Vertical Lines, Fissures, and Cracks

On a healthy hoof, there should be no vertical or horizontal lines, and no fissures or cracks visible. If any of these are present, they are the first clear signs that the hoof is "out of balance". You hear this expression from many hoof-care professionals, but what exactly does it mean? And why do lines cause cracks to form?

I will limit myself in this article to the cause of vertical lines. First of all, we must distinguish between hoof wall lines, fissures, and cracks.

Horn Lines affect only the outermost horn tubules.



Superficial lines, first signs of hoof imbalance

They are a result of acquired deviations of the physiological hoof shape, especially the hoof wall. Any change in the shape of the hoof leads to counteracting hoof wall mechanics, affecting the strong but elastic horn tubules and their intertubular horn. These initially superficial lines are the first signs that the hoof capsule is under stress. If the mechanical forces that cause the stress are not addressed, the lines can go deeper and rupture the horn tubules out of their connection and turn into Fissures:



Fissures are vertical cohesive separations between and along the outer horn tubules of the hoof wall. While lines are often ignored and dismissed as cosmetic, fissures are taken more seriously because they are more clearly visible and associated with other problems. While the hoof wall is not yet split, fissures are deeper than lines. The hard but flexible outermost layer of horn tubules is torn from their bond with their intertubular horn. Often these defects are also considered to be only superficial and not taken seriously, as the hoof wall is not yet completely split. The cause is very often sought in traumas or even pathogens. Since the disconnections provide perfect entry points for germs and bacteria and can further damage the hoof wall, it is easy to focus on the thing that is most obvious first. Unfortunately, cause and effect are reversed. The pathogens only penetrate the hard protective hoof wall when it is already damaged, not the other way around. For this reason, it, unfortunately, makes no sense to treat the hooves with hoof care products, regardless of the ingredients, as the cause of the problem, which is purely mechanical in nature, is not eliminated. These oils or ointments prove to be extremely ineffective, because the already produced horn, which consists of dead and keratinized cells of the coronary corium, will not be accessible. Even an improvement in nutrition through numerous supplements will not remedy mechanical changes that are purely due to hoof trimming.

Very often the horse owner is told that cracks increase or arise due to dryness or even too much wetness. The anatomy of the hoof is not taken into consideration. Nature has provided the hoof with an excellent self-protection device, which regulates its own moisture balance. The less-dense inner hoof wall tubules are more supple, capable of retaining and attracting water, while the tubule density increases outwards. The outermost tubules are more rigid and harder, thus perfectly capable of bearing weight. The correct moisture content of the inner horn tubules is regulated by the body's blood circulation supplying all horn-producing coria. Thehoof wall is therefore a perfect protective barrier, smoothly connected to its dermal lamellae. No moisture can pass through that barrier to the inside or outside of the hoof. However, water can be absorbed through the hoof sole, frog, and the tubules of the weight-bearing rim vertically touching the ground. The hoof 'sweats' through its hoof sole and will only absorb moisture to a minimal extent. For this reason, all measures that try to change the texture or quality of the hoof wall, unfortunately, have no success in the treatment of cracks.

It is necessary to treat the generating forces that cause cohesive fractures within the horn tubules by proper hoof treatment. If this is not done, fissures can turn into **cracks**. The hoof wall is then completely severed and, depending on location, can cause separated hoof wall segments to drift apart. This condition then becomes a challenge for many hoof trimmers. Unfortunately trying to solve the problem with clamps, silicone, clips, or other "Band-Aids" is more counterproductive than helpful. Here too, the cause-effect principle is misunderstood if the focus lies more on the symptom than on the actual root cause.

Toe crack, medial in the toe wall. Treatment was focused on the crack, by "rasping it out". The actual cause of the crack lies in the levering quarter walls. Horizontal demarcation lines show how much the quarter walls are compressed. The horn tubules 'fold', they can't wear off. The side clips promote this problem. The lateral view shows the additional underrun heels, another aspect of the cause.



The crack grows out very quickly and effectively if the hoof is brought back into its physiological shape with the right filing technique, back "into balance." This means that

the horn shoe, the hoof capsule, is aligned to its individual internal structures and not the other way around which unfortunately is attempted in most cases. The cause of hoof deformations and their consequences, such as cracks, is often seen in general conformation faults of the horse, the way the horse uses its hooves due to certain limb conformations, and resulting biomechanics. Once again, cause and effect are reversed here. Most horses develop conformational abnormalities BECAUSE the hooves have not been properly cared for in the past. In general, a foal is born with very even hooves. Due to first contact with counterpressure, posture, and load patterns, the shape and load of the individual bone axes and all involved joints, tendons, and ligaments change over the years. The horse will try to adapt its hoof shape to its limbs and develop a certainly forced break-over point on the hoof if the right corrections are absent in the early years.

Not many foals have the luxury to get the right hoof treatment from the beginning. In the adult horse, an attempt is then made to compensate for movement anomalies using hoof correction, which is not possible for the hoof and horse, since it is already used to its inner deformations. Often the hoof is then forced into a shape that it cannot compensate for in the long term, which is precisely what causes symptoms such as hoof cracks. Also, adjacent internal structures such as joint surfaces, tendons, and ligaments are affected. The cause for the crack is then sought in the conformation fault of the horse. A symptom resulting from incorrect hoof trimming, such as a hoof crack, is by no means the result of movement or position anomalies, but solely from the individual alignment of the hoof capsule to its coffin bone. No crack has to be a chronic problem as an alleged result of too steep, crooked, turned out, or flat hooves and the resulting postures. It doesn't matter which bone axis or hoof shape the horse has developed individually on each leg, what is important is that the corresponding hoof capsule is individually aligned to its coffin bone. Only then can the crack grow out as the hoof wall renews itself in the correct alignment. If hoof walls drift away from the coffin bone or if certain parts of the hoof wall are more stressed or used than others, pulling and levering forces arise that deform the hoof capsule. As already mentioned, every deformation leads to further stress reactions of the horn tubules. It is therefore important to control these mechanical forces, for which abrasion and ground counterpressure are necessary, which consequently only applies to the barefoot. Every artificial attachment to the hoof capsule increases leverage since the natural wear and the abrasion control by the hoof trimmer are absent at short intervals. With increasing length and slope of the separated hoof wall segments, their spreading effect also increases. The necessary horn abrasion is lost when a shoe is applied and effectively becomes counterproductive.

Where can cracks appear in the hoof wall?

Since different hoof wall mechanics work against each other everywhere in the hoof wall, horn lines and cracks can also occur everywhere in the hoof wall. Nevertheless, there are typical localizations in which horn cracks occur frequently in particular, as they are associated with typical hoof capsule deformations. The most common one that one sees is the toe crack, which forms due to a forced break-over manner.

In the pictures, you can see different localizations of the toe crack but always exactly in the break-over point of the individual toe wall. If the crack is in the middle, the wall parts to the left and right of it, are unphysiologically thicker because they are utilized less, causing the central break over point. Due to the reduced wear on these two toe wall parts, the horn builds up over time if there is no correction. It becomes more and more forceful and turns into an obstacle for the horse to toe over it. Furthermore, the horn tubules will bend or compress there because they do not wear off. Those hoof wall parts begin to flare or thicken and remain a stiff obstacle. The individual wall segments, particularly rigid in the toe wall, are now drifting further and further apart. The horse is forced to only break over in the middle.



A toe crack can also develop more lateral to the middle. In the pictures below the natural break-over point is not located in the middle.

Different Hoof wall mechanics generated by differently loaded and used/unused hoof wall parts have torn the hoof capsule apart at exactly that spot where the hoofcapsule is naturally weakened the most: at the break-over point:



Other typical hoof wall regions where cracks can occur are the transitions between the hoof quarter walls and the heel walls.

There the elastic ungular cartilages connect to the dimensionally stable coffin bone in the inner rear part of the hoof capsule. The hardness and structure of the bone, in contrast to the elastic fiber cartilage, form a predestining background for the development of such hoof wall defects. The different structures and dynamics of bone and cartilage generate opposing hoof wall mechanics. These result in changes in the shape of the hoof wall at the transitions between the hoof quarter walls and the heel walls. A Heel wall can become unphysiologically rounded if it is pushed under or contracted due to too much load. The horn tubules of the rounded segment cannot bend outwards. Their rigidity meets the mechanics of the bending quarter wall which often results in horn tubule separation.



Attempts to work on the symptom, e.g. to "rasp out" the rounding or smooth it out (picture 1 below) or to stop the crack with a horizontal groove (picture 2 below), are of course completely useless.



Fissures and cracks are serious indications that the efficiency and integrity of the locomotor system of the horse are at risk as it is a result of an imbalanced foundation, the hoof.

Underrun heels create an unphysiological rounding. The toe wall has no function anymore. Too much weight burdens the heel, pushes the rounding outward further. First lines and fissures start to develop at the transition of the heel to the quarter wall.



1 year later, the hoof-pastern axis is aligned, but there are still lines visible, the heel is not yet aligned with the toe line. The hoof is not rehabilitated yet.



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