

Ankle Braces Effectively Reduce Recurrence of Ankle Sprains in Female Soccer Players

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Objective: The purpose of this study was to examine the effectiveness of ankle bracing and taping in preventing recurrences of ankle sprains, specifically in female athletes.

Design and Setting: Varsity soccer players' medical records over a five-year period were retrospectively reviewed at a Division III women's college. Data were extracted regarding any history of ankle sprain(s), type of intervention used as prophylaxis after the ankle sprain, number of exposures, and any incidence of recurrence.

Subjects: All collegiate varsity soccer players who had suffered a previous sprain to either one or both ankles (38 players) were identified as subjects.

Measurements: Each previously injured ankle ($n = 56$) was considered as a case for the analysis. Ankles that had a previous sprain received one of four interventions: 1) a canvas, laced ankle brace ($n = 19$), 2) taping ($n = 12$), 3) a combination of taping and ankle bracing ($n = 8$), or 4) no treatment ($n = 17$).

Results: The four intervention groups had a total of 1717 practice exposures and 650 competitive game exposures; exposures did not differ among the 4 groups. Ankle sprain recurrence frequency was 0%, 25%, 25%, and 35% for the braced, taped, combination, and untreated groups, respectively. The recurrence incidence for the braced group was significantly lower than that of the other three groups. The ankle sprain recurrence frequency did not differ among the taped, combination, and no treatment groups.

Conclusion: We suggest that prophylactic ankle bracing is effective in reducing the incidence of ankle sprains in female soccer players with a previous history of ankle sprains.

Key Words: ankle bracing, ankle sprains, female soccer players

Ankle injuries are among the most common impairments in intercollegiate athletics, accounting for 12 to 18% of all injuries,¹⁻¹⁰ and the large majority of these injuries are ankle sprains.^{1,2,4} Athletes with a previous history of ankle sprains are also more likely to reinjure the ankle.^{1,2,11,12}

The application of external ankle support (taping, wrapping, and/or bracing) has long been advocated as a method for preventing ankle sprains¹³ because it can limit the range of motion of the joint.¹⁴⁻¹⁸ However, exactly how much restriction is needed to prevent overstretching of the ligaments is still in question.^{19,20} Authors have reported that prophylactic taping² or use of a laced stabilizer²¹ can significantly reduce the frequency of ankle sprains. Taping has also been shown to reduce recurrence of ankle sprains in basketball players.²

Since 1979, our athletic training staff at Wellesley College has systematically performed preseason screening²² and collected injury data on the athletes, all of whom are female.⁴ In 1987 we began offering lace-up ankle braces as well as a standard taping technique as prophylaxis for individuals with a history of previous ankle sprains. Over the next few years, we observed a dramatic reduction in the recurrence of ankle sprains in athletes wearing ankle braces, which was not the case in those who were taped. In order to systematically determine the effectiveness of the braces in reducing the frequency of reinjury, we conducted a retrospective cohort study examining ankle sprain recurrences in athletes using different types of external ankle support (or no support).

MATERIALS AND METHODS

Over a five-year period (1988-1992) medical records were examined for all varsity soccer players. Athletes who had a previous ankle sprain were considered subjects for this investigation. A previous ankle sprain was defined as one that was reported by the subject during the preseason screening, one that took place prior to the start of the season (ie, over the summer), or one that occurred during a previous sport season. Each subject was followed for only one soccer season after the previous sprain.

Thirty-eight players were identified as subjects for this analysis. Seven players had a previous sprain to the left ankle, 13 had a previous sprain to the right ankle, and 18 had previous sprains to both left and right ankles. Each previously sprained ankle (total of 56 ankles) was considered a separate case. Cases

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were grouped according to the type of protective intervention used on the ankle.

For all subjects, the following data were extracted from athletic training records: physical characteristics (age, height, weight), type of intervention (if any), number of exposures (number of practices and games in which each subject participated for that season), and whether an ankle sprain recurrence had taken place. Weight was measured on a beam scale with athletes wearing shorts, t-shirt, and no footwear. Height was measured with the anthropometer attached to the scale. Age at the beginning of the sport season was calculated to the nearest year from the subject's date of birth.

An ankle injury recurrence was defined as any ankle sprain occurring as a result of participation in varsity soccer that required treatment by the athletic training staff. Intervention options included taping, bracing, a combination of both tape and brace, or no intervention (neither bracing nor taping). Athletes who had previous sprains to both ankles may have had a different intervention for each ankle (ie, right braced, left taped, etc.) The selection of intervention depended on the year and on the individual. In 1988, athletes with a previous sprain were advised, but not required, to use some type of prophylaxis (either tape, brace, or both together). In 1989, athletes with a previous sprain were required to choose tape, brace, or both. By 1990, we required all soccer players with a history of ankle sprain to wear a brace for practices and games. For certain individuals, tape was also applied under the brace.

The standard ankle taping procedure was a modified basketweave with two medial and two lateral heel locks, and two half-figure 8 strips pulling the foot into slight eversion. Preparation for taping included applying tape adherent and pretape underwrap. Taping was performed by certified athletic trainers or experienced student athletic trainers in all cases. The brace used was the Swede-O Universal Ankle Support (North Branch, MN), a canvas lace-up brace worn over one sock. Athletes were instructed in the proper application of the brace by a certified athletic trainer. In the combination of tape and brace, the ankle was taped as above and the brace worn over the tape and one sock.

Information on exposures was abstracted from the practice and game schedules for each soccer season studied and from the medical records of each subject (practices and games missed for any reason). A practice exposure was defined as any practice session in which the athlete participated. A game exposure was any competition with another college in which the subject participated. Total exposures were the sum of the game and practice exposures. All players wore low-top shoes with molded or screw-in type cleats for both practices and games.

Data Analysis

Descriptive statistics were calculated on the physical characteristics and the exposure data. Overall differences in the exposures among the four groups were tested using a one-way analysis of variance. Differences in overall reinjury frequency among the groups were tested using a 2×4 (injured/noninjured vs groups) χ^2 analysis. Where sample sizes were

fewer than five in a cell, Yates correction was applied. Differences among groups were tested using the Fisher exact (FE) test.

RESULTS

The 38 subjects had a mean (SD) age of 19.1 years, height of 165.8 ± 7.7 cm (65.3 ± 3.0 inches), and weight of 61.6 ± 8.8 kg (156.2 ± 19.4 lbs).

There were a total of 1717 practice exposures and 650 game exposures. Table 1 shows descriptive statistics on the exposures for each of the four groups. There were no significant differences among the groups in the number of total exposures ($F(3,52) = 0.56, p = .64$), practice exposures ($F(3,52) = 0.38, p = .77$), or game exposures ($F(3,52) = 0.48, p = .70$).

The influence of the four interventions on recurrence of ankle sprains is shown in Table 2. The group with ankle bracing had no ankle sprain recurrences. There were significant differences in overall frequency of ankle sprain recurrences among the four groups ($\chi^2(3) = 7.65, p = 0.05$). The braced group had significantly fewer recurrences than the group with no treatment (FE, $p = 0.006$) and the group that was taped (FE, $p = 0.05$); the braced group also tended to differ in recurrence frequency from the combination group (FE, $p = 0.08$). The group that was taped did not differ in ankle injury recurrences frequency compared to the combination group (FE, $p = 0.70$) or the group that had no treatment (FE, $p = 0.43$). The combination group did not differ in injury frequency compared to the group with no treatment (FE, $p = 0.49$).

DISCUSSION

This is the first study to report on the efficacy of ankle bracing for prevention of ankle sprain recurrence in female athletes. We observed that ankle bracing was associated with a significant reduction in the frequency of ankle sprain recurrence in female collegiate varsity soccer players, while taping was considerably less effective. Differences in exposure cannot account for the lower injury frequency in the braced group since the number of practices and games were similar to the taped group (see Table 1).

There are few reports in the literature on the advantages and disadvantages of ankle bracing.²³ Unlike tape, the ankle brace can be tightened by the athlete if it becomes loose during practice or competition.²¹ Bunch et al³ reported that lace-on ankle braces lost only 5 to 9% of their initial support during use (taping lost 21%), but they used a mechanical testing device

Table 1. Practice Sessions, Game Sessions, and Total Sessions Attended by Subjects in Each Intervention Group (Values are Means \pm SD)

Treatment Intervention	Practice Sessions	Game Sessions	Total Sessions
Braced	30.5 \pm 8.6	10.8 \pm 8.5	41.4 \pm 13.5
Taped	32.8 \pm 3.8	12.3 \pm 6.3	45.1 \pm 8.7
Combination	32.6 \pm 6.2	14.4 \pm 5.1	47.0 \pm 9.7
No treatment	30.5 \pm 8.6	11.7 \pm 6.4	42.2 \pm 12.5

Table 2. Ankle Sprain Reinjury Frequency in the Four Groups

Treatment Intervention	Injured	Not Injured	Total	Percent Injured
Braced	0	19	19	0
Taped	3	9	12	25
Combination	2	6	8	25
No treatment	6	11	17	35

that eliminated human factors, like sweat accumulation and movements in many axes, that are possible at the ankle.

It was somewhat surprising that taping was not more effective in preventing ankle sprain recurrences. Garrick and Requa² reported a prospective study in which athletes who had a previous history of ankle sprains were 3.4 times less likely to be reinjured if they were taped. However, Rovere et al²¹ reported that a lace-up brace was more effective than taping in preventing ankle sprains in college football players. In agreement with Rovere et al,²¹ our data show that subjects with an ankle brace were much less likely to be reinjured.

The practice of taping ankles to protect against sprains is nearly universal. Although taping can provide an initial custom fit that is comfortable and protective,²⁴ the ability of tape to restrict the ankle's range of motion after the initial application may be compromised as use continues. Taping has been shown to lose 18 to 83% of its ability to restrict range of motion after a period of athletic activity.^{19,20,25-27} Some possible causes of this loosening include moisture accumulation under the tape (which reduces its adherence to the skin) and mechanical failure such as tearing and rolling downward.^{24,28,29} The effectiveness of taping may be also limited by the mobility of the skin to which the tape is applied. Skin problems such as dermatitis and blisters can be caused by repeated daily applications of tape.^{16,24,28}

Other factors to consider are the cost of taping and the need for the presence of a skilled individual (athletic trainer) to apply the tape. The cost per athlete of disposable tape is much more than that of a reusable ankle brace.²¹ In our training room we estimate that we could buy two to three braces (each guaranteed effective for one season) with the money we would spend taping one ankle for the soccer season. In addition, with minimal training, athletes can apply their own ankle braces, which they can also use during their own recreational activities.

Subjects in the combination group were 1.4 times less likely to be reinjured than subjects in the group with no treatment, although this was not statistically significant. Our initial assumption was that the protective effects of brace and tape would be additive, but our results do not support this. While the combination group and the taped group had an equal risk of reinjury (see Table 2), the difference between the braced group and the combination group was not significant. This may have been due to small sample size and/or subject selection bias. The combination group consisted of six ankles with history of multiple (three or more) recurrent ankle sprains and two ankles with an associated tendon injury and only one previous sprain. A history of multiple sprains may have made them more likely to have been reinjured as other authors have reported,^{1,2,11} but

8 of the 19 ankles in the braced group had a history of multiple sprains and none of these was reinjured.

The same factors that contribute to the loosening of tape when applied alone would also be acting on the tape under the brace, thus reducing its protective effect. In addition, the added layer of tape may provide further physical separation of the brace from the joint, thus decreasing the brace's ability to restrict excess joint movement.

Athletes using the combination seemed to feel an increased sense of confidence in their ankle stability with the tape under the brace, at least on initial application. Such confidence may have allowed the athlete to play with less worry and thus maintain good concentration. However, it may also have provided a false sense of security that could have resulted in more risk taking during play.

In summary, we suggest that ankle bracing is effective in reducing ankle sprain recurrences during a season of varsity soccer since the brace prevented ankle sprain recurrences (no reinjuries). Thus, we feel that the brace is to be preferred over tape as a method of ankle protection for those with a history of previous ankle sprain. Further study would be needed to determine whether the combination of tape and brace together is actually less effective than the lace-up brace alone.

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