Evaluating posture in horses

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February 14, 2017

Assessing habitual postures, along with understanding the significance of posture, can yield more accurate diagnosis and treatment of lameness and other issues in your equine patients.

Do you have an equine patient that responds well to your treatments for musculoskeletal pain – but keeps presenting with the same signs? Some conditions like joint fusions can only by managed, not resolved. But there might be an overlooked factor re-creating the same pattern of pain and dysfunction. That factor could be the horse's habitual posture.

Posture is the "elephant in the room"! Horses often stand for 20 to 23 hours each day, only lying down briefly for REM sleep. Yet the significance of posture is largely ignored in our veterinary training, our evaluation of lameness, and in veterinary literature.

NNP and deviations

In 2014, Maximum Horsepower Research conducted a study, funded by the American Holistic Veterinary Medical Foundation, which sought to characterize normal neutral posture (NNP) and abnormal compensatory posture (ACP) in horses.[1] It was found that three factors are predictably responsible for deviations from NNP in most domestic horses:

1. Integration of the head-neck-back neuromuscular function[2, 3]
2. Distorted hoof balance[4, 5]
3. Dental malocclusions[6, 7]

Correcting the distorted structures through farriery and dentistry, and addressing the functional changes (with manual therapies, acupuncture, extended turnout and/or appropriate exercise) can be highly effective in restoring NNP, and can allow horses to heal these chronic pain syndromes instead of our having to treat recurring signs.

Normal neutral posture is metabolically less costly to maintain, an important factor for large animals. NNP is observed as the default posture in most wild/feral horses that self-manage their feet and teeth by grazing over large ranges. NNP is primarily characterized by limbs positioned with Metacarpal 3/Metatarsal 3 (cannon) bones perpendicular to level ground, or to the center of the earth on a slope.

A normal compensatory posture (NCP) is one in which a horse maintains good mechanical balance, using minimal energy with maximal stability, while accommodating an injury or resting a limb. If a horse stands frequently with more than one leg camped in from the vertical, it can be a sign of abnormal compensatory posture (ACP).

Signs associated with different postures

Normal neutral posture (NNP)

- Cannon bones vertical to ground
- Lowest point of back located just behind withers
- Straight spinal contour (at rib heads) from just behind withers to lumbosacral junction
- Relaxed cervical postures with minimal muscular definition
- Longissimus muscles soft and evenly developed, with no pain or spasm
- Symmetrical feet of a pair, front and hind
- Frog width of front feet at widest point equal to or greater than that of hind feet

Normal compensatory posture (NCP)

- Associated with injury, allows healing
- Three out of four legs close to or at vertical
- Limbs arranged to make stable tripod
- Often same (injured) leg off-loaded

Abnormal compensatory posture (ACP)

- Usually ≤ one vertical leg
- Sum of limb angles >12° (positive measured angle towards center of horse)
- Muscle soreness on back and haunches, most frequently at thoracolumbar and lumbosacral junctions
- Overly developed gluteal muscles, “bubble butt”
- Tight hamstring muscles (semi-membranosus/tendonosus)
- Front frogs less wide than hind, asymmetrical feet of a pair, front or hind
- Often “lame” leg is heavily loaded at rest

Characteristics of abnormal compensatory posture

It has been observed clinically that many horses with chronic ACP tend to fidget, shifting their position often, especially on hard ground surfaces. Stalled horses with ACP will often mound their bedding to create a standing surface that feels more comfortable and consistent with their altered neurologic information and organization.

Our research suggests that horses with ACP recruit muscles normally used for locomotion to support themselves during quiet stance. The muscles most commonly affected are the cranial thoracic limb muscles, the caudal thigh muscles and the longissimus muscles, which become overused, sore and eventually even fibrotic. These muscles contain predominantly fast twitch fibers for powering locomotion, and are not well suited for constant use for stance.

This pattern is similar to horses suffering from Equine Motor Neuron Disease, a condition that selectively attacks Type 1 (slow oxidative) fibers in postural muscles, and results in an identical habitual posture, and similar “restless” behaviors, because their postural muscles can’t be used to stand still.8 However, unlike EMND patients, who have a primary muscle physiology dysfunction,

horses with ACP caused by structural/ functional distortion of the postural control system can regain normal posture rapidly by normalizing structural input and "reprogramming" their functional postural control systems.

Techniques for evaluating posture

Photography

Whether in the field or the veterinary clinic, it is most useful to measure habitual posture, or how the horse tends to stand on his own, while resting or feeding. Photography can be very useful for this, as it allows assessment of posture from across a field, or in a stall, when our presence or handling has not affected the horse.

Many factors affect posture, including neuromuscular integrity, proprioceptive input from hooves, dentition and unfamiliar ground surfaces, as well as non-mechanical influences including emotions, external stressors, handling and changing environments. The best procedure is to take multiple "snapshots" of the patient's posture. A pattern of the most common postures should emerge for that horse, and that can be correlated to information gleaned from the hooves. When using this method, two common confounding factors are non-level ground and distortions created by the angle of lens trajectory.

Bringing the horse into a barn or clinic for assessment will usually solve the problem of level ground, but often changes the horse's relationship with his environment. To mitigate these factors, it can be helpful to allow the horse to equilibrate to the environment for 20 minutes or more. Some horses will require the presence of a companion horse before settling to their habitual posture. In a flat-floored stall, they can demonstrate feeding postures if hay is on the floor, and possibly even sleep/resting postures if they are comfortable. Each of these postures can be evaluated and documented as they are significant in the forensics of structural/functional balance distortions, altered gaiting patterns and lameness.

If the animal is held, the handler should be neutral, and have no expectations about how the horse should stand, as most animals will sense this and fidget or "pose". The handler should not restrain the position of the horse's head in any way. The horse should be held with a "light" hand until he settles to stillness and the default posture is noted, videoed or photographed. He then can be walked at an easy pace on level ground, and as the handler stops, the horse is allowed to come to a full stop on his own, and to wait till he is calm. This sequence should be repeated three to five times until the evaluator feels comfortable that the posture exhibited is consistent. At each "full stop", a lateral photograph can be taken.

Photographs should be taken with the camera accurately parallel to the spinal axis of the animal, perpendicular to the center of the animal and/or each pair of legs being examined and preferably close to the horizontal plane of the legs and feet to avoid distortion.

Vertical and horizontal references in the picture such as plumb structures, posts or trees and truly flat, level standing surfaces are important. Measuring the angle each cannon bone makes with the ground can be done with a simple protractor, a digital program like ImageJ, or the smart phone app "Angle Meter".

From lateral photographs, or using a protractor application while taking photos or video, measure the center of each cannon bone's angle with respect to level ground from directly lateral to a pair of limbs or to the whole horse from a sufficient distance to minimize distortion. By convention, a positive angle is considered caudal from the vertical on the forelimbs and rostral from the vertical on the hind limbs. The sum of all four angles of the legs is totaled, giving a postural score. A score of more than 12° is suspect for abnormal compensatory posture (ACP). Any leg not fully weight bearing is not added to the total.

Measuring limb angle

Using the smart phone app, "Angle Meter", one can measure the cannon bone angle in real time or on a screen photograph. The program has a level, as well as an angle measure, to avoid picture distortion. Tilt the phone to line up the angle measure with the leg.

Developing skill with these measuring tools – "Angle Meter", "ImageJ" or protractor – can be challenging; but in general, these measurements usually turn out to be sensitive enough for their margin of error, because most horses with clinically significant ACP have a total limb angle score in excess of 20. In a postural analysis that is close to the minimum deviation, other factors can usually help confirm or disprove ACP, such as hoof measurements or dentition asymmetries.

Significance of identifying ACP

The forensics of sports injury begin with posture. A neutral posture (NNP) symmetrically strengthens the musculoskeletal system in the configuration that experiences the greatest loading at high speed movements, which is when the cannon bones are vertical to the ground surface. When a horse has chronic ACP, the loaded legs, often for 20 hours a day, are at angles and asymmetrical, which does not remodel the bones appropriately for movement stresses. Here are the most common stance patterns seen:

1. Normal neutral posture: Four limbs squarely placed, cannon bones vertical, frog width equal side to side, forelimb frog width at widest point at heel up to 10% larger than hindlimb frog width.
2. Lateral bend pattern: Limbs not symmetrically placed, legs consistently closer together on one side, frog widths uneven side to side, though not always so; front to hind frog width ratio can vary: F>H, F=H, H>F.
3. Pace pattern: Limbs not symmetrically or squarely placed, often with legs on same side in advance of legs on opposite side, frog widths uneven side to side, larger frogs fore and hind on same side. Front to hind frog width ratio can vary: F>H, F=H, H>F.
4. Diagonal pair pattern: Frog widths uneven side to side, larger frogs on a diagonal pair of legs (LF/RH or RF/LH), front to hind frog width ratio can vary: F>H, F=H, H>F.
5. "Goat-on-a-rock": Legs "camped in", front limbs placed behind vertical, hinds in front of vertical, hind frog width 5% to 20% larger than fore.

These correspond generally to gaiting patterns produced by central pattern generators in the spine which can be elicited by balance changes or abnormal supraspinal input.[9, 10]

Conclusion

Awareness and evaluation of our patients' habitual postures, along with accurate quantification and understanding of the significance of posture, can lead to much more accurate diagnosis and treatment of lameness and other mechanical, physiologic and emotional issues. Postural evaluation can give us an objective tool for evaluating the effectiveness of our interventions over time and for educating ourselves and our clients.

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