



EVALUATING THE EFFECTIVENESS OF FOUR-LAYER COMPRESSION BANDAGING ON CHRONIC VENOUS ULCERS: A CLINICAL STUDY

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Conflicts of Interest: Nil

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ABSTRACT

Chronic venous ulcers (CVUs) are a prevalent and debilitating condition that significantly impacts patients' quality of life. This clinical study aims to evaluate the impact of four-layer compression bandaging on the healing of chronic venous ulcers. A total of 100 patients with clinically diagnosed CVUs were enrolled and randomized into two groups: one receiving four-layer compression bandaging and the other receiving standard care. The primary outcome measured was the percentage of ulcer area reduction over 12 weeks. Secondary outcomes included patient-reported pain levels and quality of life assessments using the Venous Clinical Severity Score (VCSS). The results indicated that patients in the four-layer compression bandaging group demonstrated a statistically significant reduction in ulcer size (mean reduction of 75% vs. 30% in the standard care group, $p < 0.001$). Additionally, patients reported lower pain levels and improved quality of life compared to those receiving standard care. This study concludes that four-layer compression bandaging is an effective treatment modality for chronic venous ulcers, promoting faster healing and enhancing patient comfort.

Keywords: Chronic venous ulcers, compression bandaging, wound healing, clinical study, quality of life.

INTRODUCTION

Chronic venous ulcers (CVUs) represent a significant healthcare challenge, affecting a considerable number of patients worldwide. These ulcers typically result from prolonged venous hypertension and are characterized by slow healing, pain, and a high recurrence rate (1). CVUs can severely impair a patient's quality of life, leading to physical limitations, psychological distress, and increased healthcare costs (2). Traditional management strategies often focus on wound care and lifestyle modifications, but they frequently fall short in promoting significant healing (3).

Compression therapy has emerged as a cornerstone in the management of CVUs, as it aims to improve venous return and decrease venous pressure in the lower extremities. Various compression systems exist, with four-layer compression bandaging (4LCB) gaining attention for its effectiveness (4). The four-layer system typically consists of a combination of

different elastic and inelastic bandages, providing graduated compression that enhances venous circulation while protecting the ulcer (5). Studies have shown that compression therapy can significantly enhance healing rates and reduce ulcer recurrence compared to standard care methods (6).

Despite the established benefits of compression therapy, the optimal bandaging technique remains a topic of debate. A systematic review highlighted that while various compression modalities are effective, four-layer bandaging has shown superior outcomes in several studies (7). However, further clinical evidence is required to substantiate these findings and clarify the specific benefits of four-layer compression bandaging over other methods.

This clinical study aims to assess the impact of four-layer compression bandaging on the healing of chronic venous ulcers. By comparing healing rates, patient-reported pain levels, and quality of

life metrics between patients receiving four-layer compression and those receiving standard care, this study seeks to provide valuable insights into the effectiveness of this treatment modality in clinical practice.

Aim and Objectives:

Aim:

To evaluate the effectiveness of four-layer compression bandaging in promoting the healing of chronic venous ulcers compared to standard care.

Objectives:

1. To measure the percentage reduction in ulcer area over 12 weeks in patients treated with four-layer compression bandaging versus those receiving standard care.
2. To assess patient-reported pain levels and quality of life improvements associated with four-layer compression bandaging.

Materials and Methods:

This clinical study was conducted at a tertiary care hospital and involved 100 patients diagnosed with chronic venous ulcers. Patients

were randomly assigned to receive either four-layer compression bandaging (intervention group) or standard care (control group). The study duration was 12 weeks, during which patients were assessed bi-weekly for ulcer size, pain levels using a visual analog scale (VAS), and quality of life using the Venous Clinical Severity Score (VCSS).

Inclusion Criteria:

- Adults aged 18 years and older with a diagnosis of chronic venous ulcers (≥ 6 weeks duration).
- Patients able to provide informed consent.

Exclusion Criteria:

- Patients with active infections or malignancies in the ulcer area.
- Those with arterial insufficiency, skin allergies to bandaging materials, or other contraindications to compression therapy.

Statistical analyses were performed using SPSS software, with results considered significant at $p < 0.05$.

Results:

Table 1: Comparison of Ulcer Size Reduction

Group	Baseline Ulcer Area (cm ²)	Ulcer Area After 12 Weeks (cm ²)	% Reduction	p-value
Four-Layer Compression Bandaging	20 ± 5	5 ± 2	75%	<0.001
Standard Care	20 ± 5	14 ± 4	30%	<0.001

Table 2: Patient-Reported Outcomes

Outcome Measure	Four-Layer Compression (n=50)	Standard Care (n=50)	p-value
Mean Pain Level (VAS)	2 ± 1	5 ± 1	<0.001
VCSS Score	2 ± 1	5 ± 2	<0.001

Description:

The results indicate a significant reduction in ulcer size for patients treated with four-layer compression bandaging compared to those receiving standard care. Furthermore, patients in the intervention group reported lower pain levels and improved quality of life as measured by VCSS.

Discussion:

This study provides compelling evidence for the effectiveness of four-layer compression bandaging in managing chronic venous ulcers. The significant reduction in ulcer size observed in the four-layer compression group compared to the standard care group aligns with previous research highlighting the superior healing rates associated with compression therapy (8,9). Compression therapy works by reducing venous

pressure, thereby promoting venous return and facilitating wound healing (10).

The marked decrease in patient-reported pain levels and improved quality of life as indicated by the VCSS score further underscores the advantages of four-layer compression bandaging. Chronic venous ulcers often lead to significant discomfort and limitations in daily activities, and effective pain management is a crucial aspect of treatment (11). The findings from this study support the implementation of four-layer compression bandaging as a standard practice for patients with chronic venous ulcers.

While this study strengthens the existing literature, it is essential to acknowledge potential limitations. The sample size, while adequate, may not fully represent the broader population of patients with CVUs. Future studies should aim to include larger and more diverse populations to validate these findings. Additionally, longer follow-up periods may be beneficial to assess the long-term efficacy and recurrence rates associated with different compression modalities (12).

In conclusion, this study highlights the importance of utilizing four-layer compression bandaging as an effective treatment for chronic venous ulcers, demonstrating significant improvements in healing rates, pain levels, and overall patient satisfaction.

Conclusion:

In summary, four-layer compression bandaging significantly enhances the healing of chronic venous ulcers compared to standard care. Patients treated with this method experienced a greater reduction in ulcer size, lower pain levels, and improved quality of life. Given the high prevalence and recurrence rates of chronic venous ulcers, the adoption of four-layer compression bandaging as a standard treatment protocol can greatly benefit patients and healthcare providers alike. Future research should continue to explore the long-term outcomes and potential benefits of this compression method in diverse patient populations.

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