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**How to Recognise Hindlimb Lameness: An Obvious Lameness to Subtle Gait Abnormalities**

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**Take Home Message**

Accurate identification of hindlimb lameness is an acquired art. Horses should be examined under a variety of circumstances, including in hand, on the lunge and when appropriate ridden or driven. Reliance should not just be placed on assessment of hindquarter movement, but many other visual and audible clues.

**Introduction**

The identification of lameness is an art, a skill that with practice and guidance can be enhanced. It requires an understanding of normal gaits and how they may be modified under a variety of circumstances. The aim of evaluating a horse’s gait is to determine firstly whether the horse is lame or sound, and secondly, if lame, which is/are the lame limb/limbs. Less commonly the gait is assessed to determine whether a change in performance is related to training, or if it is a pain-related problem, or due to a neurological abnormality. The recognition of hindlimb lameness is particularly challenging because of the many ways in which the gait may be modified. Moreover differentiation between low grade ataxia and lameness is not always easy, and lameness and ataxia may coexist.

**Assessment of Asymmetry**

It is generally agreed that one of the most important indices of hindlimb lameness is asymmetry of movement of the hindquarters. There is a recent report that highlights the inability of the human brain to detect asymmetries in movement of < 25%, using a computer model. The aim of the model was to determine how capable we are of assessing hindlimb lameness, based on evaluation of movement of the tubera coxae. The model had 2 forms, one in which there was random asymmetry of movement between 2 objects and the other which simulated the patterns of movement seen in a lame horse. In the first model no differences were seen in the skill of inexperienced assessors compared with experienced clinicians, suggesting that there are no innate differences in the ability to detect asymmetry. However, the experienced clinicians performed best with the real lameness-based data. Nonetheless, even with lameness-based data the accuracy of detecting asymmetry of movement simulating low-grade lameness was poor.

The subjectivity of lameness evaluation has long been recognised and there have been some excellent recent reviews highlighting how kinematic and kinetic gait analysis can provide much more objective and potentially more accurate information compared with subjective visual appraisal for a unilaterally lame horse. Whether such technology would be useful for assessment
of a bilaterally lame or multilimb lame horses remains open to question. With respect to analysis of hindlimb lameness there has been some evidence to suggest that evaluation of movement of the dorsal midline of the pelvis was a more accurate reflection of hindlimb lameness than movement of the tubera coxae.\textsuperscript{5,6}

In a recent paper in The Clinical Teacher\textsuperscript{7} it was suggested that there are many variations in the way physical examinations of patients are conducted, but there is no evidence that these variations are less effective than ‘approved’ methods; the origins of the techniques have sometimes been lost and, since there is little evidence-base for them, we should therefore evaluate and challenge current practice. Should we challenge the current methods of assessing lameness?

**What to Look for**

When writing the first edition of ‘Diagnosis and management of lameness in the horse’\textsuperscript{8} I was fascinated to learn that my co-editor, Dr. Mike Ross, looks at hindlimb lameness in a rather different way to myself. Whilst we both look at movement of the pelvis, Dr. Ross focuses on the upwards movement of the side of the lame limb (the so-called hip hike) whilst I intuitively look at the degree of excursion, but focusing on the downwards movement. We reach the same conclusions, but in a different way. I can appreciate the movement that Dr. Ross observes, but it is not the intuitive way in which my brain processes the information that I perceive. Likewise I have tried to use movement of the dorsal midline of the pelvis as the number one criterion for determining which is the lame hindlimb, but in some horses, dependent in part on their conformation I find this more difficult. It is also impossible with a horse with a naturally high tail carriage, such as an Arab, some Warmbloods and gaited horses, when the tail conceals the tubera sacrale.

In truth determination of the lame hindlimb is not just assessed by evaluating the horse at a trot moving away from the observer. It is a summation of information gained by evaluation of the horse at both the walk and the trot and not only from in front and behind, but also from the side, sometimes varying the speed of the trot to determine how change in velocity alters the gait. Visual information is combined with auditory assessment of the sound of the gait. Hearing the weight of foot falls and the sound of a slight toe drag and any irregularities of rhythm gives valuable additional information. The ease of detection of gait asymmetry is influenced not only by the degree of lameness, but also by the natural extravagance of the paces. In addition to assessment of movement of the pelvis, many other features are evaluated. These include alteration of rhythm, height of arc of foot flight, presence or absence of a toe drag, stride length, limb flight, degree of flexion of the upper limb joints and extension of the metatarsophalangeal joint, whether the horse is moving straight on 2 tracks or on 3 tracks, and the presence of a head nod. Usually there is reduced extension of the metatarsophalangeal joint of the lame limb, but in association with loss of suspensory ligament function, the fetlock of the lame limb may extend (sink) more. Horses with hindlimb lameness often ‘drift away from the lame limb’ i.e. a horse with right hindlimb lameness may move on 3 tracks with the hindquarters to the left; however, occasionally a horse drifts towards the lame limb. A head nod mimicking an ipsilateral forelimb lameness may reflect hindlimb lameness, i.e., a horse with left hindlimb lameness may show a head nod when the left hindlimb and right forelimb are bearing weight, mimicking left forelimb
lameness. Exacerbation of lameness by flexion of the postulated lame limb can help to validate identification of the correct limb.

Gait characteristics such as stumbling, tripping, or a hindlimb ‘giving way’ may be noted by a rider. These may be a manifestation of lameness or ataxia. Subtle ataxia can be challenging to detect, but observing the horse decelerate from trot to walk can be very revealing. A neurologically normal horse usually takes rhythmical hindlimb steps, of equal length, with a similar height of arc of foot flight, but an ataxic horse may take bouncy steps, keeping the croup high, in an irregular rhythm, with one hindlimb being flexed slightly more than the other.

**Different Lameness Characteristics**

Identification of lameness sounds straightforward, but the characteristics of different lamenesses vary considerably. Although Buchner suggested that horses adapt their movement to pain in a limb in a rather uniform way, possibly because of the limited degree of freedom in their movement pattern, this is not my clinical experience. I am sometimes astonished how 2 horses with hindlimb lameness can modify their gaits so differently. A compensatory head nod may be seen in only one of two horses with a similar degree (be it mild or severe) of hindlimb lameness. Moreover there are potential complicating issues of assessment of a lame horse. A skewbald or piebald horse with one white hindquarter and one coloured hindquarter, or a horse with unilateral gluteal muscle atrophy in the non-lame limb, or a horse with asymmetry in height of the tubera sacrale, or an excitable horse which will not trot straight potentially confound our interpretation. A bilaterally symmetrical hindlimb lameness manifest merely as a short stride, stiffness and lack of hindlimb impulsion makes it difficult to identify a lame limb. All of these factors potentially compromise our ability to detect the lame limb. Some can be solved – an excitable horse can either be worked or sedated - but you cannot change the markings of a coloured horse, the height of tail carriage or the positions of the tubera sacrale and asymmetry of hindquarter musculature.

I grade lameness on a scale of 0-8, but I find it extremely difficult to assign a lameness grade based purely on a single characteristic of the gait (e.g., pelvic excursion). As a result I try to ascribe a grade, but also give a description of the gait, as the following examples illustrate.

One horse with osteoarthritis of the distal hock joints may show a mild toe drag, but obvious asymmetry of the pelvic excursion and a shortened cranial phase of the stride and be ascribed a lameness grade of 4.

A second horse with similar radiological abnormalities may show less obvious asymmetry of the pelvic excursion, but show a stiffer limb flight and more obvious toe drag, but also be ascribed a grade of 4.

A third horse may move on 3 tracks, drifting away from the lame limb and may have a more obvious audible irregularity of rhythm and be ascribed a grade 5.

A fourth horse may show axial deviation of the lame limb during protraction, toe drag and head nod when the horse is bearing weight on the diagonal of the lame limb, with only mild asymmetry of the pelvis and also be ascribed grade 5.

A fifth horse may swing the lame limb stiffly outwards as it is protracted and show the most obvious pelvic asymmetry, but have no head nod and may maintain an audibly
regular rhythm with no toe drag. It may be difficult to decide whether to ascribe a grade 4 or 5, especially if the lameness fluctuates slightly each time the horse is trotted.

Differences can be observed in the limb flight e.g., swinging the lame hindlimb outwards during protraction, or swinging the lame hindlimb in under the body during protraction but landing in line with the ipsilateral forelimb, or moving closely behind or ‘plaiting’. In my experience it is generally not possible to suggest the source of pain causing lameness based on these observations. Some horses may rotate the heel of the foot outwards during weightbearing at the walk, or place the foot somewhat axially with the fetlock and hock appearing to wobble outwards. These do not appear to be specific for any particular source of pain. Very few gait abnormalities are pathognomonic for the site of pain or mechanical malfunction, notable exceptions being fibrotic or ossifying myopathy, upward fixation of the patella and partial disruption of the gastrocnemius muscle.

In many hindlimb lamenesses it appears that the cranial phase of the stride of the lame hindlimb is shortened; less commonly the caudal phase of the stride is reduced or there is a combination of shortening of the cranial and caudal phases of the stride. These observations are generally not useful in determining the likely site of pain, although with severe plantar foot pain the caudal phase of the stride is often markedly shortened. Some horses appear uncomfortable when turning especially towards the lame limb. This is also not a specific finding, although I have observed this most commonly with pain arising from the foot, tarsocrural, femorotibial and coxofemoral joints. Unwillingness or inability to load the heel may be the result of a very severe lameness, irrespective of the site of pain, foot pain or mechanical restriction in association with desmopathy of the accessory ligament of the deep digital flexor tendon. Lameness characteristics may differ at the walk and the trot, reflecting the longer duration of the stance phase at the walk compared with the trot, and the greater extension of the distal limb joints. Some horses appear lamer in walk than in trot, whereas others are lamest in trot.

**Assessment in Circles**

Evaluation of the horse moving in circles on the lunge can be helpful, with some lamenesses becoming more evident with the lame hindlimb on the inside of a circle and some with the lame hindlimb on the outside of a circle. However, with mild lameness which is not modified by being on a circle, detection of lameness may be more difficult than in straight lines. Lameness may modify the horse’s body posture with a tendency to lean in, so that the body is no longer perpendicular to the ground. This makes evaluation of pelvic symmetry more difficult, but alterations in rhythm may make it easier to detect the lame limb. The lame hindlimb may cross in under the horse’s body during protraction when on the inside of a circle and/or have an accentuated toe drag. When on the outside of a circle a shortened cranial phase of the stride of the lame hindlimb may be exaggerated. Assessment of a horse moving on the lunge can also help to determine if a head nod present in conjunction with a hindlimb lameness is related to the hindlimb lameness, or reflects a forelimb lameness. If the hindlimb lameness deteriorates on the lunge, but the head nod remains unchanged, or if the head nod is worse but the hindlimb lameness stays the same, it can probably be concluded that there is coexistent forelimb and hindlimb lameness. This requires verification using local analgesic techniques, further discussion of which is beyond the scope of this commentary.
The Influence of a Rider

Mild hindlimb lameness may still be barely detectable and it is important to recognise the influence of the weight of a rider on hindlimb gait, especially when in rising trot. In many but not all horses with hindlimb lameness, lameness is accentuated by the weight of a rider. The lameness is usually accentuated when the rider sits on the diagonal of the lame hindlimb and the horse feels more uncomfortable to the rider on this diagonal. The horse may adjust its rhythm to try to shift the rider back to the opposite diagonal. In some horses obvious (grade 4/8) lameness may be apparent on one hindlimb when the rider sits on the diagonal of the lame limb, but the lameness may completely disappear when the rider changes diagonal.

A subtle lameness may still be inapparent and riding consecutive 8-10 metre diameter circles to the left and to the right as a figure of 8 may induce irregularities of rhythm reflecting lameness and a change in the speed, with the horse slowing down when uncomfortable. There may be an increased tendency for the inside hindlimb to cross in under the body during protraction, and for the hindquarters to swing outwards. Likewise performing so-called lateral movements such as shoulder-in, travers, and half pass may induce gait irregularities that are not otherwise apparent. Upward transitions may lack impulsion and may be irregular; the horse may remain croup high in downwards transitions and take short hindlimb steps.

In some horses the only manifestation of a hindlimb gait abnormality may be a tendency to change limbs behind in canter, to become disunited. In others the overriding picture may be of a stiff back, a lack of hindlimb impulsion, ‘overbending’ and coming ‘behind the bit’ or leaning on the rider’s hands with a tendency to become ‘above the bit’. This is illustrated by the following case example:

A horse was examined because of suspected back pain, but with no history of lameness. When ridden, no overt lameness could be seen or felt, but the horse was reluctant to bend to the left, leant on the rider’s left hand, was inclined to be slightly above the bit, and lacked ‘connection’ between the hindlimbs and the forelimbs, holding the back rather stiffly. The horse showed a grade 2/8 left hindlimb lameness in hand in straight lines, characterised by pelvic asymmetry, and a grade 1/8 left forelimb lameness on the left rein on a firm surface. Desensitisation of the left front foot abolished the left forelimb lameness; in straight lines the horse now showed a grade 3/8 left hindlimb lameness, with a mild toe drag. The left hindlimb lameness was substantially improved by perineural analgesia of the deep branch of the lateral plantar nerve, after which the horse showed a grade 1/8 right hindlimb lameness. This lameness was eliminated by perineural analgesia of the deep branch of the lateral plantar nerve. When reassessed ridden the horse took a light, even contact with the bit and worked consistently on the bit, with swing through the back. There was much improved hindlimb impulsion and an overall bigger stride all round. The horse was now easy to bend to either the left or the right. Thus what appeared superficially to possibly be a back problem, a problem which was impossible to grade when the horse was ridden, was actually a multiligament lameness.
Comparison of both the quality of the gait and the contact with the bit in both rising and sitting trot can help to differentiate between primary thoracolumbar pain and protective back stiffness in a horse with hindlimb lameness. A horse with primary thoracolumbar pain may become tenser, less forward going and have a less steady head carriage in sitting compared with rising trot, whereas a horse with primary hindlimb lameness may look and feel similar in both rising and sitting trot.

In dressage horses, gait problems may only be apparent in movements requiring extreme collection such as canter pirouettes, passage or piaffe. Unless the rider is skilled enough to produce sufficient collection the problem may be inapparent; conversely a highly skilled rider is sometimes able to ‘ride through the problem’. Therefore assessment of the horse with > 1 rider of differing abilities is sometimes helpful.

In a small proportion of horses with hindlimb lameness, lameness induces saddle slip, most commonly to the side of the lamer limb, but sometimes towards the non-lame or less lame limb. This may be the complaint of the rider, rather than a recognised lameness. The degree of saddle slip does not necessarily reflect the severity of lameness. An ill-fitting saddle or a crooked rider may also induce saddle slip, so it is important to differentiate the underlying cause.

There remain a small but important group of horses in which even a highly skilled and experienced lameness clinician cannot see lameness, but a skillful rider can feel lameness. I never cease to be amazed by the large degree of apparent asymmetry of movement I can feel when riding a horse which I cannot detect by visual appraisal. We also must not forget the horses that only show lameness when ridden, or perform poorly at high speeds.

The other less well-recognised phenomenon that must also be recognised is the compensatory changes in hindlimb gait that can be induced by either ipsilateral or contralateral forelimb lameness. This provides added complication to gait assessment. A horse which has no obvious lameness, but a shortened stride, probably reflecting a multilimb lameness, presents yet another challenge.

It goes without saying that gait analysis should be preceded by clinical examination, and by visual inspection and palpation the clinician may already have been alerted to potential clinical problems. Combining conventional techniques with assessment of acupuncture points may give additional clues. The use of flexion tests can also give valuable additional information, although the results do not necessarily point to the source of pain causing lameness.

**Grading the Lameness**

When assessing lameness, a clinician must be prepared to grade the lameness and to use the spectrum of grades of whichever grading system they elect to use, and be as consistent as possible in assigning a grade. However, no grading system can take into account a bilaterally symmetrical lameness. The purpose of grading the severity of lameness is to provide a subjective characterisation of the lameness, so that it can be documented. This allows communication between individuals, and comparisons in lameness grades as a response to local analgesia. I find that people learning how to interpret nerve blocks expect a black and white situation, i.e., the
difference between lameness and complete abolition of lameness. If lameness persists there is a
tendency to imply that the local analgesic technique failed to influence the lameness. However, if
one recognises that a baseline grade 4 (out of 8) left hindlimb lameness seen in straight lines,
changed to grade 1 after perineural analgesia, it is clear that there was significant and substantial
improvement in the baseline lameness, hence a positive response to local analgesia.

Conclusions

I believe that it is crucial to take into account many features of a horse’s gait, its balance and
quality of paces, by both looking and seeing from many vantage points under a variety of
circumstances, listening and hearing, and if applicable also feeling the horse when ridden.

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