World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(CASE REPORT)

Effect of low-level laser therapy with circulatory exercises in varicose veins: A case report

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World Journal of Advanced Research and Reviews, 2026, 29(02), 055-060

Publication history: Received on 12 December 2025; revised on 24 January 2026; accepted on 27 January 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.2.0164

Abstract

Introduction: Varicose Veins are most common nowadays due to profession related prolonged standing like in nurse and teacher profession. This case study explores the effectiveness of combining LLLT with circulatory physiotherapy exercises in improving circulation in an individual suffering from varicose veins.

Case Description: This single-subject case study involved a 25-year-old female student with visible spider web like veins and pain. The intervention integrated Low Level Laser Therapy (LLLT) with circulatory physiotherapy exercises including improving circulation, pain relief, and strengthening. Outcome measures— Doppler ultrasound, Calf circumference and Ankle range of motion—were recorded on Day 0 and Day 28 to assess the effectiveness of the intervention.

Conclusion: This research provides a novel, evidence-based intervention strategy for addressing venous disorder. By focusing on the unique combination of LLLT with circulatory exercise protocol that can potentially improve circulation, decrease calf circumference, improve ankle ROM and enhance overall well-being.

Keywords: Varicose veins; Chronic venous insufficiency; LLLT (low level laser therapy); Physical therapy; Doppler ultrasound; Ankle range of motion

1. Introduction

Twisted, elongated, or tortuous veins are known as varicose veins (VV). High venous pressure causes branch vessels to enlarge, which results in varicosities (varicose veins)[1] The underlying pathophysiologic process is failure of the venous valves, leading to reflux and venous hypertension. This results in dilation of the venous wall, leukocyte infiltration, and release of inflammatory cytokines leading to further damage to the valves and vessel remodelling.[2] When a patient presents with symptoms such as throbbing pain, leg heaviness, easy leg tiredness, external bleeding, ankle hyperpigmentation, and venous leg ulcers, treatment should be taken into consideration.[3] Globally, varicose vein prevalence ranges from 20 to 60%, with women being at two to three times higher risk compared to men.[4]

There were 35,659 varicose vein surgeries carried out in the National Health Service (NHS) between 2009-2010. For the diagnosis and treatment of varicose veins, the NHS does not have a standardized protocol in place. [5]

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This case report describes how a circulatory exercise protocol combined with low-level laser therapy affects patient with varicose veins.

2. Case Description

A 25-years-old female student diagnosed from varicose veins in Airen Vascular on 20 May 2024. The participant reported pain, swelling and heaviness in lower leg which increased during winters, she feels discomfort during walking especially after prolonged standing. On 24 March 2025 after fill out a consent form by patient her assessment is taken in Department of Physiotherapy, Jaipur National University after which a diagnostic test doppler ultrasound is done by a professional healthcare technician in JNU hospital in which we find out that in right superficial veins and left superficial veins patient has multiple incompetent perforators are present at below the knee, thigh region and leg region. During the subjective assessment, we find out that her parents had a history of varicose veins but the patient had no history of smoking, drinking, or surgery, and she was not currently taking any drugs.

2.1. Physiotherapy Intervention

The patient was provided with physiotherapist-assisted rehabilitation program consisting of circulatory exercise protocol (including Buerger's exercise, isometric exercises, toe walking, toe standing) for 7 days a week for 4 weeks and Red Probe-type low level laser therapy with an intensity of 635nm, administered twice a week for 10 minutes for 4 weeks. Furthermore, the patient was provided with ergonomic advices. On April 8, 2025, the patient's ankle range of motion and calf circumference were measured. Both of her legs had calf circumferences between 12.5 cm, and upon measuring her ankle range of motion, her right foot's dorsiflexion range was between 0° to 15°, while her left foot's dorsiflexion range was between 0° to 10°, and her plantarflexion range of both right and left foot was between 0° to 45°. After 4 weeks training analysis of results was done using 3 outcome measures i.e. Ankle Range of Motion, Calf circumference and Doppler Ultrasound. The right foot's ankle range of motion is measured as 0° to 20° for dorsiflexion and 0° to 52° for plantarflexion, while the left foot's range is 0° to 15° for dorsiflexion and 0° to 50° for plantarflexion. After therapy, the right leg's calf circumference is 12.2 cm, while the left leg's is 12.4 cm. Although there are not any clinically significant changes are seen in Doppler ultrasound after intervention.

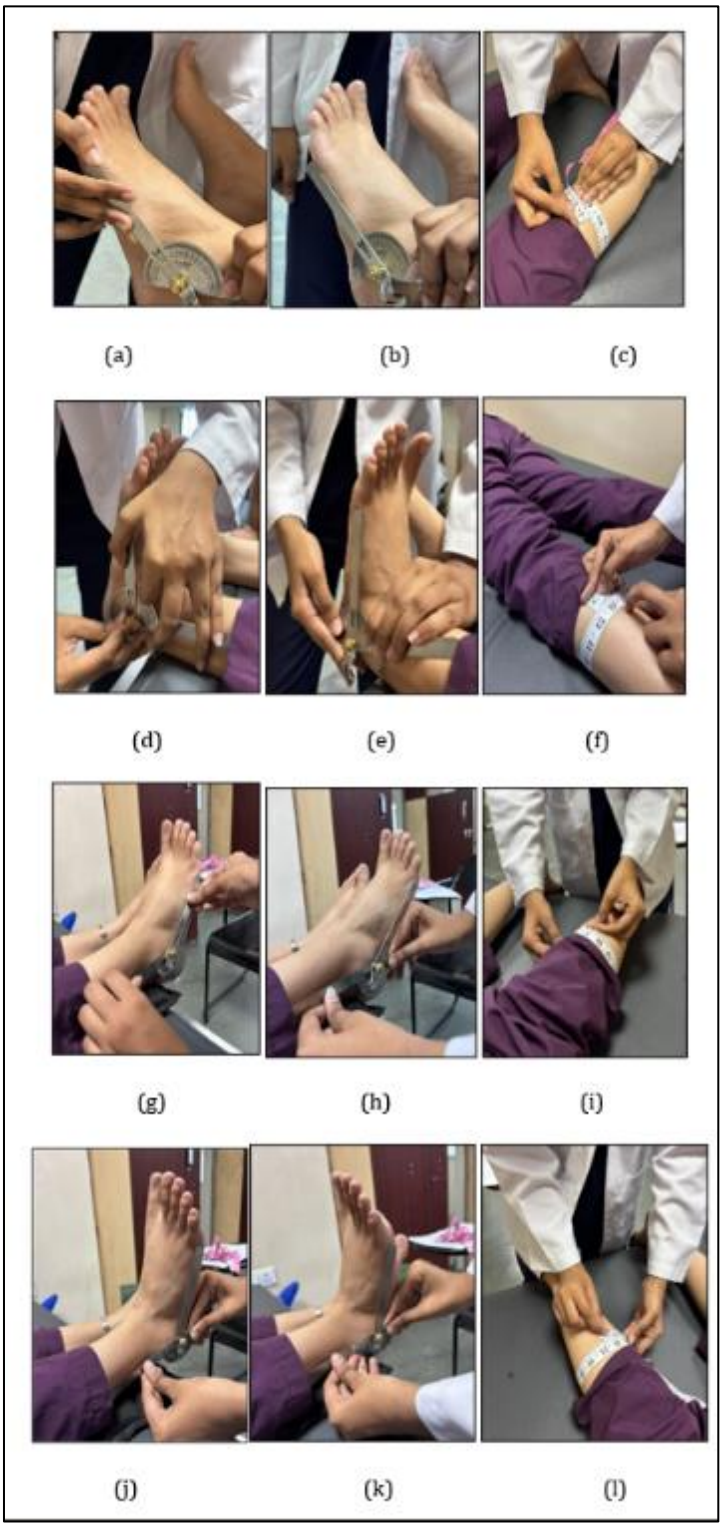
Table 1 Dosage of Circulatory Exercise Regime

Serial No.	EXERCISES		DOSAGE		
		Frequency	Intensity	Time	Type
1.	Isometrics Exercises (6)	10 reps. x 10 sec hold	1 set	Once a day for 7 days a week	Reduction of knee pain and strength of associated area
	i. Static Quadriceps				
	ii. Static Hamstrings				
	iii. Static Adductors				
2.	Toe Walking (6)	4 reps.	1 set	Once a day for 7 days a week	Improve Circulation
3.	Toe Standing (6)	3 minutes	1 set	Once a day for 7 days a week	Improve Circulation
4.	Buerger's Exercise (6)				
	i. ATMs when legs when legs elevated at 45 degrees	30 reps.	1 set	Once a day for 7 days a week	Improve Circulation
	ii. ATMs when legs elevated at 90 degrees	30 reps.	1 set		

Session Frequency: 1 session/day for 7 days a week for 4 weeks

Table 2 Pre- and post-intervention results for Ankle ROM of Left and Right foot

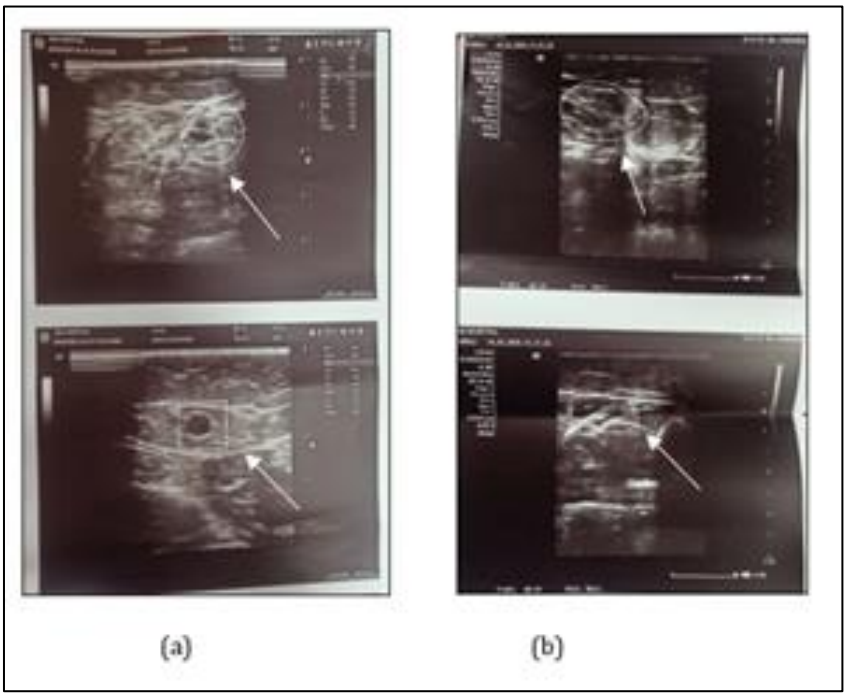
Timeline	Right Foot		Left Foot	
	Dorsiflexion	**Plantarflexion**	**Dorsiflexion**	**Plantarflexion**
Day-0	0° - 15°	0° - 45°	0° - 10°	0° - 50°
Day-28	0° - 20°	0° - 52°	0° - 15°	0° - 45°



Label	Description
a	Left foot plantarflexion post-intervention
b	Left foot plantarflexion pre-intervention
c	Left leg calf circumference pre-intervention
d	Left foot dorsiflexion post-intervention
e	Left foot dorsiflexion pre-intervention
f	Left leg calf circumference post-intervention
g	Right foot plantarflexion pre-intervention
h	Right foot plantarflexion pre-intervention
i	Right leg calf circumference post-intervention
j	Right foot dorsiflexion pre-intervention
k	Right foot dorsiflexion post intervention
l	Right leg calf circumference pre-intervention

Table 4 Pre-and post-intervention results for Calf Circumference of Left and Right leg

Timeline	Calf Circumference	
	Right Leg	Left Leg
Day-0	12.5cm	12.5cm
Day-28	12.2cm	12.4cm



Doppler Ultrasound findings of bilateral lower limb. **(a)** Marked area shows presence of varicose veins pre-intervention. **(b)** Marked area shows presence of varicose veins post-intervention.

3. Discussion

In this single-subject case study, the effect of low-level laser therapy (LLLT) with circulatory exercise protocol for improving circulation in patient with varicose veins were examined. A number of significant gaps in the existing literature on physiotherapy in varicose veins served as the impetus for this inquiry. Scientific research on focused, LLLT with physiotherapy exercises is still notably lacking, despite the fact that several studies have demonstrated the advantage of LLLT in improving circulation. The intervention approach in our study is substantiated by a research.[6], but with different outcome measures and some exercises we didn't include like improvement in thoracic mobility exercises and weight management training which they include in their research. Our results showed improvement in ankle range of motion that were clinically significant. 5° increases in right foot dorsiflexion, left foot dorsiflexion and

left foot plantarflexion and 7° increases in right foot plantar flexion are found after completing 4 weeks intervention.(Table 2) For comparison, in a study author looked into how supervised exercise affected the mobility of the ankle joints in patients who had venous leg ulcers. The findings demonstrated that patients' ankle mobility significantly improved when they engaged in frequent, supervised exercise as opposed to those who did not. Increased mobility could aid in the healing of leg ulcers and improve venous return.[7] In our study during pre-intervention calf circumference of both legs were 12.5cm and after intervention calf circumference in right leg is 12.2cm and in left leg is 12.4cm.(Table 4) For comparison, in a study author demonstrated that supervised exercise training, when combined with standard compression therapy showed that the exercise group's calf circumference was less than that of the control group, indicating that supervised exercise can successfully reduce lower limb edema in patients with venous leg ulcers.[8] There are not any clinically significant difference is seen in doppler ultrasound after intervention, for supporting our result there is a narrative review they used duplex ultrasonography to assess how MLD affected individuals with chronic venous illness. The femoral and great saphenous veins both showed enhanced venous blood flow as a result of MLD. In patients with more advanced stages of the disease, the amount of this rise was less noticeable. This suggests that although MLD can alleviate symptoms, it could not result in notable alterations that can be seen with Doppler ultrasound, particularly in more severe patients.[9]

Limitations: This study is limited by its single case study design, which restricts the generalizability. The study was only allowed to last four weeks because it was carried out to complete the requirements of a bachelor's thesis. It's possible that the small timeframe made it more difficult to evaluate the long-term impacts or circulation improvements in patients with varicose veins. inconsistent compliance with the recommended at-home workout regimen. It is hard to say if the gains were specifically brought about by the combination of LLLT and physiotherapy exercises or if they might have happened organically over time because there is no control or comparison group.

Conclusion: In conclusion this study demonstrates that LLLT, when combined with circulatory exercise protocol, can reduce calf circumference and increase ankle range of motion although there are not any clinically significant changes in doppler ultrasound. These findings underscore the need for more extensive research into circulatory specific exercises as potential adjuncts to varicose veins management strategies and with long-term outcome.

Compliance with ethical standards

Acknowledgement

The authors declare that no additional support was received for the preparation of this case report.

Disclosure of conflict of interest

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