How to Inject the Cervical and Thoracolumbar Articulations

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1. Introduction
Topline issues are common among all disciplines in equine practice.1–3 These problems can be divided up by anatomical location and generally involve the cervical, thoracolumbar, and sacroiliac regions. Treatment of the former two by injection will be covered in this report.

The cervical spine should be considered the conduit for all signals traveling from the control center of the brain to the rest of the body, particularly all four limbs.4 In the horse, issues associated with the neck may be related to its gravitationally challenged anatomical construct, functioning as a horizontally positioned boney column supported by the elastic nuchal ligament. During exercise, particularly in disciplines that require the horse to assume a collected cervical frame, excess stress may be placed on these articulations, either between the cervical bodies or the facet joints.5

Cervical dysfunction in people is commonly reported in orthopedic practice and is often associated with weakness and pain in the appendages or local pain restricting movement.6,7 Most often the clinical signs are described verbally to the attending physician; the gold standard for imaging of cervical lesions in the human patient is MRI. Due to the limitations of magnet design, however, it is not currently and may never be feasible to image the caudal cervical region of the horse. Therefore, equine clinicians are limited in their imaging capacity to radiology, ultrasound, and nuclear scintigraphy. In cases in which compression is suspected, myelography enhances the radiographic study but must be conducted under general anesthesia.

In our opinion, any horse with mild ataxia, intermittent or unrelenting forelimb lameness, or obscure hind limb lameness should be investigated for cervical issues.8,9 The pathophysiology associated with an obscure lameness may be due to a proprioceptive deficit, nerve root compression, or pain. Proprioceptive deficits may be described by the trainer or rider simply as “being heavy on the forehand” or feeling “disjointed” between the fore and hind limbs. Furthermore, any time a generalized decrease in performance is noted without corresponding lameness, a problem affecting any part of the axial skeleton should be ruled out. Recurrence of appendicular lameness after successful treatment may also be indicative of an underlying problem with the axial skeleton. In our practice, the most
common clinical signs associated with pathology in the thoracolumbar region are localized pain and aversion to saddling or mounting. More severely affected horses will react to the weight of the rider, sometimes violently, by bucking or rearing.

The physical examination of the entire axial skeleton of the horse is subjective and may be considered limited compared with examination of the limbs. Assessment of the neck includes observation of muscular development or atrophy, the response to passive cervical manipulation, and dermal stimulation. In many cases of cervical arthropathy, muscular atrophy is noted. Most horses that exhibit abnormal cervical manipulation either resist lateral flexion totally or avoid lateral flexion by offering a more ventral flexion of the head and neck. The rider often describes resistance to lateral bending, being “heavy on one rein” or resistance to achieving the frame desired. In some cases, particularly with upper-level dressage horses, the avoidance of this desired frame can even result in hypertrophy of the affected muscles along the topline. Examination of the thoracolumbar region can be even more subjective, with a painful response to direct pressure variable among horses.

It can be difficult to rule out problems in the axial skeleton without the screening tool of nuclear scintigraphy (Fig. 1), as these areas are easily highlighted by increased radiopharmaceutical uptake (IRU). In the case of myelopathy, no IRU may be noted in the cervical region. Radiography alone can be used to document some cases of cervical arthropathy. Radiography can highlight enlarged facets (Fig. 2), previous trauma (such as fracture), or enthesous bone formation and narrowing of the spinal canal, although these findings may not always carry clinical significance. Findings on ultrasound may include periarticular osteophytosis/entheseophytosis not seen radiographically. Ultrasound is also used to identify the facet joint and to guide the needle for proper intra-articular therapy.

The treatment of issues associated with the axial skeleton can often be challenging. In many cases, injection of the affected area with anti-inflammatory medication (corticosteroids) or autologous conditioned serum (ACS) may be indicated. Injection techniques for the cervical and thoracolumbar regions are described below.

2. Materials and Methods

Cervical Facet Injection

Cervical facet injection is performed once the joints to be treated are identified and the appropriate anti-inflammatory medication is selected. This technique has been described by many authors and has evolved over the years.10–14 The following procedure is described for the standing, sedated horse.

The materials needed for the procedure include the following:

- A new bottle of local anesthetic solution
- One 12-mL syringe (for the local anesthetic)
Several 25-gauge, 1½-inch hypodermic needles (for deposition of local anesthetic)
The anti-inflammatory of choice (new bottle if using corticosteroids)
18-gauge 3½-inch spinal needles (for facet joint injection)
Multiple 3-mL syringes (for the anti-inflammatory agent), one for each facet joint to be injected
Amikacin\(^b\) (if desired, particularly if using corticosteroids)
Alcohol in a standard spray bottle
Sterile scrub (chlorhexidine or betadine)

Ultrasound of the Articular Facets
Before performing the procedure, it is necessary to ensure adequate ultrasound penetration, using only alcohol without the use of any coupling gel (Fig. 3). In our clinic, ultrasound is performed using a multifrequency linear probe with the frequency set at either 8 or 10 MHz. Well-muscled horses may be more difficult to scan at the base of the neck, but lower-frequency settings and increased gain will usually allow for adequate penetration. If the image quality is insufficient, particularly during the fall and winter months, it may be necessary to clip the hair. We initially use a No. 10 blade, but in some cases clipping with a No. 40 blade is needed to visualize the facet joints adequately.

Anatomic knowledge of the cervical vertebrae and their articular processes is imperative to successful ultrasound identification of the facet joints. The cervical spine follows the ventral line of the neck, and the location of each articulation can be estimated by using the general rule that each cervical vertebra is approximately one hand-width. The vertebrae can be counted starting at the base of the ear moving toward the shoulder, with the spaces between each hand serving as the estimation of each vertebral articulation. Once the approximate locations of the joint(s) of interest have been identified from cranial to caudal using the hand-width rule, the location of the joint from dorsal to ventral must also be determined. The best way to do this is to identify the level of the transverse processes of the associated cervical vertebrae. The articular facets are usually located 6 to 8 cm proximal to the line of the transverse processes. Once the approximate location has been identified from cranial to caudal and dorsal to ventral, the ultrasound probe is placed perpendicular to the ventral line of the neck. The probe should initially be placed in a more ventral position at the level of the articular facet of interest and moved proximally until the joint is identified (Fig. 4). As the probe is advanced dorsally toward the facet joint, it is often helpful to sweep cranially and caudally with the ultrasound probe to ensure that it is located in the middle of the facet joint. Difficulty can arise when there is significant pathology resulting in periarticular osteophytes, as this will sometimes obscure visualization of the joint space. Again, sweeping cranially and caudally will usually help identify a more congruent articular margin. Typically, the facet joint at C6-C7 sits directly in front of the line of the shoulder created by the supraspinatus muscle.

5. Preparation for Articular Facet Injection
The horse is usually sedated with an alpha-2 agonist such as detomidine\(^c\) or romifidine\(^d\) combined with butorphanol\(^e\) if necessary. The dose is at the discretion of the veterinarian and should be aimed at
providing adequate sedation so the horse will not move or attempt to raise its head during the injection, but without becoming so sedate that the horse is swaying or buckling at the knees. It should be noted that if the horse seems overly sedated or becomes significantly ataxic with a small dose of an alpha-2 agonist, cord compression may be present. This should be taken into consideration, particularly if treatment of the articular facet joints does not result in resolution of the presenting clinical signs. The neck should be prepared with an initial scrub of a chlorhexidine or betadine solution (Fig. 5). Alcohol is then sprayed over the area to be examined ultrasonographically. When placing the ultrasound probe on the neck, it is critical to know which side of the screen is dorsal and which side of the screen is ventral because this will determine the side of the screen the needle will be entering from. Whether the needle always advances from the same side of the screen or another method is used (i.e., needle comes in from the left side of the screen on the left side of the neck and from the right on the right side), it should be done the same way for every horse to ensure consistency. To facilitate injection, the articular margin of the facet joint should be located toward the lower half of the screen to allow for adequate needle visualization. The needle will be placed approximately 1 cm dorsal to the proximal edge of the ultrasound probe (Fig. 6). Once through the skin, the needle is slowly advanced axially and ventrally at approximately a 45-degree angle (Fig. 10). The needle should be advanced slowly, ensuring that it can be visualized on the ultrasound screen. If the needle is not visible, the operator should sweep the ultrasound probe from cranial to caudal until the needle is visualized. Adjustments in the angle while the needle is being advanced should be done as early as possible in the process because this becomes more difficult, the

Articular Facet Injection

The facet joints are again identified with ultrasound and the 18-gauge, 3½-inch needle is inserted through the skin bleb, approximately 1 cm dorsal to the proximal edge of the ultrasound probe (Fig. 9). Once through the skin, the needle is slowly advanced axially and ventrally at approximately a 45-degree angle (Fig. 10). The needle should be advanced slowly, ensuring that it can be visualized on the ultrasound screen. If the needle is not visible, the operator should sweep the ultrasound probe from cranial to caudal until the needle is visualized. Adjustments in the angle while the needle is being advanced should be done as early as possible in the process because this becomes more difficult, the
deeper the needle penetrates within the muscle. This is particularly important when injecting C6/C7 or in heavily muscled horses in general. In addition, multiple needle tracks in the muscle may create air artifacts, making visualization more difficult over time. The needle should be advanced axially and ventrally, following the progress on the ultrasound screen as it approaches the articular margin, until the bone is contacted at the tip of the needle (Fig. 11). The stylet is removed from the spinal needle, and the medication of choice is injected. An assistant can remove the stylet and inject the medication, allowing the operator to continue watching the process on the ultrasound screen (Fig. 12).

If no assistant is available, then the operator must hold the needle steady once in the proper position and put the probe down so he or she can inject the medication. If there is resistance to injection, it may be beneficial to rotate the needle a quarter-turn or retract the needle a very small amount (1 mm) because it may be up against the bone or cartilage, creating difficulty on injection. If at any time blood is seen at the hub of the spinal needle, the needle should be removed and the injection started over. Synovial fluid is seen inconsistently, and it is not necessary to obtain fluid to ensure intra-articular injection, provided the ultrasonographer is confident with the needle placement.
Postinjection Protocol: Cervical Facet Joints

Follow-up treatment with a systemic anti-inflammatory can be done at the discretion of the attending veterinarian. The exercise protocol varies, depending on the severity of the cervical arthrosis and whether it is a first-time treatment. For more severely affected horses, particularly those being treated for the first time, we recommend a very careful return to athletics. The horse is hand-walked for several days, followed by a return to light work under saddle. Trotting and cantering is reintroduced slowly, with no attempt at collection or excessive cervical bending initially. By 3 to 4 weeks after injection, full work is allowed, including asking for a frame. In cases of repeat injection, the return to full work and collection is much quicker and may occur within 2 to 5 days.

Thoracolumbar Facet Injections

Injection Technique

A technique has been described for an ultrasound-guided injection of the thoracolumbar intervertebral facet joints. Preparation is similar to the cervical spine; however, the injection site is not desensitized before injection, and a longer needle is recommended. Identification of the facet joints begins by finding the 18th rib and following it dorsally to its articulation at T17-T18. The probe is held just off midline and angled slightly axially, initially finding the dorsal spinous process (DSP), which can be followed down to the facet joint (Fig. 13). The facet joint is identified as a transverse hyperechoic line proximal to the rib (thoracic) or transverse process (lumbar) (Fig. 14). The needle can be placed either axial or abaxial to the ultrasound probe. In the axial approach, the needle should be angled at approximately 40 degrees before insertion.

Thoracolumbar DSP Injections

Injection Technique

In cases when over-riding DSPs are creating clinical signs, it may be advantageous to inject anti-inflammatory medication adjacent to the over-riding processes. In most cases, the offending region is identified either by nuclear scintigraphy or radiography. Counting cranially (or caudally) from the 18th rib, each DSP is identified. The injection technique used involves placing the ultrasound probe directly on midline to identify the DSPs (Fig. 15). Once the offending space is located, the probe is positioned so that the caudal edge of cranial DSP and the cranial edge of the caudal DSP is visualized, placing the space between the two directly in the
After routine preparation, a 25-gauge, 1½-inch needle is introduced directly abaxial to the probe and angled back toward midline until the bone is contacted (Fig. 17). No attempt is made to inject “between” the DSPs because most cases associated with clinical signs have little space between over-riding processes. This procedure is repeated on both the left and right sides of midline.

**Postinjection Protocol: DSPs**

The return to work after injection of the spaces between the DSPs is usually immediate but does not generally involve any under-saddle exercise initially. It is usually beneficial to begin by line-driving or lunging aimed at stretching and rounding the topline. Depending on the severity of the over-riding DSPs, the return to full work under saddle may be several days to several months. In the case of young, immature horses, it may even be beneficial to turn the horse out for 6 to 12 months to allow the topline to become stronger and more mature.

**3. Results**

Examination of the authors’ last 234 cervical injections revealed that 70% underwent nuclear scintigraphy before injection. In 56% of the cases, only the facet joints at C6-C7 were injected, whereas 34% (81/234) had C5-C6 and C6-C7 injected. In 9% (21/234) of the cases, the facet joints at C4-C5, C5-C6, and C6-C7 were injected. Overall client satisfaction was much higher (92%) when the facet joints were injected based on history, clinical examination, IRU on a bone scan, and radiographs. If no bone scan was performed, the satisfaction with the cervical injection was much lower (63%). In most cases (230/234), the cervical facet joints were injected bilaterally.

**4. Discussion**

The diagnosis and treatment of topline issues can represent a significant challenge to the equine practitioner. Although diagnostic means have been touched on in this report, treatment by injection is the focus. In our practice, injection of the cervical facet joints is a relatively common procedure in horses with problems of the axial skeleton, whereas injection of the thoracolumbar facet joints, DSPs, and sacroiliac region are uncommon, simply because we have found other methods of managing these cases to be effective. Horses with disorders of the axial skeleton other than those affecting the cervical
HOW TO MAKE RATIONAL CHOICES FOR INTRA-ARTICULAR INJECTIONS

Successful treatment of cervical arthropathy with intra-articular corticosteroids seems to imply that the pathology is somehow related to articular or periarticular inflammation. In our case load initially were with corticosteroids; however, recent applications have included the use of ACS. Becker et al. used ACS successfully in people with lumbar radiculopathy. Other treatments for cervical issues may include acupuncture, massage, manipulation, or shock wave therapy. In horses that do not improve with intra-articular injection and have neurological deficits, cord compression should be considered, and additional diagnostics in the form of a myelogram may be warranted. In most cases, the facet joints were injected from both the right and left sides, based on radiographic and/or scintigraphic evidence that facet arthrosis was present bilaterally. Unilateral facet joint injection was a rare occurrence in our case load and was usually performed when there was a unilateral forelimb lameness attributed to facet arthrosis.

Return to function after treatment of a cervical arthropathy can be difficult to quantify, particularly because the clinical signs may be considered obscure to begin with; and, in some situations, the treatment has been combined with other therapies aimed at concurrent appendicular skeletal abnormalities. In cases in which ataxia is noted, return to exercise should only be with stern warnings and limitations for the safety of the rider and for legal reasons. In moderate to extreme cases of cervical compression or unremitting pain associated with the cervical arthropathy, cervical body fusion has been successfully used. Regression of the enlarged facet joint has been documented with plain radiography and myelography after cervical stabilization.

In the horses with mild clinical signs associated with over-riding DSPs, improvement is relatively easy to quantify. The back pain and resistance to forward work subsides, and the horse returns to a normal athletic routine. In cases in which severe clinical signs are present, it becomes difficult to determine when the horse can return to work under saddle. If the presenting signs include a horse that bucks or rears violently when ridden, particularly if the owner is an amateur, the decision to return the horse to work under saddle should be undertaken very seriously, if at all. In severe cases of back pathology, retirement may be the best and most humane option. Surgical removal of the offending DSPs has also been described as a successful method of managing this disorder.

In our case load, it is not uncommon to see a combination of topline pathologies present in the same horse. Horses with cervical arthropathy often have some degree of sacroiliac soreness present and vice versa, begging the discussion as to which syndrome preceded the other and which is more vital to the horse and its future athletic function. More importantly, cases of over-riding DSPs often have issues associated with both the cervical and sacroiliac regions. In such cases, treating the pathology in the thoracolumbar region will only temporarily improve the horse because the underlying pathology in the cervical and sacroiliac regions may be causing the horse to “invert” its topline, leading to the development of the over-riding DSPs. In such a horse, treatment of the cervical and sacroiliac dysfunction, combined with “retraining” of the topline, can result in improvement or resolution of clinical signs. Retraining the topline may include cantering under saddle or lunging with a collection device such as a Pessoa lunging rig. Such training modifications should be explored in conjunction with the trainer and owner. The goal is to restore physiological function as quickly as possible, so the horse “rehabilitates” itself.

The diagnosis of topline disorders in the horse can be challenging enough, but the treatment of these abnormalities can be a source of significant frustration to the equine practitioner. This report addresses in depth just one method of managing such cases.

References and Footnotes


*Orthokine, ORTHOGEN Veterinary GmbH; Düsseldorf, Germany.*

*Amikacin, Ben Venue Laboratories, Bedford, OH 44146.*

*Dormosedan®, Orion Corporation, Espoo, Finland.*

*Sedivet®, Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO 64506.*

*Torbugesic®, Fort Dodge Animal Health, Fort Dodge, IA 50501.*