

Original Article

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## The Efficacy of Intermittent Cervical Traction in Cervical Spondylosis with Radiculopathy.

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### Abstract:

**Background:** Degeneration of cervical spine is one of the most common causes of neck and arm pain with disability. Many studies have done regarding correlation between cervical traction and cervical spondylosis but still there is lack of data about effect ICT (intermittent cervical traction) on cervical spondylosis and radiculopathy.

**Methods:** This prospective randomized clinical trials was performed at physical medicine & Rehabilitation department, Combined Military Hospital (CMH) Dhaka and BSMMU (Bangabondhu sheikh mujib medical university), Dhaka over a period of six months. 80cases completed the study after selecting by consecutive sampling according to inclusion & exclusion criteria. The neligible participants allocated into two groups. Group-A were managed by supervised ICT, NSAID's, therapeutic neck exercise, soft cervical collar and ADL advice. Group-B received same as A -group management except (ICT). Evaluation made at initial visit and weekly for six weeks. Assessment of the patient was done by VAS, NPRS, pain frequency score and neck ROM. Student's 't' tests, chi square tests were done to see the level of significance. "P" value < 0.05 considered as significant.

**Results:** Among the 80 patients, mean age was  $45 \pm 9.25$  years, 65% were male and 35% were female. Maximum patients were predominantly table worker 30(37.5%) and mean BMI was  $24.95 \pm 1.86$ . After six weeks treatment VAS, NPRS, Pain frequency score shows significant difference of improvement "P" value < 0.05 between two groups.

**Conclusion:** So it is suggested that add on therapy of intermittent cervical traction with NSAID and exercise inflict significant effects in pain and functional ability in patients with cervical spondylosis with radiculopathy.

**Keywords:** intermittent Cervical Traction, Cervical spondylosis, radiculopathy.

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### Introduction:

Neck pain or pain radiating from neck is the second most common musculoskeletal disability confronting the physiatrist.<sup>1</sup>

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People can suffer at least once neck pain during their life time.<sup>2</sup> Pain in cervical region is commonly faced in outpatient department as well as low back pain.<sup>3</sup> Usually 95% of individuals will experience cervical pain by 65 years. At some point of life 10% of the population experienced severe episodes of neck discomfort, about 12.3% has been estimated as annual incidence.<sup>4</sup> Cervical degenerative arthritis is one of the most common causes of neck pain and disability.<sup>5</sup> This degenerative arthritis is more common after fourth decade.<sup>6</sup> Spondylosis may be associated with neurological dysfunction. Commonly C6, C7 and C5 roots affected at C5/6, C6/7 and C4/5 vertebral levels respectively, among them C6 mostly.<sup>7</sup> Annual incidence rate of Cervical radiculopathy is 107•3 per 100,000 for men and 63•5 per 100,000 for women, with peak age at 50-54 years.<sup>8</sup> It is a neurophysiologic dysfunction of the nerve roots pathology

process.<sup>9</sup> Degenerative spine disease causes narrowing of the diameter of neural foramen or canal of the spinal column and compromise nerve root integrity.<sup>10</sup> The primary goal of treatment include pain reduction, improvement in muscle weakness, avoidance of spinal cord compression, and recurrence prevention.<sup>11</sup> Non-operative treatment of cervical spondylosis without cervical myelopathy will frequently improve or complete recovery from neck pain and radiculopathy.<sup>12</sup> Physical therapy is a very important part of the treatment strategy, which includes exercises to optimize the range of motion and muscular control.

Gentle manipulation and intermittent traction can be useful.<sup>13</sup> Cervical traction essentially decreases lordosis, opens the foramina, and elongates the erector spine. Cervical traction applies a distractive force across the cervical intervertebral disc space. It is commonly used by patients having cervical radiculopathy. Twenty five pounds of force is needed to distract the mid-cervical segments when applied for 25 min at an pulling angle of 24°. Cervical traction can be done with an intermittent heavy weight or a continuous light-weight regimen in the physical therapy center or home setting.<sup>14</sup> The studies supports the Practice of cervical traction for management of pain as well as improvement in function and strength of patients with cervical radiculopathy.<sup>15</sup> Though many studies have been done regarding outcome of intermittent cervical traction in cervical spondylosis, but very few regarding intermittent cervical traction, which can play an important role in cervical radiculopathy with spondylosis to reduce neck pain and radicular pain in early time.

In our country, although many people in the community have been suffering from chronic neck pain, not much work has done in this field. In Bangladesh a study by Shakoor MA and others stated that cervical traction has better effects on cervical spondylosis in relation to IRR.<sup>16</sup> In another study at IPGM&R, Dhaka, he found that cervical traction along with NSAIDs had its better improvement than short wave diathermy with NSAIDs.<sup>17</sup>

But a paucity of information present in our country regarding relation of ICT (intermittent cervical traction) in cervical spondylosis with cervical radiculopathy. This study purpose was to

see the outcome of intermittent cervical traction on pain and disability of patients facing cervical radiculopathy with spondylosis for improvement of their working capacity and thus they may be able to contribute themselves for the prosperity of the country.

#### **Materials and Methods:**

A prospective RCT study was carried out in the physical medicine and Rehabilitation department, Bangabandhu Shiekh Mujib Medical University, Dhaka over a period from 10th February 2017 to 10th August 2017. A total of 90 patients of cervical spondylosis (CS) with radiculopathy enrolled in our study according to inclusion and exclusion criteria irrespective of gender.

The diagnosis of CS was confirmed by history and clinical examination. The selected patients were non randomly sanctioned into two groups on the basis of the admission. Among the selected 90 patients, the even numbered (2, 4, 6 and so on) were included in Group A (experimental group) and odd numbered in Group B (controlled group). Inclusion criteria was patients aged? 30 years and? 70 years of both sexes suffering from neck and radicular pain with limited or painful ROM of cervical movement, average pain intensity of 3 or more on a 10 cm VAS for the last week before baseline assessment were only included as study population and patient with features of myelopathy, local lesion like rotator cuff tears, tennis elbow and carpal tunnel syndrome, other pathological and infectious entities e.g. rheumatoid arthritis, ankylosing spondylitis, tuberculosis, or has a bony injury to the cervical spine, severe acute neck pain, systemic disease (cardiac, cerebrovascular, pulmonary system or malignancy) that contraindicated to cervical traction and exercise were excluded from this study. Data were collected from the selected patients using a semi structured questionnaire starting from demographic characteristics, clinical history, a detailed clinical examination, preoperative findings and post operative outcome including complications. Outcome measures were by VAS, NPRS.

Data cleaning validation and analysis performed using the SPSS (Statistical package for social

sciences) -package program (version-20.0) for Windows. The result presented in tables in mean, standard deviation (SD) and percentages. Student's 't' tests, Chi-square test were done as required to see the level of significance. "P" value<0.05 considered as significant. The summarized findings of data analyses were presented in the form of tables and figures with due statistical interpretation.

### **Clinical Intervention:**

All symptoms and signs of each participant was recorded accordingly and clinical diagnosis was made. Relevant investigation was done. Thus diagnosis made confirmed those who had cervical degenerative arthritis present in X-ray cervical spine. Some patient excluded by doing MRI of cervical spine who shows findings of cervical myelopathy.

Patient other than cervical spondylosis with cervical radiculopathy was exempted after providing necessary treatment. Sample was selected by consecutive sampling from eligible participants. A brief idea about the nature of study and intervention was delivered to each patient. Written informed consent was taken before entering in to trial.

Each participant allocated to either group A - experimental group or group B -control group by randomization using lottery method. Intermittent mechanical traction was performed with the patient in sitting posture, 15 minutes per day. The pulling angle was 150 to 240 of neck flexion. The on/off cycle was set to 20 second of pull force and 10 second of relaxation force.

After the treatment of the patients as per schedule, assessment of the patient was done by VAS, NPRS, Pain frequency score and Neck ROM. Follow up of the patients was weekly for 06 weeks and the outcomes were recorded in the assessment data sheet from the first visit. Further data was collected from each patient in every visit.

Manual or mechanical intermittent cervical traction plays an important role in the rehabilitation of cervical radiculopathy if it is added on multimodal option of rehabilitation<sup>18</sup>.

### **Traction:**

Traction is defined as the act of exerting a pulling force<sup>19</sup>. Traction is a modality used to

stretch soft tissues and separation of joint surfaces or bone fragments by the use of a pulling force.

Application of the force must be of appropriate magnitude and duration in the proper direction, meanwhile resisting body movement with an equal and opposite force<sup>20</sup>. Traction continues to be used in the clinical management of cervical and lumbar region pain disorders. The methods of cervical traction delivery includes manual, motorized, mechanical or hydraulic or with the assistance of gravity via inversion. The force can be continuous, sustained or intermittent. The magnitude, direction and duration of the pull varies uniformly. Cervical traction is generally given manually, mechanically, or motorized with head sling or chin sling, or with a distraction unit which remains supine posterior.

Optimal pulling angle ranges between 20°and30°offlexion, while 25 lb of force is necessary to reverse the normal cervical lordosis and the earliest distraction of vertebral segments to bring about 21. Cervical traction may be prescribed, a typical regimen includes 8 to10 pounds for sessions of 15 to 20 minutes with the device at 20 to 25 degrees of flexion (22).

Mechanical traction for the cervical spine can be applied intermittently or continuously. The physiological effects of such treatment may include separation of vertebral bodies, distraction and gliding of facet joints, widening of the intervertebral foramen, tensing of ligamentous structures, straightening of spinal curves and stretching of spinal musculature.

Traction has also been reported to relieve pain by relaxation of muscle, mechanoreceptors stimulation or inhibitory effect of muscle guarding<sup>23</sup>.

Therapeutic neck exercise: Strengthening exercise are important because the cervical spine is extremely mobile compared with other areas of the body. Active exercise should be utilized in most regimens of treatment.

The exercise can be grouped into: a) Isometric neck muscle strengthening exercises b) Shoulder raising exercise. Exercise improves poor muscle tone and helps the stability of the neck and shoulder. The patient should be encouraged to continue with exercise because if otherwise the symptoms will recur. Exercise is aimed at

strengthening the para-vertebral muscles not increasing the range of motion.

In acute phase, exercise of any type cannot be tolerated and it should not be prescribed until the acute stage has subsided (25). ADL: Activity of daily living (ADL) instructions: (Appendix A)

NPRS: The Numeric Pain Rating Scale (NPRS) is a unidimensional measure of pain intensity in adults. The NPRS is a numeric version of segmentation of visual analog scale (VAS) in which a participant selects a whole number (0-10 integers) that best reflects the pain intensity. The usual format is a horizontal bar or line. The NPRS is dedicated by terms describing severity of pain as like as VAS.

Although various iterations exist, the most commonly used is the 11-item NPRS. It is also called NRS-11, which is 11-point scale for patient self-reporting of pain. It is for adults and children 10 years old or older. Rating Pain Level 0 = No Pain, 1-3 Mild Pain (nagging, annoying, interfering little with ADLs), 4-6 Moderate Pain (interferes significantly with ADLs), 7-10 Severe Pain (disabling; unable to perform ADLs) (25).

VAS: The visual analogue scale or VAS tries to measure a characteristic or attitude which is believed to range across a continuum of values and cannot be directly measured easily. For example, the severity of pain that a respondent feels ranges across a continuum from none to an extreme amount of pain.

From the respondents' point of view this spectrum appears continuous +/- their pain doesn't take discrete jumps, as a categorization of none, mild, moderate and severe would be proposed. It was to capture this idea of an underlying continuum that the VAS was devised. Operationally a VAS is a horizontal line normally, 100 millimeter in length, scored by word descriptors at the end of each.

The patient marks the point on the line that they feel expresses their perception of the current state. The VAS score is measured by mm (millimeter) from the left hand end of the line to the point that the patient marks. Result We treated 80 patients, among them 40 were in group A, other 40 group B. The mean age of the patients of both sexes are  $45.61 \pm 9.26$  years and  $45 \pm 9.34$  years for 'A' group and 'B' group respectively. Out of 90 patients most (42.45%)

of them belong to age group 40-49 years, second highest 30.75% from age group 30-39 years.

Among the total 80 patients, 52 (65%) persons were male and 28 (35%) were female. Male to female ratio was 1: 1.85. The outcome measurement of pain score measured by VAS, NPRS taken on 1st day as baseline assessment then weekly for six weeks. The age distribution of the total population are illustrated in table I. Most of the patients have gradual onset of pain found in this study (62.5% in 'A' group and 60% in 'B' group).

Outcome of Group-A patient assessed by VAS, NPRS, and pain frequency score, neck flexion and extension, lateral bending and rotation.

Significant improvement ( $P < 0.05$ ) was observed between Initial and after treatment on 6th week's visit. Treatment response in Group A demonstrated on Table 2. Table 3; shows outcome of group B patients, assessed by VAS, NPRS, Pain frequency score, neck flexion + extension, lateral bending and rotation. Significant improvement ( $P < 0.05$ ) was observed between Initial and after treatment on 6th week's visit.

## Result

We treated 80 patients, among them 40 were in group A, other 40 group B. The mean age of the patients of both sexes are  $45.61 \pm 9.26$  years and  $45 \pm 9.34$  years for group A and group B respectively. Out of 90 patients most (42.45%) of them belong to age group 40-49 years, second highest 30.75% from age group 30-39 years. Among the total 80 patients, 52 (65%) persons were male and 28 (35%) were female. Male to female ratio was 1: 1.85. The outcome measurement of pain score measured by VAS, NPRS taken on 1st day as baseline assessment then weekly for six weeks. The age distribution of the study population are illustrated in table I. Most of the patients have gradual onset of pain found in this study (62.5% in group A and 60% in group B). Outcome of Group-A patient assessed by VAS, NPRS, Pain frequency score, neck flexion + extension, lateral bending and rotation. Significant improvement ( $P < 0.05$ ) was observed between Initial and after treatment on 6th week's visit. Treatment response in Group A demonstrated on Table 2. Table 3; shows

outcome of group B patients, assessed by VAS, NPRS, Pain frequency score, neck flexion + extension, lateral bending and rotation. Significant improvement ( $P < 0.05$ ) was observed between Initial and after treatment on 6<sup>th</sup> week's visit. At presentation the VAS, NPRS and Pain frequency score difference in group-A and group- B was not significant ( $P > 0.5$ ). After the whole treatment period the difference of improvement between groups were significant. By analyzing pain scores with VAS as outcome measurement, obtained results revealed post treatment improvement in both group. In comparison of post treatment VAS score between groups, experimental group found remarkable improvement (Table II, III and Figure-1). By analyzing data of VAS and NPRS as outcome measures for both the groups, following results were obtained. Improvements of Post treatment VAS and NPRS were noticeable in experimental group-A (Table: IV and Table: V).

**Table I: Age Distribution**

Age group (in years)	Group A (n=39)		Group B (n=41)		P value
	N	%	n	%	
30-39	12	30.8	13	31.7	
40-49	16	41.0	18	43.9	
50-59	8	20.5	7	17.1	
60-70	3	7.7	3	7.3	
Total	39	100.0	41	100.0	
Mean±SD	45.61±9.26		45±9.34		0.77 <sup>ns</sup>

ns = not significant

Values were expressed as mean ± standard deviation. Statistical analysis was done by student's 't' test (unpaired) with 95% CI (confidence interval), n= number of patient in groups

**Table-II: Treatment response in group-A**

Characteristics	Pre-treatment W <sub>0</sub>	Post treatment W <sub>6</sub>	P-values	95% CI
VAS	7.05±0.79	0.94±0.64	0.0001	5.78 to 6.43
NPRS	6.15±1.06	0.6±0.5	0.0001	5.15 to 5.92
Pain Frequency Score	7.05 ±0.68	0.79±0.83	0.0001	5.91 to 6.6
Flexion +Extension	88.97±5.86	111.79±7.47	0.0001	-25.84 to 19.79
Lateral Bending	23.97±4.46	29.87±3.53	0.0001	-7.71 to -4.08
Rotation	51.41±5.72	58.58±5.61	0.0001	-9.72 to 4.61

Values were expressed as mean ± standard deviation. Statistical analysis was done by student's 't' test (unpaired) with 95% CI (confidence interval), w<sub>0</sub>= at the 1<sup>st</sup> attendance, w<sub>6</sub>= at the end of 6weeks.

**Table III: Treatment response in group-B**

Characteristics	Pre-treatment W <sub>0</sub>	Post treatment W <sub>6</sub>	P-values	95% CI
VAS	6.87±0.78	1.29±0.81	0.0001	5.23 to 5.9
NPRS	6.0±0.8	1.4±.59	0.0001	4.29 to 4.9
Pain Frequency Score	6.9±0.8	1.2±0.95	0.0001	5.3 to 6.0
Flexion +Extension	88.17±5.67	107.56±7.91	0.0001	-22.2 to 16.5
Lateral Bending	23.65±4.47	30.60±3.56	0.0001	-8.72 to -5.17
Rotation	51.21±5.45	56.82±4.71	0.0001	-7.87 to -3.37

Values were expressed as mean  $\pm$  standard deviation. Statistical analysis was done by student's 't' test (unpaired) with 95% CI (confidence interval),  $w_0$  = at the 1<sup>st</sup> attendance,  $w_6$  = at the end of 6 weeks.

**Comparative study between Group-A and Group-B:**

**Table-IV: Comparison of treatment response between two group**

Variables	Pretreatment score	Post treatment score
VAS	Group-A	7.05 $\pm$ 0.79
	Group-B	6.87 $\pm$ 0.78
	P-values	0.3 <sup>ns</sup>
	95% CI	-0.169 to 0.529
NPRS	Group-A	6.15 $\pm$ 1.06
	Group-B	6.0 $\pm$ 0.8
	P-values	0.47 <sup>ns</sup>
	95% CI	-0.26 to 0.56
Pain Frequency Score	Group-A	7.05 $\pm$ 0.68
	Group-B	6.9 $\pm$ 0.8
	P-values	0.37 <sup>ns</sup>
	95% CI	-0.18 to 0.48

Chi-square test

ns = Not significant

\*\* = Significant (P<0.05)

**Discussion**

The study was aimed to evaluate the outcome of ICT (Intermittent cervical traction) on cervical spondylosis with radiculopathy.

Two group were treated, Group A received intermittent cervical traction, NSAID's, therapeutic neck exercise, soft cervical collar and ADL advice. Group B receive NSAID's, therapeutic neck exercise and soft cervical collar and ADL advice. Evaluation made at initial visit and weekly and sixth week after ward. In this study outcome of patients were assessed by VAS, NPRS, Pain Frequency score and neck range of motion. The mean score of VAS before treatment were 7.05  $\pm$  0.79 and 6.87 $\pm$ 0.78 in Group A and Group B respectively (p=0.3). The mean score of VAS in 6th weeks after treatment were 0.94  $\pm$  0.64 and 1.29  $\pm$  0.81 in Group A

and Group B respectively (p=0.03). Pain was significantly decreased in Group A after 6th week compare to Group B.

The mean score of NPRS before treatment were 6.15 $\pm$ 1.06 and 6.0 $\pm$ 0.8 in Group A and Group B respectively (p=0.47). The mean score of NPRS in 6th weeks after treatment were 0.6 $\pm$ 0.5 and 1.4 $\pm$ 0.59 in Group A and Group B respectively (p=<0.001). That is NPRS was significantly decreased in Group A after 6th week compare to Group B which was not significant before treatment.

The mean score of pain frequency score before treatment were 7.05 $\pm$ 0.68 and 6.9 $\pm$ 0.8 in Group A and Group B respectively (p=0.37). The mean score of pain frequency score in 6th weeks after treatment were 0.79 $\pm$ 0.83 and 1.2 $\pm$ 0.95 in Group A and Group B respectively (p=0.01). Frequency of pain was also significantly decreased in Group A compare to Group B after the completion of treatment.

This study indicate that intermittent cervical traction reduces neck pain along with the frequency of pain in cervical spondylosis with radiculopathy because significant difference in improvement was observed in response to cervical traction after treatment. The result is in the line with the result of Jellad A et al<sup>18</sup>. The British Association of Physical Medicine also found significant improvement in their study.

They found that during traction relief of their symptom was obtained in 105 out of the 114 patients (92%)<sup>26</sup>. Shako or MA et al observed significant difference in improvement with the cervical traction versus SWD and cervical traction versus IRR. So the finding of the study was found similar with the studies mentioned above<sup>16,17</sup>.

Table-8 showed significant improvement was occurred in Group- B with conventional treatment without cervical traction. Chard J et al found that there are moderate improvement of pain and function due to posture correction without side effect. They further added that NSAIDs were highly effective for pain and function but with potential side effects (27). This is in favor of this study but there were less side effects. This may be due to use of NSAIDs along with omeprazole.

GI complications related to NSAIDs treatment are more injurious to patient's health. The use of cervical traction (ICT) is subject to discussion. Few authors advised that it is less effective in chronic cervical radiculopathy (cervical radiculopathy of over 3 months) 28-30.

In another study Young AL et al. also didn't found significant difference of improvement (31). In the literature, several modes of traction have been evaluated for the treatment of neck and radicular pain resulting from cervical spondylosis. Several authors report favorable results. Hafez AR and Zakaria AR showed in their study that, intermittent cervical traction is more effective than sustained traction 32.

Constantoyannis C et al found significant improvement in response to supervised intermittent door cervical traction<sup>33</sup>. The effect of traction on the intervertebral space (with varying cervical spine postures) has been evaluated by several authors. Chung CT et al. noted that in sitting position the anterior lean traction provided more intervertebral disc space in both anterior and posterior aspects than axial cervical traction did<sup>34</sup>. General objectives in applying cervical traction are to stretch the posterior cervical region and enlarge the interspaces at the intervertebral foramina <sup>35</sup>.

Probably due to this distraction there was good result obtained in this study. Conclusion: Intermittent cervical traction may be applied to treat cervical patients with spondylotic cervical radiculopathy. Decreasing the pain level and frequency was observed in this study. In particular, patients treated with a short duration of 6 weeks had the best outcome.

The NPRS and Pain frequency score, when used in conjunction with the VAS of pain, provides a comprehensive assessment of the patient, allowing the clinician to make good judgments about the clinical effects of cervical traction. The results conclude that intermittent cervical traction and exercise yields significant effect to relieve pain, functional improvement or disability in patients with cervical spondylosis with radiculopathy.

### **Limitations:**

This study was performed in tertiary hospital; patients who were attended and received management are mainly from urban area. So, this study may not focus the entire population and the sample size was not sufficient to propose a cost effective method for the treatment of cervical spondylosis with radiculopathy.

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### **Recommendations:**

Further studies with more number of patients are needed for verification of various information collected from the present study. Q Multicentered & long duration studies are required.

**Disclosure:** All the authors declared no competing interest.

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