How to Evaluate Head and Pelvic Movement to Determine Lameness

Kevin G. Keegan, DVM, MS; David A. Wilson, DVM, MS; and Joanne Kramer, DVM

Careful evaluation of the pattern of vertical head and pelvic motion may allow the practitioner to determine when (impact, full weight bearing, or push off) the pain is occurring in the affected limb. Knowing when the pain is occurring within the affected limb may be helpful in isolating specific lameness within the lame limb. Authors' address: E. Paige Laurie Endowed Program, Equine Lameness, Veterinary Medical Teaching Hospital, Department of Veterinary Medicine and Surgery, College of Veterinary Medicine, University of Missouri, Columbia, MO 65211. © 2004 AAEP

1. Introduction

Most equine practitioners agree that head movement is an important motion parameter to consider when evaluating horses for forelimb lameness. When evaluating horses with hindlimb lameness, pelvic movement is an important motion parameter to consider. However, the specific components of the head or pelvic motion that are important for the evaluation of equine lameness have not been clearly described or agreed on by veterinarians. This can be seen when examining descriptions of lameness evaluation in recent equine lameness textbooks, in past proceedings of the Annual AAEP Convention, and in informal surveys of equine practitioners from around the country. For example, there are currently two equine lameness textbooks. One textbook is considered an established reference, and the other is a recent publication edited by respected clinicians. Both textbooks state that the head did not move up appreciably during the stance phase of the lame limb until the lameness was severe. Furthermore, this does not agree with the old adage “down on sound” that is frequently taught to veterinary students learning about lameness evaluation in horses.

In evaluating pelvic motion for diagnosis of hindlimb lameness, many clinicians look for a “pelvic hike,” the upward movement of one side of the pelvis. On the other hand, other clinicians look for dropping or tilting of the pelvis to one side, a downward movement of one side of the pelvis. Neither description, however, takes into consideration the recent observations that one of the most sensitive motion indicators of hindlimb lameness is the asymmetrical pattern of vertical movement of the entire pelvis during and after the stance phase of the hindlimbs.

Movement of the head also occurs with hindlimb lameness. Movement of the pelvis secondary to forelimb lameness has also been described but not yet sufficiently explored. If not taken into proper
consideration, altered movement of the head secondary to primary hindlimb lameness and altered movement of the pelvis secondary to primary forelimb lameness could confuse the lameness evaluation.

2. Materials and Methods
In our lameness laboratory, we have studied head and pelvic movement in over 100 horses with induced and naturally occurring forelimb and hindlimb lameness of various levels of severity over the last 3 yr. 4-9 The horses with these lameness conditions have been captured on videotape, and their movement has been measured with sensitive computer-assisted gait analysis equipment. We have also theoretically explained these observations by developing models based on frequency analysis of the periodic motion of the vertical head and pelvic movement during soundness and lameness. From these observations and measurements, we have found several links between head and pelvic movement and lameness in the horse.

3. Results
Forelimb Lameness

1. The head moves down less during the stance phase of the lame limb and up less after the

Fig. 1. Left forelimb lameness (pain at impact/first half of stance). The top curve is the vertical head motion, and the bottom curve is the vertical motion of the right forelimb foot. S. stance phase of the right forelimb foot.

Fig. 2. Right forelimb lameness (pain at midstance). The top curve is the vertical head motion, and the bottom curve is the vertical motion of the right forelimb foot. S. stance phase of the right forelimb foot.
Right Forelimb Lameness
(pain during 2nd half of stance)

Fig. 3. Right forelimb lameness (pain during second half of stance). The top curve is the vertical head motion, and the bottom curve is the vertical motion of the right forelimb foot. S, stance phase of the right forelimb foot.

Severe Left Forelimb Lameness

Fig. 4. Severe left forelimb lameness. The top curve is the vertical head motion, and the bottom curve is the vertical motion of the right forelimb foot. S, stance phase of the right forelimb foot.

stance phase of the lame limb when the pain occurs maximally at hoof impact or within the first half of the stance phase of the stride (Fig. 1).
2. The head moves down less during the stance phase of the lame limb when the pain occurs maximally at full weight bearing (Fig. 2).
3. The head moves up more after the stance phase of the lame limb when the pain occurs maximally during the second half of the stance phase of the stride (Fig. 3).
4. The head does not move up appreciably during the stance phase of the lame limb until the lameness is severe (Fig. 4).

These observations can also be mathematically confirmed with a frequency-based description of a linked two-body kinematic model.

Hindlimb Lameness

1. The pelvis moves down less during the stance phase of the lame limb and up less after the stance phase of the lame limb when the pain occurs maximally within the second half of the stance phase of the stride (Fig. 5).
2. The pelvis moves up less after the stance phase of the lame limb when the pain occurs maximally within the first half of the stance phase of the limb (Fig. 6).
3. The pelvis does not move up appreciably during the stance phase of the lame limb until the lameness is severe.

These observations can also be mathematically confirmed with a frequency-based description of a single-body kinematic model.

Compensatory Lameness

1. During primary hindlimb lameness, the head moves down less during the stance phase of the ipsilateral forelimb, mimicking a forelimb lameness. The false, compensatory forelimb lameness can be “severe” enough to overshadow the primary hindlimb lameness (Fig. 7).

2. During primary forelimb lameness, the pelvis moves up less after the stance phase of the contralateral hindlimb, mimicking a hindlimb lameness. The false, compensatory hindlimb lameness is usually much milder than the primary forelimb lameness (Fig. 8).
4. Discussion

Head movement as an evaluation of forelimb lameness can be confusing. Sometimes the movement is less down, sometimes the movement is less down and less up, and sometimes the movement is more up, depending on the specific lameness conditions encountered. Pelvic movement as an evaluation of hindlimb lameness is also confusing. Sometimes the movement is less up, and sometimes the movement is less down, depending on the specific lameness conditions seen. A more objective and specific description of the various head and pelvic movements seen during lameness will assist equine practitioners in their clinical lameness evaluations. An objective evaluation of head motion during primary hindlimb lameness and pelvic motion during primary forelimb lameness will also help clinicians decipher the true meaning of some obscure multiple limb lameness conditions.

References