

To Compare the Effectiveness of Vascular Exercises Versus Vascular Massage Therapy on Lower Extremity Function and Blood Circulation Among Female Subjects with Chronic Venous Insufficiency

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ABSTRACT

OBJECTIVE: The aim of the study was to analyze the effectiveness of vascular exercises versus vascular massage therapy for the patient with the chronic venous insufficiency.

BACKGROUND OF STUDY: Chronic venous insufficiency is a common condition in the elder person, pregnancy women, obesity etc., The symptoms are pain, swelling, loss of ankle joint range of movement. Earlier studies have shown the benefits of exercise in the patients. The purpose of this study was to analyze the effectiveness of vascular exercises and vascular massage therapy among the chronic venous insufficiency patients.

METHODOLOGY: This is an experimental study of comparative type. This study was carried out in the faculty of physiotherapy department, Dr. M.G.R. educational and research institute after the approval from institution review board for 12 weeks. 20 subjects were included in the study based on the inclusion and exclusion criteria after getting their consent for participation. The subjects were divided into two groups by random sampling method. Ankle brachial pressure index [ABPI] and lower extremity functional scale [LEFS] is used for pre and post assessment. The subjects in group A performed vascular exercises for 30 mins/day for 3 days/week for 12 weeks. The subjects in group B performed vascular massage therapy in lower extremity for 30mins/day for 3day/week for 12 weeks

RESULT: On comparing pre-test and post-test within group A and group B on Ankle Brachial Pressure Index and lower extremity function scale score. Group A shows highly significant difference in mean values at $P \leq 0.001$

CONCLUSION: The study revealed that vascular exercises was more effective in the treatment of chronic venous insufficiency compared to vascular massage therapy.

KEYWORDS: Chronic venous insufficiency, vascular massage therapy, vascular exercises.

INTRODUCTION

The chronic venous insufficiency [CVI] is a condition characterized by reflux or obstruction of the venous blood in the lower limb and result in the venous hypertension [1]. The prevalence is 57.6% in women and

42.4% in men. The chronic venous insufficiency was ranged from mild to severe by the clinical symptoms [2]. The prevalence is increases dramatically with age. Risk factors are old age people, female, pregnancy, over obesity, genetic, family

history, environment, behaviour, changes in lifestyle [3].

To understand the pathophysiology, it is important to know about the anatomy of lower limb venous system. The lower limb is composed of superficial, deep, perforator veins. The superficial veins are present above the muscle. Superficial veins are subdivided into short and long saphenous veins. The deep veins are subdivided into popliteal vein, femoral vein, peroneal vein, anterior, and posterior tibial vein. The function of veins is to return the deoxygenated blood from the lower limb to the heart [4].

The pathophysiology is based on the factors they are venous valve incompetence, inflammation response to the vessel wall will alter the hemodynamic resulting in the state of venous hypertension, dysfunction of the muscle pumping caused by the musculoskeletal and neuromuscular disease, prolonged bed rest, joint stiffness reduces the venous blood movement. These pathophysiological factors cause the reflux of venous blood in the leg, and then artery blood also get accumulated in the lower limb which is known as venous stasis. The prolonged stage of venous hypertension will result in the dermal changes such as hyperpigmented, dilation of the veins. This ultimately result in appearance of spider veins and ulceration. This causes reduction in the speed of walking, ankle joint range of movement [ROM], muscle weakness [5]. It is classified based on the clinical, etiology, anatomical, pathophysiology and this classification is called CEAP classification [6].

It is diagnosed by the following physical examination, doppler, duplex ultrasound, phlebography, plethysmography, ambulatory venous pressure [7]. Surgery treatment such as Venous phlebectomy, valve reconstruction surgery is performed at the later stages of CVI. Sclerotherapy, endovascular therapy is performed to reduce the venous stasis. conservation treatment such as pharmacological, compressive bandage, exercise, wound care are adopted to relieve the symptoms [8]. The ankle brachial

pressure index is used to measure any changes in blood pressure. Lower limb functional scale is used to measure the improvement in functional ability of patients. Hence, the aim of this study was to find the effectiveness of vascular exercises versus vascular massage therapy on the lower extremity function and blood circulation in CVI.

Recent researchers have found that exercises are an effective method for prevention and treatment of chronic venous insufficiency disease [9]. There are evidences that stating exercise will improve the calf muscle pump and increase the circulation and oxygen content in blood to the affected area and improve the ankle ROM, muscle strength, muscle endurance, reduce the pain and swelling, thereby improving the functional ability and the quality of life [10].

The massage therapy involves variety of techniques to manipulate the joint and soft tissue in the body. They decrease pain, swelling and increase the range of motion of the affected area where massage is performed. Massage also produces some changes in the physiological factors such as increase the blood flow and help to drain the body fluid from the area [11].

MATERIAL AND METHODS

This is an experimental study was carried out in the faculty of physiotherapy department, Dr. M.G.R. educational and research institute after the approval from institution review board for 12 weeks. 20 subjects were included in the study based on the inclusion and exclusion criteria after getting their consent for participation. The subjects were divided into two groups by random sampling method. The subjects were clinically diagnosed with mild to moderate CVI, pain in leg, limit in ankle ROM, swelling in ankle joint, oedema in lower limb, female gender at age from 30 to 70 years were included. Neurological disorder, loss of ankle joint stability, loss of consciousness, unstable vital signs, visual impairment, uncooperative patients, carcinogen were excluded.

20 subjects fulfilling inclusion criteria were included in this study after getting their consent for participation. Subjects were divided into 2 group randomly, as group A and group B, each group had 10 subjects. ABPI and LEFS was used for pre and post assessment. Group A received vascular exercises and Group B received vascular massage therapy for 12 weeks. This study is based on Helsinki declaration the research was carried out.

TABLE 1: Demographic characteristics

Age	Group A	Group B
30-40	2	2
41-50	2	2
51-60	2	2
61-70	4	4
Relationship		
Married	6	7
Widow or single	4	3
occupation		
Working	5	4
House wife	5	6

MATERIAL USED: Thera-Band, chair, mat, pillows, oil (or) powder, bolster.

OUTCOME MEASUREMENT TOOLS:

The ankle brachial pressure index may a ratio of vital sign at the ankle to the brachial pressure. The ABPI is calculated by the help of formula. $ABPI = \text{higher ankle systolic pressure} / \text{higher brachial systolic pressure}$. The sphygmomanometer cuff instrument is used to assess the lower extremity pressure in the posterior tibial, dorsal pedis artery. The normal value is 1.0 – 1.4, acceptable range from 0.9 – 1.0, some arterial disease ranges from 0.8 -0.9, moderate arterial disease range from 0.5 -0.8, severe arterial disease range from less than 0.5 [12].

The Lower extremity functional scale is a scale used to assess the ability of subjects with the venous diseases impact on the activities of daily living [13]. It has 20 questions related to the ability, symptoms, and progression of the conditions [14].

INTERVENTION:

GROUP A:

Subjects in group A received vascular exercises for 30 mins/day for 3days/week for 12 weeks and they were instructed not to do any other type of exercise during that period. They were trained with the following exercises program. The exercises were given to bilateral lower extremity muscles group.

Stretching Exercises.

Stretching was done for 4 repetitions for 10 seconds. This was done for both the legs.

Quadriceps Stretching: The subjects were made to lie on the left side and rest the head in the palm of left hand. The right-side hip was extended with knee flexed and foot plantar flexed by holding the hand in between the toe and ankle joint. Then the heel was gently pulled towards the buttock to stretch quadriceps.

Hamstrings Stretching: The subjects were asked to lie on supine and then flexed the hip with knee extended and ankle in dorsiflexed. Then the thigh was gently pulled towards the body to stretch the hamstrings.

Adductors Stretching: The subjects were instructed to sit on the floor. Then hip was abducted, externally rotated with knee flexed and the soles of feet were brought together. Then the butterfly position was maintained and then place the hand over the knee and gently pushed it down to contact the floor.

Abductors Stretching: The subjects were asked to lie on supine with one leg fully straight and then other leg crossed over the straight leg with knee flexed. Then place the hand over the knee and the knee was pulled towards the body.

Metabolic Ankle Exercises.

Metabolic ankle exercises were done for 2 sets, 5 repetitions and progressed to the 3sets, 10 repetitions. The subjects were instructed to lie on supine and then the legs were elevated and supported by the pillows at 20 cm height. The subjects are performing the ankle dorsiflexion and plantar flexion movement alternatively. Then perform the

ankle rotation in clockwise, anticlockwise direction.

90° elevation ankle movement: The subjects were asked to lie supine and then asked to keep one leg at rest and other leg was raised and hip flexed at 90° with knee extended. Then performed ankle flexion and extension movements for 3 times.

Resistance Exercises.

Resistance exercises were done for 2 sets, 5 repetitions and progressed to 3 sets, 10 repetitions.

Thera-band exercise: The subjects were asked to lie supine and then the leg was raised to 90° with knee extended. Then performed dorsiflexion and plantar flexion of ankle movement against the resistance provided by the band. The band was placed over the ball of foot. The resistance was changed according to the color code.

Heel raising exercise: The subjects were asked to stand at the edge of the step with ball of foot. Then the heel was raised and relaxed. The resistance was increased by the ankle weight cuff.

GROUP B:

Subjects in group B received vascular massage therapy for 30 mins/day for 3days/week for 12 weeks and they were instructed not to do any other type of exercise during that period. The massage was given to bilateral lower extremity muscles group.

Hip Extensors Massage.

The patients were asked to lie in prone and then the bolster was placed under the ankles. Then superficial stroking and effleurage were applied to the gluteal muscles for 2 min. Then superficial to deep effleurage and petrissage [palmar kneading, muscles stripping] were applied on the gluteal for 5 min. Then same step was performed for the posterior aspect of thigh group of muscles for 8 min. Then this session ended by applying superficial effleurage, stroking to the muscles for 2 min.

Knee Extensors Massage

The patients were asked to lie on supine and then the bolster was placed under the knees. Then superficial stroking and effleurage were applied to the muscles for 3 min. Then superficial to deep effleurage and petrissage [palmar kneading, muscles stripping, wringing] on the quadriceps muscles for 10 min. Then this session ended by applying superficial effleurage, stroking to the muscles for 2 min.

DATA ANALYSIS.

The collected data were tabulated and analysed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t- Test) was adopted to find statistical difference between the two groups.

TABLE-2 Comparison of Lower Extremity Functional Scale Score Between Groups.

Test	Group - A		Group - B		T - Test	df	Significance
	Mean	S. D	Mean	S. D			
Pre-Test	38.20	8.58	38.30	7.24	-.028	18	.978*
Post Test	62.30	9.34	50.60	7.42	3.09	18	.000***

TABLE – 3 Comparison of Ankle Brachial Pressure Index Score Between Groups.

Test	Group - A		Group - B		T - Test	df	Significance
	Mean	S. D	Mean	S. D			
Pre-Test	.633	.128	.634	.116	.002	18	.998*
Post-Test	.908	.067	.775	.081	3.97	18	.000***

TABLE- 4 Comparison of Lower Extremity Functional Scale Score Within Groups.

Groups	Pre- Test		Post- Test		T - Test	Significance
	Mean	S. D	Mean	S. D		
Group- A	38.20	8.58	62.30	9.34	-11.19	.000***
Group- B	38.30	7.24	50.60	7.42	-15.30	.000***

Table – 5 Comparison of Ankle Brachial Pressure Index Score Within Groups.

Group	Pre-Test		Post-Test		T - Test	Significance
	Mean	S.D	Mean	S.D		
Group- A	.633	.128	.908	.067	-6.10	.000***
Group- B	.634	.116	.775	.081	-8.20	.000***

RESULT

On comparing the mean value of Group A and Group B on Ankle brachial pressure index (ABPI) score, it shows a significant increase in the Post test Mean values in both groups, but vascular Exercises (Group A) shows 0.908 which has the high Mean value is effective than vascular massage therapy (Group B) 0.775 at $P \leq 0.001$. Hence Null Hypothesis is rejected.

On comparing the Mean values of Group A, Group B on Lower extremity function scale (LEFS) score, it shows a significant increase in the Post test Mean values in both groups, but vascular exercise (Group A) shows 62.30 which has the high Mean value is effective than vascular massage therapy (Group A) 50.60 at $P \leq 0.001$. Hence Null Hypothesis is rejected.

On comparing pre test and post test within group A and group B on Ankle Brachial Pressure Index and lower extremity function scale score Group A showed highly significant difference in mean at $P \leq 0.001$

On comparing pre test and post test between group A and group B on Ankle Brachial Pressure Index and lower extremity function scale score Group A showed highly significant difference in mean at $P \leq 0.001$

DISCUSSION.

Chronic venous insufficiency is a widespread disease and caused by the ageing process, increased by body weight, sedentary lifestyle, occupations, genetic factors, and pregnancy. It is a characteristic dysfunction of walls of veins, during refilling of venous blood this dysfunction leads to chronic venous hypertension [15]. Despite the discovery of prime pathophysiological factors of CVI in the recent times, till date compression therapy remains as the utmost choice of treatment. Evidence from various studies reported that regular exercise and

elevation, compression were used to reduce the symptoms of disease.

Hence this study intended to compare the effectiveness of vascular exercises and vascular massage therapy for the chronic venous insufficiency patients. Almost all the subjects who participated in this study showed improvement such as reduction of pain, improvement in functional ability of lower limbs after 12 weeks of intervention period. Subjects in the group A [vascular exercises] reported that they experienced a better improvement in the functional ability of the lower limbs and reduction of pain after 12 weeks of intervention periods.

It was like the finding of Leal et al., who found that the vascular exercises improved the ankle range of motion and strength of calf muscle and reduced the symptoms of chronic venous insufficiency disease such as tiredness, pain, swelling and improved the quality of life [16]. Volpe. EFT et al., also found that supervised exercises benefit on improvement in calf muscle contraction, improved the ankle range of motion, reduce the severity of the disease, improved the resistance of calf muscle in chronic venous insufficiency patients [17]. Da Silva JL et al., conducted a systematic review to evaluate the influence of therapeutic exercises and found that therapeutic exercises enhance the QOL in CVI subjects by reduction of pain, improve the calf muscle pumping activity and reduce the progression of condition [18]. Subjects in the group B [vascular massage therapy] reported that they find reduced the feeling of pain after 12 weeks of intervention periods. It was like the finding of Molski et al., manual lymphatic drainage is a similar form of massage found that influences the systemic blood flow function, reduced the swelling, and improve QOL [19]. Mar. A et al., also proved that vascular massage therapy was increased the skin temperature where massage was applied by increasing in

blood flow. The vasodilation was occurred by the effect of vascular massage on endothelium and surrounding cells with contact between the blood and vessel wall. [20]

On considering the result of this study both the groups showed significant reduction in the chronic venous insufficiency disease symptoms, after 12 weeks of intervention periods. However greater improvement was seen in group A [vascular exercises] Followed by group B [vascular massage therapy]. While comparing the results of both the groups. This study reveals that vascular exercises showed better reduction of pain and improved functional ability of lower limbs followed by vascular massage therapy.

CONCLUSION

This study showed significant improvement in the chronic venous insufficiency after involvement of subjects in any form of physical therapy, like vascular exercises, vascular massage therapy. In this study vascular exercises showed greater reduction in symptoms and improvement in function in chronic venous insufficiency disease. Hence vascular exercises are an effective management in subjects with chronic venous insufficiency disease.

Declaration by Authors

Ethical Approval: This study was reviewed and approved by the ISRB ref no: A – 45 / PHYSIO / IRSB / 2020-2021 at Dr. M.G.R Educational and Research Institute.

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REFERENCES

1. Aguilar-Ferrández ME, Castro-Sánchez AM, Matarán-Peñarrocha GA, García-Muro F, Serge T, Moreno-Lorenzo C. Effects of kinesio taping on venous symptoms, bioelectrical activity of the gastrocnemius muscle, range of ankle motion, and quality of life in postmenopausal women with chronic venous insufficiency: a randomized controlled trial. *Arch Phys Med Rehabil.* 2013;94(12):2315-2328. doi: 10.1016/j.apmr.2013.05.016

2. Dekiwadia DB, Jindal R, Varghese R, et al. Executive Summary: A Consensus Statement - Part I: Recommendations for the Management of Chronic Venous Disease (CVD) in India and Key Role of Primary Care Doctors. *J Assoc Physicians India.* 2016;64(8):53-56.
3. Scott TE, LaMorte WW, Gorin DR, Menzoian JO. Risk factors for chronic venous insufficiency: a dual case-control study. *J Vasc Surg.* 1995;22(5):622-628. doi:10.1016/s0741-5214(95)70050-1
4. Eberhardt RT, Raffetto JD. Chronic venous insufficiency. *Circulation.* 2005;111(18):2398-2409. doi: 10.1161/01.CIR.0000164199.72440.08
5. Klonizakis M, Tew GA, Gumber A, et al. Supervised exercise training as an adjunct therapy for venous leg ulcers: a randomized controlled feasibility trial. *Br J Dermatol.* 2018;178(5):1072-1082. doi:10.1111/bjd.16089
6. Quilici BC, Gildo C Jr, de Godoy JM, Quilici BS, Augusto CR. Comparison of reduction of edema after rest and after muscle exercises in treatment of chronic venous insufficiency. *Int Arch Med.* 2009;2(1):18. Published 2009 Jul 14. doi:10.1186/1755-7682-2-18
7. Santler B, Goerge T. Chronic venous insufficiency - a review of pathophysiology, diagnosis, and treatment. *J Dtsch Dermatol Ges.* 2017;15(5):538-556. doi:10.1111/ddg.13242
8. Orhurhu V, Chu R, Xie K, et al. Management of Lower Extremity Pain from Chronic Venous Insufficiency: A Comprehensive Review. *Cardiol Ther.* 2021;10(1):111-140. doi:10.1007/s40119-021-00213-x
9. Araujo DN, Ribeiro CT, Maciel AC, Bruno SS, Fregonezi GA, Dias FA. Physical exercise for the treatment of non-ulcerated chronic venous insufficiency. *Cochrane Database Syst Rev.* 2016;12(12):CD010637. Published 2016 Dec 3. doi: 10.1002/14651858.CD010637.pub2

10. Padberg FT Jr, Johnston MV, Sisto SA. Structured exercise improves calf muscle pump function in chronic venous insufficiency: a randomized trial. *J Vasc Surg.* 2004;39(1):79-87. doi: 10.1016/j.jvs.2003.09.036
11. Franklin NC, Ali MM, Robinson AT, Norkeviciute E, Phillips SA. Massage therapy restores peripheral vascular function after exertion. *Arch Phys Med Rehabil.* 2014;95(6):1127-1134. doi: 10.1016/j.apmr.2014.02.007
12. Al-Qaisi M, Nott DM, King DH, Kaddoura S. Ankle brachial pressure index (ABPI): An update for practitioners. *Vasc Health Risk Manag.* 2009; 5:833-841. doi:10.2147/vhrm.s6759
13. Binkley JM, Stratford PW, Lott SA, Riddle DL. The Lower Extremity Functional Scale (LEFS): scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. *Phys Ther.* 1999;79(4):371-383.
14. Mehta SP, Fulton A, Quach C, Thistle M, Toledo C, Evans NA. Measurement Properties of the Lower Extremity Functional Scale: A Systematic Review. *J Orthop Sports Phys Ther.* 2016;46(3):200-216. doi:10.2519/jospt.2016.6165
15. Labropoulos N. How Does Chronic Venous Disease Progress from the First Symptoms to the Advanced Stages? A Review. *Adv Ther.* 2019;36(Suppl 1):13-19. doi:10.1007/s12325-019-0885-3
16. Leal, LMS Santos, RC Couto, SGP Moraes. Vascular physiotherapy for treatment of chronic venous disease: review article - *Jornal Vascular ...*, 2016 - SciELO Brasil Jan-Mar 2016 <https://doi.org/10.1590/1677-5449.003215>
17. Volpe EFT, Resqueti VR, da Silva AAM, Gualdi LP, Fregonezi GAF. Supervised exercise protocol for lower limbs in subjects with chronic venous disease: an evaluator-blinded, randomized clinical trial. *Trials.* 2020;21(1):414. Published 2020 May 19. doi:10.1186/s13063-020-04314-1
18. da Silva JL, Lima AG, Diniz NR, Leite JC. Effectiveness of therapeutic exercises for improving the quality of life of patients with chronic venous insufficiency: a systematic review. *J Vasc Bras.* 2021;20: e20200248. Published 2021 Jun 16. doi:10.1590/1677-5449.200248
19. Castro-Sánchez AM, Moreno-Lorenzo C, Matarán-Peñarrocha GA, Feriche-Fernández-Castany B, Granados-Gámez G, Quesada-Rubio JM. Connective tissue reflex massage for type 2 diabetic patients with peripheral arterial disease: randomized controlled trial. *Evid Based Complement Alternat Med.* 2011; 2011:804321. doi:10.1093/ecam/nep171
20. Molski P, Kruczyński J, Molski A, Molski S. Manual lymphatic drainage improves the quality of life in patients with chronic venous disease: a randomized controlled trial. *Arch Med Sci.* 2013;9(3):452-458. doi:10.5114/aoms.2013.35343

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