

# The impact of ankle kinesio taping on pain management in patients with acute ankle sprain

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## ABSTRACT

**BACKGROUND:** The objective of this study was to assess the efficacy of Kinesio Tape (KT) application as a complementary treatment for patients with acute ankle sprain (AAS) in an Emergency Department (ED) setting.

**METHODS:** A prospective, quasi-randomized controlled trial was conducted in a tertiary care ED. Adult patients diagnosed with isolated, stable Grade 1 and Grade 2 AAS were included. Patients were divided into two groups: the KT group, where KT was applied in addition to conventional treatment, and the control group, receiving only conventional treatment. Pain intensity, analgesic usage, and patient satisfaction were assessed.

**RESULTS:** While pain levels were similar between both groups at baseline and the 30th minute, the control group reported significantly lower pain levels at the 60th minute ( $p=0.575$ ,  $p=0.437$ , and  $p=0.042$ , respectively). The KT group exhibited reduced analgesic drug consumption and higher patient satisfaction levels ( $p<0.001$  and  $p=0.003$ , respectively). Logistic regression analysis revealed that the difference in pain intensity at the 60th minute lost significance, while analgesic usage and patient satisfaction remained significant ( $p=0.631$ ,  $p=0.003$ , and  $p=0.026$ , respectively).

**CONCLUSION:** KT application, as a complementary treatment, may reduce the need for analgesics and enhance patient satisfaction in patients with AAS in the ED. Further research is needed to refine its application and confirm its effectiveness in standard AAS treatment protocols.

**Keywords:** Ankle sprain; analgesic medication; kinesio tape; emergency department; patient satisfaction.

## INTRODUCTION

Acute ankle sprains (AAS) are a common cause of referrals to primary care physicians and Emergency Departments (EDs). They occur at a rate of approximately one injury per 10,000 individuals daily in the general population. This incidence significantly increases within the sports community, including both amateur and professional athletes, where AAS accounts for 20% to 25% of all reported sports-related injuries.<sup>[1-3]</sup>

The primary mechanism of acute AAS involves a combination of foot inversion and adduction. In ankle anatomy, the lateral ankle ligaments-namely the anterior talofibular, calcaneofibular, and posterior talofibular ligaments-are particularly prone to injury through this mechanism.<sup>[3,4]</sup> The predominant injury mechanism for AAS entails the same combination of foot inversion and adduction, leading to frequent injuries of these lateral ankle ligaments. AAS can typically be diagnosed clinically.

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cally, and such cases rarely require surgical intervention. The routine use of Magnetic Resonance Imaging (MRI) is uncommon in the diagnostic process. However, MRI is necessary for cases with unclear clinical findings, chronic ankle instability, or when a detailed assessment of ligaments is essential for surgical planning.<sup>[5]</sup>

In the ED, AAS cases are classified based on clinical examination. Ankle ligament injuries are traditionally categorized into three grades (Grade 1, Grade 2, and Grade 3), reflecting the severity of the injury. Grade 1 injuries, which indicate ligament stability, respond well to conservative treatments. These include rest, cryotherapy, and the development of therapeutic strategies that involve the local or systemic administration of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). Grade 2 injuries, which can present as either stable or unstable, necessitate a nuanced approach to management. For stable Grade 2 ankles, a comprehensive strategy involving rest, cryotherapy, and therapeutic regimens with NSAIDs, either administered locally or systemically, is recommended. Conversely, unstable Grade 2 ankles require immobilization, typically through the use of splints, for those undergoing conservative treatment.<sup>[4,6]</sup> All Grade 3 injuries, characterized by inherent instability, generally require surgical intervention.<sup>[7]</sup> Additionally, patients displaying any form of instability are routinely referred to orthopedic or foot and ankle specialists for further consultation in the ED.

Previous research and clinical practice have highlighted Kinesio Tape (KT) as a potential enhancement to standard analgesic care.<sup>[8]</sup> Developed in the 1970s by Japanese chiropractor Dr. Kenzo Kase, KT is a non-pharmacological, elastic therapeutic tape with remarkable stretchability-up to 140% of its original length. This elasticity is believed to offer benefits when applied to the skin, providing a therapeutic stretching effect. KT serves as a valuable adjunct to treatment, exerting multifaceted influences. These include the modulation of muscle function, the enhancement of cutaneous proprioception, the facilitation of improved local circulation, and the support of precise joint positioning.<sup>[9,10]</sup> Furthermore, KT offers enhanced patient comfort compared to conventional rigid bandages, allowing for a broader range of joint motion due to its inherent elasticity.<sup>[11]</sup>

While KT has been applied in the management of ankle injuries by sports physicians and practitioners of complementary medicine, its adoption into the standard practices of Emergency Physicians (EPs) has not yet occurred. Remarkably, no previous research has investigated the impact of KT on pain resulting from AAS within the ED setting. The primary aim of our study is to assess the efficacy of KT as a complementary intervention alongside conventional analgesic therapy in patients presenting with stable AAS.

## MATERIALS AND METHODS

A prospective quasi-randomized controlled trial was con-

ducted at the Emergency Department of Training and Research Hospital in Muğla Sıtkı Koçman University, Türkiye, from January 1 to October 31, 2023. The study was approved by the local Institutional Review Board and the regional Medical Ethics Committee (Reference number: 10. 08. 2022-13/ XIII). All patients provided written informed consent prior to their inclusion in the study.

For the study's power analysis, an effect size of 0.75 was derived from the data of a reference study using G-Power 3.1 software. With a significance level of 0.05, a power of 85%, and a confidence level of 95%, it was determined that a minimum of 66 subjects was needed, evenly divided as 33 participants per group.<sup>[11]</sup>

The study enrolled adult patients diagnosed with isolated stable Grade 1 and Grade 2 AAS. Exclusion criteria included patients under 18 years of age, individuals with unstable AAS injuries (defined as those with concomitant ankle fractures or dislocations necessitating splint treatment), patients with multiple traumatic injuries, and individuals who declined to participate in the study. Patients meeting the inclusion criteria were enrolled through a quasi-randomization process, which took place during the 7-day periods each month when a certified KT practitioner, specifically the same EP, was on duty. Patients were assigned to the KT or control group based on their file numbers: those with odd file numbers to the KT group and those with even file numbers to the control group. The Numerical Rating Scale (NRS) is a universally recognized tool for assessing pain frequently used in the ED.<sup>[12]</sup> Pain severity in patients with AAS was evaluated using an NRS, graded on a scale from 0 to 10. This assessment was performed by the initial attending physician to ensure blinding to the study's objectives. Following informed consent, patients received dexamethasone 50 mg/2 ml intravenously (IV). Subsequently, patients were stratified into two groups based on their file number assignment. In the KT group, KT was applied using the jellyfish technique concurrently with IV treatment. Conversely, the control group received no additional interventions beyond standard care. Both groups were prescribed dexamethasone 25 mg oral tablets upon discharge, to be taken as needed with a maximum frequency of three times daily at 8-hour intervals.

In the KT group, participants with stable Grade 1 and Grade 2 AAS had KT applied by the same EP who is also a certified KT practitioner. The preparation involved cutting two 10 cm lengths from a 5 cm wide roll of tape. Each piece had a central buttonhole made before being divided into six fan-shaped strips on both sides. The first tape segment was placed over the site of pain, with the buttonhole centered, and the fan-shaped strips were spread outward without tension. The second tape segment was applied perpendicular to the first, with its buttonhole also centered on the painful area. Its fan-shaped strips were unfolded without tension.<sup>[13]</sup> A visual representation of the KT application process is depicted in Figure 1.

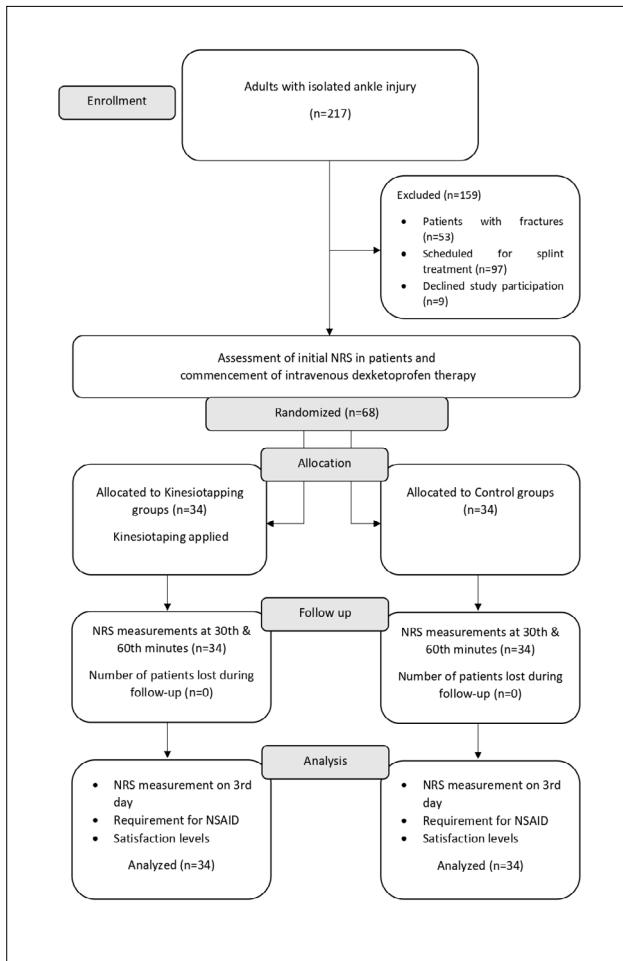


Figure 1. Flowchart and study design.

In this study, assessments of pain intensity were conducted to evaluate the effectiveness of KT as an adjunct to standard analgesic care in patients with AAS. The primary outcome measures involved quantifying pain intensity using the NRS. These measurements were carried out by the attending physician who initially examined the patients in the ED, with data collected at both the 30-minute and 1-hour marks post-treatment. Additionally, secondary outcome measures were administered 72 hours after the patients' discharge. Researchers conducted these assessments through telephone interviews, using contact information from the patients' medical records. The secondary outcome measures included assessing pain severity using the NRS, evaluating dextketoprofen usage, and gauging patient satisfaction with the treatment process. Satisfaction was rated on a Likert-type scale ranging from 1 (indicating very dissatisfied) to 10 (indicating very satisfied). This comprehensive approach was designed to provide insights into the efficacy of KT in pain management and patient satisfaction in the context of AAS.

The normality of the data distribution was assessed using the Kolmogorov-Smirnov test. Due to the absence of a normal distribution for all measured parameters, nonparametric statistical tests were employed. Continuous variables were



Figure 2. Application of kinesio taping.

presented as either mean ± standard deviation (SD) or median (minimum-maximum), depending on their distribution. Categorical variables were presented in absolute values and percentages. The Mann-Whitney U test was used to evaluate the significance of differences in gender, age, and Body Mass Index (BMI) averages between groups. The Mann-Whitney U test was also applied to assess the significance of variations in the means of the NRS scores. The Chi-square test was utilized to examine the use of painkillers, while the Mann-Whitney U test was employed to determine differences in the number of painkillers used and their associated effectiveness scores. Further, logistic regression analysis was conducted to explore the data in depth. For all statistical tests conducted, the threshold for statistical significance was set at  $p < 0.05$ . Data analysis was carried out using Statistical Package for the Social Sciences (SPSS) for Windows (version 23.0, SPSS Inc., Chicago, IL).

## RESULTS

During the study period, a total of 217 patients with isolated ankle injuries were admitted to the ED. Of these, 159 patients were excluded for various reasons, leaving a cohort of 68 patients. These were then divided into the KT group ( $n=34$ ) and the control group ( $n=34$ ), based on their file numbers. Notably, all participants completed the study, as shown in Figure 2.

The average age of the participants was  $32 \pm 14$  years, and 57.4% ( $n=39$ ) were men. After the grouping process, an equitable distribution was achieved, resulting in a 1:1 ratio between the KT and control groups. Importantly, there were no significant differences between the two groups regarding age, gender distribution, BMI, and baseline NRS scores ( $p=0.329$ ,  $p=0.462$ ,  $p=0.704$ , and  $p=0.575$ , respectively), as detailed in Table 1.

At baseline and the 30-minute mark, pain levels were comparable between the two groups. However, at the 60-minute assessment, the KT group exhibited a statistically significant decrease in pain intensity compared to the control group ( $p=0.575$ ,  $p=0.437$ , and  $p=0.042$ , respectively). Remarkably,

**Table 1.** Baseline characteristics of participants

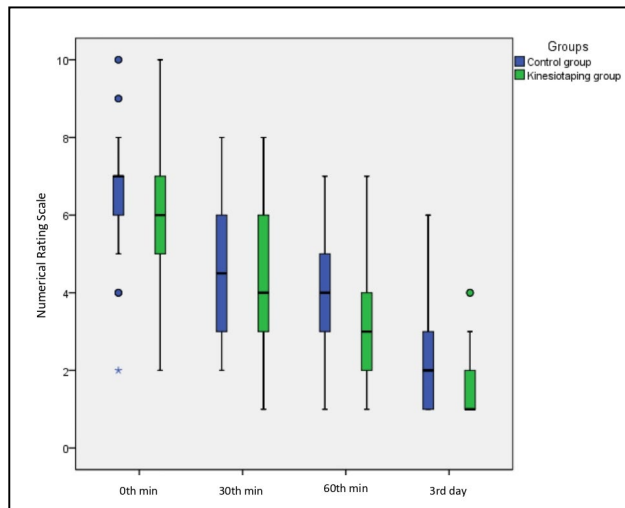
	KT Group (n=34)	Control Group (n=34)	p
Gender (Women/Men, n)	13/21	16/18	0.462
Age (years)	29.88±10.23	35.15±16.82	0.329
BMI (kg/m <sup>2</sup> )	26.25±6.02	25.77±5.94	0.704
NRS at 0th minute	6.38±1.79	6.56±1.69	0.575

Data are expressed as mean ± SD, median (min-max), or count for categorical variables unless otherwise indicated. Abbreviations: BMI: Body Mass Index; KT: Kinesio Taping; NRS: Numerical Rating Scale.

**Table 2.** Comparison of outcomes between groups

	KT Group (n=34)	Control Group (n=34)	p
NRS at 0th minute	6.38±1.79	6.56±1.69	0.575
NRS at 30th minute	4.24±1.90	4.59±1.77	0.437
NRS at 60th minute	3.09±1.62	3.88±1.57	0.042
NRS at 3rd day	1.68±1.00	2.09±1.35	0.169
Total analgesic medication dosage (n)	2 (0-8)	5 (0-8)	<0.001
Level of satisfaction	8.68±1.34	7.71±1.31	0.003

Data are expressed as mean ± SD, median (min-max), or count for categorical variables unless otherwise indicated. Abbreviations: KT: Kinesio Taping; NRS: Numerical Rating Scale.



**Figure 3.** Box plots showing Temporal Evolution of Pain Scores. Lines denote median values, boxes represent the 25th to 75th percentiles, and whiskers indicate the range. Several outliers are present.

no discernible difference was observed between the two groups in pain level assessments conducted on the third day ( $p=0.169$ ). Intriguingly, the KT group showed a noteworthy reduction in the use of analgesic medications, indicating a decreased need for NSAIDs ( $p=0.000$ ). Furthermore, the KT

group reported significantly higher levels of patient satisfaction with their treatment experience ( $p=0.003$ ), as summarized in Table 2.

Upon conducting a detailed analysis of these significant findings through logistic regression, the initially observed significant difference in NRS at the 60th minute between the two groups lost its statistical significance ( $p=0.631$ ). In contrast, the quantity of analgesic medication used and patients' satisfaction levels with the treatment continued to exhibit statistical significance ( $p=0.003$  and  $p=0.026$ , respectively). A graphical representation illustrating the evolution of NRS levels over time for both groups is depicted in Figure 3.

## DISCUSSION

In this study, our objective was to assess the utility of KT application as a supplementary therapeutic modality for patients with AAS. Our findings indicate that the adjunctive use of KT, alongside dexamethasone, significantly reduces the requirement for analgesic medications among patients presenting with AAS in the ED.

The application of KT is not a conventional approach for managing AAS in ED settings. Standard management of AAS typically includes strategies such as rest, elevation, ice, compression, and NSAIDs. Clinicians often harbor reservations about the benefits and potential adverse effects of NSAIDs,

particularly concerning their use in this context. It is well-established that NSAIDs are effective in alleviating pain during the acute phase of AAS.<sup>[14]</sup> However, the potential for significant adverse effects on the gastrointestinal tract and tissue healing due to NSAID use remains a contentious issue.

The existing body of literature on KT application predominantly focuses on its use in managing chronic pain rather than its application for acute pain scenarios. A meta-analysis that included studies on chronic low back pain highlighted the significant effectiveness of KT as a modality for pain management. However, this meta-analysis pointed out certain limitations, such as variations in KT treatment protocols, differences in KT application techniques, and the diversity of patients' skin types.<sup>[15]</sup> In contrast, the findings of another meta-analysis, which synthesized studies on shoulder pain, indicated that combining exercise with KT led to substantial improvements in patient outcomes, even though KT alone did not outperform other treatments.<sup>[16]</sup> Similarly, our study found that standalone KT application did not provide significant pain relief. Nonetheless, in a double-blind, controlled clinical trial comparing KT with other strapping techniques for osteoarthritis-related pain management, the KT group reported a significant reduction in pain. Additionally, a statistically significant decrease in analgesic usage was observed among participants in the KT group.<sup>[17]</sup> It is also noteworthy that a randomized trial involving sternotomy patients found that KT application reduced the need for opioid analgesics and enhanced patient satisfaction,<sup>[18]</sup> aligning with the findings of our study, where the KT group exhibited lower NSAID consumption and higher levels of patient satisfaction.

Research indicates that KT application can produce a variety of effects, including the reduction of muscle tension and the enhancement of muscle strength through an inhibitory effect that alleviates muscle pressure. Furthermore, KT may contribute to increased joint stability and facilitate joint movements by improving proprioception in ligaments, tendons, and nerves. The analgesic role of KT is believed to involve the activation of the gate control mechanism, the initiation of inhibitory mechanisms, and the effective reduction of edema and inflammation through improved blood flow to the fascia. Notably, the application methods for KT can vary, involving the cutting of tape into specific shapes and sizes and applying it with different levels of tension. Although KT presents promising benefits, the precise mechanisms underlying these effects continue to be the focus of ongoing research and speculation.<sup>[19-22]</sup>

KT, well-established in physical therapy and sports medicine, has shown its potential as an adjunctive treatment in the ED context, without any reported adverse effects. We postulate that its use could lead to a reduction in patients' prolonged dependence on NSAIDs and help mitigate potential complications associated with NSAID use.

The primary limitation of our study is its quasi-randomized

design, necessitated by the limited availability of KT practitioners, which restricted the creation of a comprehensive study population. Furthermore, the absence of any intervention beyond standard treatment in the control group represents an additional limitation. To mitigate potential placebo effects observed in the KT group, incorporating a placebo taping procedure in the control group could have offered valuable insights; however, this was regrettably omitted from our study design. Another limitation was the reliance solely on clinical manifestations to assess the severity of ligament injuries in AAS patients, without incorporating MRI for a more objective evaluation in the ED. Although MRI could potentially offer a more detailed assessment of ligament damage in AAS patients, its routine use in ED settings poses practical challenges.

## CONCLUSION

In conclusion, while KT application did not show significant efficacy in providing acute analgesia for patients with AAS beyond conventional treatment, it did result in a reduction in the use of analgesic medications during the treatment course. Therefore, KT application can be considered a viable complementary treatment option. Significantly, this study represents a pioneering exploration of a novel treatment approach within the context of EDs. To further incorporate KT into standard treatment protocols for AAS patients, additional research is necessary to validate its efficacy and refine its application.

**Ethics Committee Approval:** This study was approved by the Muğla Sıtkı Koçman University Ethics Committee (Date: 10.08.2022, Decision No: 13/XIII).

**Peer-review:** Externally peer-reviewed.

**Authorship Contributions:** Concept: Ö.F.K., Y.G.; Design: Ö.F.K., Y.G., Z.N.K.; Supervision: Ö.F.K., Y.G.; Resource: Ö.F.K., Z.N.K.; Materials: Ö.F.K., Z.N.K., M.B.C.; Data collection and/or processing: Z.N.K., E.A.Y.Y.; Analysis and/or interpretation: Ö.F.K., E.A.Y.Y., Y.G.; Literature search: Ö.F.K., Z.N.K., M.B.C., E.A.Y.Y., Y.G.; Writing: Ö.F.K., Z.N.K., Y.G.; Critical reviews: Ö.F.K., Z.N.K., Y.G., E.A.Y.Y.

**Conflict of Interest:** None declared.

**Use of AI for Writing Assistance:** Not declared.

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## ORJİNAL ÇALIŞMA - ÖZ

## Akut ayak bileği burkulması olan hastalarda ayak bileği kinesio bantlamının ağrı yönetimine etkisi

Ömer Faruk Karakoyun,<sup>1</sup> Zeynep Nisa Karakoyun,<sup>2</sup> Elif Aylin Yüce Yörük,<sup>3</sup> Mustafa Buğra Coşkun,<sup>4</sup> Yalçın Gölçük<sup>4</sup><sup>1</sup>Muğla Eğitim ve Araştırma Hastanesi, Acil Servis, Muğla, Türkiye<sup>2</sup>Muğla Sıtkı Koçman Üniversitesi, Tıp Fakültesi, Anatomi Ana Bilim Dalı, Muğla, Türkiye<sup>3</sup>Türkiye Cumhuriyeti Sağlık Bakanlığı Muğla Halk Sağlığı, Muğla, Türkiye<sup>4</sup>Muğla Sıtkı Koçman Üniversitesi, Tıp Fakültesi, Acil Tıp Ana Bilim Dalı, Muğla, Türkiye**AMAÇ:** Bu çalışmanın amacı, Acil Servis (AS) ortamında Akut Ayak Bileği Burkulması (AABB) olan hastalarda Kinezyotape (KT) uygulamasının destekleyici tedavi olarak etkinliğini değerlendirmektir.**GEREÇ VE YÖNTEM:** Üçüncü basamak bir AS'te prospektif yarı-rasgele kontrollü bir çalışma yapılmıştır. İzole stabil Grade I ve Grade 2 AABB tanısı konmuş erişkin hastalar dahil edildi. Hastalar, iki gruba ayrıldı: KT grubu, geleneksel tedaviye ek olarak KT uygulanan grup; kontrol grubu ise sadece geleneksel tedavi alan grup. Ağrı şiddeti, analjezik kullanımı ve hasta memnuniyeti değerlendirildi.**BULGULAR:** Her iki grup arasında başlangıçta ve 30. dakikada benzer ağrı düzeyleri bildirilirken, kontrol grubu 60. dakikada anlamlı ölçüde daha düşük ağrı düzeyleri bildirdi (sırasıyla p=.575, p=.437 ve p=.042). KT grubu, analjezik ilaç tüketiminde azalma ve daha yüksek hasta memnuniyet düzeyleri sergiledi (sırasıyla p<.001 ve p=.003). Lojistik regresyon analizi, 60. dakikada ağrı şiddetindeki farkın anlamlı yitirdiğini, ancak analjezik kullanımı ve hasta memnuniyetinin anlamlı olduğunu ortaya koydu (sırasıyla p=.631, p=.003 ve p=.026).**SONUÇ:** KT uygulaması, destekleyici bir tedavi olarak, AS'teki AABB hastalarında analjezik ihtiyacını azaltabilir ve hasta memnuniyetini artırabilir. Uygulamanın etkinliğini doğrulamak ve standart AABB tedavi protokollerindeki yerini belirlemek için daha fazla araştırmaya ihtiyaç vardır.**Anahtar sözcükler:** Acil servis; ayak bileği burkulması; analjezik tedavi; hasta memnuniyeti; kinezyotape.

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