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CASE REPORTS

Use of Cervical Spine Manipulation Under Anesthesia for Management of Cervical Disk Herniation, Cervical Radiculopathy, and Associated Cervicogenic Headache Syndrome

James Herzog, DC[a]

ABSTRACT

Objective: To demonstrate the benefits of cervical spine manipulation with the patient under anesthesia as an approach to treating a patient with chronic cervical disk herniation, associated cervical radiculopathy, and cervicogenic headache syndrome.

Clinical Features: The patient had neck pain with radiating paresthesia into the right upper extremity and incapacitating headaches and had no response to 6 months of conservative therapy. Treatment included spinal manipulative therapy, physical therapy, anti-inflammatory medication, and acupuncture. Magnetic resonance imaging, electromyography, and somatosensory evoked potential examination all revealed positive diagnostic findings.

Intervention and Outcome: Treatment included 3 successive days of cervical spine manipulation with the patient under anesthesia. The patient had immediate relief after the first procedure. Her neck and arm pain were reported to be 50% better after the first trial, and her headaches were better by 80% after the third trial. Four months after the last procedure the patient reported a 95% improvement in her overall condition.

Conclusion: Cervical spine manipulation with the patient under anesthesia has a place in the chiropractic arena. It is a useful tool for treating chronic discopathic disease complicated by cervical radiculopathy and cervicogenic headache syndrome. The beneficial results of this procedure are contingent on careful patient selection and proper training of qualified chiropractic physicians. (J Manipulative Physiol Ther 1999;22:166-70)

Key Indexing Terms: Chiropractic Manipulation; Anesthesia; Intervertebral Disk Herniation; Cervical Vertebra

INTRODUCTION

Spinal manipulation under anesthesia (MUA) has been used to treat a wide variety of musculoskeletal disorders dating as far back as the 1930s and 1940s. Most of the forms of MUA discussed in the literature have been performed and documented by the medical and osteopathic professions.[1,2] It would also appear that most of this research has dealt primarily with MUA as an approach to treating certain types of mechanical lumbar and cervical spine dysfunction. The generally accepted rationale for how MUA works is based on solid scientific data relating to muscle and joint physiology. Authors and researchers such as Guyton,[3] Fung,[4] Crowe,[5] and Hill[6] have all helped to establish the unique physiologic properties that synovial joints and muscles have and how those properties act when subjected to traction and stretching forces. MUA in the clinical setting is based on the hypothesis that fibrous adhesions in the joint capsules and surrounding supportive tissues can be altered by the use of specific manipulative and stretching techniques. The result of altering adhesions is increased mobility of the motor unit caused by an increase in flexibility of the supportive tissues.[7-10] Siehl[11] and Claybourne[12] have documented the validity of MUA as a procedure useful in treating musculoskeletal disorders when restriction of the joint, joint capsule, and surrounding musculature has taken place as a result of the formation of fibrous adhesions.

Over the past 15 years, new medical and chiropractic research has documented the benefits of SMT for certain types of musculoskeletal disorders. Prestigious medical journals such as *Spine, British Journal of Industrial Medicine, New England Journal of Medicine, Annals of Internal Medicine, Journal of the American Medical Association,* and *Journal of the American Osteopathic Association*[13-18] have all documented these benefits. This research explosion comes at an interesting time for our profession. Clearly, as time has been going on members of the osteopathic profession have been gradually decreasing their use of SMT while increasing their use of pharmacology and surgery to treat patients. Remarkably, this has been occurring at the same time that much of the research and excitement about the benefits of SMT has been taking place. This leaves most spinal manipulation performed by the chiropractic profession.

Spinal manipulation has been shown to be an effective treatment for certain types of spinal conditions. Spinal MUA, however, may provide therapeutic benefits to those who have been unresponsive to the traditional manipulative approach. This article discusses the use and benefits of spinal MUA in a case of cervical disk herniation and associated cervical radiculopathy and cervicogenic headache syndrome.

[a]Private practice of chiropractic orthopedics, Freehold, New Jersey.
Submit reprint requests to: James Herzog, DC, The Back and Neck Center, 70 Schanck Rd, Freehold, NJ 07728.
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ASE REPORT

A 29-year-old woman in excellent health was involved in rear-end collision in which the car she was driving was hit om behind while at a stoplight. She was wearing a shoulder arness seatbelt; however, she recalled being thrown back-ard on impact and then forward, as in the classic whiplash enario. She denied any head trauma or loss of consciousess. She complained of dizziness and nausea at the scene of e accident and was taken by ambulance to a local hospital here she was examined and underwent a series of cervical pine radiographs. All radiographs were negative for fracure. The patient was then given muscle relaxants and pain edication and was released. Over the next several days, she egan to have neck and lower back pain. Within a week she omplained of numbness and tingling that radiated into the ight arm and hand. The patient consulted a local chiropracor who diagnosed cervical and lumbar sprain. He treated her or approximately 3.5 months. Treatment included spinal anipulation and electric muscle stimulation. No improvenent was noted, and by now the patient had begun to have sere headaches at an increasing frequency. She then consulted a local orthopedist who ordered lumbar spine adiographs. These were negative for fracture or gross osseous pathologic conditions. Physical therapy was ordered or 8 weeks. Muscle relaxants and anti-inflammatory medcation were also prescribed. At the end of the 8 weeks, she elt worse. She now had constant severe neck and back pain. Her right arm tingled daily, and she had daily headaches as well. The patient also complained of increased episodes of lizziness and nausea. She was unable to perform her tasks at work as a secretary and was placed on disability by her orthopedist. She was then referred to a neurologist who ordered cervical and lumbar spine magnetic resonance imaging studies. The cervical spine studies demonstrated a right posterior C5/C6 disk herniation with no apparent spinal or foraminal stenosis and normal spinal cord morphology and signal. The lumbar spine studies demonstrated a mild levoscoliosis and possible conjoined nerve roots on the left at the L4/L5 level. No spinal or foraminal stenosis was noted and no disk herniations were present. Electromyographic examination of the upper and lower extremities was ordered by the neurologist. The result of the cervical study was a C5/C6 radiculopathy. The lumbar study was normal with no signs of radiculopathy. A somatosensory evoked potential study was ordered on the upper extremities and was suggestive of somatosensory dysfunction on the right side. The result of a magnetic resonance imaging study of the brain was normal. The neurologist referred the patient back to her orthopedist, where several more weeks of physical therapy were ordered. After this course of treatment, she was still in severe pain. Her orthopedist offered her little else and suggested she consult a neurosurgeon.

The patient was hesitant to do so. After some discussion, her orthopedist recommended that she try chiropractic treatment again and referred her to my office. At the initial consultation, the patient complained of stabbing neck and upper back pain that radiated into the right scapula. She had numbness and tingling radiating down her right arm into her hand. She stated that her headaches were severe and complained of nausea and dizziness. She described having difficulty with her concentration and attention since her accident. She thought she was forgetful and complained of having difficulty getting a good night's sleep because of her pain. Her lower back was painful but not as severe as the neck pain. No lower extremity paresthesias were noted, and bowel and bladder function was normal. On evaluation, the upper and lower extremity reflexes appeared to be normal at +2 on the right and left.

Palpation revealed trigger points and muscle spasms of the trapezius, scalenes, suboccipital muscles, and rhomboid muscles bilaterally in the cervical and thoracic spines, as well as tenderness over the lumbar extensor musculature at the L3/L4/L5 levels. The mid to lower trapezius muscles had many localized areas of hypertonic muscle fibers that reproduced cervical and occipital pain on digital pressure.

Flexion in her cervical spine was painful at 60 degrees, whereas extension produced pain and restriction at 35 degrees. Right and left rotation were full and pain free, whereas right and left lateral flexion produced pain and restriction at 25 degrees. Muscle strength in the upper extremities was normal at 5/5. Grip strength was 5/5 and symmetric. Peripheral sensation testing of the upper extremities demonstrated hypoesthesia in the right C5 and C6 dermatomal levels.

The cervical foraminal compression test was positive on the right for radicular pain. This maneuver, when performed on the left side, also produced local neck pain on the left, indicating facet jamming. The Soto Hall test was positive for cervical and upper thoracic spine pain, and spinous percussion produced pain at the C2/C3 and C5-T3 levels. A right shoulder depression test alleviated the cervical and arm pain, whereas the left shoulder depression test increased the pain. George's test for potential vertebral artery syndrome was negative on the right and left sides. Valsalva maneuver was negative for radicular pain but did elicit neck pain.

Evaluation of her lumbar spine revealed all ranges of motion to be full. There was pain noted on extension and on bilateral rotation. Evaluation of the lower extremity muscle strength was 5/5. Toe to heel walk was normal. Straight leg raising did not cause any radiating pain. Hibbs test was negative bilaterally for sacroiliac joint involvement. Kemp's test elicited low back pain without radiculopathy, suggesting of a facet syndrome. My impression was cervical disk herniation at the C5/C6 level with a C5/C6 cervical radiculopathy, lumbar sprain, lumbar facet syndrome, cervicothoracic fibromyalgia, and cervicogenic headache syndrome, all posttraumatic and chronic.

The patient was asked to fill out a visual analog pain intensity scale to describe her cervical spine pain. A 0 to 10 numeric scale was used, with 0 representing "no pain" and 10 representing "the worst possible pain." The patient rated her pain as an 8. I recommended treatment for 6 weeks at a frequency of 3 times per week. Treatment included specific spinal manipulation to the cervical, thoracic, and lumbar

spines, as well as ultrasound therapy and spray-and-stretch therapy. She agreed and was reevaluated 6 weeks later. On the reevaluation, she was still in obvious distress. Her lumbar spine pain had resolved; however, she continued to have paresthesias into her right hand and was still complaining of headaches, although somewhat less severe. She now rated her pain as a 7 on the pain scale. I explained to the patient that her chronic pain was not responding as quickly as I had hoped.

We discussed MUA as a possible treatment option. This patient was a candidate for the procedure on the basis of specific criteria that have been accepted and taught by schools such as National College of Chiropractic and Parker College of Chiropractic.[19,20] The patient agreed to the 3-day procedure. She underwent preadmission testing with an anesthesiologist and was medically cleared for the procedures. MUA on the patient's cervical and thoracic spines was performed on 3 successive days. The patient was asked to fill out the pain intensity scale after the 3-day procedure. She rated her overall pain between 3 and 4. Follow-up treatment consisted of 6 weeks of post-MUA therapy. This included spinal traction, spinal manipulation, hot packs, interferential stimulation, and stretching techniques to the affected regions of the spine. The patient was released 6 weeks later, when she reported 90% improvement of her neck and upper back pain, no upper extremity paresthesias, and an improvement in her headaches, which she estimated to be 95% better. Her pain scale rating was a 2. She returned to work and had maintained the improvement 3 months later.

DISCUSSION

In the past the medical profession has generally taken the approach to treating cases of cervical disk herniation with medication, physical therapy, epidural steroid injections, and ultimately surgery. The chiropractic profession offers these patients manipulation and rehabilitative measures. MUA is an old procedure now reawakening in our profession. The generally accepted indications and contraindications for this procedure include the following.

Indications

1. Bulging, protruded, prolapsed, or herniated disks without free fragment that are not suitable for surgery
2. Frozen or fixated articulations from adhesion formation
3. Failed low back surgery
4. Compression syndromes, with or without radiculopathies, caused by adhesion formation but not associated with osteophyte formation
5. Restricted motion that causes pain or patient apprehension, but manipulation is the therapy of choice
6. Patient who is slow to respond to manipulation and adjustments when manipulation is the treatment of choice
7. Patient who has unresponsive pain that interferes with the function of daily life and sleep patterns but that falls within the parameters of manipulative treatment
8. Unresponsive muscle contracture that is preventing normal daily activities and function
9. Posttraumatic syndrome injuries from acceleration deceleration mechanisms that result in painful exac bations of chronic fixations
10. Chronic recurrent neuromusculoskeletal dysfunct syndromes that are easily exacerbated
11. Neuromusculoskeletal conditions that are not suitab for surgery but have reached MMI with conservati therapies
12. Patients who are considered disk surgery candidates b who fall within the parameters of MUA, which may b an alternative or interim step and may be useful as eith a therapeutic or diagnostic tool in determining the pro nosis of the patient's care

Contraindications

1. Any form of malignancy
2. Metastatic bone disease
3. Tuberculosis of the bone
4. Acute bone fractures
5. Manipulation to old compression fractures
6. Acute inflammatory arthritis
7. Acute inflammatory gout
8. Uncontrolled diabetic neuropathy
9. Syphilitic articular or periarticular lesions
10. Gonorrheal spinal arthritis
11. Advanced osteoporosis
12. Spinal cord tumor
13. Disk herniation protruding 5 mm or more into spina canal
14. Widespread staphylococcal or streptococcal infection
15. Presence of an aortic aneurysm
16. Unstable spondylosis
17. Any medical problem in which anesthesia is contraindicated[19]

Certain conditions, most of which are typically seen in the chiropractic setting, that have been shown to respond favorably to MUA are documented in the literature and include chronic noninflammatory arthritis, fibrositis, myofascitis herniated disk syndrome, joint fixation syndromes, and failed back surgery syndromes.[19,21-23]

It is important for the patient's condition to fall into the criteria previously listed if MUA is to be considered. It is of equal importance that the physician be properly trained in the techniques of MUA because they differ from those used in the office setting. MUA procedure and protocols begin with informed consent. Explanation of the medical, surgical, and procedural options available to the patient are adequately covered before the procedure. The patient is draped in appropriate gowning and is accompanied to the operative area. Appropriate monitoring instruments are placed on the patient. These typically include a blood pressure cuff, heart monitor, and pulse oximeter. Oxygen is also supplied by the anesthesiologist or attending nurse. When the patient and doctors are ready, the sedative is administered by the anesthesiologist.

When MUA to the cervical spine is performed, the patient is lying supine on the table. With the patient's arms crossed

over his or her chest, the approach is from the cephalad end of the table. Axial traction is applied to the cervical spine by manual means while the thorax is stabilized by the first assistant. Traction is also achieved in flexion, lateral flexion bilaterally, and in an oblique manner bilaterally. The patient's head is then rotated to the right, and a specific contact is taken on a vertebra. The spinal segment is taken into full range, the elastic barrier of resistance is reached, and a low-velocity thrust is performed. The procedure is then repeated on the opposite side of the cervical spine.

When MUA to the thoracic spine is performed, the patient is lying in the supine position on the table. The arms are crossed over the chest to achieve traction in the thoracic spine. Segmental selection is made by rolling the patient to one side. A contact is made and the patient is rolled back over. Again a low-velocity thrust is performed. This procedure can then be used on other thoracic segments.

Success of the procedure depends on the following:

1. *Careful patient selection:* The patient's condition must meet certain criteria. If this is done after the generally accepted protocols, the success of the procedure should be higher.
2. *Qualification of chiropractic physicians:* These procedures are highly specialized and require training and certification. The procedures and techniques that are currently used and accepted as standard are taught by at least 3 chiropractic institutions through their postgraduate divisions. The physician undergoes at least 36 hours of classroom training and must perform at least 3 MUA procedures under instructor observation. The physician must then pass a written examination. On successful completion of all requirements, the doctor is certified to perform these procedures.
3. *Post-MUA therapy*: This 6-week program is essential to the success of the procedure. Post-MUA care includes hot packs; passive range of motion stretching of the cervical, thoracic, and lumbar spines; and interferential currents coupled with cryotherapy. This procedure is to be administered consecutively for 2 to 3 days, depending on the chronicity of the case. After the first week, proprioceptive neuromuscular facilitation stretching, manipulation, and isometric and flexibility exercises are initiated. At the beginning of the second week of care, a progressively resistant exercise (isotonic) program in conjunction with manipulative therapy is instituted. From the third week to the end of the therapy program, active exercise continues 3 times weekly, with manipulation being performed only once weekly. This is to promote joint stabilization, patient independence, and decreased physician dependence. The post-MUA therapy continues for a total of 6 to 8 weeks. At that time the patient will have achieved a maximum therapeutic benefit and be discharged. Rehabilitation and strengthening of the supporting tissues will help maintain the effects of the alteration of the fibrous adhesions that have occurred with the MUA.
4. *The use of anesthesia:* Perhaps the major reason that this procedure works so well is because anesthesia is used. All anesthesia is not the same. For this procedure, the anesthesia usually used is methohexital (Brevital) or propofol (Diprivan). Thiopental sodium may also be used; however, clinical experience with the use of this drug, a barbiturate, dictates that the patient wakes in a very groggy and disoriented state, will generally feel like he or she has a hangover, and may have a headache. If a patient has head or neck pain to begin with, thiopental sodium may not be the best choice. Methohexital and propofol are fast-acting sedatives, or hypnotics, because they can easily cross the blood-brain barrier.[24] Propofol is rapidly cleared from the blood by both distribution into fatty tissues and rapid metabolic clearance through the liver to inactive metabolites. Although the terminal elimination half-life of propofol is 1 to 3 days, the rapid metabolic clearance results in a short duration of clinical effect. The sedative effects typically dissipate within 5 to 10 minutes after the infusion is discontinued.[24] This is why the patient awakes feeling fresh and is fully alert usually within 1 hour.

These anesthetics place the patient in a twilight state. This is not deep sedation as is seen in open-body surgery. The patient is in a relaxed sleep, and the muscle spasm and splinting reflexes are depressed. This is because methohexital and propofol help to inhibit the internuncial neuron transmission to the alpha motor neurons to prevent the body's secondary response of protective muscle spasm when pain is felt, usually from type II and type IV mechanoreceptor sources at the joint articulation site or from pain-sensitive tissue in muscles.[25-28] With no muscle spasm present and with the patient anesthetized, the adhesions in the muscles can be stretched and altered. This elongation of the muscle allows the physician to take the joint to its full range of motion, when a low-velocity thrust is used to further stretch and alter the adhesions in the joint and capsules. This alteration of adhesions may be, in part, responsible for the increase in spinal flexibility and the overall decrease in pain that has been reported.[19] Cervical disk herniation with irritation of the surrounding nerve root and fibrotic changes in the muscles and joints has been shown to be responsive to MUA. The work of Gordon and Russo,[19] Greenman,[23] and Hughes[22] seems to corroborate this finding. Prior work by Alexander,[21] Nelson et al,[29] and Ben-David and Raboy[30] have all documented the benefits of MUA on lumbar disk syndromes and associated fibrotic changes in the lumbar spine. Although the exact mechanism of this therapeutic approach is still hypothesized, knowledge of muscle and joint physiology likely holds the secret. More research is necessary for proof that adhesion alteration or breakdown actually occurs. Regardless, it seems to appear that MUA has a positive effect on certain types of conditions that have been unresponsive to traditional therapeutic approaches.

My patient demonstrated an increase in her cervical and thoracic ranges of motion shortly after the first procedure. With each successive day of the MUA, this patient continued to display increases in spinal range of motion and increases in supporting muscle flexibility. Her complaints gradually decreased, and she was found to have maintained

the benefits of increased range of motion and decreased pain almost 4 months later.

This article discusses a case in which spinal MUA was used on a patient who had not made substantial improvement with traditional conservative treatment. Significant increase in overall muscle flexibility and spinal range of motion was realized after each procedure. The rationale for MUA use is to control and alter the fibrous adhesions that are a result of the inflammatory cycle. By altering adhesions that are responsible for restricted muscle and joint flexibility, we are able to restore muscle and joint integrity. This is helped by the use of anesthesia, whereby muscle spasm and splinting reflexes are lost but ligamentous and pain reflexes are maintained.

CONCLUSION

MUA has been shown to be of benefit in a case of cervical disk herniation with cervical radiculopathy and cervicogenic headache syndrome. At present, the literature suggests that certain types of conditions respond favorably to MUA. Most of this research surrounds conditions typically seen in the chiropractic setting. Discopathic disease and adhesive muscular disorders may benefit from this approach when other modalities have failed. Spinal MUA may be a promising tool that chiropractors can call on when presented with patients whose conditions fit certain criteria. Proper patient selection, physician training, and careful follow-up therapy are all important aspects of MUA. More research needs to be done to prove or disprove the theory behind adhesion alteration. Until then, case reports will continue to be the only measurable tool used to document MUA procedures and their effects.

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