

# Diagnostics

BY CHRISTY WEST

## Diagnosing Coxofemoral Subluxation with Ultrasound

Subluxation (partial dislocation) of the coxofemoral joint between the femur and pelvis in horses is rare; only two cases have been reported in the literature. However, six cases were seen at the University of California, Davis, in a three-year period, suggesting that perhaps this problem is somewhat more common than previously thought. Suzanne Brenner, DVM, an intern at UC Davis, discussed a technique for diagnosing these subluxations with ultrasound.

Radiographs have been considered the gold standard for diagnosing pelvic disorders, she noted. But the views needed to identify subluxation require the horse to be on its back under general anesthesia, while ultrasound in the standing horse is much quicker, carries less risk to the horse, and can provide a solid diagnosis. All six of the UC Davis cases were diagnosed with ultrasound.

Affected horses were quite lame (mostly Grades 4/5, with one exhibiting Grade 3 lameness), with an acute onset of lameness in five horses and insidious (slow) onset in one horse. Crepitus (a bone-grinding noise), muscle atrophy, and pelvic asymmetry were seen in some horses, but only one case had all three signs. No horses had external (outward) rotation of the distal (lower) limb, which has been noted in other reports of the condition. All six cases showed clear displacement of the head of the femur on ultrasound, and five horses had associated acetabular (coxofemoral joint rim) fractures and severe joint effusion (fluid swelling).

Four of the affected horses were euthanized, and only one of the remaining two horses is comfortable at the walk, leading investigators to conclude that the prognosis for this condition is not favorable.

“Coxofemoral subluxation should be considered when a hind limb lameness is suspected to originate from the pelvic region,” Brenner concluded. “Diagnosis can



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Veterinarians have a plethora of diagnostic imaging tools available to help them come to a conclusion about a horse's lameness.

be readily and safely obtained through the use of dynamic ultrasound in the standing horse if weight-bearing and resting views are performed.”

## Computed Tomography for Imaging the Stifle

The stifle joint is often implicated in cases of lameness, but it can be a notoriously tough joint to image. Radiography, ultrasonography, nuclear scintigraphy (bone scan), and diagnostic arthrography (joint evaluation) all can be used, but they all have limitations. And no currently available MRI units are big enough to accept a horse's stifle for imaging.

Computed tomography (CT), however, might be able to image the stifle with detail approaching that of MRI, and with a shorter examination time. Erik Bergman, DVM, Dipl. ECAR, a veterinarian from Lingehoeve Diergeneeskunde, in Lienden, the Netherlands, presented a study of the technique and clinical application of stifle CT evaluation.

“Historically, CT has been infrequently

used to evaluate the anatomy of the upper limbs for a variety of reasons, such as the physical constraints of the horse, gantry (ring around the imaging tunnel) size, X ray tube output, and difficulties in linking a table strong enough to support a horse to the CT scanner,” he said. “Advances in all of these areas—in addition to CT-scanner software and hardware improvements—have made the technique reported possible.”

After development of CT arthrography (joint evaluation) technique via contrast media on cadaver specimens, Bergman described the findings and procedures used to evaluate stifles on 16 horses with CT (general anesthesia is required). Horses were Grade 2-4/5 lame on the AAEP lameness scale, and pain had been localized to the stifle joint by joint blocks and thorough lameness examinations.

Diagnostic images were achieved in all horses, and ultrasound-guided contrast media injection for arthrography was successful in all cases. Lesions were found on CT that correlated with the clinical exam in 14 of the 16 horses, and 12 horses had



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multiple lesions. The most common problem was a lesion of the meniscotibial ligament and/or its insertion onto the proximal tibia, which was found in six of 16 horses (37.5%).

"CT was vastly superior to radiography for evaluation of hard tissues, including bone and dystrophic soft tissue mineralization," he reported. "Ultrasound and radiography consistently underestimated the extent of bone remodeling in these cases."

Bergman noted that CT arthrography carries two major benefits over radiography and ultrasound—the ability to find lesions not previously seen with these two methods, and a more complete evaluation of the extent of lesions seen with these methods. "In several cases, ultrasound accurately identified the lesions, but the CT scan documented other lesions or more extensive pathology than was suspected."

"In conclusion, the techniques of equine stifle CT and CT arthrography are feasible and clinically useful," Bergman summarized. "CT should be considered complementary to a complete clinical examination and other diagnostic imaging modalities. In this group of clinical cases, CT was useful to define the extent of suspected or previously diagnosed injuries and to identify injuries that were elusive. This information allows clinicians to develop more directed therapeutic plans or provide a more accurate prognosis."

### Specificity of Digital Flexor Tendon Sheath Nerve Blocks

Diagnosing lameness in horses has often been termed an art and a science, in part because the use and interpretation of nerve blocks to isolate sources of pain is more art than exact science. In recent years, several blocks have been found to numb more structures than scientists previously thought based on research performed at Auburn University; this, in turn, impacts the interpretation of lameness that is attenuated by those blocks. To help sort out one particular block, Justin Harper, DVM, a resident in equine surgery at Auburn, presented the results of a study on analgesia of the digital flexor tendon sheath (DFTS).

He said the study was designed to answer one question: Is analgesia of the

DFTS specific, only desensitizing the digital flexor tendon sheath and its contents, or is it nonspecific, blocking more structures distal to (lower than) or outside the confines of the sheath itself?

Six horses with no pre-existing forelimb lameness were studied in three trials (using temporary lameness induction methods); the first used set screws to induce solar

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DR. ERIK BERGMAN

pressure at the heel or toe, the second used endotoxin to create joint inflammation in the coffin joint, and the third used endotoxin to create inflammation in the navicular bursa. Each horse was videotaped walking and trotting toward and away from the camera before and after lameness induction, then the horses were blocked at the DFTS and videotaped again at 10 and 20 minutes after the block was applied.

Four investigators blinded to the video timing evaluated the videos on a 10-point lameness scale. Median lameness scores after trial 1 (sole pain) were not significantly improved at 10 minutes post-block, but they were significantly improved after 20 minutes. In trials 2 and 3 (coffin joint pain and navicular bursa pain), there were no significant improvements in lameness at 10 or 20 minutes after the blocks were applied.

"Analgesia of the DFTS using the palmar axial sesamoidean approach does not interfere with pain originating from the sole, coffin joint, or navicular bursa if evaluated within 20 minutes," Harper concluded. "So, if pain is attenuated with the DFTS block, chances are the pain is in the deep digital flexor tendon."

### Diagnosing Upper Cannon Area Injuries

Pain originating in the upper cannon bone area, just below the knee or hock, is common in all types of equine athletes. Determining exactly what structure is injured, though, can be difficult; some injuries can only be seen with high-field MRI. Matthew

Brokken, DVM, clinical assistant professor of veterinary clinical sciences at the University of Florida, described a Washington State University study of lameness originating in this area.

"Detection of abnormalities, specifically desmitis (ligament inflammation) of the inferior check ligament (ICL) and proximal suspensory ligament (PSL), has not been possible in some horses (via radiography or X rays, ultrasound, or nuclear scintigraphy)," he explained.

For the retrospective study, 45 horses with lameness localized to the proximal metacarpus/metatarsus (upper cannon bone area) were selected. Most were Warmbloods (20) and Thoroughbreds (12), and the horses ranged from 3 to 17 years of age. All were lame; 22 had been lame for less than four months, 22 for longer, and one had been lame for an unknown time. Forelimb lameness affected 29 horses. Thirty-one horses were Grade 3/5 lame, nine were Grade 2 lame, and one was Grade 4. All were imaged with a high-field (1.0-tesla) MRI system.

"The use of MRI in this area allowed an accurate diagnosis in 44 of 45 horses," Brokken reported. "The transverse proton density sequence was the most helpful in detecting subtle changes in signal and size within the ICL and PSL. Having an accurate diagnosis enabled appropriate treatment in these horses, which helped a high percentage of them to return to their intended use."

Researchers found that 23 horses had desmitis in the upper 4 cm of the PSL—13 had desmitis in hind limbs and 10 in forelimbs. Sixteen horses had ICL desmitis; 12 had lesions from 1-4 cm below the upper end of the cannon bone and four had them 5-10 cm down. Of the remaining six horses, one had ICL and PSL desmitis in the same limb, one had desmitis in both ligaments but on different limbs, one had an injury to the cannon bone, one had effusion (fluid swelling) of the distal tarsal sheath of the deep digital flexor tendon (DDFT), one had a DDFT injury, and one had no obvious abnormalities.

"It is interesting to note that 59% of horses that had lameness localized to the proximal metacarpal region (forelimb) had ICL damage," noted Brokken. "Previously it was thought that horses that block to the

proximal metacarpal region usually have a proximal suspensory injury,” but these results prove that this isn’t always the case.

Treatments ranged from a six-month rest and rehabilitation program (33 horses) to surgery, injections, and various combinations thereof. Forty-three of the horses were available for followup:

- Eight of 10 horses (80%) with forelimb PSL desmitis returned to full work.
- Nine of 13 horses (69%) with hind limb PSL desmitis returned to full work.
- Ten of 16 horses (63%) with ICL desmitis returned to full work. Five of eight horses that had ICL desmotomy (complete cutting of this ligament) returned to full work. “The success of ICL desmotomy in these horses further supports the importance of making an accurate diagnosis, because (in) horses with ICL desmitis you have a surgical option that is not appropriate for horses with PSL desmitis,” Brokken noted.
- The two horses with both ICL and PSL desmitis returned to full work, as did the horses with distal tarsal sheath effusion and DDFT injury.
- Eight horses had ultrasound evaluations, but ultrasound findings were unremarkable or misinterpreted as PSL injury when ICL injury was detected instead by MRI. “Ultrasonographic examination of the PSL is technically challenging,

especially in the hind limbs,” Brokken commented.

“In conclusion, lameness localized to the proximal metacarpal and metatarsal region has been a diagnostic challenge,” Brokken concluded. “Traditional imaging modalities don’t always yield an accurate diagnosis. High field strength MRI should be considered in performance horses with lameness localized in the proximal metacarpal and metatarsal areas.”

*For more information, see “Magnetic Resonance Imaging Features of Proximal Metacarpal and Metatarsal Injuries in the Horse,” Veterinary Radiology and Ultrasound, Vol. 48, No. 6, 2007, pp 507-517.*

### MRI for Diagnosing Sesamoidean Ligament Desmitis

The high degree of detail seen with MRI has made it possible for veterinarians to find equine injuries they’ve never seen before. One example of this—MRI evaluation of desmitis in the oblique and straight distal sesamoidean ligaments—was described. Sarah Sampson, DVM, doctoral graduate student in equine surgery and MRI at Washington State University (WSU), discussed the anatomy of these ligaments and a study of findings and treatment success in 27 horses.

“The distal sesamoidean ligaments include four ligaments (straight, paired

oblique, paired cruciate, and paired short distal sesamoidean ligaments) that comprise the distal suspensory apparatus,” she explained. “That apparatus resists extension of the fetlock and holds the suspensory bones to the first and second phalanges. The distal sesamoidean ligaments are susceptible to overload injury from hyperextension.

“Initially, diagnosis of desmitis in these ligaments relied on observations of swelling over the palmaroproximal (upper rear) aspect of the digit or on ruling out other causes of lameness in the area with radiographs,” she noted. Ultrasound has been helpful in some cases, but she said this area is hard to evaluate with ultrasound.

However, MRI was found to be a very good way to identify these injuries, much more so than ultrasound or swelling. After describing the anatomy and imaging of these ligaments in great detail, Sampson described a retrospective study of affected horses. Of the 27 horses, most (15, 55.6%) were jumpers or dressage horses, and the age range of the whole group was 2 to 13 years. All were lame—six for less than four months, 19 for longer, and two for an unknown length of time. Seventeen horses had hind limb lameness (left, right, or bilateral), while the rest had forelimb lameness.

MRI confirmed injuries of the oblique

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(ODSL) or straight distal sesamoidean ligament (SDSL) in all study horses, but only one horse had palpable swelling in the distal sesamoidean ligament region. Only two horses' injuries were detected with ultrasound by referring practitioners (four horses were reevaluated with ultrasound at WSU).

Most of the horses (24/27, 89%) had injuries of the ODSL, and these were more frequently in the hind limb (16/24, 67%). The total number of medial (inside) and lateral (outside) branch injuries was about the same overall, but forelimbs tended to have medial branch injuries (87% of forelimb injuries) and hind limbs tended to have lateral branch injuries (71%).

Sampson noted that blocking the digital flexor tendon sheath eliminated most lameness due to distal sesamoidean ligament injury after 30 minutes. Thus, this injury should be considered when this block alleviates lameness.

**Returning to Work** The primary treatment for all cases was six months of rest and a rehabilitation program. Twenty-two horses had initial hyaluronic acid and methylprednisolone acetate injections into the digital flexor tendon sheath to combat inflammation, swelling, and fibrous tissue formation. Two horses also underwent ligament splitting.

All six horses with short-term lameness (less than four months' duration) were sound at follow-up (one to three years after diagnosis). Eight of 12 horses (67%) with lameness for more than four months at the time of diagnosis were sound. Ten horses had mild lesions, and four of the five available for follow-up (80%) were sound. Thirteen of 14 horses with moderate lesions were available for follow-up, and of those 10 (77%) were sound. Two of three horses with severe lesions were sound (67%). Finally, 16 of 21 horses (76%) that were available for follow-up were competing at the same or a higher level of performance than before the injury. The remaining five were lame and had been retired.

"The ability of most of these horses to return to athletic performance indicates that the prognosis is not as poor as previously reported," Sampson noted. "High-field strength MRI is capable of early diagnosis of distal sesamoidean ligament injury, and appropriate treatment soon after injury may provide a better prognosis for returning to performance."

"Injury to the ODSL or SDSL can occur without palpable abnormalities in the region," she concluded. "These injuries do not need to be severe to cause performance-limiting lameness in athletic horses, and they should be considered in the differential diagnosis when examining horses with lameness that blocks out in the area of the pastern or metacarpophalangeal/metatarsophalangeal region. High-field strength MRI is a valuable way to evaluate ODSL and SDSL desmitis."

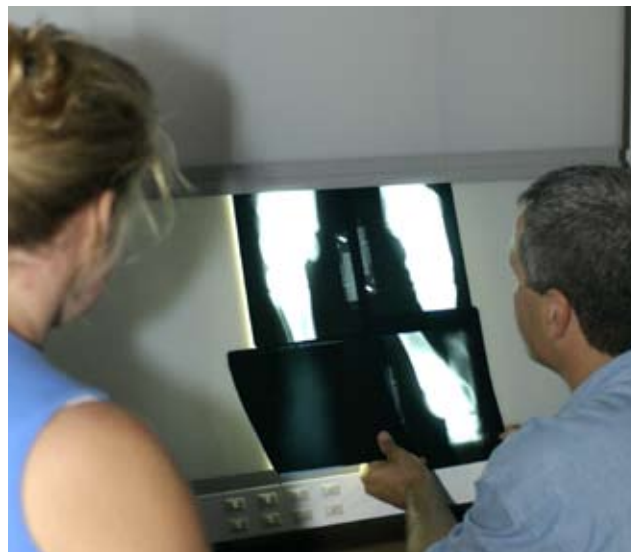
### Purchase Exam for Public Auction Forum

Sale description accuracy, radiograph (X ray) repositories, radiograph quality, radiograph reports, medications, and genetic diseases—what do they all have in common? All of these topics were discussed during the Purchase Exam at Public Auction Forum, an open discussion session.

The first item on the agenda was a report of what happened based on recommendations from the 2006 forum regarding statements made by announcers about a horse's condition while a horse was in the ring. Some felt that a veterinarian should be involved in writing or reviewing these statements to ensure accuracy, as these statements can impact buying decisions. Inaccuracies in sale ring announcements, some veterinarians feel, can often have the effect of glossing over or minimizing a problem.

There wasn't much of a result from those recommendations, said one attendee; the AAEP didn't get involved and sales companies didn't either, so any further action on this will have to happen on the local level.

**Radiograph quality and repositories** Radiograph repositories and quality were discussed extensively; different sales' procedures, handling of images, and technological concerns were mentioned as well. One concern shared by many attendees was that a significant number of radiographs in the repository are either of poor quality or



Repository radiograph quality is one issue faced by veterinarians evaluating sale horses.

ANNE M. EBERHARDT

the wrong angle to see areas of interest.

"I have a tough time being critical of colleagues, but if you can't read the films you can't read them," said one veterinarian. "It happens enough that some attention needs to be paid to it."

Sale companies often allow only one study of each horse in the repository, which makes it impossible to get new views unless the veterinarian takes them himself. However, concerns about maintaining the integrity of the medical record complicate the issue.

There were a couple of suggestions to improve this situation. "One, we could improve our educational efforts for the veterinarians so they all know it's not just about the right views, but also the right angles, exposures, etc.," opined one attendee. "And if the sales companies would agree to have some sort of quality control in place, that would help, but they haven't wanted to take the responsibility."

Another veterinarian suggested reviewing radiographs post-sale to approach the issue without threatening veterinarians' relationships with their clients. The Kentucky Association of Equine Practitioners held just such an educational session after a Keeneland sale in Lexington in 2007, which was well-received.

**Radiograph Interpretation** Moving on to radiograph interpretation, moderator Scott Hay, DVM, president and managing partner of Teigland, Franklin, and Brokken in Ft. Lauderdale, Fla., commented, "We need to emphasize that it's our responsibility not

so much to find lesions as to assess their impact. When you start out, it's all about finding something wrong, and lots of good horses are penalized. The evolution is that you find a lesion, and maybe you emphasize it, but maybe you don't. It's important to have people assess the impact of lesions rather than just filling pages with lists of anomalies."

Attendees agreed that there is often pressure to minimize reports of lesions to help sell a horse, but the flip side of that is the trouble one can have if a lesion is not reported pre-sale and is found post-sale. Most said they draw a hard line between reports and opinions, listing all their findings in a report, but not offering an opinion on them unless requested. Others prefer to put their opinions on reports as long as the findings are not omitted.

**Medications and medical records** The availability of a horse's medical records was also a topic of discussion; Hay noted that legislation has been proposed in Florida to make a horse's entire medical history public at the horse's auction. "It's pretty far-reaching what they're proposing," he said. "It would include any history of any disease, EPM, all vaccination records, any lameness, anything. It's a little scary that some of the things written there could become legislation."

Disclosing a horse's entire health record is cumbersome and raises client confidentiality issues, opined one veterinarian.

Medication usage in sale horses is another issue, and it's one that's not exactly clear-cut. "The problem with medication issues is that they vary from state to state," said one attendee. Several studies are ongoing to determine typical baseline values for several compounds and hormones; these will provide the basis for additional research to develop withdrawal times and acceptable levels of various medications.

**Genetic diseases** The forum ended with a presentation by Stephanie Valberg, DVM, PhD, Dipl. ACVIM, director of the University of Minnesota's Louise and Doug Leatherdale Equine Center. She presented new information on the inheritance, testing, and clinical signs of five equine genetic diseases that affect Quarter Horses and related breeds. Test results for these diseases are playing an increasingly important role in many sale environments.

She noted that a DNA mutation has been identified in only eight equine diseases,

although with the genome research completed in 2007 that number will likely increase soon. She discussed hyperkalemic periodic paralysis (HYPP), glycogen-branching enzyme deficiency (GBED), hereditary regional dermal atrophy (HERDA), polysaccharide storage myopathy (PSSM), and malignant hyperthermia (MH). The three genetic mutations that don't affect Quarter Horses are severe combined immunodeficiency syndrome (SCID) in Arabians, overo lethal white syndrome (OLWS) in Paints, and junctional epidermolysis bullosa (JEB) in Belgians.

### How Important Is That Airway Exam Grade?

The airways of many breeds of horses, particularly Thoroughbreds, are evaluated via an endoscope and graded before sale. The intent is to identify horses whose airways might have problems that could limit the horses' performance at maximal exercise, so buyers can consider this in their purchasing decisions. Scott Pierce, DVM, of Rood & Riddle Equine Hospital in Lexington, Ky., presented a study investigating the exam results and later racing performance of 2,954 Thoroughbred yearlings in an effort to answer the question of just how significant airway grades are.

The exam takes only one to two minutes, and it evaluates arytenoid cartilage function (these cartilages should be able to abduct, or move completely out of the airway to allow maximum airflow) on a scale of 1-4. Epiglottises are also evaluated; a short or otherwise abnormal epiglottis can contribute to dorsal displacement of the soft palate, which can also obstruct airflow. Following are the grading scales Pierce used to evaluate all study horses between 1998 and 2001, and the results.

#### Arytenoid function (AF)

- Grade 1: Synchronous movement, symmetrical cartilages; maximal abduction easily achieved. 19% of horses (571) were in this category.
- Grade 2a: Mildly asynchronous, mildly asymmetrical, maximal abduction easily achieved (70%, 2,068 horses).
- Grade 2b: Asynchronous, asymmetrical, maximum abduction with difficulty (9%, 260 horses).
- Grade 3: Asynchronous, asymmetrical, limited arytenoid movement. Full abduction is usually not achieved and especially is not maintained (2%, 55 horses).

- Grade 4: No arytenoid movement, no abduction. No horses were Grade 4, but Pierce noted that most of these horses would not be offered for sale, as they are usually withdrawn.

#### Epiglottis structure (ES)

- Grade 0: Normal epiglottis with good thickness, length, and definition with normally serrated edges. 81% of horses had normal epiglottises.
- Grade 1: Slightly flaccid, with adequate length and texture, but slightly thinner than normal and without serrated edges (14% of horses).
- Grade 2: Mildly flaccid, with adequate length, thinner than normal, curled edges, and no dorsal vasculature (4% of horses).
- Grade 3: More severe, moderately flaccid, very thin, and bent easily (1% of horses).
- Grade 4: Severely flaccid, extremely thin, markedly short, and bent easily (0 horses).

Race records for the 2-, 3-, and 4-year-old years were collected and analyzed in context of the throat exam findings. Pierce reported no difference in the number of starts, earnings per start, or total earnings of horses with Grade 1 vs. Grade 2a arytenoid function at 2, 3, or 4 years of age. Grade 2b horses had significantly lower total earnings per year at 2 and 4 years of age than Grades 1 or 2a, and they almost had significantly lower earnings at Grade 3, but a few big winners in this group kept the numbers at this age from being significant. Grade 3 horses had fewer starts and lower earnings than Grades 1, 2a, and 2b.

Forty-three percent of horses with Grade 3 arytenoid function went unraced, compared to 15% of Grade 2b, 16% of Grade 2s, and 13% of Grade 1.

Horses with epiglottis structure grades of 0-2 all performed about the same, while those with Grades 3 and 4 had significantly decreased earnings at ages 2 and 4.

"So what do I tell clients?" Pierce asked. "I tell them Grades 1 and 2a arytenoids function are no problem. For Grade 2b, there's something there. They don't perform as good as the 1s and 2as; however, if you think the horse is really special, I would buy him anyway. I can't condemn all of these horses. Grade 3s are bad.

"For epiglottis structure, Grades 0-2 are no problem, but I can't recommend horses with higher grades or a really flaccid or short epiglottis," he concluded. 🐾