

Randomized clinical trial

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Outcome evaluation of physiotherapy & drug management for chronic cervical radiculopathy

Abstract

Background: Cervical radiculopathy (CR) is one of the prevalent causes of neck pain and disability. Physiotherapy and pain medications are the common nonoperative management, and in Physiotherapy, there are many concepts of assessment and management. This study aims to determine the comparative effectiveness of three specialized physiotherapy approaches or only pain medications for managing CR cases.

Methods: A prospective, assessor, and participant-blind, four-arm Randomized control trial (RCT) has been conducted on 120 patients with chronic cervical radiculopathy in 4 specialized centers of Dhaka city recruited between July and December 2022. Four groups (n=30) was treated through structural diagnosis and management concept (SDM), regional approaches (RA), McKenzie mechanical diagnosis and therapy (MDT) concept prescribed by advanced practice physiotherapist (APP), or pain medications prescribed by the specialist physician for 4 weeks.

Discussion: After 24 sessions every group shows improvement in neck pain, ROM, disability and quality of life. During intermediate analysis (14days), no group shows more significant changes than another. After post changes (24days) the pain severity score differ significantly only between Medication and RA, RA and Medication; mean pain affective interference score differ between Medication and RA, RA and Medication; and pain physical interference between Medication and RA; RA and Medication. Mean score of ROM were significantly different between medication and RA, Medication and SDM; MDT and RA, MDT and SDM; RA and Medication, RA and MDT; SDM and Medication, SDM and MDT. Besides mean score of WHOQOL Brief (physical) were significantly different between Medication and SDM (p=.000); MDT and SDM (p=.000); RA and SDM (p=.045); SDM and Medication (p=.000), SDM and MDT (p=.000), SDM and RA. Overall improvement (mean score changes) found in pain, ROM, disability, QOL among all groups. Trial registered to the Clinical Trial Registry India CTRI/2022/03/040922 on 08/03/2022.

Keywords: chronic cervical radiculopathy, structural diagnosis and management, regional approaches of physiotherapy, McKenzie MDT, pain medication

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Introduction

A global assessment found that the prevalence of neck discomfort over a year varied from 16.7% to 75.1% (mean 37.2%).^{1,2} According to a different study, the prevalence of neck discomfort over the course of a year ranges from 4.8% to 79.5% and the overall incidence in the general population is estimated to be between 0.4% and 86.8%.³ Throughout the previous two decades, the prevalence of neck pain has increased and is currently second only to back pain as the most prevalent musculoskeletal illness.^{4,5} Over half of all adults is located. Women are much more prone than males to develop and experience chronic neck discomfort. to have experienced neck pain in the prior six months.⁶

Physiotherapy as exercise therapy, manual therapy in various specialized approaches, electrotherapies, minimally invasive procedures, assistive gadgets, and lifestyle changes are only a few of the treatment possibilities included in conservative treatment.⁷ By using therapeutic messages, oscillatory motions, mobilization, manipulative therapies, stretching, and structural correction, registered professionals can passively support healing while reducing uncomfortable symptoms, regaining mobility, and reducing handicap.⁸ Patients are given prescriptions for exercise treatment, followed by therapist instruction and execution. 9 Several specialized approaches, such the McKenzie idea, Mulligan concept, and Cyriax concept, are treated with manual or exercise therapy.^{8,9} The 1985 introduction of the widely utilized specialist physiotherapy technique known as McKenzie mechanical diagnosis and therapy (MDT) established its

centralization of symptoms premise.¹⁰ Via a process of examination and diagnosis, every patient with neck or back issues in the MDT approach receives personalized exercise, either in the direction of flexion or extension. For lumbar spine issues, a systematic review¹⁰ revealed that MDT was beneficial in reducing pain quickly in the short term for less than 3 months, whereas a cervical spine trial¹¹ found otherwise. MDT and other exercise therapies had a similar short-term outcome in pain. However, MDT is evident to have a greater reduction of disabilities in the long term for more than 3 months compared to analgesic pain medications, therapeutic booklet, postural or back care advice, strength training, and spinal mobilization and exercise therapy.¹⁰ Regional approaches (RA) and Structural diagnosis and management (MDT) are newer approaches than MDT. Regional approaches focus on the regional interdependence model where a region is treated rather than local treatment only. For cervical pain disorders, activating deep neck flexors and scapular muscles and stretching the upper cervical extensor and pectoralis muscles are widely used. It means treating the upper cross syndrome rather than only the cervical spine.¹² Regional approaches support treating the cervical spine through repeated retraction, traction, and mobilization but also include the neck, shoulder, and thoracic regions for managing cervical radiculopathy. The study suggests RA is superior to McKenzie MDT and medication alone to reduce pain, improve cervical mobility, improve cervical muscle strength, reduce disability, and improve quality of life in Chronic spinal mechanical pain patients.¹³ Structural diagnosis and management (SDM) is a newly developed approach for mechanical disorders

of the spine causing neuromuscular impairments¹⁴ that involves a comprehensive assessment of the mechanical problems of a spinal segment focusing not only the affected segment but also the complete spinal and peripheral biomechanics. There are similarities between RA and SDM, but despite seeking the source of musculoskeletal problems in a scattered way, the SDM concept categorizes the problems as muscular dysfunction, myoneural dysfunction, and complete mechanical dysfunction based on the pattern and nature of neuromuscular structures involved. SDM hypothesis is that in mechanical musculoskeletal disorders, the first response comes from muscular tissues affecting their ability to stretch or be strengthened. With more involvement or chronicity, the neural structures respond by altering their ability to stretch or normal afferent, efferent or autonomic function; with prolonged impairment, the neural tissue gets sensitized. In these cases, both the muscles and nerves get involved. In the third stage, the articular surfaces or surrounding biomechanics get involved, too, leading to complete mechanical dysfunction. The manual or exercise therapy is targeted to the affected structures, and the treatment might not be given directly to the affected structures; associated structures are treated first,¹⁵ to normalize the biomechanics and create the environment for a complete recovery. Till today, no published studies support the SDM approach in spinal mechanical pain and radiculopathies.

Methodology

Study design

The study was a prospective, four-arm Randomized control trial (RCT) with an assessor and participant blinded to group allocation. 160 patients with cervical radiculopathy suffering for more than 6 months were enrolled with a hospital-based randomization process in 4 specialized centers of Dhaka to be recruited between July and December 2022. With a concealed allocation process, the patient was recruited to any of the specialized physiotherapy approach groups, enrollment in only pain medication groups was convenient to the respondents who willingly want to take medications only or dropped out from physiotherapy sessions after the initial day of assessment and management. All groups will have a similar number of respondents (n=30). For this trial, we will follow Standard Protocol Items: Interventional Trials 2013 (SPIRIT) guidelines, to maintain the quality of the interventional trial.

Study settings

Participants was recruited and treated in three specialized physiotherapy set-ups, and one specialized hospital. The specialized physiotherapy setup includes the Agrani Specialized Physiotherapy center, specialized physiotherapy and arthritis research center, and unique pain and specialized physiotherapy center. The only pain medication group was treated and follows up at Impulse hospitals limited. We are not disclosing the specification of centers for therapy group allocation to ensure the physiotherapists and the patients are blinded to group allocation. We are expecting similar baseline criteria of respondents as all of them are enrolled from Dhaka city, moreover, the block design may ensure more similarity of baseline. Collecting respondents from different centers will increase the rigor of the study and ensure that there was no cross-contamination of data.¹⁶

Eligibility criteria

Participants was included in this study with (1) any two of three diagnosis criteria of CR⁶ as (a) unilateral or bilateral radicular pain with or without neck pain, (b) paraesthesia or numbness and/or weakness, and/or altered reflex in the dermatome or myotome of cervical nerve

root C2-C8, and (c) Magnetic resonance imaging (MRI) confirmed nerve root compression related with clinical findings. Other inclusion criteria include (2) CR for more than 6 months,⁵ (3) Brief Pain Inventory (BPI) pain severity score between 1 and 6 on an 11-point scale ranging from 0 to 10, (4) age between 18 and 50 years, to avoid the degenerative changes of the intervertebral disc, and (5) male or female sex. On the other hand, participants was excluded if- (1) any medical condition prevents the application of desired treatment confirmed by a consultant physician, (2) a Pathological source of pain including TB spine, spinal tumor, or abscess, (3) Early spinal fracture, (4) Rheumatoid arthritis or ankylosing spondylitis, (5) Red flags syndrome including cervical myelopathy, (6) Patient unwilling or declined to participate in either physiotherapy approaches or pain medication, (7) dropped out within the first week of inclusion.¹⁷

Interventions

Four groups of participants was receiving four independent treatment approaches for 4 weeks. The treatment was provided by either McKenzie mechanical diagnosis of therapy (MDT) approach, Regional approach (RA), Structural diagnosis and management (SDM) approach, or only pain medication. There was no added treatment to ensure the true effect is documented.

McKenzie mechanical diagnosis of therapy (MDT)

McKenzie MDT Cervical spine assessment, diagnosis, and treatment form of the McKenzie Institute was used to diagnose and treat CR cases with a customized approach. The components of treatment are the findings from the assessment and test movements. The treatment team will consist of 5 physiotherapists working in the musculoskeletal area supervised by a consultant physiotherapist completing McKenzie A and B Module from the McKenzie Institute.¹⁸

Regional approach (RA)

The regional approach is applied through an assessment and treatment model (Extended data 1). The assessment models screens CR as the 1st step of problems and examine the whole region of cervical, thoracic and upper limb region as 2nd and 3rd step. In the 4th step, RA categorizes the screened impairments in a Biopsychosocial model. Ra is a universal concept; the diagnosis and treatment are based on a hypothetical principle that asks for examining a region instead of any specific structures. The treatment components are basic manual therapy approaches categorized by correction of asymmetry of alignment, treatment of soft tissues, and restoration of mobility. The RA treatment team consists of 5 physiotherapists working in a musculoskeletal physiotherapy set-up supervised by another physiotherapist with a doctoral degree in evaluating RA concepts¹³ on spinal mechanical problems.

Structural diagnosis and management (SDM)

SDM is an assessment and treatment approach for musculoskeletal problems. SDM cervical spine assessment (Extended data 2) has 5 parts. The components consist of subjective assessment, history, pain assessment at six states, selective cervico-dorsal muscle stretch and strength test, neurological assessment of sensory and motor examination of C1- C8 nerve roots, Dural test or sign, and nerve sensitivity test. From these assessments, a provisional diagnosis of affected structures is made, and the treatment is specified according to the findings of the above assessment. This treatment is provided by a team of 5 physiotherapists supervised by two advanced practice physiotherapists with a minimum experience of 16 years in musculoskeletal physiotherapy.

Pain medication

Physicians will prescribe a wide range of medications to control pain and associated impairments as a simple analgesic as paracetamol, tramadol/paracetamol, codeine-based analgesics, Non-steroidal anti-inflammatory pain medication, opioid analgesics, muscle relaxants, corticosteroids, GABA receptor agonists, neuropathic medications.⁷ The prescribing physicians was either an orthopedic surgeon, neurologist, neurosurgeon, general practitioner, or physiatrist. Physiotherapy approaches was provided once to twice a day for a maximum of 45 minutes session, 5 days a week for 4 weeks, and the pain medication was prescribed twice or thrice a day, for 4 weeks. The intervention was monitored through a checklist (Extended data 3). We anticipate no major adverse effects, but a checklist was maintained (Extended data 4) for monitoring adverse events of the intervention.

Outcome measurement

Primary outcomes

Pain: A Brief Pain Inventory (BPI) was the outcome measure for pain. BPI measures pain through 3 subscales covering all domains of impairments, 1) Pain severity, 2) Pain affective interference, and 3) Pain physical interference. Pain severity is measured by a 0 to 10-point scale indicating no pain to pain as bad as can be imagined. It is calculated by the mean of four items. The Pain affective interference has seven items scoring 0 to 10 and calculated through average. The pain physical interference is three items scoring 0 to 10, measuring how pain interferes with a person’s activity and livelihood. The BPI is a widely used and recommended tool for musculoskeletal neuropathic pain outcomes.¹⁹

Range of motion: A goniometer reading was employed to measure the range of motion (ROM) of the cervical spine. A goniometer is an instrument that measures the available range of motion at a joint. The art and science of measuring the joint ranges in each plane of the joint are called goniometry. This is a universal tool to measure ROM, also valid to measure ROM of the cervical spine.²⁰

Disability: The neck disability index (NDI) was used to determine disability induced by CR. The NDI is the most widely used and most strongly validated instrument for assessing self-rated disability in patients with neck pain. It has been used effectively in both clinical and research settings in the treatment of this very common problem. When measuring neck and arm pain associated with impairment in Serbian patients with cervical radiculopathy, the NDI Scale is a reliable tool.²¹

Secondary outcome

Quality of life

World Health Organization Quality of life questionnaire (WHOQoL) brief questionnaire was used to determine the quality of life for CR cases. The WHOQOL evaluates how people see their place in life concerning their objectives, expectations, standards, and worries as well as the culture and value systems in which they live. Over four years, it was jointly created in several centers with varied cultural backgrounds. The WHOQOL was successfully piloted on around 4500 respondents in 15 cultural contexts. The new WHOQOL Field Trial Form has been prepared and is currently undergoing field testing because of this data. The WHOQOL generates a multi-dimensional profile of quality-of-life scores across six categories and 24 sub-domains. The tool is validated for determining the quality of life in people having chronic pain (Figure 1).²²

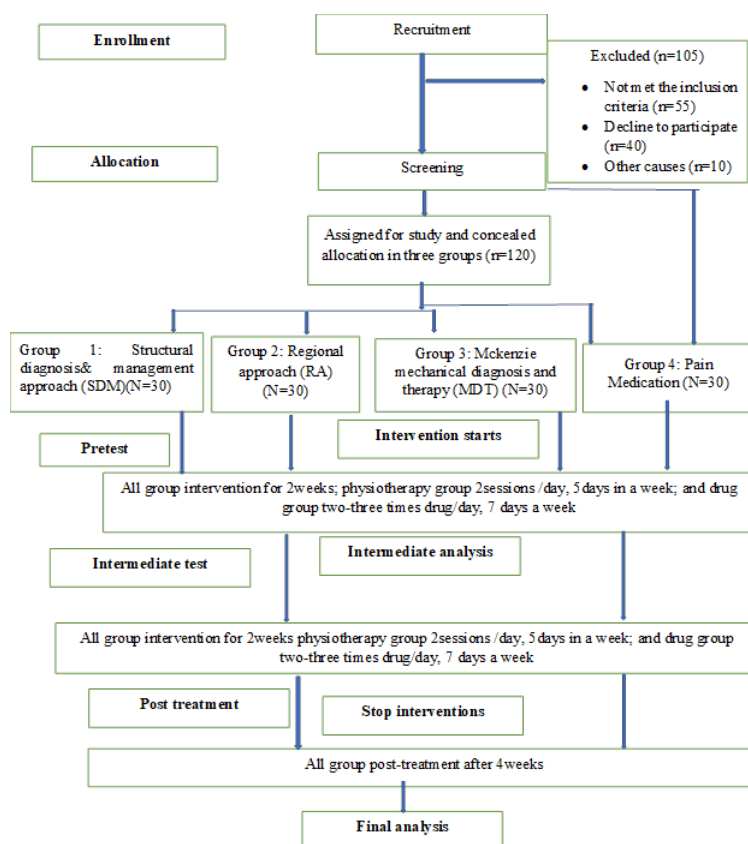


Figure 1 Consort guideline.

Result

The mean age of the participants was 35.1 (SD 7.1) and male female ratio was 24:6. Baseline Neck Disability Index was 31.93 for

Mediation group and 39.97 for Regional approach group. Baseline pain severity was 5.05 cm for medication group and 4.97 cm for Regional Approach group (Table 1).²³

Table 1 Baseline characteristics of participants

	Medication	MDT	RA	SDM	F Value (P)
Age (year)	34.9 (±7.9)	35.07 (±7.4)	36.00 (±7.9)	35.57 (±8.05)	0.22*(0.882)
Sex (M/Fe)	24/6	23/7	25/5	23/7	
BMI	25.93 (±2.5)	25.15 (±2.5)	22.84 (±4.4)	19.09 (±2.4)	3.07*(0.928)
Pain Severity (cm)	5.05 (±1.1)	5.03 (±0.8)	4.88 (±1)	4.97 (±1.3)	0.15*(0.79)
Pain affective interference (cm)	4.5 (±1.1)	4.44 (±0.8)	4.25 (±1)	4.47 (±1.3)	0.35*(0.917)
Pain physical interference (cm)	4.6 (±1.1)	4.62 (±0.8)	4.47 (±1)	4.6 (±1.3)	0.17*(0.507)
ROM (Extension)	39.00 (±12)	37.17 (±12)	37.63 (±12)	36.93 (±8)	0.209*(0.89)
NDI (0-50)	31.93 (±5.3)	30.03 (±5.4)	31.13 (±4.6)	31.07 (±6.3)	0.164*(0.92)
WHOQOL Brief (Physical)	38.37 (±7.2)	38.13 (±7.4)	39.97 (±8.9)	39.8 (±7.7)	0.781*(0.507)

Within-group analysis (pre-posttest) reveals that pain (severity, pain affective interference, physical interference) ROM, disability and quality of life changes significantly ($p < .001$) in the medication, MDT, RA, and SDM intervention groups (Table 2).

Table 2 Paired sample t-test within group

Variable	Medication			MDT			RA			SDM		
	Mean	t	95% CI	Mean	t	95% CI	Mean	t	95% CI	Mean	t	95% CI
Pain Severity (cm)	2.45	10.72*	1.95-2.86	2.84	12.2*	2.37-3.3	2.98	14.28*	2.55-3.41	2.8	11.36*	2.29-3.3
Pain affective interference (cm)	2.13	9.722*	1.68-2.58	2.46	11.73*	2.03-2.89	2.54	14.38*	2.18-2.9	2.47	10.67*	2-2.95
Pain physical interference (cm)	1.7	7.187*	1.22-2.12	2.23	8.99*	1.71-2.73	2.45	10.11*	1.96-2.9	2.23	8.28*	1.68-2.78
ROM (Extension)	26.16	19.09*	23.3-28.9	29.8	17.5*	29.45-30.14	36.87	13.98*	31.5-42.3	43.57	23.01*	39.69-47.43
NDI (0-50)	23.43	14.14*	20-26.8	24.17	17.86*	21.39-26.9	26.23	59.81*	25.3-27.1	27.13	34.27*	25.51-28.75
WHOQOL Brief (Physical)	3.53	4.194*	1.81-5.25	3.6	5.37*	2.22-4.97	5.87	5.14*	3.53-8.19	7.07	6.7*	4.9-9.22

The pain severity score, pain affective interference score and pain physical interference score do not differ significantly between medications, MDT, RA, and SDM (Table 3).

Table 3 Multiple comparisons in between groups by one-way MANOVA in Intermediate test (Post hoc tukey HSD analysis)

Variables	Groups (I)	Groups (J)	Mean difference (I-J)	P value (sig.)	95% CI	
					Upper limit	Lower limit
Pain Severity	Medication	MDT	0.0833	0.981	-0.4825	0.6492
		RA	0.3733	0.318	-0.1925	0.9392
		SDM	0.1067	0.961	-0.4592	0.6725
	MDT	Medication	-0.0833	0.981	-0.6492	0.8559
		RA	0.29	0.542	-0.2759	0.5859
		SDM	0.0233	1.001	-0.5425	0.1925
	RA	Medication	-0.3733	0.318	-0.9392	0.2759
		MDT	-0.29	0.542	-0.8559	0.2992
		SDM	-0.2667	0.61	-0.8325	0.4592
	SDM	Medication	-0.1067	0.21708	-0.6725	0.5425
		MDT	-0.0233	0.21708	-0.5892	0.8325
		RA	0.2667	0.21708	-0.2992	-0.4825
Medication		0.833	0.21708	0.981	-0.1925	
RA		0.3733	0.21708	0.318	-0.4592	
SDM		0.1067	0.21708	0.961	-0.4592	
Pain affective interference	Medication	Medication	-0.833	0.21708	0.981	-0.6492
		MDT	0.29	0.21708	1	-0.2759
		SDM	0.0233	0.21708	0.318	-0.5425
	RA	Medication	0.2667	0.21708	0.542	-0.9392
		MDT	0.833	0.21708	0.61	-0.8559
		SDM	0.3733	0.21708	0.961	-0.8325
	SDM	Medication	0.1067	0.21708	1	-0.6725
		MDT	-0.833	0.21708	0.61	-0.2992
		RA	0.29	0.21708	0.981	-0.4592
		Medication	0.833	0.21708	0.318	-0.6492
		RA	-0.2667	0.21708	0.961	-0.2759
		SDM	0.1067	0.21708	0.542	-0.5425
Pain physical interference	Medication	Medication	-0.833	0.21708	1	-0.9392
		MDT	-0.2667	0.21708	0.318	-0.8559
		SDM	0.1067	0.21708	0.542	-0.5425
	RA	Medication	-0.3733	0.21708	0.61	-0.9392
		MDT	-0.2667	0.21708	0.961	-0.8559
		SDM	-0.2667	0.21708	0.542	-0.8325
	SDM	Medication	-0.1067	0.21708	0.961	-0.6725
		MDT	-0.0233	0.21708	1	-0.5892
		RA	0.2667	0.21708	0.61	-0.2992

The pain severity score differ significantly only between Medication and RA (p=.004), RA and Medication (p=.004); mean pain affective interference score differ between Medication and RA (p=.003), RA and Medication (p=.003); and pain physical interference between Medication and RA (p=.001); RA and Medication (p=.001). Mean score of ROM were significantly different between medication and RA (p=.004), Medication and SDM (p=.000); MDT and RA (p=.035),MDT and SDM (p=.000); RA and Medication (p=.004),

RA and MDT (p=.035); SDM and Medication (p=.000), SDM and MDT (p=.000).Disability (NDI) mean score do not differ significantly between medications, MDT, RA, SDM. Mean score of WHOQOL Brief (physical) were significantly different between Medication and SDM (p=.000); MDT and SDM (p=.000); RA and SDM (p=.045); SDM and Medication (p=.000), SDM and MDT (p=.000), SDM and RA (p=.045) (Table 4).²⁴

Table 4 Multiple comparison in between groups by one-way MANOVA in post-test (Post hoc tukey HSD analysis)

Variables	Groups (I)	Groups (J)	Mean difference (I-J)	P value (sig.)	95% CI	
					Upper limit	Lower limit
Pain Severity	Medication	MDT	0.0833	0.981	-0.4825	0.6492
		RA	0.3733	0.318	-0.1925	0.9392
		SDM	0.1067	0.961	-0.4592	0.6725
	MDT	Medication	-0.0833	0.981	-0.6492	0.8559
		RA	0.29	0.542	-0.2759	0.5859
		SDM	0.0233	1.001	-0.5425	0.1925
	RA	Medication	-0.3733	0.318	-0.9392	0.2759
		MDT	-0.29	0.542	-0.8559	0.2992
		SDM	-0.2667	0.61	-0.8325	0.4592
	SDM	Medication	-0.1067	0.961	-0.6725	0.5425
		MDT	-0.0233	1	-0.5892	0.8325
		RA	0.2667	0.61	-0.2992	-0.4825
Pain affective interference	Medication	MDT	0.833	0.21708	0.981	-0.1925
		RA	0.3733	0.21708	0.318	-0.4592
		SDM	0.1067	0.21708	0.961	-0.4592
	MDT	Medication	-0.833	0.21708	0.981	-0.6492
		RA	0.29	0.21708	0.542	-0.2759
		SDM	0.0233	0.21708	1	-0.5425
	RA	Medication	0.2667	0.21708	0.318	-0.9392
		MDT	0.833	0.21708	0.542	-0.8559
		SDM	0.3733	0.21708	0.61	-0.8325
	SDM	Medication	0.1067	0.21708	0.961	-0.6725
		MDT	-0.833	0.21708	1	-0.2992
		RA	0.29	0.21708	0.61	-0.4592
Pain physical interference	Medication	MDT	0.833	0.21708	0.981	-0.6492
		RA	-0.2667	0.21708	0.318	-0.2759
		SDM	0.1067	0.21708	0.961	-0.5425
	MDT	Medication	-0.833	0.21708	0.981	-0.9392
		RA	-0.2667	0.21708	0.542	-0.8559
		SDM	0.1067	0.21708	1	-0.5425
	RA	Medication	-0.3733	0.21708	0.318	-0.9392
		MDT	-0.2667	0.21708	0.542	-0.8559
		SDM	-0.2667	0.21708	0.61	-0.8325
	SDM	Medication	-0.1067	0.21708	0.961	-0.6725
		MDT	-0.0233	0.21708	1	-0.5892
		RA	0.2667	0.21708	0.61	-0.2992

Figure 3 illustrates that there is improvement in each intervention, but the size of improvement is greater in the SDM group than in the other three groups in the case of outcome measurement. But in cases

of pain, there is a significant reduction in the regional approach group (Figure 2).

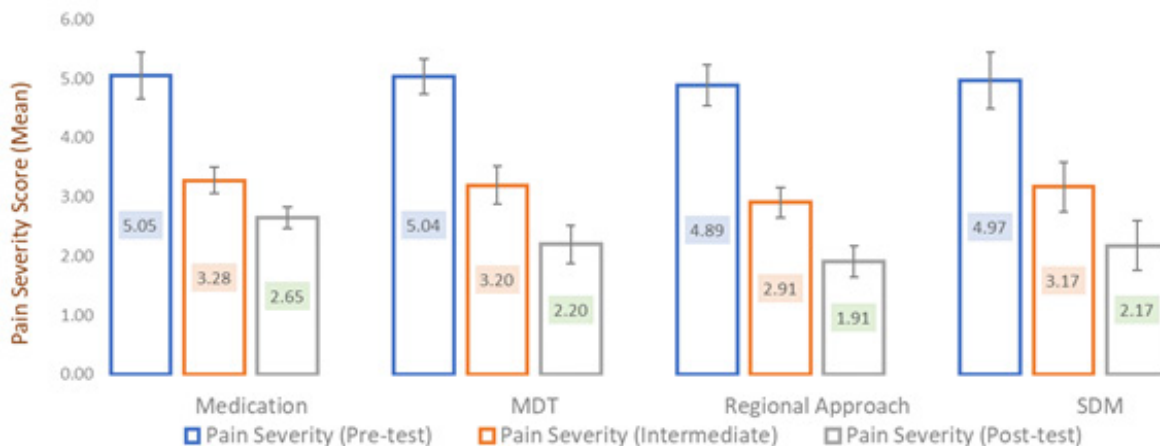


Figure 2 Changes of pain severity score from baseline to post-test.

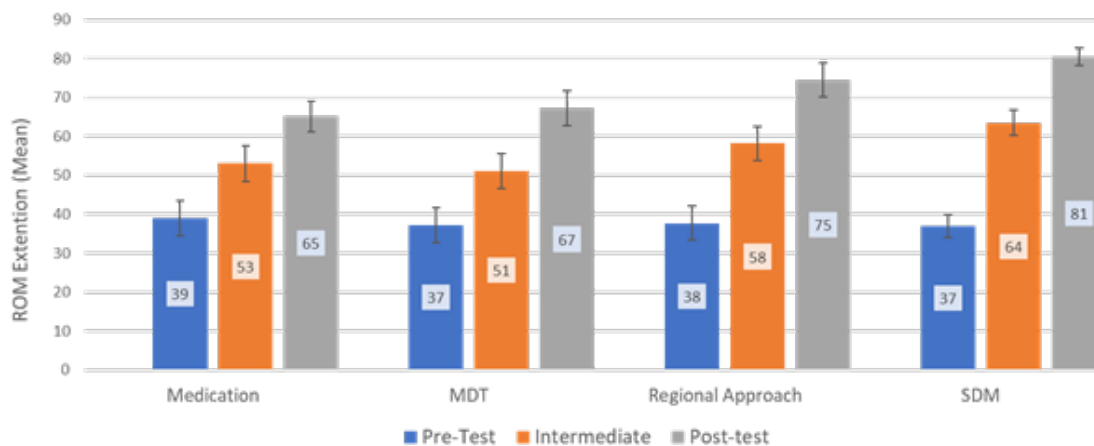


Figure 3 Changes of rang of motion (extension) from baseline to post-test.

Discussion

Chronic cervical radiculopathy (CR) has a high risk of recurrence and imposes a large illness burden.² Using painkillers and muscle relaxants mimics inflammatory reactions and relieve symptoms. The cervical spine’s biomechanics may return to normal once painful symptoms fade. Painkillers have a large short-term healing period that can last up to 8 weeks;²⁵ but, with repeated bouts, a divergence from normal biomechanics is unavoidable. By encouraging postural correction and education as well as maintaining osteokinematic and arthrokinematic motion of the cervical motion segments through test movements and manipulative techniques,²⁶ the McKenzie mechanical diagnosis and therapy (MDT) approach improves the restoration of normal biomechanics of the cervical spine.¹⁰ Thus MDT provides a longer remission of pain and prevents disability from less than 3 months compared to pain medications.¹¹ With the chronicity for more than 6 months⁵ and recurrent episodes of CR, the cervico-dorsal and upper extremity become involved thus new structures contribute to the biomechanical abnormality as secondary consequences. Both Regional approaches and SDM concentrates on the overall cervico-dorsal and upper-cross-region, the treatment approaches and sequences are different.²⁷ Regional approach (RA) is an open-ended

theoretical basis of assessment and figuring out what chain mechanism is impaired and treating a region or multiple joints/structures.¹³ Structural diagnosis and management (SDM) is a structured process that can detect the specific structure(s) involved in the impairment and measure the extent of involvement. The management approach of the regional approach can be implemented by active means such as self-treatment or passive means when the therapist releases or stretches. So, it is the integration of treatment and formulation of an open-ended approach based on careful physical examination and observation so that any component of the impaired chain does not miss. On the other hand, SDM is very selective in the treatment in terms of structural involvement.²⁸

After 24 sessions every group shows improvement in neck pain, ROM, disability and quality of life. During intermediate analysis (14days), no group shows more significant changes than another. After post changes (24days) the pain severity score differ significantly only between Medication and RA, RA and Medication; mean pain affective interference score differ between Medication and RA, RA and Medication; and pain physical interference between Medication and RA; RA and Medication.²⁹ Mean score of ROM were significantly different between medication and RA, Medication and SDM; MDT

and RA, MDT and SDM; RA and Medication, RA and MDT; SDM and Medication, SDM and MDT. Besides mean score of WHOQOL Brief (physical) were significantly different between Medication and SDM ($p=.000$); MDT and SDM ($p=.000$); RA and SDM ($p=.045$); SDM and Medication ($p=.000$), SDM and MDT ($p=.000$), SDM and RA. Overall improvement (mean score changes) found in pain, ROM, disability, QOL among all groups.³⁰

Conclusion

RA, MDT, SDM has similar effect on Reduction of pain, increasing range of motion, reducing disability, and improving the overall quality of life in Cervical Radiculopathy patients as well as their families. Hopefully this research will update the rehabilitation process of cervical radiculopathy patients in Bangladesh.

Data accessibility

There is no underlying data to be accessed.

Extended data

Extended data is available in the Mendeley Data, V1, www.doi.org/10.17632/mvj9rf6yjkj.1

Extended data 1: Regional approach assessment and treatment concept

Extended data 2: SDM Cervical spine assessment and treatment form

Extended data 3: the medication chart and home exercise checklist

Extended data 4: the adverse effects reporting checklist

Extended data 5: Informed consent

Reporting guideline

For generating the protocol, we followed Interventional Trials 2013 (SPIRIT) guidelines (Table 1), and for the RCT we will follow consolidated statements for reporting randomized trials (CONSORT) guidelines (Figure 1).

Author contributions

MAES, MMR, MSI contributed to Conceptualizing, Planning, Funding Acquisition, Investigation, Administration, Writing (review & editing), and approval. MWI, MSI contributed to Investigation, Conceptualizing, Supervision, and review.

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Conflicts of interest

The authors declared that they have no known competing financial interests or personal relationships that could have appeared to influence the work that will be reported in this paper.

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