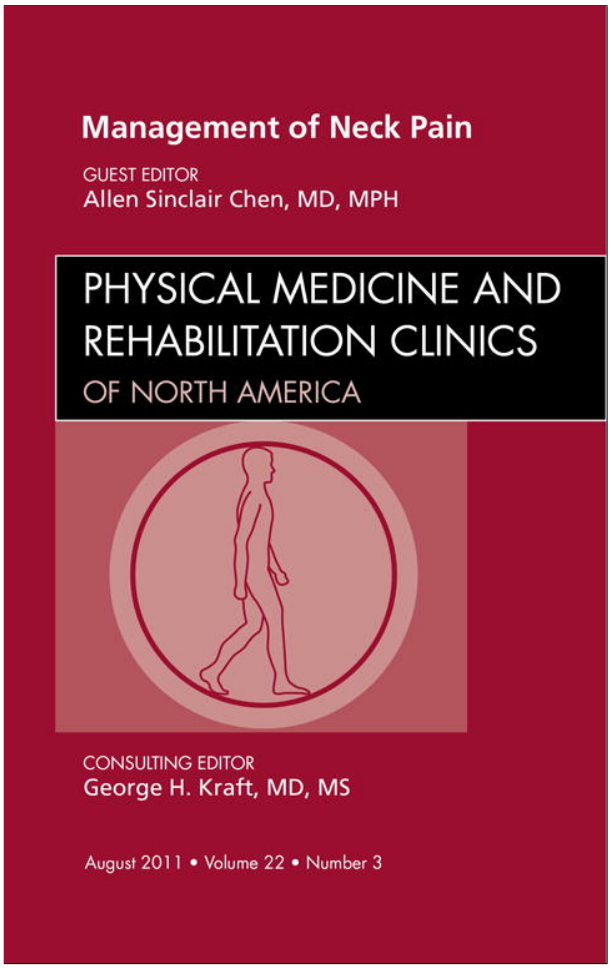

Complementary and Alternative Treatment for Neck Pain: Chiropractic, Acupuncture, TENS, Massage, Yoga, Tai Chi, and Feldenkrais

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KEYWORDS

• CAM therapy • Acupuncture • Chiropractic • TENS • Yoga • Tai Chi • Massage therapy • Feldenkrais

Neck pain is a modern American epidemic, affecting most adults at some time during their lives. In a survey of more than 2000 individuals, 54.2% of respondents experienced neck pain in the previous 6 months and neck pain disabled 4.6% of the adult population surveyed.[1] A 2007 National Health Interview Survey conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics reported approximately 38% of adults and almost 12% of children used some form of complementary and alternative medicine therapy.[2] Although western medicine offers many options for the management of neck pain, most have modest efficacy at best and there are few with clearly demonstrated benefits. Therefore, many patients with chronic neck pain turn to complementary and alternative medicine (CAM)

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including chiropractic, acupuncture, transcutaneous electric nerve stimulation (TENS), massage, yoga, Tai Chi, and Feldenkrais to help manage their pain.

CHIROPRACTIC CARE

Since the beginnings of the chiropractic profession in the United States in 1895, there has been continued growth and interest in this therapeutic option. By the late 1990s, of the 42% of individuals using at least one form of alternative therapy within the past 12 months, 11.1% received chiropractic care.[3] Furthermore, nearly 8% of adults and 2.8% of children received chiropractic or osteopathic manipulative therapy in the prior 12 months.[2]

An important principle of chiropractic care involves functional reactivation of the patient. Whereas spinal manipulative therapy (SMT) remains a central feature of chiropractic care, this modality may be used in combination with rehabilitative exercises, ice, heat, electric stimulation, ultrasound, and encouragement of healthy lifestyle modifications. During the course of treatment, the gradual return to activity is encouraged. Ongoing reassessment helps ensure a path toward optimal recovery.[4]

The goals of SMT are to restore dysfunctional joint mechanics and to reduce mechanical stress on the adjacent tissues, thereby reducing pain. Three types of SMT have been described, including unloaded spinal motion, manual repetitive oscillations, and high velocity low amplitude (HVLA) manipulation. Unloaded spinal motion involves continuous passive motion with motorized tables and manual application of flexion-distraction techniques. HVLA manipulation is performed by delivering a quick, impulse-like thrust within a joint's range of motion. The chiropractor may choose a specific SMT technique considering such factors as the patient's age, stature, and diagnosis.[5]

Various theories have attempted to explain the benefits of chiropractic manipulation. Examples include the release of plica or entrapped synovial folds, the relaxation of hypertonic muscle by sudden stretch, the disruption of articular or periarticular adhesions, and the restoration of normal motion to displaced joints or vertebral segments.[6] The biomechanics of chiropractic manipulation have been well described by Triano.[5] Indications for SMT include focal tenderness to palpation, abnormal tissue tone, symptoms reproduced with provocative testing, and joint dysfunction or reduced mobility. Contraindications for SMT are listed in **Box 1**, including instability, infection, myelopathy, and so forth.[4]

Research has shown short-term treatment effect of SMT with exercise. A 2004 Cochrane review of mechanical neck disorders reported that mobilization and/or manipulation combined with exercise compared with no treatment led to improved function, pain reduction, and perceived effect.[7] A subsequent review of subacute and chronic neck pain reported that the combination of mobilization, manipulation, and exercise demonstrated greater short-term pain relief and quality of life improvements than exercise alone. Greater short-term pain reduction was also achieved in patients with acute whiplash with the combination of chiropractic treatment and exercise compared with traditional care, defined as any two of the following: cervical collar, advice, or pain medication. Radicular symptoms were not assessed.[8] Results from The Bone and Joint Decade (2000–2010) Task Force on Neck Pain and Associated Disorders showed education, mobilization, and exercise to be more efficacious than usual care or physical modalities for whiplash-associated disorders.[9]

Recent reviews have also demonstrated some benefits of SMT for neck disorders when used alone. A 2010 Cochrane review demonstrated "low-quality" evidence that neck manipulations for acute or chronic cervical conditions reduce pain in

Box 1
Contraindications to SMT

Relative contraindications
- Acute disk herniation
- Osteopenia
- Spondyloarthropathy
- Patient on anticoagulant medication
- Bleeding disorder
- Psychologic overlay
- Hypermobility

Absolute contraindications
- Progressive neurologic deficit
- Destructive lesions, malignancies
- Acute myelopathy
- Unstable os odontoideum
- Healing fracture or dislocation
- Avascular necrosis
- Bone infection
- Segmental instability
- Cauda equina syndrome
- Large abdominal aortic aneurysm
- Referred visceral pain
- Long-term repeated manipulation with symptom relief lasting less than 1 day
- Recognized secondary gain, malingering

Data from Liebenson C. Rehabilitation of the Spine. A practitioner's manual. Philadelphia: Lippincott Williams & Wilkins; 2007. p. 3–29; 72–90; 487–509; 753–75; 852–85.

comparison to controls. In addition, "very low to low-quality" evidence exists that thoracic spine manipulation alone provides immediate reduction in acute neck pain or whiplash symptoms.[10,11] Neck pain can be related to aberrant thoracic spine biomechanics, such as decreased thoracic spine mobility.[12] Thrust mobilization or manipulation showed greater short-term reduction in neck pain and disability than non-thrust technique.[13]

The most common side-effects of manipulation are generally benign and self-limited. In a prospective survey of 1058 patients undergoing 4712 treatments, the most common side-effects included local discomfort (53%), headache (12%), tiredness (11%), and radiating discomfort (10%). These effects tended to occur within 4 hours of treatment and were characterized as "mild" or "moderate" in the majority of patients. The majority experienced resolution within 24 hours without serious complications.[14] In a systematic review of SMT for neck pain, side-effects were also benign and transient, including radicular symptoms, headache, or exacerbation of neck pain.[10] The risk of minor symptoms appeared to be greater with manipulation versus mobilization in the report from the Bone and Joint Decade Task Force.[9] The risk of vertebrobasilar artery

(VBA) stroke has been estimated as 1 in 200,000[15] to 1 in several million.[16] A case-control study demonstrated that the risk of VBA stroke associated with chiropractic care was not significantly different than for primary care practitioners.[17]

Functional reactivation of the patient focuses on the patient's symptoms; dysfunction such as impairment, abilities, and participation in vocation and recreational activities; and distress. The goals of functional reactivation are to avoid inactivity, which can result in a deconditioned state, and to encourage a gradual, safe return to activities. Manual therapy, including SMT, is an integral part of chiropractic care that may be used alone or in combination with rehabilitative exercise, ice or heat, electric stimulation and ultrasound, and modification of lifestyle factors. The decision to apply SMT for the management of neck pain is a multifactorial process based on history, physical examination, and clinical assessment of the benefit to risk relationship in the context of patient preference.

ACUPUNCTURE

Acupuncture involves the insertion of needles into the body to achieve a treatment effect. Needle types and sizes vary, as do the techniques and theories behind their application. In the classical context, needles are inserted into well-defined, anatomic points on the body with the goal of influencing and normalizing the circulation of chi energy. The Chinese character for chi (also spelled qi) is translated as "rice vapor," and represents an energy gleaned from digested food and inspired air. Each person is bestowed with a certain amount of original energy at birth as well. Depending on the subtype of chi, it can flow around the body's surface to defend against external pathogens, along deeper channels or meridians, or from organ to organ in a cyclical pattern. Any imbalances in this flow, whether due to deficiency, excess, or blockage of chi, can result in disease states.

Using acupuncture needles, deficient chi can be tonified, excess chi can be dispersed, and obstructed chi can be dispelled with a series of treatments. Tonification of chi begins by inserting needles along the acupuncture points involving the deficient meridian or organ. Needle insertion is followed by one or more methods of tonification, including manipulating the needles manually, holding a burning, glowing moxa herb (*Artemmisia vulgaris*) near the inserted needles, or by applying low frequency (eg, 4 Hz) electrical stimulation via electrodes clipped to the needles. Dispersion of excess chi can be accomplished by leaving the inserted needles in place undisturbed. Obstructions in the flow of chi can be dispelled by inserting needles along the channel before and after the obstruction. High-frequency electrical stimulation can be applied to augment the effect. Some practitioners may also use herbal medicines, either alone or concurrent with acupuncture treatments, to further influence and harmonize chi.

Acupuncture can employ other paradigms besides influencing chi flow through channels and meridians. Ah Shi points, which are defined by the site of maximal tenderness to palpation rather than by anatomic landmarks, can be needled with the goal of reducing pain. The Japanese surface release technique involves insertion of numerous superficial needles over the affected area, with the idea that the effect penetrates to deeper levels. In auricular acupuncture and Korean hand acupuncture, the body as a whole is represented somatotopically on the ears or the hands, respectively. Local needles inserted into these somatotopic microsystems are thought to have therapeutic effects on the part of the body that is represented at the needle tip. These microsystems can be used alone or at the same time as other treatments to enhance the overall effect.

The heterogeneity of acupuncture interventions and difficulty in blinding present a challenge for reviewing the use of acupuncture for mechanical neck disorders (MND). Birch and Jamison[18] (1998) compared Japanese-style shallow needling of relevant points with sham treatment needling irrelevant points in patients with mechanical neck disorders. A significant treatment benefit was measured. White and colleagues[19] (2000) compared an acupuncture treatment involving needle insertion and stimulation to a sham treatment without needle stimulation and again found a treatment benefit measured at the end of the treatment. However, while showing a clinical effect in favor of acupuncture for MNDs, these studies scored at most 2/5 on the validated Jadad 1996 criteria for methodological quality.

A randomized, controlled trial examining standardized acupuncture needle points versus control points for neck and shoulder pain by He and colleagues[20] (2004) showed no significant effect on pain intensity until 6 to 7 treatments were completed. The investigators concluded that 8 to 10 acupuncture treatments should be given within a few weeks for relief of neck and shoulder pain. In this study, the treatment group had less intense pain than the control group at 3-year follow-up, but not at 6-month follow-up. The investigators surmised the duration of the treatment effect was probably due to breaking the patient's chronic pain cycle, rather than the acupuncture treatment effect persisting for 3 years. In addition, the lack of significant effect at 6-month follow-up may have been due to the persistence of a placebo effect on the control group at 6-months, which was not as robust at 3 years.

Acupuncture for MNDs has also been studied in comparison to nonsham controls. Coan and colleagues[21] (1982) showed that acupuncture is more effective at pain relief than a wait-list control for patients with chronic mechanical neck pain and radicular symptoms with Jadad score 3/5. Irnich and colleagues[22] (2001) showed acupuncture to be significantly better than massage for MNDs at short-term follow-up (<3 months) with Jadad score 2/5. A meta-analysis of three trials[22–24] performed by The Cochrane Collaboration showed moderate evidence (three trials, 338 participants) that acupuncture is more effective than inactive treatment for pain relief for patients with chronic MND measured at short-term follow up.[25] In the intermediate (3–12 months) and long-term follow-up categories (>12 months) in this Cochrane review, a single high-quality but underpowered study compared acupuncture with sham and showed no effect.

A cohort study by Blossfeldt[26] (2004) showed an overall success rate of 68% of acupuncture for chronic neck pain, with success defined as 50% or greater improvement of pain at the completion of three or more treatments. However, the study was not blinded, had no formal inclusion or exclusion criteria, did not include a control group, and treatments were individualized rather than standardized. Although Blossfeldt's study does not prove a treatment effect of acupuncture for chronic neck pain, it is an example of a relatively high level of self-reported patient improvement for a low-risk treatment. Of the 172 patients Blossfeldt treated, only two had complications, including one skin reaction and one migraine headache.

Acupuncture is a relatively safe modality for mechanical neck pain. A systematic review on the safety of acupuncture by Ernst and White[27] 2001 showed the most common adverse events were needle pain (1%–45%), fatigue (2%–41%), and bleeding (0.03%–38%). The incidences of syncope and feeling faint ranged from 0% to 0.3%. Pneumothorax was rare, occurring only twice in nearly a quarter of a million treatments. Overall, acupuncture for mechanical neck disorders is relatively safe. Some evidence exists that it has a beneficial clinical effect for pain relief in the short-term. Further studies are needed to clarify the possible long-term effects and to examine which treatment strategies work best for various cervical conditions.

TENS

TENS, or transcutaneous electrical nerve stimulation, is the application of a pulsed electrical current through the skin to peripheral sensory nerves for the control of pain. Muscle contractions may occur as a side effect, although they are not the primary goal as in neuromuscular electrical stimulation.[28] TENS is often applied via a portable unit consisting of a battery, signal generator, and electrodes. Currents are usually less than 100 mA with pulse rates ranging anywhere from 2 to 200 Hz. Placement of TENS electrodes is subjective, and painful sites, sites contralateral to the pain, nerves, trigger points, and even acupuncture points have been targeted.[29]

The advantages of TENS include relative comfort, rapid-onset of therapeutic effect, capability for continuous and portable use, and applicability to a variety of pain conditions. The main disadvantages are the relatively short-duration and poor carryover of the treatment effects.

Serious complications from TENS are rare. Manufacturer-listed contraindications include pregnancy, cardiac pacemaker, and epilepsy. Electrode placement over the anterior neck should be avoided, as carotid sinus stimulation could lead to vasovagal hypotension and glottic or laryngeal nerve stimulation could lead to laryngospasm and airway occlusion. Electrode placement near active malignancy should also be avoided without caution due to promotion of cell growth by electrical currents in vitro. Electrodes should be placed over healthy, normal skin due to the risk of damaging frail skin or causing burns in insensate skin. Contact dermatitis may occur, and hypoallergenic electrodes are available. Driving or operating potentially hazardous equipment should not be done during TENS.[30]

High frequency stimulation reduces pain by depolarizing type 1 afferents in muscle and skin which competes with signals from painful nerve endings per the Gate Theory of Pain. Low frequency stimulation (1 to 10 mA) is associated with the release of endorphins and serotonin.[28]

The choice of frequency may be directed by the clinical diagnosis. For example, in a randomized, double-blinded, controlled trial of 32 subjects, Walsh and colleagues[31] (1995) found that low-frequency TENS at 4 Hz was more effective in decreasing ischemically-induced pain than 110 Hz TENS, placebo, and no treatment. TENS at 2 Hz may be helpful for postoperative and radicular pain, although this intervention was not placebo-controlled.[32]

Three trials reported immediate posttreatment pain relief when using TENS for chronic cervicalgia in comparison to sham controls.[33–35] Frequencies varied from 60 to 143 Hz and schedules varied from 1 to 10 treatments. Various studies have examined the addition of TENS to other treatment modalities. Chiu and colleagues[36] (2005) compared three groups consisting of infrared irradiation, infrared irradiation plus TENS, and infrared irradiation plus exercise. When infrared irradiation was combined with either TENS or exercise, subjects showed significant improvements in disability, isometric neck muscle strength, and pain scores. However, TENS was no more effective than exercise.

In another modality-combining study by Hou and colleagues[37] (2002,) the use of TENS for cervical myofascial pain was examined. Treatment groups consisted of active range of motion exercises plus warm packs versus the former combined with TENS and either ischemic compression of myofascial trigger points or stretch and spray technique. The groups combining TENS and a myofascial release technique showed significant improvements in pain tolerance and visual analog scale pain scores.

Hendriks and Horgan[38] (1996) studied the addition of Ultra-Reiz TENS at 143 Hz to a treatment regimen of ice, physiotherapy, postural education, and cervical collar use

for patients with acute whiplash-associated disorders. The addition of Ultra-Reiz TENS to the treatments resulted in significant pain intensity reduction and improved cervical range of motion at the end of a 6-week treatment regimen. However, the outcome assessor may not have been blinded.

Nordemar and Thorner[39] (1981) compared the effects of TENS, cervical collars, and manual therapy for acute cervical pain. Improvement was rapid in all groups, although TENS use led to more rapid restoration of cervical mobility. Farina and colleagues[40] (2004) examined the effect of TENS at 100 Hz compared with frequency-modulated electromagnetic stimulation from 1 to 40 Hz (FREMS) and both were shown to be similarly effective at visual analog scale pain score reduction.

In a study by Escortell and colleagues[41] (2010) patients with mechanical neck disorders were randomized to either TENS at 80 Hz or manual therapy (neuromuscular techniques, post-isometric stretching, spray and stretch, and Jones technique.) Both treatments resulted in greater than half of the patients having significantly reduced visual analog scale pain scores at short-term follow-up. Neither treatment was shown to be more effective. Success rates decreased to one-third of patients at a 6-month follow-up.

A recent Cochrane review by Kroeling and colleagues[42] (2010) summarized the evidence for TENS for neck pain. This modality might be more effective than placebo, but has not been shown to be more effective than other interventions. When assessing the included trials, funding biases and small sample sizes were considered. The quality of available evidence, as per the review authors, was low to very low. It has been noted by other investigators that proper blinding of TENS for research purposes is difficult.[43] Further research may change estimations of the effectiveness of TENS on cervical disorders.

MASSAGE THERAPY

Massage is one of the oldest healing arts. Chinese records dating back 3,000 years document its use; the ancient Hindus, Persians, and Egyptians applied forms of massage for many ailments; and Hippocrates wrote papers recommending the use of rubbing and friction for joint and circulatory problems.[44] Goals of massage are to restore the patient to optimal function, help prevent future injury, promote better posture, and create more efficient use of muscle activation.

The most commonly involved tissues in a patient with neck pain are the sternocleidomastoids, scalenes, upper trapezius, levator scapulas, splenius capitis, pectoralis, and intercostals as well as the surrounding fascia. Excessive tension in any or all of these tissues, bilaterally or unilaterally, can produce mild-to-severe discomfort, compromise natural mobility, create pathologic cervical vertebral alignment, and can activate headaches.[45,46]

Massage techniques are too numerous to describe in specific detail for scope of this article, but most fall under one or more of the categories of: “effleurage” or gliding; “petrissage” or kneading; “tappotement” or tapping; and friction, including static pressure, myofascial release, cross fibril, and vibration. All of these techniques elicit mechanical compression and stimulation to soft tissue.[47]

Massage therapy has been shown to have direct benefits, including improved circulation, cumulative rise in oxytocin, decrease in basal hypothalamic-pituitary axis activity, enhanced feelings of relaxation, increased feelings of well-being, and reduction in measures of anxiety, depression, and pain.[48,49] Massage also has been shown to increase serotonin levels and promote reduction of analgesic use.[45]

Chen and Grinnel[50] (1995) found that stretching skeletal muscle in the physiologic range more than doubled the spontaneous release of acetylcholine from its motor nerve terminal. This raises end-plate potentials, which causes activation of integrins in the cytoplasmic membrane and an increase the activation of calcium. Thus, massage, particularly myofascial techniques, may improve muscular performance and tone.

Massage has the added benefit of increasing blood and lymphatic fluid flow. Studies have shown that mechanical energy is able to stimulate new capillary formation of arterial, venous, and lymphatic vessels.[51,52] These also showed that smooth muscle cells significantly increased production of collagen after the application of mechanical stimuli. In addition, mechanical signals (ie, produced by static friction or pressure incorporated in massage) are able to augment cell proliferation (especially fibroblasts), stimulating the healing process at the site of injury.[53] As a result of the mechanical effect of massage strokes, more blood is pushed through the massaged area. As such, massage strokes support the venous and lymphatic drainage from the massaged area.[47]

Survey studies document that recipients of massage have improved joint mobility and pain reduction.[54] For this reason, some institutions have integrated massage into patient care programs. A study of 24 hospitalized patients with neck pain at the University of South Carolina found that pain scores were significantly reduced immediately following therapeutic massage.[55,56]

A combination of massage techniques applied to the cervical, shoulder, and upper back musculature can increase cervical active and passive ranges of motion, reduce reported headache severity, and reduce pain complaints. These changes can often be achieved in a few sessions. To be most effective, massage treatment should be followed up by patient education regarding proper diaphragmatic breathing techniques for relaxation, cervical stretches to maintain the length relationships achieved by the massage, as well as strengthening exercises for the muscles of the cervical spine. Contraindications to massage include cancer, unstable fractures, severe hypertension, fever, contagious skin condition, and tumors.

YOGA

Yoga is a popular mind-body exercise that couples physical exercise with mental focus through breathing and meditation. There has been a dramatic increase in the popularity of yoga in America over the last decade. In 1998, a United States national survey estimated that 15.0 million American adults used yoga at least once in their lifetime and 7.5 million during the previous year. Participators reported using yoga for both wellness and health issues; specifically, 21% of respondents used yoga in the previous 12 months for back or neck pain.[57] More recently, according to Yoga Research and Education Council statistics, 15 million Americans practiced yoga more than three times weekly in 2003.[58]

Although there are no published studies on the effectiveness of yoga for neck pain, there are several studies focusing on the role of yoga in managing chronic low back pain (CLBP). In 2005, Williams and colleagues[59] evaluated the efficacy of a yoga intervention compared with an educational control group on pain-related outcomes in patients with CLBP. They showed that yoga could significantly reduce pain and disability and decrease use of pain medications in CLBP patients. Sherman and colleagues[60] conducted a randomized controlled trial in 2005 comparing the effect of yoga classes to conventional exercise classes and a self-care book in patients with CLBP. They concluded that yoga was more effective in reducing pain and improving functional status than a self-care book. More recently, in 2009 Williams and colleagues[61] published another study on the effectiveness and efficacy of yoga

for CLBP compared with standard medical care. They found that yoga reduced pain intensity and functional disability in patients with CLBP; there was also a trend in the yoga group to reduced pain medication usage.

There are also several studies on the effect of yoga on stress, anxiety, and depression. A pilot study by Woolery and colleagues[62] in 2004 found a yoga program to be beneficial on psychological outcomes in mildly depressed patients. Michalsen and colleagues[63] reported that a yoga program markedly alleviated perceived stress and related anxiety and depression symptoms in distressed women. Interestingly, the effect of yoga on mood may be immediate. West and colleagues[64] found a single 90-minute yoga class reduced perceived stress and negative mood directly after the yoga practice in healthy subjects.

It follows that yoga may have similar benefits for patients with neck pain. Patients with chronic neck pain may have associated biomechanical deficits, including poor posture, contracted upper neck muscles, and weak scapular stabilizers. With chronic neck pain, there may also be associated symptoms of stress, anxiety, or depression. Because of yoga's physical emphasis on postural restoration, flexibility, and strengthening; and mental emphasis on relaxation and meditation; it may reduce pain, improve function, and lower stress, anxiety, and depression in patients with chronic neck pain.

Physically, yoga focuses on improving patient posture, flexibility, and strength. One of the goals of the asanas, or postures, is to re-establish a normal cervical curve or neutral cervical spine. One achieves this by cultivating a conscious awareness of alignment throughout the yoga practice, during all standing and sitting poses. Another focus of the asanas is to improve flexibility. In some instances, upper neck muscles, including the upper trapezius and levator scapulae, can assume a state of constant isometric contraction against the weight of the head and downward pull of gravity. The anterior chest muscles such as the pectoralis also become contracted. The focus of several asanas is to bring awareness to the upper trapezius and levator scapulae, and attempt to reduce unconscious contraction of these muscles. For the pectoralis muscles, many asanas focus on lifting and opening up the chest. After flexibility is achieved in the tight muscles, focus shifts to strengthening weak muscles. In chronic neck pain, the lower trapezius and rhomboids, important stabilizers of the spine, can become weak. Several poses activate scapular stabilizers, lower trapezius, and rhomboids.

In addition to the physical focus on posture, flexibility, and strength, yoga's mental focus through breathing and meditation targets stress and anxiety. Pranayama, the breathing technique used with asana, can be a powerful way to relax and is considered by many to be the first step toward relieving neck tension. Meditation has also been shown to be effective in managing chronic pain. Kabat-Zinn[65] studied 51 chronic pain patients, including those with low back, headache, neck, and shoulder pain, in a preliminary cohort study. A 10-week stress reduction and relaxation program taught patients hatha yoga, emphasizing mindfulness, self-regulation, meditation, and detached observation, which theoretically "uncouples" the sensory experience from the "affective alarm reaction." At 10 weeks, 50% of subjects had pain score reductions of greater than or equal to 50%. A follow up study of 12 cycles of classes over a 4-year period totaling 225 subjects was later conducted by Kabat-Zinn and colleagues.[66] These subjects engaged in the same methods of stress reduction described in his preliminary work. When questionnaires were given to these groups of cohorts, 60% to 72% of subjects rated their pain as "moderate" or "great improvement" and 30% to 55% rated their pain as "greatly improved." Only 1% to 15% rated their pain as worse and 25% rated their pain as the same. Eighty-six percent reported that they gained something of lasting value or importance. Of the subjects, 115 reported free comments in questionnaire. Of these, 20% reported a "new outlook on life" and

40% reported ability to control, understand, or cope better with pain and stress. At 4 years, 81% of respondents reported that they still meditated. Depending on follow-up interval of these cohorts, 40% to 70% of responders reported that they still practiced yoga. Rosenswaig and colleagues[67] recently investigated effects on 133 subjects who underwent 8 weeks of mindfulness training, focusing on meditation techniques, including body scan, awareness of breathing, awareness of emotions, mindful yoga and walking, mindful eating, and mindful listening. Subjects with back or neck pain (n = 35) showed significant improvement on six of eight Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) indices, including bodily pain.

Patients with a recent injury such as a motor vehicle collision or fall; radicular pain in the arms or legs; neurologic symptoms such as paresthesias, weakness, or gait instability; persistent or recurrent pain; or dizziness and nausea should seek medical evaluation and clearance before starting a yoga practice. Also, some poses should be avoided in patients with neck pain as they can strain the neck and lead to serious injury. In the absence of these contraindications, yoga can be helpful in diminishing pain, improving function, and reducing stress and anxiety in patients with neck pain. As with many modalities, more well controlled randomized studies are needed to further evaluate the role of yoga in managing neck pain.

TAI CHI CHUAN

Tai chi chuan (tai chi) is an ancient Chinese martial art that focuses on slow, controlled, continuous movements coordinated with breathing, resulting in motion meditation.[68] The swaying movement of Tai Chi demands more range of motion and its slow speed creates less impact forces than walking. Modern styles of tai chi trace their development to the five traditional schools: Chen, Yang, Hao, Wu, and Sun. Traditional Chinese medicine theorizes that disease results when the flow of Qi (internal energy) is blocked and when there is disharmony between yin and yang forces. Tai chi can balance these forces along with improving function through movement and medication. Most research is conducted on the Sun and Yang styles, although many research studies do not mention the style of tai chi in their intervention.[69] The Sun style is currently endorsed by the US Arthritis Foundation as low impact exercise that can reduce joint pain.[70]

Between 1974 and 2010, approximately 475 English studies on the benefits of tai chi were published; 20% of these were randomly controlled trials.[71] Overall, these studies show some physical and psychological benefits. Unfortunately, most studies compare tai chi to no other intervention, and there are no direct studies on tai chi and neck pain. The strongest proven benefit of tai chi is improved balance and fall reduction, which can prevent exacerbations of neck pain and may improve head-down posture, commonly observed in those fearful of falling.[72] Chen also found that tai chi practice was associated with less fear of falling, increased confidence in balance and movement, increased overall well-being, and improved body stability.[73] Some studies state that tai chi may improve sleep, decrease tension, reduce anger, and improve self-esteem, but likely not more than other interventions that include meditation.[74,75] A 15-week intervention of tai chi practice was effective in reducing the impact of life on tension headaches.[76] Several of these studies showed better posture stability in the elderly and improved posture in young adults. One study of 56 people measured range of motion and found a lessening of “poking chin,” head tilting, and shoulders level.[77] A longitudinal study found people who practice tai chi for years had better eye-hand coordination with fewer submovements when attempting a task.[78] Tai chi has been shown to increase general function in specific diseases of osteoarthritis,[69,79] rheumatoid arthritis,[71] and ankylosing spondylitis.[80]

Although tai chi has not been shown to worsen any disease process with tender swollen joints,[71] research suggests that there is no benefit in joint disease modification. In addition, it has not been shown to increase strength or flexibility of the upper extremities.[79]

Tai chi has a significantly higher level of participation than physical therapy. This can be attributed to the benefits of group therapy, having a mind-body intervention,[75] and being more appealing than range of motion exercises.[71] Tai chi also has the benefit of being considered safer than most forms of exercise,[69] although studies do report individuals dropping out due to knee or back pain.[72] In one small study, 14% of tai chi students (or 2 people out of 14) had injuries compared with 30% of those practicing karate. Training greater than 3 hours per week was also a significant predictor of injury.[81]

Although there are no studies specifically on the use of tai chi for neck pain, this modality may benefit patients when neck pain is associated with poor neck posture and stress. Tai chi's mind-body component might help it be a more effective and satisfying intervention than physical therapy, and it is safe to recommend to even frail patients.[71] Future studies need to be done to better understand the association of tai chi with neck pain and functional outcomes.

FELDENKRAIS

The Feldenkrais Method of somatic education offers a clinical tool to help alleviate neck pain and to restore natural function. A practice of neuromuscular re-education that allows a person to sense their whole self more clearly, Feldenkrais may be used for headaches, cervicalgia, postlaminectomy symptoms, degenerative disc disease, thoracic outlet syndrome, postural malalignment, hyperlordosis, and flat cervical spine.

This modality is named after its founder, Moshe Feldenkrais DSc (1904–1984), and consists of two trademark lesson plans: Awareness Through Movement (ATM) and Functional Integration. ATM lessons can be taught in a group setting where a practitioner verbally guides the patients through a sequence of gentle, pain-free movements with the goal of becoming more deeply aware of their own biomechanics.

Functional Integration lessons are individualized sessions where the practitioner communicates through gentle touch, guided movements, and verbal cueing, to lead the patient toward sensing tension and patterns that contribute to deficient functioning. The patient stays fully clothed and is always an active participant in the healing process. The learning process is facilitated by moving in pain-free ranges, thus avoiding sympathetic arousal that could exacerbate symptoms.[82,83] The intended outcome of Feldenkrais lessons is that the patient moves with increased fluidity, greater active range of motion without increased effort, decreased pain, and an improved sense of well-being.

The Feldenkrais principle of maximum efficiency with minimal effort allows a patient to learn through experience and sensation, to function with less joint strain, less biomechanical error, and decrease the kinematic wear and tear on joints that shows up as dysfunction.[84,85]

From the Feldenkrais perspective, guiding a patient with neck pain toward relief and recovery often requires looking beyond the cervical spine. Within this perspective, cervical pain can be literally originating from the neck, but could also be initiated from any number of other sources. These include insufficient breathing patterns, pelvic obliquities, insufficient differentiation of the eye or head movements, overuse of upper extremity musculature, restricted lumbar motion, or even a foot injury that causes malfunctioning up the skeletal chain. The practitioner observes the global

movement of a patient with neck complaints, then attempts to unravel any limitations of movement so that the original neck pain is diffused and function improves.

In a randomized control trial comparing physiotherapy and the Feldenkrais method in a control group in female industrial workers with neck and shoulder pain, Lundblad and colleagues[86] found that the Feldenkrais group showed significant decreases in neck and shoulder complaints and in disability during leisure time. The two other groups showed no change (physiotherapy group) or worsening of complaints (control group).

The efficacy and cost of using group Feldenkrais lessons with chronic pain patients was studied by Bearman and Shafarman.[87] Medicaid recipients with chronic headaches and/or musculoskeletal problems reported more mobility and decreased perception of pain, both immediately after the program and in a 1-year follow-up questionnaire, using the National Pain Data Bank protocol of the American Academy of Pain Management. Patient costs dropped from an average of $141 per month to $82 per month, representing a 40% savings.[87]

Quantifying the goal of achieving functional movement with less effort and greater efficiency was studied by Brown and Kegerris.[88] This small study used 21 subjects, divided into two groups, to measure the muscular activation during an ATM class by use of electromyographic biofeedback equipment. It also recorded subjects' perceptual recognition of changes and whether such perceived changes were due to use of suggestion, imagery, and visualization. Both groups received the same 45 minute lesson; one listened to the lesson in its entirety, while the other received an edited version where all references to imagery, visualization, or cues pertaining to lightness, comfort, or ease were removed. Both groups showed a decrease in electromyographic activity and in perceived exertion. Although not compared with any control groups, the experimenters concluded, "This study supports the use of Feldenkrais Method clinically for increasing attention to posturing, movements, and changes in muscular activity."[88]

In another study by Kerr and colleagues[89] (2002), the State-Trait Anxiety Inventory[90,91] was administered to volunteers at the beginning and end of the first, fifth, and tenth (final) 1-hour ATM lesson. Although there was no control, an overall significant decrease in anxiety scores was measured. Although many subjective reports of improvements in quality of movement and pain relief from the Feldenkrais method exist, future clinical studies using standardized outcome tools are needed to help objectify these improvements.

SUMMARY

Of the multitude of treatment options for the management of neck pain, no obvious single treatment modality has been shown to be most efficacious. As such, the clinician should consider alternative treatment modalities if a modality is engaging, available, financially feasible, potentially efficacious, and is low risk for the patient. As evidence-based medicine for neck pain develops, the clinician is faced with the challenge of which treatments to encourage patients to pursue. Treatment modalities explored in this article, including chiropractic, acupuncture, TENS, massage, yoga, tai chi, and Feldenkrais, represent reasonable CAM methods to offer patients with neck pain.

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