

# A Preliminary Randomized Clinical Trial on the Effect of Cervicothoracic Manipulation Plus Supervised Exercises vs a Home Exercise Program for the Treatment of Shoulder Impingement

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## ABSTRACT

**Objective:** The purpose of this study was to investigate changes in pain, disability, and range of movement after cervicothoracic manipulation plus exercise therapy in individuals with unilateral shoulder impingement syndrome.

**Methods:** Forty-one patients (30 men, 11 women; aged  $47 \pm 9$ ) diagnosed with unilateral shoulder impingement syndrome attended 10 sessions for 5 weeks (2 sessions/wk). Eligible patients were randomly allocated to 2 study groups: cervicothoracic manipulation plus exercise therapy ( $n = 21$ ) or home exercise program ( $n = 20$ ). The outcomes measures included the visual analog scale (VAS); the Disabilities of the Arm, Shoulder, and Hand score; Shoulder Disability Questionnaire; subacromial impingement syndrome (Hawkins-Kennedy Test and Neer Test); and shoulder active range of motion (movements of flexion, extension, rotation, adduction, and abduction). Assessments were applied at baseline and 24 hours after completing 5 weeks of related interventions.

**Results:** After 5 weeks of treatment significant differences between-group differences were observed in the Disabilities of the Arm, Shoulder, and Hand score ( $P = .012$ ); however, no statistically significant differences were achieved for Shoulder Disability Questionnaire ( $P = .061$ ) and pain intensity ( $P = .859$ ). Both groups improved with regard to disability and clinical tests for detecting subacromial impingement syndrome.

**Conclusions:** This clinical trial suggests that cervicothoracic manipulative treatment with mobilization plus exercise therapy may improve intensity of pain and range of motion compared with the home exercise group alone; the home exercise group had significant changes for flexion, extension, adduction, and abduction, but not for external and internal rotation movement in patients with shoulder impingement. (J Chiropr Med 2016;xx:0-9)

**Key Indexing Terms:** *Shoulder Impingement Syndrome; Musculoskeletal Manipulations; Pain; Disability Evaluation; Movement*

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## INTRODUCTION

Shoulder pain may be characterized by the presence of pain in the anterior, lateral, or posterior aspect of the shoulder, including the lower cervical spine and shoulder blade region. Several factors contribute to subacromial impingement syndrome, including rotator cuff weakness, posterior capsule tightness, poor scapulohumeral rhythm, and muscle imbalance of the scapular upward rotation force couple.<sup>1</sup> The most prevalent diagnosis, among the different causes of shoulder pain, is rotator cuff tendinopathy with impingement.<sup>2</sup> The prevalence of shoulder pain ranges from 20% to 50% in the general population.<sup>3</sup>

Many treatments for shoulder impingement syndrome (SIS) are available in clinical practice.<sup>4-8</sup> Combined treatments composed of exercise and other therapies tended to yield better effects than single-intervention therapies.<sup>4</sup>

Exercise therapy and other physical therapies, such as kinesiotaping, specific exercises, and acupuncture, are effective treatment for patients at an early stage of SIS.<sup>4,5</sup> Manual therapy directed at the thoracic spine, as a standard treatment or combined with exercise, has been reported to improve pain and disability and increase global rating scale change for SIS.<sup>6-9</sup> However, the mechanisms by which thoracic spinal manipulative therapy (SMT) improves pain and shoulder motion have not been established. Limited thoracic spine mobility has been linked to shoulder pain.<sup>10,11</sup> Spinal manipulative therapy has been reported to have neurophysiological effects, including shoulder muscle performance and central nervous system hypoalgesia.<sup>12</sup> It has been proposed that the neurophysiological effect of joint manipulation may alter the inflow of sensory information to the central nervous system.<sup>13,14</sup> There is evidence that SMT stimulates primary afferent neurons from paraspinal tissues and pain processing.<sup>14</sup> The clinical justification behind thoracic SMT for shoulder pain is in part based on the concept of regional interdependence described by Wainner et al,<sup>15</sup> who suggest that seemingly unrelated impairments in remote anatomic regions may be associated with primary symptoms in subacromial shoulder pain.

A systematic review and several controlled trials reported short-term beneficial patient-rated outcomes with the use of manual therapy to the thoracic spine and shoulder.<sup>6,7,16,17</sup> In addition, recent studies have reported improvements in patient's rated pain and function after a single treatment of thoracic SMT in patients with subacromial impingement syndrome, but they did not find mechanical changes in thoracic spine or shoulder mobility.<sup>14,18</sup> However, none of these studies included a symptomatic or asymptomatic control group for comparison in the controlled trials. Furthermore, no studies included cervicothoracic mobilization with and without impulse technique and exercise therapy in low cervical spine for the upper thoracic spinal dysfunction in SIS. Both therapies can have significant benefits on pain and disability for the treatment of shoulder impingement. The aim of this preliminary randomized clinical trial was to investigate changes in pain, disability, and range of movement after 10 sessions of cervicothoracic manipulative treatment plus exercise therapy compared with a home exercise program in patients with unilateral shoulder impingement.

## METHODS

### Participants

Patients with unilateral shoulder pain compatible with a medical diagnosis of SIS within the dominant right hand were screened for eligibility criteria in this clinical trial.<sup>19</sup> Patients were eligible if they reported the following<sup>1</sup>: pain or dysfunction with overhead activities<sup>2</sup>; pain during active shoulder movements<sup>3</sup>; positive Neer/Hawkins-Kennedy test<sup>4</sup>; recent onset of pain within the last 12 months<sup>5</sup>;

nontraumatic onset<sup>6</sup>; baseline pain level of  $\geq 2$  out of 10 on an 11-point numeric scale.

Patients were excluded if they exhibited any of following criteria<sup>1</sup>: the presence of any red flags<sup>2</sup>; a history of frozen shoulder<sup>3</sup>; disorders of the acromioclavicular joint<sup>4</sup>; degenerative arthritis of the glenohumeral joint<sup>5</sup>; known calcifying tendonitis (if identified by radiograph)<sup>6</sup>; posttraumatic disorders; or<sup>7</sup> shoulder surgery or elbow, hand, or wrist surgery and blatantly misdiagnosed cervical spine disorders.

The study was approved by the local Ethics Committee (Servicio Andaluz de Salud) in accordance with the Helsinki Declaration. All patients signed an informed consent before their inclusion. This study has been registered as trial number NCT02214199.

### Outcome Measures

In this study, a visual analog scale (VAS) was used to assess the intensity of pain. The VAS is a 10-cm line anchored with 0 at one end representing no pain and 10 at the other end representing the worst pain imaginable.<sup>20</sup> It has been reported to be reliable and valid for assessing pain intensity, and it was selected as an outcome measure based on its ability to detect immediate changes in pain exhibiting a minimal clinically important difference between 0.9 and 1.1 cm.<sup>21,22</sup>

The Disabilities of the Arm, Shoulder, and Hand (DASH) is a 30-item self-reported questionnaire. It has physical function items, symptom items, and social/role items.<sup>23</sup> This is a self-report questionnaire where patients can rate difficulty and interference with daily life on a 5-point Likert scale. The DASH scoring formula is  $([(\text{sum of } n \text{ responses}) / n] - 1)$  where  $n$  represents the number of completed items. The score test ranges from 0 (no disability) to 100 (most severe disability).

The Shoulder Disability Questionnaire (SDQ) is a pain-related disability questionnaire that contains 16 items describing common situations that may induce symptoms in patients with shoulder disorders. All items refer to the preceding 24 hours. Response options are either yes or no, and the "not applicable" category should be used when the situation at issue did not occur during the preceding 24 hours. A final score is calculated by dividing the number of positively scored items by the total number of applicable items and subsequently multiplying the score by 100, resulting in a final score ranging between 0 (no disability) and 100 (all applicable items positive).<sup>24</sup>

The Neer and Hawkins-Kennedy tests are used to identify possible subacromial impingement syndrome. In the Neer test, the therapist stabilizes the patient's scapula with one hand while passively flexing the arm as it is internally rotated. If the patient reports pain in this position, then the result of the test is positive.<sup>25</sup> The Hawkins-Kennedy test is best performed with the patient in a relaxed sitting position. The patient is examined while sitting with the shoulder flexed to 90° and elbow flexed

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