

# THE EFFECT OF ADDING FORWARD HEAD POSTURE CORRECTIVE EXERCISES IN THE MANAGEMENT OF LUMBOSACRAL RADICULOPATHY: A RANDOMIZED CONTROLLED STUDY

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## ABSTRACT

**Objective:** The purpose of this study was to determine the immediate and long-term effects of a multimodal program, with the addition of forward head posture correction, in patients with chronic discogenic lumbosacral radiculopathy.

**Methods:** This randomized clinical study included 154 adult patients (54 females) who experienced chronic discogenic lumbosacral radiculopathy and had forward head posture. One group received a functional restoration program, and the experimental group received forward head posture corrective exercises. Primary outcomes were the Oswestry Disability Index (ODI). Secondary outcomes included the anterior head translation, lumbar lordosis, thoracic kyphosis, trunk inclination, lateral deviation, trunk imbalance, surface rotation, pelvic inclination, leg and back pain scores, and H-reflex latency and amplitude. Patients were assessed at 3 intervals (pretreatment, 10-week posttreatment, and 2-year follow-up).

**Results:** A general linear model with repeated measures indicated a significant group  $\times$  time effect in favor of the experimental group on the measures of ODI ( $F = 89.7$ ;  $P < .0005$ ), anterior head translation ( $F = 23.6$ ;  $P < .0005$ ), H-reflex amplitude ( $F = 151.4$ ;  $P < .0005$ ), H-reflex latency ( $F = 99.2$ ;  $P < .0005$ ), back pain ( $F = 140.8$ ;  $P < .0005$ ), and leg pain ( $F = 72$ ;  $P < .0005$ ). After 10 weeks, the results revealed an insignificant difference between the groups for ODI ( $P = .08$ ), back pain ( $P = .29$ ), leg pain ( $P = .019$ ), H-reflex amplitude ( $P = .09$ ), and H-reflex latency ( $P = .098$ ). At the 2-year follow-up, there were significant differences between the groups for all variables adopted for this study ( $P < .05$ ).

**Conclusions:** The addition of forward head posture correction to a functional restoration program seemed to positively affect disability, 3-dimensional spinal posture parameters, back and leg pain, and S1 nerve root function of patients with chronic discogenic lumbosacral radiculopathy. (*J Manipulative Physiol Ther* 2015;xx:1-12)

**Key Indexing Terms:** *Randomized Controlled Trial; Posture; Head; Low Back Pain; Radiculopathy*

Lumbosacral radiculopathy associated with disk herniation is one of the most common health-related complaints.<sup>1</sup> It is a disorder associated with delayed recovery, persistent disability, and increased health care utilization and costs.<sup>2</sup> Despite the high prevalence of this condition,<sup>3</sup> its conservative treatment has been a challenge<sup>4</sup> because there is no strong evidence for the effectiveness of most treatments, particularly in long-term management.<sup>5</sup>

The challenge that clinicians face results from focusing on pathoanatomy as one of the most common etiological

factors of back pain, ignoring the significant role of dysfunction. It is important to address Murphy's concept,<sup>6</sup> which states that "pathoanatomy and dysfunction often interact to produce clinical symptoms." In terms of biomechanical dysfunction, there is a growing interest in the quantification of abnormal asymmetrical posture.<sup>7-11</sup> Abnormal posture is one of the most important etiological factors associated with low back pain.<sup>12,13</sup>

Studies have reported that many postural reflexes such as the vestibulocollic reflex, cervicocollic reflex, pelvo-ocular reflex, vestibuloocular reflex, cervico-ocular reflex, and cervical somatosensory input are located or occur in the head and neck region.<sup>14</sup> Given the high incidence of forward head posture, especially in older adults,<sup>15</sup> a correction of this abnormal posture must achieve optimal postural correction in which the spine orients itself according to the normalized reference point.<sup>16</sup>

One component lacking in nearly all forms of lumbar radiculopathy treatment is the effect of the cervical spine in determining spinal posture closely linked to low back pain.<sup>12,13</sup> To the best of our knowledge, only 1 published

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randomized controlled trial has addressed head posture correction and its effect on spinal posture, and that study was limited to adolescent idiopathic scoliotic patients.<sup>16</sup>

Although the effect that forward head posture has on the entire nervous system has been reported,<sup>17,18</sup> there are few controlled studies evaluating the effect of abnormal head posture on lumbar nerve root function. The current evidence to support the role of forward head posture correction in patients with lumbar disk herniation radiculopathy lacks the experimental data to support a cause-and-effect relationship and interventional outcomes. The purpose of this study was to evaluate the immediate and long-term effects of a multimodal program, with the addition of forward head posture correction, on disability, 3-dimensional spinal posture parameters, back and leg pain, and S1 nerve root function of patients with chronic discogenic lumbosacral radiculopathy.

## METHODS

A prospective, randomized, controlled study was conducted at a research laboratory of our university and was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12613000321741). All of the patients were selected from the outpatient clinic of our institution. The patients participated in the study after signing an informed consent form before data collection. Recruitment began after approval was obtained from the Ethics Committee of the Faculty of Physical Therapy, Cairo University. The patients were recruited from January to October 2010 for a 10-week treatment investigation with a 2-year follow-up.

The patients were screened before inclusion in the study by measuring their lateral cervical radiographs for anterior head translation (AHT), and a distance of more than 15 mm was required to be included in the study.<sup>19</sup> Another inclusion criterion was confirmed chronic unilateral lumbosacral radiculopathy associated with L5-S1 lumbar disk prolapse, with symptoms lasting longer than 3 months to avoid the acute stage of inflammation. Patients underwent magnetic resonance imaging to detect disk lesions corresponding to the S1 nerve root. All of the patients had unilateral leg pain with mild to moderate disability according to the Oswestry Disability Index (ODI) (up to 40%)<sup>20</sup> and side-to-side H-reflex latency differences of more than 1 millisecond and prolonged H-reflex latency more than 30 milliseconds.<sup>21</sup> Patients with lumbar hyperlordosis, a common posture aberration in chronic low back pain patients, were selected.<sup>22</sup> The exclusion criteria included a previous history of lumbosacral surgery, metabolic system disorder, cancer, cardiac problems, peripheral neuropathy, history of upper motor neuron lesion, spinal canal stenosis, rheumatoid arthritis, osteoporosis, and any lower extremity deformity that might interfere with global postural alignment.

The patients were randomly assigned to the experimental group (n = 77) or the standard care group (n = 77) by an independent person who selected numbers from sealed envelopes containing numbers chosen by a random number generator. The randomization was restricted to permuted blocks of different sizes to ensure that equal numbers were allocated to each group. Each random permuted block was transferred to a sequence of consecutively numbered, sealed, opaque envelopes that were stored in a locked drawer until required. As each participant formally entered the trial, the researcher opened the next envelope in the sequence in the presence of the patient. The patients in both groups completed a 10-week functional restoration program supervised by a physical therapist. Those in the standard care group received only the functional restoration program. The experimental group additionally received a forward head posture corrective exercise program.

## Functional Restoration Program

The exercises were continued independently for a 2-year period at a public gymnasium. The exercise component of the program consisted of 3 major phases. In phase 1, the patient attended 2 sessions per week for 4 weeks, and during this phase, the patient was educated about his/her injury. The patient was taught self-management strategies aimed at minimizing therapist dependence and empowering the patient to gain control over symptoms. Patients were also taught the meaning of the stress-tension-pain circle as a cognitive pain model and learned coping strategies and reduction of catastrophizing thoughts. The patients participated in relaxation exercises during and between the sessions. The psychologist emphasized the need to practice the relaxation techniques at home daily. The therapists identified instances of maladaptive thinking and encouraged the group to challenge these instances and to provide more appropriate interpretations and alternatives. The educative section of this program was led by a clinical psychologist. Besides implementing the educational and self-management strategies, retraining of the transversus abdominis, lumbar multifidus, and pelvic floor muscles began during this phase.

The next rehabilitation phase consisted of integrating the stabilizing pattern into a clinic-based, supervised functional restoration program. In this stage, the patients attended the clinic 3 times per week for a 6-week period and completed 2 additional exercise sessions each week at home. Exercises included walking on a treadmill, step-ups onto a 15-cm-high step, and lifting upper limb dumbbells (bicep curls, forward raises, and bilateral side raises). The patient was instructed to maintain the stabilizing pattern learned during phase 1 while performing all exercises. Upright cervicothoracic posture was also encouraged. Exercises were separated into 3 sets of short-duration activities to avoid excessive fatigue of the stabilizing muscles. For the

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