Kissing spines: Diagnosis and treatments

In the first of a two part series Ben Jacklin MA VetMB MRCVS, resident in equine surgery, Royal Veterinary College, discusses the latest developments

For those of us working with equine athletes, and leisure horses alike, it won't have escaped our notice that certain diagnoses and surgical treatments are, from time to time, in vogue. Perhaps the best example of this is amputation of 'kissing spines,' (overriding/impinging spinous processes; ORSP) which has variably been popular over the past 50 years, with mixed opinion on success. However, new research, and the development and improvement of new techniques both in diagnosis and treatment, have meant that horses can increasingly be accurately diagnosed and treated effectively. As a result of this better understanding, vets, physiotherapists, trainers, and owners can now be far more optimistic about treatment, and horses can frequently return to full function regardless of their intended pursuit.

Skeleton of a thoracolumbar spine showing two sites of impinging spinous processes

Anatomy

The vertebral skeleton of the horse consists of 7 cervical, 18 thoracic, 6 lumbar, 5 sacral, and 15-21 caudal vertebrae. Variations are not uncommon and most frequently involve the presence of only 5 lumbar vertebrae, which is more common in Arabian horses. Less frequently, horses are encountered with 17 or 19 thoracic vertebrae. In the midline on the dorsal aspect of each vertebra lies the spinous process, which projects dorsally, and varies considerably in size along the length of the spine. It is minimal in size in the cervical region, with the exception of the second and seventh cervical vertebrae. The processes then increase in size up to the fourth or fifth thoracic vertebrae, and reduce in size to the fifteenth or sixteenth vertebrae.

From this point caudad (towards the tail) they are roughly equal in size, up to the final lumbar and first sacral vertebrae, which are somewhat shorter. Cranially (towards the head) the processes are inclined in a dorso-caudal direction, to a decreasing degree as one moves caudad along the spine. The fifteenth or sixteenth thoracic vertebra is known as the anticlinal spinous process, which is vertical in orientation, caudal to which the processes are inclined dorso-cranially. At the lumbo-sacral junction this alters and the 1st sacral vertebra is inclined dorso-caudally, leaving a significant space between the spinous processes of L6 and S1. In the caudal thoracic spine, the dorsal components of the spinous processes become more beak shaped, usually between the 11th and 18th thoracic vertebrae, and this is most pronounced in Thoroughbreds.

It is these spinous processes that are subject to 'crowding' in cases of ORSP, and impingement and overriding of these processes results in the pain and inflammation seen clinically in affected horses.

What types of horses are affected?

The traditional view of ORSP is of a disease affecting the jumping horse. However, critical evaluation of the data has dispelled this myth, and while flat racing Thoroughbreds were previously not considered susceptible, recent work has identified that racehorses are highly represented both in terms of back pain, and the presence of ORSP. Similarly the condition is now recognised in a wide variety of breeds, engaging in all manner of equine activities.

Contrary to popular belief, age has not consistently been correlated with the presence of clinical signs and ORSP. Horses which are "short-backed" are thought to be pre-disposed, but this has not been demonstrated objectively. ORSP is most commonly seen between the 12th and 17th thoracic vertebrae, but can be seen in other locations.

Assessing lesion significance

Grade 1
Narrowing of the interspinous space with mild increased opacity of the cortical margins of the spinous processes

Grade 2
Loss of the interspinous space with moderate increased opacity of the cortical margins of the spinous processes

Grade 3
Severe increased opacity of the cortical margins of the spinous processes, caused in part by transverse thickening, or radiolucent areas

Grade 4
Severe increased opacity of the cortical margins, osteolysis, and change in shape of the spinous processes; overriding (overlap) of the spinous processes

Denoix, J.–M. and S.J. Dyson, Thoracolumbar spine, in Diagnosis and management of lameness in the horse, M.W. Ross and S.J. Dyson, Editors. 2011, Elsevier: Philadelphia. p. 592-601

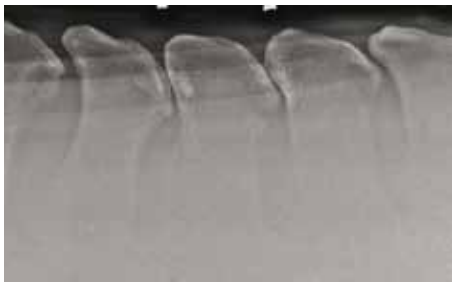
Normal vs abnormal

Understanding of the capacity of the thoracolumbar spine in the horse for movement, has increased in recent years. When clinicians first began treating horses for back pain, they proceeded under the belief that the equine spine was a rigid structure, which had little capacity for significant movement. However, as early as 1968, a loss of flexibility of the horse's spine was identified as abnormal, and subsequent research has revealed the equine spine to be capable of significant levels of movement; including dorsiflexion, ventroflexion, axial rotation, and lateral bending.

Despite this improvement in understanding, back pain in horses is without doubt still over-diagnosed. Further to this, it is now widely accepted that even when present, back pain is (not surprisingly), frequently secondary to hind limb lameness. For this reason it is crucial to investigate and eliminate lameness before diagnosing primary back pathology.

Diagnostic tests

It is important to remember that ORSP of the equine thoracolumbar spine represents a common radiographic and post mortem finding, and indeed has been identified in skeletons of an extinct and undomesticated species of equid. Post-mortem studies of horses without any clinical evidence of back pain reveal a high prevalence (86-92%) of ORSP. For these reasons, accurate and meticulous use of diagnostic tests are required to reach a secure diagnosis.



Grade 1 and Grade 2 ORSP lesions affecting two interspinous spaces in a 12 year old Thoroughbred

A Grade 4 ORSP lesion affecting a single interspinous space in an 8 year old warmblood gelding

Clinical examination

Palpation of the equine back is frequently the mainstay of initial suspicion of back pain, but there are multiple confounding factors. Research has shown that age and breed play a major part in how a horse will respond to palpation, and the results of palpation of the equine back are both variable and unreliable. As a result, both false negatives and false positives are common. Pain responses can be dramatic, and localised areas of muscle tension may suggest a lesion in that location, but these findings are subjective and again vary between breeds and individuals. Ability to ventroflex and dorsoflex the spine can also be tested, and some horses may exhibit a 'guarding' against spinal flexion, which is far more suggestive of pathology than dramatic bending/flexing in response to digital pressure.

Radiography

Radiographic examination is a non-invasive, and relatively easy to perform method of assessing the vertebral column. This can give not only useful information as to the presence/absence of ORSP, but also can identify other lesions within the spine, such as osteoarthritis of the articular process joints, or ventral vertebral spondylosis. However, studies have shown ORSP lesions are frequently seen radiographically in clinically normal horses (up to 40%), so caution must be exercised in their interpretation. For this reason a variety of grading systems have been developed to assess spinal radiographs, such that 'higher grade' lesions are far more closely correlated with clinical signs of back pain, and far less common in normal horses. Use of a grading system can assist in assessing the likelihood of lesion significance.

Local anaesthesia

Local anaesthetic injected into the area of ORSP is arguably the most specific method of assessing the significance of lesions identified on radiographs. Placing lead markers on the back during radiographic examination identifies the site for injection; the markers are subsequently marked using a marker pen or small clipped patch, prior to aseptic preparation and injection. Use of diagnostic anaesthesia in this way relies on repeatable and consistent clinical signs (e.g. bucking/bronking, resentment of girthing). Clearly a horse, which rears when mounted, is not a good candidate for 'testing' before and after blocking. However, where consistent signs are present and the horse displays convincing improvement following local anaesthesia, a lesion can be far more securely implicated. As if purely to confound this test however, elegant research published from Sweden in 2006 took normal horses with no signs of back pain, and injected their interspinous spaces with local anaesthetic. They discovered that this significantly altered back function and movement, and recommended caution when interpreting the results of this diagnostic test. The take home message is that subtle changes in rider perception of movement may not be indicative of a positive response to the block.

Injection of steroids in a similar manner is also used on occasion to assess the significance of ORSP lesions, as well as being the mainstay of conservative treatment. A positive response and improvement in clinical signs following medication is certainly supportive of the ORSP being the source of a clinical

problem, but systemic effects of steroids are well documented, and as such this approach in the absence of other diagnostics could lead to misdiagnoses.

Nuclear scintigraphy

The principle of nuclear scintigraphy is that a radioactive molecule (radionucleotide) is chemically attached to a pharmaceutical compound, which is then injected into the bloodstream. These radiopharmaceuticals, once administered to the horse, are capable of localising to specific organs and/or cell receptors. This allows nuclear scintigraphy to image the metabolic activity of tissue to some extent, rather than assessing changes to the tissue anatomy as in the case of radiography. In horses this radiopharmaceutical is almost always formed from Technetium99 and Methylene Disphosphonate (MDP), which is preferentially taken up by bone. In cases of ORSP it can not only corroborate radiologically identified areas of pathology and attribute them some significance, but can also implicate the spine in cases of non-specific poor performance without overt evidence of back pain.

Research has shown that areas of increased radiopharmaceutical uptake (IRU, or "hotspots") are common in the spinal column of horses without any clinical evidence of back pain (up to 79%). However, areas of IRU are far more commonly found in those animals that are clinically affected (95-100%). Furthermore, in those horses which do show IRU in the region of the spinous processes, up to 98% have been shown to have radiographic evidence of ORSP. Not only can scintigraphic evaluation further evaluate the relevance of ORSP lesions, it can also be very effective in identifying other pathology within the spine, such as osteoarthritis of the articular process joints, which would reduce the chances of a successful outcome, especially if only the ORSP were treated.

Summary

No diagnostic test is 100% sensitive, nor 100% specific for the identification of a disease process; meaning that every diagnostic available will both miss diseased cases, and wrongly diagnose normal cases. The frequencies of these errors are expressed as the sensitivity and specificity of the test you are performing respectively. This applies to veterinary medicine, human medicine, and the sciences universally, and is no more true than in the case of ORSP.

Historically, cases of ORSP were frequently diagnosed on the basis of just one of the diagnostic tests described above. However, the publication of good quality data following research into ORSP, and further validation of the more recent techniques, has shown that a combination is required to make a definitive diagnosis. With more accurate diagnoses, we are better able to treat accurately the clinical problems with which horses present, and be sure we are treating the inciting cause. Once an accurate diagnosis is made, horses can progress to the range of state-of-the-art techniques now available for the treatment of kissing spines.

References

Crowhurst RC; Symposium on back problems in the horse. Backs-clinical signs. Equine Vet J, 1975. 7(2): p. 66-8.

Cousty M et al; Location of radiological lesions of the thoracolumbar column in French trotters with and without signs of back pain. Vet Rec, 2010. 166(2): p. 41-5.

Dyce KM, Sack, WO, and Wensing CJG; The neck, back and vertebral column of the horse, in Textbook of Veterinary Anatomy, KM Dyce, Sack, WO and Wensing CJG, Editor 2002, Saunders: Philadelphia, Pennsylvania 19106. p. 510-515.

Ehrlich,P.J et al; Results of bone scintigraphy in horses used for show jumping, hunting, or eventing: 141 cases (1988-1994). J Am Vet Med Assoc, 1998. 213(10): p. 1460-7.

Erichse C. et al; Scintigraphic evaluation of the thoracic spine in the asymptomatic riding horse. Vet Radiol Ultrasound, 2003. 44(3): p. 330-8.

Erichsen C, et al; Relationship between scintigraphic and radiographic evaluations of spinous processes in the thoracolumbar spine in riding horses without clinical signs of back problems. Equine Vet J, 2004. 36(6): p. 458-65.

Getty R; Equine Osteology, in Sisson and Grossman's The Anatomy of the Domestic Animals, R. Getty, Editor 1975, W.B. Saunders Company: Philadelphia. p. 260-263.

Jacklin BD, Minshall GJ and Wright IM; A New Technique for Subtotal (Cranial Wedge) Ostectomy in the Treatment of Impinging/ Overriding Spinous Processes: Description of Technique and Outcome of 25 Cases Equine Vet J. 2014

Jackson RK; Symposium on back problems in the horse. (3) Diseases of the horse's spine-"comparative aspects". Equine Vet J, 1975. 7(2): p. 79-80.

Jeffcott, LB; Symposium on back problems in the horse (2) The diagnosis of diseases of the horse's back. Equine Vet J, 1975. 7(2): p. 69-78.

Jeffcott LB; Radiographic Features of the Normal Equine Thoracolumbar Spine. Veterinary Radiology, 1979. 20(3-6): p. 140-147.

Jeffcott LB; Back Problems in the Horse—A look at past, present and future progress*. Equine Veterinary Journal, 1979. 11(3): p. 129-136.

Jeffcott LB; Disorders of the thoracolumbar spine of the horse--a survey of 443 cases. Equine Vet J, 1980. 12(4): p. 197-210.

Klide AM; Overriding vertebral spinous processes in the extinct horse, Equus occidentalis. Am J Vet Res, 1989. 50(4): p. 592-3.

Landman MA; et al., Field study of the prevalence of lameness in horses with back problems. Vet Rec, 2004. 155(6): p. 165-8.

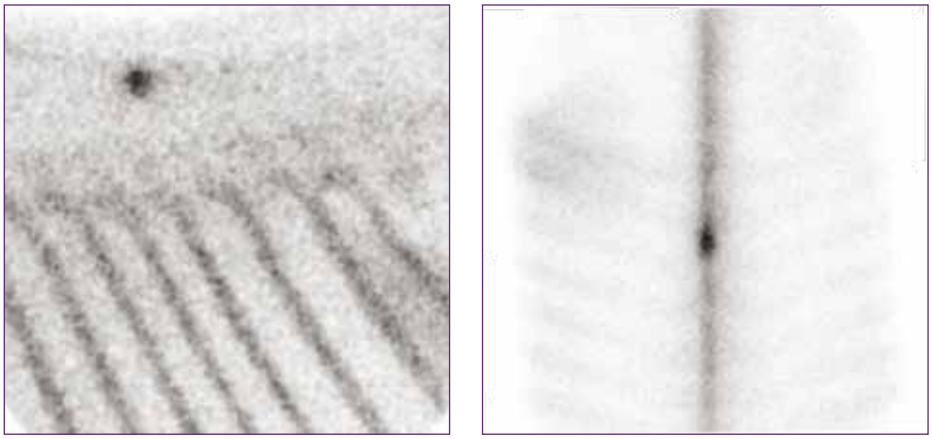
Marks D; Notes on management of thoracolumbar pain in the horses. Proc. Am. Ass. equine. Practnrs, 1985. 30: p. 353-357.

Roethlisberger Holm K, Wennerstrand J, Lagerquist U, Eksel, P, and Johnston C; Effect of local anaesthesia on movement of the equine back Equine Vet J. 2006. 38 (1) p65-69

Steckel RR et al; Scintigraphic Diagnosis of Thoracolumbar Spinal Disease In Horse - A Review of 50 Cases. Proceedings of the Thirty-Seventh Annual Convention of the American Association of Equine Practitioners, 1992: p. 583-591.

Walmsley JP et al; Impingement of the dorsal spinous processes in two hundred and fifteen horses: case selection, surgical technique and results. Equine Vet J, 2002. 34(1): p. 23-8.

Zimmerman M, Dyson S, and Murray R; Close, impinging and overriding spinous processes in the thoracolumbar spine: The relationship between radiological and scintigraphic findings and clinical signs. Equine Vet J, 2012. 44(2): p. 178-84.



Bone Scan (Scintigraphic) images of the caudal thoracic spine of a horse viewed a) from the left side, and b) from above the spine. This horse had a single ORSP lesion correlating with the hotspot in these images