How to Enhance Soundness and Healing in Cases of Laminitis with Unilateral Distal Displacement using the Wooden Shoe or the EVA / Wooden Shoe.

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This paper describes a method of treating cases of unilateral palmar laminitis using the Wooden Shoe (aka Steward Clog). This method varies significantly from a previously advocated technique using the Wooden Shoe. In this paper we report on the use of a different/modified technique to load the unaffected wall in horses with marked unilateral displacement of the distal phalanx. Additionally, the wooden shoe used represents further development of the shoe as originally described.

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Introduction:

The variety of benefits the Wooden Shoe offers the laminitic horse is evident by the widespread use throughout the horse industry. Ease of application and design modifications allow the shoe to be utilized effectively by practitioner and/or farrier without an expertise in therapeutic shoeing. The application process allows a non-traumatic procedure that relies heavily on the input of the horse in maximizing the horse’s comfort. Lateral and dorsopalmar radiographs are vital information to aid the proper trim in the therapeutic shoeing procedure.

Unilateral distal displacement usually is accompanied by dorsal capsular displacement in laminitic cases. The damaged laminae allow overload injury to portions of the wall / bone interface and this can manifest itself in variable displacement of the distal phalanx within the hoof capsule. The mechanical pull of the deep digital flexor tendon, combined with the weight forces produce the most common manifestation of laminitis- dorsal capsular displacement. The pattern of displacement varies with the distribution of damage and load, the exact pathophysiology of which has yet to be determined.

Unilateral displacement is usually medial in the front limbs and lateral (author’s opinion) in the hind limbs (see Fig.1). Conformational overloading of the medial wall’s damaged lamellae (in the fore limbs) is thought to be the usual cause of fore limb medial displacement (see Fig. 2). The hind limb is (typically) overloaded on the lateral aspect of the hoof (because of the single leg resting stance) and this can often manifest as lateral

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1 Reference No. 1.
2 Reference No. 2.
3 Reference No. 3.
4 Reference No. 4.
displacement (if the lamellae have been sufficiently damaged and overloaded). The diagnosis is based on the physical appearance of the foot, asymmetrical pain distribution and radiographs. Dorsopalmar radiographs are very helpful in revealing the condition\(^5\).

Once the displacement has occurred, a dip can be palpated in the integument immediately proximal to the wall on the affected side. Additionally, the hoof capsule displaces to and rotates towards the separated side. This displacement and rotation increases with time as the wall on the affected side shows little or no growth and the opposite side shows normal or increased growth.

Previous descriptions of the use of the wooden shoe in the treatment of unilateral distal displacement have focused on extending the shoe towards the unaffected side to shift the center of pressure away from the most damaged lamellae.

The roller motion design feature (particularly the mediolateral breakover portion) of the Wooden Shoe and the subsequent use of an ethylene vinyl acetate (EVA) pad (similarly designed) allowed the patients to (immediately) formulate a consistent, comfortable therapeutic formulation that enhanced soundness.

**Materials and Methods:**

Plywood (1.125 inch) is cut and shaped to form the basic Wooden Shoe design\(^6\).

Mediolateral sloping can be increased to allow the patient to easily manipulate foot loading. The longer the slope is extended toward the centerline of the shoe, the easier mediolateral breakover is achieved (see Fig. 3) and the hoof can shift weight to the less painful heel by slightly rolling the shoe. The sloping can be extended past the centerline to form a wedge effect to the shoe with the widest portion of the wedge under the affected heel (see Fig. 4).

The addition of EVA (ethylene vinyl acetate) to a layer of plywood (with the perimeter of the EVA cut in the same shape as the basic Wooden Shoe) allows the patient to self-adjust the EVA and adds the same mechanics to the shoe (see Fig. 5). Additional concussion absorption is a very beneficial feature- as well as the selective stabilization the elastic, plastic properties the EVA possesses.

**Results:**

Five horses (Four QH, 1 Arabian, ages 3 – 20 years) with bilateral medial displacement (front feet), 6 cases (5 QH, 1 Paint, ages (2-22 years) with unilateral displacement (four front and 2 hind feet) have been treated using this technique. Increased comfort and a better radiographic DIP joint alignment were noted when modifications were made.

Successful outcome depended on the amount of lamellar damage and the amount of vascular damage as evidenced by bone loss and permanent bony displacement. Four horses (4) with minimal bilateral displacement- returned to pasture sound, three (3) patients with minimal unilateral displacement in a single foot are (occasionally) ridden at a walk. Four (4) of the horses are maintained in restricted environments with limited soundness.

\(^5\) Reference No. 3,4.

\(^6\) Reference No. 2.
Six feet required partial wall resection after displaying wall detachment (greater than 1 inch of detachment). The (dead / nutritionally compromised) wall below the attachment appears to shrink toward the distal phalanx and the growth from the coronet prolapses over the distal wall if it is not removed. The wall detachment is often misdiagnosed as a “gravel abscess” as it presents itself at the coronary band.

Discussion:

This shoe allows the patient to selectively load and self adjust breakover and wedging. The Wooden Shoe requires the practitioner have a knowledge of the breakover needs of the particular case: whereby, mediolateral point of breakover is appropriately applied. The addition of EVA to the shoe’s solar surface allows the patient to apply the point of breakover and subsequent wedging effects to the shoe. Both shoe designs enable the horse to re-adjust the mediolateral breakover as the hoof growth mediolateral asymmetries occur between shoeings.

The sloping of the mediolateral surface to the wooden shoe allows the patient to “roll” the shoe to realign the DIP joint and to load the hoof according to the comfort of the patient. The use of the EVA material on the bottom of a layer of plywood allows the patient to conform the shoe to the mechanical / comfort needs of the patient. The plastic properties of the EVA allows the surface to maintain the compressed areas, yet, usually, maintains elastic properties to absorb concussion and further conform as the hoof grows. These cases- immediately- loaded the shoe to the unaffected side, wedging (mediolaterally) the shoe such that the DIP joint was realigned (see Fig. 1,3,5 ).

Excessive damage to the affected wall can result in an increase in hoof growth on the unaffected side as compared to the affected side. This causes increased wedging to the hoof capsule between trims (see Fig. 5).

Unilateral palmar displacement is a very difficult, devastating overload injury / manifestation to cases of complicated dorsal capsular laminitis. The amount of damage to the entire lamellae combined with the amount of load to a particular area of the lamellar interface accounts for the various manifestations of laminitis. Reducing load to the laminae prior to devastating overload injury is possible in some cases, but unfortunately, some cases experience devastating lamellar damage and overload injury / consequences such that therapeutic mechanical manipulation aimed at lessening / redistributing the load is of no benefit in re-establishing acceptable long-term soundness.

References:


Reference No. 6.


Fig. 1. This hind limb suffered lateral displacement of the distal phalanx as evident in this dorsopalmar radiograph. The increased distance in the DIP lateral joint space (arrow), increased thickness of the lateral hoof wall, and differential lines of the nutrient foramen of P3 compared to the distal aspects of P2- all suggest unilateral displacement.
Fig. 2. This acute laminitis case was suffering pre-existing mediolateral imbalance that was possibly creating increased loading to the medial lamellar interface. Both front feet of this bilateral valgus deviated horse were shod similarly to the above radiograph. Wooden shoes were applied and this hoof required medial hoof wall resection 45 days later (see Fig. 5) due to severe wall disruption. Note the abnormal radiolucent area (lamellar interface area) on the medial aspect (arrow).

Fig. 3. The hoof in Fig. 1 was shod using the wooden shoe. No trimming was done to the hoof between shoes. The shoe has been outlined in white lines. The arrow shows the medial slope (red line) that was extended to past the shoe’s midline after extending the shoe medially. (The slope of the red line is exaggerated for illustration purposes.) Note how the joint space has realigned in a more normal manner. This is accomplished by allowing the horse to increase load to the medial heel in this lateral sinker.
Fig. 4. Following separation of the medial wall, the separated hoof capsule was resected. The growth rings proximally illustrate the disparity in hoof growth between the medial and lateral wall before resection; the lateral wall markedly outgrew the medial wall. Prior to application of the shoe, the coronary band was tilted down towards the medial side. The foot is twisted to the medial side (red line) due to disparity in heel wall growth and mediolateral shoe positioning. Following application of the shoe, the EVA compressed such that the medial coronet is now proximal to the lateral coronet.
Fig. 5. This EVA / Wooden shoe has self-adjusted to meet the biomechanical and comfort needs of this medial sinker. The lateral heel has grown more than the medial heel and the shoe can readjust for this difference. Soundness improved in the 30 days this particular shoe was worn due to hoof stabilization.

Fig. 6. This drawing illustrates the loading and compression of the EVA material in this unilateral displacement drawing. The mediolateral wedging effect realigns the joint.
space and aids in comfort of the patient. The radiograph displays the joint and shoe angles. The sole was trimmed with no mediolateral imbalance 30 days prior.