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Empowering patients with cervical spondylosis by self-traction and self-stretching strategies -an experimental study

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Abstract
Background: Cervical spondylosis (CS) is a degenerative disorder of the intervertebral discs, most commonly affecting the C5–C7 levels. It frequently leads to neck pain, non-traumatic myelopathy, and neurological impairments such as paraparesis and quadriparesis. The prevalence of CS is estimated at 25% in adults under 40 years and up to 60% in those over 40 years, with neck pain incidence ranging widely from 0.4% to 86.8%. Physiotherapeutic interventions such as traction and stretching aim to reduce pain, enhance range of motion (ROM), and improve functional performance.
Objective: To compare the effectiveness of self-traction versus self-stretching, when combined with conventional physiotherapy interventions, on pain, ROM, and functional performance in patients with cervical spondylosis.
Methods: Forty-six patients with CS aged 30–60 years were randomly assigned into two groups: Group A (n=23) received self-traction with conventional physiotherapy, while Group B (n=23) received self
-stretching with conventional physiotherapy. Outcomes including pain intensity (VAS), cervical ROM, and functional performance (Neck Disability Index, NDI) were assessed at baseline and after 4 weeks of intervention. Statistical analyses included parametric and non-parametric tests depending on data normality, with significance set at $p \leq 0.05$.
Results: Both groups demonstrated significant improvements in pain, cervical ROM, and functional performance after 4 weeks ($p<0.05$). Between-group comparisons revealed that self-traction combined with conventional physiotherapy was significantly more effective than self-stretching in reducing pain, improving ROM, and enhancing functional outcomes.
Conclusion: Both self-traction and self-stretching are beneficial adjuncts to conventional physiotherapy in the management of cervical spondylosis. However, self-traction yields superior improvements in pain relief, cervical mobility, and functional performance, and may be recommended as a preferred clinical intervention.

Keywords: Cervical spondylosis, self-traction, self-stretching, physiotherapy, range of motion, Neck Disability Index

Introduction

Cervical spondylosis (CS) is a progressive degenerative condition of the cervical spine that primarily begins with intervertebral disc degeneration and advances to involve vertebral bodies, ligaments, and facet joints. It is considered the most common age-related spinal disorder, with radiographic evidence of degeneration observed in up to 50% of individuals over the age of 50 and nearly 95% by the age of 65 [1, 2]. The condition frequently involves the C5–C6 and C6–C7 segments, often manifesting as neck pain, restricted range of motion (ROM), radiculopathy, and in severe cases, myelopathy [3]. The prevalence of CS is reported to be 25% in adults below 40 years and as high as 60% in those above 40 years, highlighting its growing clinical and socioeconomic burden [4].

The clinical presentation of CS is variable and depends on the degree and location of degenerative changes. Common symptoms include chronic neck pain, stiffness, cervicogenic headache, paraesthesia, and functional limitations, with radiculopathy resulting from nerve root compression and myelopathy from spinal cord involvement [5]. Neck pain associated with CS is often linked to postural imbalance and adaptive shortening of muscles such as the sternocleidomastoid, upper trapezius, pectoralis, and suboccipital group [6]. Studies from India have reported radiological changes in up to 78% of patients at the C5–C6 and C6–C7 levels, reinforcing its high prevalence in the general population [7]. With age-related progression, static mechanisms such as osteophyte formation and dynamic mechanisms such as abnormal spinal motion contribute synergistically to nerve and cord compression [8].

Management of CS typically involves both surgical and conservative interventions. While surgical treatment, including decompression and fusion procedures, is reserved for patients with progressive neurological deficits or spinal instability, conservative management remains the mainstay for most cases [9]. Among conservative options, physiotherapy plays a central role by reducing pain, restoring mobility, and improving functional performance. Interventions such as manual therapy, exercise therapy, stretching, and traction have been shown to alleviate symptoms effectively [10]. Cervical traction in particular helps increase intervertebral space, reduces nerve root compression, and enhances ROM, whereas stretching improves the extensibility of soft tissues, reduces stiffness, and corrects muscle imbalances [11, 12].

Self-administered physiotherapy techniques such as self-traction and self-stretching have gained importance in recent years due to their cost-effectiveness, feasibility, and patient independence. Self-traction promotes joint decompression and relaxation of paraspinal muscles, while self-stretching enhances flexibility and decreases muscular stiffness, both ultimately improving cervical ROM and reducing pain [13, 14]. However, despite the widespread clinical use of these techniques, limited evidence exists comparing their relative effectiveness when combined with conventional

physiotherapy. Therefore, the present study aims to investigate and compare the outcomes of self-traction and self-stretching along with conventional physiotherapy interventions in patients with cervical spondylosis. This comparison may provide valuable insights into the development of cost-effective and accessible treatment strategies for individuals with CS.

There are many evidences available for effects of traction and stretching among the patients of CS. There is less evidence available for self-traction and self-stretching for the patients of CS. There is no evidence available comparing self-traction and self-stretching in patients with CS. So, the main purpose to do this study is to compare the effects of self-traction and self- stretching and to find out which technique gives better results on pain, ROM and functional performance in patients with CS.

Methodology

Study-Design

The present study followed a pre–post experimental design to evaluate the comparative effectiveness of self-traction and self-stretching in patients with cervical spondylosis.

Study-Population

The study population consisted of clinically diagnosed patients with cervical spondylosis.

Study Sample

Male and female participants aged between 30 and 60 years with cervical spondylosis were included in the study.

Sampling Technique

Participants were recruited using a purposive sampling technique based on eligibility and willingness to participate.

Sample Size

The sample size was calculated using G*Power software version 3.1.9.7, with an alpha level set at 0.05, statistical power of 0.80, and effect size derived from a pilot study. The required sample size was estimated to be 22.875 participants. Considering no dropout rate, a total of 46 participants were recruited, with 23 participants allocated to Group A (self-traction with conventional physiotherapy) and 23 participants to Group B (self-stretching with conventional physiotherapy).

Study Duration

The total duration of the study was one year, including recruitment, intervention, and follow-up.

Study Setting

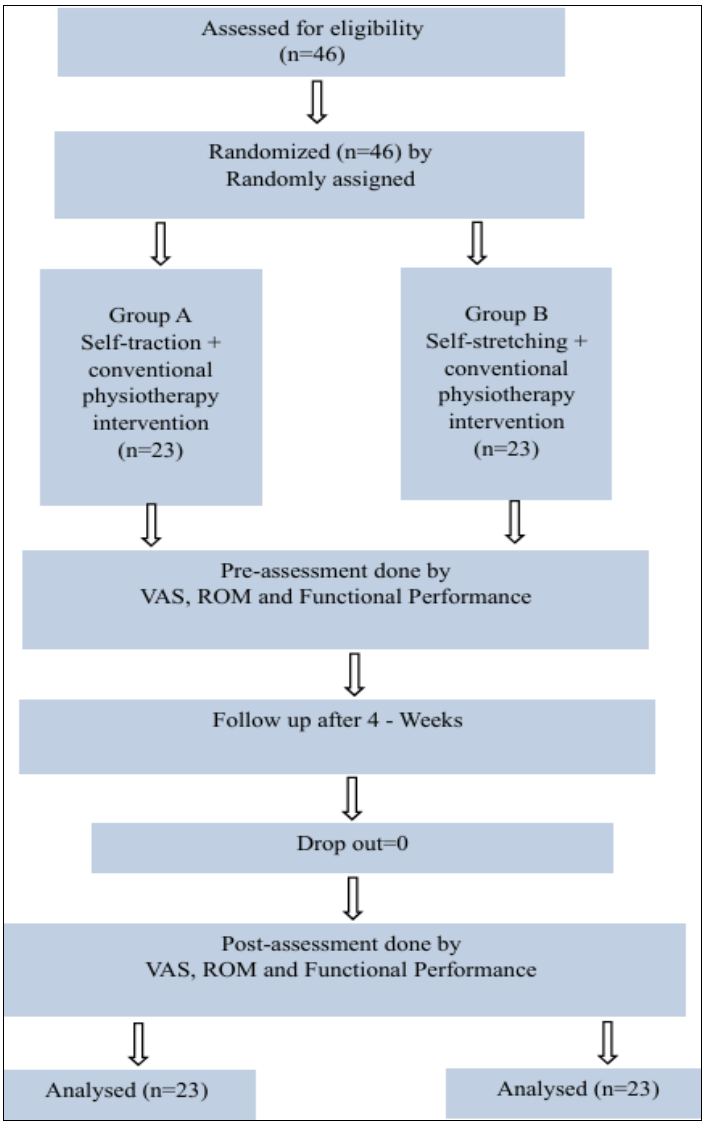
The study was conducted at the Outpatient Department of SPB Physiotherapy College and selected private physiotherapy outpatient clinics in Surat city.

Selection Criteria

Inclusion Criteria

Participants were eligible for the study if they met the following criteria:

- Diagnosed cases of cervical spondylosis [7, 22]
- Both male and female patients [13, 22, 34]
- Radiologically confirmed grade I and II cervical spondylosis [35]
- Age between 30 and 60 years [13, 29]
- Acute or chronic neck pain [22]
- Medically stable condition
- Willingness to participate in the study Exclusion Criteri a Participants were excluded if they presented with:
- Infectious or inflammatory spinal disorders, or congenital deformities of the cervical spine [13, 29]
- Symptoms of vertigo [21]
- History of prolonged steroid use [28]
- Cervical spondylosis grade III, IV, or V [35]
- Cervical trauma with fracture or dislocation, or a history of cervical spine surgery [29]
- Ischemic heart disease or other serious systemic illnesses [13, 14]



Outcome Measures

range of motion (ROM) and functional performance. (Cervical ROM will be assessed through goniometer.)

Pain will be assessed through the visual analogue scale (VAS).

Functional performance will be assessed through neck disability index (NDI).

Procedure

All participants were screened based on the selection criteria and allocated into two groups. Prior to intervention, demographic details and baseline characteristics were recorded. Cervical range of motion (ROM) was assessed

using a universal goniometer in flexion, extension, side flexion (right and left), and rotation (right and left) positions. Pain intensity was evaluated using the Visual Analogue Scale (VAS), and functional performance was assessed using the Neck Disability Index (NDI).

Group A received self-traction along with conventional physiotherapy interventions, while Group B received self-stretching along with conventional physiotherapy interventions. Conventional physiotherapy included hot moist pack application, isometric cervical exercises, and postural correction education. The intervention was administered for a total duration of four weeks. Participants performed the respective self-techniques under supervision during initial sessions, and later continued under guided monitoring to ensure adherence and accuracy of performance.

In the self-traction technique, participants were instructed to perform traction in a sitting position by using their hands to provide an upward lift to the occiput and mandible, creating a decompressive force on the cervical spine. This technique was performed in repetitions as per the prescribed protocol.

In the self-stretching technique, patients performed targeted stretching exercises for cervical flexors, extensors, and lateral flexors to improve soft tissue mobility and reduce stiffness. Each stretch was held for 20–30 seconds and repeated for the recommended sets.

Outcome measures (VAS, cervical ROM, and NDI) were recorded at baseline (0 week) and after completion of the intervention period (4 weeks). All assessments were performed by an independent physiotherapist blinded to group allocation to minimize bias.

Statistical Analysis

Data were analysed using JAMOVI version 2.3.28. Variables included age, gender, VAS, cervical ROM (flexion, extension, side flexion, side rotation), and NDI. Baseline characteristics were compared to assess homogeneity between groups. Given the small sample size (<50), the Shapiro–Wilk test was applied to assess normality.

Parametric tests (paired t-test, independent t-test) were used for normally distributed data, while non-parametric tests (Wilcoxon test, Mann–Whitney U test) were applied for non-normal data. Within-group changes were analysed using paired t-test or Wilcoxon test, and between-group differences were analysed using independent t-test or Mann–Whitney U test as appropriate. A 95% confidence interval was used, with statistical significance set at $p<0.05$.

Result

46 patients were assessed for eligibility, so 23 patients in each group, group A and group B. There was no drop out at the end of the study. 46 patients were enrolled in the study and randomized by chit method to one of the treatment groups (23 group A and 23 group B). Mean age of participants in group A was 42.74 and group was 43.04. Minimum age (30) and maximum age (60) in group A and group B. All the 46 patients were assessed for all the outcomes measures at the end of the 4th week of intervention. Frequency and percentage of male and female patients of both groups, group A and group B in the study was calculated.

According to the Shapiro–Wilk test for Group A baseline data, VAS ($p=0.002$) and ROM side flexion right ($p=0.010$) were not normally distributed ($p<0.05$). In contrast, ROM flexion ($p=0.315$), extension ($p=0.113$), side flexion left ($p=0.054$), side rotation left ($p=0.143$) side rotation right ($p=0.667$), and NDI ($p=0.301$) showed normal distribution ($p>0.05$).

Table 1: Demographic Data

		GROUP A	GROUP B
AGE (MEAN)		42.74	43.04
GENDER	MALE	10 (43.48%)	8 (34.79%)
	FEMALE	13 (56.53%)	15 (65.22%)
TOTAL		23 (100%)	23 (100%)

Table 2: Normality of Data of group a

OUTCOME MEASURES		SHAPIRO-WILK TEST
		NORMALITY
		Group A
VAS PRE		0.002
ROM	FLEXION PRE	0.315
	EXTENSION PRE	0.113
	SIDE FLEXION LEFT PRE	0.054
	SIDE FLEXION RIGHT PRE	0.010
	SIDE ROTATION LEFT PRE	0.143
	SIDE ROTATION RIGHT PRE	0.667
NDI PRE		0.301

Table 3: Normality of data of group b

OUTCOME MEASURES		SHAPIRO-WILK TEST
		NORMALITY
		Group B
VAS PRE		0.005
ROM	FLEXION PRE	0.002
	EXTENSION PRE	0.123
	SIDE FLEXION LEFT PRE	0.013
	SIDE FLEXION RIGHT PRE	0.082
	SIDE ROTATION LEFT PRE	< 0.001
	SIDE ROTATION RIGHT PRE	0.045

The Shapiro–Wilk test for Group B showed that ROM (extension, side flexion right) and NDI had p-values >0.05, indicating normal distribution; hence, parametric analysis using the paired t-test was applied for these variables. Conversely, VAS and ROM (flexion, side flexion left, side rotation left, side rotation right) had p-values <0.05, indicating non-normal distribution; therefore, the Wilcoxon test was used for within-group analysis of these variables.

Table 4: Patients Baseline Characteristics

VARIABLE		GROUP A	GROUP B	p VALUE
		MEAN ± SD	MEAN ± SD	
AGE (YEAR)		42.74 ± 8.74	43.04 ± 8.53	0.079
GENDER		M: 43.48%	M: 34.79%	
		F: 56.53%	F: 65.22%	
VAS PRE		6.74 ± 1.14	6.61 ± 1.03	< 0.001
ROM	FLEXION PRE	35.00 ± 6.83	36.39 ± 6.67	0.001
	EXTENSION PRE	36.09 ± 3.54	36.26 ± 4.61	0.043
	SIDE FLEXION LEFT PRE	36.61 ± 4.56	35.74 ± 5.49	0.035
	SIDE FLEXION RIGHT PRE	37.30 ± 7.88	38.30 ± 5.09	< 0.001
	SIDE ROTATION LEFT PRE	38.57 ± 3.26	40.70 ± 4.71	< 0.001
	SIDE ROTATION RIGHT PRE	41.04 ± 2.65	40.96 ± 4.72	0.010
NDI PRE		29.96 ± 7.24	32.96 ± 6.26	0.077

In the present study, Group A participants who received Self-traction along with conventional physiotherapy had a mean age of 42.74 ± 8.74 years. Their baseline values are mentioned in above table.

Table 5: Within group comparison of outcome variable

VARIABLE		GROUP A (Paired t test)		
		PRE INTERVENTION (MEAN ± SD)	POST INTERVENTION (MEAN ± SD)	p VALUE
ROM	FLEXION	35.00 ± 6.83	47.83 ± 7.259	< 0.001
	EXTENSION	36.09 ± 3.54	47.61 ± 3.799	< 0.001
	SIDE FLEXION LEFT	36.61 ± 4.56	46.00 ± 5.427	< 0.001
	SIDE ROTATION LEFT	38.57 ± 3.26	48.13 ± 2.849	< 0.001
	SIDE ROTATION RIGHT	41.04 ± 2.65	50.96 ± 3.662	< 0.001

The p-value for ROM (Flexion) was found to be <0.001, which is statistically significant (<0.05), indicating a difference between pre- and post-treatment values. The post-treatment mean was higher than the pre-treatment means, suggesting that ROM (Flexion) improved significantly following the intervention.

Table 6: Within group comparison of outcome variable

VARIABLE		GROUP A (Wilcoxon)		
		PRE INTERVENTION (MEAN ± SD)	POST INTERVENTION (MEAN ± SD)	p VALUE
VAS		6.74 ± 1.14	2.65 ± 0.0885	< 0.001
ROM	SIDE FLEXION RIGHT	37.30 ± 7.88	47.00 ± 7.311	< 0.001
NDI		29.96 ± 7.24	16.04 ± 7.654	< 0.001

The p-value for VAS was <0.001, indicating a statistically significant difference between pre- and post-treatment scores. As the post-treatment mean was lower than the pre-treatment means, it suggests a marked reduction in pain levels, demonstrating significant improvement after the intervention.

Table 7: Within group comparison of outcome variable

VARIABLE		GROUP B (Paired t test)		
		PRE INTERVENTION (MEAN ± SD)	POST INTERVENTION (MEAN ± SD)	p VALUE
ROM	EXTENSION	36.26 ± 4.61	44.57 ± 5.68	< 0.001
	SIDE FLEXION RIGHT	38.30 ± 5.09	45.61 ± 6.07	< 0.001

The p-value for ROM (Extension) was <0.001, showing a statistically significant difference between pre- and post-treatment values. The higher post-treatment means compared to the pre-treatment mean indicates that ROM (Extension) improved significantly following the intervention.

Table 8: Within group comparison of outcome variable

VARIABLE		GROUP B (Wilcoxon)		
		PRE INTERVENTION (MEAN ± SD)	POST INTERVENTION (MEAN ± SD)	p VALUE
VAS		6.61 ± 1.03	2.96 ± 1.07	< 0.001
ROM	FLEXION	36.39 ± 6.67	46.52 ± 7.39	< 0.001
	SIDE FLEXION LEFT	35.74 ± 5.49	43.78 ± 5.05	< 0.001
	SIDE ROTATION LEFT	40.70 ± 4.71	47.61 ± 4.71	< 0.001
	SIDE ROTATION RIGHT	40.96 ± 4.72	47.70 ± 4.90	< 0.001
NDI		32.96 ± 6.26	20.83 ± 7.20	< 0.001

The p-value for VAS was <0.001, confirming a statistically significant difference between pre- and post-treatment scores. Since the post-treatment mean was lower than the pre-treatment means, it reflects a notable reduction in pain, indicating significant improvement after treatment.

Table 9: Normality of pre-post difference

VARIABLE		SIGNIFICANCE (p value)
VAS		0.001
ROM	FLEXION	< 0.001
	EXTENSION	0.036
	SIDE FLEXION LEFT	0.094
	SIDE FLEXION RIGHT	0.282
	SIDE ROTATION LEFT	0.430
	SIDE ROTATION RIGHT	0.077
NDI		< 0.001

The normality test results showed that the p-value for VAS was 0.001 (<0.05), indicating the data were not normally distributed. Similarly, ROM (Flexion) with a p-value <0.001 and ROM (Extension) with a p-value of 0.036 (<0.05) also

demonstrated non-normal distribution. However, ROM (Side Flexion Left) had a p-value of 0.094 (>0.05), suggesting that the data for this variable were normally distributed.

The normality test results showed that ROM (Side Flexion Right) (p = 0.282), ROM (Side Rotation Left) (p = 0.430), and ROM (Side Rotation Right) (p = 0.077) had p-values >0.05, indicating normally distributed data. In contrast, NDI (p <0.001), VAS (p = 0.001), ROM (Flexion) (p <0.001), and ROM (Extension) (p = 0.036) had p-values <0.05, indicating non-normal distribution. Hence, parametric tests (Unpaired t-test) were applied for ROM (Side Flexion Left, Side Flexion Right, Side Rotation Left, and Side Rotation Right), while non-parametric tests (Mann–Whitney U test) were used for VAS, ROM (Flexion, Extension), and NDI for between-group analysis.

Table 10: Betweeen group comparison of outcome measure using unpaired t-test

VARIABLES		GROUP A	GROUP B	p VALUE
		DIFFERENCE MEAN ±SD	DIFFERENCE MEAN± SD	
ROM	SIDE FLEXION LEFT	9.39 ± 3.487	8.04 ± 1.988	0.094
	SIDE FLEXION RIGHT	9.70 ± 2.961	7.30 ± 2.458	0.282
	SIDE ROTATION LEFT	9.57 ± 2.842	6.91 ± 2.392	0.430
	SIDE ROTATION RIGHT	9.91 ± 1.832	6.74 ± 2.397	0.077

Table 11: Betweeen group comparison of outcome measure using mann whitney u test

VARIABLES		GROUP A	GROUP B	p VALUE
		DIFFERENCE MEAN ± SD	DIFFERENCE MEAN± SD	
VAS		4.43± 0.896	3.65 ± 0.885	0.001
ROM	FLEXION	12.83 ± 3.200	10.13 ± 1.687	< 0.001
	EXTENSION	11.52 ± 2.333	8.30 ± 2.601	0.036
NDI		15.17 ± 4.030	12.61 ± 3.526	< 0.001

Measure Using Mann Whitney U Test

Discussion

Cervical spondylosis (CS) is a common age-related degenerative disorder of the cervical spine, often leading to neck pain, reduced mobility, and functional limitations. It involves intervertebral discs, vertebral bodies, ligaments, facet joints, and nerve roots, and can result in pain, stiffness, and neurological complications. Conservative management, particularly physiotherapy, remains the mainstay of treatment, with evidence supporting its role in improving pain, ROM, and quality of life.

Self-traction is known to relieve pain by stretching facet joint capsules and widening intervertebral foramina, thereby improving function. It has significant therapeutic effects and is widely used in early-stage CS. Similarly, self-stretching improves blood flow, reduces muscle stiffness, enhances flexibility, and increases ROM by elongating shortened soft tissues.

In this study, 46 patients with CS were randomly allocated into two groups: Group A received self-traction with conventional physiotherapy, and Group B received self-stretching with conventional physiotherapy. Interventions were given 5 days per week for 4 weeks. Outcomes assessed included pain (VAS), ROM (goniometer), and functional performance (NDI). Post-intervention assessments demonstrated improvements across both groups, supporting the effectiveness of these exercise approaches in CS management.

The study findings suggest that self-traction combined with conventional physiotherapy produced greater improvements in pain reduction, cervical ROM, and functional performance compared to self-stretching with physiotherapy. The superior effect of self-traction may be attributed to decompression of cervical soft tissues, widening of intervertebral foramina, and stretching of facet joint capsules, which enhance circulation, relax paraspinal muscles, and reduce pain transmission. Previous evidence also supports its effectiveness in improving cervical mobility and functional status.

Self-stretching, however, was also effective in reducing pain, improving ROM, and enhancing functional performance. It improves flexibility, reduces passive muscle stiffness, and increases blood flow without the need for special equipment, making it an accessible and cost-effective intervention.

In this study, while both interventions were beneficial, self-traction demonstrated comparatively greater outcomes in pain relief, ROM, and function. Given the high cost of mechanical traction devices, self-traction and self-stretching serve as practical, low-cost alternatives for managing CS.

Limitations include a small sample size, short-term intervention (4 weeks), single-city recruitment, and limited outcome measures (pain, ROM, functional performance). Future studies should include larger samples, longer follow-up, and broader functional assessments to strengthen evidence on the long-term effectiveness of these techniques.

Conclusion

Both self-traction and self-stretching, when combined with conventional physiotherapy, are effective in reducing pain, improving cervical ROM, and enhancing functional performance in patients with cervical spondylosis. However, self-traction demonstrated greater effectiveness compared to self-stretching. Therefore, incorporating self-traction along with conventional physiotherapy may provide superior clinical outcomes in the management of cervical spondylosis.

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