



EFFECT OF PNEUMATIC COMPRESSION THERAPY ON FILARIAL LYMPHEDEMA GRADE II (PILOT STUDY)

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ABSTRACT **Background:** Filarial lymphedema is a form of chronic progressive oedema in which there is significant persistent swelling present in the lower limb which exists as second leading causes of global health public problem. Reducing limb volume and avoid next stage of oedema using pneumatic compression therapy is inexpensive and easily accessible mechanical device. **Purpose:** This study aimed to find out the effectiveness of pneumatic compression therapy in patients with filarial lymphedema grade II. **Methods:** The Pilot study was conducted in the division of PMR. There are five clinically diagnosed lymphedema grade II patients from the department of plastic surgery were included in this study. They were treated with pneumatic compression therapy for 30 minutes per day for 4 weeks. The volumetric measurement of lower limb and circumference of lower limb were evaluated before and after the intervention and data was collected and analysed. **Result:** The mean value of circumference of lower limb has been reduced after the intervention proved with significant p value (< 0.05). **Conclusion:** It was concluded that pneumatic compression therapy is effective in reducing the lymphedema in patients with filarial lymphedema II.

KEYWORDS : Filarial lymphedema, Pneumatic compression therapy, circumferential measurements, volumetric measurements.

INTRODUCTION

Lymphedema has been defined as an abnormal accumulation of capillary filtrate with proteins, cytokines and chemokines, recirculating lymphocytes, products of parenchymatous cells, and debris of senescent cells. Oedema of tissues develops once the intercellular space has been filled with stagnant fluid. Lymphedema of lower limbs is a consequence of obstruction of the main lymphatic's caused by inflammation, trauma, excision of lymph nodes, and irradiation. Persons afflicted with lymphedema have significant problems as impaired extremity function, recurrent episodes of soft tissue inflammation, lymphorrhea, and unsatisfactory cosmesis, and a variety of psychological and social issues¹. More than 120 million men, women and children suffer from lymphatic filariasis and its lasting effects. It is a leading cause of disability in the world. According to WHO, an estimated 120 million tropical and subtropical area of the world are infected with lymphatic filariasis; of these almost 25 million, mostly women have lymphedema or elephantiasis of the leg². Lymphatic filariasis (LF) is endemic in as many as 80 countries and lymphoedema is the commonest clinical presentation of LF^{3,4}. It is estimated that there are 16.02 million cases of lymphoedema caused by LF globally and of these 7.44 million (46.4%) live in India and this condition has a significant socio-economic impact on the patients⁵⁻⁷. Filarial lymphedema is one of the most common problems confronting rehabilitation professionals. Therapeutic efforts remain focused on minimizing the oedema, mitigating complications, and on reversing and restoring the functional and cosmetic nature of the limb. The therapies available for oedema reduction are divided into three categories: rehabilitative interventions, pharmacologic therapies, and surgery. Among the conservative methods, external compression remains the mainstay modality. One of the most promising methods is intermittent pneumatic compression (IPC). Intermittent pneumatic compression (IPC) is often suggested in the field of physical treatment of primary and secondary lymphedema⁸⁻¹¹. The most basic definition of the IPC is that it consists in the application of a force on an oedema in order to evacuate its components as much as possible towards the physiological ways of drainage: venous – lymphatic's – interstitial. There exists limited literature regarding the use of IPC in the treatment of secondary or primary lymphedema. Considering this paucity of information and the existence of so many different points of view, based on clinical and laboratory experiences, this study was undertaking an overview of the current state of knowledge concerning the use of IPC in the treatment of primary and secondary lymphedema. Its treatment strategies have not yet been well defined and very little work has been done in our country. Recently limited literature has been proved that pneumatic compression therapy was successful in treating the patients with lymphedema. The aim of the study is to find out the

effectiveness of Pneumatic Compression Therapy (PCT) in reducing oedema in patients with filarial lymphedema grade (II).

MATERIAL AND METHODS

A Pilot study was conducted in the division of Physical medicine and Rehabilitation. The purpose of the study was clearly explained, and informed consent was obtained before the study. Five cases with clinically diagnosed lymphedema II were included from the department of plastic surgery based on the inclusion and exclusion criteria using convenient sampling method. Inclusion criteria; all age groups with grade 1 and 2 filarial lymphedema, Both genders, Patients who are actively willing to participate, Patients with either one or both lower limbs involved and the exclusion criteria; Open and cut injuries of lower limb, Deep vein thrombosis, Untreated infections of lower limb, Systemic diseases (e.g., SLE, RA), Severe renal/cardiac disorder, Upper limb lymphedema. Baseline measurements were recorded for the following parameters; name, age, sex and duration of condition. After the pre assessment the subjects were given Pneumatic compression therapy was given with the protocol of 30 minutes/ day, 5 days /week, for 4 weeks. Circumferential measurement and volumetric measurement were used as outcome measures. The pre and post evaluation of the above-mentioned variables, limb girth using inch tape and volumetric measurements were recorded. In Volumetric measurement oedema was measured by submerging the limb in water filled container and measuring the water elevation. Circumference of lower limb has been measured by using inch tape at various levels. To allow more valid comparison of sequential measurement, any anatomical land marks are used as reference points for placement of tape (below knee in leg, in ankle (head of the first metatarsal in ankle, base of the fifth Metatarsal in foot). After the 4 weeks the collected data were analysed using suitable statistical tools.

DATA ANALYSIS AND RESULTS

There are five patients with lymphedema were included in the study and basic characteristics age, sex, duration of condition was recorded and volumetric and circumferential measurement of lower limb were evaluated before and after intervention. The data were collected and analysed with the appropriate statistical tools. Descriptive statistics were used to describe the basic characteristics of the study population and paired 't' test was used to find out the difference between pre and post assessment of outcome measures. Table 1 displayed the basic characteristics and baseline measurements of study variables. It was observed that out of 5 patients 4 males and 1 female patient were included. Two patients were observed in the age of above 60, one patient was observed in the age of above 50 and one patient was observed in the age of above 40, one patient was observed in the age of

below 40. The observed people are adults. Among 5 people, 2 persons found with the duration of condition more than one year and 2 persons were found with the duration of condition less than one year. And only one person found with one month duration. Table 2 shows that the mean values with the standard deviation of circumferential measurement of lower limb observed in leg, ankle and foot. The observed mean values has been reduced after the intervention; in leg it was reduced from 13.64 to 12.24, in ankle (head of the fifth metatarsal) from 8.98 to 8.40, ankle (base of the metatarsal) from 9.54 to 8.96 and foot from 9.10 to 8.50. The results infer that there was significant difference exist between the means of pre and post intervention. Paired 't' test was used to find out the difference between the variables. The observed p value (<0.05) shows that there was significant reduction in the circumference of lower limb after the intervention. Table 3 shows the comparison of mean values with the standard deviation of level of water when the affected limb was immersed. It was observed that the pre intervention score improved from 18.46 to 17.30 after intervention. It denotes that there is significant difference exist in the water level before and after the intervention which is statistically proved with the p value (<0.05). The result infers that there is significant reduction of swelling of lower limb after the intervention.

Table 1 Basic Characteristics And Study Variables Of Patients With Lymphedema

S. no	Age	sex	Volume- tric measure- ment	Circumferential measurement of lower limb (inches)				
				Dura- tion of con- di- tion	(Water level in litres)	Leg	Ankle (Head of 1st meta- tarsal)	Ankle (Base of 5th metatar- sal)
1	39	M		6 months	19.1	14.2	9.3	9.3
2	48	M		1 month	19.4	14.6	9.5	9.9
3	65	F		1 year	17	11.9	8.5	8
4	62	M		9 months	18	14	9	9.8
5	55	M		2 years	18.8	18.5	9.2	9.2

Table 2 - Comparison Of Circumference Measurement Of Lower Limb Before And After Intervention (PCI)

Study variables	Pre intervention		Post- intervention		t- value	p- value
	Mean	SD	Mean	SD		
(Limb Circumference measurement)						
Leg (below knee)	13.64	1.0	12.24	1.3	5.970	0.004
Ankle (head of the first metatarsal)	8.98	0.7	8.40	0.3	2.141	0.009
Ankle (Base of the fifth Metatarsal)	9.54	0.8	8.96	0.3	2.693	0.055
Foot	9.10	0.3	8.50	0.2	4.472	0.011

Table 3- Comparison Of Volumetric Measurement Of Lower Limb Before And After Intervention

MI	Group	N	Mean	Standard Deviation	t- value	p- value
Level of Water Affected Limb was Immersed	Pre- intervention	5	18.46	0.96	5.058	0.007*
	Post intervention	5	17.30	1.19		

DISCUSSION

Lymphedema is one of the condition leads to physical suffering, permanent disability and economic loss worldwide. Therapeutic efforts remain focused on minimizing the oedema, mitigating complications, and on reversing and restoring the functional and cosmetic nature of the limb. The therapies available for oedema reduction are less and intermittent pneumatic compression (IPC) is one of the most promising methods. The main objective of the study was to find out effectiveness of Pneumatic Compression Therapy (PCT) in patients with filarial lymphedema grade (II). This study included 5 patients from plastic surgery outpatient department. It was observed that out of 5 patients 4 males and 1 female patient were included. Two patients were observed in the age of above 60, one patient was

observed in the age of above 50 and one patient was observed in the age of above 40, one patient was observed in the age of below 40. The observed people are adults. Among 5 people, 2 persons found with the duration of condition more than one year and 2 persons were found with the duration of condition less than one year. And only one person found with one month duration. This study employed as pilot study which consists of only one female and gender was not equally distributed. The duration of the condition also heterogeneous and differs among the patients.

After the baseline measurements the patients were treated with pneumatic compression therapy for one session (30 minutes)/ per day, 5 days /week, for 4 weeks. The pre and post evaluation of circumferential measurement and volumetric measurement of the lower limb were recorded. The results inferred that there was significant difference exist between the means of pre and post intervention. It shows there was significant reduction in the circumference of lower limb after the intervention. The study results supported by the study done by S.C. Muluk et al., (2013) examined the effectiveness of advanced pneumatic compression device in reducing limb volume and concluded that pneumatic compression device can reduce limb volume and pain and enhance ability to improve ADLs¹⁰. During compression, oedema fluid is squeezed to the non-compressed regions. Therefore, after compression, the tissue skeleton regains its pre-massage shape, although there is less oedema fluid and decrease of limb circumference. The results of volumetric measurement of lower limb revealed that there is significant reduction of swelling of lower limb after the intervention. Similar results found in the study done by Y.Manjula et al., (2002) evaluated the sequential intermittent pneumatic compression for filarial lymphedema^{11,12}. Volumetric measurement was done before and after the treatment. The study concluded that sequential intermittent pneumatic compression reduces morbidity in filarial lymphedema. Hence it was concluded that Intermittent Pneumatic Compression (IPC) is effective in reducing lower limb oedema in patients with filarial lymphedema grade (II). This study has little strength; this study was carried out in the population from the rural area and simple, standardized physical measures were used to evaluate lymphedema. The limitations of the study were Range of motion, pain and activities of daily living has not been included in this study, the psychological component of the patients and quality of life components were not included in this study and the study employed as pilot study and further randomized controlled trails are needed to confirm the results with larger population.

CONCLUSION

It was concluded that Intermittent Pneumatic Compression (IPC) is effective in reducing lower limb oedema in patients with filarial lymphedema grade (II).

Source Of Funding: Nil

Conflict Of Interest: The authors declared that they have no conflicts of interest.

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