

The Internal Arch Theory

With the development of how I believed the equine foot dealt with energy, it becoming increasingly clear that the foot was capable of utilizing a great deal of energy for the creation of locomotion. It was also becoming increasingly clear that our obsession with trying to explain how this energy was absorbed may in fact be creating a road block to our true understanding of how this energy is used. With the help of lateral thinking, I came to this conclusion; the tradition of utilizing bone and dynamic tissue to create a means of balance was ineffective and that soft tissue must somehow be addressed. How was the leap from traditional theory to the traditional means of achieving balance made? How does one support the other? I could not make this jump any longer and began by asking myself; is the hoof capsule and its lamellae attachment responsible for the position of P3 in relation to the coffin joint? If this was so, then why did the position of P3 remain constant with the removal of the hoof capsule?

Through dissection and the removal of the hoof capsule I observed the structures (soft tissue, cartilage and ligaments) that were responsible for the position of P3 in relationship to the coffin joint. These structures represented an internal spring, and remembering that springs store and release energy, I began to work the internal spring into theory. The internal arch is in effect made up of P3, the navicular bone and all of the ligaments, connective tissue that constitutes the coffin joint, the lateral cartilages, digital cushion and all remaining connective tissue of the foot. Over time and through applied research the importance of the internal arch has been revealed as a major breakthrough in our understanding of how the equine foot deals with the energies created by the stride and how this energy is utilized in locomotion.

Theory Overview

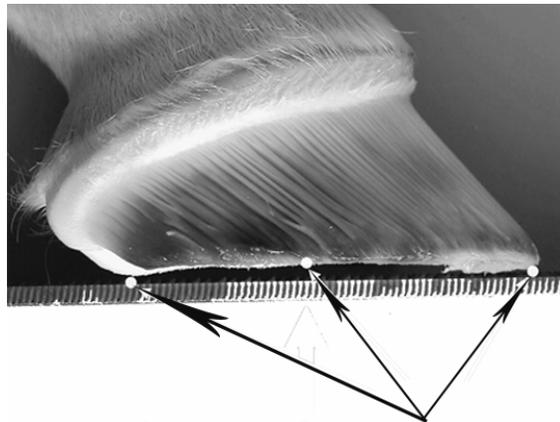
Beginning with initial contact we observe the angle of the bar making contact with the ground. Excess kinetic energy of initial contact is buffered by the inner wall, protecting the dermal layers from the higher frequencies of vibration created by the hoof making contact with the ground. The impact phase sees both heels making contact with the ground initiating pastern movement, kinetic energy is received by the hoof wall and is being stored in the outer hoof wall as the capsule begins to distort. As the stride continues with the stance phase, pressure builds within the foot as the internal arch begins to load, further storing energy. As the arch is loaded and the hoof capsule distorts, pressure is exerted on the dermal layer, as it meets the resistance provided by the hoof capsule producing the stimuli needed for correct function. Studies now indicate that as the pastern descends the blood to the foot is reduced and under extreme load of stride is in fact shut off. (Video, Pollitt) Just prior to mid stance we could have a closed system effectively storing massive amounts of energy, this dependent upon the force encountered ($F = A \times M$). Hemodynamics is likely to be far more effective in a closed system, as the blood attempts to move through the foot meeting extreme resistance. Energy is released (transformed) in the form of heat and upon release is dissipated through the circulatory system. At the moment the pastern begins to rise, (beginning of the breakover phase) the blood is released under pressure, effectively purging the foot of the excess energy that

has not been utilized for locomotion. As the stride continues with the breakover phase, the release of stored energy from both the internal arch and that energy which is produced by the horse, takes place in the form of locomotion. Breakover is defined by the moment the angle of the bar leaves the ground. Neurological stimulus has been and is being produced and processed in an attempt to define the continuing stride. Correct structure and function are required, if there is any hope of achieving performance. The internal arch, I believe is the true foundation of this theory and without having correct structure to the foundation high performance is not obtainable.

Note: FACT, THEORY, SPECULATION defines the process that science uses in its development.

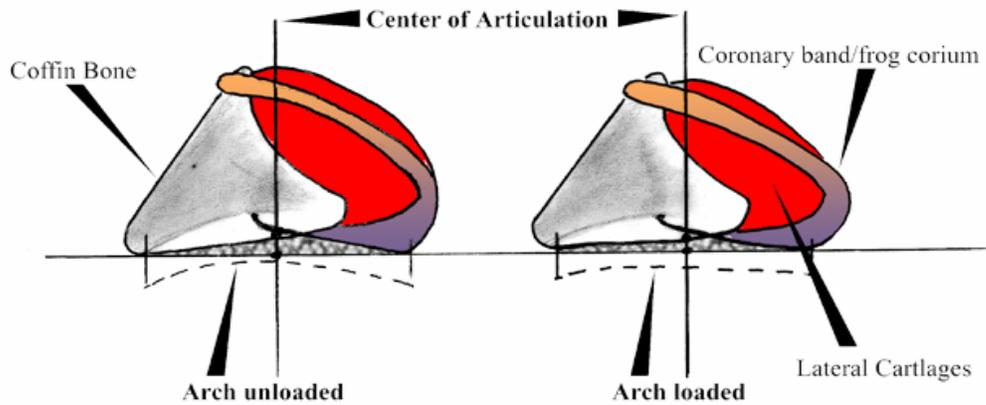
Internal Arch Theory Utilizing Momentum

- Foot's Internal Spring
- Stores and releases energy
- Provides suspension
- Nourish Epidermal layer
- Mirrors Epidermal layer



Points used to define the Internal Arch

Internal Arch Function



- Suspension
 - Bio-mechanical suspension
- Store and release energy
 - Locomotion
- Recipient of Stimulus
 - Neurological functions
- Produces Epidermal Layer
 - Creates Bio-mechanical support