Proceedings of the 18th Annual Meeting of the Italian Association of Equine Veterinarians SIVE

Feb. 3-5, 2012 - Bologna, Italy

Next SIVE Meeting:

Feb. 1-3, 2013 – Arezzo, Italy

Reprinted in the IVIS website with the permission of the Italian Association of Equine Veterinarians – SIVE
http://www.ivis.org
Lameness is the most important cause of poor racing performance in racehorses and the leading health problem of all horses, in general. In a recent study, 50% of horse operations in the USA with 3 or more horses had ≥ 1 lame horses and on any given day, 5% of horses could be expected to be lame. In another study, 74% of Standardbred (STB) and Thoroughbred (TB) racehorses evaluated for poor racing performance had lameness problems contributing to poor performance and lameness examination was critical in comprehensive sports medicine evaluation. Lameness was the leading cause of wastage in TB racehorses. Often, however, overt clinical signs of lameness are minimal and convincing trainers and owners of the relevance of lameness to the horse’s poor performance is difficult. Lameness severity can range from moderate-to-severe, being visible at a walk or trot in hand, to subtle or mild lameness seen only at speed or while racing. Common comments by trainers include “the horse is not lame”, “you won’t see lameness at a trot in hand”; in many of these horses, however, lameness is evident at a trot in hand or the horse has a short-choppy gait likely caused by bilateral forelimb or hindlimb lameness, making assigning lameness to any one limb a difficult task. In TBs, subtle signs of lameness include failure to break from the gate aggressively or a change in breaking behavior, lugging in or out, and failure to switch leads normally. A common complaint by exercise riders is that horses feel “off at speed” or are “off behind”. In the 4-beat gait, the gallop, the RH impacts the ground first, followed by the LH, RF and finally the LF. It is commonly, but erroneously assumed that horses with LF lameness would be reluctant to take the left lead and horses failing to switch from the left to right lead down the stretch are lame in the RF. Bone stress measured in the radius and McIII is greater in the non-lead (trailing) forelimb so a lame horse may change or fail to change leads to protect the non-lead forelimb. Ground reaction forces are greater in the non-lead forelimb. For instance, a horse lame in the LF would prefer to remain in the left lead. A horse reluctant to take a lead or change leads may be lame behind. In the left lead, the RH must absorb a considerable amount of concussion and then generate propulsive forces, but while it impacts the ground first, stance time, flexion of the upper limb joints and ground reaction force are greater in the LH. Therefore, a horse bearing out in the stretch after switching from the left to right leads may be lame in the RH/LF. Gait characteristics of the gallop are complex, but an accurate history can help discern potential sites of lameness. Horses that are bilaterally lame may have few localizing signs, particularly at speed. Bilateral lameness causes horses to have a short, choppy gait resembling what is classically considered a gait consistent with sore feet. However, the most common cause of a short, choppy gait in my TB referral population is pain originating from the fetlock joints – both forelimb and hindlimb. The most common
cause of high speed lameness is mal or non-adaptive bone remodeling, a form of subchondral bone injury, affecting the distal third metacarpal/metatarsal bones (McIII/MtIII), in 1 to 4 limbs. There is considerable difference regarding lameness distribution and prognosis in STB and TB racehorses. Gait differences between the breeds undoubtedly play a role. Less rotational forces in certain joints of STBs such as the carpus may reduce overload injury when compared to TBs and explain a near equal distribution of carpal problems in the middle carpal (MC) and antebrachiocarpal (ABC) joints in TBs, but a near absence of confirmed lameness of the ABC joint in the STB. Diseases such as suspensory disruption, catastrophic or incomplete fractures of the humerus, tibia and McIII/MtIII, and bucked shins are much less common in the STB. In general, STBs have a better prognosis than TBs for soft tissue injuries such as suspensory desmitis and superficial digital flexor tendonitis. In the TB, load characteristics account for more forelimb than hindlimb lameness, but hindlimb lameness has been underemphasized and should not be overlooked. I have found that descriptions of lameness or predictions from where pain is originating obtained from exercise riders are often erroneous. For instance, the term “up high” is often used to predict sites of pain in TBs that feel “off” while breezing; most often, pain is located in the distal hindlimb. Lacking power leaving the starting gait is often a finding indicative of bilateral hindlimb lameness. Horses that stumble often injure existing areas of stress related bone injury (SRBI). Stress related bone injury of distal MtIII is a most important lameness issue, but one difficult to differentiate without accurate diagnostic analgesia and advanced imaging techniques. Unlike in the STB in which cortical bone injury is rare, in the TB cortical and subchondral bone injury occurs commonly. In our lameness textbook we asked authors to give “their best guess” as to the distribution of lameness in the respective sporting categories. In North American (NA) TBs, the most common sites (diagnoses) are front foot, MCP/MTP joints, carpus, suspensory desmitis, dorsal cortex of McIII, SDF tendonitis, tibial stress fractures, distal hock joint pain, myositis and other stress fractures. In the European TB, the 10 most common lameness conditions are foot related lameness, suspensory desmitis, lameness associated with the middle carpal joint, subchondral bone injuries of distal Mc/MtIII, lameness subsequent to bacterial infection, stress fractures of long bones, splints, “undiagnosed hindlimb lameness”, fractures of the proximal phalanx and distal Mc/MtIII, and distal hock joint pain. While there are obvious similarities (foot pain being the most common), differences between what is commonly seen in NA and in Europe are interesting and may reflect differences in track surfaces (grass and all weather tracks vs. dirt), training methods (training on the straight undulating surface in England, for instance) Cortical bone injury, in particular the bucked shin complex, is more common in NA than in Europe. SDF tendonitis appears more common in NA than in Europe, whereas the opposite is true with lameness subsequent to bacterial infection, an unusual finding in NA. Track surface likely plays a major role in determining distribution of lameness. In a preliminary study evaluating the differences in scintigraphic findings between horses training on grass/all-weather surfaces and dirt revealed fewer cortical stress fractures in horses training on grass/all weather surfaces than in those trained on dirt. The most common scintigraphic abnormality was increased radiopharmaceutical uptake (IRU) of the distal Mc/MtIII in both groups. Recent preliminary evidence using a novel wireless accelerometer revealed peak impact accelerations were higher on grass than on dirt. Ryan et. al. found that accelerations were greatest on take off and not on landing, accelerations were much greater with toe grabs and the less when a glue-on shoe was used (the glue-on shoe had a concave inner-surface rim pad interposed between the shoe and hoof wall). Lameness examination can be challenging in the TB racehorse, particularly in young horses that tend to be fresh or unruly. Palpation can be difficult particularly in the hindlimbs but
must be undertaken diligently to detect subtle abnormalities such as pain on deep palpation of soft tissue structures or cortical bone, an early clinical sign of inflammation. Diagnostic analgesia is easiest to perform in a clinic situation where it can be done in combination with other work to minimize "down time" but can be challenging in fractious horses. Since the gallop is a gait in which visual differences are difficult to detect horses are not often blocked and taken back onto the track. Fractious horses are often referred for scintigraphic examination before blocking; scintigraphy is used as a screening tool in these horses and is often successful in defining abnormal areas. Scintigraphic examination is clearly indicated when horses are lame after a race or work but warm out of lameness in 3-5 days. In these horses stress related bone injury such as humeral, tibial or pelvic stress fractures is often seen.

Diagnostic analgesia is extremely important to determine clinical relevance of palpation findings and those seen in diagnostic images, and to localize lameness. In TBs diagnostic analgesia can be a challenge and frankly is often not done by veterinarians in our referral practice. We do hundreds of bone scans each year in TB horses, in particular those with hindlimb lameness, basically as screening procedures; in many horses, we find lesions readily abolished with diagnostic analgesia after the fact. Diagnostic analgesia is obviously easier in a clinic setting, with experienced handlers, assistants readily willing to spend time trotting horses for observation, and in some horses with horses under the influence of mild sedatives/tranquilizers. Recent evidence and clinical experience suggest the palmar digital nerve block abolishes pain in the majority of the foot, and specificity of intra-articular (IA) and intra-thecal analgesia of the DIP joint and navicular bursa, respectively, is in doubt. Careful and selective analgesia of the MC joint and proximal metacarpal region is critical in differentiating proximal suspensory desmitis and injury of McIII from osteochondral fragmentation of the MC joint. Perineural analgesia is much more effective in abolishing subchondral bone pain than is IA analgesia, a concept extremely important in differentiating hindlimb lameness. Low plantar analgesia, or selective lateral palmar metatarsal analgesia is necessary to diagnose MTPJ lameness, and specifically, mal or non-adaptive remodeling of distal MtIII. The lateral plantar metatarsal block is done by depositing 2-5 ml of local anesthetic solution just distal to the distal end of MtIV (bell of splint bone). Local anesthetic solution should be placed deep and a noticeable ‘bleb’ should be achieved subcutaneously. I wait a minimum of 10-15 minutes after this block. In some horses this block will result in the horse switching to contralateral hindlimb lameness, indicating the presence of bilateral subchondral bone injury. I find it interesting that when horses switch to contralateral hindlimb lameness, degree of lameness is often more pronounced than in the original limb. Horses with bilateral hindlimb lameness as a result of mal or non-adaptive bone remodeling will often have short, choppy gaits, an observation that is diminished or abolished after lateral plantar metatarsal analgesia. High planar analgesia is often overlooked but hindlimb proximal suspensory desmitis is not common in NA TBs. A palmar/plantar digital and dorsally directed subcutaneous ring block should be used instead of the basisesamoid or the abaxial sesamoid block since these latter blocks may inadvertently abolish pain associated with the MCP/MTP joints.

Well-exposed and positioned radiographs are equally important in the TB as outlined in the STB racehorse. Digital radiography has dramatically improved overall exposure in routine radiography. Down-angled oblique and flexed DP views of the MCP/MTP joints are important in evaluating Mc/MtIII for the presence of sclerosis and radiolucent lesions and for detecting small fragments originating from the base of the proximal sesamoid bones. The tangential (skyline) view of the distal row of carpal bones is important in evaluating C-3 for the presence of sclerosis. Sclerosis is the earliest radiographic sign of subchondral bone injury and can progress to chip or slab fracture. Radiographic views that should be considered are: foot – horizontal oblique views to...
evaluate the subchondral bone of P-III for radiolucent areas or incomplete fractures; carpus - tangential (skyline) view of the distal row, particularly of the radial fossa of C-3, dorsolateral palmaromedial oblique view; tarsus - dorsomedial plantarolateral oblique view (shows most common sites for radiographic changes associated with OCD, distal tarsitis, and T-3 and Mt-III fractures); MTPJ - down-angled oblique views to open up the space between P-I and the sesamoids, follow-up and down-angled DP views to rule out mid-sagittal P-I fractures; stifle - caudocranial view to evaluate femorotibial joint space (particularly medial) and condylar lesions. Ultrasoundographic examination of soft tissues in the metacarpal/metatarsal region is important, particularly of the proximal suspensory region. A frequently overlooked region is the proximal plantar metatarsus. Bone scintigraphy is extremely important in the identification of SRBI of cortical and subchondral bone. In the STB SRBI almost always involves subchondral (cancellous) bone and cortical SRBI such as tibial and humeral stress fractures, and dorsal McIII injury is rare. In the TB SRBI of both subchondral and cortical bone is common.

Scintigraphic examination is extremely important in the diagnosis of SRBI of both cortical and cancellous bone. In our population approximately 15-18% of TB racehorses admitted for scintigraphic examination have humeral, pelvic and tibial stress fractures, diagnoses difficult or impossible to make without scintigraphy. Humeral stress fractures, most commonly involve the proximal, medial and caudal metaphyseal cortex or the distal, caudal medial cortex (lateral and cranial views are mandatory) and often occur in horses returning to training after a 45-60 day rest (in the eastern US, January and February) (Fig. 1). Thoroughbred fillies are at greater risk for pelvic stress fractures (Fig. 2). Single or multiple areas of IRU of the ilium (wing to base of tuber sacrale) are most common. Tibial stress fractures most commonly occur in the caudolateral cortex, but medial fractures do occur (Figs 3 and 4). I have never seen the cranial cortex involved. Horses with severe lameness in which IRU involves both the medial and lateral cortices, distally, are at particular risk for catastrophic fracture even when given stall rest and should be managed carefully and tied (to prevent recumbency (Fig. 5). Stress

![Figure 1](image1.png)

**Figure 1** - Lateral delayed (bone) phase scintigraphic images of a 3-year-old Thoroughbred colt approximately 60 days into training that developed pronounced LF lameness. Focal, moderate to intense increased radiopharmaceutical uptake (IRU, large arrow) is seen in the proximal caudal (medial location seen in cranial view not shown) cortex diagnostic for a humeral stress fracture. Note a similar, but less prominent, area of IRU is present in the RF but clinical signs were most prominent in the LF. The presence of a stress fracture bilaterally or scintigraphic evidence of contralateral stress related bone injury is common. Radiographic evidence of stress fracture in this location is difficult to obtain.

![Figure 2](image2.png)

**Figure 2** - Left and right delayed phase dorsal hemipelvic scintigraphic views of a 3-year-old TB filly with severe LH lameness as the result of a ilial stress fracture at the base of the left tuber sacrale (double arrow – fracture in left ilium can be seen in both views). Note a less prominent area of increased radiopharmaceutical uptake (small arrow) is seen in the ilial body. After a 6 month rest this filly returned to race training but developed hindlimb lameness as a result of re-injury of the left pelvis. As a result of fracture pelvic asymmetry (slightly lower left tuber sacrale) developed.
fractures in general should be suspected in horses with pronounced lameness that abates after 1-3 days of walking and in which signs of other distal limb abnormalities are minimal. Tibial stress fractures occur in horses in advanced training or while racing, unlike those involving the humerus.

Stress fractures must be differentiated from enostosis-like lesions (ELLs). ELLs are areas of IRU of the medullary cavity of long bones, rather than the cortex, and likely result from some sort of intramedullary accident, hemorrhage, or other insult causing intense osteoblastic activity to occur (Fig 6).12,13 When compared to TB racehorses with stress fractures those with ELLs are more likely to have raced before lameness develops, and horses were significantly older than the population of...
horses undergoing scintigraphic examination. Horses with humeral and femoral ELLs were lamer than those with ELLs of the tibia, radius, or Mc/MtIII. While recurrence was not found a few TB racehorses developed an ELL elsewhere causing pain that resulted in lameness, and when >1 ELL was present, horses were significantly less likely to race. The most common scintigraphic finding in horses with high speed lameness, poor racing performance, poor training performance, or frankly, in horses admitted to our hospital with undiagnosed lameness problems is SRBI of distal Mc/MtIII (Fig. 7).

Most common lameness conditions are well recognized and described. Differences in distribution and prognosis between racing breeds is important during deliberations with clients. Importantly, understanding the pathogenesis and various manifestations of SRBI of subchondral bone is necessary to accurately diagnose and manage common lameness conditions and ascribe prognosis. Most of the common forms of osteochondral fragmentation seen in the carpus and MCP joint are not single event injuries but rather one of the results of SRBI. Fractures of Mc/MtIII, C-3, the tibia, humerus and pelvis are most often preceded by SRBI. Distal phalanx fractures are more common in the lateral aspect of the LF and medial aspect of the RF and in some horses have been preceded by scintigraphic evidence of abnormal bone modeling, indicating fractures are likely the result of SRBI and not single-event injuries. Arthroscopic surgery is the mainstay of management of horses with osteochondral fragmentation. Frontal and sagittal C-3 slab fractures should
Medial Mc/MtIII fracture are best repaired using bone plates and special recovery techniques from general anesthesia; bone plates can be removed 3-4 months after surgery with the horse in the standing position. I use osteostixis and positional screw placement in TBs with dorsal cortical fractures of McIII, or shock wave therapy.

I still favor the use of desmotomy of the accessory ligament of the superficial digital flexor muscle (superior check desmotomy) for TBs with superficial digital flexor tendinitis and combine the technique with tenoplasty or bone marrow injection, but prognosis is no better than 50%. I seldom manage TB racehorses with suspensory desmitis.

Risk of catastrophic breakdown needs to be considered highly when considering management options. Branch desmitis is often associated with apical or abaxial proximal sesamoid bone (PSB) fractures, most commonly involving the medial PSB in the forelimb. SRBI of distal Mc/MtIII is common in all racehorses but is difficult to treat and recurs.7,9 Rest, controlled return to training, shock-wave therapy, biphosphonate therapy, shoeing strategy changes (reducing loads on fetlock joints by using flat or rim shoes, training barefoot) and subchondral forage are possible therapeutic options. Intra-articular injections do not appear helpful until cartilage damage occurs, a late development in most horses.
REFERENCES


