Innovations in Shoeing: To Flex or not to Flex!

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Flexible shoes are a category of horseshoes that are not rigid metal and are generally composed of plastic or a collection of various materials. In this article, I will use the term ***composite shoes*** --- such shoes are generally made of plastic such as polyurethane and may contain metal inserts, depending on the specific design.

What does it mean to flex?

Any material such as plastic, wood, hoof keratin, and even metal can flex to some degree. The defining factor is by how much one material can flex compared to another – that is, things are relative. The important factor in shoeing is the relationship of a particular material to that of the hoof keratin.

Keratin is the building material of the hoof capsule. It has specific mechanical properties as do polyurethane, metal, and other materials.

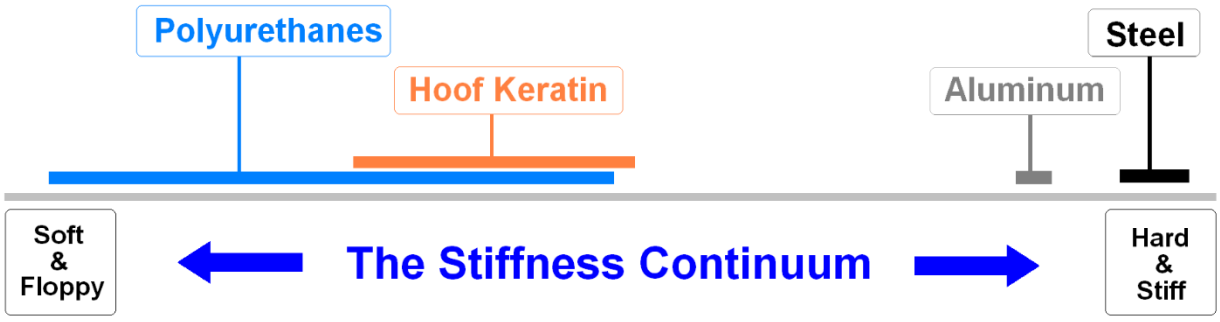

Figure 1: There is a "stiffness continuum" from materials that are very flexible to materials that are very rigid. The blue bar shows the range over which polyurethanes can be formulated – any given polyurethane is somewhere on that range. The orange bar shows the range over which the hoof keratin can vary (for many reasons, mostly hydration). The light gray and dark gray bars show that aluminum and steel are very far away from the hoof's keratin in terms of stiffness.

To function naturally, the entire hoof capsule needs to be able to flex to a certain degree --- not just the caudal (back) area of the hoof. However, it can also be said that the heel area should not expand excessively, neither in an upwards direction nor a sideways direction. Too much displacement in the heel area could mean that the hoof is not trimmed correctly or that the bars are failing structurally. Generally, a good hoof is compact, stands under the bony column, and has more surface area behind the apex of the frog than ahead of the apex of the frog. So, flexibility is generally a good thing, but like everything, too much of a good thing can be too much!

Figure 2: This is an example of compact hoof.

The advantage of a composite shoe

A good composite shoe is advantageous for the health of the hoof since the materials used for this type of shoe come reasonably close to the natural properties of the keratin. In other words, these shoes are more synergetic with mechanical behavior of the keratinized capsule. There is often noted improvement in quality and hoof growth with a well-designed composite shoe.

The material used for the shoe design does not guarantee proper function of the entire capsule. A good shoe design goes beyond the choice of material. For instance, adding a large amount of metal inside a composite shoe can lessen the advantage of flexibility. There are also limitations on how much a composite shoe should flex. Too much flexibility may not provide support.

Besides protecting the hoof from over-wearing, a composite shoe reduces concussion to the entire limb, and hence provides more comfort to the horse.

I have been using composite shoes for the past 15 years --- the first 5 years with a German made shoe, and the last 10 years with EponaShoe. I have long term records of my own horses and clients' horses shod in composite shoes. If these shoes are placed correctly and with the correct trimming, most horses seem to stay sounder, have more energy, and are overall happier. This has been true for horses with no issues but also others with pathological issues such as ringbone, navicular, and laminitis. Of course, good overall care plays a significant role in the well-being and longevity of horses. Horses are not meant to be ridden --- it is not 'natural' to ride horses. (Note that I have been riding horses for over 40 years, this comment is not meant to chastise anyone!) A new shoe design will not be the cure for poor horsemanship and poor horse care.

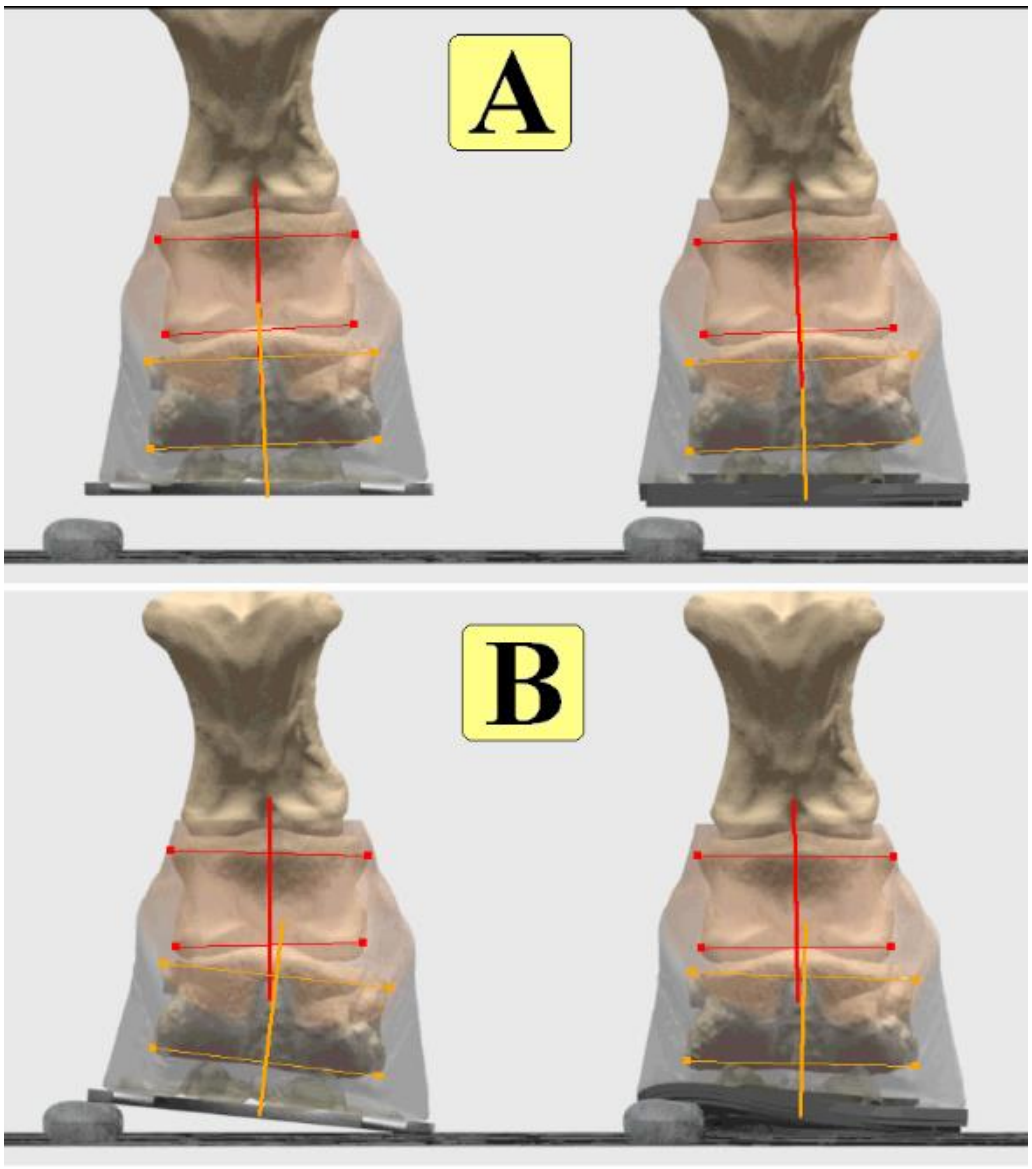

Figure 3: This simulation suggests that a rigid metal shoe may cause more stress at the coffin joint than a flexible EponaShoe. A flexible shoe will allow the hoof capsule to flex in ways similar to a barefoot hoof.

Another advantage of composite shoes is that it is very easy to transition back to barefoot if desired. A good composite shoe creates better hoof quality and good sole depth. In general when a horse goes back to being barefoot there are minimal issues with making the change. This is not always the case with transitioning from metal to barefoot.

What to expect when using a composite shoe

When a horse is barefoot and starts wearing composite shoes, there is generally little to no transition period for the hoof to adjust. Problems can arise with some barefoot hooves with issues such as thin soles, poor conformation or hooves that have been trimmed incorrectly. With time and correct trimming most hooves come back to a better shape and health.

When a horse transitions from metal shoes into composite shoes, there will also be a period of adjustment for the hoof capsule. It is a little like transitioning to barefoot but with the advantage of more comfort for the horse during the adaptation period. Horses are often not uncomfortable but hoof capsules can go through some significant morphological changes (see figure 4.) During this period, shoe sizes can change very fast, this may cause some shoe loss at the beginning or shorter shoeing intervals. Once the hooves have stabilized to a more natural function this is no longer an issue.

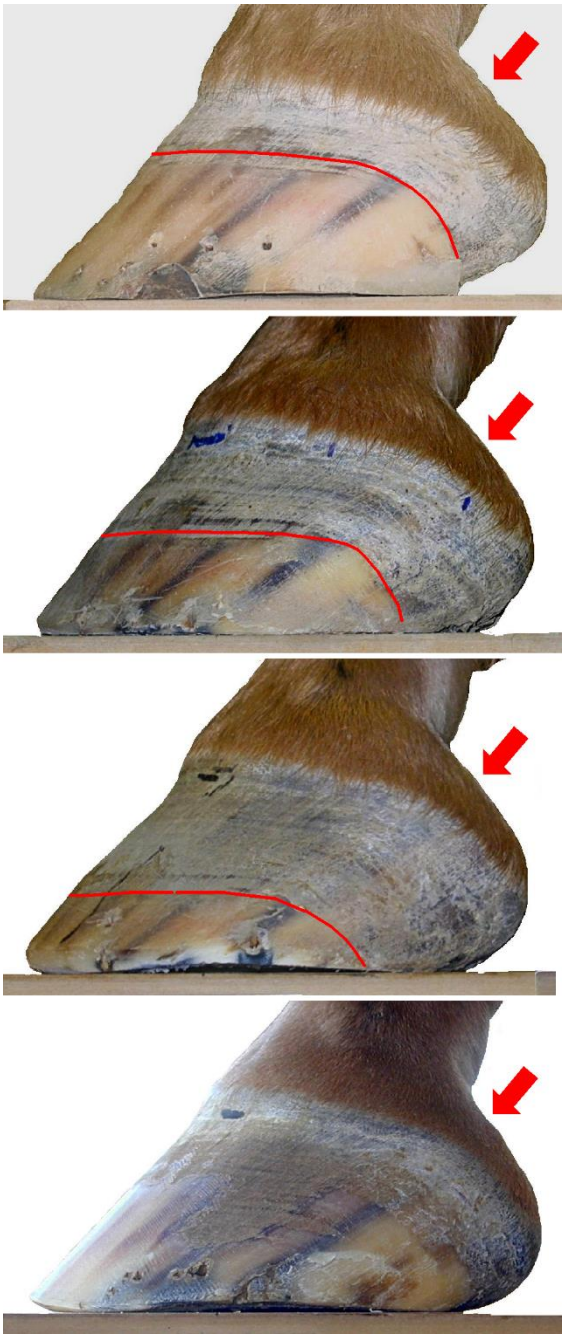

Figure 4: The top image shows a hoof that was metal shod, the three remaining pictures show the hoof when in a composite shoe returning to its ‘natural’ shape, meaning the capsule has returned to its original mechanical properties. The deformities within the hoof capsule are shown below the red line. The red arrows mark the displacement of the collateral cartilages.

Please remember that traditional rigid metal shoes have helped horses through the centuries, and still do today. A thin metal shoe is not necessarily bad for the hoof. Lameness issues or bad hoof conformation are not caused solely by the type of shoes used. Riding -- or any use of the horse by humans --- may cause the hoof to deform in various ways. Flexible shoes offer the promise of avoiding what rigid metal shoes induce: a rigid constraint applied to the hoof often employed over a long period of time. We seem to be living in a more compulsive and competitive world (than say, 20 years ago.) There was a time when farriers could advise horse owners to give their horses a break from riding and metal shoes. Being barefoot for a couple of months or more was done normally during the off show season. This is often no longer the case.

Trimming for a composite shoe is similar to trimming for keeping a horse barefoot. In my opinion, the trim is more centric to success with composite shoes. Compared to being shod in metal shoe, a hoof wearing a composite shoe is one step closer to behaving as nature intended. Placement of the shoe and shaping of the toe bevel also affects whether the hoof is allowed to function naturally. So the details of the trim and shoe placement are very important.

Variety of attachment methods

Most composite shoes can be nailed on like regular metal shoes. Nailing is a successful means of attachment that has been used for at least a thousand years, and while it may be possible to avoid nailing, it remains a reasonable choice of securing shoes. Designing a composite shoe that will nail well while allowing the hoof to maintain flexibility is a bit of challenge. Some shoes have introduced a complete metal rim shank – think a thin rim metal shoe – that is covered with polyurethane. Such a design may give up the benefits of a truly flexible shoe. On the other hand, if the shoe is too soft, it will not hold nails well. A good design is a balancing act.

Most composite shoes can be glued on. In some designs the gluing is done using a cuff with glue applied to the outer hoof wall. With other designs the shoe is glued directly to the underside of the hoof.

Attaching composite shoes with casting tape material is another option.

There are combinations of these three attachment methods that can also be used, for example a glued-on shoe could be further reinforced with a couple nails.

The future of composite shoes

More and more traditional farriers are beginning to also use composite shoes for some clients. Many barefoot trimmers also use composite shoes when going barefoot is not fully successful. There is an increase in composite shoe products coming onto the market in the past 3 years. The vast majority of horses are still metal-shod, but this may change in the future.