CHIROPRACTIC EVALUATION AND MANAGEMENT

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Practitioners have seen a recent proliferation in the use of chiropractic on horses. Nevertheless, because veterinarians have not been formally educated in chiropractic principles or techniques in their traditional training, many practitioners do not understand the basic premise behind chiropractic or its indications or contraindications. In addition, only limited research has been done to evaluate the clinical use of chiropractic techniques on quadrupeds. Veterinary medicine, for the most part, has been forced to acknowledge the use of animal chiropractic and other nontraditional modalities by owners who have sought practitioners who use these techniques and have experienced their perceived therapeutic effects.[43] If veterinarians have not taken the time or effort to learn about these nontraditional techniques, objectively evaluating the use of chiropractic on horses or discussing the indications for a specific treatment modality is difficult. Therefore, owners often seek advice about alternative therapies or treatment from someone who is not their regular veterinarian, often without the knowledge of their veterinarian. In addition, some individuals claim to be "equine chiropractors," but they are not professionally trained or licensed in either chiropractic or veterinary medicine. Chiropractic requires a working knowledge and understanding of vertebral anatomy, physiology, biomechanics, pathology, and rehabilitation. The purpose of this article is to describe the principles, indications, and contraindications for equine chiropractic evaluation and treatment.

WHAT CHIROPRACTIC HAS TO OFFER TO VETERINARY MEDICINE

The prevalence of back problems in horses varies greatly (0.9%–94%) depending on the specialization or type of practice surveyed: general practice

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(0.9%), Thoroughbred racehorse practice (2%), veterinary school referrals (5%), mixed equine practice (i.e., dressage, showjumpers, eventing) (13%), spinal research clinic (47%), or equine chiropractic clinic (94%).[18] Chiropractic provides expertise in the evaluation of joint- and spinal-related disorders and can provide an additional means of diagnosis and early treatment options in certain types of gait abnormalities or performance problems, especially conservative treatment of mechanically related musculoskeletal disorders. Prepurchase examinations using chiropractic examination techniques can also help to identify horses that have chronic underlying neck or back problems.[41] Chiropractic addresses subclinical conditions or abnormal biomechanics that may progress to future debilitating musculoskeletal injuries. Chiropractors are also trained in the use of physiotherapy techniques, strength training exercises, massage, stretching techniques, and other forms of musculoskeletal and nerve rehabilitation. Equine chiropractic is a complementary modality that can be used in veterinary medicine for the diagnosis, treatment, and potential prevention of select musculoskeletal disorders in horses.

CHIROPRACTIC PRINCIPLES

The word "chiropractic" is derived from the Greek words *cheir*, meaning "hand," and *praktike*, meaning "business" or to "practice." The purpose of chiropractic is to optimize health through the body's inherent healing ability as affected by and integrated through the nervous system. The practice of chiropractic focuses on the relationship between structure (primarily the vertebral column) and function (as coordinated by the nervous system) and how that relationship affects the preservation and restoration of health. Chiropractic is a form of manual therapy that uses short-lever, high-velocity, low-amplitude, controlled thrusts. Forces are applied to specific articulations or anatomical regions to induce a therapeutic response via induced changes in joint structures, muscle function, and neurological reflexes. The principle common to all chiropractic theories is that joint dysfunction affects the normal neurological balance found in healthy individuals. The theory of a "bone out of place" is outdated and not supported by current spinal research.

BACK PROBLEMS IN HUMAN MEDICINE

In humans, 60% to 80% of the general population suffers low back pain at some time in their lives.[27] Most individuals recover within 6 weeks, but 5% to 15% of patients are unresponsive to treatment and have continued disability that accounts for 75% to 90% of the total costs related to managing this disorder. Recurrence rates of low back problems in humans range from 22% to 62% within 1 to 4 years. From these human statistics and equine clinical experience, it could be implied that most back problems in horses fortunately resolve on their own, despite what we do as practitioners. In a study of 190 horses with chronic back problems, irrespective of diagnosis or treatment, 57% recovered completely, 17% had no improvement, and 38% had recurrence or continuance of signs of back pain.[17] It is often difficult to predict which horses have back problems that are self-limiting, which horses are likely to respond to treatment, and which horses are likely to become permanently disabled.

Most human patients with low back pain do not have structural pathological conditions that can be clearly diagnosed as the cause of their symptoms.[3] A

poor correlation often exists between radiological and clinical signs of vertebral pathology. Traditional medicine has focused on structural pathology, whereas chiropractic focuses more on musculoskeletal dysfunction. The goal of structural diagnosis is to localize and identify the nature of the lesion. A functional diagnosis requires the investigation of functional relationships, regional interactions, and the organism as a whole.[27] Acute pain is often directly related to painful stimuli and tissue injury. Chronic pain is attributable only partially to physical events or nociceptive influences, however. Illness behaviors such as anxiety, inactivity, and pain avoidance are major factors in chronic pain.[27] In acute situations in which nociceptive factors predominate, the patient's activity level should be guided by pain as a warning of impending injury. In cases of chronic pain, the focus should be on functional reactivation and not on pain avoidance, as most structural healing has already occurred.[27] Management of back pain should be geared toward identifying the underlying functional disorder or deconditioning syndrome and early aggressive conservative therapy. Nonspecific back pain is most likely related to functional impairment and is not a structural disorder. Therefore, back pain may be related to muscle or joint dysfunction with resultant soft tissue irritation and pain generation.[27] Musculoskeletal health depends on movement and use. Scientific evidence suggests that long-term rest is contraindicated for back pain.[1, 34]

PHYSIOLOGY OF JOINT MANIPULATION

A vertebral motion segment is the functional unit of the spine and includes two adjacent vertebrae and the associated soft tissues that bind them together. Joint motion can be categorized into three zones of movement: physiological, paraphysiological, and pathological (Fig. 1). The physiological zone of movement includes both active and passive ranges of motion and is the site where joint mobilization occurs. The paraphysiological zone of movement exists outside the joint's normal elastic barrier and is the site of joint cavitation. The normal elastic barrier of the joint is a semirestrictive anatomical barrier between the physiological and paraphysiological ranges of motion. The pathological zone of movement lies outside the limits of normal anatomical joint integrity and is characterized by joint injury (e.g., sprain, subluxation, or luxation). Vertebral motion segment injury may cause altered proprioception, protective muscle guarding, altered intervertebral disc and joint biomechanics, and increased tension and stress in the joint capsules and adjacent ligaments.[11, 26]

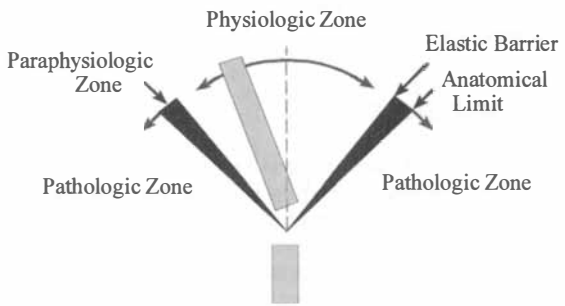

Figure 1. Three zones of articular motion.

The goal of chiropractic treatment is to restore normal joint motion, stimulate neurological reflexes, and reduce pain and muscle hypertonicity. Successful manipulation requires proper technique (i.e., correct direction, force, amplitude, and velocity) and heightened psychomotor skills.[11] A thorough knowledge of vertebral anatomy and joint biomechanics is required for proper chiropractic evaluation and treatment. During a successful adjustment, a "release" or movement of the restricted articulation is often palpable. An audible "cracking" or "popping" sound may also be heard during adjustment as the applied force overcomes the elastic barrier of joint resistance.[4, 31] The rapid articular separation produces a cavitation of the synovial fluid.[14] Radiographic studies after adjustment have shown a radiolucent cavity within the joint space (i.e., vacuum phenomenon) that contains 80% carbon dioxide and lasts for 15 to 20 minutes.[37] A second attempt to recavitate the joint is going to be unsuccessful and potentially painful until the intra-articular gas has been reabsorbed (i.e., refractory period).

PATHOPHYSIOLOGY OF SPINAL SEGMENTAL DYSFUNCTION

Spinal segmental dysfunction (i.e., chiropractically defined "subluxation") is a vertebral lesion characterized by (1) asymmetrical or loss of normal joint motion in one or more planes, (2) an altered point tenderness or diminished pain threshold to pressure in the adjacent paraspinal tissues or osseous structures, (3) abnormal paraspinal muscle tension, and (4) visual or palpatory signs of active inflammatory processes or chronic tissue texture abnormalities (i.e., edema, fibrosis, hyperemia, or altered temperature).[26] Multiple theories have been proposed and tested over the years to explain the pathophysiology of spinal segmental dysfunction and its interactions and influences on the neuromusculoskeletal system.[11, 26] The vertebral subluxation complex is a theoretical model of spinal segmental dysfunction that incorporates the complex interaction of pathological changes in nervous, muscular, articular, ligamentous, vascular, and connective tissues.[9] Altered mechanical and biochemical processes influence the neuromusculoskeletal system in the following ways: altered joint mobility (hypomobility, hypermobility), altered articular neurophysiology and pain sensation (inhibition, facilitation), altered muscle function (hypertonicity, atrophy), connective tissue changes (fibrosis), and vascular alterations (ischemia, hyperemia).[26] Additionally, the inflammatory process influences all of these components to produce biochemical and cellular changes that result in distinct vertebral histopathology. The theory of a "bone out of place" is outdated and not supported by current spinal research.

ARTICULAR PATHOPHYSIOLOGY

The zygapophyseal joints are synovial articulations that undergo joint capsule pathology and articular degeneration like any other synovial joint. Articular degeneration usually progresses through three phases of pathology: dysfunction, instability, and degeneration.[25] Joint dysfunction is characterized by restricted joint motion, localized pain and inflammation, and abnormal paraspinal muscle hypertonicity. Restricted articular motion stimulates local biochemical alterations and the release of inflammatory products.[8] The inflammatory process can alter the intra-articular environment and further contribute to joint capsule pathology

and periarticular fibrosis. Muscle hypertonicity may restrict joint motion and contribute to adhesion formation. Joint immobilization also produces bone demineralization, capsular adhesions, and loss of ligamentous strength. Restoring joint motion leads to normal joint function depending on the amount and duration of the immobilization.[9] Joint motion is essential for the prevention of joint contracture and adhesion formation. Progressive joint immobilization is characterized by initial musculotendinous contractures followed by capsular and periarticular adhesions and eventually intra-articular adhesions.[9]

Joint degeneration continues, as the dysfunctional joint is unable to distribute normal biomechanical stresses. The instability phase of joint degeneration is characterized by cartilaginous, meniscal, capsular, and ligamentous deformation and degeneration. Abnormal joint and paraspinal tissue biomechanics induce additional subchondral bone changes and joint derangement. Reduced or asymmetrical motion in one vertebral motion segment may induce compensatory hypermobility in adjacent vertebral segments due to injuries to the joint capsule or ligamentous laxity. The increased joint mobility results in joint instability, joint derangement, and secondary muscle hypertonicity. Joint instability also affects the neurological influences of proprioception and the central neuromotor control of movement and posture.[27] Potential radiographic findings of articular instability may include osteophyte formation (i.e., traction spurs) or vertebral instability (i.e., listhesis). The vertebral degenerative phase is characterized by attempted stabilization of the degenerative tissues. Chronic joint immobilization can lead to fibrocartilaginous replacement of the joint cavity and eventual ankylosis.[20] Radiographic signs of advanced osteoarthritis and osteophyte formation, spinal ligament ossification, and spinal ankylosis can be visualized at this stage.

ARTICULAR NEUROPATHOLOGY

Articulations are involved in proprioception, nociception, and muscular and sympathetic reflexes.[32] Mechanical or chemical alteration in articular neurophysiology can affect both mechanoreceptor and nociceptor function. Mechanoreceptor stimulation induces both reflex inhibition and hypertonicity via altered local and systemic neurological reflexes. In response to chronic pain, new movement patterns are learned by the central nervous system (i.e., neuroplasticity and spinal learning) and adopted in an attempt to reduce pain sensation. Altered movement patterns are perpetuated by muscular imbalance and joint dysfunction that predispose the locomotor system to further injury. Long after the soft tissues have healed, adaptive vertebral movement patterns may continue to persist.[27] Treatment of altered movement patterns includes relaxation or stretching of hypertonic muscles, mobilization of restricted articulations, strengthening weak muscles, and re-education of movement patterns.

Nociceptor stimulation results in a lowered pain threshold, sustained afferent stimulation, and reflex paraspinal musculature hypertonicity.[11, 27] In humans, the vertebral articulations are a common primary source of pain. Like cutaneous and visceral pain, deep somatic pain is associated with cutaneous hyperalgesia, tenderness, reflex muscle spasms, and sympathetic hyperactivity. Prolonged and sustained muscle spasms produce additional nociceptive impulses that propagate and aggravate the initial injury. In humans, the musculoskeletal structures most sensitive to noxious stimuli are the periosteum and joint capsules.[23] Subchondral bone, tendons, and ligaments are moderately sensitive to pain. Muscles and cortical bone are less sensitive. Musculoskeletal pain (i.e., scleratogenous pain) is usually poorly localized to the lesioned structures or tissues compared

with dermatomal pain patterns. Deeper lesions usually produce aching generalized sensations, whereas superficial lesions produce sharp well-localized pain. Therefore, the most common indicators of spinal pain in horses are reduced vertebral motion, poorly localized pain, and poor performance. Chiropractic may affect mechanically related musculoskeletal pain via stimulating nociceptive reflexes and neuropeptides (i.e., endorphins and enkephalins).[26]

MUSCLE PATHOPHYSIOLOGY

A painful stimulus may cause certain muscles to become overactive, although other muscles may be inhibited.[27] Muscular imbalances produce restricted joint motion, altered proprioception, impaired reciprocal inhibition, and altered movement patterns. Musculotendinous disuse results in loss of strength, incoordination, atrophy, loss of flexibility, and further joint dysfunction. Postural or antigravity muscles (slow-twitch type 1 fibers) are most easily activated in muscular guarding and become hypertonic. The dynamic or phasic muscles (fast-twitch type 2 fibers) tend to be inhibited and undergo disuse and weakness. A hypertonic muscle has increased metabolic demands and may have focal areas of ischemia (i.e., trigger point).[27] A shortened muscle also biomechanically restricts and neurologically inhibits antagonistic muscles. As a result, altered joint biomechanics and further muscle fatigue or injury may occur. Immobilization-induced changes in muscles are often completely reversible depending on the length of immobilization, muscle fiber types, and resting muscle length.[42] The sequelae of immobilization may become permanent and outlast the primary injury. Spinal manipulation is thought to affect mechanoreceptors (i.e., Golgi tendon organ and muscle spindle) to cause muscle relaxation and correct abnormal motor patterns.[9]

HUMAN CHIROPRACTIC RESEARCH

Meta-analysis of human clinical trials of spinal manipulation show that spinal manipulative therapy is consistently more effective than other comparison treatments in the treatment of low back pain.[2] Most studies evaluate subjective measures of pain reduction, objective measures of altered vertebral range of motion, and functional measures of activities of daily living and work-related activities. Spinal manipulation affects mechanically related cervical and low back pain in humans.[5, 28] Human chiropractic studies have also shown improved vertebral motion after adjustment.[13, 29, 39] Palpatory changes in osseous symmetry postmanipulation are often associated with soft tissue alterations and not actual joint realignment.[27] Soft tissue responses such as those in joint capsules, muscles, ligaments, and tendons and postural neuromuscular reflex patterns should be the focus of future spinal manipulative studies rather than articular malpositioning (i.e., bone out of place).[36] Significant increases in muscle strength as measured by surface electromyographic signals have been recorded in peripheral muscles after passive cervical mobilization and cervical adjustments when compared with baseline levels.[30] Other researchers have not found consistent changes in the H-reflex in human patients with low back pain following manipulation.[16]

INDICATIONS FOR CHIROPRACTIC CARE

Chiropractic conditions in performance horses usually have a history of a traumatic event or injury related to overexertion.[40] Severe or life-threatening injuries may gradually improve but never totally resolve, or they improve for a short time but later develop debilitating arthritis or soft tissue fibrosis. Trailer accidents, falling over backwards, and dramatic falls over jumps are examples of some of these injuries. Injuries may also occur over a long period due to chronic or repetitive injuries associated with poor saddle fit, improper riding techniques, inadequate shoeing, or faulty conformation. Long periods of confinement, inconsistent training programs, overuse syndromes, or stresses and strains related to athletic activities may also predispose horses to musculoskeletal injuries and reduced performance. Chiropractic care can help to manage the residual muscular, articular, and osseous components of some of these injuries in performance horses. Older horses, just like elderly humans, are susceptible to loss of spinal flexibility, joint degeneration, and loss of muscle strength. Aged horses also have increased healing times and increased chances of having chronic conditions or abnormal musculoskeletal compensations from prior injuries.

Chiropractic treatment addresses mechanically related disorders of the nervous or musculoskeletal system. Chiropractic care can provide a conservative means of treatment for horses with back problems and may also help in the prevention of some mechanically related disorders. Research suggests that spinal manipulation may also affect certain neurological and visceral disorders (e.g., cardiovascular, respiratory, gastrointestinal) via somatovisceral reflexes in both animals and humans.[11, 26] Trained animal chiropractors should be able to evaluate spinal disorders and determine if a back problem is going to be potentially responsive to chiropractic care or if the condition would be better managed with traditional veterinary care. Unfortunately, chiropractors are often asked to treat animals as a last resort when all else has failed or when the disease has progressed to an irreversible condition. Chiropractic care has helped some of these chronic conditions when other types of treatment have failed; however, it is usually much more effective when employed earlier in the course of a disease.

EQUINE CHIROPRACTIC PRACTITIONERS

Due to its potential misuse, chiropractic evaluation and treatment should be provided only by specially trained individuals. Licensed professionals, including human chiropractors and veterinarians who have pursued additional specialized training after finishing professional school, are qualified to treat animals chiropractically. The primary organization involved in training veterinarians and chiropractors in animal chiropractic is the American Veterinary Chiropractic Association. Many untrained individuals claiming to be "equine chiropractors" do not have any formal schooling or training in the basic principles and techniques of chiropractic. Untrained individuals also often have a limited knowledge of equine musculoskeletal anatomy, physiology, biomechanics, and potential pathology. Most state chiropractic and veterinary medical boards do not allow chiropractors to treat animals unless they are working under the direct supervision of a veterinarian. This means that both the veterinarian and the chiropractor must work together in the evaluation and treatment of the horse. This does not happen often in reality, especially if the chiropractor is not a licensed professional. It is strongly recommended that owners and referring

veterinarians seek out licensed professionals who have had specialized training and experience in chiropractic evaluation and treatment of horses.

CHIROPRACTIC EVALUATION

Like any medical evaluation, chiropractic evaluation begins with observing the patient from a distance for conformation, posture, and signs of lameness. The focus of the examination is placed on evaluating the static and dynamic characteristics of the spine and pelvis. Initially, the horse's general attitude and behavior are monitored for signs of pain or discomfort. Spinal conformation is then evaluated for proper alignment and symmetry, with special attention to the top line, shape and height of the withers, and osseous pelvic symmetry. It is thought that short-coupled horses have a higher incidence of osseous disorders, whereas long-backed horses are more prone to soft tissue injuries.[6] Conformation is a structural relationship of body segments, whereas postural analysis deals more with functional relationships. The horse is stood on a hard level surface and evaluated for a preferred or shifting stance, head and neck carriage, spinal curvatures, and muscular symmetry. Chiropractic gait analysis focuses on evaluating regional vertebral mobility and pelvic motion symmetry in addition to the typical lameness assessment. Gait analysis may help to rule out lower limb disorders and rule in vertebral dysfunction, although limb lameness has been reported in about 85% of horses with back problems.[35] Motion asymmetries, restricted vertebral or pelvic mobility, inability to track straight, and lack of propulsion are a few of the characteristics that are evaluated. Tape on the spinal midline or tuber coxae may help to visualize subtle motions (Fig. 2). Evaluation of the response to being saddled and ridden is important for a complete assessment of horses with back problems. Inspection of the tack for proper use and fit is always suggested on initial examination. Saddles and restraint devices should be evaluated for proper fit, padding, and positioning on the horse.

The physical examination is used to rule out other more common causes of lameness or neurological disorders. The chiropractic spinal examination focuses on evaluating and localizing segmental spinal dysfunction. Palpation is reliable to localize and identify soft tissue and osseous structures for changes in texture, tissue mobility, or resistance to pressure.[6, 7, 22] The tissue layers are evaluated from superficial to deep with increasing digital pressure and discrete palpatory movements. Shapes of structures, transitions between structures, and attachment sites may also be palpated.[27] Soft tissue texture and mobility can be compared between the skin, subcutaneous tissue, muscle, and thoracolumbar fascia. Patient response to palpation is important, especially in evaluating tenderness or hypersensitivity. The hallmarks of segmental spinal dysfunction include abnormal paraspinal muscle tension, pain, and edematous tissue.[9] Osseous palpation involves evaluating osseous structures for pain, morphology, asymmetries, and alignment. Individual thoracic, lumbar, and sacral spinous processes are palpated for a painful response, and the tuber sacrale is palpated for height asymmetries. Individual spinous process deviation is common but not associated with spinous process fracture or vertebral malposition (i.e., bone out of place) as is commonly thought. Overlapping or malaligned dorsal spinous processes are often caused by spinous process impingement, developmental asymmetries in the neural arch, or isolated dorsal spinous process deviation of unknown etiology.[12, 19, 38]

Motion palpation is used to evaluate each vertebra for loss of normal joint motion and overall resistance to induced motion (see Fig. 2). Vertebral segments

Figure 2. Thoracolumbar spinal motion palpation with induced lateral flexion.

with altered motion palpation findings can occur with or without localized muscle hypertonicity and pain. To fully use palpation in the evaluation of the musculoskeletal system, there has to be an understanding of how joint motion is assessed.[27] Moving an articulation from a neutral position first involves evaluating a range of motion that has minimal uniform resistance. As the articulation is moved toward the end of that range of motion, there is a gradual increase in the resistance to movement (i.e., joint end feel). End range of motion starts when any change in resistance to passive joint manipulation is palpable. Joint end feel is evaluated by bringing the articulation to tension and applying rhythmic oscillations to the joint to qualify the resistance to movement. The normal joint end feel is initially soft and resilient and gradually becomes more restrictive as maximal joint range of motion is reached (see Fig. 1). This anatomical barrier marks the end of physiological joint movement. A pathological or restrictive end range of motion is palpable earlier in passive joint movement and has an abrupt restrictive end feel when compared with normal joint end feel. The goal of palpating joint movement is to evaluate the initiation of motion resistance, the quality of joint motion and end feel, and the overall joint range of motion. Each vertebral segment is evaluated for altered motion palpation findings in flexion and extension by right and left lateral flexion and right and left rotation. Similar palpatory findings can be noted in other soft tissues such as skin, connective tissue, muscles, and ligaments.[7] Comparisons of motion palpation findings before and after adjustment are made to evaluate the vertebral motion segment response to chiropractic treatment. Evaluation of regional vertebral

motion in humans is reliable; however, intersegmental vertebral motion palpation currently has questionable reliability.[9, 10, 15, 21]

Vertebral range of motion is evaluated to detect whether movement is normal, restricted, or hypermobile. Segmental causes of vertebral movement restrictions include capsular fibrosis, effusion, and inflammation. Regional causes of vertebral movement restrictions include periarticular soft tissue adhesions, musculotendinous contractures, and, more commonly, protective muscle spasms. By combining the evaluation of joint range of motion and the presence or absence of pain at the extremes of motion, diagnostic interpretations can be implied.[24] Normal joint motion is painless, suggesting that articular structures are intact and functional. Normal joint mobility that has a painful end range suggests that a minor sprain of the associated articular tissues is present. Painless joint hypomobility suggests that a contracture or adhesion is present. Painful hypomobility suggests an acute strain with secondary muscle guarding. Painless hypermobility may indicate a complete rupture, and painful hypermobility suggests a partial tear of the evaluated structure.

A neurological examination is indicated in the evaluation of horses with back problems to rule out traumatic, infectious, and toxic etiologies. Postural reactions also help to assess the proprioceptive status, which is often compromised in spinal disorders. A commonly forgotten diagnostic test is rectal palpation. Osseous palpation rectally is useful for evaluating fractures, pelvic canal symmetry, and lumbosacral or sacroiliac joint degenerative joint disease. Externally induced pelvic motion during rectal palpation helps to assess lumbosacral joint motion internally. Palpation of the sublumbar (iliopsoas) muscles for pain, swelling, or asymmetry is also important in evaluating horses with back pain.

CONDITIONS NOT TREATED BY CHIROPRACTIC

Chiropractic is not a "cure all" for every back problem and is not suggested for treatment of fractures, infections, neoplasia, metabolic disorders, or nonmechanically related joint disorders. Acute episodes of sprains or strains, degenerative joint disease, or impinged spinous processes are also relative contraindications for chiropractic adjusting. All neurological diseases should be fully worked up to assess the potential risks or benefits of chiropractic treatment. Serious diseases requiring immediate medical or surgical care need to be ruled out and treated by conventional veterinary medicine before routine chiropractic treatment is begun. Nevertheless, chiropractic care may contribute to the rehabilitation of most postsurgical cases or severe medical conditions by helping in the restoration of normal musculoskeletal function. Chiropractic care cannot reverse severe degenerative processes or overt pathology. Chiropractic works optimally in the early clinical stages of disease versus end-stage disease, where reparative processes have been exhausted. This is why chiropractic care and other holistic modalities often fail to produce their fully desired therapeutic effects when used as a last resort.

COMPLICATIONS OR ADVERSE EFFECTS OF CHIROPRACTIC ADJUSTMENTS

Potential unwanted side effects from properly applied chiropractic treatments include a transient stiffness or worsening of the condition after adjustment (i.e., aggravated complaint, worsening of pre-existing state, regional soreness,

lameness).[11] Adverse reactions from spinal adjustment are uncommon but may occur immediately after adjustment or insidiously within the next 6 to 12 hours. The undesired effects usually last less than 24 to 48 hours. If more serious reactions are noted which last longer than 1 to 2 days, a thorough re-examination and appropriate treatment should be pursued. If the condition does not improve with conservative care, referral for more aggressive diagnostic or therapeutic modalities is recommended. Potential harmful side effects of improperly applied manipulation by untrained individuals include permanent articular damage or loss of function (i.e., torn ligaments, injured muscles, luxated joints, fractures, or paralysis if severe underlying pathology is present).

EQUINE CHIROPRACTIC TECHNIQUES

Most of what we know about animal chiropractic has been borrowed from human chiropractic techniques, theories, and research and adapted to our animal patients. Therapeutic trials of chiropractic adjustments are often used, as we currently have limited knowledge about the effects of chiropractic care in animals. Chiropractic adjustments are applied to areas of spinal segmental dysfunction, and the horse's condition is closely monitored as the neuromusculoskeletal system responds to the applied treatment. Chiropractic is a conservative modality that may be applied repetitively over a set time, as the patient's own recuperative abilities are used in the healing process to restore normal joint motion and neurological function. This is sometimes a confusing idea for practitioners or clients accustomed to a "one-time fix."

If the question is "how can a 1000-lb horse be adjusted," the answer is "one vertebral segment at a time." The equation (force = mass × acceleration) helps to explain what is happening when a force is applied to a horse's back during adjustment. Because the mass (i.e., vertebral segment) is constant, a rapidly applied adjustive thrust produces a proportionately larger force within the vertebral column than a slowly applied adjustive thrust can produce. Small rapidly applied adjustments are also easier to control and carry less risk of soft tissue injury than more forceful types of manipulation. Additionally, if the horse does not relax the paraspinal musculature, the mass that is affected increases dramatically from the weight of one vertebral segment to the weight of the entire vertebral region or potentially the weight of the entire horse. An effective adjustment cannot be applied to a nervous tense horse without risk of injury to the horse or the practitioner. Chiropractic adjustments are usually done without subjecting the horse to sedation or other medications but may occasionally be done with the horse under anesthesia if indicated. Chiropractic is not done with sledge hammers and boards, ropes and pulleys, pick-up trucks, or tractors. These types of techniques are often applied without a thorough understanding of joint physiology, spinal anatomy or biomechanics, or chiropractic principles. A good rule of thumb to follow is if it does not look like something that you would be willing to have done to yourself, you should not have it done to a horse.

Horses are usually held by a trained handler on a loose lead during the chiropractic adjustments. The cervical spine, sacrum, and extremities are evaluated and adjusted as needed from ground level. Adjustments of the thoracolumbar spine and pelvis often require that the chiropractor stands on an elevated surface in order to make effective adjustments; this also ensures proper positioning to limit potential injury to the chiropractor (Fig. 3). Equine chiropractic is physically demanding and requires significant mental concentration. The horse

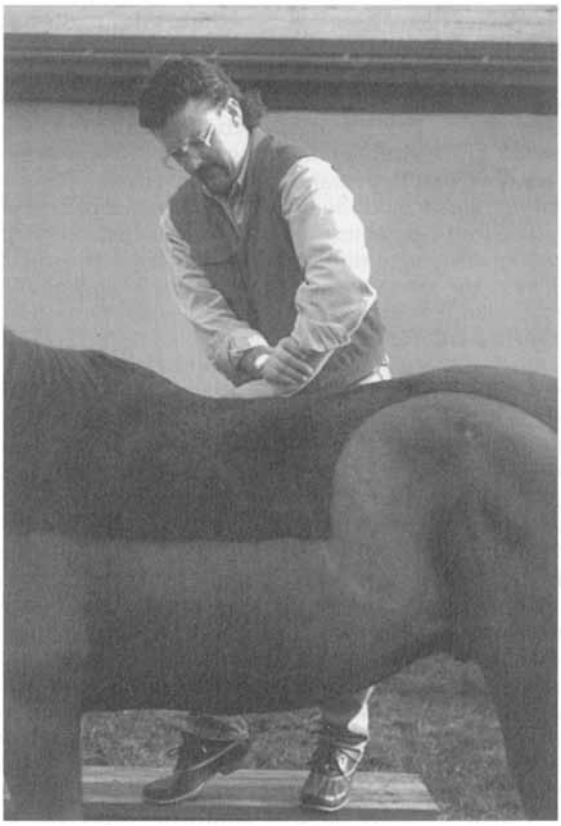

Figure 3. Chiropractic adjustment in the caudal thoracic vertebral region.

must be relaxed and focused on what the practitioner is doing. The practitioner must also be relaxed and focused on the horse to adjust a specific vertebra without causing injury to the surrounding tissues or to himself. Environmental distractions are counterproductive to effective chiropractic care. Muscle relaxation allows the specified joints to be brought to tension before adjusting and an evaluation of the elastic barrier of the joint. Motion palpation is used to evaluate joint motion restrictions so that the adjustive thrust can be applied correctly. Stabilization of adjacent joints or vertebral segments is required for the application of a proper adjustive thrust. Chiropractic adjustments involve rapid small-amplitude forces applied to specific musculoskeletal structures with the intent of evoking a therapeutic response.

Postadjustive recommendations for active horses in training usually include stall rest or pasture turnout for 1 day. This provides an opportunity for the horse's body to respond to the applied treatment without being exposed to potential inciting factors of the vertebral segmental dysfunction. The horse is asked to return to normal work the next day unless other musculoskeletal injuries are present, in which case, appropriate supportive care is recommended. If stiffness or soreness is noted after adjustment, an additional day of rest is

suggested. If severe or continued discomfort is noted for 2 days, re-examination and appropriate referral, medical treatment, or physiotherapy should be prescribed.

ADJUNCTIVE RECOMMENDATIONS AND PROGNOSIS

Chiropractic care is often supplemented with massage, physiotherapy modalities, and stretching or strengthening exercises to facilitate soft tissue rehabilitation and to help restore normal vertebral joint motion. These concurrent therapies also help to encourage owner participation in the healing process by providing close monitoring of the patient's progress. Other recommendations may include changes in training schedules or activities, corrective shoeing, or tack changes. Many repetitive use disorders may benefit from cross-training activities. Some practitioners have also reported synergistic therapeutic effects with the combined use of chiropractic, acupuncture, and other holistic modalities in equine patients. Conditions with an acute onset usually respond rapidly to adjustments, whereas chronic conditions usually require long-term treatment or rehabilitation. Patients with chronic injuries may gain only short-term improvement of restricted motion, pain, or muscle hypertonicity. This corresponds to current research findings on joint immobilization and spinal learning. Chronic conditions usually require a series of adjustments to effect a more lasting improvement.

SUMMARY

A thorough knowledge of equine spinal anatomy, biomechanics, and potential pathology is required to understand the principles and theories behind chiropractic and to apply its techniques properly. Chiropractic provides additional diagnostic and therapeutic means that may help equine practitioners to identify and treat the primary cause of lameness or poor performance. Specialized training in the evaluation and treatment of vertebral joint dysfunction and neuromusculoskeletal disorders places chiropractic in the forefront of conservative treatment of spinal-related disorders. Nevertheless, limited research is currently available on equine chiropractic and other nontraditional modalities in veterinary medicine. In 1996, the American Veterinary Medicine Association's Committee on Alternative and Complementary Therapies suggested that the research community should be encouraged to prioritize avenues of research and to allocate research funds to projects that are designed to provide further scientific evaluation of these modalities.[33] The future of equine chiropractic in veterinary medicine is dependent on future research into the clinical effects of chiropractic techniques and the basic pathophysiology of spinal-related disorders in horses.

For more information on equine chiropractic or postgraduate seminars, the reader should contact the American Veterinary Chiropractic Association, 623 Main Street, Hillsdale, Illinois 61257 [Office: (309) 658-2920; Fax: (309) 658-2622; E-mail: AmVetChiro@aol.com].

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