Original Article

Effectiveness of thoracic manipulation versus scapular stabilization exercises on pain and functional disability in cervical spondylosis

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Abstract

Objective: To assess how effective thoracic manipulation and scapular stabilization exercises are in decreasing pain and improving functional ability in individuals with cervical spondylosis. The study compared their combined effectiveness in a single investigation, as past studies had only examined their individual impacts on neck pain.

Study design: It was a Randomized Control Trial study design.

Place and duration of study: The study was conducted from August 1st, 2021, to January 31st, 2022, at Islamabad Physiotherapy & Rehabilitation Center.

Material and Methods: An RCT was conducted where 30 patients were randomly assigned to two groups over a duration of six months. Eligible participants, aged 35 to 65, experienced neck pain persisting for at least three months, with confirmed cervical spondylosis. Exclusions included recent cervical spine surgery, cervical myelopathy or radiculopathy, and vascular syndromes. Whiplash injury history also excluded participation. Data collection employed questionnaires and the Neck Disability Index (NDI). Group 1 received Thoracic Manipulation, and Group 2 received Scapular Stabilization Exercises (3 days for two weeks), alongside conventional treatments (cervical stretching and cervical isometrics). Assessments occurred pre and post-intervention, with analysis using SPSS version 25.0.

Results: Total Mean score of NDI in group 1 was improved from 47.33 ±13.788 to 25.07 ±7.923 with p value of less than 0.001 whereas total mean score of NDI in group 2 was improved from 42.8 ±13.262 to 25.47±11.351 with p value of less than 0.001 thus significant improvements were noted in both groups. When both groups were compared, with p value greater than 0.05 showing that both the interventions applied were effective.

Conclusion: Both thoracic manipulation and scapular stabilization exercises demonstrate equal effectiveness in alleviating pain and reducing functional disability in individuals with cervical spondylosis.

Keywords: Spondylosis, Thoracic manipulation, Scapular Stabilization, Neck Disability Index, Neck pain, Functional disability

1. Introduction

Cervical spondylosis is a long-term, gradually worsening degenerative condition, often associated with aging. It results from the gradual wear and tear affecting specific segments of the cervical spine over time. The levels most commonly affected are C6-C7 and C5-C6.[1] Neck pain is the predominant symptom in cases of symptomatic cervical spondylosis, with an occurrence rate of 13%-15%. [2] Neck pain stands out as a major contributor to disability, with approximately 50% of individuals likely to persistently encounter some level of pain or experience recurring episodes.[3] Cervical spondylosis is a common issue as the neck spine ages. It happens when osteophytes form and narrow the spinal canal. This pressure can lead to direct damage to the nerves or changes in blood supply, causing problems in the spinal cord.[4] Neck pain often correlates with reduced health-related quality of life (HRQoL), affecting physical health, interpersonal relationships, and mental well-being.[5] Neck pain is more prevalent among working women than men, and its incidence and associated disability have notably increased over the past 25 years. This trend is expected to continue as the population ages.[6]

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Cervical spondylosis-related pain typically begins with conservative treatment, excluding red flags and surgical conditions. This treatment involves patient education, modalities, therapeutic exercises, non-thrust manipulations (mobilizations), and thrust manipulation techniques.[7] Manipulation techniques are found to be beneficial in treating neck pain. Manipulation of the thoracic spine is characterized by a swift, low-amplitude thrust targeted at any region of the thoracic spine. Typically, the upper thoracic levels are selected for manipulation to address neck discomfort.[8] The cervical and scapular regions are interconnected, implying that dysfunction in one may have ramifications on the other due to their anatomical and functional relationship. Strengthening scapular muscles and mobilizing the scapula can alleviate pain in the thoracic and cervical spine. Scapular stabilization exercises involve movements like scapular retraction, lateral pull-downs, shoulder shrugs, and push-ups.[9]

In a study led by Javier Gonzalez-Iglesias et al., thrust manipulation in the thoracic spine was investigated for its impact on individuals with neck discomfort. Findings indicated significant improvements in clinical outcomes among those experiencing neck pain. The manipulation group exhibited greater enhancements in pain and disability scores compared to the control group.[10] In a study by Palesa A. Huisman et al. on thoracic spine manipulation for neck pain relief, therapeutic benefits were evident. Combining thoracic manipulation with electrotherapy notably reduced pain and dysfunction, surpassing outcomes with electrotherapy alone. Moreover, thoracic manipulation consistently showed superior efficacy.[11] John Krauss and colleagues conducted a study on upper thoracic spinal manipulation's effect on neck pain and cervical motion restrictions, focusing on T1 to T4. The study group received manipulation targeting less mobile upper thoracic segments, showing enhanced cervical rotation range and potential pain relief in the cervical region.[12] Boyoung Im et al. investigated the impact of scapular stabilization exercises on neck posture, pain levels, and quality of life in individuals with neck discomfort. Fifteen participants were divided into Group A, receiving scapular stabilization exercises, and Group B, the control group performing relaxation exercises. Post-training, the scapular stabilization group showed significant improvements in head-to-spine alignment, upper trapezius and serratus anterior muscle engagement, Neck Disability Index ratings, and Visual Analog Scale pain ratings.[13] Christoffer H. Andersen et al conducted research on outcome of scapular exercises on chronic neck pain. Their study concluded that, in people with chronic pain in the neck region, scapular exercise lower pain intensity and increase shoulder elevation strength. There was substantial improvement in pain levels.[14] Jeong-Il Kang et al. researched the effectiveness of scapular stabilization exercises in improving neck alignment and muscle activity to alleviate neck pain. The study found scapular stabilization exercises to be a beneficial intervention for muscle strengthening. Enhanced posture, facilitated by activated neck muscles, contributed to the reduction of associated neck pain.[15]

The objective of this study was to compare thoracic manipulation and scapular stabilization exercises for pain relief and reduced disability in cervical spondylosis patients. Unlike prior research focusing on these interventions separately on neck pain, this study uniquely assessed both within a single trial.

2. Materials & Methods

A randomized controlled trial was conducted from August 1st, 2021, to January 31st, 2022, at Islamabad Physiotherapy & Rehabilitation Center. Thirty participants of both genders were included, with sample size calculated using the open-epi sample size calculator with a 5% level of significance and 95% confidence interval. Non-probability convenient sampling was utilized, followed by random allocation into control (n=15) and experimental groups (n=15) using the Sealed Envelope Method. Eligible participants experienced neck pain for at least three months, were aged between 35-65 years, and had a diagnosed case of cervical spondylosis. Exclusion criteria included a history of cervical spine surgery in the previous 12 months, diagnosis of cervical

myelopathy or radiculopathy, vascular syndromes such as vertebrobasilar insufficiency, and a history of whiplash injury. Data collection employed a questionnaire containing demographic details and the Neck Disability

Index (NDI) to measure pain and disability levels. Group 1 received Thoracic Manipulation for two weeks, performed three days a week, with manipulation applied at the upper thoracic level using the Thoracic Screw Manipulation

Technique. Group 2 received Scapular Stabilization Exercises for two weeks, including shoulder shrugs, chair press-ups, and scapular retractions, performed three days a week. Data were collected at baseline and after two weeks of intervention using the NDI and analyzed using MS Excel and SPSS version 25.0. Inferences were drawn using paired and independent samples t-tests and represented in the forms of graphs and tables.

3. Results

The objective of this study was to compare the effectiveness of thoracic manipulation versus scapular stabilization exercises on pain and functional disability in cervical spondylosis. Patients were divided into two Groups. Group 1 received the thoracic manipulation, Group 2 received Scapular Stabilization Exercise regime. A total of 30 patients were included with a mean age of 49 years in Group 1 and 46 years in Group 2. The majority of participants were female (25 out of 30), with diverse occupational backgrounds including housewives, office workers, tailors, laborers, retirees, and teachers. Within-group analysis revealed a significant improvement in Neck Disability Index (NDI) scores for both groups after two weeks of intervention (Group 1: pre-intervention mean score of 47.33 ±13.788 improved to 25.07 ±7.923; (Table I and Figure I) Group 2: pre-intervention mean score of 42.8 ±13.262 improved to 25.47 ±11.351), with p-values less than 0.001. (Table I). However, between-group analysis using independent t-tests showed no significant difference in mean NDI scores post-intervention (p > 0.005). These findings suggest that both thoracic manipulation and scapular stabilization exercises are effective in reducing pain and functional disability in cervical spondylosis patients, with no significant difference observed between the two interventions. (Table II).

Variable		Baseline (Mean ± SD)	After II Weeks (Mean ±SD)	P Value
Total NDI Score	Group I	47.33±13.788	25.07 ±7.923	<0.001***
	Group II	42.8 ±13.262	25.47 ±11.351	<0.001***

Table I: Paired t test showing comparison of means pre and post intervention in Group I & Group II

Variable	At Baseline		P value	After II weeks		P value
	Group I Mean ±SD	Group II Mean ±SD		Group I Mean ±SD	Group II Mean ±SD	
Total NDI Score	47.33±13.788	42.8±13.262	0.367	25.07±7.923	25.47±11.351	0.912

Table II: Independent samples t test showing comparison of means between the Groups pre and post intervention.

4. Discussion

In this study, we explored the efficacy of thoracic manipulation and scapular stabilization exercises in alleviating pain and functional impairments among patients diagnosed with cervical spondylosis. Our findings, as indicated by the independent t-test results with a p-value > 0.05, suggest no significant difference between the two intervention groups, implying that both thoracic manipulation and scapular stabilization exercises led to improvements in pain levels and functional impairments. These results align with previous research, such as the study conducted by Javier Gonzalez-Iglesias et al., where patients undergoing thoracic spine manipulation showed greater improvements in pain and disability compared to those receiving electro/thermal treatment alone.[10] Similarly, our study's second group, undergoing scapular stabilization exercises, also exhibited improvements in

pain scores and functional disability, as reported in the study by Boyoung Im et al where he inspected the effects of scapular stability exercise on posture, pain levels, and functional impairments. The group receiving scapular stabilization exercise regime displayed remarkable enhancements in the head-to-spine alignment, upper trapezius muscle engagement, serratus anterior muscle engagement, Neck Disability Index ratings and Visual Analog Scale ratings for pain.[13] Although cervical thrust joint manipulation has shown significant benefits in previous research, as the study conducted by Emillo J. Puentedura's demonstrated significant improvements in NDI and pain levels with cervical thrust joint manipulation[16] our study suggests that thoracic manipulation can also yield positive outcomes, particularly in cases where cervical manipulation is not recommended or poses risk. Thus, provides a potentially safer alternative for optimizing patient outcomes while minimizing risks associated with cervical manipulation.

Cross et al. demonstrated that in situations where cervical thrust manipulation is contraindicated, thoracic thrust manipulation presents favorable results and that manipulation of the thoracic spine enhances pain relief, range of motion, and self-reported function in individuals experiencing mechanical neck pain.[17] Considering the potential risks associated with cervical spine manipulation, utilizing thoracic spine manipulation may serve as a prudent alternative to optimize patient outcomes while mitigating associated risks.

Cagnie et al. revealed that neck pain often coincides with scapular dyskinesia and malalignment.[18] Thereof the effectiveness of thoracic manipulation and scapular stabilization exercises in our study highlights their potential as viable treatment options for managing cervical spondylosis. Scapular stabilization exercises, in particular, offer advantages such as ease of performance and incorporation into patients' home exercise plans (HEPs). This is supported by Ha-yeon Kim's study, where scapular stabilization exercises significantly improved pain scores and functional abilities.[19] Arsh et al.'s research on manual therapy to the cervical and upper thoracic spine highlighted the effectiveness of providing therapeutic intervention in closely linked regions to alleviate symptoms and provide relief. [20] Therefore, endorsing the validation for examining the effectiveness of therapeutic interventions focusing on interconnected regions, our study underscores the significance of our approach in tackling cervical spondylosis via scapular stabilization exercises and thoracic manipulation.

In our study, employing both the independent t-test and paired t-test demonstrated the effectiveness of thoracic manipulation and scapular stabilization exercises. Utilizing the Neck Disability Index as our measure, a decrease in disability scores indicated improvement in patients receiving both interventions. Notably, the comparison of mean NDI scores between the two intervention groups showed no significant difference, affirming both interventions' efficacy in managing cervical spondylosis. Thoracic manipulation and scapular stabilization exercises offer distinct yet effective treatment options, as demonstrated in this study, supporting their utilization in clinical practice.

Conclusion:

It is concluded from the study that thoracic manipulation technique and scapular stabilization exercises are equally effective in reducing pain and functional disability in patients with cervical spondylosis.

Recommendations:

Long-duration follow-up should be conducted post-intervention to assess the sustainability of intervention effects. Future studies may explore additional techniques of thoracic manipulation to expand the understanding of their efficacy. Furthermore, comparative studies between cervical and thoracic manipulation techniques in patients with cervical spondylosis could elucidate the most effective approach for this condition. Additionally, comparing scapular mobilizations with scapular stabilization exercises could provide insights into their relative effectiveness.

Limitations of the study:

The study lacked long-term follow-up to evaluate the maintenance effects of the interventions post-cessation.

Additionally, resource constraints limited the scope of the study and may have impacted its generalizability.

Disclosure & Conflict of Interest:

The authors have no conflict of interest. This research didn't receive any specific grant from funding agencies in the public, commercial or not for profit sectors.

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