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Research Article

Is Kinesio taping beneficial in the short term after Weber Type B lateral malleolar fractures? A randomized controlled trial

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ABSTRACT

Objective: Surgical treatment of Weber type B ankle fractures often requires careful postoperative rehabilitation, especially when syndesmotic injuries are present. In recent years, Kinesio taping (KT) has been used in various orthopedic conditions, though its role in fracture recovery remains debatable. This study aimed to explore whether KT might support early recovery in such cases.

Methods: Thirty adult patients with isolated Weber B ankle fractures and confirmed syndesmotic injury were enrolled. They were randomly assigned to 2 groups. One received KT in addition to a conventional rehabilitation protocol; the other followed rehabilitation without taping. Pain was assessed using the Visual Analog Scale. Ankle range of motion (ROM), swelling (via tape measurement), and functional mobility through the Timed Up and Go (TUG) test were also evaluated on postoperative days 1, 7, 14, and 28. Measurement reliability was verified using intraclass correlation coefficients. Statistical comparisons involved *t*-tests and analysis of variance ($P < .05$).

Results: On day 1, outcome measures were similar between groups. However, by day 7 and more evidently on day 28, the KT group showed reduced pain, improved ROM, and faster TUG performance ($P < .001$). Edema reduction was particularly noticeable and persisted throughout follow-up.

Conclusion: Kinesio taping may serve as a beneficial adjunct during early postoperative rehabilitation following Weber B fractures. Importantly, integrating KT into standard care protocols may enrich patient-centered rehabilitation approaches due to its simplicity, safety, and noninvasive nature.

Level of Evidence: Level I, Therapeutic Study.

Introduction

Ankle fractures are relatively common injuries, accounting for roughly 9% of all fractures treated in orthopedic practice.[1] Among them, Weber type B fractures—those affecting the lateral malleolus at the level of the syndesmosis—are particularly noteworthy due to their frequent association with syndesmotic injuries.[2] These concomitant injuries can often be overlooked initially but are challenging to treat once they progress to chronic instability or post-traumatic arthritis.

Traditionally, unstable fractures have been managed with surgical fixation followed by 6 weeks of immobilization and restricted weight-bearing. However, emerging research is prompting a reconsideration of this approach. Increasing evidence suggests that early mobilization and controlled loading may lead to improved recovery outcomes.[3]

Still, when the syndesmosis is involved, the situation becomes more complex. It's no longer solely about bone healing.[4] Maintaining the integrity of soft tissues and promoting early functional recovery are equally important. While immobilization offers protection, it comes with downsides—joint stiffness, muscle weakness, and sometimes slower circulation.[5]

This growing awareness has led clinicians to explore complementary strategies. One approach gaining traction is Kinesio taping (KT). It's noninvasive, elastic, and designed to mimic skin. Kinesio taping is thought to help reduce pain and support proprioception.[6,7] It's been used in sprained ankles, after knee replacements, and in various musculoskeletal conditions with promising effects.[8]

However, the current body of evidence supporting the use of KT in fracture management—particularly in cases involving the syndesmosis—remains limited. A significant number of studies demonstrate variability in application techniques and often fail to incorporate standardized reliability assessments in their outcome measures. This inconsistency hampers the ability to draw definitive conclusions regarding the efficacy of KT in such complex injury patterns.[6]

It was hypothesized that the addition of KT to a conventional rehabilitation protocol would provide statistically significant improvements in early (first 4 weeks) functional mobility scores, primarily by reducing soft-tissue swelling through enhanced lymphatic drainage and improving joint mobility via biomechanical support.

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The goal was to investigate whether KT, when added to a standard postoperative protocol, could make a meaningful difference in early outcomes—namely, pain, swelling, joint mobility, and functional performance—in patients recovering from Weber type B fractures with syndesmotic injury.

Material and methods

Study design and participants

This was a prospective, randomized controlled trial conducted in 2025 at Fatih Sultan Mehmet Training and Research Hospital, a tertiary academic hospital in Istanbul, Türkiye.

Ethics committee approval was obtained from the Clinical Research Ethics Committee of Kartal Koşuyolu High Specialization Training and Research Hospital (Decision No: 2024/11/844 Date: June 4, 2024). Written informed consent was obtained from all participants prior to enrollment. All procedures complied with the Declaration of Helsinki. Each participant provided written informed consent before participation. This study was prospectively registered at ClinicalTrials.gov (Identifier: NCT06958133).

A priori power analysis was performed using G*Power. Based on an expected large effect size (Cohen's $d=1.2$), a significance level of $\alpha=0.05$, and a power of 80%, a minimum of 11 participants per group was determined to be sufficient. To allow for potential dropouts, 15 participants per group were enrolled.

A total of 30 adult patients with isolated Weber type B lateral malleolar fractures and concomitant syndesmotic injury were enrolled in the study.

Syndesmotic injury was confirmed using preoperative axial computed tomography imaging and intraoperative assessment performed after anatomic reduction and plate fixation of the lateral malleolus and before syndesmotic screw insertion.

Radiographic assessment of the distal tibiofibular relationship was performed on standard anteroposterior and mortise radiographs. Tibiofibular overlap (TFO) was measured 1 cm above the joint line and was considered abnormal when it was less than 5 mm on anteroposterior radiographs and less than 1 mm on mortise views (Figure 1A, Figure 2).

Intraoperative assessment of syndesmotic stability was performed under fluoroscopic guidance using a hook test applied to the distal fibula to assess residual instability. Syndesmotic injury was confirmed when widening of the distal tibiofibular joint was observed during hook testing (Figure 1B).

These assessment criteria were applied equally to both groups, and no significant differences in postoperative syndesmosis alignment quality were found between them.[9]

HIGHLIGHTS

- Postoperative Kinesio taping (KT) reduced early pain levels in Weber type B ankle fractures.
- Patients receiving KT regained dorsiflexion range of motion more quickly.
- The taping group showed a faster and more stable reduction in ankle edema.
- No taping-related complications were observed throughout the rehabilitation period.
- Kinesio taping may serve as a simple and supportive method in postoperative rehabilitation.

Medial clear space (MCS) was not used as a primary diagnostic criterion for syndesmotic injury. Medial clear space was assessed on post-fixation static fluoroscopic mortise views as an intraoperative screen for medial-sided instability. Patients with persistent MCS widening after anatomic fibular reduction suggestive of deltoid ligament insufficiency were excluded.

Decisions regarding syndesmotic fixation were based on intraoperative hook testing under fluoroscopic guidance after fibular fixation, together with tibiofibular alignment parameters and fluoroscopic assessment.

All surgeries were performed by 2 senior orthopedic surgeons working within the same clinical unit. Both surgeons adhered to a shared institutional protocol, using standardized techniques including anatomical distal fibular locking plate placed laterally, along with a single 3.5 mm cortical screw for syndesmotic fixation using a quadricortical purchase to ensure adequate stability. Closed reduction of the distal tibiofibular joint was confirmed in all patients intraoperatively using fluoroscopy. Postoperative radiographs were obtained to evaluate the quality of reduction using standard parameters: tibiofibular clear space, TFO, and MCS.

Inclusion criteria were patients aged between 18 and 65 years, diagnosed with a unilateral Weber type B ankle fracture with confirmed syndesmotic injury, surgical intervention performed within 24 hours of injury, initiation of rehabilitation on the first postoperative day, and provision of written informed consent.

Patients were excluded if they had a history of previous surgery on the affected limb, additional lower extremity fractures, neurological or rheumatologic disorders, active smokers, diabetes mellitus, dermatological issues compromising skin integrity, or known allergies to KT. Patients with concomitant medial or posterior malleolus fractures were also excluded. In addition, patients demonstrating persistent MCS widening after anatomic fibular reduction (suggestive of deltoid ligament insufficiency, with or without syndesmotic injury) were excluded.[9] Of the initially screened patients, 10 were excluded due to medial malleolus fractures (n=4), suspected deltoid ligament injury (n=3), previous surgery on the affected limb (n=2), or diabetes mellitus (n=1).

Randomization and group allocation

Participants were randomly assigned to 2 groups using computer-generated block randomization performed after surgery before initiating rehabilitation protocols (block sizes of 4-6) via Random Allocation Software v1.0. Allocation concealment was maintained using sequentially numbered, sealed opaque envelopes prepared by an independent researcher not involved in the study.

Group 1 (n=15): Standard rehabilitation + KT.
Group 2 (n=15): Standard rehabilitation only.

Rehabilitation protocol

All patients followed a structured rehabilitation program initiated within the first 24 hours post surgery:

Cryotherapy: Applied for 15 minutes, 3 times daily.
Early mobilization: No immobilization devices (e.g., splints, casts, or removable braces) were used. Active-assisted ankle dorsiflexion and plantarflexion exercises were initiated within the first 24 hours.

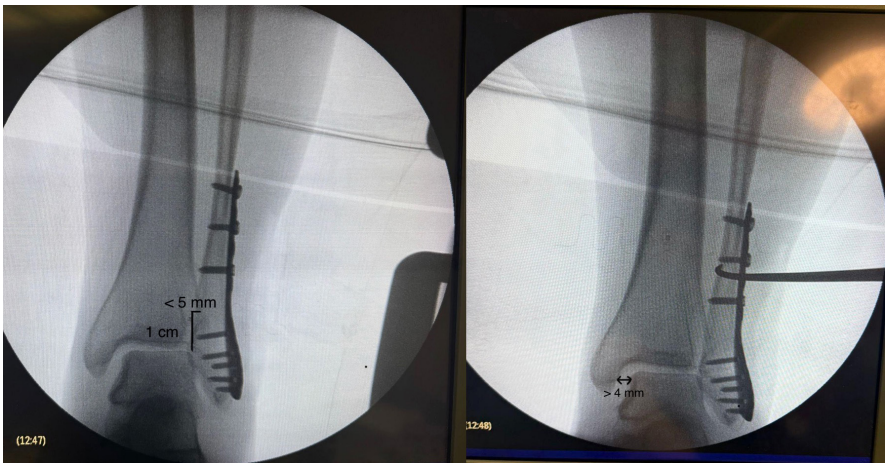

Figure 1. Intraoperative fluoroscopic assessment of syndesmotic stability after anatomic fixation of the lateral malleolus and before syndesmotic screw insertion. (A) Anteroposterior fluoroscopic view demonstrating the distal tibiofibular relationship and measurement level of tibiofibular overlap 1 cm above the ankle joint line. (B) Intraoperative hook test applied to the distal fibula under fluoroscopic guidance, demonstrating widening of the distal tibiofibular joint consistent with syndesmotic instability.

Weight-bearing progression: Partial weight-bearing with crutch assistance was initiated at the end of the first postoperative week after intraoperative confirmation of stable syndesmotic fixation. Patients began with toe-touch weight-bearing (≈10%-15% body weight) and gradually progressed to 25%-50% between weeks 1 and 6, in line with early mobilization protocols described in previous reports.[10] No postoperative immobilization devices (splints, casts, or braces) were used. Full weight-bearing was permitted at postoperative week 6 after radiographic confirmation of fracture union and syndesmotic stability in all patients.

Kinesio taping protocol

In group 1, all KT applications were performed by a single certified physiotherapist with over 3 years of clinical experience, ensuring consistency across patients. A combined taping method was used, incorporating both lymphatic (fan) and mechanical (I-band) techniques.

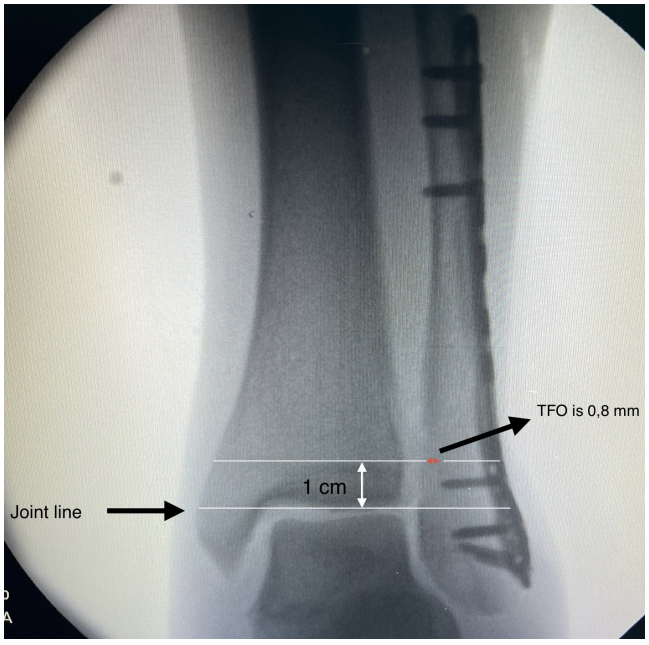

Figure 2. Intraoperative mortise fluoroscopic view demonstrating tibiofibular overlap (TFO) measured 1 cm above the ankle joint line. In this representative image, TFO was 0.8 mm, consistent with syndesmotic injury criteria.

Taping was initiated on postoperative day 1 and applied every 3 days using a standardized protocol. The lymphatic (fan) component was applied with low tension (10%-15%) according to Kase guidelines to promote skin lifting and facilitate lymphatic drainage for edema control.[11] The mechanical (I-band) component was applied over the lateral malleolus with higher tension (50%-75%) to provide proprioceptive input and reinforce the lateral ligament complex, particularly the anterior talofibular ligament and calcaneofibular ligament. Application landmarks included a starting point 2 cm proximal to the tip of the lateral malleolus with distal extension around the ankle joint.

This protocol continued for the entire 28-day follow-up period, totaling approximately 9 sessions per patient. Patients were instructed to perform daily activities and prescribed exercises without limitation. No serious skin irritation was reported; 2 patients experienced mild erythema, which resolved spontaneously with topical moisturizers.

Lymphatic (fan) technique: As shown in Figure 3, the tape was applied proximally to distally in a fan shape to support lymphatic drainage.
Mechanical (I-band) technique: As shown in Figure 4, flat strips were applied over the lateral malleolus to enhance stability.
Combined technique: As shown in Figure 5, both techniques were integrated to provide mechanical support and circulation benefits.

The lymphatic (fan) technique was applied proximally to distally with 10%-15% tension, following Kase guidelines, to facilitate lymphatic drainage. The mechanical ("I-band") technique was applied with 50%-75% tension directly over the lateral malleolus, targeting the anterior talofibular and calcaneofibular ligaments. Application landmarks included a starting point 2 cm proximal to the tip of the lateral malleolus with distal extension around the ankle joint. All taping was performed by a single physiotherapist with >3 years of KT experience to ensure standardization.

Although the primary study outcomes were evaluated during the first 28 days, all patients routinely underwent radiographic examination at postoperative week 6 as part of standard clinical follow-up. Fracture union and syndesmotic stability were confirmed in every patient at this time point.

Figure 3. Lymphatic (Fan) technical application in Kinesio taping.

Outcome measures and time points

Clinical assessments were performed on postoperative days 1, 7, 14, and 28 by 2 blinded physiotherapists. At postoperative week 6, radiographs were obtained to confirm fracture union and syndesmotic stability prior to advancing to full weight-bearing. No functional or clinical scoring was performed at this time point, as the study was specifically designed to evaluate short-term recovery within the first 4 weeks. The following parameters were recorded:

Pain: Visual Analog Scale (VAS), 0-10

Range of motion (ROM): Dorsiflexion, measured with a goniometer

Edema: Measured using a standard tape measure placed circumferentially around the ankle at a level 2 cm proximal to the tip of the lateral malleolus, which served as a consistent anatomical landmark for all patients. The percentage difference in ankle circumference was calculated using the formula:

$$\frac{Injuredside - Uninjuredside}{Uninjuredside} \times 100\%$$

Figure 4. Mechanical ("I" Tape) technical application in Kinesio taping.

Figure 5. Application of the combined method in Kinesio taping.

[12]Functional mobility: Timed Up and Go (TUG) test;[13] values <10 seconds considered normal for healthy adults

Measurement reliability

To ensure reliability, both intra-rater and inter-rater consistency were analyzed using intraclass correlation coefficients (ICC). Repeated measures by the same physiotherapist showed excellent reliability:

ROM: ICC=0.93 (95% CI: 0.87-0.97)
Edema: ICC=0.89 (95% CI: 0.82-0.94)
TUG: ICC=0.95 (95% CI: 0.91-0.98)

Inter-rater reliability was also high:

ROM: ICC=0.91
Edema: ICC=0.87
TUG: ICC=0.92.[13] Values ≥0.90 were interpreted as excellent, while 0.75-0.90 indicated good reliability.

Statistical analysis

All analyses were performed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA). Normality of data was assessed with the Shapiro–Wilk test.[14] All continuous outcome variables were found to be normally distributed ($P > .05$ across groups and time points), validating the use of parametric tests. Between-group comparisons were conducted using independent samples *t*-tests. Within-group comparisons and time-based changes were evaluated using paired *t*-tests and repeated measures analysis of variance. Categorical variables (such as gender and side) were compared using the chi-square test or Fisher's exact test when appropriate. Effect sizes (Cohen's *d*) were also calculated, with values ≥0.8 interpreted as large effects. A significance level of $P < .05$ was accepted.

The interpretation of intraclass correlation coefficients followed the guideline by Koo and Li.[15]

Results

There were no statistically significant differences in age ($P=.6157$), sex distribution ($P=.2723$), or side of injury ($P=.4612$) between the groups (Table 1).

Table 1. Age, gender, and side distributions

Parameters	Group 1 (n=15)	Group 2 (n=15)	*P*
Age (years) (mean ± SD)	44.5 ± 10.0	42.9 ± 7.0	.6157
Sex (male/female)	9/6	5/10	.2723
Side of injury (Right/left)	7/8	10/5	.4612

Pain (Visual Analog Scale)

Visual Analog Scale scores were comparable between groups on postoperative day 1 (P=.2052). However, by day 7, group 1 reported significantly lower pain levels than group 2 (P=.0033), and this difference became more pronounced on day 28 (P < .001) (Table 2, Figure 6). Evaluations for VAS, ROM, and edema were performed only on postoperative days 1, 7, and 28. No data were collected on day 14 for these parameters.

Range of motion

Initial dorsiflexion angles were similar between groups (P=.1697). On day 7, ROM had improved significantly in group 1 compared to group 2 (P < .001). This trend continued on day 28, with group 1 showing further gains (P < .001) (Table 3, Figure 7).

Functional mobility (Timed Up and Go test)

Timed Up and Go test results demonstrated superior performance in group 1 at all measured time points. On days 7, 14, and 28, group 1 completed the test in significantly less time than group 2 (P < .001). These findings indicate better functional mobility in group 1 throughout the early recovery period (Table 4).

Edema

No significant differences in swelling were observed between the groups on day 1 (P=.4297). However, by day 7, group 1 exhibited a marked reduction in edema compared to the control group (P < .001). This reduction remained consistent on day 28 (P < .001), suggesting a lasting effect of KT on soft-tissue swelling (Table 5, Figure 8).

At the routine sixth week clinical follow-up, radiographic evaluation confirmed fracture union in all patients.

Table 2. Comparisons of VAS between groups

Parameters	Group 1 (mean ± SD)	Group 2 (mean ± SD)	*P*
VAS – first day	5.93 ± 1.16	6.53 ± 1.19	.2052
VAS – seventh day	3.66 ± 0.81	5.00 ± 0.91	.0033
VAS – twenty-eighth day	1.20 ± 0.41	2.66 ± 0.81	<.001

VAS, Visual Analog Scale.

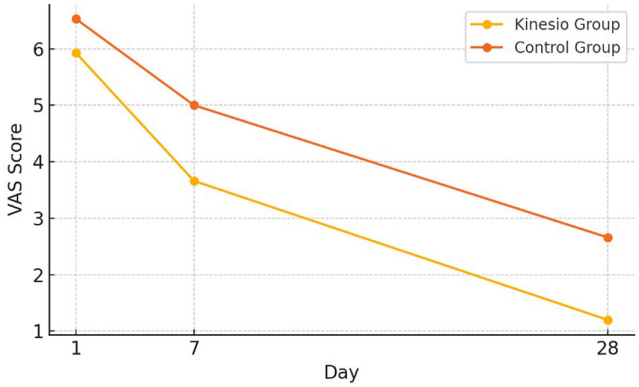

Figure 6. Change in Visual Analog Scale.

Table 3. Comparisons of ROM between groups

Parameters	Group 1 (mean ± SD)	Group 2 (mean ± SD)	*P*
ROM – day 1	12.33 ± 2.58	10.93 ± 2.43	.1697
ROM – day 7	18.86 ± 2.41	14.80 ± 1.42	<.001
ROM – day 28	24.00 ± 2.28	18.93 ± 2.28	<.001

ROM, range of motion.

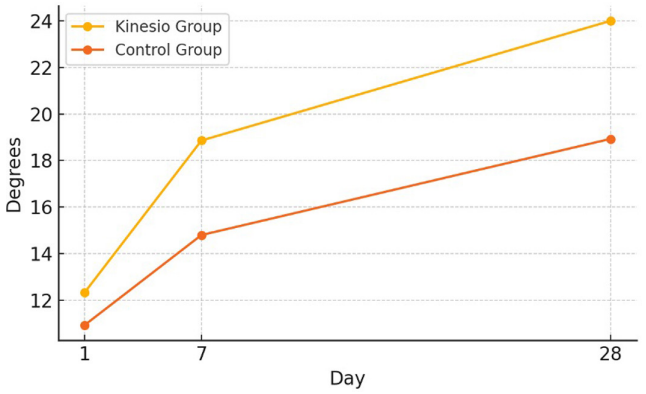

Figure 7. Change in range of motion.

Table 4. TUG test comparison between groups

Parameters	Group 1 (mean ± SD)	Group 2 (mean ± SD)	*P*
TUG – day 7	20.73 ± 1.71	23.26 ± 1.98	<.001
TUG – day 14	16.80 ± 1.52	20.00 ± 1.41	<.001
TUG – day 28	12.86 ± 1.64	17.13 ± 1.36	<.001

TUG, Timed Up and Go.

Discussion

This study demonstrates that the addition of KT to a standard rehabilitation protocol for Weber type B ankle fractures with syndesmotic injury leads to significant improvements in early postoperative outcomes. Specifically, KT was associated with reduced pain, diminished edema, and enhanced functional mobility during the first 28 days after surgery. These findings support the hypothesis that KT can serve as a valuable adjunctive therapy in early rehabilitation.

Table 5. Comparisons of edema between groups

Parameters	Group 1 (mean ± SD)	Group 2 (mean ± SD)	*P*
Edema – day 1	6.13 ± 1.55	6.46 ± 1.41	.4297
Edema – day 7	3.93 ± 1.09	5.60 ± 0.91	<.001
Edema – day 28	2.26 ± 0.59	4.60 ± 0.91	<.001

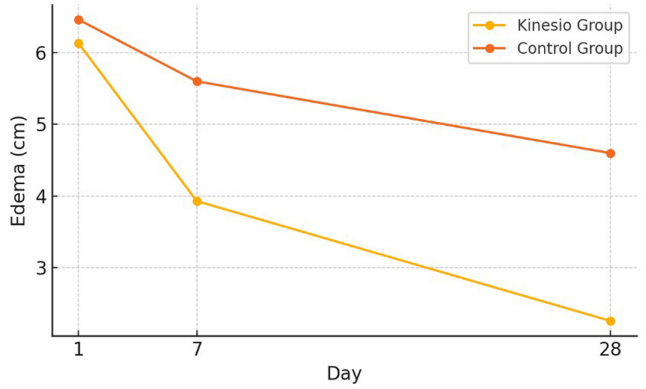

Figure 8. Change in edema measurements.

Patients in the KT group reported significantly lower pain scores at all follow-up points compared to controls. The analgesic effect of KT observed in this study aligns with previous reports suggesting its potential to modulate pain perception through cutaneous stimulation and proprioceptive feedback.[6]

A particularly noteworthy finding was the accelerated resolution of postoperative swelling in the KT group. This effect may be attributed to KT's proposed mechanism of lifting the skin, thereby enhancing lymphatic drainage and interstitial fluid movement. Guney-Deniz et al demonstrated comparable results in patients undergoing total knee arthroplasty, reporting significant reductions in edema and associated functional improvements.[16] Similarly, a placebo-controlled study published in *Acta Orthopaedica et Traumatologica Turcica* reported significant edema reduction and improved early recovery in patients following ACL reconstruction.[17] Horoz et al also observed effective edema control in conservatively managed distal radius fractures.[18]

While the findings support the efficacy of KT in postoperative rehabilitation, Nunes et al reported limited therapeutic benefit of KT in lateral ankle sprains.[19] These discrepancies may reflect differences in injury mechanism and the soft-tissue inflammatory response between acute sprains and surgically managed fractures.

Improved dorsiflexion ROM and superior TUG test performance in the KT group reflect meaningful gains in functional recovery. Early restoration of ankle mobility is critical for preventing stiffness and promoting confidence in ambulation. These results are consistent with prior literature emphasizing KT's potential to facilitate proprioceptive input and dynamic stabilization during rehabilitation.[20,21] Moreover, KT's tactile stimulation has been theorized to modulate sensorimotor integration, potentially optimizing neuromuscular control and proprioception during functional recovery.[7,22]

The neurophysiological mechanisms underlying KT's analgesic effect are multifactorial. Melzack and Wall's Gate Control Theory provides a foundational framework for interpreting how tactile stimulation of cutaneous mechanoreceptors, as facilitated by KT, may attenuate nociceptive transmission through competitive gating of afferent signaling pathways.[23] Such neuromodulatory effects could plausibly account for the enhanced volitional movement engagement observed in KT cohorts, wherein diminished pain perception lowers kinematic inhibition.

From a clinical perspective, KT represents a low-risk, easily implementable adjunct that may accelerate functional recovery. However, this study has several limitations. First, although outcome assessments were performed by 2 blinded physiotherapists, the treating physiotherapist who applied KT could not be blinded due to the nature of the intervention, which may introduce potential performance bias. In addition, the relatively small sample size (15 patients per group) may limit the generalizability of the findings and the ability to detect small-to-moderate effect sizes; effect sizes were calculated, but their generalizability remains limited. Second, the present study was intentionally designed to focus exclusively on the very early postoperative phase, during which soft-tissue healing, edema control, and pain modulation are most clinically relevant and where KT is expected to exert its primary therapeutic effect. Accordingly, the predefined follow-up window was limited to 28 days. Although this design allowed them to isolate and evaluate the immediate physiological impact of KT, it inherently does not capture outcomes beyond the early phase. Week-6 clinical follow-up was performed as part of routine care and confirmed uneventful fracture healing in all patients; however, these data fell outside the original study framework and were therefore not included in the analysis. Future studies with an extended early-to-mid-term assessment may further complement and expand upon the findings.

Third, although a single certified physiotherapist applied all taping interventions using a standardized protocol to minimize variability, subtle differences in tape tension or application technique may still exist. Future studies with larger cohorts, multicenter designs, and extended follow-up periods are warranted to validate and expand upon these findings.

Kinesio taping appears to be a practical adjunct in the early rehabilitation of Weber type B ankle fractures with syndesmotic injury. It was associated with reduced pain, decreased edema, and improved dorsiflexion mobility during the critical early postoperative period. Its noninvasive design and easy integration into standard protocols make it an attractive option for supporting patient recovery.

These findings suggest that KT may enhance early functional outcomes after surgical fixation. Future studies with larger cohorts and extended follow-up periods are warranted to further explore its long-term benefits and optimal application strategies.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Artificial Intelligence Usage Statement: The authors declared that no artificial intelligence tool was used in the preparation of the manuscript.

Ethics Committee Approval: Ethical committee approval was received from the Clinical Research Ethics Committee of Kartal Koşuyolu High Specialization Training and Research Hospital (Approval no: 2024/11/844, Date: 04.06.2024).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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