# Effect of osteopathic manual therapy on cervical pain and dysfunction in the performance horse

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## Introduction

The neck is “absolutely fundamental to the way a horse moves”. (Leste-Lasserre, 2023) Cervical pain and dysfunction have become a more frequently recognized cause of poor performance or even sometimes lameness in performance horses. This may be because there are now more reliable and readily accessible imaging techniques for the cervical region. But even with those newer diagnostic imaging modalities they often fail to “fully elucidate the underlying disease process which is similar to what is seen in human patients”. (Story et al., 2021) Cervical pain can be more complicated to diagnose than typical appendicular skeleton disorders. There is also a lack of peer-reviewed equine literature on the cervical region so in this paper, I will be referring to human studies as well as equine studies. The purpose of this paper will be to answer the question, can osteopathic manual therapy have a positive effect on equine cervical pain and dysfunction?

## Structure and biomechanics of the cervical region

The equine neck consists of 7 cervical vertebrae. The first two vertebrae in the neck are known as the atlas (1st) and axis (2nd). These two vertebrae have unique structures and biomechanics. The atlanto- occipital joint has the largest amount of flexion and extension in the cervical region at 85 degrees. This accounts for 32% of the total cervical flexion and extension. The atlantoaxial joint has 108 degrees of rotation. This accounts for 83% of the total cervical rotation. From C2 down to C7 lateral flexion increases. Starting at 20-30 degrees at C2/3 to 45 degrees at C6/7. (Clayton & Townsend, 1989) The joints in between these vertebrae are known as articular process joints. (APJ) The neck has 8 cervical nerves. The sixth to eighth cervical nerve also connects to the brachial plexus. (Dyson, 2011) This connection to the brachial

plexus along with the fact that the cervical region is only one part of the spinal column shows that pain and dysfunction in the cervical region is likely to affect other parts of the body. A horse's neck is 6% of their total body weight and most of that is muscle. (Leste-Lasserre, 2023) The cervical ventral muscles are primarily flexors of the neck while the cervical dorsal muscles are primarily extensors of the neck. The superficial muscles are responsible for mobility and range of motion, while the deeper muscles provide stability and support. (Rombach, 2013) The major muscles of the neck include brachiocephalicus, omotrasversarius, splenius, semispinalis capitis, longus colli, and multifidus. Brachiocephalicus and omotransversarius help protract the forelimb and extend the shoulder. Splenius and semispinalis capitis muscles extend the neck and elevate the head. Multifidus and longus colli stabilize the joints. The nuchal ligament is also an important structure of the neck. It has a funicular and lamellar part.

The funicular part of the nuchal ligament extends from the occiput to the withers where it turns into the supraspinous ligament. The supraspinous ligament runs down the back over the dorsal spinous processes and inserts onto L3. The lamellar part of the nuchal ligament connects to the transverse processes of C2-C6. “By storing and releasing the elastic strain energy, the nuchal ligament can also contribute (approximately 33%) to the dynamic motion of the head and neck during locomotion.” (Gellman & Bertram, 2002) All of these structures can have disorders that can cause the horse to have cervical pain and dysfunction.

## Veterinary Diagnostic Imaging for the Cervical Region

### Radiography

Radiographs provide a good starting point for imaging the cervical region as most veterinarians will be able to take images in the field without having to take the horse to a

specialty clinic. Radiographs of the cervical region have also become a common practice in pre-purchase exams. Radiographs allow for evaluation of the bones, including structure and alignment. (Story et al., 2021) Radiographs can be taken from the skull to the first thoracic vertebrae to encompass all 7 cervical vertebrae. Oblique images can also be taken to look for spinal cord compression. “All radiographic findings must be interpreted in conjunction with the clinical examination findings.” (Story et al., 2021)

Ultrasonography

This is another tool that most veterinarians will already have and be able to easily use in the field. Ultrasound is also “frequently used as an adjunct to radiographs to further assess the changes in cervical APJ margins, joint capsules, and other soft tissues (e.g., nuchal ligament and bursae).” (Story et al., 2021)

Computed Tomography (CT)

This is considered a more advanced imaging technique that must be done in a clinic under sedation or general anesthesia depending on the type of machine. CT myelography is also another form of CT evaluation. “CT provides excellent bone detail and allows for more comprehensive assessment of osseous changes compared to radiographs.” (Story et al., 2021) CT myelograms can be used to diagnose osteoarthritis of the articular process joints, fractures, malformations, and some soft tissue injuries. (Dyson, 2011)

**Clinical Examination of the Cervical Region**

Many of the same clinical exam techniques used by veterinarians can also be employed by osteopaths in their assessment's. It is first important to try to differentiate between pain and dysfunction although they can coexist. Observing the horse eating off the ground can be important. "Especially with lesions in the caudal neck region, a horse may have to straddle the forelimbs excessively to lower the head to the ground to graze." (Dyson, 2011) Another easily observable sign of caudal cervical pain is a horse that alternates forelimb placement from a normal square stance to a position with one limb forward and the other back. (Story et al., 2021) Muscle symmetry of the neck is also an important factor to observe. If any area is overdeveloped or underdeveloped this can be a clue as to dysfunction in that area. Horses with cervical pain often show obvious discomfort when palpated during a static exam. A pilot study was done by Nicole Rombach to develop an ethogram for diagnosing neck pain. The neck pain subjects in the study had been diagnosed with exams and imaging including radiography and ultrasound. Control subjects were examined and free from neck pain. The assessor carrying out the palpatory exam was blinded to what group the horse was in. Each horse was able to be correctly identified as being in the neck pain group by palpatory assessment alone. (Rombach, 2013) During palpation not only muscle tone but myofascial tone should be considered. Fascia is examined for signs of tightness or reaction to palpation. Myofascial trigger points can be very painful when palpated and can feel like tight guitar strings. "Patchy sweating or change in hair color reflecting intermittent sweating may suggest local damage to a sympathetic nerve as a branch of the nerve exits of each vertebra." (Dyson, 2011)

A dynamic exam should also be used. This can involve passive and active movement of the neck, walking/trotting in a straight line, riding the horse under saddle, and working in a circle on the lunge. Cervical pain can cause forelimb lameness and should be considered "when pain cannot be localized to the limb." (Dyson, 2011) Certain cervical disorders can also cause spinal cord compression which can cause neurologic symptoms. These symptoms can vary from severe ataxia to more subtle changes in movement patterns. Treats can be used to check the horse's range of motion. A treat is used to ask the horse to put its nose to chest/knee/fetlock (flexion), extend the neck to reach forward and up, nose to shoulder/flank/hock to test lateral bending. These movements require active muscle contraction by the horse. (Stubbs & Clayton, 2008) Any restrictions in mobility should be noted.

Watching the horse with a rider and also on the lunge line can be very important. Horses with cervical dysfunction are typically stiff when asked to bend their neck and may have difficulty performing certain movements in their training, especially on a circle. (Story et al., 2021) It is useful to see how the horse reacts to a rider asking them to flex their head and neck. The rider can also ask the horse to laterally bend the neck in both directions. "Abnormalities in head or neck carriage may only be appreciated on the lunge line with the head carried toward the outside of the circle (i.e. difficult to turn in one direction) or gait deficits noticed with or without side reins. Other horses may have pronounced lowering of the head and extension through the lower cervical region and appear to have generalized neck stiffness." (Story et al., 2021)

**Disorders of the Cervical Region**

Osteoarthritis (OA) of the cervical articular process joints (APJ)

Osteoarthritis is a commonly diagnosed joint problem in performance horses. “Osteoarthritis is a disease of the cartilage surface and bone structure; however it is important to recognize other structures within the joint complex, which include subchondral bone, joint capsule, synovium, and paraspinal muscles, are also affected and can be a primary source of cervical pain.” (Story et al., 2021) Several studies have been conducted to determine the correlation between radiographic evidence of OA in the APJ and clinical signs. A study of 100 warmblood show jumpers (free of lameness) was done in 2021 to assess the prevalence of cervical OA. C6-C7 was most commonly affected with OA. At C6-C7 mild joint effusion was seen on ultrasound in 37 cases and mild capsulitis was found in 36 cases. Horses competing in higher level classes had significantly higher OA grades at C6-C7. There was no correlation between age, neck pain, and neck range of motion with the presence of OA on radiographs. (Espinosa-Mur et al., 2018) This shows that the amount of OA on radiographs does not always correlate with the level of neck pain and dysfunction or be the cause of poor performance.

Vertebral Body

Fractures of the cervical vertebrae can typically be diagnosed by radiographs. “Clinical signs are sudden in onset and include holding the neck in an abnormally low position, stiffness, a focal or more diffuse area of pain, soft tissue swelling, and muscle guarding.” (Dyson, 2011) Unilateral or bilateral lameness may also occur. These can be caused by things such as the horse falling, pulling back when tied up, or rearing up and flipping over backward. This is why it is especially important to have veterinary involvement when dealing with the cervical region as an osteopath. If an owner suspects acute trauma and a horse has neck pain it is important that the horse has been cleared by a veterinarian before proceeding with any treatment.

## Nuchal Ligament Desmopathy

As stated earlier the nuchal ligament has two parts and connects to the thoracolumbar region of the horse through the supraspinous ligament. “Horses with suspicion of nuchal ligament enthesopathy or desmopathy may be unwilling to position their head straight in the bridle, resist poll flexion, and may have inconsistent responses to tissue palpation.” (Dyson, 2011) Horses with insertional desmopathy may have a history of trauma such as pulling back when tied up or being ridden/lunged in a hyper-flexed position. Injuries to the tendon of insertion of the semispinalis are also possible. (Dyson, 2011)

## Soft Tissue Sources of Pain and Dysfunction

Fascia is the connective tissue that surrounds and connects all the body's tissues on a superficial and deep level. “In horses with cervical pain and dysfunction, compensatory nociceptive and biomechanical mechanisms likely contribute to densification of the fascial tissues and the development of chronic recurrence of pain.” (Story et al., 2021) As discussed earlier the neck is predominantly made up of muscle. The neck muscles are likely an important source of neck pain and dysfunction. (Story et al., 2021) Since many of these muscles also help to move the forelimb/shoulder problems will not be limited to the neck. For example, muscle spasm of the brachiocephalicus can shorten the protraction of the forelimb. (Dyson, 2011) Osteoarthritis can affect the muscles surrounding the joint as well. The stabilizing muscles can be inhibited by APJ inflammation and pain which in turn leads the horse to contract the long neck muscles to try and stabilize the neck during movement. This typically leads to the neck being stiff. When the primary source of pain is treated (OA) the stabilizing muscles do not automatically resume normal function. (Leste-Lassere, 2023) There are ways to help strengthen the stabilizing muscles

after treatment. A study of 8 horses was done to evaluate the outcome of using dynamic mobilization exercises. The exercises were done five days a week for three months. At the conclusion of the study cross-sectional area of multifidus increased and asymmetry of multifidus from left to right decreased. (Stubbs et al., 2011) Therapeutic exercises to strengthen deep paraspinal muscles may help in preventing recurrence of neck pain due to intersegmental vertebral instability. (Rombach, 2013)

### Nerve Root Pain

Nerve root impingement can occur in the cervical region. The spinal nerve roots exit through the intervertebral foramen in the cervical vertebrae putting them at risk for impingement. “There appears to be clinical evidence to suggest nerve root impingement or a similar syndrome occurs within the horse.” (Story et al., 2021) It may cause radicular or referred pain and be a cause of forelimb lameness. This can be associated with severe osteoarthritis, especially in the caudal cervical region, and can be diagnosed using contrast CT. (Dyson, 2011)

## Veterinary Treatment Options

There are many treatment options available to veterinarians in the treatment of cervical pain. Some very commonly used treatments for pain and inflammation such as NSAIDS are not typically as effective when treating cervical pain. There are several surgical options but these are only considered in extreme cases such as unstable fracture or cervical vertebral compressive myelopathy (CVCM). (Story et al., 2021) In this paper the most commonly used current treatments will be covered. These treatments can only be administered by a veterinarian.

### Extracorporeal Shockwave Therapy (ESWT)

The use of ESWT was adapted in horses from human medicine. It has been shown to decrease pain and improve cervical range of motion in human patients. Anecdotal evidence suggests that horses with myofascial pain and restricted mobility of the cervical spine respond well to ESWT. It has also been shown to be useful in treating osteoarthritis conditions. (Story et al., 2021)

Intra-Articular Injections

The use of intra-articular injections is a frequently used management strategy in combating OA in the distal limb. The cervical articular process joints are injected using ultrasound guidance. Injections can be either corticosteroids or a form of orthobiologic therapy. Biologics can be an option if the horse has a metabolic condition or other reason where steroids would be contraindicated. It was reported that "71% of symptomatic horses returned to normal function or improved in performance with cervical IA corticosteroid treatment." (Birmingham et al, 2010) According to other studies, this improvement can be short-lived with "55% (of horses) showing improvement for a duration of less than 1 month up to 6 months." (Dyson, 2011)

Acupuncture/Mesotherapy

It may differ in other countries but in the United States acupuncture on animals can only be administered by a veterinarian. Acupuncture is used to control pain and inflammation. In studies on rodents it has been shown to "protect against articular cartilage erosion as well as chondrocyte inflammation and these effects may help in clinical cases of cervical OA." (Story et al., 2021) Anecdotally horses with cervical pain respond well to acupuncture and it can prolong treatment intervals when combined with other therapies. Mesotherapy is another treatment that is similar to

acupuncture because it works on some of the same pain pathways. It can reduce muscle spasms and improve range of motion in horses with chronic neck pain. (Peters & Rombach, 2015)

**Osteopathic Assessment of the Cervical Region**

Osteopaths focus on the cause of pain and dysfunction rather than concentrating solely on the symptoms. One of A.T. Still's founding tenets of osteopathy is that structure and function are interrelated. If there is a structural or functional change in one part of the body, the change will not only affect that region but the body as a whole. (Christian, 2020) Therefore pain and dysfunction in the cervical region can cause compensation patterns throughout the whole body. "Although there may be acute pain in one region there will often be other areas of longstanding dysfunction, apparent on observation and palpation, with which the horse has coped by making adjustments to the way it moves. The point at which it can no longer make adequate adjustments is where the problem significantly interferes with performance." (Pusey et al., 2010) For example, if the horse is unable to use the momentum generated by the weight of the head to assist with forward movement because of cervical pain the horse will compensate by generating the movement with the hind legs and strain the lumbosacral region. (Pusey et al., 2010)

According to Dr. Haussler, "the ability to localize pain or stiffness to a specific vertebral level or defined spinal motion pattern provides a level of specificity that is required to diagnose subtle performance issues and to address vague or poorly localized sources of pain or upper limb lameness." (Haussler, 2018) This is where osteopathic techniques are very useful. A technique like OAB can be used to both diagnose and treat somatic dysfunction. Individual vertebrae and the range of motion of the cranial and caudal neck regions can be

assessed using OAB. T.A.R.T. is an important osteopathic palpatory technique. Tissue texture (T) change is one sign of somatic dysfunction. This can be shown as muscle spasm (muscles feel hard or tense) or hypo/hypertrophic muscle. Asymmetry (A) is the result of the body adjusting to a somatic dysfunction. Things like posture, and uneven muscle development can be signs of asymmetry. Restriction of motion (R) is when joints are limited in their range of movement. Tenderness (T) is when the horse flinches, pins their ears, pulls away, or is otherwise not comfortable when tissue is palpated. Very painful palpation is a sign of a more acute injury. (Christian, 2020) All of these palpation techniques can be used on the cervical region to identify pain and dysfunction.

**Osteopathic Manual Treatments of the Cervical Region**

Osteopathic treatment aims to increase mobility which increases afferent input from proprioceptors of muscles and joints which act to inhibit pain pathways. (Pusey et al., 2010)

HVLA

Chiropractic is an offshoot of osteopathy and they have the same origins. HVLA stands for high-velocity low-amplitude thrusts which are aimed at specific joints. It is one technique used in both chiropractic and osteopathy. The goal of using HVLA is to restore normal motion to the joint and reduce pain. Most of the studies in horses are on chiropractic, not osteopathy. “Equine osteopathic evaluation and treatment procedures have been described in textbooks and case reports, but no formal hypothesis-driven research exists.” (Haussler, 2016) Chiropractic is a multi-modal treatment that can help to treat muscular, articular, and osseous components of injuries in performance horses. (Haussler, 1999) In a human study of 82 patients, one group

received only HVLA cervical manipulation and the other a combination of cervical, cervicothoracic and thoracic manipulation. Results showed a single HVLA manipulation on the cervical region produced the same effects on pain and increased mobility as using multiple manipulations (cervical, cervicothoracic and thoracic). (Saavedra, et al., 2013) The conclusion can be drawn that HVLA may be an effective treatment for cervical dysfunction (stiffness) and can be used to successfully decrease cervical pain in horses.

OAB Osteopathic Articular Balancing

OAB also known in humans as GOT (general osteopathic technique) is a direct technique invented for use in animals by Dr. Stuart McGregor. It involves "gentle, repetitive, and passive motion of a joint into its restricted barrier to loosen the joint." (Parsons & Marcer, 2006) It can be used not only as a treatment but also as a diagnostic technique. OAB can help determine whether the joint movement is normal, restricted, or hypomobile. According to Dr. Haussler joint mobilization and manipulation can provide "important diagnostic and therapeutic approaches for addressing equine axial skeleton problems that are not otherwise available in veterinary medicine." (Haussler, 2016) If it is suspected that dysfunction is related to articular structures joint mobilization and manipulation are the most indicated manual therapy techniques. These techniques will help restore joint range of motion and reduce pain. Joint manipulation reduces pain and relaxes muscle by its effect on the mechanoreceptors. (Haussler, 2016) OAB should be considered a useful diagnostic and treatment for horses with cervical pain and dysfunction.

Myofascial Release

As mentioned earlier in the paper the cervical musculature and fascia are considered to be a highly likely source of pain for the horse. Myofascial release is considered a direct or indirect technique depending on how it is used. The treatment aims to reduce tension and improve function in the muscles and fascia. A direct approach takes tissue towards the barrier of resistance with a hold until tissue relaxation is felt. The indirect technique takes tissue towards the path of least resistance and it is held until a release is felt. (DeStefano, 2011 p 156-157) While studies on myofascial release are limited there are some involving neck pain in humans. 41 patients with neck pain were enrolled in a two-week trial using either myofascial release (MRT) or physical therapy (PT). At the end of the trial improvement of pain was 20% greater in the MRT group than the PT group. (Rodriguez et al., 2018) Even though no studies exist on myofascial treatment in cervical pain in horses it can be deduced that its use could have a positive effect on cervical pain in horses.

**Conclusion**

Horses cannot perform at their peak if they have pain and dysfunction. As explored in this paper traditional veterinary medicine has its limitations in diagnosing and treating disorders in the cervical region. Physical therapists, osteopaths, and chiropractors use mobilization and manipulation techniques to evaluate and treat soft tissue and joint problems in both humans and animals, but there is very little scientific evidence available to support their use in veterinary medicine. (Haussler et al., 2021) Despite the lack of strong peer-reviewed scientific evidence and studies, there is strong anecdotal evidence that osteopathic manual therapy can have a positive effect. Osteopathic treatment has many advantages because the practitioner is always looking for the cause of pain using a global approach to address the whole body. This is what makes

osteopathic manual treatment so useful in helping performance horses be able to function optimally and compete successfully. In conclusion, osteopathic manual therapy can have a positive effect on equine cervical pain and dysfunction.

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