An approach to diagnosing lameness in equine patients

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Categories : Equine, Vets

Date : December 7, 2015

Lameness is the most common reason for veterinary examination evidenced in numerous studies[1,2,3].

Within the overall UK horse population, which is close to one million, about 19% of horses will suffer a lameness episode each year[4,5]. Therefore, veterinary surgeons need to be competent in the recognition and diagnosis of lameness in horses.

Flexion test of the proximal hindlimb. This test can help to distinguish upper from lower hindlimb pain, although it is very non-specific and should not be used as a primary tool to localise lameness. False-positive tests are possible, with distal limb lameness being exacerbated by this test. In addition, in an uncooperative horse this test can prove hazardous to the vet.

Reaching a diagnosis can be straightforward and rapid, as in the case of a foot abscess or laminitis; however, in other cases, reaching a diagnosis may require multiple diagnostic nerve blocks, multiple imaging modalities and, potentially, diagnostic surgery.

When lameness is associated with clear localising signs – such as a soft tissue swelling, a sore tendon or a synovial effusion – reaching a diagnosis may be swift. If clear localising signs are absent then the challenge of reaching a diagnosis becomes greater and may require a number of days and a degree of patience from the veterinary surgeon, the owner and the horse.

The overall challenge in lameness evaluation is to reach one specific diagnosis so clear advice can be provided to the owner regarding treatment and prognosis. The lameness evaluation can be seen as a mystery that needs to be solved, with each piece of information gathered contributing to the solution. Sometimes, more than one source of lameness is present; however, it is useful to start with the assumption there is one problem.

This article will focus on lameness diagnosis in the horse without clear localising signs, but the principles presented apply to any horse with lameness.

Examination components

History

The main components of the lameness evaluation must include the horse's basic details and a good history. Knowing the horse's age, breed and use can immediately allow the list of potential differential diagnoses to be shortened. Basic information related to the history is important to build a picture of the lameness, but will also contribute to the final advice to owners.

Relevant information relating to the lameness includes duration, severity (at onset and since), any change in lameness with exercise, recent alteration in shoeing or exercise regime, response to any medication and any previous veterinary intervention. While obtaining the history, it can be useful to observe the horse in the stable or paddock to assess stance (resting one limb, shifting weight) and willingness to move around.

Clinical examination

Prior to the horse being examined in motion, a systematic physical examination of the horse at rest is essential. This examination will ensure the appendicular and axial skeletal elements are palpated carefully. Ideally, the examination should encompass muscle, ligaments, tendons and joints, as well as an assessment of foot balance and response to palpation of the neck and back.

Each limb should be lifted and the range of motion of the joints assessed. Any areas of perceived abnormal swelling should be compared to the opposite limb so the examiner can appreciate what is normal for that individual. Horses may have mild to moderate synovial effusions that have developed over time that represent incidental findings. Most commonly, these would be apparent in the digital flexor tendon sheaths (wind galls). Standing the horse square and observing for any asymmetry of musculature or bony landmarks in the forelimbs and hindlimbs can be helpful.

Once the examination at rest has been completed, the next step is examination in motion. Ideally, examination in motion would take place on a firm, flat surface for walking and trotting in a straight line and lungeing, as well as a soft riding school surface for additional lungeing. Depending on the facilities available, the ideal may not be achievable, but this does not preclude the completion of a

thorough lameness evaluation. The more subtle the lameness, the more important a consistent surface becomes during the examination since alterations to the gait may be minimal.

During the examination, three initial questions need to be answered:

- Is the horse lame?
- In which limb or limbs is the lameness?
- What is the severity of the lameness?

The answers to these questions help the veterinary surgeon make decisions regarding how the examination should progress.

Is the horse lame?

The basic question “Is the horse lame?” is important, since an owner’s perception of a gait deficit or altered way of going does not necessarily indicate lameness. If lameness is defined as a gait abnormality attributable to the musculoskeletal system then not all gait abnormalities represent a true lameness.

The most common non-musculoskeletal gait abnormalities presented to the vet as lameness involve neurological conditions. Neurological conditions present with gait deficits that result in ataxia, dysmetria, hypermetria, proprioceptive deficit, paresis and/or weakness, with the potential diagnoses including primarily cervical vertebral malformation, cervical spine osteoarthropathy and peripheral neuropathies. Recognition of these neurological deficits is important since diagnostic nerve blocks are not appropriate for these cases, unless there is a true lameness concurrently.

In which limb is the lameness?

Detecting the lame limb or limbs relies on an ability to detect an asymmetry of gait between the right limbs and the left limbs of the forelimbs and/or hindlimbs. Traditionally, gait asymmetry has been detected by assessing head movement, gluteal mass movement, stride length and stride rhythm.

Observations with subjective grading works well for most cases; however, some objective measurement tools for assessing lameness have been developed that use inertial motion sensors, a combination of gyroscope, accelerometer and global positioning technology. The motion sensing equipment is combined with wireless technology, automated processing and a laptop or tablet to allow horse side use.

The Equinosis Lameness Locator consists of a combined accelerometer and gyroscope placed on the head and pelvis of the horse, with a gyroscope on the right forelimb. The system provides a vector that indicates the lame limb, based on an asymmetry of limb impact or limb push off[6].

A different system, Equigait, uses four to five inertial motion sensors (accelerometers) placed on the poll, withers, midline pelvis and each hip to measure differences in movement between the right hip and left hip. The system provides a sinusoidal curve of motion that allows for comparisons between left limbs and right limbs to determine the abnormal limb[7]. These systems are becoming increasingly popular, but do not replace careful clinical examination and observation by the veterinary surgeon.

The traditional methodology for detecting lameness in the forelimb relies on asymmetric vertical excursion of the head, evaluated with the horse trotting. In a sound horse at the trot, the horse's head should remain level. In a lame horse, the head is raised up as the lame forelimb strikes the ground. The degree of head excursion indicates the severity of lameness, with the greater excursion indicative of greater degree of lameness. The head nod is useful for detecting forelimb lameness, regardless of whether the horse is moving in a straight line or in a circle.

Detection of hindlimb lameness is often less straightforward since the asymmetry of hip movement appreciated with the horse trotting in a straight line is difficult to assess with the horse trotting in a circle. Additional gait characteristics that assist in the detection of lameness on a circle include asymmetry of stride length, asymmetry of cadence, toe drag and fetlock drop. Other features of gait that may assist in detection of lameness include poor movement of the back, holding of the tail to one side or holding the head and neck to the outside of the circle.

All of these measurements of gait asymmetry are subjective and most easily detected when the lameness is severe, but can become more difficult to appreciate if the lameness is mild.

What is the severity of the lameness?

Defining the severity of the lameness is important for a number of reasons, including determining how the diagnostic work-up proceeds, assessing alteration in lameness following nerve blocks or treatment and for communication with other veterinary surgeons. For example, if the lameness is defined as severe then limited examination in motion will be undertaken and diagnostic imaging techniques may be used without any diagnostic nerve blocks. Unfortunately, a universal or worldwide agreed lameness scale does not exist.

Three main lameness grading systems seem to be in use. In one system common in the UK, the lameness is graded from 0 to 10, with 0 being a sound horse and 10 a non-weight bearing lameness. In general, a lameness graded between 1 and 3 is mild, between 4 and 6 moderate and between 7 and 10 severe. Using this method, a grade of lameness can be assigned separately for the walk, the trot on a straight line and again in each direction on the circle. The origin of this scale is not known, but has been used in numerous studies in which lameness has been graded[8].

A scale ranging from 0-8 advocated by Dyson (2011)[9] separates the lameness into mild, moderate and severe at walk and trot in a straight line and on different size circles. The scale is as follows: 0

= sound, 2 = mild, 4 = moderate, 6 = severe and 8 = non-weightbearing.

A third scale has been advocated by the American Association of Equine Practitioners that grades the lameness from 0 = sound to 5 = non-weight bearing lame. This scale incorporates the degree of lameness at the walk and the trot together for each grade, leaving a lack of breadth in the ability to describe the lameness. For instance, a horse of grade 3 lameness is described as being sound at the walk, but consistently lame at trot in a straight line and on a circle, giving no indication of the severity of the lameness.

Since no universal agreement exists on how lameness is graded, it is important to state in communication between veterinary surgeons, or in scientific papers, which scale has been used so the severity of lameness is clear to the veterinary surgeons involved.

Once these three main questions have been answered, it will be easier to decide the best approach to determine the anatomic location of the problem. Finding the exact anatomic structure(s) responsible for the lameness is essential to reaching a specific diagnosis, treatment plan and prognosis.

What is the anatomical location of the lameness?

Reaching an anatomical diagnosis is most challenging when localising signs are absent during the clinical examination. Diagnostic nerve blocks are the gold standard clinical tool used to localise the lameness. Flexion tests are often performed in an effort to localise the lameness to the distal or proximal limb; however, the horse's responses to flexion tests are not necessarily repeatable or reliable[10]. Hoof testers should be used in almost every lameness examination to eliminate the possibility of a foot abscess, foot bruise or close nail.

Diagnostic nerve blocks: gold standard

Regardless of the experience of the veterinary surgeon in lameness diagnosis, diagnostic nerve blocks are the main tool used to localise the lameness to a specific anatomical region. In general, perineural local anaesthetic blocks are performed initially to determine the general anatomical region of the discomfort.

After the general region has been identified, more specific intrasynovial (intra-articular, intrathecal) nerve blocks can be performed in an effort to pinpoint the area of pain. Once a specific anatomical region has been identified, diagnostic imaging techniques can be used to reach an accurate diagnosis.

The general rule for diagnostic anaesthesia is to begin distally on the limb with perineural anaesthesia, progressing proximally with additional blocks in a systematic manner. This approach facilitates identifying a focal anatomical region on which to concentrate.

For example, with lameness that does not respond to local anaesthetic placed on the palmar digital nerves at the level of the collateral cartilages (palmar digital), or subsequently at the level of the abaxial proximal sesamoid bones (abaxial sesamoid), but responds to a low four-point block, the veterinary surgeon would be most suspicious of a problem in the fetlock joint region.

Then, additional diagnostic nerve blocks would include the metacarpophalangeal joint and the digital flexor tendon sheath. There is inadequate space to describe all of the nerve blocks in this article, so the reader is referred to the literature for the specific descriptions.

The systematic approach is the mainstay of lameness diagnosis, but there are times it is not used. The pattern of nerve blocks should never become random. The most common exception to the distal-to-proximal pattern is when a clear synovial effusion is present, in which case intra-articular anaesthesia is likely to be the first approach.

Demonstration of anaesthesia of the palmar digital nerve. The local anaesthetic is being placed slightly proximal to the optimum location, which is about 1cm further distal at the level of the proximal extent of the lateral hoof cartilages. The optimal volume of local anaesthetic for injection is 1.5ml, but for efficiency, the syringe may be loaded with 3ml, with half the solution used for the medial and half for the lateral palmar digital nerve.

Sometimes, a positive flexion test may persuade the veterinary surgeon to focus on a particular joint before performing perineural anaesthesia. However, the flexion tests are not reliable and can

prove misleading as to the source of the lameness. It is a risky proposition to proclaim a definitive diagnosis based on flexion test results without confirming the source of lameness with diagnostic nerve blocks.

In general, when approaching a forelimb lameness, deviating from the distal to proximal rule for perineural anaesthesia is uncommon. However, the distal-proximal progression is more likely to be circumvented in hindlimb lameness for a number of reasons.

First, the foot (excluding foot abscesses) is not the most common cause of hindlimb lameness. More common causes are osteoarthritis of the small tarsal joints, proximal suspensory desmitis and stifle joint soreness. Therefore, there is some justification for beginning diagnostic anaesthesia with intra-articular anaesthesia of the small tarsal joints in the first instance, which can be followed by a distal limb perineural block if there is not alteration to the lameness.

The exact sequence in which nerve blocks are performed will be altered depending on the response shown by the horse. The total number of perineural or intrasynovial nerve blocks required for any case is difficult to predict, with the lameness examination potentially requiring a couple of hours (for one to two blocks) or a number of days to locate the anatomical source of pain.

Diagnostic anaesthesia is a mainstay of lameness diagnosis and remains the gold standard for localising lameness. However, the area desensitised by the nerve blocks can be more widespread than anticipated if the local anaesthetic diffuses further away from the site of injection than anticipated. Two examples would be a fracture of the first phalanx being desensitised by an abaxial sesamoid nerve block and a horse developing paresis of the suprascapular nerve following diagnostic anaesthesia of the scapulohumeral joint.

Horse compliance can be a significant problem when performing perineural or intrasynovial diagnostic nerve blocks, particularly in the hindlimbs. Many horses are amenable to the diagnostic anaesthetic techniques, either with minimal restraint or placement of a nose twitch and lifting up another of the limbs. Some horses permit a number of blocks to be performed before developing avoidance behaviour. Sometimes the avoidance behaviour can be overcome without sedation.

A study demonstrated sedation of horses for diagnostic anaesthesia does not alter the evaluation of lameness once the sedation has worn off[11]. Therefore, if necessary for human or equine safety, sedation may become the sensible and necessary approach to perform certain nerve blocks.

Contraindications for nerve blocks would include a severe lameness suspected to be a fracture, cellulitis, moderate soft tissue swelling or a local wound. The most common complications associated with diagnostic nerve blocks are swelling at the site of injection, either in response to the substance or due to haematoma formation. Rare complications include infection of the tissue (perineural), infection of the synovial structure (intrasynovial), peripheral neuropathy (cubital and shoulder joint anaesthesia) and bent or broken needles.

After localisation of lameness

Once the lameness has been localised to an anatomical region, diagnostic imaging can begin. Choice of diagnostic imaging modality is important to maximise the efficiency of reaching a diagnosis and to minimise the effect on the client's wallet. The most common diagnostic imaging modalities would be ultrasound and/or radiography, which can aid in reaching a definitive diagnosis in many cases. Other cases may require the use of nuclear scintigraphy, MRI or CT to reach a definitive diagnosis.

In conclusion, lameness evaluation in the horse is best approached in a systematic, methodical and patient manner. The key to becoming successful in lameness diagnosis is development of the ability to recognise and grade lameness consistently, and to accurately perform the diagnostic nerve blocks. Once the anatomical location of the lameness is found, half of the task has been accomplished.

References

1. Ross MW (2003). Lameness in horses: basic facts before starting. In Ross MW and Dyson SJ (eds), *Diagnosis and Management of Lameness in Horses*, Elsevier Saunders, St Louis: 3-8.
2. Jeffcott LB, Rossdale PD, Freestone J et al (1982). An assessment of wastage in Thoroughbred racing from conception to four years of age, *Equine Veterinary Journal* **14**(3): 185-198.
3. Dyson PK, Jackson BF, Pfeiffer EU and Price JS (2008). Days lost from training by two- and three-year-old Thoroughbred horses: a survey of seven UK training yards, *Equine Veterinary Journal* **40**(7): 650-657.
4. Slater J (2014). Findings from the National Equine Health Survey, 2013, *Veterinary Record* **175**(11): 271-272.
5. Ireland JL, Clegg PD, McGowan CM et al (2012). Comparison of owner-reported health problems with veterinary assessment of geriatric horses in the United Kingdom, *Equine Veterinary Journal* **44**(1): 94-100.
6. Keegan KG, Kramer J, Yonezawa Y et al (2011). Assessment of repeatability of a wireless, inertial sensor-based lameness evaluation system for horses, *American Journal of Veterinary Research* **72**(9): 1,156-1,163.
7. Olsen E, Andersen PH and Pfau T (2012). Accuracy and precision of equine gait event detection during walking with limb and trunk mounted inertial sensors, *Sensors (Basel)* **12**(6): 8,145-8,156.
8. Arkell M, Archer RM, Guitian FJ and May SA (2006). Evidence of bias affecting the interpretation of results of local anaesthetic nerve blocks when assessing lameness in horses, *Veterinary Record* **159**(11): 346-349.
9. Dyson SJ (2011). Can lameness be graded reliably? *Equine Veterinary Journal* **43**(4): 379-382.

10. Busschers E and van Weeren PR (2001). Use of the flexion test of the distal forelimb in the sound horse: repeatability and effect of age, gender, weight, height and fetlock joint range of motion, *Journal of Veterinary Medicine. A, Physiology, Pathology, Clinical Medicine* **48**(7): 413-427.
11. Rettig MJ, Leelamankong P, Rungsri P and Lischer CJ (2015). Effect of sedation on fore- and hindlimb lameness evaluation using body-mounted inertial sensors, *Equine Veterinary Journal* [Epub ahead of print].