Laminitis Terminology

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At the Second International Equine Conference on Laminitis and Diseases of the Foot, held Nov. 10-11 in West Palm Beach, Fla., a guide to laminitis terminology was presented by course director James A. Orsini, DVM, Dipl. ACVS, associate professor of surgery at the University of Pennsylvania's New Bolton Center. Universally understood terminology helps everyone communicate what is going on with a laminitis case, he noted.

Laminitis--inflammation of the laminae within the hoof. (Note: Lamellae and laminae are synonymous. Lamellar and laminar are the best descriptive terms; in the United States, laminar is commonly used.) It is characterized by clinically normal hooves and none of the hoof distortions typical of chronic founder. There is a failure of attachment between the distal phalanx and the inner hoof wall. The condition involves a metabolic disturbance in the laminae of the digit and the consequent compromise of their biochemical integrity. A laminitic horse shows a characteristic lameness and other signs, including warm feet, bounding digital pulses, and abnormal positioning of the coffin bone inside the hoof. Part of the difficulty with early laminitis is identifying it in the horse which is still radiographically normal.

Founder refers to a chronic laminitis condition. The interdigitation (interlocking) of the laminae fails, with separation and pulling of the coffin bone (P3) away from the hoof wall. Many times the separation is worse on the medial side (inside) of the hoof.

Sinker--a hoof with coronary band depressions that extend over the length of the coronary band. This is a serious problem with much greater injury and problems with support than lower-grade laminitis.

Alternate Types of Laminitis

Support laminitis occurs when one limb bears excessive weight during recovery from injury to the opposite limb. This might occur with fractures, for example.

Traumatic laminitis, a.k.a. road founder occurs when the horse is overworked on a hard surface. This was not a problem until man started working horses on paved roads; the horse was not made to pound on asphalt all the time.

Stages of Laminitis

The developmental phase starts when the horse is exposed to the causative agent and ends with the first signs of lameness. This is the phase during which laminar separation is triggered and no signs of foot pain are apparent. It lasts between 24 and 60 hours.

The acute phase begins when clinical changes occur in the horse's feet, including: Bounding digital pulses; heat; possible sensitivity to hoof testers; lameness; "camped in front" stance. This phase starts with the first signs of lameness and continues until 72 hours have passed without physical or radiographic evidence of mechanical collapse of the foot. There is abrupt ending of the acute phase with foot collapse (rotation or sinking of the coffin bone). This phase can last from 24-72 hours after the initial insult.
The **subacute phase** is a mild period with less severe clinical signs and without mechanical failure of the foot. It often ends without permanent laminar damage. This is the ideal resolution of the acute phase. This phase can last from 72 hours post-insult to life (ideally). During this phase, there is still a chance of the horse ending up with a normal foot.

The **refractory phase** occurs when the horse does not respond or is minimally responsive to treatment within seven to 10 days. This time frame is arbitrary, but it seems to work. It is advisable to use cold therapy and other measures to decrease inflammation.

The **chronic phase** begins with separation of the coffin bone from the hoof wall. It can last indefinitely, with clinical signs ranging from continuous mild lameness, severe foot pain, degeneration of laminar attachments, hoof wall deformation, and sloughing of the hooves. This phase can last from 72 hours post-insult to life.

**Other Laminitis Terminology**

**Bar Shoe**--provides wall support by closing the semi-circle of the horseshoe.

**Breakover**--the movement just before the horse's hoof leaves the ground. With a longer toe, there is more force on the deep digital flexor tendon (DDFT) during breakover.

**Carpal (distal) check ligament desmotomy**--similar to deep digital flexor tenotomy, but with less drastic results; rarely done.

**Coronary grooving**--niches carved in the coronary band to promote dorsal hoof wall growth using a burr (relieves the pressure of weight bearing at the coronary band).

**Coronary shear lesions**--these are evidence of digital collapse or altered hoof growth.

**Deep digital flexor loading**--during laminitis, the stress on the deep digital flexor tendon can worsen the rotation of the coffin bone.

**Deep digital flexor tenotomy**--done to relieve the pain of chronic laminitis. Cutting the deep digital flexor tendon reduces the pull of the tendon to decrease the tearing forces on the lamellae and lower the heels.

**Digital instability**--Increased mobility of the coffin bone and the hoof capsule.

**Dorsal hoof wall resection**--removal of the hoof wall to the depth of the laminae to expose necrotic tissue and/or allow drainage of infected laminae. Reasons for performing resection include purulent drainage with complete separation of the hoof wall from the skin of the coronary band; and presence of gas density between the hoof and distal phalanx on a lateral radiograph.

**Flat feet**--evidence of digital collapse or altered hoof growth.

**Founder distance**--the vertical distance between the proximal limit of the dorsal hoof wall and the proximal limit of the extensor process of the distal phalanx.

**Founder rings**--Horizontal ridges in the hoof wall that indicate previous bouts of laminitis.
Mechanical failure--displacement of the foot relative to the hoof capsule, increased digital instability, decreased strength of the lamellar interface.

Mechanism--the pathophysiologic steps or pathways that tie the inciting cause to a common clinical lameness.

Modified toe shoes--shoes designed to lessen the effect of the deep digital flexor tendon load and to minimize breakover stresses of the dorsal hoof wall. Includes rocker toe, square toe, rolled toe, and a shoe that is "set back under the toe."

Prodromal stage--the early or developmental phase.

Rocker (a.k.a. bevel)--beveling the hoof wall 15-20 degrees with hoof nippers or a hoof rasp. It reduces the weight-bearing forces on the dorsal hoof wall, and decreases the tearing and the leverage for breakover.

Rotation--(phalangeal, third phalanx, coffin bone, P3) also called capsular displacement, loss of digital stability, and distraction of P3 from the dorsal hoof wall. The extensor process of the third phalanx rotates dorsally. On radiographs, the distance between the hoof wall and bone is greater distally (toward the ground surface of the foot) than proximally (upper part of the foot).

Sawhorse stance--also called camped in front. This occurs when the horse takes weight off the front limbs and pivots on the hind limbs.

Seedy toe--increased width of the white line.

Sinking--also called distal displacement of the distal phalanx or vertical displacement of the coffin bone. Laminar separation is occurring in all parts of the hoof and the horse's weight is forcing the bone through the sole, indicating more severe damage to the laminae than occurs during rotation. Radiographic evidence includes widening of the space between the hoof wall and the bone.

Solar compression--the front of the solar margin of the third phalanx begins to compress the blood supply of the sole, especially at the toe of the hoof, and can cause solar bruising and/or necrosis. This often leads to abscess formation.

Solar prolapse--also called dropped sole. The rotated pedal bone causes the sole to bulge downward.

Sole support--includes sole packing or frog support.

Subsolar/submural abscesses--Radiographically one sees submural (under/below the hoof wall) radiolucenty (dark areas on a radiograph indicative of gas pockets).

Wedges--heel wedges reduce the adverse effect (strong pull) of the deep digital flexor tendon.