean was 2.907 with 27.025 to 40.175 (95% CI), t-value was 11.56 and p< 0.0001. And there was statistical significance between Pre and Post Volumetric Assessment of Group A and the mean paired difference was 29.20 ± 7.584 with standard error mean was 2.398 with 23.775 to 34.625 (95% CI), t-value was 12.176 and p < 0.0001. And there was statistical significance between Pre and Post Volumetric Assessment of GroupB.

Table 2: Paired t-test between Pre and Post Girth Assessment of Group A and Group B

GROUP A								
Paired Samples Test								
	Paired Differences							
				95% Confidence Interval of the Difference				
Girth Assessment	**Mean**	**Std. Deviation**	**Std. Error Mean**	**Lower**	**Upper**	**T**	**Df**	**Sig. (2-tailed)**
Pre - Post Girth	2.540	0.9513	0.3008	1.860	3.220	8.444	9	<0.0001
GROUP B								
Paired Samples Test								
	Paired Differences							
				95% Confidence Interval of the Difference				
Girth Assessment	**Mean**	**Std. Deviation**	**Std. Error Mean**	**Lower**	**Upper**	**T**	**Df**	**Sig. (2-tailed)**
Pre - Post Girth	2.770	1.101	0.3480	1.983	3.557	7.959	9	<0.0001

In the above tables, the paired difference was calculated, the mean paired difference was 2.540 ± 0.9513 with standard error mean was 0.3008 with 1.860 to 3.220 (95% CI), t-value was 8.444 and p< 0.0001. And there was statistical significance between Pre and Post Girth Assessment of Group A and the mean paired difference was 2.770 ± 1.101with standard error mean was 0.3480 with 1.983 to 3.557 (95% CI), t-value was 7.959 and p < 0.0001. And there was statistical significance between Pre and Post Girth Assessment of Group B.

Table 3: Comparison between Pre-Volumetric Assessment of Group A and Group B

Volumetric Assessment	Mean	SD	P-value	Unpaired t-test Value	degree of freedom
Pre-Volumetric Assessment Group A	45.800	10.369	0.4232	0.8196	18
Pre-Volumetric Assessment Group B	42.7	5.964			

In the above table, mean pre volumetric assessment of Group A was 45.800, SD was 10.369 and mean pre volumetric assessment of Group B was 42.7, SD was 5.964. Unpaired t-test value was 0.8196 and P-value was 0.04232. Also, the Mean Difference was -3.1 with 95% CI -11.047-4.847. Hence on basis of p-value we can state there was no statistical significance between Pre volumetric assessment of Group A and Group B.

Table 4: Comparison between Pre-Girth Assessment of Group A and Group B

Girth Assessment	Mean	SD	P-value	Unpaired t-test Value	degree of freedom
Pre-Girth Assessment Group A	3.46	1.166	0.6281	0.4929	18
Pre- Girth Assessment Group B	3.2	1.193			

In above table, mean pre girth assessment of Group A was 3.46 and SD was 1.166 and mean pre girth assessment of Group B was 3.2 and SD was 1.193. Unpaired t-test value was 0.4929 and P-value was 0.6281. Also, the Mean Difference was -0.2600 with 95% CI -1.368-0.8482. Hence on basis of p-value we can state there was no statistical significance between Pre girth assessment of Group A and Group B.

Table 5: Comparison between Post Volumetric Assessment of Group A and Group B

Volumetric Assessment	Mean	SD	P -value	Unpaired t-test value	degree of freedom
Post Volumetric Assessment Group A	12.2	5.554	0.5339	0.6343	18
Post Volumetric Assessment Group B	13.5	3.342			

In above table, mean post volumetric assessment of Group A was 12.2, SD was 5.554 and mean post volumetric

assessment of Group B was 13.5, SD was 3.342. Unpaired t-test value was 0.6343 and P-value was 0.5339. Also, the Mean Difference was 1.300 with 95% CI -3.006-5.606. Hence on basis of p-value we can state there was no statistical significance between Post Volumetric assessment of Group A and Group B.

Table 6: Comparison between Post Girth Assessment of Group A and Group B.

Girth Assessment	Mean	SD	P -value	Unpaired t-test value	degree of freedom
Post Girth Assessment Group A	0.92	0.7376	0.0681	1.941	18
Post Girth Assessment Group B	0.43	0.3057			

In above table, mean post volumetric assessment of Group A was 0.92, SD was 0.7376 and mean post volumetric assessment of Group B was 0.43, SD was 0.3057. Unpaired t-test value was 1.941 and P-value was 0.0681. Also, the Mean Difference was -0.0681 with 95% CI -1.020-0.04043. Hence on basis of p-value we can state there was no statistical significance between Post Girth assessment of Group A and Group B.

Discussion

In this study effectiveness of faradism under pressure and complex decongestive therapy in peripheral oedema was compared and primary goal was to evaluate effect of complex decongestive therapy on peripheral oedematous conditions. We found significant effect of CDT and FUP on peripheral oedematous conditions but no significant improvement in volumetric measurements in inter-group comparison. Various studies revealed positive effects of CDT on lymphedema volume and HRQoL in BCRL. The effect of 2–4 week of CDT on quality of life (QoL) and severity of pain by Mondry et al in the same population demonstrated decrease in girth had a significant correlation with the reduction in pain VAS scores, but not with the increase in QoL. Kim et al. found that during the maintenance phase of CDT, QoL significantly improved and in contrast with the study of Mondry et al., it was correlated with the reduction in limb volume. Buragadda et al. compared patients with BCRL receiving CDT and a home program or conventional treatment. The conventional treatment group performed MLD, a low elastic compression garment, glenohumeral mobilization, and deep breathing exercise. And the 1-hour home program included self-lymphatic drainage, skin care, and remedial exercises. The results of this study indicated significant improvements in the arm function, pain, and lymphedema volume in both groups but greater improvements were seen in the group receiving the home program. The effects of compression garments were compared with compression bandaging within the initial treatment phase of a decongestive lymphatic therapy for a total of 10 treatment sessions in BCRL. The results of this study revealed greater volume reduction, but worse upper extremity functions in compression bandaging group compared to compression garment group.[10]

Application of CDT in patients with early lymphedema would provide better recovery for upper extremity functions, as well as better volume reduction.

Pre and post treatment volumetric and girth measurements were compared. Within the group comparison, post treatment there was significant improvement noted in volumetric and girth measurements in both the groups. Between the group comparison, post treatment there was no significant improvement noted in volumetric measurements but significant improvement was noted in girth measurement inter group comparison.

Previous studies did not signify any comparision in the effect of FUP and CDT in subjects with peripheral oedema.

Thus, present study was undertaken to find effectiveness of FUP versus CDT in subjects with peripheral oedema which obtained significant results. And thus, concluded with significant decrease in oedema.

Conclusion

We found that both FUP and CDT were significantly effective in reducing peripheral oedema but CDT was more effective compared to FUP. This treatment was effective by reducing the volumetric and girth measurements which improved quality of life of patients.

Conflicts of Interest: The authors declare that there are no conflicts of interest concerning the content of the present study.

Funding source: This study was funded by Krishna Institute of Medical Sciences Deemed to Be University Karad, Maharashtra.

Ethical Approval: From institutional ethical committee of Krishna Institute of Medical Sciences Deemed to Be University Karad, Maharashtra.

Abbreviations:

CDT: Complex decongestive therapy, FUP: Faradism under pressure, MLD: Manual lymphatic drainage, MCB: Multi-layer compression bandaging.

Acknowledgement: We acknowledge the guidance and constant support of Dean, Faculty of Physiotherapy, KIMSDU, Karad; Dr.Mandar Malawade and Dr.Kakade SV for help in statistical analysis.

References

1. Chelcy S Jaju, Sandeep Shinde. PREVALENCE OF PERIPHERAL NEUROPATHY IN CHRONIC MUSCULOSKELETAL OEDEMATOUS CONDITIONS. Int J Physio. 2019Dec.9; 00:282-6.
2. Trayes KP, Studdiford JS, Pickle S, Tully AS. Edema: diagnosis and management. American family physician. 2013 Jul 15;88(2):102-10.
3. Carpentier PH, Maricq HR, Biro C, Ponçot-Makinen CO, Franco A. Prevalence, risk factors, and clinical patterns of chronic venous disorders of lower limbs: a population-based study in France. Journal of vascular surgery. 2004 Oct 1;40(4):650-9.
4. Kimura G. Pathogenesis of edema and its classification. Nihon rinsho. Japanese journal of clinical medicine. 2005 Jan;63(1):11-6.
5. Cho S, Atwood JE. Peripheral edema. The American journal of medicine. 2002 Nov 1;113(7):580-6.
6. Villeco JP. Edema: a silent but important factor. Journal of Hand Therapy. 2012 Apr 1;25(2):153-62.
7. Zasadzka E, Trzmiel T, Kleczewska M, Pawlaczyk M. Comparison of the effectiveness of complex decongestive therapy and compression bandaging as a method of treatment of lymphedema in the elderly. Clinical interventions in aging. 2018; 13:929.
8. Heinig B, Wollina U. Complex decongestive therapy. Der Hautarzt; Zeitschrift fur Dermatologie, Venerologie, und verwandte Gebiete. 2015 Nov;66(11):810-8.
9. Vojáčková N, Fialová J, Hercogová J. Management of lymphedema. Dermatologic therapy. 2012 Jul;25(4):352-7.
10. Sezgin Ozcan D, Dalyan M, Unsal Delialioglu S, Duzlu U, Polat CS, Koseoglu BF. Complex decongestive therapy enhances upper limb functions in patients with breast cancer-related lymphedema. Lymphatic Research and Biology. 2018 Oct 1;16(5):446-52.
11. Bieri D, Heath J, Samios R. THE EFFECTS OF FARADISM UNDER PRESSURE ON VENOUS PRESSURE. Australian Journal of Physiotherapy. 1970 Dec 1;16(4):159-60.
12. Susan B. O'Sullivan, Thomas J. Schmitz, George D. Fulk; Physical Rehabilitation: Vascular, Lymphatic, and Integumentary Disorders; Ch 14, pg 577 - 644.