BRACING FOLLOWING SYNDESMOSIS ANKLE INJURY IN ATHLETES

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Introduction

A sprained syndesmosis joint between the distal tibia and fibula may cause a serious disruption in ankle function (Boytim et al., 1991; Taylor, Englehardt & Bassett, 1992). Rehabilitation may include lower leg range of motion, proprioceptive, and resistance exercises (Garrick and Requa, 1988) and occasionally surgical fixation with syndesmosis screw may be required before function returns (Amendola, 1992). Recovery following a syndesmosis sprain usually takes longer than does improvement after a severe ankle sprain (Hopkinson et al., 1990) and athletes with this injury may not return to sports quickly. Because of the long recovery time, treatment of syndesmosis sprains is often frustrating (Taylor and Bassett, 1992).

Ankle instability and extreme range of motion may be decreased by bracing or taping and actual treatment time may also be reduced (Karlsson, Sward & Andersson, 1993; Karlsson & Lansinger, 1992). Despite the knowledge that external support in the form of orthoses or braces may decrease treatment time, little information is available concerning the functional changes in weight-bearing as a result of brace usage. The purpose of the present study was to evaluate functional characteristics of walking with and without a brace in athletes during recovery from a syndesmosis sprain.

Methodology

Five adult volunteers (age range 20-42) who had sustained a syndesmosis sprain during sports activities participated in the study.

Gait Protocol

Since forces monitored between the foot and the ground provide information about weight-bearing ability following a lower extremity injury, ground reaction force data were chosen to document function. Kinematic data were also collected from the lower extremity to determine the angular and velocity adaptations associated with brace usage. Subjects walked along a 6 metre walkway in which was imbedded a force place (Advanced Medical Technology, Inc) flush with the surrounding platform. Kinematic data were collected using an optotrak system (Norther Digital, Waterloo, Canada). Subjects walked using no brace, a semi-rigid orthosis (Sure-step) and a lace-up brace (Swedo-O).

Trials were collected during level walking, walking up and down a step and on a ramp. These three conditions were used since they represent some surface that may be encountered, but represented conditions that were not likely to exacerbate the syndesmosis injury.

Anterior-posterior and vertical ground reaction forces (GRF) were collected, amplified with an AMTI amplifier, analog-to digitally converted, calibrated, and stored. Maximum vertical and maximum and minimum anterior-posterior ground reaction forces were determined and averaged across trials. Impulse values representing the area under the force-time curve were established for the total vertical GRF and the anterior-posterior forces separately. Discrete variables, including foot and ankle angles, and heel contact velocity were determined from the kinematic data. Data were statistically analysed using ANOVA.

Results

Individuals did adjust their gaits with different braces as was noted by both the kinematic variables and the GRFs. For example, bracing affected heel contact velocity with the semi-rigid orthosis demonstrating the highest average foot contact velocity (1.33 m/sec) and the lace-up brace the lowest (.98 m/sec) in the anterior-posterior direction. Angular displacements of the foot relative to the ground and over the edge of the surface were not dependent on the type of brace.

The effects of brace use, however, varied between the subjects. Figure 1 demonstrates the effects of brace use on two subjects for both anterior-posterior and vertical ground reaction forces. Note that subject A3 had greater braking force with a brace whereas subject A4 showed increased weight-bearing without bracing.

The gait parameters were also different based on the ground surface characteristics. The greatest foot angle was found at the edge of the step and ramp, and the lowest midswing foot angle was during level walking. Going up the step and ramp required the greatest braking times, whereas the least times were required for the down step conditions. In contrast, the push-off time was greatest in the down step condition and lowest for the step up condition, The total anterior-posterior ground reaction force was positive during flat walking stepping down and going up the ramp, but negative for stepping up and going down the ramp. The vertical braking impulse was lowest for going up and down the ramp. Push-off impulses were lowest for stepping up and for going down ramp.

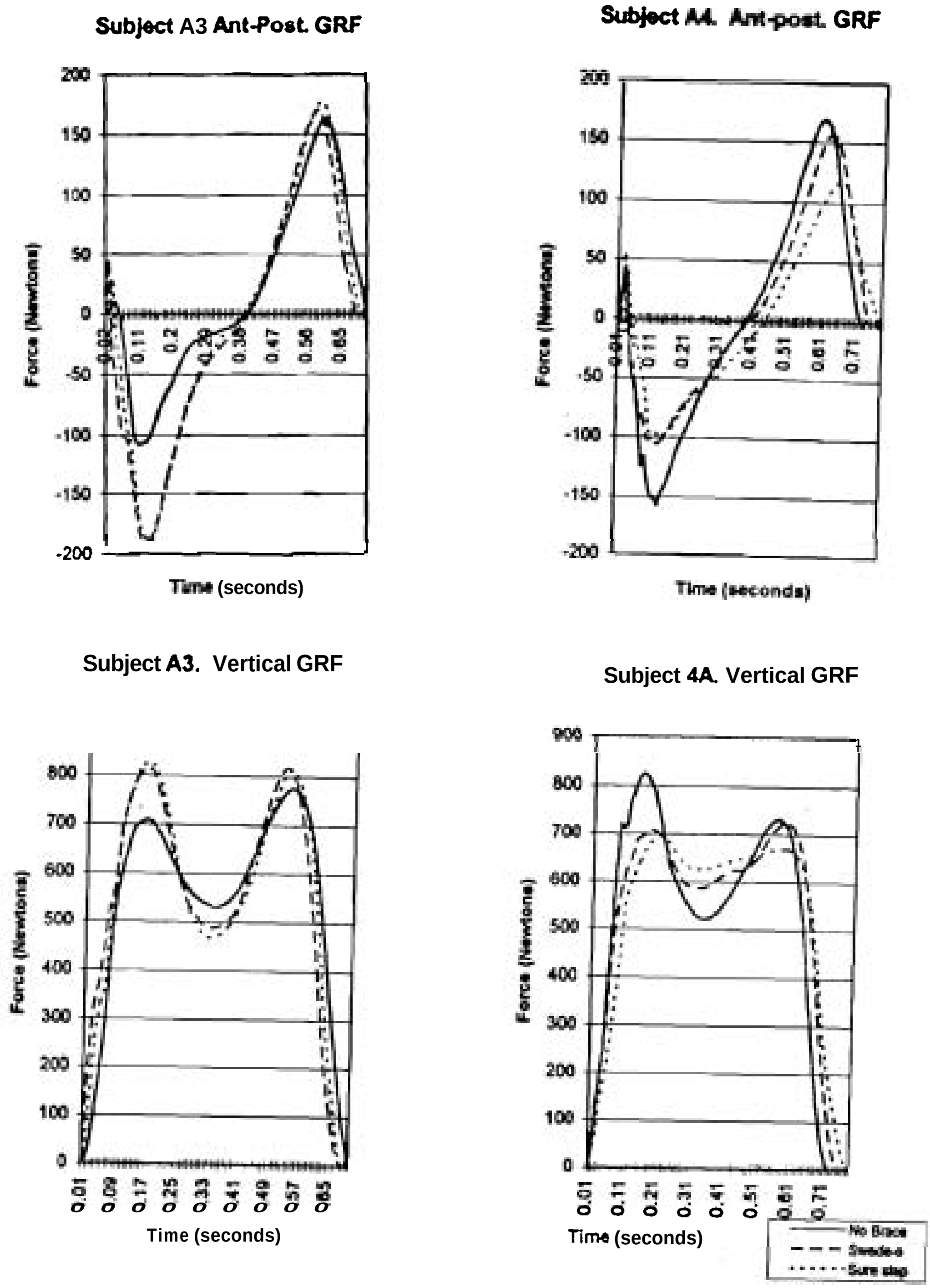

Figure 1. Plots of GRF for two individuals who exhibited different effects of brace use. Subject 3A used increased force both in the anterior-posterior and the vertical directions with a brace whereas subject 4A exhibited less force.

Discussion

Characteristics of the athletes may have produced differences in brace effectiveness. Subjects were at different stages of recovery following sprains and the initial sprains may have varied in severity. Unfortunately, no index for syndesmosis sprains was available by which to evaluate subjects. Also, subjects were involved in different sports and at a range of levels. Brace preference also varied among the subjects which may have impacted on gait adaptations.

Ankle stability and prevention of recurrent sprains are treatment goals (Eiff et al, 1994) particularly for athletes wishing to return safely to sports participation. Further research may focus on the type of brace and optimal time and extent of bracing to use for athletes.

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