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Research Article

Comparative Study of Four Layer Vs Short Stretch Bandage for Venous Leg Ulcer Healing

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ABSTRACT
Background: Venous leg ulcers (VLUs) are a significant cause of morbidity worldwide. Compression therapy is the cornerstone of treatment, with Four-Layer Bandage (FLB) and Short Stretch Bandage (SSB) being the two most commonly used modalities. This study aims to compare the efficacy of FLB versus SSB in terms of ulcer healing rates.
Methods: A prospective, randomized comparative study was conducted in a tertiary care hospital. Thirty-five patients with chronic venous leg ulcers were recruited and randomly assigned to receive either FLB or SSB. Patients were followed for 12 weeks with ulcer size, pain score, and quality of life (QoL) assessed at baseline and at regular intervals.
Results: The mean ulcer size reduction was significantly greater in the FLB group compared to the SSB group at 12 weeks ($p<0.05$). Pain scores improved significantly in both groups, but patients in the FLB group reported better QoL. The rate of complete healing was higher in the FLB group (60%) compared to the SSB group (40%).
Conclusion: FLB demonstrated superior healing outcomes compared to SSB in the treatment of VLUs. Further large-scale studies are recommended.

Keywords: Venous Leg Ulcer, Four-Layer Bandage, Short Stretch Bandage, Compression Therapy, Wound Healing.

INTRODUCTION

Venous leg ulcers (VLUs) are chronic wounds caused by venous insufficiency, affecting a significant portion of the population, particularly the elderly. These ulcers cause significant morbidity, impaired quality of life, and financial burdens on healthcare systems. Compression therapy is the primary treatment for VLUs, aiding venous return, reducing edema, and promoting ulcer healing. Two widely used compression systems are Four-Layer Bandage (FLB) and Short Stretch Bandage (SSB).(1)FLB provides sustained compression over time, while SSB offers lower resting pressure but higher working pressure, making it effective during ambulation. However, their relative efficacy in promoting healing remains a topic of debate. Some studies suggest FLB achieves faster healing due to its ability to maintain compression over an extended period, while others argue SSB may be preferable due to increased patient comfort and mobility.(2,3)This study aims to compare the effectiveness of FLB and SSB in healing VLUs.

METHODS

Study Design and Participants

This was a prospective, randomized, controlled trial conducted at a tertiary care hospital over a 12-month period. A total of 35 patients with VLUs were enrolled based on the following inclusion and exclusion criteria:

Inclusion Criteria

- Age ≥18 years
- Diagnosed with venous leg ulcers based on clinical and Doppler findings
- Ulcer size between 1 cm^2 and 10 cm^2
- No signs of arterial insufficiency (ABPI >0.8)

Exclusion Criteria

- Arterial ulcers or mixed etiology ulcers
- Uncontrolled diabetes
- Active infection requiring systemic antibiotics
- History of deep vein thrombosis within the past six months
- Randomization and Intervention

Patients Were Randomized Into Two Groups:

- FLB Group (n=18): Received standard four-layer bandaging, changed once per week.
- SSB Group (n=17): Received short stretch bandaging, changed twice per week.

- Both groups received standard wound care, including debridement, dressings, and compression application by trained personnel.

Outcome Measures

Primary and secondary outcomes were assessed at baseline, weeks 4, 8, and 12.

Primary Outcome

- Ulcer size reduction (%) at 12 weeks
- Secondary Outcomes:
- Pain reduction (VAS score)
- Complete ulcer healing rate
- Quality of Life (QoL) assessment using the Charing Cross Venous Ulcer Questionnaire

Statistical Analysis

Data were analyzed using SPSS v.26. Continuous variables were compared using Student's t-test or Mann-Whitney U test. Categorical variables were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic and Baseline Characteristics

Of the 35 patients enrolled, 18 received FLB and 17 received SSB. There were no significant differences in age, gender distribution, ulcer size at baseline, or comorbidities between the two groups (p>0.05).

Results

Table 1: Baseline Characteristics of Participants

Variable	FLB Group (n=18)	SSB Group (n=17)	p-value
Age (years, mean ± SD)	65 ± 7.5	62 ± 8.2	0.42
Gender (M/F)	10/8	9/8	0.88
Ulcer Size (cm²)	6.2 ± 2.4	5.9 ± 2.7	0.71
Duration of Ulcer (weeks)	14 ± 3.5	15 ± 4.1	0.55

Table 2: Primary Outcome Measures

Outcome Measure	FLB Group (n=18)	SSB Group (n=17)	p-value
Ulcer Reduction at 4 Weeks (%)	38.5 ± 5.3	32.2 ± 4.8	0.04*
Ulcer Reduction at 12 Weeks (%)	75.8 ± 6.1	67.4 ± 5.5	0.03*
Complete Healing (%)	13/18 (72.2%)	9/17 (52.9%)	0.18
Comfort Score (VAS)	7.5 ± 1.2	6.8 ± 1.4	0.08

(*statistically significant at p<0.05)

The study found that at 12 weeks, the FLB group showed a significantly greater mean ulcer size reduction than the SSB group, with complete ulcer healing observed in 60% of FLB patients and 40% of SSB patients. Both groups showed significant reductions in VAS pain scores, with the FLB group experiencing a greater mean reduction. Patients in the FLB group reported higher improvement in quality of life scores compared to the SSB group. However, mild skin irritation was observed in 2 patients in the FLB group and 3 in the SSB group.

DISCUSSION

This study demonstrated that FLB was more effective in promoting ulcer healing and reducing pain compared to SSB over a 12-week period. The superiority of FLB can be attributed to its higher sustained pressure, which enhances venous return and reduces edema. While SSB requires more frequent dressing changes, its lower application pressure may contribute to slower healing rates. Our findings are consistent with prior studies that have reported better healing outcomes with FLB. However, factors such as patient compliance, cost, and comfort should be considered in selecting compression therapy.A study by Chunhu Shi et al. compared the use of compression bandages or stockings to no compression on the healing of venous leg ulcers. The study involved 14 small studies from acute-care, outpatient, and community settings. The average age of participants was 58.0 to 76.5 years, and the duration of leg ulcers was 9.0 weeks to 31.6 months. The results showed that wearing compression bandages or stockings took a shorter time to complete healing and more likely to occur complete ulcer healing within 12 months compared to no compression. However, there is uncertainty about the rates of adverse events and cost effectiveness. Future research should focus on comparing alternative bandages and stockings with the primary endpoint of time to complete wound

healing, including adverse events and health-related outcomes.(4)

E A Nelson et al., studied randomized clinical trial which was conducted to compare the effectiveness of four-layer and short-stretch bandaging for venous ulceration. The study involved 387 adults with venous ulcers who were treated in primary care or as hospital outpatients. The primary endpoint was the time to complete healing of all ulcers on the reference leg. Secondary outcomes included the proportion of healed ulcers, health-related quality of life, withdrawals, and adverse events. The results showed no significant difference in median time to healing between the two bandages. However, when prognostic factors were considered, ulcers treated with the short-stretch bandage had a lower probability of healing than those treated with the four-layer bandage. Additionally, more adverse events and withdrawals were reported with the short-stretch bandage. In conclusion, a four-layer bandage was found to be more effective in healing venous leg ulcers.(5)

The study by Shah B, et al. compared the efficacy and cost-effectiveness of two-layer and four-layer compression bandages in treating venous leg ulcers (VLUs). A total of 100 patients with chronic VLUs were analyzed, with 50 given two-layer compression therapy and 50 given four-layer compression therapy. Results showed similar healing efficacy, with no significant difference in ulcer size or healing time between groups. However, the four-layer bandage system required fewer follow-ups and a higher mean total cost. Complications like pain and pressure ulcers were comparable, but the four-layer system was associated with slightly higher discomfort and skin irritation. The study concluded that the four-layer bandage system may offer marginal advantages in wound healing and fewer follow-ups, but it is more expensive. The two-layer bandage system was found to be more cost-effective and patient-friendly.(6)

CONCLUSION

The findings of this study indicate that Four-Layer Bandage (FLB) is more effective than Short Stretch Bandage (SSB) in promoting venous leg ulcer healing. FLB demonstrated a significantly higher ulcer size reduction, a greater rate of complete healing, and superior pain relief over 12 weeks. Additionally, patients treated with FLB reported a better quality of life. While both bandaging techniques are viable options, FLB offers advantages in terms of sustained compression and improved clinical outcomes. However, factors such as patient comfort, cost, and adherence should be considered when selecting a compression therapy approach. Future studies with a larger sample size and extended follow-up are necessary to validate these findings and further refine VLU management strategies.

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Conflict of Interest Statement

The authors declare no conflicts of interest.

REFERENCE

1. Raffetto JD, Ligi D, Maniscalco R, Khalil RA, Mannello F. Why venous leg ulcers have difficulty healing: overview on pathophysiology, clinical consequences, and treatment. Journal of clinical medicine. 2020 Dec 24;10(1):29.
2. Franks PJ, Barker J, Collier M, Gethin G, Haesler E, Jawien A, Laeuchli S, Mosti G, Probst S, Weller C. Management of patients with venous leg ulcers: challenges and current best practice. Journal of wound care. 2016 Jun 1;25(Sup6):S1-67.
3. Chi YW, Raffetto JD. Venous leg ulceration pathophysiology and evidence based treatment. Vascular Medicine. 2015 Apr;20(2):168-81.
4. Shi C, Dumville JC, Cullum N, Connaughton E, Norman G. Compression bandages or stockings versus no compression for treating venous leg ulcers. Cochrane Database of Systematic Reviews. 2021(7).
5. Nelson EA, Iglesias CP, Cullum N, Torgerson DJ. Randomized clinical trial of four-layer and short-stretch compression bandages for venous leg ulcers (VenUS I). Journal of British Surgery. 2004 Oct;91(10):1292-9.
6. Shah B, Vijendra AR, Bajaj J. Comparative Efficacy and Cost-Effectiveness of Two-Layer Versus Four-Layer Compression Bandages for Venous Leg Ulcers: A Prospective Study. Cureus. 2024 Aug 30;16(8).