0008-3194/2003/291–297/$2.00/©JCCA 2003

Use of McKenzie cervical protocol in the treatment of radicular neck pain in a machine operator

Sundeep Rathore, DC, FCCRS(C)

A case of mechanical neck pain with radiation into the upper extremity in a 53-year-old man is presented. The use of standard chiropractic manipulative therapy was not an option due to patient apprehension. A reduction of symptoms was reported with certain spinal movements. This made the patient a candidate for the use of spinal loading strategies as described by McKenzie. The application of McKenzie cervical therapy resulted in improved symptoms and function in this individual. The McKenzie protocol, and its use in the management of neck pain, is discussed.
(JCCA 2003; 47(4):291–297)

KEY WORDS : McKenzie, cervical spine, radicular neck pain.

On présente un cas de cervicalgie de nature mécanique avec transfert aux membres supérieurs chez un homme de 53 ans. L'utilisation du traitement chiropratique usuel n'a pas été envisagée en raison des craintes manifestées par le patient. On a signalé lors de certains mouvements vertébraux une diminution des symptômes. Cela a rendu le patient apte à l'utilisation des stratégies de pressions vertébrales décrites par McKenzie. L'utilisation du traitement cervical de McKenzie a entraîné chez ce patient une diminution des symptômes et l'amélioration des fonctions cervicales. On analyse le protocole de McKenzie ainsi que son utilisation dans le traitement de la cervicalgie.
(JACC 2003; 47(4):291–297)

MOTS CLÉS : McKenzie, colonne cervicale, cervicalgie radiculaire.

Introduction

Neck pain is a common complaint in the general population with an estimated lifetime prevalence of 67% among adults aged 20–69 years and an estimated cost of 1% of total health expenditures in the Netherlands.[1,2,3] It is the second most common complaint seen in chiropractic practice and is generally treated with spinal manipulative therapy.[4] Spinal manipulation and mobilization have been shown to be viable and safe options in the short-term treatment of neck pain.[5–14] In this case spinal manipulative care was declined by the patient which necessitated the need to employ other treatment methods. The McKenzie protocol, which has been commonly utilized in low back conditions, may also be employed in the treatment of mechanical neck pain. It makes use of similar presentations in pain response to spinal loading in neck movements and postures, and categorizes them into certain conditions. These are the postural, dysfunction and derangement syndromes. In this case, we discuss the derangement syndrome which is theorized to be an anatomical disruption or displacement of disc material within a motion segment.[15]

The McKenzie method utilizes a loading strategy that incorporates the centralizing phenomenon; this is defined as a rapid change in the location of pain from a distal or peripheral location to a more proximal or central position to the spine.[16,17] This has been shown to be an accurate

Correspondence may be sent to Dr. Sundeep Rathore at 3530 Derry Road East, Suite 210, Mississauga, Ontario, Canada L4T 4E3. Phone: 905-673-6100.

predictor of successful conservative treatment outcome in the low back.[16,17,18] Peripheralization occurs when symptoms move from an area more proximal to an area more distal or lateral from the midline of the spine.[17]

Case report

A 53-year-old male machine operator reported lifting a radiator core weighing approximately 40 kg overhead and noted a gradually increasing deep boring sensation over his lower cervical region. He recalled his neck to be in a flexed and slightly right rotated position. He felt this would resolve itself and finished his workday. That night he noted an aching pain at the base of his neck which extended into the midback and right upper extremity. Specifically, this referred into the right inferior angle of the scapula and the right posterior aspect of the forearm and somewhat into the 3rd and 4th digits. Relieving factors involved overhead elevation of the right arm, internal rotation of the arm and the use of analgesic medication. Aggravating factors included coughing, lifting 5 kg boxes and neck flexion and rotation to the right. Intensity of symptoms was reported as 5/10 at best and 8–9/10 at worst on the numeric rating scale. Symptoms were not progressive. The patient reported a disturbed sleep pattern.

Past musculoskeletal history indicated repeated episodes of mild neck pain that generally resolved within a few days. Past medical history was unremarkable.

He had followed up with his family physician prior to the onset of care and was placed on a three-week regimen of Voltaren and Robaxicet for symptom relief. He noted minimal relief from these medications and discontinued their use. He was referred for radiographic, MR and EMG nerve conduction studies by his family physician.

Examination revealed the patient to be alert, with normal speech. He was pleasant, appearing his stated age, cooperative and presented in acute distress. Postural examination revealed slight right lateral bending of the cervical spine. Orthopedic examination revealed a positive Valsalva maneuver and increased pain with shoulder depression testing. Upper limb tension testing[15] of the brachial plexus was positive with contralateral cervical lateral bending, shoulder abduction, forearm supination and wrist and finger extension. This reproduced symptoms into the right upper extremity. Cervical distraction testing was noted to relieve symptoms. Foraminal compression testing and lateral spinous challenge testing indicated C5–6, C6–7 facet dysfunction. Thoracic outlet testing was unremarkable. Right shoulder examination was unremarkable. Muscular examination revealed hypertonicity over the cervical erectors and the upper fibres of the trapezius musculature. Neurological examination revealed decreased sensation to pin prick and light touch over the C7 dermatome on the right. Deep tendon reflexes were 2+ and symmetrical, with the exception of the triceps reflex which was 1+ on the right. Muscle strength testing of the upper limb was unremarkable. Lower extremity neurological assessment was unremarkable.

A McKenzie mechanical assessment was conducted. Initial evaluation involved gross range of motion. A single cervical protrusion (maximal forward gliding or anterior translation of the head while zero sagittal rotation is maintained), flexion, retraction (maximal rearward gliding or posterior translation of the head while zero sagittal rotation is maintained), extension, side bending and rotation movements were performed (Figures1, 2). The amount of movement loss was noted. He had 35 degrees of flexion, 20 degrees of left lateral bending, 50 degrees of left rotation, and 20 degrees of extension actively, limited by pain. This indicated a moderate movement loss in flexion, and a major loss of retraction and extension. A CROM (Cervical Range of Motion, Performance Attainment Associates, St. Paul, MN) goniometric device was used.[19] All other cervical ranges of motion were within normal limits.

Movements were then performed on a repeated basis (5–15 times) and the effects on symptoms (produced, abolished, unaffected, peripheralized or centralized) were noted. Repeated test movements demonstrated centralization of symptoms with repeated retraction and extension at end range. This was rapid and accompanied with an increase of 15 degrees of extension and the patient being able to retract his neck. Flexion movements peripheralized symptoms without a range of motion change.

The postural syndrome would present with a full range of motion. In the dysfunction syndrome there would be a range of motion loss with pain occurring only at the end range. In this case, symptoms were constant occurring during motion and at end range, with an accompanying rapid response to spinal loading. A diagnosis of cervical derangement syndrome was made.

Special testing

A radiographic evaluation demonstrated generalized de-

Figure 1 Cervical protrusion.

Figure 2 Cervical retraction.

generative changes, and C5–6 facet arthopathy was noted. Electro-diagnostic and conduction parameters were within normal limits in the right extremity deltoid, pronator teres, and first dorsal interosseus muscles. A decreased recruitment in the lateral triceps was noted in the needle EMG component of testing. MR evaluation of the cervical spine revealed multilevel narrow and desiccated discs at the C5–6 and C6–7 levels. There was moderate degenerative change seen throughout the cervical spine. At the C5–6 level, mild right neuroforaminal stenosis was seen secondary to a combination of uncovertebral joint degenerative change as well as facet arthopathy. At the C6–7 level, mild uncovertebral joint degenerative change, as well as facet arthopathy, were observed, resulting in mild bilateral neuroforaminal stenosis. Mild right neuroforaminal stenosis was also noted secondarily to a combination of uncovertebral joint degenerative changes, as well as facet arthropathy.

A treatment plan serving to reduce the derangement, recover function and prevent recurrence was initiated. The patient was to be seen three times per week for six to eight weeks.

Assessment findings indicated neck extension caused the centralization of symptoms and flexion peripheralized symptoms, and therefore the initial phase of care would favor extension. Due to the acute nature of the condition, end range neck movements were performed in the supine position, with clinician assistance. Flexion exercise was initially avoided. The initial procedure was chin tuck or retraction exercise. A small pillow was used under the occiput to maintain slight flexion. Exercises were performed at a frequency of ten to fifteen times for three to four sets with clinician overpressure applied. The patient was given ergonomic advice on the importance of maintaining proper spinal mechanics. The individual was to avoid a forward head or chin poking posture and perform home exercise. The patient was to pull his head and neck posterior into a position in which the head was directly over the shoulder girdle, while the head and eyes remained level. The end position was to be maintained for one second and then allowed to relax into a resting posture.[20] This procedure was to be done at home for 10–15 repetitions every waking hour.

On the second and third sessions, the patient performed

chin tucks without restriction and reported no pain. Progressive exercises were given, consisting of chin retractions with the addition of cervical extensions in the supine position. These were done for four sets of fifteen repetitions. Centralization occurred as extremity symptoms no longer extended past the right elbow region. In the second week of care, exercises were performed with the patient in the seated position. They consisted of chin tucks and neck extension exercises with clinician-applied overpressure in the end range of motion. In the third week, retraction and extension exercises with practitioner-applied traction were performed. This involved the patient lying supine with the head off the treatment table to the upper thoracic spinal level with clinician-applied traction and extension maintained throughout the range of motion to end range (Figure 3). The patient always started and ended in the chin-retracted position.

At the end of the third week of care, the patient reported resolution of arm symptoms and mild to moderate neck pain. Pain intensity was reported to be 4/10 on the numeric rating scale. Range of motion of measurements indicated normal neck extension of 65 degrees, limited neck flexion and left lateral flexion of 45 degrees and 15 degrees respectively.

In the fourth week of care, previously avoided movements were incorporated into the treatment regime: first retraction with lateral flexion, then neck rotation, and finally combined retraction and neck flexion with overpressure done in the sitting posture. These were done in four sets of fifteen repetitions. Following each exercise ten repetitions of neck extensions were performed.

After this phase of care, cervical range of motion was measured to be 55 degrees of flexion, 65 degrees of extension, 45 degrees of left lateral bending and 90 degrees of bilateral rotation. This was within normal limits. Mild lower neck pain still occurred with prolonged overhead activity. Pain intensity was reported as 2/10 on the numeric rating scale, at the worst.

The patient was then progressed to a four-week active rehabilitation program. The first week consisted of the introduction of sensorimotor training, involving sitting and bouncing on a gym ball while maintaining a chin tuck with the eyes and head level. He also performed brief repetitive isometric exercises (BRIMES) to the neck region. These were initially done with the neck in neutral posture, and with a clinician resisting flexion, extension, lateral flexion and rotation. Contractions were held for 5 seconds/repetition and repeated 5–10 times as per patient

Figure 3
Clinician traction-retraction in extension.

tolerance. This progressed to contractions done at incremental 15 degree angles of neck flexion, extension, and lateral flexion in the second week of care. The third and fourth weeks of care involved quadruped track and cervical stabilization exercises done by utilizing a swiss gym ball as described by Murphy.[21] For upper body strengthening, isotonic exercises were performed, consisting of dumbbell overhead military presses and seated pulley rowing exercises. Three sets of each exercise were performed, with the first set done at the 10 RM (ten repetition maximum), the second set done at the 75% of the 10 RM weight, and the third set done at 50% of the 10RM weight.

After this period, the patient reported a pain intensity of zero and returned to regular fulltime duties without restrictions. He was advised to maintain proper neck mechanics, and to continue cervical stabilization exercises in the home setting. One-month follow-up by phone indicated no incidence of re-aggravation and a complete resolution of complaints.

Discussion

The McKenzie method of care has been successful in the treatment of neck pain in the short term.[22,23] It divides conditions into three syndromes based on symptoms and their response to loading. The first is the postural syndrome that exhibits neck pain, without physical findings. The patient demonstrates a full range of motion and an unremarkable examination. It is thought that normal tissues are placed in a position of prolonged or excessive stretch, with pain ceasing when the offending tension is removed.[15] Symptoms are similar to bending one's finger into a hyperextended position, for a prolonged period of time, and which cease upon its return to a neutral position. Postural abnormalities have been implicated in the increased incidence of pain in otherwise healthy individuals.[24] Treatment consists of patient education on posture. A cervical lordosis is to be maintained with the head held over the shoulder region. This generally resolves symptoms and, as there are no functional limitations, no further care is required.

The second condition is the dysfunction syndrome, whose hypothesized pathoanatomy is adaptively shortened tissue due to scarring or fibrosis of the ligamentous structures in the spine. This is secondary to trauma, poor posture or degenerative change.[15,25] Overpressure or sustained loading may increase pain at the end range of motion. The patient exhibits intermittent pain and the symptoms resolve once the stress on the affected tissues is removed. Therefore, if range of motion were limited in extension, a loading strategy to provoke the dysfunction (viz., repeated extension to end range) would be prescribed. This is to restore motion to the restricted movement plane, and would generally involve a prolonged course of care of up to a few months.[25]

The derangement syndrome is thought to result in an obstructed range of motion.[15,16] Symptoms are constant and, on examination, present themselves during and at the end range of motion. The patient response to testing may result in symptoms that become more or less severe. A positive response to spinal loading in this syndrome would result in lowered pain intensity, centralization of symptoms or an increased range of motion. This change can occur immediately or after a period of time. The cervical spine and disc have been implicated as pain generators in the neck, scapular and arm regions.[26,27,28] McKenzie postulated that neck flexion would cause a movement of the nucleus pulposus to a more posterior position due to increased mechanical compression on the anterior surface of the intervertebral disc.[15] Anatomically, there does appear to be an increased risk of posterior displacement of the disc, particularly in flexion movements.[29] Neck retraction, which has been advocated by McKenzie in the treatment of the derangement syndrome, causes extension of the lower cervical segments and may alleviate stress on the posterior annulus and thereby relieve pain.[30,31] In patients with neck and radicular pain, repeated neck retraction was shown to result in a significant decrease in peripheral pain and decreased nerve root compression, whereas neck flexion produced an increase in peripheral pain and nerve compression.[20] Additional benefits may occur. In a study of normal subjects, individuals adopted a less protracted posture after repeated neck retraction movements.[32]

The McKenzie system of diagnosis and treatment promotes a more active patient-directed approach. However, the methodology tends to be overly simplistic. McKenzie does not address other causes or treatments of neck and arm pain, for instance: myofascial pain syndromes, as described by Travell and Simons.[33] In a study of patients performing cervical and extension exercises, no change was noted in cervical and scapular trigger point sensitivity using pressure pain thresholds.[34]

In this case, McKenzie protocols and active exercises

were utilized in the treatment of a cervical derangement syndrome, in a single individual. It serves to highlight the need for further study of the effectiveness of the McKenzie method, in differing neck conditions, within a larger sample group.

Conclusion

In the chiropractic setting there are circumstances where spinal manipulative therapy is not an option. The practitioner must be open to other possible methods of patient care. Non-manipulative conservative measures such as the McKenzie method have been commonly used in the lumbar spine region and may be employed in the treatment of mechanical neck complaints.

References

1 Bovim G, Schrader H, Sand T. Neck pain in the general population. Spine 1994; 19(12):1307–1309.
2 Borghouts JA, Koes BW, Vondeling H, Bouter LM. Cost of illness of neck pain in the Netherlands in 1996. Pain 1999; 80(3):629–636.
3 Cote P, Cassidy JD, Carroll L. The Saskatchewan Health and Back Pain Survey. The prevalence of neck pain and related disability in Saskatchewan adults. Spine 1998; 23(15):1689–1698.
4 Hurwitz EL, Coulter ID, Adams AH, Genovese BJ, Shekelle PG. Use of chiropractic services from 1985 through 1991 in the United States and Canada. Am J Public Health 1998; 88:771–776.
5 Gross AR, Kay T, Hoadras M, Goldsmith C, Haines T, Peloso P, et al. Manual therapy for mechanical neck disorders: a systematic review. Manual Therapy 2002; 7(3):131–149.
6 Ben-Eliyahu DJ. Chiropractic management and manipulative therapy for M.R.I. documented cervical disk herniation. J Manip Physiol Ther 1994; 17(3):177–185.
7 Bronfort G., Evan R, Nelson B, Aker PD, Goldsmith Ch, Vernon H. A randomized clinical trial of exercise and spinal manipulation for patients with chronic neck pain. Spine 2001; 26(7):788–797.
8 Aker PD, Gross AR, Goldsmith CH, Peloso P. Conservative management of mechanical neck pain: Systemic overview and meta-analysis. BMJ 1996; 313:1291–1296.
9 Coulter I. Manipulation and mobilization of the cervical spine: the results of a literature survey and consensus panel. J Musculo Pain 1996; 4:113–123.
10 Hurwitz EL, Aker PD, Adams AH, Meeker WC, Shekelle PG. Manipulation and mobilization of the cervical spine. A systemic review of the literature. Spine 1996; 21:1746–1760.
11 Kjellman GV, Skargren EI, Oberg BE. A critical analysis of RCT a neck pain and treatment efficacy. A review of the literature. Scand J Rehab Med 1999; 31:139–152.
12 Di Fabio RP. Manipulation of the cervical spine, risks and benefits. Phys Ther 1999; 79:50–65.
13 Rosenfield M, Gunmarsson R, Bomenstein P. Early intervention in whiplash-associated disorders. A comparison of two treatment protocols. Spine 2000; 25:1782–1787.
14 Hurwitz EL, Morgenstern H, Harper P, Kominski GF, Yui F, Adams AH. A randomized trial of chiropractic manipulation and mobilization for patients with neck pain:clinical outcomes from the UCLA neck pain study. Am J Public Health 2002; 92(10):1634–1641.
15 McKenzie RA. The Cervical and Thoracic spine: Mechanical Diagnosis and Therapy. Waikanae, New Zealand: Spinal Publications;1990.
16 Donelson R, Aprill C, Medcalf R, Grant W. A Prospective study of Centralization of Lumbar and Referred Pain. A predictor of symptomatic discs and annular competence. Spine 1997; 22(10):1115–1122.
17 Donelson R, Silva G, Murphy K. Centralization Phenomenon Its usefulness in evaluating and treating referred pain. Spine 1990; 15(3):211–213.
18 Werneke M, Hart DL, Cook D. A Descriptive study of the Centralization Phenomenon. A Prospective Analysis. Spine 1999; 24(7):676–683.
19 Youdas JW, Garrett TR, Suman VJ, Rogard CI, Hallman HO, Carey JR. Normal range of motion of the cervical spine: an initial goniometric study. Phys Ther 1992; 72(11):770–780.
20 Abdulwahab PS, Sabbahi M. Neck retraction, cervical root decompression, and radicular pain. JOSPT 2000; 30(1):4–12.
21 Murphy DR. Chiropractic Rehabilitation of the Cervical spine. JMPT 2000; 23(6):404.
22 Kjellman G, Oberg B. A randomized clinical trial comparing general exercise, Mckenzie treatment and a control group in patients with neck pain. J Rehabil Med 2002; 34(4):183–190.
23 Schmidt I, Rechter L, Hansen VK, Therkesen K, Rasmussen C. The effect of the involvement of financial compensation with the outcome of cervicobrachial pain that is treated conservatively. Rheumatology 2001; 40:552–554.
24 Griegel-Morris P, Larsen K, Mueller-Klaus K, Oatis CA. Incidence of common postural abnormalities in the cervical, shoulder and thoracic regions and their association with pain in the age groups of healthy subjects. Physical Therapy 1992; 72(6):26–32.
25 Liebenson C. Rehabilitation of the Spine: A Practitioner's Manual. Williams and Wilkins; 1996. p.225–252.

26 Cloward RD. Cervical discography. A contribution to the etiology and mechanism of neck, shoulder, and arm pain. Ann Surg 1959; 150:1052–1064.
27 Harms-Righdahl K. On assessment of shoulder exercise and load elicited pain in cervical spine. Scand J Rehab Med 1986; S14:1–40.
28 Schellhas KP, Smith MD, Gundry CR, Pollei SR. Cervical discogenic pain. Prospective corelation of MRI and discography in asymptomatic subjects and pain sufferers. Spine 1996; 21(3):300–312.
29 Mercer S, Bogduk N. The ligaments and annulus fibrosis of human adult cervical IVD. Spine 1999; 24:619–628.
30 Ordway RN, Seymour RJ, Donelson RG, Hojnowski LS, Edwards WT. Cervical Flexion, Extension, Protrusion and Retraction. A radiographic segmental analysis. Spine 1999; 24(3):240–247.
31 Fennell AJ, Jones AP, Hukins DW. Migration of the nucleus pulposus within the intervertebral disc during flexion and extension of the spine. Spine 1996; 21(23):2753–2757.
32 Pearson ND, Walmsley RP. Trial into the Effects of Repeated Neck Retractions in Normal Subjects. Spine 1995; 20(11):1245–1251.
33 Simons DG, Travell JG, Simons LS. Myofascial Pain and Dysfunction: The Trigger point Manual, Volume 1: Upper half of the body. 2nd ed. Baltimore: Williams and Wilkins;1999.
34 Hanten WP, Barrett M, Gillespie-Plesko M, Jump KA, Olson SL. Effects of active neck retraction with retraction\extension and occipital release on the pressure pain threshold of cervical and scapular trigger points. Physio Theory and Pract 1997; 13:285–291.