

Dr. Redden's Equine Podiatry Series

In-Depth Laminitis

Contents

Accepting the Case

Page 6

Performing An Informative Clinical/Radiographic Exam

Page 8

Obtaining a Thorough History

Page 20

Treating the Insured Horse

Page 26

Determining the Goals

Page 36

Treatment Options

Page 39

Emergency Treatment

Page 42

Safely Shipping the Acute Case

Page 47

Venogram Technique & Interpretation

Page 49

Therapeutic Shoeing

Page 60

Partial & Full Wall Ablations

Page 75

Safely Using A Sling

Page 83



Falling Springs
Arts and Recreation Center

Versailles, Kentucky

Performing an Informative Clinical/Radiographic Examination

The exam and history are a discovery exercise. We must first be aware of what we need to know about the case. Secondly, we must have a well-defined method of searching for the clues we need. The following are points of interest that will help us organize and develop a consistent protocol for finding the answers we need.

- 1) How lame is the horse on the Obel grading scale (1-5)?
- 2) When did you first notice the horse to be lame; hours, days, weeks?
 - i) 1-6 hours is a red alert with a big window of opportunity
 - ii) 6-24 hours is a red alert, but the window of opportunity is quickly diminishing
 - iii) 1-7 days means the owner or trainer has been treating the horse and notice this is not going away. You will most certainly have damage that has occurred. Radiographs and venograms will reveal pathology.
 - iv) 4-6 weeks is a critical time for all laminitic cases with significant insult. Many cases will appear to be responding favorably and are considered stable simply because they are comfortable on Bute. Many will be slowly deteriorating with no clinical signs to show how badly they have rotated or sunk. This is the big black hole that swallows many cases and those trying to treat the syndrome. Venogram studies will reveal the subtle changes long before the 6-week crash.

What to Expect Down the Road With Degrees of Damage and Optimum Treatment

- 1) 6months-1 year post insult
 - i) The very mild insult case is back in training with no clinical or radiographic pathology.
 - ii) The next level is turned out with 15-20mm of sole, slightly disfigured growth rings, and a slight discrepancy in the HL. Occasionally, a case will have a periodic abscess caused by a small necrotic piece of the palmar rim.
 - iii) The mid-scale cases will possibly require realignment and a DDF tenotomy. You may find that the PA is 10°-15° and the sole less than 15mm. Abscesses and draining may be apparent, as well. This case was possibly cut, but no one realigned PIII before the surgery. PIII remained trapped in the capsule with a 10° PA. The new hoof didn't grow back around a healthy positioned coffin bone. This is another dark hole that exists due to the lack of knowledge concerning the details. Laminitis is a mechanical disease and basic principles of physics must be a part of the working protocol. Before performing a DDF tenotomy, realign the palmar surface of PIII (0°-5° is a healthy range.)
 - iv) The mid to high-scale cases will be recovering from a DDF tenotomy and possibly a partial hoof wall ablation. Complications include abscesses caused by necrosis and osteomyelitis. Many of these cases will start contracting and become upright very quickly. You must deal with this contracture either by casting or another tenotomy.
 - v) High-scale cases will have as good of a hoof as they will ever have in 5-6 months. Bone disease may be grade 3-5, osteomyelitis will be present, frequent abscess will occur, and you will be faced with high-maintenance shoeing, debridement, surgery and casting to control the contracture.
 - vi) The chronic case survived. It was treated with minimum mechanics and managed to survive. This case can have a wide range of damage. Regardless of the degree of damage, when this case presented lame, it was due to an abscess. Occasionally, they

will have a significant rim fracture, but this rarely a source of pain. Contrary to belief, horses do not re-founder simply because they had a significant previous episode. They must be subjected to injury, disease, grain overload, etc. in order to re-founder.

Recurrent Laminitis is Most Always An Abscess!

Those at the upper end of the chronic scale will have severe superficial and often associated DDF contracture. They will knuckle over and be very crippled, purulent drainage will be present at the apex, the top of the coronary band and through the heel bulbs. You will be able to smell them. You can temporarily ease the pain and the deformities, but the long-term results are unattainable due to the level of tissue destruction.

Categorizing the stages of the syndrome relative to the degree of damage, timing of treatment, efficiency of treatment, tissue response, and the financial ceiling of the client may help you better focus on the details of the case. We must deal with the situation we are presented with today regardless of the information we had yesterday. Discover what needs to be fixed and fix it!

Listen for the Key Words!

Often the client will ramble on about the past several days, weeks and months. I like to ask questions pertinent to the case, and then sit back and listen to the detailed history. It is important to place the case on the imaginary scale so you can advise the client of what the next steps are, what the cost may be, and what the potential outcomes may be.

Don't Jump To Conclusions

Keep an open mind, listen to the horse and the owner, but don't get caught doing what they want you to do. Look for your own answers!

Be Honest With Yourself and Your Client

Your client is grasping for answers...don't be guilty of doing the same.

Be Aware of What is Expected of You

If you are out of your element and feel inadequate, then you need to make that known. Seek out the help you need to successfully treat the case. If help isn't near, do the best you can. Confirm your limitations, as well as your concern for the horse and the client.

Examining the Acute Case

Many times it is obvious that a horse is lame by simply looking at the confirmation and gait, but finding the source of lameness can be a challenge. Traditionally, we have used hoof testers to find areas that seem to be more sensitive than normal, hoping this will lead us to a diagnosis. We must use caution when we use hoof testers, as we can cause a pain response in a perfectly healthy area. Likewise, it is common to find a lack of sensitivity on areas that we would expect

to find a normal response. *Use hoof testers with discretion, as the information can be far more misleading than helpful!*

What kind of hoof tester is best suited for a good exam?

I personally like a pair with very flexible handles or a flexible head so I can feel the amount of pressure I am applying to the foot. I also watch closely for movement in the sole and wall as I apply the tester. The slightest movement is all the pressure you need to elicit pain.

When using a hoof tester, begin in an area of the foot that you least expect to be sore and work toward the pain. Work back and forth across the sole, using less pressure as you approach the painful area. This method will help pinpoint the seat of pain and prevent unwarranted damage from the tester pressure.

Be aware of the following conditions as you examine a prospective laminitis case:

- Thin, traumatized soles due to excessive wear, short trims and lack of growth.
- PIII fracture
- White line disease
- Shoe bound (nails very close to the sensitive tissue)
- Hot nails (typically 3-5 days post shoeing)
- Abscesses
- Puncture Wound
- Keratoma

Pain located in the center of the toe, just off of the frog, is certainly not pathognomonic for laminitis. Be careful and be very observant. Don't get hung up on tester response when suspecting laminitis, as it can be very misleading.

Using Thumb Pressure

Many times, all you need is thumb pressure to check the sole, bulbs and coronary band for areas of increased sensitivity. Palpating the hoof capsule and coronary band can often lead to key clues (e.g. a ledge along the coronary band). When a leak appears at the coronary band, note the following:

- Moisture
- Color
- Odor
- Location

From the leak, trace the line of the tubules to the ground surface and examine it thoroughly for a septic entry.

Elevated Pulse

It is elevated compared to what? To learn the range of norm, simply check the pulse on several breeds of horses when they are sound. Check when they are sleeping, following exercise, pawing for food, in cold and hot weather, etc. When you know this information, an elevated pulse will be more meaningful.

When checking the pulse on a sound horse, also be aware of the surface temperature of the foot by placing the back of your hand on the foot. This will help you become familiar with the wide range of temperature that changes throughout the day in sound horses. I don't put much faith in the temperature, as many mid to high-scale cases are often quite cool to touch.

Examine With the Shoe On

When laminitis is suspected, try to make your assessment with the shoe on, unless you have become very proficient in estimating sole depth. When the sole is 15-20mm, it is not overly detrimental to remove the shoe. The exception is when significant displacement has occurred.

Forcing a lame horse to stand on a thin sole invariably causes more pain and damage to the foot. When you need to see under the shoe, it is best to have radiographic information before pulling the shoe. This will enhance your treatment protocol and prevent unwarranted problems.

Capsular rotation is only a small part of the cascading events that contribute to the compartmental syndrome. The effects of laminitis can be accurately assessed by monitoring several radiographic, soft-tissue parameters and how they relate to each other. Laminitis is not a short-term disease. At best, the mildest case should be assessed over 30-45 days. Measuring any and all soft-tissue zones requires a consistent, accurate, repeatable protocol. Comparative film must be just that; comparable. Therefore, a strict, detailed protocol must be developed and used religiously from case-to-case and foot-to-foot in order to obtain dependable, comparative measurements.

Baseline Film

When possible, make an effort to obtain informative film at the time of the initial exam. Prior radiographic abnormalities that are discovered days to weeks later are often misleading.

Requirements for repeatable, comparative, informative film:

1. Center beam focused 3/4" above the ground surface, parallel to the load surface of the hoof, and perpendicular to the sagittal plane of the foot. Horses that wear shoe packages require a higher beam due to build up.
2. Use two blocks, one under each foot. Loaded views are slightly more informative overall, but not necessary to assess soft-tissue damage. Very lame horses refuse to stand on the hard blocks, so set the foot out in front and take the film very quickly. **Do not block the foot for the sake of taking film.** Unwarranted damage can occur.

Evaluating the Sole

Observing the conformation of the sole can be helpful in the discovery experience. Is the sole cupped, flat or bulging? Does it have rasp marks on it from the last farrier visit? Is it uniform across the toe? Does one side of the foot appear to be more full than the other? The answers to these questions can help you determine if you are dealing with a medial sinker or a white line disease case.

Radiographic Exam

Radiographs are used to help define the relationship of the coffin bone to the hoof capsule, as well as the hoof capsule to the ground surface. The information gained by measuring the precise location of the bone within the hoof capsule is what you need to start assessing the stage of the syndrome and the severity of damage.

What We Need to Learn From Film

The expression of pain is often the first indication that laminitis is effecting the foot. The initial stage of inflammation follows a very serious cellular pathology that sets the stage for the events to come. Once we see the physical signs of lameness, a large amount of damage has already occurred. Subsequent damage can be seen radiographically as the coffin bone moves from its normal anatomical position between the wall and ground surface. We must be aware of the healthy relationship between horn and bone for respective breeds, age and use. This working knowledge allows us to track the syndrome as it progresses.

Healthy Soft Tissue Parameters

The average light-bone horse with a 5" foot or less will have the following soft-tissue parameters:

- HL 15/15
- SD 15mm with 3mm cup
- PA 3°-5°
- CE 0-5mm
- DB 20-25mm

In big heavy broodstock with age and weight gain, the HL zone increases to 22mm.

Standardbred horses, as a rule, are closer to 20/20.

Warmblood horses can have an HL of 20/20 if they have a 6" foot.

Very small miniatures have an HL of 9/9

Weanlings will have an HL of 13/10. Young horses will have a narrower HL near the apex of the coffin bone. This also holds true for horses that have had their wall backed up hard by the farrier. You can easily detect this radiographically. These numbers are not written in stone, but they are a great baseline for observing healthy HL zones.

Measuring the HL Zone

The HL zone is measured just below the extensor process base to the outer limit of the wall. This is the top number. The bottom number is measured from the apex to the outer wall. A bead of radiopaque paste on the wall, from the crest to the toe, is necessary to accurately measure the zone.

Sole Depth

A healthy sole needs to measure at least 15mm on shoeing day. The first 10mm directly beneath the apex is reserved for the circumflex vessel and sole corium. This leaves 5mm of cornified sole.

Many times we see speed horses with <10mm of sole, and we wonder why they are foot sore. This is pathology on a grand scale!

Palmar Angle

The palmar angle will be 3°-5° in the front feet, and slightly higher in the hind. The bone angle varies greatly with horses, but as a rule the norm is 50°-51°. With a 50° bone angle and a 3° PA, the result is a 53° hoof angle.

When the PA drops to 0°, the cushion begins to get crushed. As the wings of PIII continue to tip into the sole several degrees, the cushion becomes dysfunctional. This is referred to as negative palmar angle or caudal rotation. Heel pain is a constant finding in horses that compete without the benefit of a protective digital cushion, frog and heel network.

Palmar angle is influenced by trimming, shoeing and significant pathology.

Coronary Band/Extensor Process

The CE varies greatly between sound horses. The measurement from the top of the hoof crown to the top of the extensor process is a valuable aid for tracking the coffin bone as it descends in the hoof capsule. Placing the radiopaque paste at the coronary crest clearly defines this reference point. Without this distinct marker, it is a guess.

Remember that we are tracking the minute changes in the zone, so accuracy is vital.

With sinkers, this is the second dimension to change. You can measure 2-3mm long before your eye will pick up the subtle changes. This is very significant. When the HL and CS both increase, it indicates that very serious damage has occurred. This is “red alert” time.

Digital Breakover

Draw a vertical line from the apex to the ground surface and measure forward to the shoe or where the foot leaves the ground. This measurement is used a mechanical indicator; the longer the distance, the more tension the DDF exerts on the laminae and sole corium. Taking radiographs with a shoe on offers good insight to the mechanical advantages or disadvantages of the shoe.

Each soft-tissue parameter offers its own unique bit of information, yet they all work together. When we measure them independently and fit all the pieces of the puzzle together, we have the ability to identify and track the degree of damage. If you want to become proficient in recognizing zone changes, measure every parameter on every horse; no matter the reason for the exam!

Digital Imaging

The advent of digital radiography, has tremendously improved detail and resolution. Unfortunately, the digital format often produces an image that is not 100% true to scale. Printers are designed to print more than one image on a sheet, which means the image has to be

considerably smaller than the actual foot. The years you spent training your eye to recognize small variances of distance is lost on the smaller images. This is not an issue for those who have never measured the parameters. But it is tough for those of us who have trained our eye to split a millimeter when looking at true-scale radiographs.

If you are using digital imagery, be aware of the scale of the film. Convert the scale or use a mouse to measure all vital areas.

Interpreting Soft Tissue Changes

An 18 year-old thoroughbred stallion presents overweight with a crested neck. He is wearing shoes on the front feet and is trimmed behind. He became acutely lame in the front feet during breeding season. The gross exam revealed:

- Three sets of nail holes in both feet
- Quarter clips
- Clinches standing up
- Feet overgrowing the shoes
- Soles are flat to slightly dropped
- Noticeable ledge on the coronary band
- Increased pulse, more medial than lateral
- LF grade 2 club
 - slight wall bulge; anterior, lateral quarter
 - slight dish; medial, anterior quarter
 - medial toe area dropped more than lateral quarter
- Hoof testers reveal pain over entire sole area

Radiographs reveal:

Left Front

- HL 20/30 (opaque zone not visible)
- SD 5mm
- PA 15°
- CE 15mm, no halo
- DB 35mm

Right Front

- HL 18/18
- SD 15mm
- PA -1°
- CE 15mm, no halo
- DB 35mm

The LF club foot has obvious rotation, but we do not measure this traditional angle. It has very little value when used solely as a damage indicator. The HL is more accurately measured, as are the subtle changes. Rotation has been used for years to determine laminitic damage, but this often causes confusion.

A lucent zone can be seen within the HL zone on the LF. It appears as a faint line at the ground surface and become quite large as it reaches the upper 2/3 of the capsule. The margins of this dense air zone are irregular, and the proximal border has several points and peaks. A relatively large area of air density is also superimposed over the bone.

What is going on with this valuable stallion?

The HL zone on the LF measures 20/30. At first glance, it appears to be laminitis, as there are several degrees of rotation, and he is bilaterally lame.

Be careful. If this is laminitis, the “L” side of the HL will be involved. Can we discern this from the film? We can’t because the opaque zone that separates the most inner wall from the laminae is not visible. It is distorted by white line disease.

The irregular shaped lucent zone is superimposed over the bone and extends to the ground surface, confirms that the “H” side is involved. This is horn disease with possible lamellar involvement.

Why is he lame?

It is very possible that he fits the stereotype of a laminitic case, but he has miserable, thin-soled feet. He is also a big horse that was shod 10 days prior. The clinches are standing up, which means the shoes are loose. They are loose because there is not enough horn mass to prevent excessive horn movement. The horn has not grown 1/8” in the last 3 months (3 sets of nail holes). A venogram is necessary to confirm whether he suffers from white line disease, laminitis or both.

There are a ton of horses with feet just like this, and they often do become laminitic. Fortunately, many become bilaterally lame simply due to the lack of foot that result in internal bruising.

Soft-Tissue Pathology

Using soft-tissue details to examine all laminitic feet offers a whole new perspective concerning a diagnosis and the solution to the problem. Lucent zones are often the most informative images we can look for. Laminitic lucent zones appear first as a fine line along the inner margin of the horn wall. They indicate that PIII is getting ready to move from the healthy zone. As a rule, the HL increases 5-10mm before the lesion appears.

Once displacement is well on the way, the lucent zone gets wider at the distal end. This zone is limited by the inner sole margin, and therefore does not extend to the ground surface, even when penetration of PIII is present.

The proximal border has a uniform radius and is never superimposed over the bone. Rotation and the fact there is a gas density are the only two radiographic similarities between laminitis and white line disease.

Apex Halo

Lucent zones in close proximity to the apex are very serious. The horse is normally quite lame and painful to the testers regardless of where you put them; especially over the apex of the frog. Often a very faint halo can be seen surrounding the apex. As a rule, the entire sole will be

undermined. It can be drained along the sole/wall margin. Avoid going through the sole to prevent exorbitant granulation and unwarranted secondary problems.

Small Lucent Slivers Beneath PIII

When you see a linear, lucent zone ventral to the apex and within 5mm of the bone, it is due to a gas-producing abscess. When the sole is 20mm or thicker, this area can be difficult to drain without causing complications from opening a large hole in the sole. I normally elect to use hot Animalintex® around the coronary band as a means to encourage migration of the abscess. This can be a very painful time for the horse, but fortunately it normally only takes a couple days for it to open at the heel or coronary band.

If the lucent line is 1mm x 5mm in length, and located 10mm below the bone, it no longer involves the sensitive structures. Draining is not necessary. It can be trimmed out as the sole grows.

Lucent Coronary Band

When a distant, dark line can be seen at the coronary band, you have a major problem. The digit is septic and only days from sloughing. The gross exam will confirm this; the coronary band will be swollen, have weeping serum, and purulent exudate. The skin color is hyperemic, and the horse is normally very lame. He can also be physiologically nerved due to vascular shutdown, therefore showing no signs of pain.

Use these basic descriptions to help build your database concerning the small variances in the syndrome. Work on your “eye memory,” and the tough cases will begin to get easier.

Therapeutic Shoeing – Determining the Mechanical Goals

- Whether to shoe
- What are the requirements of the shoe?
- What shoe is needed?
- How is the foot prepared?
- How and where the shoe is placed
- What are the goals for using the shoe?
- What are the drawbacks?
- How long will the shoe be worn?

These are typical questions that should be on the minds of the vet-farrier team as they evaluate each case and plan a strategy for the immediate treatment as well as for the long-term care.

When to Shoe

The appropriate time is dependent on many factors:

- How well the case was evaluated.
- The degree of damage.
- The efficiency of the shoe.
- How the shoe is attached.
- The goals of the client
- The experience of the farrier and the equipment he/she has.
- Availability of informative film.
- Availability of sedation, blocking, or slings when indicated.
- The condition of the hoof capsule

Much controversy exists concerning what the appropriate shoe is for a laminitic horse. Some even believe that all shoes are detrimental to the horse. The real truth lies in our ability to make it happen. If we fail to define the unique characteristics of the case or the particular foot in question, then we have very little to talk about. This syndrome is very complex and it is human nature to seek a quick, precise treatment protocol for syndromes that we know very little about. All the ideas and concepts that have been used over the last few centuries have merit to some degree, as they seemed to work for particular cases. However, we have no idea what the start model looked like.

- How much damage and how long since onset?
- What was the condition of the feet?
- What breed was the horse?
- What were the goals?
- Who defined “success?”
- What were the criteria for “success?”

In order for us to compare one method to another, we must clearly define the start model. Soft-tissue parameters, external features, vascular patterns, the clinical picture and tissue response are

the basics of describing the model. Simply shoeing a laminitic horse in lieu of this information has inherent risks of failure.

Since there are many questions that must be answered before you can decide when and how to shoe a horse, we must have a starting point that will group cases into useful categories.

Cases are either acute or chronic, and defining when acute become chronic is immaterial. Knowing the current demands of the foot is of the utmost importance. The largest window of response is the first few hours after onset. After this time, the response begins to diminish quickly. The problem is that most all cases appear painful for the first few hours to days. Assuming they don't have significant damage can be deadly.

For argument sake, lets think about acute as being the prodromal stage before PIII displacement occurs. We will consider this Bracket 1.

Bracket 1

- Demands significant DDF release using a self-adjusting 20° palmar angle with cushion support.
- No shoes during this time
- No concussion
- Ice
- Strict stall rest- walking can help perfuse the foot, but if you missed the window of opportunity, walking can be too great a risk of causing further damage.

This case will heal well and go back into training in 45-60 days with no displacement.

Bracket 2

Four Point Rocker Trim is beneficial when:

- The onset was very mild and treated as Bracket 1
- No signs of radiographic damage (HL, SD, CE all remain in healthy zones)
- Horse is sound and off all medication for 10days after being weaned out of both sets of wedges
- You have plenty of sole

If all these criteria are met, the four-point trim is most beneficial. Rocker in the middle of the foot. There is a good self-adjusting 6°-10° PA for 3-4 weeks. After this time, the horse can return to training if the pulse remains normal and all soft-tissue parameters are in healthy zones.

Bracket 3

Four-Point Rocker-Flat Shoe

When the above horse returns to light training and is too foot sore to remain barefoot, he can be shod with a moderately rockered flat shoe. The shoe score will be 2-3 and will provide a 4°-6° self-adjusting palmar angle. This is probably the maximum you will want for a horse in training.

Bracket 4

Four-Point Rocker Rail Shoe

This is optimal after the horse has been wearing a modified ultimate for 30-60 days. He has significant sole growth (8-10mm in 30 days). You have significant damage that is confirmed by a venogram, the circumflex is well below the palmar rim, and the fimbriae are decent but not in optimal condition. The foot is also sweaty and soft from the effects of the hot weather.

Rocker the rail shoe to gain 15°-18° PA and gain a drier foot. Continue stall rest until the onset growth ring has grown down to the level of the apex.

Bracket 4b

Rockered Rail-Long-term chronic case

These cases have distorted hoof capsules, walk off slowly, and turn on their back feet when they are asked to move. X-rays reveal:

- HL 20/40
- SD 15-20mm **Note the good sole depth!**
- PA 8°-10°
- CE 15mm
- DB 45mm

The heel growth exceeds the toe by 3:1, and he has good quality wall. This is an ideal case for the Rockered Rail. They respond well in this shoe and should be maintained in this shoe for several months.

Application

Push the heels back to get a 0°-1° PA with the branches of the shoe. Rocker the toe, but leave maximum sole depth. Clip and shape the shoe, and nail it on easily. Take post-shoeing x-rays to ensure that you have a good 15°-18° PA.

One month after shoeing you should find uniform growth rings and sole depth of approximately 25mm. Horn growth will also be proportional to sole growth. Use this type shoe until the hoof capsule has grown completely out and the lamellar scar is minimal.

This makes you look good as a farrier because they respond so nicely. Stay with the rockered rail until the entire hoof wall has grown out. At this time, ease down to a rockered flat shoe, then to a rockered four-point trim when possible.

Bracket 4c

Rail Shoe with a Tail

This is a flat rail shoe with an extension welded into the heel. When to use:

- Cases that have moderate to severe vascular damage
- Circumflex vessel flipped up over the apex of PIII
- Cases that grow little or no sole in 60 days using a modified ultimate or equivalent

- Can't be taken off Bute
- DDF tenotomy, following realignment, is indicated.

Application

This shoe has no rocker because it would prevent the tendon ends from pulling apart and they would heal at the same level after being cut. The goal of the surgery is a tendon gap that will provide more longevity in the tendon after healing.

When derotating to gain a 0° PA, you may have to raise the toe if there is no heel to take off. Your options for raising the toe are:

- Lift the toe with a goose neck screwed to the front of the hoof
- Lift the toe with Advance Cushion Support (ACS) and Equilox shoe
- Lift the toe with ACS and Vettec Fast Set®

Realigning the PA tightens the pull of the DDF. You must quickly cut the tendon when you realign, as the increased tension will cause more damage.

Bracket 5

Toe Extension-Heel Raise

Indications:

- The superficial and deep digital flexor tendons are contracted.
- Horse knuckles over at the fetlock
- Heavily dished foot with old access drainage holes along the face.
- HL 20/50
- PA 45°
- SD 10-15mm
- DB 30mm

A rockered rail would cause further superficial flexor contracture, and the horse would not be able to stand. The rail would help the DDF, but we need a toe extension to hold the fetlock in place. The extensor group must act at the point of contraction of the toe extension if it is going to pull the fetlock back. This shoe can also be used in conjunction with surgery on the SDF, DDF or both.

When cutting the SDF, I apply the shoe, cut the tendon, then cast from the knee to the bulbs of the heels. It is important not to cast the shoe, as the coffin joint must be able to move in order for the fetlock to drop back.

When cutting both the SDF and DDF, I recommend using a sling. I apply the shoe, cut the SDF mid-cannon, followed by the DDF if the fetlock is still forward of perpendicular. It is critical that you use the sling to support the weight of the horse. You want him to bear enough weight to put the fetlock into the desired position (10°-15° inside vertical) then cast immediately.

Caution! Allowing the horse to load the limb will frequently cause explosive fractures of the sesamoids. **You must use a sling and be alert to the slightest load.**

Pushing the fetlock past vertical alignment with the pastern and casting for 6-10 weeks following surgery can offer favorable results. Unfortunately, most of my cases have done well for a year, then they knuckled over again. Applying a cast at the first sign of contracture is helpful in managing the long-term case.

Example 1

We are looking at the Thoroughbred Stallion described earlier, however it is 30 days later. The horse was treated in a modified ultimate or similar device designed to offer a self-adjusting palmar angle of 20° with cushion support. The horse was kept on strict stall rest. Radiographs were taken every 5-10 days while he was in the ultimates. Venograms were performed 2 weeks and 30 days post onset.

Clinical Picture:

The horse is sound in the stall, he feels great, and is playful even on the club foot that has white line disease. What do you think his soft-tissue parameters are?

Club Foot

- HL
- SD
- PA
- CE
- DB

Low Heel Foot

- HL
- SD
- PA
- CE
- DB

30 Days Post

The venogram reveals good fimbriae length and alignment on the low heel foot, while the club foot has slightly less sole. The increased sole depth on the low heel foot indicates that the mechanics of the shoe adequately reduced the forces at play, allowing reperfusion to the solar plexus. The club foot has been compressed since he was a weanling and will never have totally uncompromised vascular solar supply. However, this foot is responding favorably. The external growth rings also indicate that an accelerated growth rate has occurred.

The low heel foot has approximately 3/4" of new growth at the toe and half of that at the heel. The club foot has 1/4" of growth at the toe with twice the amount at the heel. This is an improvement as the heel-toe ratio is better than before.

Options:

The ultimates can be used for another 30 days, as they are working well, offer good mechanics and are easily kept on with bandages. This allows for easy access to the foot for examination and treatment as indicated. The down side of prolonged use of a modified ultimate with Advance Cushion Support (ACS) is subsequent sweating of the foot in hot, humid weather. This can cause the hoof capsule to lose its structural stability. The sagging effect of a saturated hoof capsule further compromises circulation. This can be confirmed with a venogram. Constant observation will help you avert unwarranted complications. When the foot is soft from sweating, I often use a heavily rockered rail shoe. It is a judgment call based on the degree of healing and the amount of damage you started with.

Pre-shoeing film are needed for the farrier. The sole depth and palmar angles while in the ultimate are of the utmost importance. Taking a horse out of a device providing a 20° palmar angle can cause serious setbacks if structural stability has not been established with a good healing mode. Simply setting the foot down onto a hard surface for several minutes during the trimming/shoeing process can challenge the integrity of the healing laminae.

Providing a 20° self-adjusting palmar angle has tremendous potential to significantly reduce the DDF pull on PIII over the laminae, and it unloads the sole corium. These effects must not be taken for granted when the device is removed, as the DDF will be in full tension without the device.

A common error is to remove the mechanical device while taking follow-up film 4-6 weeks following a significant onset. Many of these cases will be acceptably sound, off anti-inflammatory medication, and show mild-moderate sole growth (3-5mm). They walk soundly to the wash rack or x-ray area, stand on the x-ray blocks, and walk back to their stall where their modified ultimate is re-applied. Within hours, they are very uncomfortable and require Bute to get around in their stall. Another set of film made 3-5 days later reveal that significant displacement has occurred. This was caused by kicking the DDF tendon back to full tension and challenging the laminae that could not support the load.

The same can be said of venograms that are performed 30-45 days following onset. A blocked horse is subjected to an hour of unprotected tendon load. This can cause serious damage and result in a very lame horse when the block has worn off. Many mistake this as an ill effect of the venogram.

I like to over-protect my cases for the first 45-60 days. Therefore, I place a modified ultimate on the loaded foot while I take radiographs, perform a venogram or shoe the horse.

How to Shoe This Horse

Always shoe the better foot first when dealing with bi-lateral or uni-lateral foot problems. The majority of lame horses will stand better on their bad foot before it is reshod. If you have a sling, this does not become an issue. When a sling is available, I choose not to block the foot, as it adds more trauma to the loaded foot. Consequently, this causes unwarranted stress and damage. When a sling is not available, it is wise to block the very painful foot to make the shoeing more bearable for the farrier, the handler and the horse.

It is easy to get angry when a lame horse is trying to take your leg off with a nail, but we must always remember why they are fighting. **Have compassion!**

Shoe Application-Example 1

Thoroughbred Stallion-Low Heel Foot

Push the heels back to good solid horn, starting at the widest part of the foot. Rocker the toe starting slightly beyond the widest part of the foot. Keep in mind the sole depth. When your lateral film reveals 20mm or more, you can lose a maximum of 4-6 mm. This is equal to 2-3 swipes with a good, sharp rasp.

I like for the foot to have a gentle, round surface from the heel to the toe with the crown at the widest part of the foot. A rail shoe of some sort is rockered in the same fashion. When this shoe is placed on the foot, it should sit evenly on the anterior quarters and the heel tubules. If the shoe touches the horn at the widest part of the foot, this is acceptable. If there is an air gap at the widest part of the foot, between the shoe and the horn, especially on heavily rockered shoes this is also okay. (You may elect to fill this space with Equilox.) The quarters carry very little of the load with a rockered shoe.

When there is plenty of foot to rocker, the horn wall and sole are normally of good quality and mass, and the horse seldom objects to hammer blows, I will nail the shoe but not block the clinches. If there is little foot to rocker, and the horse does not want his foot up more than a few seconds, then I will quickly stick two nails in a clipped shoe and set the foot back on the ground. I will then use Equilox or Vettec to secure the shoe.

Be quick with your work, and be aware of the slightest clues from the horse. IF you think you have had his foot up too long, then set it down. Wait a few seconds and pick it up again. IN the long run, this will save precious time and be much easier on you and the horse.

The post shoeing x-rays of the foot should reveal a PA of 0° with the heel side of the shoe. It will reveal a 12°-15° PA with the ground surface. It is difficult to get a 15° PA out of a flat shoe, no matter how much you rocker it!

Shoe Application-Example 1

Thoroughbred Stallion - Club Foot with White Line Disease and Laminitis

We have less sole and more heel to work with on this foot. The PA remains at 10° after being in the modified ultimate for 30 days, which means we have not had the mechanics necessary to override the pull of the DDF. This is why the heel continues to grow 2-3 times faster than the toe. The growth rings confirm this.

Back the heels up hard starting slightly behind the widest part of the foot. Imagine creating a 0° PA with the wings of PIII while leaving maximum sole depth under the apex of the coffin bone. Rocker the toe very little as there is very little sole to work with!

Note the location of the most proximal border of the lucent zone (white line disease). When this has moved distally with the new horn growth, you can leave the horn wall intact. Often using a

20° PA will adequately reduce wall stress and mechanical tearing which allows the invading forces to invade and grow at the same speed as the wall growth. Leaving the wall on for this reason has great merit, but when the defect continues to be at the same or more proximal location, it is best to remove the wall thoroughly and medicate the defect in an effort to eliminate the fungi. Remember to follow-up every 3-4 weeks with thorough debridement to eliminate any and all seed beds that may form as the new horn wall grows out.

Caution is due when you remove a large section of undermined hoof wall on a relatively sound horse. It can cause subtle to severe lameness regardless of the shoe that is used to protect the sole and reduce DDF tension. The wall provides great protection, even when undermined and detached from the inner horn

When it is necessary to remove the wall, keep in mind that you will need a shoe (preferably a rockered rail) with quarter clips and a positive heart or sole pack. I prefer to glue this on with Equilox or the Vettec nail attachment. The Vettec method requires you to place nails through the holes of the shoe and bend them over at the top. Fit them tightly along the outer wall. Use Fast Set® along the nails, incorporating them into the wall.

Shoe Score

For every 2° the shoe alters the static palmar angle, give the shoe a score of one (1). So a 10 score shoe will raise the palmar angle 20° and greatly reduce the DDF pull, subsequently increasing perfusion and accelerated horn growth. This shoe will also serve to treat the laminitic involvement in the same fashion.

If the venograms reveal moderate loss of contrast over the coronary plexus, circumflex, medial coronary plexus and terminal arch, I would prefer to use higher mechanics. Place a flat rail with a tail extension on the foot, establishing a 0° PA relative to the wings of PIII and the shoe. Remove the undermined horn wall and clean up the area. Next, cut the DDF mid-cannon. This will allow zero tendon influence for 2-5 months, which is plenty of time to grow a ton of sole, grow out most of the defect, and treat both the white line disease and laminitis.

Example 2 - Thoroughbred Broodmare. Acute, Bilateral Laminitis

This mare is a grade 5/5 on the first day. She is treated with a load of Bute and modified ultimates. She shows dramatic response in the first 3-4 hours. Initial x-rays reveal the following:

- HL 20/20
- PA 2°-3°
- SD 15mm
- CE 15mm
- DB 35mm

The external appearance reveals slightly dished feet, old toe cracks and flat soles. She is broodmare sound most of the time. Since she is very responsive, I elect not to do a venogram on Day 1.

On Days 3-5, if she requires Bute in order to be happy, then I will perform a venogram. She must stay in the modified ultimate during the exam. I remove the modified ultimate with ACS and replace it with an ultimate with no ACS for the x-rays, as the ACS will cause distortion in the film. She is not to step out of the modified ultimate while she is blocked!

A venogram reveals both circumflex vessels are slightly prolapsed over the apex of the PIII. This is not good. The possibility of a DDF tenotomy may be the best option.

Three or four days later, there is no improvement, and the circumflex is prolapsed even further. The soft-tissue parameters measure:

- HL 20/20
- PA 2°
- SD 8mm
- CE 22mm

Note the CE and SD!

This case is getting progressively worse even though she is pretty sound on Bute. She needs derotation shoeing, immediately followed by a DDF tenotomy, in order to save her life. Without the benefit of the venogram, you would never suspect that she was going south quickly.

This is a typical case that responds well but can't be taken off Bute. Cases like this either lose sole or fail to grow sole 30 days after being put in ultimates. Since they are not responding favorable, they need more aggressive mechanics, and a tenotomy with realignment is indicated. The fimbriae remain dysfunctional due to excessive compression from the download, and PIII continues to slowly sink. The HL remains static as the 20° PA actually forces the apex upward by transferring the load to the heel, cushion and impar ligament.

This can be confusing as everyone is looking for the deteriorating signs of rotation. When they don't see these signs, they gain a false sense of security. The venogram will help sort out the case that appears to be stable but is actually losing vascular supply.