Overriding Spinous Processes ("Kissing Spines") in Horses: Diagnosis, Treatment, and Outcome in 212 Cases

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"Kissing spines" is a radiographic diagnosis. It occurs in 39% of the horse population but does not cause problems in all horses. Kissing spines make a horse 3 times more likely to have back pain. Kissing spines are more likely associated with clinical problems in Thoroughbreds, dressage horses, horses 5 years of age or less, and horses with 5 or more vertebrae involved. Thermography is very helpful in suggesting the pathology in the evaluation of horses with back pain. Lateral radiographs of the spinous processes of the thoracolumbar vertebrae are used to confirm and characterize the condition. A therapeutic regimen combining shockwave, mesotherapy, and exercise had the most successful outcome in clinical cases. Author’s address: Anoka Equine Veterinary Services, 16445 70th St. NE, Elk River, MN 55330; e-mail: turner@anokaequine.com. © 2011 AAEP.

1. Introduction
Equine back problems are considered a significant cause of alterations of gait and performance in the elite athlete. "Kissing" spinous processes are considered one of the causes of back pain.1–3 However, there have been no large case studies that characterize, locate, and identify the pain associated with kissing spines. The prevalence of back problems in lameness practice has been reported as 2.2%, and the clinical signs are reported as highly variable.1 The purposes of this study were to further investigate kissing spines as a cause of poor performance in horses, to characterize any breed or occupational predisposition, determine associated clinical signs, assess which diagnostic tests are effective, and describe treatments and outcomes of the cases.

2. Materials and Methods
The horses in this study were presented to Anoka Equine Veterinary Services from February 1, 2004, to January 31, 2011, for assessment of vague lameness or poor performance, and whose work-up led to a diagnosis of overriding spinous processes (kissing spines) (Group 1). For each horse, signalment, history, presenting complaint, and clinical findings, including thermography (when performed), were recorded. Back pain was determined to be present if the horse showed either marked reaction to digital pressure over the thoracic spine or thoracic epaxial muscles, or alternatively, resisted pressure (stiff, failure to ventroflex or dorsoflex under any stimulus). Thermographic evaluation was performed after the basic clinical examination and before radiography. Radiography of the horse's back was performed in every case with either standard radiographic equipment or with direct digital radiography. Four serial lateral radiographic projections of the thoracolumbar spine were made from the withers through the lumbar vertebrae. The individual thoracic vertebrae were identified by their position...
relative to the antclinal thoracic vertebrae (T15). The diagnosis of kissing spines was made when two or more vertebrae were either touching or overlapping (Fig. 1). The locations and number of kissing vertebrae involved were identified.

A protocol of shockwave, mesotherapy, and exercise (SME) was recommended for all cases; however, some clients elected more limited therapy. Extracorporeal shockwave was performed using an 80-mm focused device delivering 2000 impulses at the highest energy setting. The treated area included the affected spinous processes plus the associated epaxial muscles. Mesotherapy is a technique of multiple (720) intradermal injections starting at the withers, then over the back and croup using a solution of anti-inflammatories and lactated Ringers. The exercise program was daily mounted walk and trot in a “long and low” frame to stretch the horse’s back, progressing to trotting over ground poles and cavalletis to encourage further stretching and flexion of the back. Assessment of saddle fit was recommended. Treatment outcome was considered successful if the clinical signs disappeared and the horse was able to resume its previous level of competition.

Horses with kissing spines (Group 1) were compared with two other groups of horses; horses that were diagnosed with back pain but did not have kissing spines (Group 2) and control horses (without back pain) (Group 3). Group 2 horses were used to determine if there were any historical or clinical findings that are pathognomonic for kissing spines. Group 2 horses were seen during the same period as the Group 1 horses. Group 3 were horses presented for prepurchase or pretraining soundness evaluation of their backs as controls for this study. This latter group was used to determine the prevalence of overriding spinous processes in a non-clinical group. Groups were compared using Chi-square analysis, with significance set at p < 0.05.

Fig. 1. Radiograph showing typical kissing spines (black arrows).

Owners and veterinarians evaluated the effectiveness of treatment in eliminating the clinical problem. Treatment response was evaluated as excellent when the horse returned to its regular work, the owner’s complaint was eliminated, and veterinary examination showed elimination of clinical signs. A very good response was achieved when the horse returned to work and veterinary examination showed elimination of signs but the owner still had minor complaints. A good response was recorded when the horse returned to work, veterinary examination indicated relief of pain, but the horse was stiff and the owner had minor complaints. A poor response was recorded if the horse did not return to work despite some improvements in the owner’s complaint and the clinical signs. The therapy was considered of no value if no improvements were seen. Factors such as age, use, and number of vertebrae involved were compared as to their effects on outcome. Final resolution of the case was determined whenever possible by clinical re-evaluation or phone contact with the client.

3. Results

Four thousand four hundred seven horses were evaluated for lameness or poor performance between February 1, 2004, and January 31, 2011. Back pain was identified on clinical examination in 310 horses (7%). Two hundred twelve of the 310 horses (68%) were diagnosed with kissing spines. Seventy horses that had never shown any signs of back pain had their backs radiographed, of which 27 had overriding spinous processes (39%).

Signalment of Affected Horses

Group 1 consisted of a wide variety of breeds but most commonly in Thoroughbreds or Thoroughbred crosses, Quarter Horse types, or Warmbloods (Fig. 2). Ninety of the horses were geldings, 58 were mares, and 4 were stallions. The majority of Group 1 horses were between 6 and 10 years (Fig. 3). The horses were used in a wide variety of disciplines, but dressage was the most common (Fig. 4). In comparing Group 1 and Group 2 horses, a different distribution of breeds, age, and use was recorded (Figs. 2–4). These differences were statistically significant for overrepresentation in the kissing spines group of Thoroughbreds (p < 0.001), horses 5 years of age or less (p < 0.01), and dressage horses (p < 0.05).

History

The affected horses in this study presented for either back soreness or for lameness evaluation because of a change in the horse’s behavior. Wide varieties of abnormalities were reported in the horse’s behavior and could be divided into three categories: ground behavior, riding behavior, and discipline specific behavior (Table 1). A horse may exhibit more than one behavior. Group 1 and Group 2 horses had similar histories and behaviors.
Clinical Findings
Each horse showed either marked reaction to digital pressure over the thoracic spine or thoracic epaxial muscles or showed no reaction to pressure (stiff, failure to ventroflex or dorsoflex under any stimulus). Group 1 and Group 2 horses had similar findings.
Concurrent lameness was found in 53 of the 212 Group 1 horses, based on clinical examination and nerve blocks. Fifteen horses had hock pain, 4 had...

Fig. 2. Chart showing the varied breed distribution between back-sore horses with and without kissing spine.

Fig. 3. Chart showing the varied age distribution between back-sore horses with and without kissing spine.

Fig. 4. Chart showing the varied discipline distribution between back-sore horse with and without kissing spine.
stifle pain, 8 had forelimb lameness, 14 had hip or pelvis problems, 4 had mild neurologic signs (grade 1/2 to 1 ataxia), and 7 had other issues (right rear pastern, right rear distal tendon sheath, cervical facet arthritis, gastric ulcers, and head shaking).

Thermography was used to evaluate 192 of the 212 Group 1 horses and 62 of the 98 Group 2 horses. This imaging proved to be the most useful diagnostic test to differentiate kissing spines cases from other causes of back soreness prior to radiology. Kissing spines were suspected whenever one of three thermal patterns associated with kissing spines in a previous study1 were identified during examination. The horses with kissing spine showed: a “hot streak” perpendicular to the thoracic spine (33 horses) (Fig. 5), a “cold streak” perpendicular to the thoracic spine (32 horses) (Fig. 6), or a combination “hot spot”–“cold streak” pattern over the back (126 horses) (Fig. 7). Only 1 horse showed a normal back thermal pattern (Fig. 8). Only 30 of the 98 Group 2 horses exhibited the above patterns. Of the other 68 Group 2 horses, 53 horses showed abnormal back patterns but the thermal change centered over the epaxial muscles rather than the spine, whereas 15 horses showed only a cold spot over the tuber sacrale. Assessment of sensitivity and specificity showed that thermal imaging has 99% sensitivity for kissing spine but only 70% specificity. The positive predictive value of the thermal patterns for kissing spine is 91%, which is a much stronger indicator in comparison to pain to palpation in the thoracolumbar region (positive predictive value = 67%).

Radiography
The location of the kissing spines ranged between the 11th thoracic vertebrae and the 2nd lumbar vertebrae. The mean number of kissing spines per horse was 4.3, with a median of 4. Eighty-eight horses had 5 or more spinous processes involved, and 124 horses had 2 to 4 involved. One hundred ninety-one of the 212 horses had involvement of the antclinal thoracic vertebrae (T15) in the kissing spines, and 21 horses had the kissing spines located caudal to T15. The most common location was T15–16, followed by T14–15 and T16–17. The further the distance cranially or caudally from T15, the lower the frequency (Fig. 9).

Seventy horses were evaluated as control cases for comparison. These horses consisted of 48 Warmbloods, 12 Quarter Horse types, 9 Thoroughbreds, and 1 Morgan. Twenty-seven of these horses had

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<tr>
<th>Ground Behaviors</th>
<th>Number of Horses Showing Sign</th>
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<tbody>
<tr>
<td>Brushing hypersensitivity</td>
<td>40</td>
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<tr>
<td>Back sore to touch</td>
<td>61</td>
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<tr>
<td>Girthy</td>
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<td>Bucking</td>
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<td>Rearing</td>
<td>25</td>
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<td>Intermittent hind toe dragging</td>
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<td>Head tossing</td>
<td>18</td>
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<td>Kicking out</td>
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<td>Excessive shying</td>
<td>10</td>
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<td>Riding quality</td>
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<tr>
<td>Hard to get on bit</td>
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<td>Behind the leg</td>
<td>61</td>
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<tr>
<td>Slow to warm up</td>
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<tr>
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<tr>
<td>Trouble in gait transitions</td>
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<td>Change in head carriage</td>
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<td>Discipline-specific behaviors</td>
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<tr>
<td>Refusing, chipping fences, jumping flat</td>
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<tr>
<td>Rushing fences</td>
<td>6</td>
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<tr>
<td>Running past barrels</td>
<td>18</td>
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Fig. 5. Thermogram showing the hot streak across the horse’s back. The hot streak (arrow) crosses the back.

Fig. 6. Thermogram showing the cold streak on the horse’s back. The streak (arrow) is usually seen on only one side of the back.
kissing spines (39%): 16 Warmbloods, 5 Quarter Horses, and 6 Thoroughbreds. Twenty-five of the horses had 2 to 4 vertebrae involved, and only 2 had 5 or more processes involved. All involved the anticlinal vertebrae (T15). Chi-square analysis shows that Group 1 horses affected have a higher prevalence of 5 or more vertebrae involved than Group 3 horses (p < 0.05).

Treatment

Owners of Group 1 horses elected a range of therapies and back exercises. The most common treatment regimen was SME therapy (shockwave, mesotherapy, exercise) (n = 110). Thirty-two owners elected mesotherapy only, whereas 29 others opted for injection of the back with corticosteroid in the region of kissing spines. One owner used electrical stimulation of the muscles. A horse with concurrent ulcers was treated only for the ulcers. Seven owners opted for exercise only. Thirty-two owners elected not to treat their horses.

Treatment response to SME was considered good to excellent in 95 of 110 cases (86%), whereas 15 responded poorly or showed no improvement. Response to SME treatment varied with the age of the horses and sites of lesions. Seventy-four young horses (6 to 10 years) were treated, of which 67 (91%) showed good to excellent results, whereas outcome was assessed as poor in 7 cases. Twenty-one of 24 treated middle-aged horses (11 to 15 years) (88%) had good results, whereas 3 were rated as poor. Six older horses (≥16 years) were treated, of which 5 had good to excellent results, whereas 1 showed no improvement. Treatment was significantly less likely to be successful in the 6 horses ≤5 years of age, in which only 2 had treatment outcomes rated as good, and no improvement was seen in 4 (p < 0.05). Fifty of 53 horses (95%) treated with SME with 2 to 4 vertebrae involved had good to excellent results with treatment, whereas 45 of 57 horses (79%) with 5 or more vertebrae involved had good to excellent results. Horses with 5 or more vertebrae involved were less likely to be successfully treated (p < 0.05).

In comparing the results of other therapies, 20 of 32 (62%) treated with mesotherapy had good to excellent results and 17 of 31 (55%) horses with corticosteroid back injections had good to excellent results. These treatments alone were less likely to be successful than the combination SME therapy (p < 0.05).

Twenty-nine horses had their saddles refitted by a professional saddle fitter as part of their therapy, with variable results: Thirteen owners reported

Fig. 8. Thermogram of a horse’s back showing a normal thermal pattern. The greatest heat is down the midline.
that the saddle change helped considerably, whereas 8 thought the change helped moderately, and 8 reported no improvement. Eleven horses in which the saddle change helped notably were dressage horses and 2 were hunter/jumpers. The 8 horses that were helped moderately were 4 event horses, 3 dressage horses, and 1 Western horse. The 8 that were not helped were 4 event horses, 2 dressage horses, and 2 Western horses.

4. Discussion
The occurrence of kissing spines in horses is thought to be related to conformation and development. In our control cases, we found 39% of the horses had overriding spinous processes in their backs without clinical evidence of back pain. This indicates that the presence of kissing spines alone is not necessarily cause for concern but should be considered as a predisposing factor for back pain, given the higher prevalence among horses with back pain in this study (212 of 310). Thoroughbreds have previously been shown to have a higher prevalence when compared with other breeds. This is corroborated by our clinical cases in which Thoroughbreds were significantly overrepresented. Jeffcott has also suggested that kissing spines occur more often in competitive jumping or dressage horses. In our study, dressage horses were significantly overrepresented. If one considers that eventing horses also train for dressage, then 55% of the horses with kissing spines and back pain perform dressage. The question is, why do these horses have a higher prevalence? Spinous impingement certainly occurs in horses without causing clinical signs. A logical assumption is that the pain or behavior change that is noted must be induced by the way the horse is used. In the discipline of dressage, the clinical signs might be induced by the concussion of the rider during the sitting trot, or, more likely, the need for the dressage horse to use its back to perform collection and lateral movements. During training or competition, the horse may overuse the back, resulting in inflammation and pain at the sites of spinous impingement.

Spinous impingement has been reported to occur most commonly between T13 and T18. Our study confirms this and adds the observation that most occur around the anterclinal vertebrae (T14–15, T15–16). The vertebral spines change direction at this site, and it is the most common area for change in spinous process morphology. This shift in angulation reduces the space between the dorsal spines and makes this the most likely area for vertebrae to touch. Because T15 is located directly under the rider’s seat, it is logical to deduce that riding induces the clinical signs. A similar study in driving horses would be of great comparative interest in investigating this hypothesis.

The clinical signs of back pain are highly variable and could not be solely used to differentiate causes of back pain. Hence, the clinical diagnosis of kissing spines has often been considered challenging. Thermography is an ideal tool to help differentiate when clinical signs and behavior changes are associated with the back. Thermography can detect subtle (0.1°C) temperature changes, and, in back sore horses, depicts an array of inflammatory patterns. The results of this study indicate a 90% positive predictive value for thermography in the diagnosis of kissing spines in back sore horses, that is, if one of the three thermal patterns described is present during an evaluation of a horse’s back, there is a 90% chance that the horse has kissing spines. The patterns have been described as “root signatures” and are thought to reflect inflammation of nerve roots from the spine. Whether this is true cannot be determined by this clinical study, but the patterns certainly were strongly associated with spinous impingement. This clinical experience with thermography indicates its value for the evaluation of back pain, and this study shows that it enhances the clinical index of suspicion more accurately than response to palpation.

Treatment of kissing spines is usually multifactorial, and no one treatment can be expected to ameliorate these problems. We used a variety of treatment regimens that had previously been identified as helping back-sore horses. The most common treatment protocol in this study was SME on 110 horses. This therapeutic regimen also proved to be more effective than any other treatments we performed. In the author’s experience, the most important aspect of any treatment regimen was the exercise program. Exercise must achieve the goal of the horse moving freely forward in a relaxed frame (“long and low”). If this goal was not achieved or attempted, therapy simply failed. Shockwave and mesotherapy are modalities that help achieve this goal. Shockwave effectively eliminated the pain and would make the horse willing to work. However, shockwave only improved the willingness, as full stretching was inconsistently achieved. As a result, mesotherapy was added. Mesotherapy is a technique of intradermal injection that is hypothesized to work through type I and II nerve fibers that can block pain transmission within the spinal cord. After treatment, increased willingness to stretch over its top line and stepping further underneath and forward with the rear legs were observed. Daily exercise was key, and ground poles and cavelletti exercises were added to the program once the horse was willing to stretch. We asked that the horse’s frame only be changed by the rider gently lifting the horse’s head and then compressing the horse by asking the horse to move into the bridle. It was imperative that the rider not force collection at any time. When successful, the treated horses showed initial improvement within 2 days, then progressive further improvement during the exercise regimen and with each subsequent treatment. This therapy was effective in 95 of 110 treated horses (86%).
Several factors play a role in the effectiveness of treatment, including client compliance. Horses under 5 years of age have a significantly poorer response to treatment. Treatment is 20% less likely to be successful in horses with 5 or more vertebrae involved. Saddle fit was changed in 29 horses, and this helped 71% of the time. This finding reiterates the need to assess all aspects of the rider-horse interaction when dealing with back pain.

5. Conclusions

Overriding spinous processes of the thoracolumbar vertebrae of horses is common. Only a small percentage of these horses become clinically painful through their backs. However, the condition is 3 times more likely in horses that present to a veterinarian with back pain. Thoroughbred horses, horses used for dressage, horses 5 years of age or less, and horses with 5 or more vertebra overriding are much more likely to develop back pain caused by the kissing spines. Medical treatments designed to reduce pain and induce muscle relaxation, combined with routine exercise to stretch and strengthen the back, are very effective and can keep the majority of affected horses working.

References and Footnote


*Versatron, High Medical Technologies AG, Lengwil, Switzerland.