Remedial farriery Part 4: Chronic laminitis

Peter Milner BVetMed BSc PhD CertES(Orth) MRCVS
THE PHILIP LEVERHULME EQUINE HOSPITAL, LEAHURST CAMPUS, UNIVERSITY OF LIVERPOOL. CH64 7TE
Ian Hughes DWCF
IAN HUGHES FARRIERS, SMITHY COTTAGE, VILLAGE ROAD, NERCWYS, MOLD, FLINTSHIRE. CH7 4EL

ABSTRACT: Chronic laminitis is a frustrating and expensive condition to treat and some horses with chronic laminitis remain with abnormal hoof growth and intermittent chronic pain. An important concept to appreciate with chronic laminitis is that the affected hoof/hooves is/are unlikely to return to their original form and function and the role of the farrier in the management of these cases revolves around the ability to stabilise and try to re-establish the functionality of this structure in the best way possible. This article discusses the problems faced when dealing with chronic laminitis and the approach taken in their assessment and management.

INTRODUCTION

There can be nothing more frustrating and disheartening as a veterinary surgeon or farrier than having to deal with the chronic laminitic patient, however with careful assessment and an appreciation of the ongoing process, a number of these cases can be successfully managed. As discussed in Part 2 of this series, laminitis is a devastating condition affecting horses worldwide. Chronic laminitis is not easy to define but it is usually thought of as a sequel to repeated ‘flare-ups’ of the acute form. It should be appreciated however that it is not as simple as thinking of chronic laminitis as just an extension of acute laminitis and that exactly the same processes are occurring in the chronic as in the acute case. Treatment can be prolonged and therefore expensive and the ethical considerations of each case should be at the forefront of both the farrier’s and veterinary surgeon’s minds (Fig. 1).

An important concept to appreciate with the chronically laminitic hoof is that the hoof itself is highly unlikely to return to its original function as a composite biomaterial. Alterations in hoof/bone angulation and continued biomechanical stresses on this structure following laminitis will feed back to the germinal layers of horn that provide the growth of the hoof, resulting in an abnormal and often inferior mechanical product. Further stresses and strains caused by this inferior product on hoof growth will continually affect the quality of the horn at these layers and so a vicious cycle ensues. Therefore the re-establishment of the normal forces on the foot whilst supporting the hoof during regrowth is an important goal in these cases but it is the continued ‘flare-up’ of laminitic episodes that can make management of the chronically laminitic horse an immense challenge.

The main aim is to move the clinically affected horse from the ‘chronically active’ state into the ‘chronically stable’ state. Chronically active laminitis describes the ongoing instability of the epidermal-dermal interface in the hoof that leads to pain and mechanical instability which in extreme examples can lead to sloughing and loss of the hoof. The usual clinical manifestation of the chronically active laminitic is intermittent pain and hoof deformation. The chronically stable state is where the hoof and sole begin to regrow and there is clinical improvement, but it is important to note that this does not imply that the hoof returns to both normal architecture and function.

Clinical signs with the chronic laminitic can include pain, recurrent foot abscessation/seedy toe and altered hoof growth (Fig. 2). Pain can result from ongoing inflammatory processes, as described in the acute laminitic, as well as through mechanical stimulation. Additionally, the presence of chronic active pain can be as a result of neuromodulation of pain pathways, both in the periphery (i.e. hoof tissues) as well as centrally (i.e. spinal cord and higher centres). This neuropathic pain state is an important factor to consider in the chronic laminitic since resolution of the mechanical abnormalities in the hoof may not concomitantly resolve the aberrant pain perception to an equivalent level.
Part of the abnormal growth patterns in the hoof is due to abnormal angulation and forces acting through the hoof but part may be due to a change in cell function from the disease process. It is recognised that following severe or repeated laminitis episodes that the cells responsible for hoof growth do not return to normal function, despite adequate and successful digital support and care. Often chronically affected horses will show dishing of the dorsal hoof wall and growth rings that converge dorsally (or alternatively described as diverging at the heels) and a ‘slipped’ appearance due to these alterations in hoof growth (Fig. 3). Additionally, some cases may have a dropped or convex sole and separation at the sole/hoof wall interface due to downward forces acting through the distal phalanx (via the weight of the horse) and from poor mechanical bonding between these structures by inferior horn (Fig. 4). This latterly manifests itself as crumbly, poor quality horn and predisposes to ascending infection and seedy toe/recurrent abscession.

Radiography is important in the management of chronic laminitis and should be used regularly to assess progression of the case following remedial farriery. Good quality lateromedial radiographs with dorsal hoof wall and solar markers will help establish the particular interventions for the case (Fig. 5). Other radiographs (for example, dorsoproximal-palmarodistal oblique projection) may be helpful to determine any additional pathology that may be present (Fig. 6). Radiological findings in the chronic laminitic may include abnormal distal phalanx/hoof wall/solar angulation (for example, rotation/sinking), modelling of the distal phalanx (particularly the dorsodistal margin), presence of laminar mineralisation (potentially mistaken for solar margin fractures) and hoof abnormalities (for example reduction in radiodensity consistent with gas shadows) as well as the general shape and conformation of the hoof. Additionally, venograms can give useful prognostic information where attenuation of blood vessels within the hoof capsule is seen as a poor sign.
The main farriery aim for managing the chronic laminitic is to restore the alignment of the pedal bone in relation to the dorsal hoof wall and sole, thereby allowing correct laminar growth. This goal and what is ultimately achieved can be very different however. The problems faced by the farrier and veterinary surgeon can be summarised as diseased/weak laminar growth, continued tension from the deep digital flexor tendon (DDFT), chronic pain and continued separation of the hoof wall and sole.

The aim of trimming the chronic laminitic is to try to re-establish the normal conformation without compromising the mechanical support. There are no hard and fast rules in this since every case has to be assessed on an individual basis including assessment of the whole animal (not just the feet), but the general principles are to trim the heels more than the toe to assist in re-alignment and to remove abnormal non-function horn, particularly at the toe region. Overtrimming in an attempt to rapidly correct the misalignment can lead to pain and instability so a staged approach is often required. The removal of non-functional horn at the toe can reduce leverage caused by the toe on the laminae (and thereby reduce laminar tearing and pain) but also removes tissue that is not contributing to the stability of the foot and may be acting as a nidus or entry point for ascending bacterial infection. A severe example of this would be a dorsal hoof wall resection. Removal of this tissue can lead to the release of trapped pus or serum (itself causing pain through a build-up of pressure) as well as being very effective in removing non-function horn, but care is required beforehand to make sure that measures are in place so that digital support is not lost. This in effect means careful assessment of the foot and hoof wall so it is important to make sure that the remaining structures can adequately support the foot once the diseased portion is removed. Overloading of the remaining structures following dorsal hoof wall resection can be disastrous. A way around this is to drill/pare out sections or holes within the dorsal hoof to allow for pus/serum drainage and then to trim/remove the distal portion of dorsal hoof, whilst maintaining stability (Fig. 7).

Shoeing the chronically laminitic, where possible, should occur following trimming. Heart bar or central support shoes allow for transfer of force away from the dorsal hoof to the caudal aspects of the foot (Fig. 8). Radiographic guidance with appropriate markers should be used to assist the correct placement of the shoe. In some severe cases, unloading of the dorsal hoof wall and re-alignment of the distal phalanx with the hoof wall can be achieved with reverse placement of the shoe (‘open toe’) and either placing reversed wedges or using polymethyl methacrylate to achieve this (Fig. 9), akin to the Equine Digital Support System. Glue-on shoes, such as the Imprint range can be secured and moulded to the foot (Fig. 10). In-filler material (for example, Equithane) in the caudal two thirds of the sole, such as polyurethane based polymers, can be added for additional solar support whilst allowing for unloading the dorsal hoof and sole.

Fig. 6: Dorsoproximal-palmarodistal oblique radiograph of the right fore foot of a 9-year-old Thoroughbred broodmare. Lateral is to the right. There is the presence of generalised osteopenia with blunting of the distal phalanx and osteolytic ‘Swiss cheese’ like appearance to the bone. There is also mineralisation of the laminae at the medial solar margin that may be mistaken for a solar rim fracture (arrow).

CORRECTIVE FARRIERY FOR THE CHRONIC LAMINITIC

Fig. 7: Fenestration of the dorsal hoof wall can allow drainage of pus or serum in chronic laminitis and therefore lead to reduction in pressure on sensitive structures in this region without needing to resort to a full dorsal hoof wall resection.

Fig. 8: Placement of a heart-bar shoe in the chronically laminitic case will increase caudal support of the foot to load bearing, thus shifting the upward force on the dorsal aspect of the hoof.
Moving from the chronic active to the chronic stable laminitic can take many weeks/months, if at all, with many clinical setbacks occurring during this time. Once stable, continued trimming and shoeing is required to keep the distal phalanx and hoof wall/pastern axis as aligned as is possible as there is always a tendency for the horn still to grow in an abnormal fashion. At a suitable point, return to normal shoes (or continued support in heart-bar shoes) can occur but this may take many months to achieve.

**ETHICAL ASPECTS OF THE CHRONIC LAMINITIC AND ADDITIONAL COMMENTS**

This article describes the problems encountered with chronic laminitis and the frustration both for the farrier and veterinary surgeon in treating these cases. An appreciation of on-going changes in chronic laminitis is fundamental in trying to resolve or at least improve the situation. Chronic pain and lack of improvement, however, should be recognised at an appropriate point and timely decisions should always be made with regard to the welfare in these cases.
MANUFACTURERS
1. Equine Digital Support System Inc., Penrose, Colorado, USA
2. Imprint Equine Footcare, Wiltshire, UK
3. Vetec Hoof Care Products, Utrecht, NL

REFERENCES

CPD CONTINUING PROFESSIONAL DEVELOPMENT
These multiple choice questions are based on the above text. Answers appear on page ??.

1. Which phrase best describes a ‘chronically’ active laminitic:
   a. Ongoing instability of the hoof at the epidermal-dermal interface
   b. Complete loss of connection between the epidermis and dermis leading to lack of suspension of the distal phalanx within the hoof capsule
   c. Hypertrophy of the germinal layer of the epidermis of the frog
   d. The presence of a discharging tract at the coronary band.

2. What radiological features can be associated with chronic laminitis:
   a. Reduction in cortico-medullary definition in the distal sesamoid bone
   b. Radiolucent line from the articular margin of the distal interphalangeal joint to the solar rim
   c. Modelling of the dorsodistal tip of the distal phalanx
   d. There are no radiological features associated with chronic laminitis.

3. What is the reasoning behind fenestrating the dorsal hoof wall in a chronic laminitic case:
   a. Allows access for local antibiotic treatment
   b. Makes placement and attachment of a support shoe easier
   c. Allows the drainage of serum or pus and reduction in pressure over sensitive tissues
   d. Allows inspection of the distal phalanx for prognostic purposes.