

Comparison of Kinesiology Tape and Compression Bandages to Manage Leg Edema in a Patient after Liver Transplantation: A Case Report

Daniel Sulka

School of Health & Rehabilitation Sciences, The Ohio State University, Wexner Medical Center, USA

Abstract

Background and Purpose: Patients with end stage renal disease with leg edema often experience pain that impairs walking and overall function. Application of compression bandages and newer kinesiology taping are used to reduce leg edema, but it is not known whether one method is more effective and tolerated than the other in this population. The purpose of this case report was to compare novel kinesiology taping with the more standardized method of short stretch compression bandage wrapping in the acute management of leg edema in a patient with end stage liver disease who underwent a liver transplantation.

Case Description: A 61-year-old male presented to physical therapy at an inpatient rehabilitation facility three months after a liver transplantation with ascites and +3 bilat lower extremity edema that limited his mobility and progress in therapy. Interventions studied include kinesiology tape and short stretch bandaging, with and without non-woven padding.

Outcomes: After 24 hours, the short stretch compression wraps yielded reductions in bilateral lower legs (-3.5 cm each mid calf) with mixed results in the thigh (+2.5 cm right LE; -1.0 cm left LE) and ankle (-2.0 cm right LE; +1.5 cm left LE). Reductions continued after 72 hours of kinesiology tape in all body segments except ankles. The greatest reduction of body segment was seen in the lower leg (-6 cm left, -7.5 cm right) over 96 total hours of treatment. Subjectively, the patient preferred the kinesiology tape and progressed to modified independence on even surfaces with a rollator walker.

Discussion: Both short stretch compression wraps and kinesiology tape yielded meaningful changes over 24-72 hours in the distal lower extremities that translated to improved patient compliance and better pain control. This may provide clinicians with more individualized, cost and time-effective intervention options to improve treatment efficacy and patient compliance.

Introduction

Individuals with end stage liver disease often present with significant leg edema, causing pain and joint range restrictions that impair walking and ability to perform daily life activities. Reductions in leg edema may improve mobility, an important activity for hospitalized patients [1]. To reduce lower extremity edema, application of inelastic bandages such as short stretch bandages are often recommended during initial treatment [2]. Basic active range of motion exercises of the extremities, especially combined with external limb compression, and bed rest with limb elevation is also helpful to patients undergoing edema reduction treatment. If swelling is reduced by antigravimetric means, the effect should be maintained by the wearing of a low-stretch, elastic measure such as compression wraps [3]. However, the disadvantages of low stretch bandages are that they lose pressure quickly following application and need to be reapplied by specialized staff [2]. Stockings may also be difficult to apply and are often not tolerated by patients overnight [2]. Low compliance and commitment of the patient to wear the stockings has been shown to result in poor outcomes [3].

To improve compliance rates, novel approaches to bandaging and compression are required as adjuncts to conventional physiotherapeutic treatments [4]. Kinesiology taping is one such intervention that has been used in the acute and inpatient rehabilitation settings. Han-Ju et al. reported acceptance of kinesiology taping was better than the bandage, and patients reported using the tape longer, with a greater ease of use, increased comfort, and convenience in daily activities [5]. It can be rapidly applied, is air-permeable and water resistant, and

may be used to ameliorate venous flow [6]. Another study has also shown to achieve significantly faster reduction of lower extremity edema compared to standard lymphatic drainage [7]. Few studies have compared kinesiology taping with conventional edema management, and no current studies exist amongst hospitalized patients or patients with end stage liver disease after a liver transplantation [1].

The aim of this case study was to examine the effectiveness of acute bilateral lower extremity (LE) edema management in a patient with end stage liver disease following a liver transplantation in an inpatient rehabilitation hospital. Specifically, the author compared two different approaches in using short stretch bandages (multi-layered with non-woven padding versus single-layered without non-woven padding to mimic variance in methods between clinicians), captured over the span of 24 hours each, to application of kinesiology taping over the span of 24-72 hours as allowed by the patient's length of stay. It was hypothesized that multi-layered compression with non-woven padding would be superior to single layered compression with non-woven padding and kinesiology taping would yield positive changes, but to an unknown extent.

***Corresponding Author:** Daniel Sulka, School of Health & Rehabilitation Sciences, The Ohio State University, Wexner Medical Center, USA, Tel: 614-946-6016; E-mail: daniel.sulka@osumc.edu

Citation: Sulka D (2017) Comparison of Kinesiology Tape and Compression Bandages to Manage Leg Edema in a Patient after Liver Transplantation: A Case Report. Int J Clin Case Stud 3: 122. doi: <https://doi.org/10.15344/2455-2356/2017/122>

Copyright: © 2017 Sulka. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Patient History and Systems Review

The patient is a 61-year-old male who was transferred from an acute hospital to an inpatient rehabilitation facility (IRF) with a history of end stage liver disease due to alcohol cirrhosis and liver transplantation surgery three months prior to his admission. The patient has abstained from drinking alcohol for the four years prior to his transplantation. His co-morbidities included hypoalbuminemia, recurrent ascites, esophageal varices with banding, severe portal hypertensive gastropathy, gastric antral vascular ectasia (GAVE) with argon plasma coagulation, chronic anemia with multiple transfusions, gastro-enteral reflux disease, osteoarthritis, diabetes mellitus 2, remote atrial fibrillation (not on anticoagulation), depression, and anxiety. Following his transplantation surgery, his hospital course was complicated by delirium, deemed to be multi-factorial in etiology. For this reason, a safety coach was required to directly supervise the patient 24 hours/day at the IRF.

Examination

The physical therapist performed an initial examination of the patient on day two of his IRF stay. The patient was alert and oriented to person, place, and time but displayed tangential and nonsensical speech at times. His lower extremity (LE) manual strength grades (via manual muscle testing) were grossly 4+/5 throughout bilaterally and although his active range of motion (ROM) was limited at the end range of hip and knee flexion, it was considered functional for his mobility needs. Moderate ascites was present with +3 bilateral LE pitting peripheral edema noted. His abdominal incision was intact with staples in place and chronic venous stasis changes were apparent on his bilateral shins. The patient appeared generally lethargic, falling asleep during pauses in the examination, and appeared older than his age. In standing he demonstrated forward head/shoulders and forward flexed trunk postural deviations. The patient's sitting balance was good but he required use of a front wheeled walker (WW) for stability in standing. Functionally, rolling and transitions supine to and from sitting required moderate (25-50%) assistance for LE support. Sit-to-stand and ambulatory transfers using the WW required moderate assistance. The patient was only able to tolerate a walking distance of five feet with contact-guard to minimum (<25%) physical assistance and needed a second person to follow behind with a wheelchair for safety. Stairs were not attempted due to safety concerns and no functional outcome measures were initially captured due to his activity intolerance.

Clinical Impression

The patient's LE edema was a primary barrier to greater activity tolerance, active LE ROM, gait progression both with a device and later without a device, standing balance, bed mobility independence, and stair climbing ability. The LE pain/discomfort affected his participation with therapies. The patient's LE edema was initially managed using Ace-bandage wrapping in a figure-8 pattern performed by nursing before short stretch compression bandage wrapping was introduced by the physical therapist. The patient's/nursing staff's compliance with wrapping was inconsistent and was not yielding significant changes in the patient's edema. For these reasons, variable methods of short stretch wrapping techniques and kinesiology taping were trialed. Patient was deemed an appropriate candidate for compression therapy, received medical approval, and consented. No medical interventions or medication administration specifically targeted to reduce the patient's edema were instituted during the duration of the case study.

Intervention

Multi-layered vs single-layered layered short stretch compression over 24 hours

Prior to dependent positioning in the morning, the patient received short stretch compression bandage wrapping of his bilateral lower extremities (metatarsal heads distally to mid-thigh proximally) while supine, with a coin-toss randomization process used to determine whether a multi-layered short stretch system or a single-layered system was worn for 24 hours. The right lower extremity was selected for the multi-layered approach, comprised of a stockinette against the skin, followed by a mid-layer of Delta-Rol cast padding wrapped cylindrically, and a superficial layer of LoPress® bandages (four inch roll distally and six inch roll proximally) moderately stretched. The left lower extremity received only the single-layer of LoPress® bandages compressed directly against the skin.

Kinesiology taping over 72 hours

Following the 24-hour application of the short stretch compression, the wraps were removed while the patient was supine and before dependent positioning in the morning. KinesioTex Gold tape was applied using fan cuts (2 on anterior thighs, 1 over posterior calf, 2 over anterior ankle compartment and dorsum of foot) based on principles of the Kinesiology Taping Association International with clinician discretion on maximizing the surface area and integumentary units involved for edema control [8]. Tape was applied proximal to distal, with tail ends of tape stretched up to 50% tension over edematous tissue. Tails were pre-curved for adhesion. No tension was applied to the ends and the adhesive was activated through rubbing over the taped surface. The kinesiology tape was applied to the patient's thighs and dorsum of feet with the patient in supine while the tape was applied to the posterior calf surface with the patient in standing with his knees partially flexed. The patient and nursing staff were educated to avoid vigorous washing of the taped surface to optimize adherence.

Measurements were obtained by the physical therapist using a standard medical tape measure while recording the largest value over three trials at the largest girth of the thigh and calf, and the figure-of-eight method at the ankle [9].

Outcomes

Short Stretch Compression

After 24 hours, the short stretch compression wraps yielded reductions in bilateral lower legs (-3.5 cm each) with mixed results in the thigh (+2.5 cm right LE; -1.0 cm left LE) and ankle (-2.0 cm right LE; +1.5 cm left LE). Subjectively, the patient reported 8/10 pain in the left LE (single-layered compression wrap without non-woven padding) after 24 hours in comparison to 0/10 pain in the right LE (multi-layered compression wrap with non-woven padding), with the patient choosing to self-maintain the wraps for therapist re-assessment. Pain dissipated with immediate removal and did not affect the treatment plan. Clinical observation revealed bulbous contour of left leg with wrap removal (Figure 1) and increased erythema in comparison to the multi-layered compression wrapping of right LE. In addition, the single-layered wrap fell below the knee and the original proximal margin of mid-thigh post 24 hours.



Figure 1: Photographic comparison of edema. a) Post initial short stretch compression wrapping. b) 24 hours after removal of right leg multi-layered short stretch and left leg single-layered short stretch wrapping. c) Kinesiology taping after 72 hours (excluding initial 24 hours of short stretch wrapping).

Kinesiology tape

After 24 hours of kinesiology tape, reductions from compression wraps were maintained and further reduced in the right thigh (-2.0 cm) and bilateral lower legs (-0.5 cm left LE; -2.5 cm right LE). Reductions continued after 72 hours of kinesiology tape in all body segments (Table 1 and Table 2), although the total net change in the ankles was 0 cm in right LE and +1.5 cm in left LE. The greatest reduction of body segment was seen in the lower leg (-6 cm left, -7.5 cm right) over 96 total hours of treatment (24 hours of compression wrapping followed by 72 hours of kinesiology tape).

Subjectively, the patient had a personal preference for the kinesiology tape, reported greater ease with overall mobility (in comparison to no treatment and short stretch compression systems) and had no pain (0/10) throughout the wearing of the tape.

Clinical observation revealed generally less erythema with kinesiology taping than compression wrapping (Figure 1). Within 24 hours of initial treatment, two pounds were lost per scale measurements and maintained at discharge.

Time of Measurement	Left Thigh	Right Thigh	Left Leg	Right Leg	Left Ankle	Right Ankle
Change 24 hours post (24 hours short stretch compression wraps)	-1	2.5	-3.5	-3.5	1.5	-2
Change 48 hours post (24 Hours kinesiology tape)	2	-2	-0.5	-2.5	1.5	3
Change 96 hours post (72 hours kinesiology tape)	-1.5	-1.5	-2	-1.5	-1.5	-1
Total Change	-0.5	-1	-6	-7.5	1.5	0

Table 1: Changes in edema over time (cm) (grey=increase).

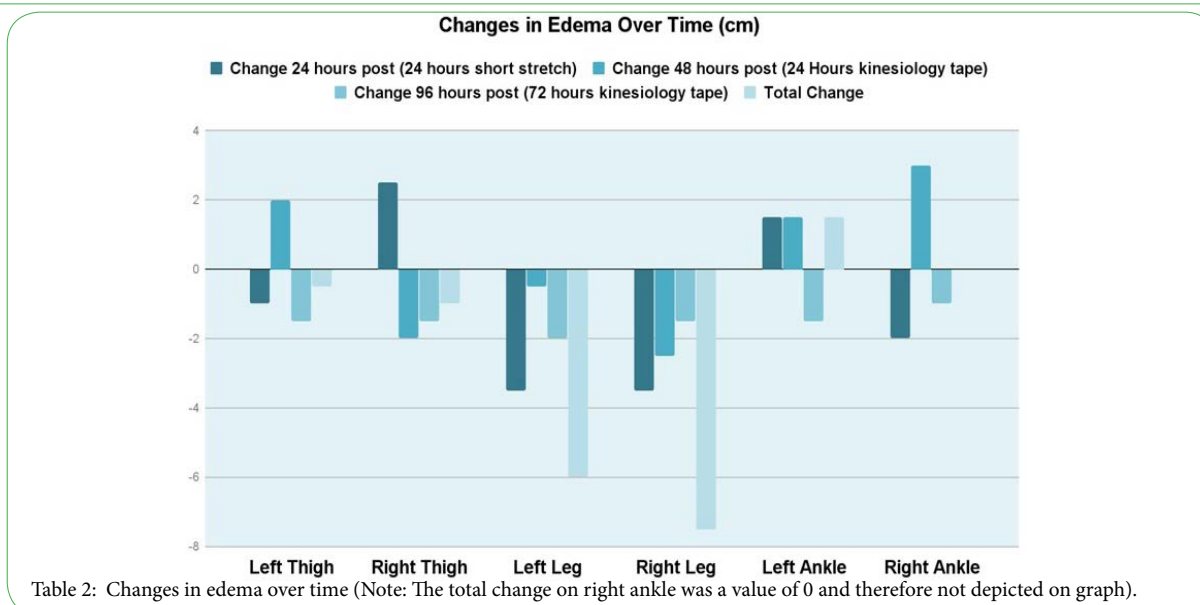


Table 2: Changes in edema over time (Note: The total change on right ankle was a value of 0 and therefore not depicted on graph).

Time of Measurement	Left Thigh	Right Thigh	Left Leg	Right Leg	Left Ankle	Right Ankle
Baseline	46	48	47	48.5	60.5	63
24 Hours post (24 hours of Lo-press)	45	50.5	43.5	45	62	61
48 Hours post (24 hours of kinesiology tape)	47	48.5	43	42.5	63.5	64
96 hours post (72 hours kinesiology tape)	45.5	47	41	41	62	63

Table 3: Edema over time (actual values in cm).

The patient discharged to a Skilled Nursing Facility (SNF) due to continued cognitive deficits (most notably short-term memory) and inability of the wife to provide recommended level of intermittent daily supervision (i.e. during waking hours, check on patient every 1-3 hours due to cognitive deficits). The patient was cleared by the physical therapist to be up ad lib with a rollator walker on the nursing unit and needed contact guard physical assist to climb four stairs with endurance limited due to fatigue. Balance progressions were tolerated without a device at that time with a Berg Balance Scale score of 49/56 (a score of < 45 indicates individuals may be at greater risk of falling in elderly population) [11].

Discussion

The data from this case study suggests that both a multi-layered short stretch compression system with non-woven padding and kinesiology taping for edema were effective in acute edema control of the lower leg in a patient with end stage renal disease after a liver transplantation, but not effective in edema control of the thigh or ankle. The changes translated to improved patient comfort through reduced pain in his LE's, increased mobility and therapy activity tolerance, and compliance to the edema intervention.

It was hypothesized and supported in the literature that the multi-layered approach would be more effective than the single-layered layered short stretch wrap [10], however the goal was to address current practice amongst clinicians using single-layered edema wraps. The patient's report of pain, increase in left ankle edema (+1.5 cm over 24 hours) and physical evidence of asymmetrical, bulbous contour in his distal lower extremity strongly supports the use of a multi-layered approach (Figure 1.b). Due to the favorable changes seen in the lower leg and absence of literature on kinesiology taping for acute edema management in patients with a chronic disease, this case study may be useful for the clinical decision making amongst interventions when considering factors such as the duration of need, severity, application time, and costs of treatments. An internal cost analysis revealed bilateral LE multi-layered LoPress® wrapping (stockinette, Delta-Rol cotton gauze, LoPress® bandages) could reach \$472 over one month, while kinesiology tape cost of two rolls yields approximately \$26 over one month (average found over four internet sites). In addition to costs, the compliance of patients with the intervention must be considered. One study reported a non-compliance rate of 33% with compression devices [4]. This patient was able to wear one application of the taping throughout 72+ hours without need for continued clinician management in comparison to the necessity of daily wrapping with multi-layered systems (sometimes multiple times per day if swelling dissipates) that may compromise consistency between various staff and thus saving valuable treatment time in the inpatient rehabilitation setting. However, if a patient is discharging to home or an alternative level of care such as a SNF, the kinesiology taping would require skilled clinicians or capable caregivers to learn the techniques for routine application for the effects to persist.

Limitations ensued when the patient was discharged to an alternate level of care from the IRF faster than anticipated limiting the duration of the study, equality of the duration of treatments (short stretch compression versus the kinesiology tape), and whether results would be maintained through follow up. Ideally, equal treatment duration would have been implemented but the discharge date was shortened when the disposition changed from home to a SNF. Kinesiology tape was implemented sooner to permit inclusion in the study prior to discharge at the IRF, with a final measure of the kinesiology tape only after the patient stayed the weekend at the SNF (72 hours). Another limitation is the lack of available evidence on kinesiology taping for edema management. Current randomized controlled trials in the literature are limited primarily to upper extremity edema in women after breast cancer and lower extremity edema in postmenopausal women with chronic venous insufficiency [4,6,12-14]. Further research and exploration in this field is necessary to determine efficacy and generalization amongst populations.

Conclusion

Both a multi-layered short stretch compression system with non-woven padding and kinesiology taping for edema may be beneficial in acute edema control of the lower leg in a patient with end stage renal disease after a liver transplantation, but not effective in edema control of the thigh or ankle. This may be associated with improved patient compliance to edema intervention, reduced pain, and improved activity tolerance and mobility.

Acknowledgements

I would like to thank Dr. Anne Kloos, Alex Seifert and Karen Hock for their expertise and contributing efforts; Alison Carlozzo and Christine Sulka for your inspiration and support.

Competing Interests

The authors declare that they have no competing interests.

References

- Mathews S, James S, Anderson JD, Merchant M, Benenati S, et al. (2015) Effect of elastic bandage wraps on leg edema in patients before and after liver transplant. *Prog Transplant* 25: 302-6, 331.
- Mosti G, Cavezzi A, Partsch H, Urso S, Campana F (2015) Adjustable Velcro® Compression Devices are More Effective than short stretch Bandages in Reducing Venous Edema in the Initial Treatment Phase: A Randomized Controlled Trial. *Journal of Vascular Surgery* 62: 790.
- International Society of Lymphology (2013) The diagnoses and treatment of peripheral lymphedema: 2013 consensus document of the international society of lymphology. *Lymphology* 46: 1-11.
- Aguilar-Ferrández ME, Moreno-Lorenzo C, Matarán-Peñarrocha GA, García-Muro F, García-Ríos MC (2014) Effect of a Mixed kinesiology Taping-Compression Technique on Quality of Life and Clinical and gait parameters in postmenopausal women with chronic venous insufficiency: Double-blinded, randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 95: 1229-1239.

5. Tsai HJ, Hung HC, Yang JL, Huang CS, Tsao JY (2009) Could kinesiology tape replace the bandage in decongestive lymphatic therapy for breast-cancer-related lymphedema? A pilot-study. *Support Care Cancer* 17: 1353-1360.
6. Aguilar-Ferrández ME, Castro-Sánchez AM, Matarán-Peñarocha GA, Guisado-Barrilao R, García-Ríos MC (2014) A randomized controlled trial of a mixed kinesiology taping-compression technique on venous symptoms, pain, peripheral venous flow, clinical severity and overall health status in postmenopausal women with chronic venous insufficiency. *Clinical Rehabilitation* 28: 69-81.
7. Białoszewski D, Woźniak W, Zarek S (2009) Clinical efficacy of kinesiology taping in reducing edema of the lower limbs in patients treated with the ilizarov method--preliminary report. *Ortop Traumatol Rehabil* 11: 46-54.
8. Kinesiology Taping Association International KT2: advanced concepts and corrective techniques of the kinesiology taping method (2013) kinesiology IP, LLC, Albuquerque.
9. Tatro-Adams D, McGann SF, Carbone W (1995) Reliability of figure-of-eight method of ankle measurement. *J Orthop Sports Phys Ther* 22 161-163.
10. Badger CM, Peacock JL, Mortimer PS (2000) A randomized, controlled, parallel-group clinical trial comparing multilayer bandaging followed by hosiery alone in the treatment of patients with lymphedema of the limb. *Cancer* 88: 2832-2837.
11. Berg KO, Maki BE, Williams JL, Holliday PJ, Wood-Dauphinee SL et al. (1992) Clinical and laboratory measures of postural balance in an elderly population. *Arch Phys Med Rehabil* 73: 1073-1080.
12. Taradaj J, Halski T, Rosinczuk J, Dymarek R, Laurowski A, et al. (2016) The influence of kinesiology taping on the volume of lymphoedema and manual dexterity of the upper limb in women after breast cancer treatment. *Eur J Cancer Care (Engl)* 25: 647-660.
13. Lubińska A, Mosiejczuk H, Rotter I (2015) kinesiologytaping - treatment of upper limb lymphoedema in patients after breast cancer surgery. *Pomeranian J Life Sci* 61:173-175.
14. Pekyavaş NÖ, Tunay VB, Akbayrak T, Kaya S, Karataş M (2014) Complex decongestive therapy and taping for patients with postmastectomy lymphedema: a randomized controlled study. *Eur J OncolNurs* 18: 585-590.