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This review accompanies the relevant episode of the Cutting Edge veterinary podcast. In each episode of this podcast, 3rd year students in the University of Calgary's veterinary medicine program fill you in on the most up-to-date literature and evidence-based practices on topics that matter to you, the practising veterinarian.

An Overview of Diagnostic Modalities and Approaches for Diagnosing Overriding Dorsal Spinous Processes in Equine

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Introduction

Overriding dorsal spinous processes (ODSP) - a condition occurring when the dorsal spinous processes of a horse's vertebrae are positioned too closely together, leading to impingement, contact, or overlap - has adopted the buzzword "kissing spine" for owners, riders, and trainers, with social media amplifying the concerns and misconceptions about equine back pain. This public misconception of equine back pain has led to clients approaching their veterinarian with a pre-emptive diagnosis or suspicion based on information gathered through industry chatter about why their horse may be under-performing. This may influence the likelihood of misdiagnosis, unnecessary treatments, failure of pre-purchase examinations and loss of sales, and even premature career-ending decisions in reference to the horse. The misconception of kissing spine continues when it comes to the diagnosis, management, and treatment. Kissing spine is a diagnostic challenge due to the often subtle signs of back pain and variability in specificity and sensitivity of diagnostic techniques.

It would be in the best interest of veterinarians to focus on identifying the cause(s) of underlying back pain, rather than jumping to the owner's perceived diagnosis. The evidence of impingement in the dorsal spinous processes in the thoracolumbar region is not a new phenomenon. Post-mortem studies have confirmed that many asymptomatic horses exhibit radiographic evidence of kissing spine[1]. Not only is dorsal spinous process (DSP) impingement seen in asymptomatic horses, but it is even found in fossilized horse species from thousands of years ago[2]. This necessitates a deeper understanding of what clinically defines horses affected by kissing spine and how we can improve our approach to diagnosing this condition in modern equine practice.

Overview of Overriding Dorsal Spinous process

ODSP, also known as Impinging Dorsal Spinous Processes (IDSP), Dorsal Spinous Process Impingement (DSPI), Dorsal Spinous Process Overlap (DSPO), or Baastrup's Disease is referred to in layman's terms as kissing spine. This condition is defined by impingement or overlap of the dorsal spinous processes of a horse's vertebrae, most frequently affecting the thoracic region (T13-T18)[6]. This abnormal proximity can contribute to varying degrees of pain, inflammation, and discomfort, particularly during movement or under saddle.

The clinical signs of kissing spine are often variable and may be subtle, making diagnosis challenging. Affected horses frequently present with a vague history. Common presenting complaints include decreased performance, reluctance to work, or generalized stiffness, particularly when bending or flexing through the back. Behavioral changes are also common, ranging from mild such as sensitivity to touch and girthiness (resistance when tightening the girth under saddle) to more pronounced reactions such as bucking, rearing, or resistance to collection and engagement[4]. On physical examination, signs may include localized sensitivity, altered posture, atrophy of the epaxial musculature, and discomfort upon palpation or induced flexion.

Back pain is a common contributor to compensatory lameness, complicating clinical evaluation. There is a strong correlation between back pain and lameness, with horses presenting for one issue often exhibiting the other[10]. This relationship suggests that back pain frequently coexists with other musculoskeletal conditions, including joint pain, tendon or ligament injuries, and general wear and tear[10]. However, the causality between lameness and back pain remains unclear—does back pain lead to lameness due to chronic movement asymmetry, or does lameness cause back pain by overloading the spine[10]? The uncertainty surrounding this interplay, highlights the necessity of a thorough diagnostic approach to accurately identify and address the underlying cause.

Current Diagnostic Modalities

A diagnosis of kissing spines is a clinical challenge due to a combination of variable presentations, vague clinical signs, and differences in specificity, sensitivity, and diagnostic value across imaging techniques[5]. Radiographs are commonly used to visualise the thoracic vertebrae and are often one of the first steps taken in the diagnostic process. Abnormalities such as narrowed spaces, sclerosis, or osteolysis of the dorsal spinous processes can possibly indicate kissing spine. A lateral view with the addition of oblique views of the thoracolumbar spine is best used for visualising overlapping structures, identifying bone remodeling, bony proliferation, or impingement. Obtaining diagnostic quality radiographs of the spine is difficult due to anatomical depth, overlapping structures, and the need for appropriate positioning[14]. The large epaxial musculature in this area requires high exposure, which increases the risk of scattered radiation generated[14]. Due to these challenges, thoracic radiographs are best taken with high energy systems and a properly aligned detector plate holder[14]. It has become industry standard to use portable x-ray units which allow acquisition of radiographs in a field setting. Radiographs made with these systems are often of poor diagnostic quality compared to images made with high energy systems. Such images reveal the dorsal spinous processes to some extent but lack the

ability to visualise deeper structures and obtain adequate detail. It has become commonplace to accept these suboptimal methods and has added to the challenge of making an accurate diagnosis.

Radiographic findings of kissing spines have been found commonly in horses with and without clinical signs of back pain[8]. Additionally, while radiographs are somewhat specific, they are not very sensitive in detecting abnormalities. Therefore, it is important to note that radiographic changes do not always correlate with clinical signs, as some horses with severe radiographic abnormalities remain asymptomatic, while others with mild abnormalities may present with significant pain[3, 13,14]. This inconsistency highlights the need for further diagnostic investigation.

Nuclear scintigraphy (bone scan) is another common diagnostic modality used in the investigation of kissing spines. During the bone scan procedure, the horse is injected with a radioactive isotope called Technetium (TC-99), which accumulates in areas with higher bone metabolism[7]. Bone metabolism can be driven by inflammation, remodeling, or microfractures, which can make it difficult to determine the exact cause of the uptake[7,14]. Bone scan does not differentiate between primary pain from kissing spine and secondary changes due to compensatory mechanisms[14]. For example, it is possible for a horse to show radioactive uptake in the vertebrae from a supraspinous ligament injury and not show radiographic changes of impingement on radiographs. A bone scan is highly sensitive, making it effective at detecting abnormalities; however, it lacks specificity, meaning the cause of radioactive uptake remains unclear.

To improve diagnostic accuracy, combining scintigraphy with thoracolumbar radiographs— which offer slightly more specificity— can provide additional insights. The correlation of high radioactive uptake in the DSPs combined with radiographic abnormalities showing increased bone remodeling and impingement has been shown to support a diagnosis of primary back pain, along with associated clinical signs[6,14]. However, mild abnormalities can be present in asymptomatic horses, which can result in an increased rate of false positives from both scintigraphy and radiographs[13,14]. This is why understanding the relationship between findings from these modalities is crucial, as access to scintigraphy may be limited and combining with radiographs may not always yield additional diagnostic value[14]. Given this, findings should not be used alone without a combination of clinical signs of back pain and ideally diagnostic analgesia[6].

Diagnostic analgesia is used to aid in the confirmation of back pain and is an important step in the diagnostic process. In order to make this modality effective, reproducible clinical signs or presenting complaints must be preestablished to determine if it produces a positive result. Therefore, performing a preliminary exam can help to identify these signs before carrying out this approach. Injection of local anesthetic into the region of interest can be performed by radiograph or ultrasound guided needle placement. Following this, a repeat exam must be performed to assess the response approximately 10 minutes after injection. A positive response to diagnostic analgesia—demonstrated by decreased or absent back pain, reduced reaction to palpation, and improved movement—suggests a diagnosis of primary back pain. However, some

horses with radiographic ODSP may not show a response to diagnostic analgesia, further highlighting the complexity of the condition.

Current diagnostic techniques—radiographs, nuclear scintigraphy, and diagnostic analgesia—are the most commonly used for evaluating overriding dorsal spinous processes. Ultrasound and MRI primarily assess soft tissue rather than bone, while standing CT is generally limited to imaging the head and upper cervical spine. Technical challenges with these modalities prevent practical imaging of the thoracic vertebrae in standing horses [9].

Despite the availability of multiple diagnostic modalities, diagnosing back pain remains a complex task. Distinguishing between true pathology and incidental findings is critical, not only for accurate diagnosis but also for effectively guiding treatment. Effective management strategies depend on determining whether kissing spine is the primary source of the horse's clinical signs or merely a coincidental finding, emphasizing the importance of diagnosing clinical back pain.

Investigating Primary Clinical Back Pain

As previously discussed, accurately diagnosing primary clinical back pain is the critical first step in determining the significance of diagnostic findings of kissing spine as the underlying cause of the owner's presenting complaint. Given the strong correlation between back pain and lameness[10], the key challenge remains: is the primary issue the back, or is the pain a secondary manifestation of an undiagnosed lameness? Majority of practitioners perform a lameness examination if suspected lameness was present, in addition to the back pain[5]. After diagnostic analgesia is performed either forelimb or hindlimb lameness may result in previously asymptomatic lesions in the thoracolumbar region becoming symptomatic[6]. Suggesting the importance of a lameness examination both in the absence and presence of analgesia.

A comprehensive lameness workup includes both static and dynamic assessments, evaluating conformation, posture, gait abnormalities at the walk and trot, flexion testing, and performance under saddle. Additionally, manipulation and palpation can be used, watching for reduced motion, protective spasms, and avoidance behaviors. Sacroiliac pain has been shown to present with lameness and thoracolumbar pain[12]. It is crucial to thoroughly examine horses with back pain for signs of lameness, as well as the underlying cause of the back pain. In cases where both conditions are present, the back pain may be a secondary response to compensating for the primary lameness issue. As a result, addressing the root cause of the lameness should be an integral part of the initial investigation into the back pain. Even with a meticulous lameness evaluation and the use of various diagnostic modalities, differentiating true clinical back pain from compensatory pain remains challenging. This underscores the necessity of a systematic and methodical diagnostic approach to accurately identify kissing spines and guide appropriate treatment, and prognosis[13].

Systematic Approach for the Diagnosis of Overriding Dorsal Spinous Process

As highlighted above, the diagnosis of kissing spine is a complex challenge, leading to the conclusion that a diagnostic algorithm would be beneficial for outlining a systematic approach to diagnosing back pain. To rule in kissing spine, two aspects of the assessment are necessary: clinical signs or presentation suggesting back pain, and a positive response to treatment or diagnostic analgesia. The algorithm below (Figure 1) proposes a series of steps in the approach to diagnosing kissing spine. First, the presenting complaint must suggest the horse is suffering from back pain. Next, a comprehensive lameness examination is required including static, dynamic, and under-saddle components to assess the potential source of lameness. As outlined above, lameness and back pain often go hand-in-hand, making this step important. If the physical examination of the back reveals signs of pain, further diagnostics are required. If no clinical suspicion of back pain is identified, the lameness examination should continue. To further investigate back pain, either or both of the following diagnostics can be utilized: radiography and nuclear scintigraphy. Positive results from both modalities do not guarantee but can increase the likelihood of a kissing spine diagnosis. A positive response to treatment or diagnostic analgesia is a critical component in confirming back pain, making it one of the most important factors in accurately diagnosing kissing spine in horses. Establishing a systematic approach for assessing horses exhibiting back pain will help in reducing the occurrence of misdiagnosis and thus prevent subsequent mistreatments.

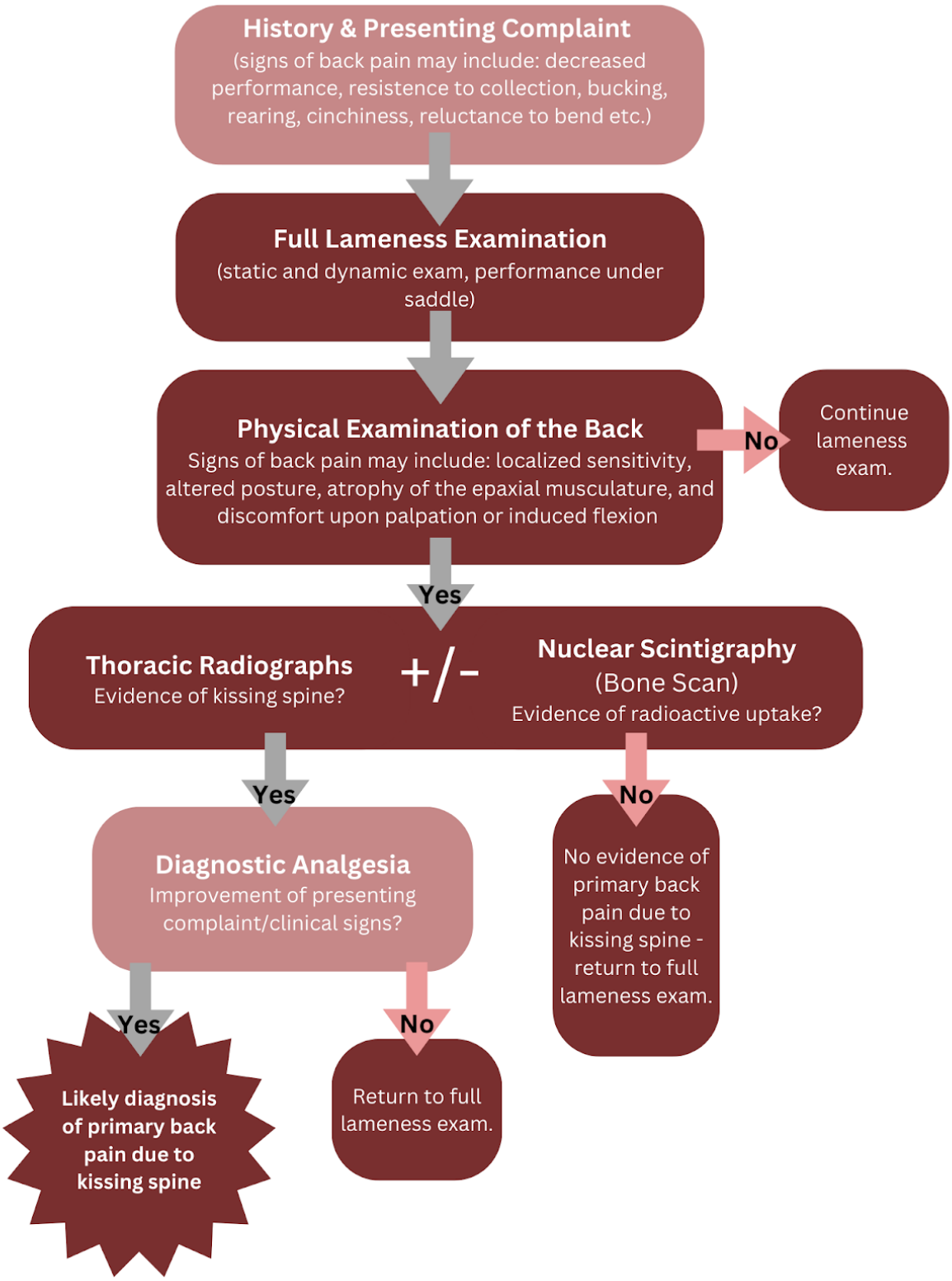

Figure 1. Systematic approach to diagnosing kissing spines.

Controversy of Diagnosing Overriding Dorsal Spinous Process during Pre-purchase Exams

Pre-purchase exams (PPE) are known to be a source of high stress for both the buyer and seller of the horse, as well as the performing veterinarian. The veterinarian's top priority during these exams is meticulous examination and investigation of the horse, noting any real or perceived abnormalities. This careful approach stems in part from the concern for missing a critical diagnosis or potential "risk factors" for future unsoundness or disease. As a result, it is common practice for survey radiographs to be obtained during a PPE to rule out any abnormalities. While radiographs can provide insight, the clinical exam is the cornerstone of a PPE for assessing the current physical health of the horse. This brings us to our "hot topic" of kissing spines and whether survey thoracic radiographs should be included in a PPE. It is becoming common through owner request and veterinarian screening, for these images to be obtained regardless of if clinical signs of back pain are evident. The complexity of this condition requires a thorough workup, including diagnostic analgesia before reaching a diagnosis, something not typically included in these exams. Given the current buzz surrounding kissing spines in the equine industry today, a single glance at a digital radiograph screen across the barn can lead to potential loss of a sale on a horse that may never be affected by back pain. The growing evidence indicating a lack of correlation between clinical signs and radiographic abnormalities of the thoracolumbar spine in many horse breeds, along with the absence of consistent and repeatable grading systems, highlights the subjective and variable nature in assessing this region radiographically[11]. The lack of scientific evidence for thoracolumbar radiograph abnormalities and future performance or risk of disease make it difficult for veterinarians to accurately address this finding with horse owners. Therefore, it would be in the best interest of the buyer, seller, and horse industry as a whole, not to include these radiographs in a PPE without clinical evidence of back pain.

Conclusion

Kissing spine and equine back pain remains a controversial topic in the equine veterinary world, due to its popularity in the equine focused social network, and its diagnostically challenging nature. Due to these factors, kissing spine is often overdiagnosed and therefore treated inappropriately with unknown long-term ramifications. Radiographing or bone scan of the thoracic vertebrae for evidence of kissing spine as part of a pre-purchase exam or without clinical suspicion of back pain is not useful or appropriate. All the current research supports the necessity of both clinical presentations or signs signaling back pain and positive response to treatment or diagnostic analgesia for accurate diagnosis. This paper focuses on the diagnostic complications of kissing spine and has not even touched on the controversy of treatment and the unknown outcomes without a definitive diagnosis. Common treatments include invasive surgeries with unknown risks and complications that may not be effective, especially when an accurate diagnosis has not been reached. It is important for veterinarians to follow clinical suspicion with confidence built in knowledge and experience and not let client interests and speculations drive clinical decision making. Further developments in the assessment and diagnosis will continue to evolve as further diagnostic modalities are created to better visualize and assess the equine spine. Therefore, in the case of kissing spines, veterinarians should be up to date with the critical research on the subject and have a sound understanding of the fundamental principles of this

condition. The systematic algorithm above outlines a mainstay diagnostic approach to any case involving back pain and will help to eliminate mis- and overdiagnosis of the condition.

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