EFFICACY OF STRUCTURED EXERCISE PROGRAM ON NECK PAIN AND SHOULDER PAIN IN INDIVIDUALS WITH C5-C6 RADICULOPATHY

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Abstract:
Background: Cervical radiculopathy refers to pain in one or both upper limbs, often associated with neck pain, secondary to compression or irritation of the nerve roots of the cervical spine. Neck pain is a common cause of disability in the general population, with a lifetime incidence of up to 54% More than 50% of patients with neck pain seen by general practitioners are referred to physiotherapy.The most commonly affected nerve roots are the c6 and c7, usually caused by c5-c6 and c6-c7 disc herniated or spondylosis. The first-line treatment for cervical radiculopathy is non-surgical; the usual treatment of choice is physiotherapywhich includes mechanical traction, manipulation, therapeutic exercises and modalities.
Objective:-The main purpose of this study was to implement and evaluate the efficacy of a structured exercise program designed specifically for neck pain and arm pain in individuals with C5-C6 radiculopathy.
Materials and methodology:-Aexperimental study was conducted at Krishna College Of Physiotherapy, KIMSDU, Karad. A total of 40 patients who were diagnosed with c5-c6 radiculopathy were included in the study. A written consent was taken and the 6 weeks protocol was explained. Post 6 weeks the data was collected and analyzed in SPSS 20.
Result:-The mean age of patients was 51±6.5 years. Patients treated with the given exercise program has shown decrease in pain (VAS on rest mean score 3.10 to 1.175 and VAS on activity mean score 6.48 to 3.63) and also decrease in disability (NDI mean score 16.30 to 8.28 where the total score of NDI was out of 50). Statistically it shows that there was extremely significant difference (p<0.0001) between pre intervention assessment and post intervention assessment.
Conclusion:-The structured exercise program designed, have been effective for neck and shoulder pain in patients with cervical radiculopathy.

Keywords: structured exercise, cervical radiculopathy, neck pain, shoulder pain.

Introduction:

Cervical radiculopathy refers to pain in one or both upper limbs, often associated with neck pain, secondary to compression or irritation of the nerve roots of the cervical spine. It can be accompanied by impaired movement, sensation or reflexes.(1) It is a permanent cause of disability and morbidity and is a common

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condition affecting men and women after middle age.[2,3] Neck pain is a common cause of disability in the general population, with a lifetime incidence of up to 54% More than 50% of patients with neck pain seen by general practitioners are referred to physiotherapy.[4]

Cervical radiculopathy is frequently encountered in physical therapy with an annual incidence of 83.2 per 100000 people and there is an increased prevalence in the fifth decade of life. Prevalence of neck pain in industrialized countries, annual prevalence of adult population is 30%-50%.[5]

It is one of the most usual health related problems[6] other than pain it includes symptoms such as paresthesia, numbness and muscle weakness in dermatomal or myotomal distribution of an affected nerve root[7]. The most commonly affected nerve roots are the c6 and c7, usually caused by c5-c6 and c6-c7 disc herniated or spondylosis[8]. Patients with cervical radiculopathy may complain of neck pain, but the most common reason people seek medical help is arm pain.[9]

Radiculopathy caused due to spondylosis occur at the uncovertebral and facet joints. The uncovertebral joint`s location anterior to the nerve root means that the bony hypertrophy tends to affect the anterior aspect of nerve root. Conversely, facet joint arthritis affects the posterior aspect of the nerve root. Loss of disc height due to degeneration leads to arthritic hypertrophy which can affect the diameter of the neural foramen and can contribute to nerve root impingement.[13]The three main types of disc herniation that lead to nerve root impingment are the most common one is intraforaminal, which results in primarily sensory radicular symptoms. Second most common is posterior, which results in weakness and inherently muscle atrophy. Third the rarest is midline herniation which,directly compress the spinal cord and results in symptoms of myelopathy, such as upper limb numbness and weakness.[14]

The first-line treatment for cervical radiculopathy is non-surgical; the usual treatment of choice is physiotherapy[10] which includes mechanical traction, manipulation, therapeutic exercises and modalities.[11]Spinal manipulative therapy includes techniques based on joint manipulation and mobilization, the main difference between each being the amplitude and velocity of the force applied to the vertebra.[12]Another conservative method of treatment is stretching and strengthening of neck and shoulder muscles[15] which will reduce the symptoms along with increase in cervical range of motion[16] and will improve neuromuscular control of cervical spine and shoulder girdle.[17]

The main purpose of this study was to implement and evaluate the efficacy of a structured exercise program designed specifically for neck pain and arm pain in individuals with C5-C6 radiculopathy.

Materials and methodology:

This experimental study was conducted at Krishna College of Physiotherapy, KIMSDU, Karad. A total of 40 patients were included in the study out of which 23 were females and 27 were males who were diagnosed with c5-c6 radiculopathy. All the subjects were radiologically diagnosed by a certified othopaedician or a certified physiotherapist. Inclusion criteria was both male and female, age group 40-60 years, individuals with unilateral arm pain, individuals who were ready to participate voluntarily, and radiological diagnosis of cervical radiculopathy. Exclusion criteria was Subjects with history of severe trauma such as fracture, congenital disorder of cervical spine, Patients with neurological deficit, spondylolisthesis, tumor, spinal surgery, pott's spine, Rheumatoid Arthritis disorder, Ankylosing spondylosis and cardiac problem.

A written consent was taken from all the patients and they were thoroughly explained about the 6 weeks treatment protocol at the beginning of the program. All the patients were assessed through VAS (visual analogue scale) and NDI (neck disability index) pre-intervention and post-intervention that is at the end of 6 weeks exercise protocol. The treatment program included patient education about the condition, stretching exercises fortrapezius, pectorals, neck extensors and posterior shoulder stretching which was followed by strengthening exercises for serratus anterior, deep neck flexors and shoulder muscles. Table no. 1 shows the stretching exercises and table no. 2 shows the strengthening exercises. Procedure of each exercises is mentioned in detail further.

Procedure:

The structured exercise program includes:-

- ❖ Education :-
- Education is one of the most important key in management. If the patient understands the condition and the reason for neck pain and arm pain then they are more likely to be compliant with the rehabilitation.

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❖ Stretching:-

1. Trapezius stretch (seated neck stretch)

• Patient sitting on a chair.

• Ask them to bend the head towards right side, with the right hand apply some extra pressure, and hold gently for 30 seconds. Repeat on both sides.

2. Posterior neck stretch (chin to chest)

• Patient sitting straight on chair.

• Ask them to gently bend the neck down to feel a stretch at the back of neck i.e. bring chin towards the chest.

3. Pectorals stretch (doorway stretch)

• Patient standing at the doorway.

• Ask him to place his hands at the doorway, gently lean through it until a stretch is felt across the front of chest.

4. Posterior shoulder stretch

• Ask the patient to stand straight, reach towards the opposite scapula with the affected arm, then with the uninvolved hand further horizontally adduct the humerus until the stretch is felt.

5. Neck extension with towel

• Patient sitting on chair

• Start with a small hand towel wrapped around the base of skull and holding the ends of the towel.

• Perform a chin tuck and extend the neck back and upwards(look up towards the ceiling). Hold the position for 30 seconds and then return to start position.

❖ Strengthening:-

1. Scapular squeeze

• Ask the patient to stand straight with both the arms at side.

• Pull arms back, bringing both the scapulas close to each other.

2. Wall push ups

• Ask the patient to stand in front of wall with hands against the wall at shoulder level

• Elbows extended and start doing push ups.

3. Resistance band exercises

• For serratus anterior :- patient standing straight with arms in front holding resistance band and ask them to do pull aparts.

4. Ball squeeze (deep neck flexors strengthening)

• Patient sitting on chair

• Ask him to hold the ball in between chin and chest and ask to squeeze the ball.

Exercises	Hold	Repetitions
Trapezius stretch (seated neck stretch)	30 seconds	3 reps on both sides
Pectorals stretch (doorway stretch)	30 seconds	3 reps
Posterior neck stretch (chin to chest)	30 seconds	5 reps
Posterior shoulder stretch	30 seconds	5 reps both sides
Neck extension with towel	30 seconds	10 reps

Table no. 1 stretching exercises

Exercises	repetitions	sets
Scapular squeeze	10	2
Wall push ups	10	2
Resistance band exercise for serratus anterior	10	2
Ball squeeze (deep neck flexors strengthening)	10	2

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Table no. 2 strengthening exercises

Fig.no.1:-trapezius stretching

Fig.no.2:-posterior neck stretch

Fig.no.3:-posterior shoulder stretch

Fig.no.4:-neck extension with towel

Fig.no.7:- resistance band exercise for serratus anterior

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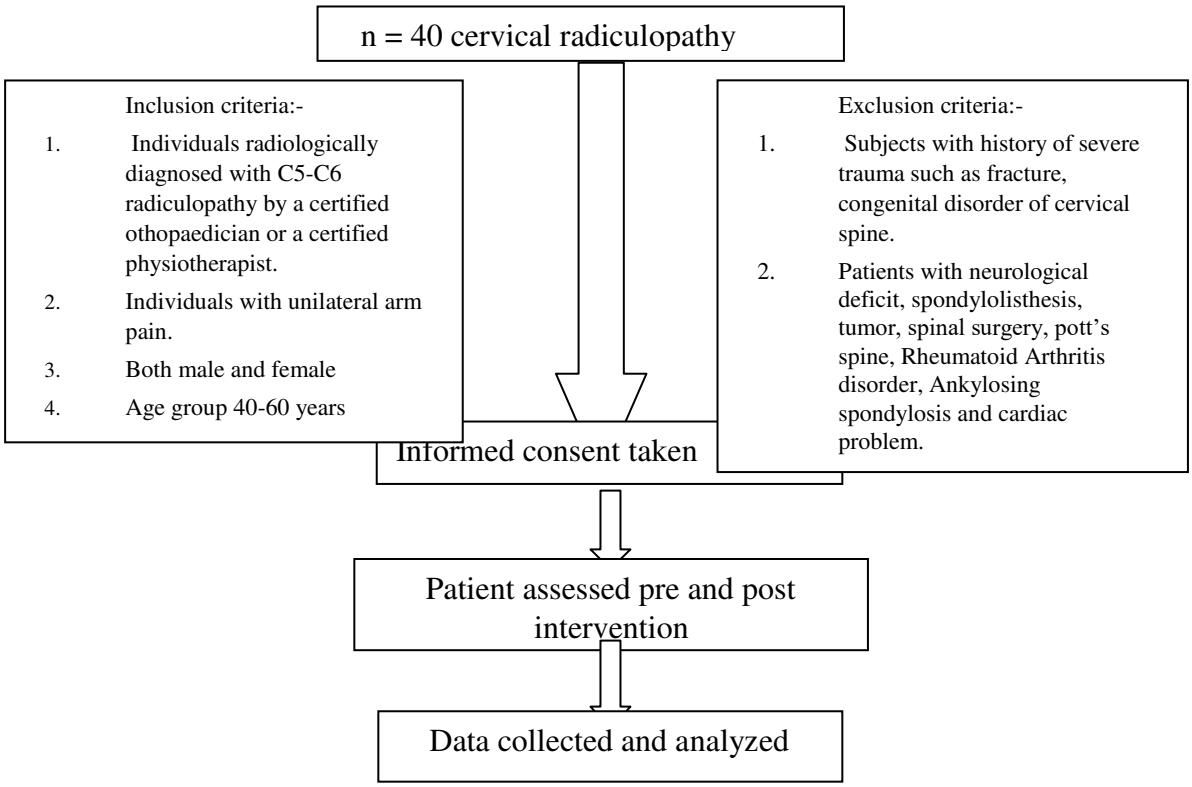
Fig.no.8:- neck flexion with ball squeeze



Statistical analysis:-The data was collected, checked and entered for analysis, the data was analyzed using Statistical Package for social science software (SPSS) version 20. Frequencies and percentages were calculated for age groups and gender. Unpaired t test was used to compare the results. The *p* value <0.0001 was considered statistically extremely significant.

Result

A total of 40 patients between the age of 40-60 years were included. The mean age of patients was 51±6.5 years. Out of 40 patients 23 were females and 17 were males.

The demographic data is shown if table no. 3.

Variables	**Number**	**%**

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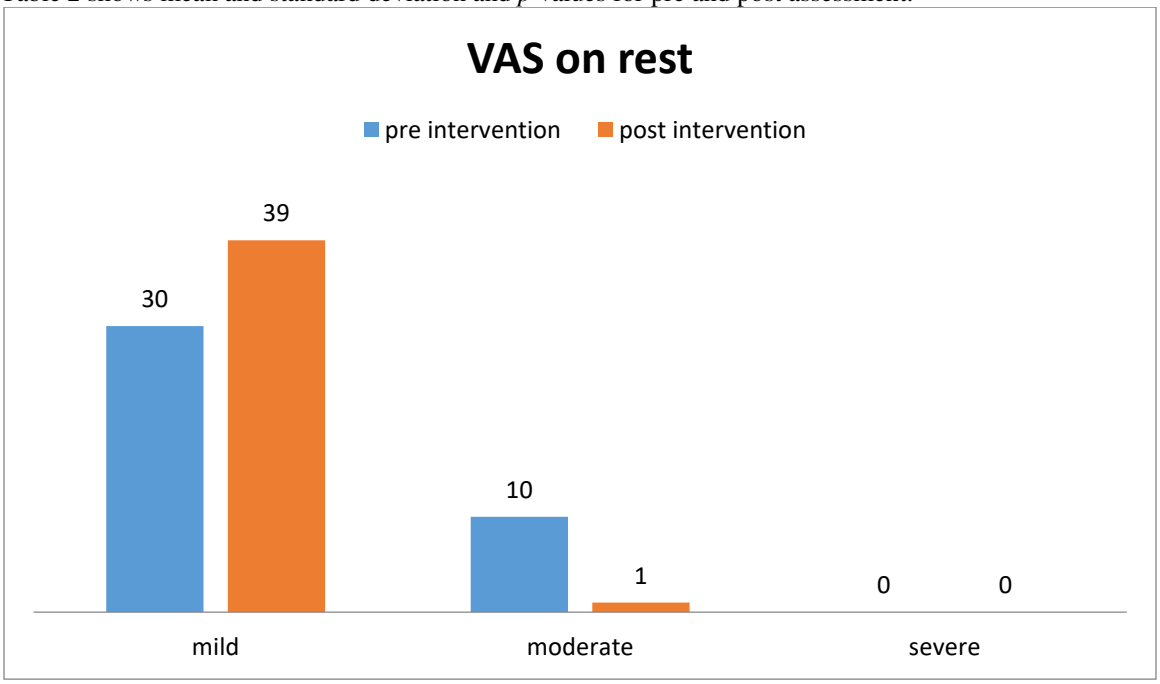
Age		
40-45	9	22.5%
46-50	10	25%
51-55	8	20%
56-60	13	32.5%
Gender		
Female	23	57.5%
Male	17	42.5%

Table no. 3:- demographic data

Patients were assessed pre intervention and post intervention through VAS on rest, VAS on activity and NDI. VAS on rest and VAS on activity was divided into mild (0-3) moderate (4-7) and severe (8-10). Graph no. 1 shows VAS on rest pre and post intervention. Pre interventionOut of 40 patients, 30 (75%) had mild pain, 10 (25%) had moderate pain, none of the patients had severe pain on rest. Post intervention out of 40 patients 39 (97.5%) had mild pain only 1(2.5%) had moderate pain. This shows that patients who had moderate pain pre intervention, later had mild pain post intervention

Graph no.2 shows VAS on activity pre and post intervention.Out of 40 patients 1 (2.5%) had mild pain, 26 (65%) had moderate pain, rest 13 patients (32.5%) had severe pain pre intervention. Post intervention 22 (55%) had mild pain, 17 (42.5%) had moderate pain and only 1 patient (2.5%) had severe pain. This shows that post intervention patient's pain has reduced from severe to moderate and moderate to mild.

Patients treated with the given exercise program has shown decrease in pain (VAS on rest mean score 3.10 to 1.175 and VAS on activity mean score 6.48 to 3.63) and also decrease in disability (NDI mean score 16.30 to 8.28 where the total score of NDI was out of 50). Statistically it shows that there was extremely significant difference (p<0.0001) between pre intervention assessment and post intervention assessment. Table 2 shows mean and standard deviation and p values for pre and post assessment.



Graph no. 1:- VAS on rest pre and post intervention

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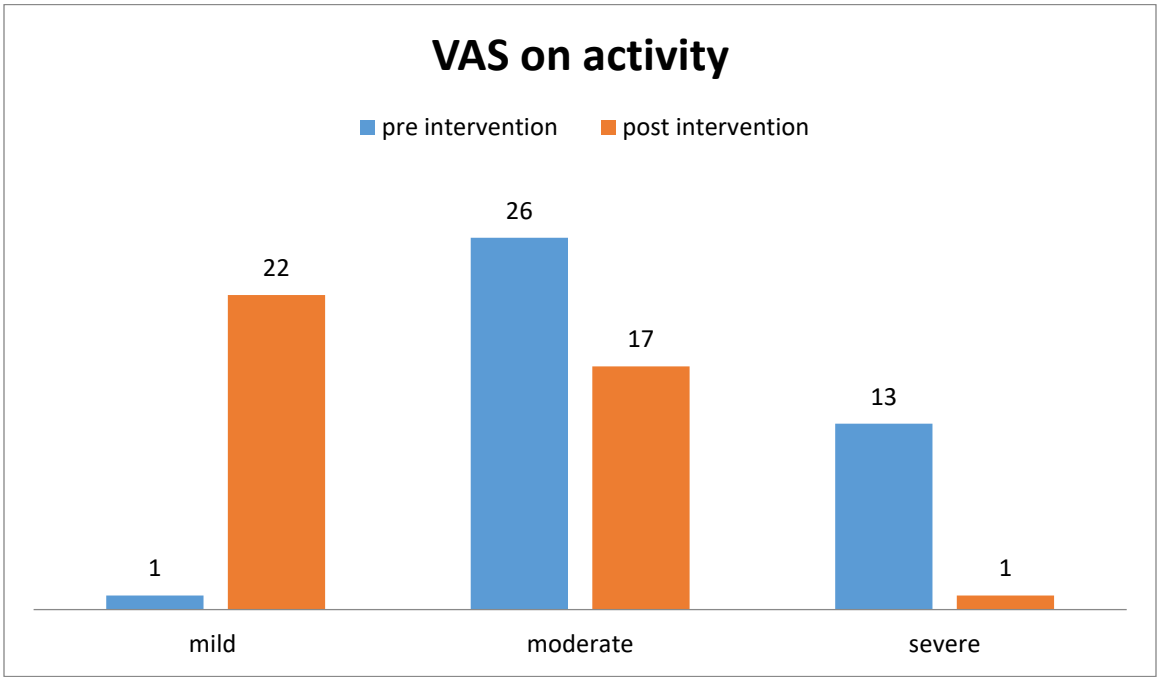

Graph no. 2:- VAS on activity pre and post intervention

Outcome measures	**Pre intervention**	**Post intervention**	***p*-value**
	Mean ± SD	**Mean ± SD**	
VAS on rest (0-10)	3.10 ± 1.27	3.10 ± 1.27	<0.0001
VAS on activity(0-10)	6.48 ± 1.69	3.63 ± 1.74	<0.0001
NDI (0-50)	16.30 ± 5.64	8.28 ± 5.24	<0.0001

Table no. 4:- Mean, standard deviation and *P* values of pre and post assessment of pain and disability.

Discussion:

The result of this study demonstrated that the exercise program structured for patients with cervical radiculopathy have been effective in reducing neck and shoulder pain. Cervical radiculopathy patients have a poor control over their cervical posture due to various factors, such as sensory input dysfunction of the deep muscles of neck with the highest muscle spindle density[18], and abnormal length and motor control of the shoulder girdle muscles.[15] An evident reduction was present in the VAS score and NDI score.

Prior studies have shown that, training of deep neck flexors reduces neck pain[19],[20] and neck disability[19],[20],[21]. Pain relief was associated with reduced obstruction of transmission of afferent inputs to the dorsal horn, or reduced abnormal compression load on the head by improving the ability to maintain the cervical spine in an upright position.[22]A randomized control trial conducted by Bronfort and team determined the relative efficacy of spinal manipulation therapy (SMT), medication and home exercise with advice (HEA) for acute and sub acuteneck pain, it was concluded that SMT was more effective than medication and also few sessions of HEA resulted in same outcomes at most time.[23]Eventhough surgical procedures stays one remedy option, various authors have advised few non surgical approaches which includes cervical traction along with other manual therapies.[24]

A study conducted by Chukaka S. Enweneka et al had mentioned that neck pain is often accompanied by protective muscle spasms. Pressure is generated within the same muscles, causing ischemia, more pain and abnormal neck posture. They have shown that posture correction is effective in reducing neck pain and muscle spasms, other studies have suggested that sternocliedomastoid muscle spasms and maybe temporomandibular joint pain can also be reduced by posture correction.[25] Another study conducted by

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Thomas R, Highland and Dreisinger et al. investigated changes in isometric strength and range of motion of cervical spine after 8 weeks of clinical rehabilitation, what they found was mean strength, range of motion, and pain relief were significantly improved in all groups.[26]
The improvement in pain and disability has occurred due to improvement in strength and endurance of deep neck flexors and shoulder muscles. The structured exercises used in this study can be an important factor in prevention and management of pain in patients with cervical radiculopathy. Limitation faced by this study was small sample size and less time duration for the exercise protocol, if there would have been a large number of sample size the result would have been better.
Future research can be carried out with increased number of sample size and also increased time duration for treatment protocol.

Conclusion:
In this present study, there is significant difference in neck pain and disability between pre and post intervention and also decrease in shoulder pain post intervention. The structured exercise program designed, have been effective for neck and shoulder pain in patients with cervical radiculopathy.
Future studies can include more exercises and can build a step by step protocol.

Ethical considerations:
Ethical approval for this study was given by the Ethics Committee of Krishna Institute of Medical Sciences, Karad. The patients visiting the out-patient department of Krishna College of Physiotherapy were approached for the study according to the inclusion and exclusion criteria. An informed consent was taken from each and every participant at the beginning of the treatment protocol.

References
1. Bono CM, Ghiselli G, Gilbert TJ, Kreiner DS, Reitman C, Summers JT, Baisden JL, Easa J, Fernand R, Lamer T, Matz PG. An evidence-based clinical guideline for the diagnosis and treatment of cervical radiculopathy from degenerative disorders. The Spine Journal. 2011 Jan 1;11(1):64-72.
2. Albeck MJ. A critical assessment of clinical diagnosis of disc herniation in patients with monoradicular sciatica. Acta neurochirurgica. 1996 Jan;138(1):40-4.
3. Sadil VF. Maitland's Vertebral Manipulation. Focus on. Alternative and Complementary Therapies. 2002;7: 70
4. Boyles R, Toy P, Mellon J, Hayes M, Hammer B. Effectiveness of manual physical therapy in the treatment of cervical radiculopathy: a systematic review. Journal of Manual & Manipulative Therapy. 2011 Aug 1;19(3):135-42.
5. Chiradejnant A, Maher CG, Latimer J, Stepkovitch N. Efficacy of “therapist-selected” versus “randomly selected” mobilisation techniques for the treatment of low back pain: a randomised controlled trial. Australian Journal of Physiotherapy. 2003 Jan 1;49(4):233-41.
6. Kondo K, Molgaard CA, Kurland LT, Onofrio BM. Protruded intervertebral cervical disk: incidence and affected cervical level in Rochester, Minnesota, 1950 through 1974. Minnesota medicine. 1981 Dec;64(12):751-3.
7. Garvey TA, Eismont FJ. Diagnosis and treatment of cervical radiculopathy and myelopathy. Orthopaedic review. 1991 Jul 1;20(7):595-603.
8. Hunt WE, Miller CA. Management of cervical radiculopathy. Clinical Neurosurgery. 1986 Jan 1;33:485-502.
9. Daffner SD, Hilibrand AS, Hanscom BS, Brislin BT, Vaccaro AR, Albert TJ. Impact of neck and arm pain on overall health status. Spine. 2003 Sep 1;28(17):2030-5.
10. Rai SC, Ajith S, Bhagavan KR, Pinto D. Cervical traction reduces pain and disability in patients with unilateral cervical radiculopathy. International Journal of Current Research and Review. 2013;5(7):33-40.
11. Nadler SF. Nonpharmacologic management of pain. J Am Osteopath Assoc. 2004 Nov;104(11 Suppl 8):S6-12. PMID: 15602035.
12. Bronfort G, Haas M, Evans RL, Bouter LM. Efficacy of spinal manipulation and mobilization for low back pain and neck pain: a systematic review and best evidence synthesis. The spine journal. 2004 May 1;4(3):335-56.

DOI: 10.9756/INT-JECSE/V14I4.136

13. Levine MJ, Albert TJ, Smith MD. Cervical radiculopathy: diagnosis and nonoperative management. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 1996 Nov 1;4(6):305-16.
14. Rothman RH, Marvel Jr JP. The acute cervical disk. Clinical Orthopaedics and Related Research. 1975 Jan 1(109):59-68.
15. Sahrmann S. Movement system impairment syndromes of the extremities, cervical and thoracic spines. Elsevier Health Sciences; 2010 Nov 19.
16. Martínez-Segura R, Fernández-de-las-Peñas C, Ruiz-Sáez M, López-Jiménez C, Rodríguez-Blanco C. Immediate effects on neck pain and active range of motion after a single cervical high-velocity low-amplitude manipulation in subjects presenting with mechanical neck pain: a randomized controlled trial. Journal of manipulative and physiological therapeutics. 2006 Sep 1;29(7):511-7.
17. Falla DL, Jull GA, Hodges PW. Patients with neck pain demonstrate reduced electromyographic activity of the deep cervical flexor muscles during performance of the craniocervical flexion test. Spine. 2004 Oct 1;29(19):2108-14.
18. Treleaven J, Jull G, LowChoy N. The relationship of cervical joint position error to balance and eye movement disturbances in persistent whiplash. Manual therapy. 2006 May 1;11(2):99-106.
19. Falla D, Lindstrøm R, Rechter L, Boudreau S, Petzke F. Effectiveness of an 8-week exercise programme on pain and specificity of neck muscle activity in patients with chronic neck pain: A randomized controlled study. European Journal of Pain. 2013 Nov;17(10):1517-28..
20. Falla D, O'Leary S, Fagan A, Jull G. Recruitment of the deep cervical flexor muscles during a postural-correction exercise performed in sitting. Manual therapy. 2007 May 1;12(2):139-43.
21. Jull G, Falla D, Treleaven J, Hodges P, Vicenzino B. Retraining cervical joint position sense: the effect of two exercise regimes. Journal of Orthopaedic Research. 2007 Mar;25(3):404-12.
22. Harms-Ringdahl K, Ekholm JA, SCHÜLDT K, NÉMETH G, ARBORELIUS UP. Load moments and myoelectric activity when the cervical spine is held in full flexion and extension. Ergonomics. 1986 Dec 1;29(12):1539-52.
23. Cleland JA, Childs MJ, McRae M, Palmer JA, Stowell T. Immediate effects of thoracic manipulation in patients with neck pain: a randomized clinical trial. Manual therapy. 2005 May 1;10(2):127-35.
24. Kanlayanaphotporn R, Chiradejnant A, Vachalathiti R. The immediate effects of mobilization technique on pain and range of motion in patients presenting with unilateral neck pain: a randomized controlled trial. Archives of physical medicine and rehabilitation. 2009 Feb 1;90(2):187-92.
25. Enwemeka CS, Bonet IM, Ingle JA, Prudhithumrong S, Ogbahon FE, Gbenedio NA. Postural correction in persons with neck pain. I. A survey of neck positions recommended by physical therapists. Journal of Orthopaedic & Sports Physical Therapy. 1986 Nov;8(5):235-9.
26. Dreisinger TE, Russell GS, Highland TR. Changes in isometric strength and range of motion of the isolated cervical spine after eight weeks of clinical rehabilitation. Spine. 1992;17(6S).

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