AN INTEGRATIVE TREATMENT APPROACH OF A PATIENT WITH CERVICAL RADICULITIS: A CASE REPORT

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ABSTRACT

Objective: To describe a case report of the use of 3 treatment methods for treatment of cervical radiculitis; manual intermittent traction, instrumental chiropractic spinal manipulation, and interferential therapy.

Clinical Features: A 54-year-old man experienced neck and left arm pain with positive orthopedic tests indicating cervical spinal nerve root involvement; he was diagnosed with cervical radiculitis

Intervention and Outcome: The patient received 10 treatments over a period of 8 weeks. Instrumental spinal manipulation, manual intermittent traction, and interferential therapy were integrated as a treatment plan for the patient. The patient's condition appeared to resolve. Outcome measures were evaluated at baseline, weeks 3, 5, and 8. Neck Disability Index scores were 32%, 14%, 8%, and 4% respectively, and the Visual Analog Scales were 8.5/10, 2.0/10, 1.0/10, and 0.5/10. The symptoms of cervical radiculitis was resolved in an 8 week period after 10 treatments.

Conclusion: The integration of instrumental spinal manipulation, manual intermittent traction, and interferential may work well together for patients with similar signs and symptoms as presented in this case. (J Chiropr Med 2005;4:97–102)

Key Indexing Terms: Neck; Radiculopathy; Manipulation, Chiropractic; Treatment Outcome

INTRODUCTION

Cervical radiculopathy is a common dysfunction of the nerve root of the cervical spine.[1] The nerve root can be mechanically distorted, encroached upon or inflamed by cervical facet arthrosis, spondylitic change such as osteophytes on uncinate processes, disc herniations, or pathological factors.[2] Neurological symptoms such as decreased deep tendon reflexes, paresthesias and motor weakness may play a role in patient signs and symptoms. Treatment of cervical radiculitis is aimed at alleviating axial neck pain and referred pain into the upper thoracic area and down the involved upper extremity.

Studies are published comparing surgical intervention versus non-surgical treatment and show favorable non-surgical outcomes.[3,4] Saal et al's longitudinal outcome study of conservative care versus surgically treated patients with cervical radiculitis revealed that 65% were successfully treated conservatively, whereas 35% underwent surgery. Long term comparison of these two groups showed that the conservatively managed group did better with respect to resolution of radiculitis, sensory disturbances, reflex abnormalities, motor weakness, return to occupation, and activities of daily living.[4–6] Surgery is absolutely indicated when there are progressive neurological findings such as myelopathy, progressive weakness, or unremitting pain despite conservative treatment.[2,5]

The purpose of this report is to describe the integration of evidence-based treatments such as intermittent manual traction and spinal manipulation with the Activator Adjusting Instrument (AAI) were used in conjunction with interferential therapy in the treatment of a patient with cervical radiculitis.

CASE REPORT

History

A 54-year-old male experienced complaints of neck pain, left shoulder and medial scapular pain, and radiating pain that traveled down his left arm into his hand. He likened the pain as a wave that would travel from his spine to the left shoulder and arm. The patient stated that he had been experiencing

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this pain in his neck upper back, and left arm after a prolonged treatment at the dentist ten days prior to coming to the office. His pain was not resolving and seemed to be getting worse over time. He was made aware of this case study, and gave written and verbal consent for participation. He had never experienced this intensity of pain in his neck, upper back and left arm; it hurt so much he had to stop what he was doing and wait for the pain to diminish.

The patient recalls dislocating his left shoulder when he was a teenager while playing soccer and he was taken to a hospital in Ghana. He recalls being treated and released, although he said after this injury, and since then, he had been weaker in his left upper arm, especially the triceps. This weakness had not interfered with his activities of daily living, and he continued to be an active soccer player and coach.

Examination

Cervical ranges of motion were (degrees): flexion (45), extension (20), right rotation (40), left rotation (30), right lateral flexion (25), left lateral flexion (15). Upper extremity reflexes were within normal limits bilaterally. Pinwheel exam was negative for abnormality within upper extremity dermatomes. Motor weakness noted in the left triceps was graded fair to good (weakness against resistance while he could maintain a muscle contraction against gravity).[7] Upper arm measurements taken 12 cm proximal from the tip of the olecranon showed a 2 cm difference between arms (right upper arm was 27 cm and the left was 25 cm). The spinous processes at C7, T1, T2, and T3 were exquisitely tender to palpation. Corresponding deep erector spinae muscles were hypertonic and tender to palpation, as were the more superficial upper and middle fibers of the trapezius.

Spurling's test was positive on the left with the reproduction of pain in the neck, down the left upper back and left arm, and down into the left hand. Spurling's was negative on the right. The shoulder abduction sign was positive on the left and negative on the right, and neck distraction was positive in that it reduced the radiating pain down the left arm and upper back. Neck distraction decreased the radicular pain (positive finding), the Valsalva maneuver was negative, ie pain did not increase in the cervical spine or down the left arm. The upper limb tension test was positive, with an increase in radicular pain as the brachial tension was increased on the left side.

Plain film radiographs of the patient's cervical spine demonstrated osteoarthritic changes with disc degeneration at C6-7, and C7-T1, as well as osteophytes anteriorly and posteriorly at these segments. While x-rays are helpful in detecting fractures, bone pathologies, osteophytes and subluxations related to trauma, they have limited predictive value regarding diagnosis on patients with a history of neck pain.[8,9] X-rays alone must be correlated with history and physical exam.[9] The patient's x-rays in this case study correlated to his history and physical exam. Cervical MRI was not recommended because the patient demonstrated improvement after the first 3 treatments.

Intervention and Outcomes

Based upon previously published evidence of treatments for cervical radiculitis,[3,6,10,11] the patient received 10 treatments along with interferential therapy for 8 weeks. Treatments twice weekly were recommended for the first few weeks of care, however, the patient could not comply due to work and family responsibilities. Treatments were consistently the same throughout the period of intervention as a means of standardization.

All treatments began with the patient prone-lying. He received full spinal manipulation with the Activator Adjusting Instrument using the Activator Method. Subluxation patterns such as a left pelvic distortion pattern were particularly noted (relative to his left sided radiculitis) and adjustments were made to the left costovertebral joints (levels 1–4), upper thoracic and cervical spine. The rationale for adjusting the patient first was to attempt to reduce vertebral subluxations and optimize (as best as possible) joint biomechanics, thereby relaxing surrounding cervical hypertonic musculature prior to traction.[12]

Manual intermittent traction was performed for 15 minutes following manipulation. The patient's neck and head were tractioned manually. The pull angle was approximately 25 degrees into cervical flexion, and the tension was manually determined by first removing the slack in the patient's cervical spine, then continuing with the traction so a definite cervical stretch was elicited, and radicular symptoms were eliminated.[13] The pull phase lasted 10 seconds

each with a 5–10 second rest period for 10 minutes.[11]

Lastly, 4 gel electrotherapy pads were placed at the cervical-thoracic junction (2 on the left, 2 on the right), and the patient was then treated with interferential electrical muscle stimulation while lying supine on an ice pack. A bolster was placed under the patient's knees, and he received interferential therapy for 15 minutes in a relaxing, dimly lit treatment room. Interferential and ice therapy were used primarily as pain modulators, and to decrease post treatment soreness. For the first 4 weeks, the patient's neck had to be flexed 20–30 degrees to eliminate his radicular pain down the left arm. As his ability to extend improved, he was gradually able to assume a neutral to slightly extended posture while receiving interferential. The patient was encouraged to perform range of motion exercises for the cervical spine within a pain free range at home, and use ice and/or ibuprofen for pain relief and inflammation as needed. It was also suggested that he not coach soccer for at least 2 weeks while he was acute. The patient stated he did comply with these recommendations.

The Neck Disability Index (NDI) and Visual Analog Scale (VAS) were used as outcome instruments to determine patient improvement. The outcome instruments and final examination findings demonstrated that the patient improved satisfactorily. The NDI is a 10-item, scaled questionnaire that is used to show changes in pain and functional limitations with treatment. The NDI has good test-retest reliability, and has shown an acceptable degree of internal consistency for the NDI.[14,15] Hains et al concluded that the NDI possesses stable properties and provides an objective means of assessing the disability of patients suffering from neck pain.[16] The VAS is beneficial because it is a way of quantifying the patient's perceived levels of pain, and it has been shown to have internally consistent values.[14,15] The VAS and NDI were studied by Hains et al[16] to determine if a response set bias existed between the two. The limitations of the VAS lie in its inherent subjectivity. While it is a commonly used method of evaluating pain outcomes in the literature and clinically, it should not be utilized independently from other instruments. The NDI and VAS were completed four times by the patient, and the results are listed in Table 1.

Re-examination on the patient's final visit yielded the following cervical ranges of motion (degrees): Cervical flexion/extension (50 and 50), Rotation right and left (45), lateral flexion right and left (35). Left triceps strength test was graded at 4/5 (fair to good). Spurling's and shoulder abduction sign were negative. Valsalva, the distraction test, and the upper limb tension test were negative. Muscles were supple and pain free to palpation at the cervical-thoracic junction, however the patient still had palpatory tenderness on the spinous processes of T3 and T4.

TABLE 1
SUMMARY OF OUTCOME MEASURE VALUES

TREATMENT DATE	NDI (%)	VAS
1ST TREATMENT	32	8.5
2 WEEKS LATER	14	2.0
5 WEEKS LATER	8	1.0
8 WEEKS LATER	4	.5

DISCUSSION

The physical examination findings supported the diagnosis of cervical radiculitis.[6,17] Wainner et al[9] assessed the reliability and diagnostic accuracy of specific clinical exam findings in their blinded prospective diagnostic study that involved 82 patients, 34 clinical examination items, and self–reporting measures including the NDI and VAS. In Wainner's study, a standardized electromyography (EMG) and nerve conduction velocity (NCV) exam provided the reference criterion for cervical radiculopathy. Each subject rated their pain with the NDI and the VAS and had an EMG/NCV exam. A physical therapist performed standard clinical neurological testing (motor, sensory, reflex), cervical range of motion, and the Spurling's, shoulder abduction, neck distraction, Valsalva, and upper limb tension tests. These five provocative tests were the result of a comprehensive literature review by Wainner and Gill[6] from an earlier study in 2000. The reliability coefficients for the examination items were calculated within a 95% confidence interval (CI) and variables were compared for diagnostic accuracy. In this study, the three provocative tests with reliability and validity values were Spurling's, shoulder abduction sign, and neck distraction.[6] Spurling's maneuver and neck distraction had a higher specificity (0.96 and 1.0) than sensitivity (0.36 and 0.40). The Valsalva maneuver and Elvey's upper limb tension test have not been studied to date to determine reliability and validity.[6,9] This study by Wainner provided evidence that supported the validity of the tests studied.[6] The examiners were blinded to the

suspected diagnoses of the subjects, and these results were compared to a reference gold standard of a needle electromyography and nerve conduction studies. The spectrum of subjects chosen for the study were generally appropriate (ages ranged from 32–2 years) for patients with degenerative disc disease although the age range could have included older subjects with degenerative disc disease and cervical spondylosis.

Spurling's test was evaluated for sensitivity and specificity by Tong et al[17] in a cross-sectional study design that included 255 patients with cervical radiculitis. Tong's data on Spurling's maneuver showed a 30% sensitivity and a 93% specificity (95%CI: 1.86–17.5). While it is not very sensitive, Spurling's is specific for cervical radiculitis diagnoses by EMG.

Neurologic examination evaluating reflexes, paresthesias, and muscle strength are usually performed by the clinician as part of the patient evaluation. Viikar-Juntura reported moderate interrater reliability for sensory and strength testing (kappa 0.40 to 0.6).[6,15] Few studies have assessed the reliability and validity of neurological examination, and Rosier et al[14] in their observational study determined that there is no single neurological sign that is both sensitive and specific for an intervertebral level, and that the diagnosis must be performed comprehensively, using deep tendon reflexes, numbness, and motor weakness. According the Viikari-Juntura, the actual value neurological tests have regarding the diagnosis for cervical radiculitis is not well established.[18]

Traction is a commonly used modality in the treatment of cervical radiculitis. Traction is reported to open the foramina, increase the anterior and posterior intervertebral disc space, stretch the cervical joint capsules, stretch neck muscles, relieve radicular symptoms, and improve localized blood flow. It can be administered either lying supine or sitting, and can be divided into mechanical or manual methods. While the use of traction is employed by many physical therapists and chiropractors, there are many opinions regarding the application and clinical results. Most studies agree that flexion of the cervical spine offers better results with traction, since it increases the size of the intervertebral foramina. A range of 20–30 degrees of cervical flexion is commonly used.[3,9,19] In a randomized clinical trial, Zylbergold and Piper[11] compared mechanical static, mechanical intermittent, and manual traction to no traction. Outcome measures included the McGill Pain Questionnaire, perceived pain intensity, range of motion, usage of medication, and use of a neck collar. Intermittent mechanical traction consisting of 25 pounds for 15 minutes (10 seconds on, 10 seconds off) resulted in a post-pain score of 0.30 (P = .06), while manual traction (given in a supine position with the neck angled at approximately 25 degrees flexion (a minimum of 20 pulls were given in a 15 minute period) had a post-pain score of 0.58. Static traction scored 0.74, compared to no care at 0.98. An analysis of covariance indicated that the three traction groups collectively showed significantly more improvement when compared with the no traction group.[11]

While the Colachis studies[13,19] indicate that approximately 30 pounds was optimum to maximally separate the cervical vertebrae, and the maximum mean vertebral separation occurred after 25 minutes of intermittent traction, the author failed to clinically correlate the outcomes in terms of patients' perceived pain and levels of function. The studies do include a noteworthy optimum cervical flexion position at 24 degrees, even though the values of traction forces and duration were not related clinically and lack generalizability.

In their randomized controlled trial study, Wong et al[20] compared the average EMG activity of the paraspinal muscles during the pull phase of intermittent traction, while utilizing a biofeedback modality. Patients with cervical radiculitis showed a decrease in EMG activity during the pull phase. The subjects who had the biofeedback modality and intermittent traction tended to show a decrease in EMG activity after traction compared to patients treated with conventional traction. The study suggests patients may be in a more relaxed state with the biofeedback traction modality, and muscle activity diminished possibly because of reflex inhibition of muscle contraction, or perhaps because of stimulation of Golgi tendon organs. These topics are of interest for future studies.

In a similar study, Abdulwahab[21] utilized electrodiagnostic testing to evaluate changes in the H-reflex of the flexor carpi radialis in order to determine the effect of manual traction on the neurophysiology of the compromised nerve root and subsequent neural conduction. The H-reflex is a monosynaptic segmental reflex, and can be helpful in assessing nerve

root excitability in situations where the nerve root is compressed, or if other neurophysiological abnormalities exist at the nerve root level. While the validity of this study is compromised by a low number of subjects (10 total), the author demonstrated a linear relationship whereby the H-reflex peak-to-peak amplitude decreased after the subject read a book for a half hour to 0.33 ± 0.18 mV (the reading position exacerbated radicular symptoms), and increased to 0.59 + 0.34 mV after cervical intermittent traction.[21] It is also worthy to note the author used manual intermittent traction with the subject seated (ten repetitions of 10 seconds on and 5 seconds off with the neck flexed at approximately 15 degrees) and recorded a change in the H-reflex. Perhaps future research could focus on what minimal traction forces (rather than maximum) are required to elicit physiological and neurological responses, and then relate these to clinical outcomes.

More than 50% of practicing chiropractic physicians in the United States and 14% of practicing chiropractors in Europe use a spinal adjusting instrument known as the AAI.[22] Keller et al evaluated the dynamic force-time and force-frequency characteristics of the AAI in an attempt to provide structural measurements and reproducible, uniform impact forces in an experimental investigative study. Their study indicated that the Activator Adjusting Instrument has a variable force spectrum (low setting for cervical spine, a middle setting for the thoracic region, and high setting for lumbar spine and pelvis) and delivers its highest energy frequency of 20 Hz.[5] In another experimental study, Smith et al[12] measured relative bone translation on a live dog model using the AAI. They found that the AAI delivers a force-time thrust in 2–4 ms (5–10 times faster than the human stretch reflex reaction time) and translates bone 1 mm. The authors suggest the small passive, sudden relative vertebral movement could also be related to nervous system input from joint receptors.[12]

It is thought that spinal manipulation with the AAI tends to avoid worsening or aggravating patient symptoms commonly associated with high velocity manual manipulation.[5,12,23] The AAI delivers a low force, high velocity thrust is well tolerated by patients in severe pain, and helps to allay patient apprehensions.[12] Cervical adjustments with the AAI are performed with the patient prone and the cervical spine in relatively neutral position, thereby eliminating the iatrogenic complications associated with rotary manipulation of the cervical spine.[22] These particular issues are significant in choosing to use the AAI for spinal manipulation in the case of severe pain associated with cervical radiculitis, as in this case study.

Few clinical studies have evaluated the benefit of interferential therapy to subjects. Interferential is characterized by a resultant beat frequency that results from the two medium frequency sine waves that cross and alternately increase, then decrease, the amplitude. This beat frequency between 0–150 Hz has physiological benefits such as decreasing edema and modulating pain.[7,24,25] Jarit et al[7] studied the effects of home interferential therapy on postoperative pain after anterior cruciate ligament reconstruction, menisectomy, or knee chondroplasty. All interferential subjects reported less pain and had less edema over set time in the outcome measurements, and the authors suggest that Interferential be utilized post surgically, and then at home. Hurley et al[24] examined the use of interferential therapy versus spinal manipulation and the combination of the two interventions in a small pilot study. Self-administered outcome questionnaires were completed at weeks 1, 6, and at 3 months and showed no statistical differences between all interventions, although the patients did improve.

Methods of treatment were integrated mainly to insure improvement of the patient's condition. Most practitioners utilize several treatment methods per diagnosis, and this case study is therefore characteristic of this approach. This particular case study involved a diagnosis of cervical radiculitis, however the source of the radicular pain is dubious. The patient's x-rays showed degenerative joint changes in the lower cervical spine, which correlated to the positive orthopedic findings. Cervical disc herniation could be ruled out with an MRI, which in this case was not done since the patient improved. Therefore, his cervical, upper back and arm pain may have had several contributing factors.

Another consideration in the patient's outcome for this study is the 8 week period of care. The issue of maturation may play a role in this case. Perhaps the patient would have recovered over an 8 week period without any intervention at all.

While this paper has multiple research design and statistical flaws, it also demonstrates the need for

further studies. Wright et al[25] performed a literature review of interventions such as electrotherapy, ultrasound, thermal modalities, exercise, and manual therapies. The literature sited suggested physiological effects by interferential therapy, although there is insufficient evidence to determine the clinical benefits or lack of benefits, in the management of musculoskeletal pain.

CONCLUSIONS

While rationale and discussion of each method is made, it is difficult to discern which treatment may have helped the patient more. The actual source of radicular pain was not definitively diagnosed by MRI or EMG, although the clinical diagnosis seemed appropriate based on history and physical examination. Therefore, the effectiveness of both manipulation and intermittent manual traction must both remain as contenders in this case. More research studies need to be done in the field of spinal manipulation for the treatment of cervical radiculitis, as well as the clinical applications of interferential therapy. Further studies such as an experimental randomized controlled trial would be better suited to isolating each intervention to measure their relative effectiveness over time.

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