

# Kinesiotaping vs elastic bandage in acute ankle sprains in emergency department: A randomized, controlled, clinical trial.

Yahya Ayhan Acar (\*), Banu Karakus Yilmaz (\*\*), Murat Karadeniz (\*\*\*), Erdem Cevik (\*\*\*\*), Ozlem Uzun (\*\*\*\*\*), Orhan Cinar (\*\*\*\*\*)

## ÖZET

**Acil serviste akut ayak bileği burkulmalarında kineziyotaping ile elastik bandajın karşılaştırılması: Randomize, kontrollü, klinik çalışma.**

Acil serviste akut ayak bileği burkulmalarının standart tedavisi kompresyondur. Kineziyotape akut ve kronik yumuşak doku travmalarında yeni bir tedavi yöntemidir. Bu tek merkezli, prospektif, randomize çalışmamızda akut lateral ayak bileği burkulmalarının tedavisinde kineziyotaping ile elastik bandaj uygulamalarının kısa dönem sonuçlarını karşılaştırmayı amaçladık. Hastalar elastic bandaj (n=35) veya kineziyotaping (n=38) gruplarından birine randomize edildi. 0, 3, 7 ve 28. Günlerdeki Karlsson skorları, ağrı skorları, ayak bileği çevresi ve analjezi ihtiyacı karşılaştırıldı. Gruplar arasında tüm parametrelerde herhangi bir fark yoktu. Sonuç olarak, kineziyotaping akut stabil ayak bileği burkulmalarının tedavisinde elastic bandaj kadar etkilidir fakat elastic bandaja bir üstünlüğü yoktur.

**Anahtar Kelimeler:** Kineziyotaping, elastik bandaj, ayak bileği burkulması

## SUMMARY

Compression is the standard of care of stable acute ankle sprains in emergency department. Kinesiotaping is a novel treatment method in acute and chronic soft tissue traumas. We aimed to compare the kinesiotaping and elastic bandage in the treatment of acute lateral ankle sprain in short term period. We conducted a single-center, prospective, randomized controlled clinical trial. Patients with acute ankle sprain were randomized into two groups either elastic bandage (n=35) or kinesiotaping (n=38). Karlsson scores, pain scores, ankle girth and additional analgesic needed were compared in 0, 3, 7, and 28 days. There was not any significant difference between two groups in all parameters. In conclusion, kinesiotaping seems as effective as elastic bandage in the treatment of acute stable ankle sprains with no advantage over it in the emergency department.

**Key words:** Kinesiotaping, elastic bandage, ankle sprain.

## Introduction

Ankle sprain is a common musculoskeletal system injury in the emergency department (ED) (1). In the treatment of acute stable ankle sprain, early mobilization and taping, elastic bandage and semi-rigid brace have gained importance as functional methods without a clear consensus. These treatments are also completed with the rest, ice, compression and elevation (RICE) application, even the RICE protocol has been reported as a treatment itself (1).

Elastic bandage is an easy to use and cheaper method but it is uncomfortable for the patient (especially restriction of daily activities) and improper application of elastic bandage can worsen edema. Kinesiotaping effects not only by decreasing edema, but also enhancing proprioception and decreasing pain. Its disadvantages are mainly being more expensive and requiring additional training. Figure 1 illustrates the application of kinesiotaping.

Kinesiotaping was applied by Dr. Kenzo Kase for the first time in 1979 and since the 1990s it has been used in the United States. Pathophysiology is not fully explained. According to Kenzo, kinesiotaping decreases the pain with facilitating neurological system, restore the muscle functions with supporting weakened muscles, reduces subcutaneous lymphatic fluid or hemorrhage and reduce muscle spasm. There are some randomized controlled trials about kinesiotaping used at shoulder impingement, Achilles tendinopathy, chronic back pain, patellofemoral pain syndrome and lymphedema treatment. Furthermore, the positive effects of kinesiotaping on pain and range of motion, especially in the early period, were shown (2). However there is no study about the effect of kinesiotaping on acute stable ankle sprain.

We aimed to compare the kinesiotaping and elastic bandage in the treatment of acute lateral ankle sprain in short term period.

## Material and methods

### Study design

We conducted this prospective, randomized, blinded, clinical study in a tertiary care setting's ED of which had an annual 600000 visits between July 2013 and November 2013. Study was registered to clinicaltrials.org website (ClinicalTrials.gov identifier: NCT01995318).

### Selection of participants

The patients whom reported an acutely twisted ankle were included in the study. Exclusion criteria were; patients under 18, pregnancy, legally incompetent to take responsibility, fracture at ankle and/or foot, unstable sprains requiring stabi-

\* Department of Emergency Medicine, Etimesgut Military Hospital, Ankara, Turkey.

\*\* Department of Emergency Medicine, Sisli Hamidiye Etfal Research and Training Hospital, Istanbul, Turkey.

\*\*\*Department of Physical Medicine and Rehabilitation, Corlu Military Hospital, Tekirdag, Turkey.

\*\*\*\*Department of Emergency Medicine, Van Military Hospital, Van, Turkey.

\*\*\*\*\*Department of Emergency Medicine, Bagcilar Education and Training Hospital, Istanbul, Turkey.

\*\*\*\*\*Department of Emergency Medicine, Gulhane Military Medical Academy, Ankara/TURKEY

Reprint request: Orhan Cinar

Adres: GATA Acil Tıp AD, Etilik, Ankara 06010

e-mail: orhancinar@yahoo.com

Makalenin Geliş Tarihi: Feb 08, 2015 • Kabul Tarihi: Dec 24, 2014 • Çevrim İçi Basım Tarihi:15 Şubat 2015

lization with cast, 48 hours since injury occurrence, multiple injuries, have neurologic deficit at lower extremities, chronic instability of ankle, had surgical treatment to ankle, knee and hip.

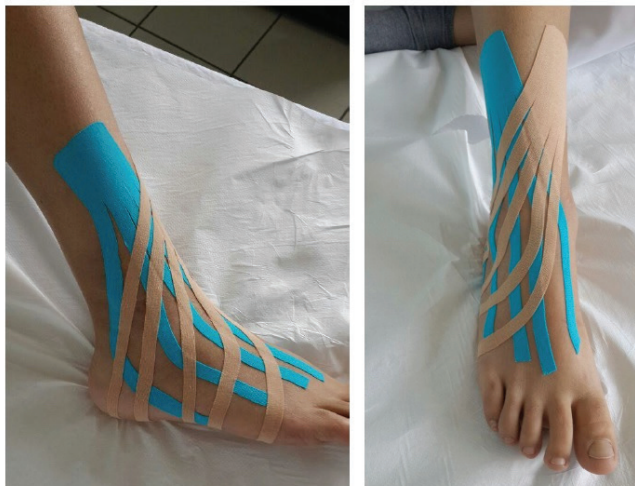


Figure 1. Application of kinesiotaping.

## Interventions

After signing an informed consent form, eligible subjects were recruited for the study and were randomly assigned to a kinesiotaping group or elastic bandage group. The simple random number table used for randomization. All patients included in the study were given standard therapy which includes rest for 2 days, elevation of the affected ankle from heart level, ice application for 20 minutes 3 times per day for 5 days. The kinesiotaping (Kinesio Tex Gold® tapes) and elastic bandage were applied for 5 days. Lymphatic correction was applied depending on the size of ankle with 2 fan cut tapes with light paper-off tension on the medial and lateral aspects of the ankle (3). Both modalities were applied by the same certified researcher.

Pain scores were obtained using numeric pain rating scale (NPRS) from 0 to 10, with 0 analogous to “no pain” and 10 equivalent to “the most severe pain encountered in life”.

Both groups were used also prescribed non-steroidal anti-inflammatory drugs (NSAID- diclofenac sodium 75 mg per oral). After regular use for two days, patients were told to take the additional doses if only they had pain. At the control days, they were questioned whether they used any additional dose.

Active range of motion (ROM) was measured with a standard manual goniometer when patients were seated on a treatment table with the knees fully extended (0°) and the feet hanging off the end of the table.

Follow up measurements were done at 0, 3, 7, and 28 day by a blinded investigator. To provide blinding, in follow ups patients were seen firstly by researcher who applied the kinesiotaping or elastic bandage. Then the application was removed and then the follow-up measurements were done by another researcher who did not know in which group was the patient randomized. After this measurements, primary researcher applied the therapy again.

## Outcome measures

The primary outcome measure was ankle joint function which was assessed with Karlsson scoring scale at the day

seven. This is a statistically validated scoring scale devised by Karlsson and Peterson. From a maximum score of 90, points are given for a series of eight categories assessing the following areas: pain (20 points), swelling (10 points), instability (subjective) (15 points), stiffness (5 points), stair climbing (10 points), running (10 points), work activities (15 points), and the use of a support device (5 points) (4).

Secondary outcome measures were ankle girth (swelling) changes, the difference in NPRS compared with initial presentation and the use of NSAID after 2 days. Ankle girth was defined as the circumferential measurement of the ankle at the level of both malleoli.

## Statistically analysis

Statistically analysis were performed by SPSS 15.0 packet programme (SPSS Inc, Chicago, IL) Normal distribution was assessed by Kolmogorov-Smirnov test. We have used Generalized Linear Model Repeated Measures to compare difference by time in parameters between group I and II. Chi-square test was used to evaluate the difference between two groups in analgesic use. Sample size was calculated as 28 for each group. ( $\mu$  (0): 40,  $\mu$  (1): 48,  $\sigma$ : 15, two-sided,  $\alpha$ : 0.05, power of test: 0.80)

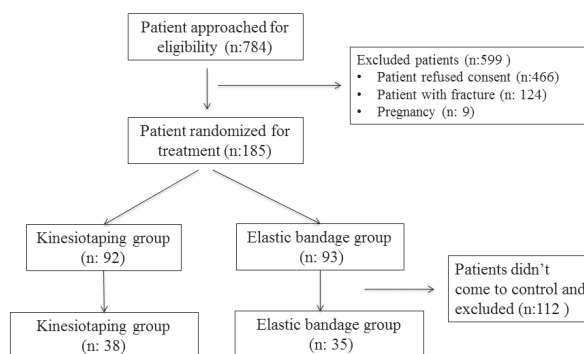


Figure 2. Flowchart of the study

## Results

185 patients were enrolled to the study but 73 of them were attended to 7-day follow-ups. 38 of them in kinesiotaping group and 35 of them were in elastic bandage group. (Figure 2). Demographics were given in Table 1. Both of groups showed normal distribution and they were not statistically different by the mean of age, height, weight and BMI.

For the improvement of Karlsson score in day 1, 3, 7 and 28 both groups showed significant improvement (Fig 1) but the change of Karlsson score by the time was not significant between kinesiotaping and elastic bandage groups. ( $df=1$ , Mean square=167.4,  $F=2.4$ ,  $p=0.144$  comparison of Group I & II (according to GLM varyans analysis)). (Figure 3, Table 2).

NPRS was decreased significantly in day 1, 3, 7 and 28. The change of NPRS score by the time was not significant between groups. ( $df=1$ , Mean square=0.012,  $F=0.005$ ,  $p=0.943$  comparison of Group I & II (according to GLM varyans analysis)). (Table 2 and Table-3).

The Ankle Girth was decreased significantly in day 1, 3, 7 and 28. The change of Ankle Grit score by the time was

**Table 1.** Demographics and baseline characteristics of the patients enrolled in study.

	Kinesiotaping group	Elastic bandage group	p	95% CI
Number of subjects	38	35	NA	NA
Age (Mean±SD)	36.86±11.09	34.46±9.93	0.122	-0.65-5.47
Male sex (%)	44	47	0.739	-0.121-0.17
BMI (Mean±SD)	27.27±4.78	26.16±4.68	0.110	-0.26-2.49
NPRS (Mean±SD)	5.30±2.36	4.91±2.26	0.266	-0,29-1.06
Initial ankle girth cm(Mean±SD)	53.79±3.82	52.81±3.88	0.083	-0.13-2.11

**BMI:** Body mass index, **NPRS:** Numeric pain rating scale, **CI:** Confidence interval, **NA:** Not applicable, **SD:** Standard deviation

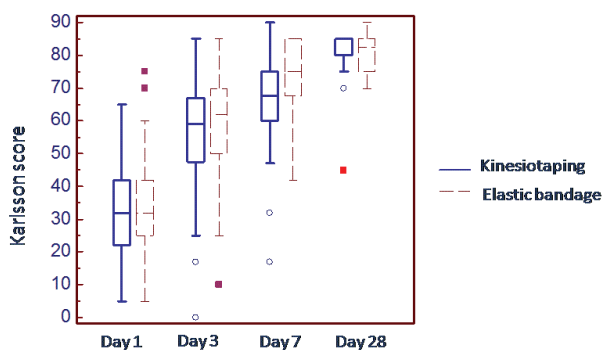
not significant between groups. (df=1, Mean square=7630.2, F=0.381, p=0.544 comparison of Group I & II (according to GLM varyans analysis).

Both groups did not show any statistically significant difference in analgesic use (p=0.001).

## Discussion

This prospective randomized trial showed that kinesiotaping as effective as elastic bandage in the treatment of acute stable ankle sprains.

Recently, functional therapies were suggested rather than surgical treatments because of the joint rigidity, ankle stiffness, impaired ankle mobility, and increased complication risk (5-7). However, surgical treatments must be considered in athletes due to decrease in sprain recurrence and objective instability (7). Below-knee cast was recommended in grade 3 sprains (8). However functional therapies were suggested, there is not enough study comparing them each other.



**Figure 3.** Karlsson scores for kinesiotaping and elastic bandage groups.

Bracing was reported superior to taping but in these studies rigid bands were used in taping (5-7). We could not find any study conducted with kinesiotaping in acute ankle sprains. Donec et al. found a decrease in edema and pain scores by kinesiotaping lymphatic correction in early rehabilitation after knee arthroplasty (3). We applied kinesiotaping lymphatic correction in acute ankle sprains and observed decrease in edema and

pain scores. Ordinarily, kinesiotaping lymphatic correction is supported by ligament and tendon correction applications of kinesiotaping after acute phase in order to prevent recurrence of sprains. In our study, kinesiotaping lymphatic correction improved Karlsson sore, NPRS, and ankle girth.

In early inflammatory phase, it is essential to control the excessive edema in order to optimize the recovery process. RICE protocol is offered for this purpose (1, 7). According to our findings, kinesiotaping lymphatic correction can be used to control this edema.

Balance and coordination exercises are important in rehabilitation process of ankle sprains (7, 9). Studies on effects of kinesiotaping in balance are controversial (10-14). Fayson et al. reported that kinesiotaping can be used in prophylaxis of ankle sprains (11).

**Table 2.** Comparison of K Score of groups

Days	Group I	Group II
Day 0*	32.1±13.3a,b,c	34.4±13.8g,h,i
Day 3*	57.4±15.9a,d,e	59.2±16.5g,j,k
Day 7*	66.1±15.3b,d,f	73.2±12.2g,j,l
Day 28 *	77.8±10.3c,e,f	80.6±6.8i,k,l

for all letter p<.0001 (according to ANOVA);

\*df=1, Mean square=167.4, F=2.4, p=0.144 comparison of Group I & II (according to GLM varyans analysis).

Terada et al. reported that restriction in dorsi-flexion occurs especially after ankle sprains and there was not adequate studies with high level of evidence in the subject of improving restriction in dorsi-flexion (15). In our study, inversion, eversion and dorsiflexion scores of patients in both groups were increased but these increases weren't statistically significant and there was no difference in both groups. Merino et al. investigated the effect of kinesiotaping on ROM and pain in athletes and they concluded that kinesiotaping could be used before sports activity to reduce pain and muscle cramps (16). Hypothesized theory of the effect of kinesiotaping on active range of motion is an increase in blood circulation in the taped

area; a physiological change that may facilitate an increased range of motion within the muscle, and so the application of kinesiotaping provides sensory feedback that reduces fear of movement and thus increases range of motion (2). Another theory suggests that the kinesiotaping stimulates cutaneous mechanoreceptors at the taped area, and this stimulation may affect the ROM (16, 17).

**Table 3:** Comparison of NPRS of groups

Days	Groups	
	Group I	Group II
Day 0*	5.2±2.3 a,b,c	4.9±2.2 g,h,i
Day 3*	2.9±2.5 a,d,e	2.5±1.9 g,j,k
Day 7*	2.3±2.3 b,d,f	1.6±1.8 g,j,l
Day 28 *	1.5±2.3 c,e,f	1.8±1.4 i,k,l

a,b,c,d,e,f; p<.0001 (according to ANOVA);  
\*df=1, Mean square=0.012, F=0.005, p=0.943 comparison of Group I & II (according to GLM varyans analysis).

Another finding of this study was the decrease of NPRS. The proposed mechanism for the pain relieving effect of kinesiotaping is through the stimulation of sensory pathways in the nervous system, and application lifts the skin and directly reduces pressure on subcutaneous nociceptors (17). Meta-analysis and reviews on this subject concluded that there was not sufficient evidence (2, 17). We also supposed that kinesiotaping can increase the joint's range of motion by reducing edema.

In ED, treatment of acute ankle sprains elastic bandage have disadvantages especially for patient's discomfort. Elastic bandage disables the patient to put on shoes even slippers. Kinesiotaping necessitates certification but in selected patients it can be a comfortable method. We considered that applying a certificated method (kinesiotaping) may be better rather than a non-certificated (elastic bandage) method. Also kinesiotaping may have future applications in many other soft tissue traumas in ED.

**Table 4:** Comparison of Ankle Girth

Days	Groups	
	Group I	Group II
Day 0*	53.7±3.8 a,b,c	52.8±3.8 g,h,i
Day 3*	52.8±3.7 a,d,e	51.1±3.8 g,j,k
Day 7*	51.8±3.8 b,d,f	51.4±4.1 g,j,l
Day 28 *	51.2±3.9 c,e,f	53.1±6.8 i,k,l

a,b,c,d,e,f; p<.0001 (according to ANOVA);  
\*df=1, Mean square=7630.2, F=0.381, p=0.544 comparison of Group I & II (according to GLM varyans analysis).

## Limitations:

Definite grading of sprains was not performed with magnetic resonance imaging. Long term follow-up was not performed. We did not ask the comfort of patients with the both treatment that can be valuable additional data.

## Conclusion

Our study showed that kinesiotaping is as effective as elastic bandage in the treatment of acute ankle sprains in ED. Kinesiotaping may be a novel application in ED for ankle sprains. We considered that kinesiotaping applications in ED have potential for extended clinical conditions.

## References:

1. Van den Bekerom MP, Struijs PA, Blankevoort L, Welling L, van Dijk CN, Kerkhoffs GM. What is the evidence for rest, ice, compression, and elevation therapy in the treatment of ankle sprains in adults? *Journal of athletic training*. 2012;47(4):435-43.
2. Kalron A, Bar-Sela S. A systematic review of the effectiveness of Kinesio Taping—fact or fashion? *European journal of physical and rehabilitation medicine*. 2013;49(5):699-709.
3. Donec V, Krisciunas A. The effectiveness of Kinesio Taping(R) after total knee replacement in early postoperative rehabilitation period. A randomized controlled trial. *European journal of physical and rehabilitation medicine*. 2014;50(4):363-71.
4. Boyce SH, Quigley MA, Campbell S. Management of ankle sprains: a randomised controlled trial of the treatment of inversion injuries using an elastic support bandage or an Aircast ankle brace. *British journal of sports medicine*. 2005;39(2):91-6.
5. Kerkhoffs GM, Struijs PA, Marti RK, Assendelft WJ, Blankevoort L, van Dijk CN. Different functional treatment strategies for acute lateral ankle ligament injuries in adults. *The Cochrane database of systematic reviews*. 2002(3):CD002938.
6. Kemler E, van de Port I, Backx F, van Dijk CN. A systematic review on the treatment of acute ankle sprain: brace versus other functional treatment types. *Sports medicine*. 2011;41(3):185-97.
7. Petersen W, Rembitzki IV, Koppenburg AG, Ellermann A, Liebau C, Bruggemann GP, et al. Treatment of acute ankle ligament injuries: a systematic review. *Archives of orthopaedic and trauma surgery*. 2013;133(8):1129-41.
8. Lamb SE, Marsh JL, Hutton JL, Nakash R, Cooke MW, Collaborative Ankle Support T. Mechanical supports for acute, severe ankle sprain: a pragmatic, multicentre, randomised controlled trial. *Lancet*. 2009;373(9663):575-81.
9. Tiemstra JD. Update on acute ankle sprains. *American family physician*. 2012;85(12):1170-6.
10. Miralles I, Monterde S, Montull S, Salvat I, Fernandez-Ballart J, Beceiro J. Ankle taping can improve proprioception in healthy volunteers. *Foot & ankle international*. 2010;31(12):1099-106.
11. Fayson SD, Needle AR, Kaminski TW. The effects of ankle Kinesio taping on ankle stiffness and dynamic balance. *Research in sports medicine*. 2013;21(3):204-16.
12. Halseth T, McChesney JW, Debeliso M, Vaughn R, Lien J.

- The effects of kinesio taping on proprioception at the ankle. *Journal of sports science & medicine*. 2004;3(1):1-7.
13. Simon J, Garcia W, Docherty CL. The effect of kinesio tape on force sense in people with functional ankle instability. *Clinical journal of sport medicine : official journal of the Canadian Academy of Sport Medicine*. 2014;24(4):289-94.
  14. Shields CA, Needle AR, Rose WC, Swanik CB, Kaminski TW. Effect of elastic taping on postural control deficits in subjects with healthy ankles, copers, and individuals with functional ankle instability. *Foot & ankle international*. 2013;34(10):1427-35.
  15. Terada M, Pietrosimone BG, Gribble PA. Therapeutic interventions for increasing ankle dorsiflexion after ankle sprain: a systematic review. *Journal of athletic training*. 2013;48(5):696-709.
  16. Merino-Marban R, Mayorga-Vega D, Fernandez-Rodriguez E. Effect of kinesio tape application on calf pain and ankle range of motion in duathletes. *Journal of human kinetics*. 2013;37:129-35.
  17. Williams S, Whatman C, Hume PA, Sheerin K. Kinesio taping in treatment and prevention of sports injuries: a meta-analysis of the evidence for its effectiveness. *Sports medicine*. 2012;42(2):153-64.