Effects of Anteroposterior Talus Mobilization on Range of Motion, Pain, and Functional Capacity in Participants With Subacute and Chronic Ankle Injuries: A Controlled Trial

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Abstract

Objective: The purpose of this study was to measure the acute (1 session) and chronic effects (6 sessions) and the follow-up (2 weeks) of anteroposterior articular mobilization of the talus, grade III of Maitland, on the dorsiflexion range of motion (ROM), pain, and functional capacity of individuals with subacute and chronic traumatic injuries of the ankle.

Methods: Thirty-eight volunteers, men and women, with a mean age of 40.8 years, with subacute and chronic ankle injuries participated. The volunteers were blinded to the study purpose and were allocated into the experimental group (EG) or sham group (SG). Dorsiflexion ROM, pain, and functional capacity were measured using the universal goniometer, visual analog scale, and Foot and Ankle Ability Measure, respectively. Measurements were taken on 4 different occasions: (1) baseline, (2) after the first session, (3) after the sixth session, and (4) at follow-up. Articular anteroposterior mobilization of the talus grade III of Maitland was applied to the EG, whereas manual contact was applied to the SG. Three series of 30 seconds each with a 30-second rest interval between the series were conducted.

Results: Significant increases in ankle dorsiflexion ROM were observed only for the EG after the first (EG: 9.5 ± 1.1; SG: 7.6 ± 1.1) and sixth (EG: 12.8 ± 1.2; SG: 8.4 ± 1.2) sessions and were maintained at follow-up (EG: 13.2 ± 1.1; SG: 9.3 ± 1.3). Decreases in pain and improvements in functional capacity (FC) were identified for both groups after the first and sixth sessions (Pain, EG: 1.3 ± 0.5; SG: 1.8 ± 0.6 and EG: 0.7 ± 0.3; SG: 0.7 ± 0.3; FC, EG: 64.6 ± 3.5; SG: 67.4 ± 4.4 and EG: 79.9 ± 3.3; SG: 86.2 ± 3.3) and remained at follow-up (Pain, EG: 0.3 ± 0.2; SG: 0.5 ± 0.3; FC, EG: 86.8 ± 2.7; SG: 89.8 ± 3.7).

Conclusion: Articular grade III mobilization improved ankle dorsiflexion ROM, when compared with the SG. Changes in pain and functional capacity were similar in both groups. (J Manipulative Physiol Ther 2017;40:273-283)

Key Indexing Terms: *Mobilization; Joint Range of Motion; Ankle; Manual Therapy*

Introduction

The ankle is the most commonly injured joint of the musculoskeletal system during the practice of sports.[1,2] Traumatic ankle injuries, which include sprains, fractures, dislocations, contusions, and ruptures of tendons, lead to pain and reduced functional capacity of the lower limb.[3] During both the subacute and chronic phases after ankle injuries, the fibroplasia process increases the stiffness of the connective tissue,[4] which limits the joint range of motion (ROM).[5] The chronicity of this condition may lead to joint misalignment, with decreased posterior glide of the talus, and, consequently, limitation in dorsiflexion ROM.[6,7] According to Norkin and Levangie,[8] posterior gliding of the talus is essential component of the arthrokinematics and

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Paper submitted September 29, 2014; in revised form April 30, 2016; accepted June 9, 2016.
0161-4754

http://dx.doi.org/10.1016/j.jmpt.2017.02.003

is necessary for the normal functioning of the ankle joint. In general, individuals with histories of ankle injuries have loss of physiological ROM, especially related to dorsiflexion, as well as limitations of the accessory movements, and reduced functional capacity.[9,10]

Manual therapy has been extensively used by physical therapists and other manual therapists for the treatment of joint dysfunctions, such as vertebral spinal injuries[11] and ankle sprains.[12] The anteroposterior talus mobilization is a common approach to restore the arthrokinematics of the ankle.[12-14] The joint mobilization technique proposed by Maitland et al.[15] is based on a graded system and is intended to restore the accessory movements of the joint by performing passive, rhythmic, and oscillatory movements. Grades I and II do not reach the limits of the tissue resistance and their objective is mainly analgesic.[16] These grades appear to promote neurophysiological effects that induce inhibitory input to the mechanoreceptors found in abundance at the joint capsule.[17] In addition, some studies reported that joint mobilization reduced hyperalgesia in both animals[18] and humans.[19,20] Probably the hypoalgesic effects associated with joint mobilization are correlated with the sympathoexcitatory effects of the treatment.[16] In grades III and IV, the mobilization reaches the resistance offered by the connective tissues on the elastic region of the load/deformation curve, with consequent stretching of these structures.[21] Studies have reported that recovery of the accessory movements of the ankle joint improves the positioning of the joint rotational center, decreases pain, and increases dorsiflexion ROM, thereby increasing functional capacity.[12,22-24]

Despite being widely used within clinical contexts and the positive results reported in the literature, few studies have evaluated the cumulative effects of joint mobilization technique proposed by Maitland in reducing pain and improving joint ROM and functional capacity. Therefore, the objective of this study was to verify the acute (1 session) and chronic (6 sessions) effects, as well as the follow-up (2 weeks) of anteroposterior articular mobilization of the talus, grade III of Maitland, on dorsiflexion ROM, pain, and functional capacity with individuals at both subacute and chronic traumatic ankle injuries.

Methods

Study Design and Sample

For this parallel-design controlled trial, 38 volunteers, 16 men and 22 women, with a mean age of 40.8 years, were recruited. The recruitment occurred from July 2012 to December 2013. The volunteers were recruited from the general community by screening physical therapy outpatient clinics. Sample size was calculated using GPower (version 3.1; University of Düsseldorf, Düsseldorf, Germany) statistical software. Based on the ankle dorsiflexion ROM from the study by Landrum et al.,[25] with an effect size (ES) of 0.88, the sample size was calculated considering $\alpha = 0.05$, power = 0.80, and the directional t test for independent samples. The obtained value was 34 volunteers. The experiment took place at the University Research Laboratory, in Belo Horizonte, Brazil. This project was approved by the university's ethical research board (# 0127.0.203.000-11) and was registered at clinicaltrials.gov (NCT02244008). All participants provided informed consent.

The following inclusion criteria were considered: traumatic subacute (2 weeks) and chronic (1 month) ankle injuries; deficit of at least 5° of passive ankle dorsiflexion,[25] minimum of 20° of ankle plantar flexion; absence of injuries on the contralateral ankle; ability to support partial or total body weight; and no analgesic use. The volunteers who had restricted joint ROM as a result of surgical fixation, ankyloses, or arthrofibrosis; vascular, rheumatic, neurologic, or neoplastic diseases of the lower limbs; infections or open lesions at the ankle region; and pain on palpation at the anterior region of the ankle, were excluded.

Procedures

The volunteers were assigned to the sham group (SG) and experimental group (EG), according to their order of arrival by an independent researcher and had an equal chance of being assigned to any of the groups. Although the randomization process was not truly random, it is important to note that the groups were similar at baseline regarding the main outcomes. The volunteers were blinded to the group to which they were allocated. After the allocation, demographic (age), anthropometric (sex, body mass, and height), and clinical data (history of injury, date of occurrence, mechanism of injury, report of imaging studies, and previous interventions) were recorded. Afterward the outcome measures were obtained in the same order (ROM, pain, and functional capacity) at 4 different occasions: baseline, after the first session, after the sixth session, and 2 weeks after the end of the interventions. According to Maitland et al.,[15] a 2-week follow-up reassessment provides a more accurate estimate of the effects of the intervention. The examiner was a physical therapist with 10 years of experience in manual therapy.

Instruments

Universal Goniometer. For the assessment of passive ankle dorsiflexion ROM, the biplanar goniometer no. 7570 was used (Richardson Products Inc., Frankfort, IL), which provides valid and reliable measures.[26-31] The mobile arm of the goniometer is a plantar platform that keeps the subtalar joint in neutral, avoiding the movements of inversion and eversion during the evaluation.[30] During the assessment, volunteers remained in prone position over a nonportable tubular metal table with their knees flexed at 90° and their ankles at 0°.[31] For the positioning of the goniometer, the examiner identified the fibula to align the medial axis of the