Cohesive Taping and Short-Leg Casting in Acute Low-Type Ankle Sprains in Physically Active Patients

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Background: Cohesive taping is commonly used for the prevention or treatment of ankle sprain injuries. Short-leg cast immobilization or splinting is another treatment option in such cases. To determine the clinical efficacy and antiedema effects of cohesive taping and short-leg cast immobilization in acute low-type ankle sprains of physically active patients, we performed a preliminary clinical study to assess objective evidence for edema and functional patient American Orthopaedic Foot and Ankle Society (AOFAS) scores with these alternative treatments.

Methods: Fifty-nine physically active patients were included: 32 in the taping group and 27 in the short-leg cast group within a year. If a sprain was moderate (grade II) or mild (grade I), we used functional taping or short-leg cast immobilization for 10 days. We evaluated the edema and the functional scores of the injured ankle using the AOFAS Clinical Rating System on days 1, 10, and 100.

Results: In each group, edema significantly decreased and AOFAS scores increased indicating that both treatment methods were effective. With the numbers available, no statistically significant difference could be detected.

Conclusions: Each treatment method was effective in decreasing the edema and increasing the functional scores of the ankle. At the beginning of treatment, not only the level of edema but also the initial functional scores of the ankle and examinations are important in making decisions regarding the optimal treatment option. (J Am Podiatr Med Assoc 105(4): 307-312, 2015)

Inversion-type ankle sprains are common injuries in sports and activities of daily living in the young and physically active population.1 Ankle sprains are one of the most common injury patterns resulting in delay in returning to work.2 Wound healing is a natural process of tissue regeneration with multiple pathways, which are immediately activated after an injury stimulus and can be divided into three overlapping phases: inflammation, proliferation or granulation tissue formation, and tissue remodeling. Swelling secondary to inflammation is the greatest barrier to healing. Thus, the goal of early treatment should be to delay or minimize swelling.3 The recovery rate for ankle function after a sprain injury may be related to the control of edema at the injury site.4

Ankle support is needed to decrease swelling and range of motion in the early stage and to provide stability to the ligaments and joint in the later stage, after returning to daily activities. Functional and nonfunctional treatment options are available. Functional treatment methods include taping and bracing, and nonfunctional methods include casting and splinting. Both of these treatment options cost more or less the same, and cohesive taping and
short-leg casting take nearly equivalent time. Despite the high prevalence of ankle sprains, debate continues as to the best methods of treating and preventing these injuries. The aim of this study was to assess the antiedema effects and patient outcome and satisfaction scores (American Orthopaedic Foot and Ankle Society [AOFAS] Clinical Rating System) of the cohesive taping and short-leg casting methods in the acute and subacute stages of the treatment of acute ankle sprains. We also examined the relationship between ankle-foot swelling and ankle function in the early and late periods after ankle sprain injuries.

Materials and Methods

This prospective clinical study was performed in the emergency and orthopedic clinics between December 1, 2011, and January 31, 2013. Ethical approval for the study was provided by the Ethical Committee of Noninvasive Clinical Research of Düzce University, Düzce, Turkey (Ethical Committee No: 2011/143). Written informed consent was obtained from each patient.

Fifty-nine physically active patients who were seen in the emergency and orthopedic clinics within a year were included: 32 in the cohesive taping group and 27 in the short-leg cast group. Patients with grade I and II ankle sprains were included. Patients with ankle edema and clinical signs of ankle sprain, such as tenderness in the lateral aspect of the ankle, underwent medical and radiodiagnostic examinations. Grade I ankle sprain was determined as the absence of a hematoma and tenderness at the anterior lateral ligament. Patients with a lateral hematoma and tenderness at the anterior lateral ligament without instability were defined as grade II, and those with lateral hematoma, tenderness, and instability were defined as grade III. We excluded patients undergoing preventive treatment for recurrent ankle sprains, patients with ankle fractures, and patients with sustained swelling (grade III) that made treatment with tape impossible. We included physically active patients with acute low-type ankle sprains within 12 hours. The participant age range was 11 to 52 years.

Patients with an acute ankle sprain were examined by a physician in the emergency department. Two-sided (anteroposterior and lateral) ankle radiographs were taken to rule out fractures. In the case of a sprain, if it was moderate (grade II) or mild (grade I), we used a functional tape or short-leg cast immobilization for 10 days. Before cohesive taping or casting, we measured ankle circumference (from lateral malleolus to medial) of the two feet with a measuring tape to determine the degree of ankle edema at that time. We evaluated the functional scores of the injured ankle using the AOFAS Clinical Rating System (Table 1).

A standard therapy regimen was advised: rest, ice, elevation, and anti-inflammatory drugs. Weightbearing was forbidden for the first 10 days. After 10 days, we saw the patient again and repeated the examination. We repeated the ankle circumference measurements and AOFAS scoring. Another tape or cast was applied for another 10 days with controlled weightbearing. After 20 days, full weightbearing was allowed. At the end of 40 days, the treatment was considered complete. We called the patients 100 days after the injury and determined AOFAS scores one more time.

An experienced orthopedic surgeon (M.U.) performed the taping in all of the patients. A cohesive tape (Roll Kohezif Bandage, Karl Otto Braun GMBH, Wolfstein, Germany) and silk zinc oxide plaster (Kurtsan Medikal, Istanbul, Turkey) were used for taping. A figure-of-eight method described by Perrin was modified for the tape application method. First, the roll cohesive bandage was used for medial and lateral supporting plasters, and, finally, a third layer was applied with cohesive tape so that medial and lateral movement was restricted (Fig. 1). There was no limitation in dorsiflexion or plantarflexion of the ankle. An orthopedic casting tape (Poly Cast, Donghae Medical Co., Ltd, Yangsan, Kyongnam, South Korea) was used as rigid ankle support for the short-leg cast in the second group that did not allow any movement of the ankle (Fig. 2). Proprioceptive exercises were performed by both groups starting 3 days after the trauma.

Statistics

Statistical analyses were conducted with SPSS software (version 11.0; SPSS Inc, Chicago, Illinois). Parametric variables were compared using the Student t test, and nonparametric and ordinal variables were compared using the Mann-Whitney U test. Group comparisons at different time points were performed only when the overall repeated-measures tests indicated statistical significance (P < .01).

Results

Patient outcomes are shown in Table 2. The mean ± SD age of the participants was 28.61 ± 8.86 years (range, 11–52 years): 27.91 ± 8.31 years in the
taping group and 29.44 ± 9.56 years in the short-leg cast group. We sought to include physically active individuals. There were 40 men (67.8%) and 19 women (32.2%). There were 21 men and 11 women in the taping group and 19 men and 8 women in the short-leg cast group. Of the injuries, 33 involved the right ankle (55.9%) and 26 the left (44.1%).

On the first day after the trauma, the mean ± SD edema was 1.56 ± 0.97 cm relative to the non-traumatized ankle (range, 0–5 cm). Mean ± SD edema was 1.57 ± 0.94 cm in the bandage group and 1.55 ± 1.02 cm in the short-leg cast group (P = .75).

The mean ± SD AOFAS score on the first day after trauma was 50.51 ± 23.5 (of 100 points; range, 5–98 points): 61.84 ± 18.47 in the bandage group.
and 37.07 ± 21.93 in the short-leg cast group (P < .01). We decided whether taping or casting would be used considering the days of the week. If the injury was on Monday, Tuesday, Wednesday, or Thursday we used a short-leg cast, and if it was on Friday, Saturday, or Sunday, we preferred the cohesive taping, randomly.

Mean ± SD edema on day 10 of treatment was 0.87 ± 0.69 cm (P < .01); 0.67 ± 0.53 cm in the taping group (P < .01) and 1.11 ± 0.78 cm in the short-leg cast group (P = .019).

The mean ± SD AOFAS score on day 10 was 70.15 ± 18.45 (P < .01; improved): 79.25 ± 12.67 (P < .01) in the taping group and 59.37 ± 18.58 (P < .001) in the short-leg-cast group.

Finally, the mean ± SD AOFAS score on day 100 was 93.81 ± 6.70 (P < .01; improved): 94.22 ± 6.22 (P < .01) in the taping group and 93.33 ± 7.33 (P < .01) in the short-leg cast group. The correlations between edema and AOFAS scores over time are shown in Figures 3 and 4, respectively.

Using the present study design, no statistically significant difference was found between the cohesive taping group and the short-leg casting group in terms of ankle edema or functional scores (AOFAS) in the acute or subacute period after ankle sprain.

**Discussion**

Taping and bracing methods are both used to treat and prevent acute ankle sprains by clinicians and athletic trainers; there is no consensus algorithm for choosing the optimal method. Herein, we did not calculate the costs of the treatments because of the different qualities and prices of application materials around the world. Both of these treatment options cost more or less the same in this study. Also, the application times of these treatment options were nearly equivalent.

In this study, we examined the treatment efficacy of these two treatment modalities using the decrease in edema and the increase in AOFAS scores as objective measures. Both treatment methods were effective in decreasing edema and increasing functional scores. We did not find any statistically significant difference between cohesive taping and short-leg casting in the treatment of acute low-type ankle sprains. Herein, we decided on treatment according to the examination and initial AOFAS scores of the patients, not edema alone. There may be other factors that decrease functional

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**Table 2. Summary of Outcome Data by Patient Group**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bandage Group (n = 32)</th>
<th>Short-Leg Cast Group (n = 27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, M/F (No.)</td>
<td>21/11</td>
<td>19/8</td>
</tr>
<tr>
<td>Age (mean [years])</td>
<td>27.91</td>
<td>29.44</td>
</tr>
<tr>
<td>Side, right/left (No.)</td>
<td>16/16</td>
<td>17/10</td>
</tr>
<tr>
<td>Edema (cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>1.57</td>
<td>1.55</td>
</tr>
<tr>
<td>Day 10</td>
<td>0.67</td>
<td>1.11</td>
</tr>
<tr>
<td>AOFAS score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>61.84</td>
<td>37.07</td>
</tr>
<tr>
<td>Day 10</td>
<td>79.25</td>
<td>59.37</td>
</tr>
<tr>
<td>Day 100</td>
<td>94.22</td>
<td>93.33</td>
</tr>
</tbody>
</table>

Abbreviation: AOFAS, American Orthopaedic Foot and Ankle Society.

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**Figure 3.** Mean ± SD change in edema in each treatment group by time.

**Figure 4.** Mean ± SD change in American Orthopaedic Foot and Ankle Society (AOFAS) scores in each treatment group by time.
ankle scores and increase pain, such as anterior fibrous bundle effects, not just edema.

The use of immobilization in the management of acute ankle injuries in adults is generally well tolerated. It has been reported that a below-the-knee cast for 10 days resulted in more rapid resolution of symptoms and pain and the greatest recovery of self-reported ankle function at the 3-month follow-up compared with other treatments (compression tape, Bledsoe boot [Bledsoe Brace Systems, Grand Prairie, Texas], and Aircast brace [Aircast Inc, Summit, New Jersey]).

Functional treatment of ankle sprains is controversial, with no consensus. It has been reported that patients with an initial ankle sprain may develop chronic ankle instability. Severe and repetitive ankle sprains increase the risk of ankle osteoarthritis. The goal in early treatment is not only to slow down acute symptoms but also to prevent tonicity of the injury. It is known that low-grade acute lateral ankle sprains result in a higher risk of reinjury than do high-grade acute lateral ankle sprains. Thus, short-leg cast immobilization would seem to be a better treatment option. In addition, a short period of immobilization in a below-the-knee cast or treatment with semirigid orthoses results in faster recovery than if the patient is given only tubular compression tape. There were no differences among a below-the-knee cast, semirigid orthosis, and tubular compression tape at the 9-month follow-up. However, other potential complications exist, such as deep venous thrombosis. We did not see this complication in any of our patients.

The treatment trend has clearly shifted in favor of functional treatment in recent years. Early mobilization speeds healing and reduces pain more effectively than does prolonged rest. Taping and semirigid bracing play an acceptable role in preventing injury or rehabilitation of the injured ankle by improving coordination and proprioception while decreasing vertical jump performance.

Taping has also become an alternative treatment option in clinical and sporting settings. However, tape strength can be decreased by exercise, causing tape fibers to break down owing to moisture accumulating on the skin from perspiration. Inversion movements of the foot in the first 24 hours are another major reason for lost strength in the tape soon after application.

Dilation of lymphatic vessels due to local inflammatory mediators is a major reason for posttraumatic edema. Decreased contractility of the lymphatic vessels can also aggravate the edema. Elastic cohesive tape protects the skin from any deformation and helps decrease tissue edema by increasing lymph flow.

In the present study, the edema around the ankle was nearly the same in both groups. There was no direct correlation between the degree of edema and AOFAS scores after trauma. Because edema is visible, the initial AOFAS score in the same patient may be higher and then decrease later when edema is not visible to the patient.

Other soft-tissue pathologic abnormalities, such as scar tissue of the synovium, meniscoid lesions associated with localized synovitis, and scar formation due to a distal fascicle of the anteroinferior tibiofibular ligaments are causes of persistent complaints after ankle sprains. Thus, clinical examination and functional ankle scores may be more valuable than edema alone in assessing ankle sprains.

The “rest, ice, compression, and elevation” (RICE) regimen is probably now the standard treatment protocol used to control swelling in the postacute phase in ankle sprains. If the tape is applied too tightly, blood flow can be impeded, leading to tissue damage and even necrosis. For this reason, an alternative taping technique using elastic cohesive taping has been developed. This alternative technique involves the use of three zinc oxide stirrups for primary restriction, followed by figure-of-eight wraps using a cohesive tape. This technique not only provides adequate support but also allows functional movement without restricting blood flow to and from the tissues distal to the taping. With the newly developed techniques, taping is becoming more popular than other treatment methods.

One weakness of this study was the lack of a homogeneous control group, which ideally would have the same injury pattern. But they were all grade I and II injury patterns, also called low-type ankle sprains. Thus, as noted, we used cohesive taping or short-leg cast immobilization for grade I and II injuries. We excluded patients with grade III injuries.

Further well-designed prospective clinical studies with larger samples are needed to determine the ideal treatment algorithm for acute low-type ankle sprains. It is also necessary to collect data during the chronic phase to show a significant effect.

Conclusions

With the numbers available, no significant difference could be detected between cohesive taping and short-leg casting in the treatment of acute low-
type ankle sprains in this preliminary study. Both
treatment methods were effective in decreasing
edema and increasing functional scores in the ankle.
At the beginning of treatment, not only the degree of
edema but also the initial functional scores of the
ankle and examinations are important in making
decisions regarding optimal treatment options.

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Conflict of Interest: None reported.

References
1. EILS E, ROSENBAUM D: A multi-station proprioceptive
exercise program in patients with ankle instability. Med
2. FERRAN NA, MAFFULLI N: Epidemiology of sprains of the
lateral ankle ligament complex. Foot Ankle Clin 1: 659,
2006.
3. VOGHT ML: Reduction of post traumatic ankle edema
with high voltage pulsed galvanic stimulation. Athl Train
4. NOERWIG JA: Edema control and the acutely inverted
5. GREENE TA, HILLMAN SK: Comparison of support provided
by a semirigid orthosis and adhesive ankle taping
before, during, and after exercise. Am J Sports Med
6. IVINS D: Acute ankle sprain: an update. Am Fam
7. CRICHTON K, FRICKER P, PURDAM C, ET AL: “Injuries to the
Pelvis and Lower Limb,” in Science and Medicine in
Sport, 2nd Ed, edited by J Bloomfield, PA Fricher, K
8. PERRIN DH: Athletic Taping and Bracing, 2nd Ed,
Human Kinetics, Champaign, IL, 2005.
9. MIYAMOTO W, TAKAO M, MATSUSHITA T: Anterior fibrous
bundle: a cause of residual pain and restrictive plantar
flexion following ankle sprain. Knee Surg Sports
10. KERKHOFFS GM, ROWE BH, ASSENDELFT WJ, ET AL:
Immobilisation for acute ankle sprain: a systematic review.
11. HERTEL J: Immobilisation for acute severe ankle sprain.
12. ITAY SA, GANEL H, HOROSZOWSKI H, ET AL: Clinical and
functional status following lateral ankle sprains. Orthop
13. VALDEIRABANO V, HINTERMANN B, HORISBERGER M, ET AL:
Ligamentous posttraumatic ankle osteoarthritis. Am J
14. ANANDACOOMARASAMY A, BARNES L: Long term outcomes
15. MALLIAROPoulos N, NTISSLEREN M, PAPACOSTAS E, ET AL:
Reinjury after acute lateral ankle sprains in elite track
16. LAMB SE, MARSH JL, HUTTON JL, ET AL: Collaborative Ankle
Support Trial (CAST) Group: Mechanical supports for
acute, severe ankle sprain: a pragmatic, multicentre,
17. NESHERWAT F, SERDO AR: Deep venous thrombosis and
pulmonary embolism following cast immobilisation of
19. TIEMSTRA JD: Update on acute ankle sprains. Am Fam
20. OZER D, SENBURSA G, BALTACI G, ET AL: The effect on
neuromuscular stability, performance, multi-joint coor-
dination and proprioception of barefoot, taping or
21. KEENAN AM, TANNER CM: The effect of high-Dye and low-
22. BUNCH RP, BEDNAIRSKI K, HOLLAND D, ET AL: Ankle joint
support: a comparison of reusable lace-on braces with
23. FLEET K, GALEN S, MOORE C: Duration of strength
retention of ankle taping during activities of daily living.
24. SZCZESNY G, OLSZEWSKI WL: The pathomechanism of
posttraumatic edema of the lower limbs: II. Changes in
25. SHIM JY, LEE HR, LEE DC: The use of elastic adhesive tape
to promote lymphatic flow in the rabbit hind leg. Yonsei
26. DEIBERARDINO TM, ARCHERO RA, TAYLOR DC: Arthroscopic
treatment of soft tissue impingement of the ankle in
27. FEKRET RD, KARZEL RP, DEL PIZZO W, ET AL: Arthroscopic
treatment of anterolateral impingement of the ankle.
28. RUCINSKI TJ, HOOKER DN, SHIELDS WE JR, ET AL: The effects of
intermittent compression on edema in postacute
29. TREÔQUET P, MEILLAND F, HOBODYNSI MB: A comparison of
the effects of ankle taping styles on biomechanics
during ankle inversion. Ann Phys Rehabil Med 56: 113,
2013.