

Equine Chiropractic: General Principles and Clinical Applications

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Chiropractic techniques provide additional diagnostic and therapeutic approaches that may help equine practitioners to identify and treat select musculoskeletal disorders. Direct measures of chiropractic techniques in horses demonstrate substantial induced vertebral motion, usually beyond the normal range of segmental motion that occurs during locomotion. Future studies need to evaluate the long-term functional effects of chiropractic. Author's address: Department of Biomedical Sciences, College of Veterinary Medicine, Cornell University, Ithaca, New York 14853-6401. © 2000 AAEP.

Introduction

Equine practitioners have seen a recent proliferation in the use of chiropractic techniques within the veterinary profession. However, since veterinarians do not receive a formal chiropractic education, many practitioners do not have a basic understanding of chiropractic principles or clinical applications. In addition, limited research has been done to evaluate the clinical effectiveness of chiropractic techniques in horses. Veterinary medicine, for the most part, has been forced to acknowledge the use of chiropractic and other non-traditional modalities by owners who have sought practitioners that use these techniques and have experienced their perceived therapeutic effects.¹ If veterinarians have not taken the time or effort to learn more about these non-traditional techniques, then objectively evaluating its use or discussing the indications or contraindications 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 veterinarian's knowledge. To complicate matters, some individuals claim to be "equine chiropractors" but are not professionally trained nor licensed in either chiropractic or veterinary medicine. The purpose of this article is to describe the general principles, indications, and contraindications for equine chiropractic care.

Chiropractic Principles

The word *chiropractic* is derived from the Greek words *cheir* meaning 'hand' and *praktike* meaning 'business or to practice'. 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 controlled forces which are applied to specific articulations or anatomic regions to induce a therapeutic response via induced changes in joint structures, muscle function, and neurologic 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.

Clinical Applications

The prevalence of back problems in horses varies greatly (from 0.9–94%), depending on the specialization or type of practice surveyed: general practice (0.9%); Thoroughbred racehorse practice (2%); veterinary school referrals (5%); mixed equine practice (dressage, show-jumpers, eventing) (13%); spinal research clinic (47%); or equine chiropractic clinic (94%).² Veterinarians often have difficulties when dealing with horses that have no obvious localized pain or have vague, unspecified lameness. Neck or back problems and lameness are often interrelated. Lower limb injuries can cause an alteration in carriage of the affected limb and altered gait, which can subsequently overwork or injure proximal limb musculature and the paraspinal musculature. Similarly, vertebral column injuries can produce gait abnormalities, increased concussive forces, and lower limb lameness. The diagnostic dilemma facing veterinarians is to decide whether the limb or the vertebral column is the primary or initial cause of the horse's clinical problem. Unless the primary cause of the neck or back pain is identified and

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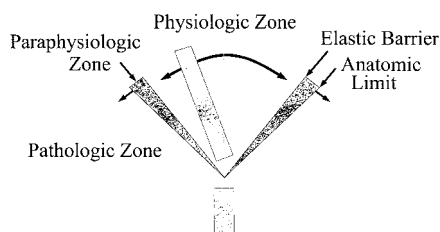


Fig. 1. Schematic representation of the three articular zones of joint movement. The elastic barrier and the anatomic limit mark the transitional boundaries between the three articular zones.

treated, most horses will have recurrent back pain when returned to work after a period of rest or trial of anti-inflammatory medications. Nonspecific back pain is most likely related to a functional impairment and not a structural disorder. Therefore, many back problems may be related to muscle or joint dysfunction with resultant soft tissue irritation and pain generation.³

Chiropractic provides expertise in the evaluation of vertebral column disorders and can provide an additional means of diagnosis and early treatment options in certain types of gait abnormalities or performance problems. Prepurchase examinations using chiropractic examination techniques can also help identify horses that have chronic underlying neck or back problems.⁴ Chiropractic addresses subclinical conditions or abnormal biomechanics that may progress to future debilitating musculoskeletal injuries. Chiropractors are also trained in the use of physiotherapy modalities, 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.

Joint Physiology

The vertebral motion segment is the functional unit of the vertebral column, which includes two adjacent vertebrae and the associated soft tissues that bind them together. Joint motion can be categorized into three zones of movement: physiologic, paraphysiologic, and pathologic (Fig. 1). The physiological zone of movement includes both active and passive ranges of motion and is the site where joint mobilization occurs (Figs. 2 and 3). The paraphysiologic zone of movement exists outside the joint's normal elastic barrier and is the site of joint cavitation (i.e., noise associated with "cracking your knuckles."). The normal elastic barrier of the joint is a semi-restrictive anatomical barrier between the physiologic and paraphysiologic ranges of motion. The pathological zone of movement lies outside the limits of normal anatomic joint integrity and is characterized by joint injury (e.g., sprain, subluxation, or

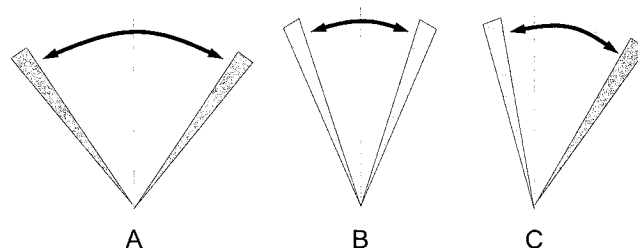


Fig. 2. Diagram of patterns of normal and altered joint range of motion. (A) Normal, symmetric joint mobility. (B) Symmetric joint hypomobility characterized by generalized joint stiffness. (C) Asymmetric joint hypomobility characterized by reduced left lateral bending.

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.^{5,6}

The goal of chiropractic treatment is to restore normal joint motion, stimulate neurologic reflexes, and to reduce pain and muscle hypertonicity. Successful manipulation requires proper technique (i.e., correct direction, force, amplitude, and velocity) and heightened psychomotor skills.⁶ 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 'popping' sound may also be heard during treatment as the applied force overcomes the elastic barrier of joint resistance.⁷ The rapid articular separation produces a cavitation of the synovial fluid.⁸ Radiographic studies postadjusting have shown a radiolucent cavity within the joint space (i.e., vacuum phenomenon) that contains

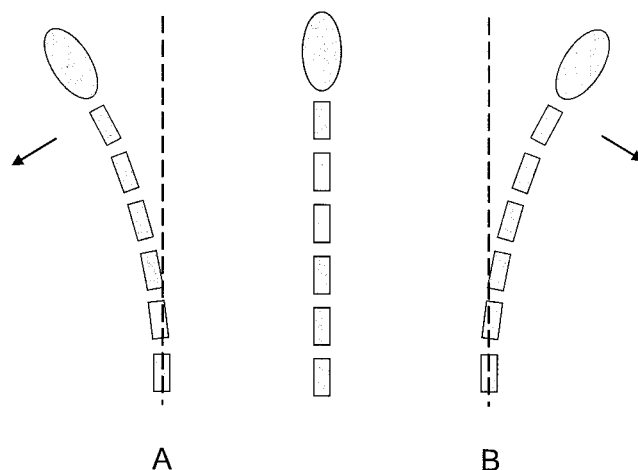


Fig. 3. Diagram of normal segmental vertebral contributions to overall vertebral column mobility during active left (A) and right (B) lateral bending. Note the smooth vertebral curvature produced by cumulative segmental joint motion.

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80% carbon dioxide and lasts for 15–20 min.⁹ A second attempt to recavitate the joint will be unsuccessful and potentially painful until the intra-articular gas has been reabsorbed (the refractory period).

Joint Dysfunction

The basic elements of joint dysfunction include altered articular neurophysiology, biochemical alterations, joint capsule pathology, and articular degeneration.^{5,6} Vertebral segment dysfunction (chiropractically defined subluxation) is a vertebral lesion characterized by 1) asymmetric or loss of normal joint motion in one or more planes (Figs. 4 and 5); 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).⁵ Multiple theories have been proposed and tested over the years to explain the pathophysiology of vertebral segment dysfunction and its interactions and influences on the neuromusculoskeletal system.^{5,6} 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).^{5,6} Additionally, the inflammatory process influences all these components to produce biochemical and cellular changes that result in distinct vertebral histopathology. The vertebral subluxation complex is a theoretical model of vertebral segmental dysfunction that incorporates the complex interaction of pathological changes in nervous, muscular, articular, ligamentous, vascular, and connective tissues.¹⁰ Alterations in articular neurophysiology from mechanical or chemical injuries can affect both mechanoreceptor and nociceptor function via increased joint capsule tension and nerve ending hypersensitivity. Mechanoreceptor stimulation induces reflex paraspinal musculature hypertonicity and altered local and systemic neurologic reflexes. Nociceptor stimulation results in a lowered pain threshold, sustained afferent stimulation (i.e., facilitation), reflex paraspinal musculature hypertonicity, and abnormal neurologic reflexes.

Back Problems

Any vertebral column disorder can have serious effects on a horse's ability to perform. Back problems can be classified into three basic types of injuries involving either the muscles, tendons and ligaments (soft tissue injuries), bones and joints (osseous injuries) or nervous system (neurologic disorders). However, multiple concurrent injuries have been reported in 17% of horses with back pain.¹¹ Diagnosis of the underlying vertebral pathology in

horses with back pain is important for the appropriate treatment and management of these disorders. Primary vertebral injuries usually affect the paraspinal musculature or vertebral articulations. Chiropractic conditions in performance horses usually have a history of a traumatic event or injury related to overexertion.¹² Trauma may occur as a single event such as a trailer accident, falling over backwards, or dramatic falls over jumps (macrotrauma). Severe injuries may gradually improve but never totally resolve or subsequently develop debilitating arthritis or soft tissue fibrosis. Chronic, overuse injuries (microtrauma) are usually 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. Older horses, like elderly humans, are susceptible to loss of vertebral column 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.

Indications

Chiropractic provides additional diagnostic approaches that are not currently available in veterinary medicine. The principal indications for equine chiropractic evaluation are back or neck pain, localized or regional joint stiffness, poor performance, and an altered gait that is not associated with overt lameness. A thorough diagnostic workup is required to identify soft tissue and osseous pathology, neurologic disorders, or other lameness conditions that may not be responsive to chiropractic care. The primary clinical signs that equine chiropractors look for are localized musculoskeletal pain, muscle hypertonicity, and restricted joint motion. This triad of clinical signs can be found in a variety of lower limb disorders, but is most evident in neck or back problems. Chiropractic care can help manage the muscular, articular, and neurologic components of select musculoskeletal injuries in performance horses. Musculoskeletal conditions that are chronic or recurring, not readily diagnosed, or are not responding to conventional veterinary care may be indicators that chiropractic consultation is needed.

Soft tissue injuries have been noted in 39% of horses with back pain.¹¹ The most commonly reported injuries included longissimus muscle strain and supraspinous and sacroiliac ligament sprains. Jeffcott reported a complete recovery rate of 73% and recurrence of 25% in horses with soft tissue injuries.¹³ Chiropractic care is usually contraindicated in the acute stages of soft tissue injury. However, as the soft tissue injury heals, chiropractic has the potential to help restore normal joint motion, thus limiting the risk for future reinjury.³ Special-

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ized soft tissue techniques can also help to treat myofascial trigger points and muscle hypertonicity characterized as noninflammatory muscular disorders that may produce ischemic, tender points or hypertonic bands within muscles. Various physiotherapy techniques can also be used with traditional veterinary care to optimize ligamentous healing.

Osseous pathology is usually localized to the mid-section of the back that lies under the saddle. Jeffcott reported a 39% prevalence of osseous vertebral lesions in horses with back pain.¹³ A thorough knowledge of the osseous anatomy and potential congenital anomalies of the axial skeleton is required for proper evaluation and treatment of vertebral column disorders. Abnormal spinal curvatures are due to either structural or functional defects. Structural defects include articular facet hypoplasia, hemivertebrae or other osseous malformations. Chiropractic is usually not indicated in structural vertebral defects since they are usually quite severe if noted clinically and affected horses are often euthanized. However, functional defects, such as unilateral paraspinal muscle contraction or joint restrictions are amendable to chiropractic care. Severe osseous changes such as joint subluxation, luxation, or fractures are often contraindications for chiropractic. Impinged spinous processes are thought to be due to conformational defects in the spinous processes.¹¹ Abdominal strengthening or spinal flexibility that promotes a reduction in spinous process impingement may be helpful in the healing process. Chiropractic care may provide symptomatic relief in early degenerative joint disease if related to joint hypomobility and subsequent joint degeneration.

Cervical myelopathy occurs due to both structural and functional disorders in the cervical vertebrae. Static compression due to malformation and dynamic lesions due to segmental hypermobility are both relative contraindications for cervical adjustments. However, regional hypomobile vertebrae may require chiropractic adjustments to help restore adjacent joint motion and potentially reduce joint hypermobility in the affected vertebrae (Fig. 4). All infectious or toxic neurologic disorders are not primary chiropractic conditions since they are not mechanically-related vertebral disorders. However, chiropractic care or certain physiotherapy modalities may be indicated after initial medical treatment to help limit residual joint dysfunction.

Trained equine chiropractors should be able to evaluate vertebral disorders and determine if the back problem will be potentially responsive to chiropractic care or if the condition should have further diagnostic evaluation or 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 conventional treat-

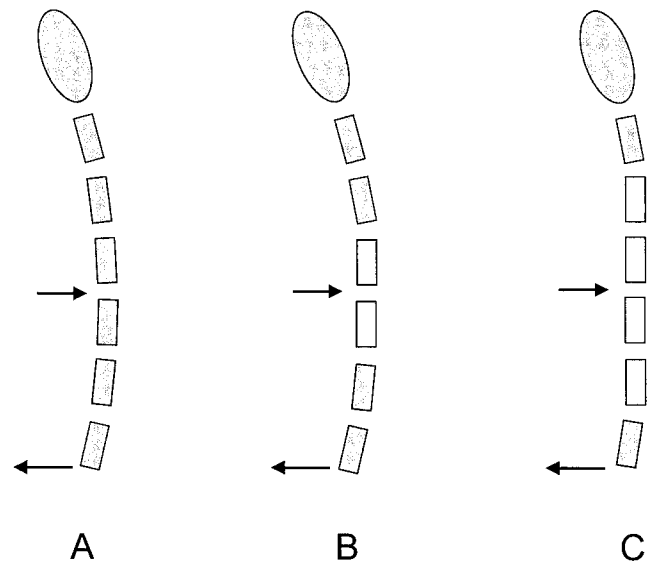


Fig. 4. Diagram of segmental vertebral motion during manually induced left lateral bending of the vertebral column. Arrows indicate direction of applied forces to vertebral column. (A) Normal segmental mobility. (B) Locally restricted vertebral motion involving two vertebrae. (C) Regionally restricted vertebral motion involving several vertebrae.

ment have failed. However, chiropractic is usually much more effective 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.

Contraindications

Chiropractic is not a 'cure all' for all back problems 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 neurologic 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. However, chiropractic care may contribute to the rehabilitation of most post-surgical 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 Evaluation

Chiropractic, like any medical evaluation, begins with a thorough history, discussion of the chief complaint, and observation of the patient from a dis-

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Table 1. Potential clinical indications for chiropractic evaluation and treatment.¹²

Poor performance
Back or neck pain
Reduced neck or back flexibility
Not able to raise or lower head and neck
Localized muscle tightness
Vague lameness
Uneven or asymmetric gait
Recent change in spinal conformation
Difficult or improper saddle fit
Discomfort with saddle placement
Resents tightening of the cinch or girth
Stiff and slow to warm up
Bucks or pins ears when ridden
Lame only when ridden
Constantly on one rein or line
Difficulty with a lead or gait transition
Refuses jumps
Resists collection
Difficulty with turning in one direction
Consistently stumbles or drags a toe
Muscle mass asymmetry
Pelvic asymmetry
Not stand squarely on all four limbs
Difficulty standing for the farrier
Holds tail to one side
Resents being groomed
Behavior or avoidance problem

tance for conformation, posture, and signs of lameness. Horses with conditions that may be responsive to chiropractic care present with a wide variety of non-specific or vague complaints (Table 1). The focus of the chiropractic exam is placed on evaluating static and dynamic characteristics of the musculoskeletal system. Initially, the horse's general attitude and behavior are monitored for signs of pain or discomfort. Vertebral column 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 horse have a higher incidence of osseous disorders whereas long-backed horses are more prone to soft tissue injuries.¹⁴ 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, vertebral 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.¹⁵ Motion asymmetries, restricted vertebral or pelvic mobility, not tracking straight, or lack of propulsion are a few characteristics that are evaluated. Tape on the

vertebral column midline or tuber coxae may help to visualize subtle motions. Evaluation of the response to placing a saddle and being ridden is important for a complete assessment of horses with back problems. Inspection of the tack for proper use and fit are 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. When indicated, a traditional orthopedic and neurologic evaluation is used. The chiropractic spinal examination focuses on evaluating and localizing segmental vertebral dysfunction. Palpation is reliable to localize and identify soft tissue and osseous structures for changes in texture, tissue mobility, or resistance to pressure.^{14,16} The tissue layers are evaluated from superficial to deep by increasing digital pressure and also shifting attention with discrete palpatory movements. Shapes of structures, transitions between structures, and attachment sites may also be palpated.³ 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 vertebral dysfunction include abnormal paraspinal muscle tonicity, pain and edematous tissues.¹⁰ 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 it is not usually 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.^{17,18}

Motion palpation is used to evaluate each individual vertebra for loss of normal joint motion and overall resistance to induced motion (Figs. 4 and 5). Vertebral segments with altered motion palpation findings can occur with or without localized muscle hypertonicity and pain. To utilize palpation in the evaluation of the musculoskeletal system fully, there has to be an understanding of how joint motion is assessed.³ 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 articula-

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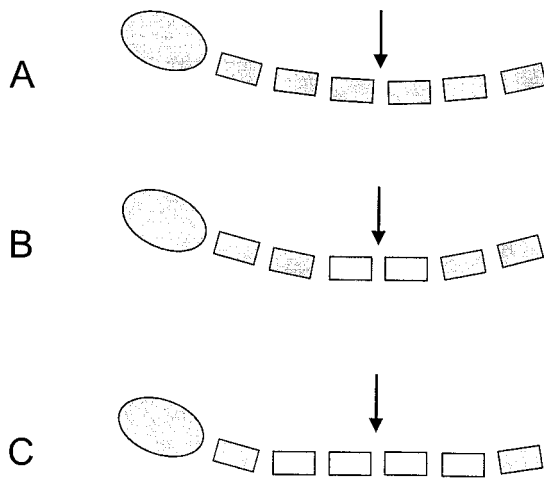


Fig. 5. Diagram of segmental vertebral motion during manually induced extension of the vertebral column. Arrows indicate direction of applied forces to vertebral column. (A) Normal segmental mobility. (B) Locally restricted vertebral motion involving two vertebrae. (C) Regionally restricted vertebral motion involving several vertebrae.

tion 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. This elastic barrier marks the end of physiologic joint movement Fig. 1. A pathologic 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 (ROM). Each vertebral segment is evaluated for altered motion palpation findings in flexion and extension; 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, or ligaments.¹⁶ Comparisons of motion palpation findings pre- and post-adjustment are made to evaluate the vertebral motion segment response to chiropractic treatment.

Vertebral range of motion is evaluated to detect whether movement is normal, restricted, or hypermobile (Fig. 2). Segmental causes of vertebral movement restrictions include capsular fibrosis, effusion, or inflammation. Regional causes of vertebral movement restrictions may include periarticular soft tissue adhesions, musculotendinous contractions, or, more commonly, protective muscle spasms. 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.¹⁹ 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 neurologic examination is indicated in the evaluation of horses with back problems to rule out traumatic, infectious, or toxic etiologies. Postural reactions also help to assess the proprioceptive status, which is often compromised in vertebral column disorders. A commonly forgotten diagnostic test in horses with back problems is rectal palpation. Rectal osseous palpation 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 iliopsoas muscles for pain, swelling, or asymmetry is also important in evaluating horses with back pain. An orthopedic examination is indicated to rule out or identify concurrent limb problems. Hematologic evaluation, radiographs, diagnostic nerve or joint blocks, muscle biopsies, or cerebrospinal fluid (CSF) analysis may be indicated in certain cases prior to chiropractic assessment and treatment. A thorough diagnostic workup, when indicated, is important for appropriate chiropractic treatment and rehabilitation.

Equine Chiropractic Practitioners

Due to potential misapplication, chiropractic evaluation and treatment should be provided only by licensed professionals who have pursued additional postgraduate training in animal chiropractic principles and techniques. The primary organization involved in training veterinarians in animal chiropractic is the American Veterinary Chiropractic Association (AVCA). Many lay individuals claiming to be 'equine chiropractors' often do not have any formal education in chiropractic or veterinary medicine and have a limited knowledge of equine musculoskeletal anatomy, physiology, biomechanics, or pathology. Most state chiropractic and veterinary medical boards do not allow human chiropractors to treat animals unless they are working under the direct supervision of a veterinarian. This requires that the veterinarian and the human chiropractor must work together in the evaluation and treatment of the horse and provide appropriate follow-up care as indicated. 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. Veterinarians that have not pursued formal post-graduate training are not qualified to provide chiropractic care and may produce more harm than good. It is a good idea to ask 'equine chiropractors' about their professional and post-graduate

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training or certification, horse experience, and the types of techniques that they use (e.g., hands only vs. hammers, mallets or mechanical devices).

Chiropractic Techniques

Chiropractic provides important therapeutic approaches that are not currently available in veterinary medicine. Most of what we know about equine 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 since we currently have limited knowledge about the effects of chiropractic care in animals. Chiropractic addresses mechanically-related disorders of the musculoskeletal and nervous systems and provides a conservative means of treatment and prevention for horses with back problems. Chiropractic techniques involve a controlled force applied to a specific anatomical region or osseous structure to produce a desired therapeutic response (i.e., restore joint motion and reduce pain). Chiropractic adjustments are applied to areas of vertebral segment dysfunction and the horse's condition is closely monitored as the neuromusculoskeletal system responds to the applied treatment. The applied treatment influences both mechanoreceptor and nociceptor function via mechanical and biological mechanisms.⁵ The 'therapeutic dosage' of chiropractic adjusting is controlled by the number of vertebral levels adjusted, the amplitude of the applied force, and the frequency of treatment.

Veterinarians and clients often ask how a 1200 pound horse can be adjusted. The answer is one vertebral segment at a time. Recent equine chiropractic research has demonstrated that forces applied to instrumented vertebral segments do induce substantial vertebral motion, usually beyond the normal range of segmental motion that occurs during locomotion.²⁰ At the L6-S1 vertebral segments, chiropractic adjustments induced $3.0 \pm 1.2^\circ$ of dorsoventral flexion, $2.7 \pm 0.4^\circ$ of lateral bending, and $2.7 \pm 0.5^\circ$ of axial rotation. Segmental vertebral motion characteristics induced during chiropractic treatment in horses are similar to those reported in humans.²¹ The induced vertebral motion supports current theories on the effects of chiropractic manipulations on joint physiology. Future studies need to evaluate the long term mechanical and neurophysiologic effects of chiropractic techniques in horses. Knowledge of normal segmental vertebral motion and response to manual therapies will further our future understanding of the pathophysiology, clinical diagnosis and treatment of back problems in horses.

In a relaxed horse, the mass (vertebral segment) that is affected by a rapidly applied adjustive thrust is proportionately smaller than the mass of the practitioner applying the treatment. However, if the horse does not relax the paraspinal musculature, then the mass that is affected increases dramati-



Fig. 6. Photograph of a typical chiropractic adjustment in the cervical vertebral region.

cally from the mass of a few vertebral segments to the mass of the entire vertebral region or potentially entire horse. In this situation it is nearly impossible to induce any vertebral movement and chiropractic adjustments are futile. An effective adjustment cannot be applied to a nervous, tense horse without risk of injury to the horse or the practitioner. Uneducated individuals that do not understand this concept and do not have thorough understanding of joint physiology, vertebral anatomy, biomechanics, or chiropractic principles will resort to overly aggressive and forceful means of applying an external force (e.g., sledge hammers and two-by-fours, three strong men and a twitch, or tractors). Small, rapidly applied adjustments are easier to control and have much less risk of soft tissue or osseous injury than more forceful types of manipulation. Chiropractic adjustments are usually done without any sedation or other medications, but may occasionally be done under anesthesia if indicated.²² A good rule of thumb is, if it does not look like something that you would be willing to have done to yourself, then maybe you should not have it done to a horse.

Chiropractic Treatment

Horses are usually held by a trained handler on a loose lead during the chiropractic treatment. The cervical vertebrae (Fig. 6), sacrum, and extremities are evaluated and adjusted as needed from ground level. However, the thoracolumbar vertebrae (Figs. 7 and 8) and pelvis often require an elevated surface to stand on for effective adjustments and proper doctor positioning to limit potential injury to the doctor. Equine chiropractic is physically demanding and requires significant mental concentration. The horse must be relaxed and focused on what the practitioner is doing. The practitioner must also be relaxed and focused on the horse to

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Fig. 7. Photograph of a typical chiropractic adjustment in the cranial thoracic (withers) vertebral region.

adjust a specific vertebral segment without causing injury to the surrounding tissues or to the practitioner themselves. Environmental distractions are counterproductive to effective chiropractic care.

Muscle relaxation allows the specified joints to be brought to tension before adjusting and to evaluate 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.

The principal indications for chiropractic treatment are localized pain, muscle hypertonicity and restricted segmental joint motion. Typically, an immediate reduction in pain and an increase in segmental vertebral motion is noted. Most horses will also have increased muscle relaxation, but other therapies (e.g., acupuncture or stretching) are often used in conjunction with chiropractic adjustment to completely resolve any remaining muscle hypertonicity. In general, conditions with an acute onset respond rapidly, whereas chronic conditions usually take long-term treatment or rehabilitation. Chiropractic is a conservative modality that may be applied repetitively over a set time period as the

patient's own recuperative abilities are used in the healing process to restore normal joint motion and neurologic function. This is often a confusing concept for most traditional practitioners accustomed to a 'one-time-fix' by utilizing potent medications or surgical procedures. Post-adjustment recommendations for actively training horses usually include stall rest or pasture turnout for one 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 segment dysfunction. The horse is asked to return to normal work the next day unless other musculoskeletal injuries are present, then appropriate supportive care is recommended. If stiffness or soreness is noted postadjusting, then an additional day of rest is suggested. If severe or continued discomfort is noted for two days then re-examination and appropriate referral, medical treatment, or physiotherapy should be prescribed.

Complications or Adverse Effects

Potential adverse effects from properly applied chiropractic treatments include a transient stiffness or worsening of the condition after adjusting (i.e., aggravated complaint, worsening of preexisting state, regional soreness, or lameness).⁶ Adverse reactions from chiropractic adjustments are uncommon,

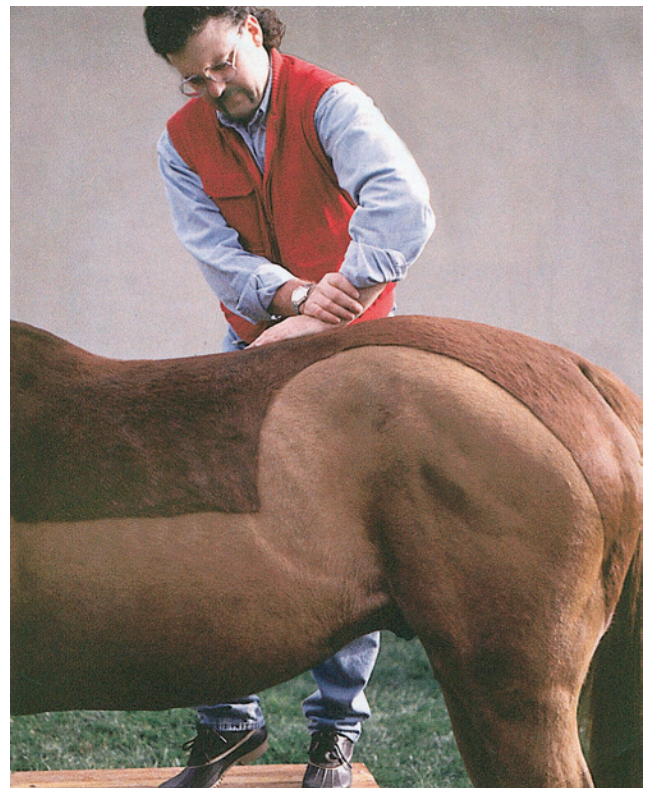


Fig. 8. Photograph of a typical chiropractic adjustment in the lumbar vertebral region.

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but may occur immediately postadjusting or insidiously within the next 6–12 hr. The undesired effects usually last less than 24–48 hr. If more serious reactions are noted that last longer than one to two days, a thorough re-examination and appropriate treatment should be pursued. If the condition does not improve with conservative care, then referral for more aggressive diagnostic or therapeutic modalities is recommended. Potential harmful effects from improperly applied manipulation from untrained individuals may 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).

Adjunctive Recommendations and Prognosis

Chiropractic care is often supplemented with massage, physiotherapy modalities, and stretching or strengthening exercises to help soft tissue rehabilitation and to help restore normal vertebral joint motion. These concurrent therapies also help to encourage owner participation in the healing process and provide 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. Many practitioners have also reported synergistic therapeutic effects with the combined use of chiropractic, acupuncture, and other holistic modalities in equine patients. Usually, conditions with an acute onset respond rapidly and have a good prognosis for return to function, whereas chronic conditions usually take 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 on joint immobilization and spinal learning.³ Chronic conditions usually require a series of adjustments to effect a more lasting improvement. Musculoskeletal health depends on movement and use. Scientific evidence suggests that long-term rest is contraindicated for back pain.²³

Summary

A thorough knowledge of equine vertebral column anatomy, biomechanics, and 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. Chiropractic provides specialized evaluation and treatment of joint dysfunction and conservative treatment of neuromusculoskeletal disorders that are currently lacking in traditional veterinary medicine. However, limited research is currently available on equine chiropractic and other nontraditional modalities in veterinary

medicine. In 1996, the AVMA'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 will provide further scientific evaluation of these modalities.²⁴ The use of chiropractic principles and techniques on animals is dependent on future research into the clinical effectiveness and indications for management of back problems in horses.

For more information on equine chiropractic or post-graduate seminars contact the American Veterinary Chiropractic Association (AVCA), 623 Main Street, Hillside, IL 61257 Office: (309) 658-2920, Fax: (309) 658-2622, E-mail: AmVetChiro@aol.com, Web site: <http://www.AnimalChiro.com>

References

- Wynn SG. Wherefore complementary medicine? *J Am Vet Med Assoc* 1996;209:1228–1233.
- Jeffcott LB. Guidelines for the diagnosis and treatment of back problems in horses, in *Proceedings*. Am Assoc Equine Pract 1980;26:381–387.
- Liebenson C. *Rehabilitation of the spine*. 1st ed. Baltimore, MD: Williams & Wilkins, 1996.
- Willoughby SL. Equine chiropractic care, in *Proceedings*. Am Assoc Equine Pract 1993;39:31–32.
- Leach RA. *The chiropractic theories: principles and clinical applications*. 3rd ed. Baltimore, MD: Williams & Wilkins, 1994.
- Haldeman, S. *Principles and practice of chiropractic*. 2nd ed. Norwalk, CT: Appleton & Lange, 1992.
- Reggars JW, Pollard HP. Analysis of zygapophyseal joint cracking during chiropractic manipulation. *J Manipulative Physiol Ther* 1995;18:65–71.
- Herzog W, Zhang YT, Conway PJW, et al. Cavitation sounds during spinal manipulative treatments. *J Manipulative Physiol Ther* 1993;16:523–526.
- Unsworth A, Dowson D, Wright V. Cracking joints: a bio-engineering study of cavitation in the metacarpophalangeal joint. *Ann Rheum Dis* 1971;30:348–358.
- Gatterman MI. *Foundations of chiropractic*. St. Louis: Mosby-Year Book, Inc., 1995.
- Jeffcott LB. Disorders of the thoracolumbar spine of the horse—a survey of 443 cases. *Equine Vet J* 1980;12:197–210.
- Willoughby SL. *Equine chiropractic care*. 1st ed. Port Byron, IL: Options for Animals Foundation, 1991.
- Jeffcott LB. Back problems in the horse—a look at past, present and future progress. *Equine Vet J* 1979;11:129–136.
- Cauvin E. Assessment of back pain in horses. *In Practice* 1997;19:522–533.
- Steckel RR, Kraus-Hansen AE, Fackelman GE, et al. Scintigraphic diagnosis of thoracolumbar spinal disease in horses: a review of 50 cases, in *Proceedings*. Am Assoc Equine Pract 1991;37:583–591.
- Chaitow L. *Palpation skills*. New York, NY: Churchill Livingstone, 1997.
- Jeffcott LB. Radiographic features of the normal equine thoracolumbar spine. *Vet Radiol* 1979;20:140–147.
- Haussler KK, Stover SM, Willits NH. Pathology of the lumbosacral spine and pelvis in Thoroughbred racehorses. *Am J Vet Res* 1999;60:143–153.
- Kessler RM, Hertling D. Assessment of musculoskeletal disorders. In: Hertling D, Kessler RM, eds. *Management of common musculoskeletal disorders: Physical therapy principles and methods*. 2nd ed. Philadelphia: J. B. Lippincott, 1990;68–71.

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20. Haussler KK, Bertram JEA, Gellman K. *In-vivo* segmental kinematics of the thoracolumbar spinal region in horses and effects of chiropractic manipulations, in *Proceedings*. Am Assoc Equine Pract 1999;45:327–329.
21. Gál JM, Herzog W, Kawchuk GN, et al. Movements of vertebrae during manipulative thrusts to unembalmed human cadavers. *J Manipulative Physiol Ther* 1997;20:30–40.
22. Ahern TJ. Cervical vertebral mobilization under anesthetic (CVMUA): a physical therapy for the treatment of cervico-spinal pain and stiffness. *J Equine Vet Sci* 1994;14:540–545.
23. Allan DB, Waddell G. A historical perspective on low back pain and disability. *Acta Orthop Scand Suppl* 1989;60:1.
24. Smith CA, Tessier GJ. AVMA at work: houses approves guidelines on alternative, complementary medicine. *J Am Vet Med Assoc* 1996;209:1026.