Immediate Effects of the Suboccipital Muscle Inhibition Technique in Subjects With Short Hamstring Syndrome

Érika Quintana Aparicio, DO,[a] Luis Borrallo Quirante, PT,[b]
Cleofás Rodríguez Blanco, DO,[c] and Francisco Alburquerque Sendín, PhD[d]

Abstract

Objective: The purpose of this study is to identify the effects of the suboccipital muscle inhibition technique in patients with short hamstring syndrome by means of tests designed to evaluate the elasticity of the hamstring muscles and pressure algometry of myofascial trigger points.

Methods: Randomized clinical trial (pre and postintervention). The study population comprised young adult students following their studies at the Physiotherapy School at the University of Extremadura (Spain) and footballers from an Extremadura Football Club with short hamstring syndrome. The sample (70 subjects = 47 male and 23 female) was randomly divided into a control group (n = 34) and an intervention group (n = 36). Mean sample age was 23.40 ± 3.82 years. The control group was subjected to a placebo technique, whereas the intervention group was subjected to the suboccipital muscle inhibition technique. Pre and postintervention evaluation was used for the assessment of hamstring elasticity, and pressure algometry was also used (myofascial trigger points). Statistical analyses were performed using the SPSS 14.5 package (SPSS Inc, Chicago, Ill), comparing the sample between groups (Kolmorogov-Smirnov test, Student *t* test, 2-way analysis of variance [ANOVA], the χ^2 test).

Results: The distribution of the quantitative variables was normal, and the mean time doing physical activity per week was 2.82 ± 4.03 hours. Two-way ANOVA afforded statistically significant results for the finger-floor test, straight leg raise test-left, straight leg raise test-right, left popliteal angle test (P values < .001), and right popliteal angle test (P = .005). For pressure algometry, only the right semimembranosus muscle afforded statistically significant differences (P = .021).

Conclusions: According to the finger-floor distance test, the straight leg raise test, and the popliteal angle test, the suboccipital muscle inhibition technique modified the elasticity of the hamstring muscles for this group of subjects. The suboccipital muscle inhibition technique modifies the pressure algometry of the semimembranosus muscle but does not modify that of the semitendinosus muscle or biceps femoris. (J Manipulative Physiol Ther 2009;32:262-269)

Key Indexing Terms: *Myofascial Pain Syndromes; Complementary Therapies; Musculoskeletal System*

The suboccipital muscle inhibition technique (SMI technique) is widely used in manual therapy. Its importance to the upper cervical spine is well-known among professionals involved in manual therapy, but its relationships with other distant structures have not yet been identified, such that we believe that it is important to study the effect at distance of the treatment of certain regions with a view to improving the functionality of others. Although the literature relating spine to hip movement is scant,[1-5] it is of interest to analyze experiments by examining the amplitude of hip movements with respect to myofascial restriction of the suboccipital muscles. Schleip[3] considers that if the tone of the suboccipital muscles is decreased (passively, with a fascial treatment, or with active movements), the length of the hamstring muscles and the increase in the amplitude of hip flexion will be greater. Possible hypotheses that relate both structures—the suboccipital and hamstring muscles—are postural control, the dura mater, and the myofascial chains.

The suboccipital muscles are involved in postural control and this will affect the results of tests involving the straight leg raise test (SLR test). Release of the muscle fascia allows greater stretching and reduces the tone of the knee flexors (hamstring muscles) owing to the high density of

[a] Physiotherapist, Policínica FisioTex, Don Benito, Badajoz, Spain; Osteopathic Physician, Osteopathic School of Madrid, Madrid, Spain.

[b] Physiotherapist, Policínica FisioTex, Don Benito, Badajoz, Spain.

[c] Physiotherapist, Policínica FisioTex, Don Benito, Badajoz, Spain; Osteopathic Physician, Department of Physical Therapy, University of Sevilla, Sevilla, Spain.

[d] Physiotherapist, Department of Physical Therapy, University of Salamanca, Salamanca, Spain.

Submit requests for reprints to: Francisco Alburquerque Sendín, PhD, E.U. Enfermería y Fisioterapia, Universidad de Salamanca, 37007 Salamanca, Spain
(e-mails: *pacoalbu@usal.es*, *pacoalbur@hotmail.com*).

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neuromuscular bundles in the suboccipital muscles.[3] The continuity of the neural system links the dura mater inserted into the suboccipital muscles[6] and the hamstring muscles, and in the SLR test, the system is tensed. Studies performed on cadavers have shown that cervical flexion elicits a movement of the spinal cord in the lumbar zone and that this movement is more pronounced when the hip is flexed.[7] An obstruction to the movement of the dura mater at these sites may affect the degree of movement allowed by the lower limb owing to the tensions of the peripheral roots of the nerve in the SLR test.[1,2,8] The latter hypothesis posits the presence of myofascial chains. Both groups of muscles belong to the posterior myofascial chain, as reported by Struyf-Denys.[9] In addition, many subjects display a shortening of the hamstring muscles, which has been described as short hamstrings syndrome (SHS), as defined by Ferrer et al.[10,11]

Although previous studies have related the suboccipital muscles to the elasticity of the hamstring muscles, none of them has used inhibition techniques. In light of this, here we were prompted to check the effect of the suboccipital inhibition technique in subjects with SHS. The aim of this study was to compare the effects of the SMI technique applied to patients with SHS and myofascial trigger points (MTrPs), using tests to evaluate the elasticity of the hamstring muscles and pressure algometry (PA) of its MTrPs. Our hypothesis was that the SMI technique applied to subjects with shortness of the hamstrings and MTrPs on the hamstring muscles would afford immediate effects, increasing the elasticity of the hamstring muscles and increasing the pain threshold to pressure on the MTrPs of these muscles.

Methods

Design

This was a randomized clinical trial (pre and postintervention). A simple blinded study design was used, with no communication between observer and therapist. Based on a pilot study, the size of the effect (4.1 cm) and the SD (5.98 cm) for the forward flexion distance (FFD) test, for an α value of .05 and a statistical power of 0.8, revealed that the size of each group should be 35 subjects (software: Ene 2.0). The study conformed to the guidelines of the Ethical Committee of the School of Osteopathy in Madrid (CCT-NANT-1748). All subjects signed an informed consent form before their inclusion.

Subjects

The study included 70 participants (47 males) with a mean age of 23.40 ± 3.82 years. The subjects came from the Physiotherapy School of the University of Extremadura (49 subjects randomized between both groups) and an Extremadura Football Club (21 subjects randomized between both groups). The period of recruitment was from January 2007 to April 2007.

The inclusion criteria were as follows: (1) willingness of the subjects to participate in the study (informed consent signature); (2) a bilateral SHS; SLR test, 80° or less; popliteal angle test (PAT) 15° or more; and FFD test −5 cm or less; and (3) presence of MTrP in the hamstring muscles. Subjects who showed the following criteria were excluded: (1) a history of traffic accidents (whiplash[12]), (2) history of fractures of the lower limbs and/or growth alterations, (3) history of herniated disk or lumbar protrusions, (4) history of acute back pain, (5) history of pain or paresthesia in the lower limbs, (6) history of muscle-tendon lesions of the hamstring muscles (tendonitis, elongations, muscle tears) at least 1 month before the study, (7) subjects with knee or hip prostheses, (8) subjects unable to adopt the position in which the tests were to be run or physically unable to undergo the interventions or assessments, and (9) subjects using medications that could affect the measurements (eg, muscle relaxants).

Evaluations

Tests of Hamstring Elasticity

Forward Flexion Distance Test. This consisted of asking the subject, standing on an anthropometric box, to perform a maximum and progressive anterior flexion of the trunk, maintaining the knees straight and lengthening the arms with the palms parallel and the fingers extended.[13,14] The therapist used a metric tape to determine the distance from the distal part of the fingers to the distance on a millimeter ruler placed on the vertical side of the box[15] (Fig 1A). This test has been reported to have good validity and reliability.[14]

Straight Leg Raise Test. With the subject in the supine position in shorts or underwear, the lateral condyle of the femur was pinpointed with a marker, as were the head of the fibula and the fibular malleolus.[15] The axis of the goniometer was placed on the projection of the greater trochanter of the femur. One of the arms of the goniometer was placed parallel to the table (checking with a level). The knee and ankle always remained in the extension position. Holding the talus and without rotating the hip, flexion of the hip was gradually increased, lifting the subject's lower limb until she or he complained of stiffness or pain in the region of the thigh, bent his/her knee, or began to swing the pelvis in retroversion. At that moment, the other arm of the goniometer was placed in the direction of the line between the head of the fibula and the fibular malleolus, and the degree of elevation of the straight leg was noted[10,11] (Fig 1B). According to some authors,[16,17] this test has high interobserver reliability (0.94-0.96).

Popliteal angle test. This test was started out from the supine position, with the lower limb to be assessed in hip and knee flexion at 90°. From this position and with the axis of the goniometer coinciding with the lateral condyle of the femur, the subject was asked to perform extension of the knee,