J Arch Mil Med. 2014 August; 2(3): e22517. DOI: 10.5812/jamm.22517

Published online 2014 August 30. **Research Article**

Ankle Sprains at a Military Male School: Taping Versus Bracing

Farzad Najafipour [1]; Farshad Najafipour [2]; Ahura Ahmadi [3,*]

[1]Department of Physical Therapy, Semnan University of Medical Sciences, Semnan, IR Iran
[3]Department of Epidemiology, AJA University of Medical Sciences, Tehran, IR Iran
[3]Community Medicine Department, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

*Corresponding author: Ahura Ahmadi, Community Medicine Department, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran. Tel: +98-2166726909, Fax: +98-2166726909,, E-mail: Ahura.ahmadi@gmail.com

Background: Functional treatments are widely used and are generally the accepted treatment for ankle sprains. Regarding effectiveness, comparing different functional treatment options could not make definitive conclusions.
Objectives: The objective of this article was to compare Taping Versus Bracing for Ankle Sprains injuries.
Patients and Methods: All injured individuals with acute ankle sprains received standard advice (rest, ice compression with a compressive bandage, and elevation) at the clinic. After a week, 150 injured individuals with grade II and III sprains were categorized randomly into two groups: one group was treated with tape and the other with a brace for four weeks. Post injury training (proprioceptive and physical) was performed for the two groups. As first outcome parameters patient satisfaction and skin complications were assessed with an organized questionnaire and quantitative scale. As late outcome parameters, the function of ankle joint was evaluated with Karlsson quantitative scale and range of motion (ROM).
Results: The study group indicated that satisfaction and comfort during brace treatment increased significantly. A cutaneous complication in the brace group was significantly lower in comparison to the other group (16.4% versus 51.9%). The ankle joint function outcome and perceived pain was the same for both groups.
Conclusions: Treating acute ankle sprain with a brace was accompanied with greater satisfaction and less pain with a similarly acceptable outcome when compared to taping.

Keywords: Military Personel; Ankle Sprain; Athletic Tape

1. Background

One of the most common joint injuries, in particular among military personnel and athletes is acute ankle sprain (1). Overall 50% of these injuries arise during sport activities and in 75% the etiology is a traumatic inversion (2). About 23,000 people in the United States are involved in ankle sprains every day, which sums up to 8,400,000 cases every year (3). Treatments with functional approaches are commonly accepted for ankle sprains. These approaches have many different types. Taping and bracing are the most common functional treatment methods used worldwide and have the best functional outcomes in comparison with elastic bandage and plaster immobilization (4). The tape method obviously has more complications, mainly involving the skin, in comparison with the elastic bandage method (5).

The specificity and sensitivity of delayed physical examination for lateral ankle ligament tearing diagnosis is 85% and 95%, respectively (6). Positive anterior drawer test and anterior talofibular ligament (ATFL) tenderness with presentation of hematoma have enhanced sensitivity to 99% (7). However, if we consider the satisfaction of the patient throughout the functional treatment of an acute ankle sprain, many questions have remained un-answered (8, 9).

2. Objectives

According to our clinical experience we proposed that the treatment of a lateral ankle sprain by a semi-rigid ankle brace causes smaller local side-effects and further subjective satisfaction than treatment by taping, with a better functional consequence Thus, the aim of this study was to investigate the available evidence in this regard.

3. Patients and Methods

This was a randomized controlled trial conducted at the trauma outpatient clinic of the Imam Reza Military Hospital in Tehran, capital city of Iran, from March 2011 to August 2013. The minimum sample size with 90% power and 5% significance level was calculated as 54 patients per group. The patients included in this study had a grade II or III ankle sprain; remarkable damage to lateral ligaments defined by existence of a lateral hematoma and tenderness at the anterior lateral ligament without (grade II) or with anterior drawer instability (grade III) as evaluated by the treating physician when referred to the outpatient clinic in 5-7 days. Grade I ankle sprain was defined as the absence of a hematoma and tenderness at the anterior lateral ligament. Patients with a presence of a lateral he-

matoma and tenderness at the anterior lateral ligament without instability were determined as grade II. Furthermore, patients with lateral hematoma, tenderness and instability were defined as grade III (10). Patients undergoing preventive treatment for recurrent ankle sprains were excluded from the study. Patients were excluded if they had a fracture following the Ottawa Ankle Rules, past medical history of ankle sprain or fracture and continuous swelling that made treatment with a tape impossible (11). Patients with an inversion trauma were examined by a physician. The initial treatment included a compressive bandage together with standard advice such as rest, ice compression and elevation. Analgesics and crutches were not standardized. Patients returned to the outpatient clinic in five to seven days after the trauma. During the visit, the physician reassessed the ankle. After obtaining an informed consent from the patients with grade II/III lateral ankle sprain, they were randomized into two equal groups. The randomization was made by random numbers calculated by the SPSS software.

One group was treated with a semi rigid brace and the other with tape, both for four weeks. The tape was reapplied in the outpatient clinic at least one time a fortnight or when patients indicated that stability was lost from the tape or for hygiene purposes or skin related disorders. Taping was done by a selected group of experienced and skilled professionals of the outpatient clinic. The tape consists of three layers. The first layer is latex free and adhesive bandage to protect the skin. The second layer consists of a 2.5 cm non-elastic strapping tape (Leukotape) used for support. The third layer consists of a 6 cm broad Elastoplast that is elastic and is used for fixation of the second layer (12). The semi-rigid ankle brace has contoured plastic shells that are held in place with a hook and loop fasteners that can be adjusted individually. This ankle support (medial and lateral side of the ankle) has cushions that stabilize the ankle's lateral ligaments preventing them from twisting. Verbal and written instructions were given for daily exercises emphasized on proprioceptive, range of motion training and strength exercises (13).

As a primary outcome parameter, patient satisfaction was assessed by a verbal rating scale, including poor (5), moderate (4), sufficient (3), good (2) and excellent (1), at the second and fourth week after the start of the study treatment. In addition, the ankle joint function was assessed using the validated Karlsson scoring scale and range of motion at 2, 4, 8 and 12 weeks after the start of the study treatment. An anterior drawer test was performed to assess the stability of the anterior talofibular ligament and compared to the uninjured ankle.

The Karlsson scoring scale consists of eight categories with a total of 90 points, assessing pain, swelling, instability, stiffness, stair climbing, running, work activities and support. Furthermore, the level of pain was evaluated using a five point pain scale: no pain (1), mild pain (2), moderate pain (3), severe pain (4) and overwhelming pain/worst ever (5). The same five point Likert scale was used to assess patient reported hygiene. Complications of the treatment were registered as allergic contact dermatitis, bullae and/or skin pressure abnormalities requiring local skin treatment or cessation of the treatment.

As a primary outcome parameter, patient satisfaction was assessed by a verbal rating scale, including poor (5), moderate (4), sufficient (3), good (2) and excellent (1), both at two and four weeks after the start of the study treatment. In addition, the ankle joint function was assessed using the validated Karlsson scoring scale and range of motion at 2, 4, 8 and 12 weeks after the start of the study treatment (14). An anterior drawer test was used to assess the stability of the anterior talofibular ligament and compared to the uninjured ankle (15).

Complications of the treatment were registered as allergic contact dermatitis, bullae and/or skin pressure abnormalities requiring local skin treatment or cessation of the treatment. The range of motion of the ankle joint covers the movement between the maximum dorsal and the maximum plantar flexion. After collecting the results of all patients, data were entered in the SPSS software version 16.0 and analyzed by descriptive and analytical statistics using the T-test. Level of significance was set at 0.05.

4. Results

One-hundred and fifty cases were included in this trial. After randomization, three cases were considered unacceptable: X-rays of all three cases revealed a fracture and met the criteria of exclusion. Early outcomes (satisfaction of patients, pain and complications) of 121 cases were recorded (12 cases in the bracing group and 13 cases in the taping group did not come for follow-up). The late outcome, meaning ankle function, for 105 cases were recorded. All cases were male with mean age of 23.3 ± 0.3. Totally, 37% of cases experienced an ankle sprain attributable to sport or related activities that were dispersed amongst the two treating groups (tape: 28/49 against 27/49, P = 0.9). The number of positive anterior drawer tests for the injured ankle compared to the uninjured ankle was similar prior to the start of the treatment (2/49 against 3/49 for the taping group and the bracing group, respectively, P = 0.2).

Score of subjective satisfaction was 2.3 ± 0.2 for the taping group and 1.45 ± 0.1 for the bracing group from the total of five points. In the taping group 51.9% of cases suffered from side effects, including skin abnormalities, bullae formation or contact dermatitis. The amount of side effects was consequentially less (16.4%) in the bracing group. Hygiene was consequentially more in cases of the bracing group. Throughout the study, three (3.9%) shifts were made from bracing to taping, because of lower stability of treatment with the brace; these three cases were excluded from the study. No shift from tape to brace was made.

The functional consequence was adjusted utilizing the Karlsson score extended throughout week four and eight, the mean of functional score was 76 (SD 11) of maximum 90 scores. Both groups were equal in this extended functional capability, including time to return to routine work and sport activities. Besides, the pain score was equal among the taping and bracing groups. Charge of bracing was $20 (para-clinic = $5 and brace price =$15) for each case but charge of taping was $10 (para-clinic = $5 and tapes price = $5); bracing was done only one time for each case.

Passive and active ROM for the taping group at week zero was 21.1 ± 2.1 and 21.7 ± 2.1, respectively. However, passive and active ROM at first visit for the taping group was 22.2 ± 2.2 and 22.1 ± 2.2, respectively. Pain score for the taping and bracing group at first visit was 3.80 ± 0.35 and 3.85 ± 0.35, respectively. Pain score for the taping and bracing group at week four was 1.55 ± 0.15 and 1.40 ± 0.10, respectively. Pain score for the taping and bracing group at week 12 was 0.55 ± 0.05 and 0.50 ± 0.05, respectively (Table 1).

Table 1. Comparing Pain, PROM (Passive Range of Motion) and AROM (Active Range of Motion) Amongst the two Groups

Time, Group	PROM (SD)	P Value	AROM (SD)	P Value	Pain (SD)	P Value
First visit		0.41		0.33		0.78
Tape	21.1 (2.1)		21.7 (2.1)		3.80 (0.35)	
Brace	22.2 (2.1)		22.1 (2.1)		3.85 (0.35)	
Week 4		0.037		0.044		0.001
Tape	13.2 (1.1)		13.6 (1.1)		1.55 (0.15)	
Brace	12.3 (1.1)		13.1 (1.1)		1.40 (0.10)	
Week 12		0.004		0.01		0.031
Tape	6.3 (0.6)		6.5 (0.6)		0.55 (0.05)	
Brace	5.7 (0.5)		5.9 (0.5)		0.50 (0.05)	

5. Discussion

Functional treatments are widely used and accepted treatments for ankle sprains. Many investigations evaluating the competency of diverse conservative treatments of acute ankle sprain have been executed; nevertheless until now, little is known about subjective satisfaction in association to functional results (10). This randomized controlled trial demonstrated a greater satisfaction, lower local complications and less pain in patients who underwent semi-rigid bracing compared to taping; however indicated no overall better functional outcome (2).

Two researches previously compared subjective satisfaction with bracing (3). Seventy-six percent of cases treated with bracing in one trial (4) were satisfied or over satisfied, but in our trial 95% of cases reported satisfaction as good or excellent. In the other randomized trial (5) cases in the bracing group qualified upper levels of satisfaction and comfort. The functional outcome indicated by the Karlsson score was also higher in the bracing group against the elastic bandage group at forty days (6).

In a meta-analysis (7) diverse functional treating approaches for adult acute lateral ankle ligament injuries were reviewed. Diversity of outcome results prohibited analysis of results and it was not possible to make absolute conclusions about the most effective functional treating approach; there appeared to be no evidence that bracing (semi-rigid) is better that taping regarding functional outcome in the personal trials. A semi-rigid ankle brace versus elastic bandage caused more stability and a more rapid return to work and sport.

Also, in this study, objective functional outcome (ROM) was the same as subjective (patient reported) functional outcome score (Karlsson scale), indicating that there was no functional ability variation amongst the two groups (8). Furthermore, the pain score was comparable amongst the taping and bracing (semi-rigid) approach at three months (9). However, the taping approach caused more side effects, (mostly skin abnormalities), when compared with treatment with an elastic bandage (10).

Acceptance of treatment with a bracing method (semi-rigid brace) is more than treatment with the taping method. One researcher, in a limited trial on the treatment of acute ankle sprain with taping and bracing, found higher subjective satisfaction, but also higher charges of treatment for a semi-rigid brace (1.5 times). Specifications of charges have been indicated previously in this article. When taping and bracing approaches are used as preventive methods, this comparison seems to be different. One trial showed that the expenses for prevention of ankle sprain were obviously more when using preventive taping instead of preventive bracing (5, 8-10, 15). Treating expenses of an ankle sprain by taping in our study was lower than bracing, mainly due to brace and tape prices (1.25 times for brace respectively). Therefore, more comfort of ankle sprain treatment comes with greater expenses (15).

In summary this trial indicates that treatment of acute lateral ankle sprain with a semi-rigid brace causes fewer side effects and a more subjective (patient) satisfaction and less pain than treatment with a tape. Regarding

former investigations there is no difference regarding functional outcome and pain. Accordingly, applying a semi rigid brace should be advised for treatment of acute ankle sprains.

Acknowledgements

The authors thank the medical staff and patients that collaborated with this study.

Authors' Contributions

All of the authors contributed equally to this study.

References

1. O'Connor SR, Bleakley CM, Tully MA, McDonough SM. Predicting functional recovery after acute ankle sprain. *PLoS One.* 2013;**8**(8).
2. Gonzalez de Vega C, Speed C, Wolfarth B, Gonzalez J. Traumeel vs. diclofenac for reducing pain and improving ankle mobility after acute ankle sprain: a multicentre, randomised, blinded, controlled and non-inferiority trial. *Int J Clin Pract.* 2013; **67**(10):979–89.
3. Wahnert D, Gruneweller N, Evers J, Sellmeier AC, Raschke MJ, Ochman S. An unusual cause of ankle pain: fracture of a talocalcaneal coalition as a differential diagnosis in an acute ankle sprain: a case report and literature review. *BMC Musculoskelet Disord.* 2013;**14**:111.
4. Kerkhoffs GM, Struijs PA, Marti RK, Assendelft WJ, Blankevoort L, van Dijk CN. WITHDRAWN: Different functional treatment strategies for acute lateral ankle ligament injuries in adults. *Cochrane Database Syst Rev.* 2013;**3**:CD002938.
5. Park J, Hahn S, Park JY, Park HJ, Lee H. Acupuncture for ankle sprain: systematic review and meta-analysis. *BMC Complement Altern Med.* 2013;**13**:55.
6. Lin CW, Hiller CE, de Bie RA. Evidence-based treatment for ankle injuries: a clinical perspective. *J Man Manip Ther.* 2010;**18**(1):22–8.
7. 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 Med.* 2011;**41**(3):185–97.
8. Baumbach SF, Fasser M, Polzer H, Sieb M, Regauer M, Mutschler W, et al. Study protocol: the effect of whole body vibration on acute unilateral unstable lateral ankle sprain- a biphasic randomized controlled trial. *BMC Musculoskelet Disord.* 2013;**14**:22.
9. Information from your family doctor. How to care for your ankle sprain. *Am Fam Physician.* 2012;**85**(12):1.
10. Robroek WCL, Van De Beek G. *Bandages and Bandaging Techniques Skills in medicine*.Maastricht: Maastricht University; 2009.
11. Cosby NL, Koroch M, Grindstaff TL, Parente W, Hertel J. Immediate effects of anterior to posterior talocrural joint mobilizations following acute lateral ankle sprain. *J Man Manip Ther.* 2011;**19**(2):76–83.
12. Bergmann G, Ciritsis BD, Wanner GA, Simmen HP, Werner CM, Osterhoff G. Gastrocnemius muscle herniation as a rare differential diagnosis of ankle sprain: case report and review of the literature. *Patient Saf Surg.* 2012;**6**(1):5.
13. Fewtrell MS, Kennedy K, Singhal A, Martin RM, Ness A, Hadders-Algra M, et al. How much loss to follow-up is acceptable in long-term randomised trials and prospective studies? *Arch Dis Child.* 2008;**93**(6):458–61.
14. Witjes S, Gresnigt F, van den Bekerom MP, Olsman JG, van Dijk NC. The ANKLE TRIAL (ankle treatment after injuries of the ankle ligaments): what is the benefit of external support devices in the functional treatment of acute ankle sprain? A randomised controlled trial. *BMC Musculoskelet Disord.* 2012;**13**:21.
15. Lardenoye S, Theunissen E, Cleffken B, Brink PR, de Bie RA, Poeze M. The effect of taping versus semi-rigid bracing on patient outcome and satisfaction in ankle sprains: a prospective, randomized controlled trial. *BMC Musculoskelet Disord.* 2012;**13**:81.