

## Navicular Disease

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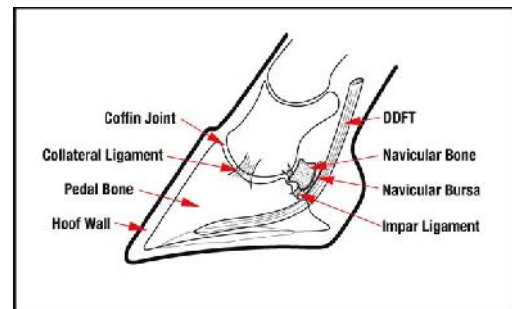
Veterinary Services, LLC



**Navicular disease**, now called **Navicular syndrome**, is a syndrome of bilateral front leg unsoundness in horses. It is caused by inflammation or degeneration of the navicular bone and its surrounding tissues, usually in the front feet. The most common presenting signs are short, choppy gait, especially at the trot, and the lameness is worse when jogging in circles or on hard ground. Sometimes one leg will be more lame than the other, but it is usually a bilateral disease (affecting both front feet). The hind feet are rarely involved. This syndrome is more common in Thoroughbreds, Paints, Quarter Horses, Warmbloods, and Paints. It is less common in ponies, miniatures, drafts, gaited horses, and Arabians. The average age when it is diagnosed is 7-14 years old.

### The Navicular Area Anatomy

The navicular bone lies behind the coffin bone and under the small pastern bone. The deep digital flexor (DDF) tendon runs down the back of the cannon and soft tissue in that area and under the navicular bone before attaching to the back of the coffin bone. The DDF tendon flexes the coffin joint, and the navicular bone acts as a fulcrum that the DDF tendon runs over.



The navicular bone is supported by several ligaments above, below, and on the side. One of these ligaments is the impar ligament, which attaches the navicular bone to the coffin bone. Cartilage lies between the navicular bone and the coffin joint, as well as between the navicular bone and the DDF tendon. The navicular bursa - a small sac that protects the DDF and navicular bone from abrasion as the tendon slides over the area - lies between the navicular bone and the DDF tendon.

### Signs

Heel pain is very common in horses with navicular syndrome. Lameness may begin as mild and intermittent, and progress to severe. This may be due to strain and inflammation of the ligaments supporting the navicular bone, reduced blood flow and increased pressure within the hoof, damage to the navicular bursa or DDF tendon, or from cartilage erosion.

Affected horses display a "tiptoe"/ choppy gait - trying to walk/trot on the toes due to heel pain. They may stumble frequently. The lameness may switch from one leg to another, and may not be consistent. Lameness usually occurs in both front feet, although one foot may be more sore than the other. A short-choppy gait at the walk or trot is common. Lameness is usually mild (1-2 on a scale of 5). It can be made worse when the horse is worked on a hard surface or on a circle.

After several months of pain, the feet may begin to change shape, especially the foot that has been experiencing the most pain, which tends to become more upright and narrow.

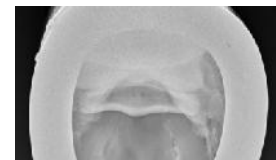
## Diagnosis

To accurately diagnose a horse with navicular disease, three criteria should be met. The horse is bilaterally lame in the front feet. The horse "blocks out" to the feet with a palmar digital nerve block. Lastly, the horse has changes to the navicular bone on radiographs.



Navicular disease - lollipops/cones

The changes may include "lollipops" or "cones" which are increased size of the vascular channels, cysts, sclerosis or decreased differentiation between the cortex and medulla, radiolucency on the flexor surface, or bone spurs. If the owner wants to go one step further, it can also be diagnosed with MRI which can also show changes to the surrounding structures including DDF tendonitis, bursitis, impar ligament injury or synovitis. Minor changes on the navicular bone without corresponding lameness does not necessarily mean the horse has navicular disease. However, if there were significant changes found on the navicular bone during a pre-purchase exam, this would cause concern for future soundness.



Normal navicular bone



Degenerate navicular bone

## Causes of Navicular Disease

There is no single known cause of navicular syndrome but can be due to many factors. The first factor is compression of the navicular bone under the DDF tendon and the back of the small pastern bone. Repeated compression in this area can cause cartilage degeneration, with the cartilage flattening and gradually becoming less springy and shock-absorbing. It may also begin to erode. Cartilage degeneration is common in navicular horses, usually along the flexor surface. Cartilage erosion may progress to the point that the bone underneath will become exposed. With the cartilage no longer present to protect it, the navicular bursa and DDF tendon may become damaged by the constant rubbing against the navicular bone. Navicular bursitis may occur. This is probably due to the friction between the navicular bone and the DDF tendon from compression. Constant

compression can also increase the bone density directly under the cartilage surfaces, especially on the flexor side.

Another main factor is the tension placed on the ligaments that support the navicular bone. Inflammation from strain of the impar ligament can decrease blood flow to and from the navicular bone, as the major blood vessels supplying the bone run up and down this area. If the ligament continues to be strained, it can thicken and permanently reduce blood flow to the navicular bone. Excess tension can also cause strain where the ligaments attach to the navicular bone, giving the bone a "canoe" shape. If tension is extreme, the ligaments may actually tear.

Because veins are more easily compressed than arteries, blood flow to the bone would be less obstructed than blood flow from the bone. This would cause a buildup of pressure within the navicular bone. The navicular bone, in response to both the increased pressure and overall decreased blood supply, would absorb mineral from its center.

There is a correlation between "toe-first landing" of the hooves and navicular problems, due to excessive strain put on the deep digital flexor tendon, as a consequence of misalignment of the lower joints. Toe-first landing, usually seen as a consequence of navicular disease, may actually be a cause or at least a contributing factor to the onset of tendon inflammation and bone modifications. It is often caused by frog and heel over-trimming, long toes, and/or poor shoeing.

### **Conformational Causes**

Certain conformational defects may contribute to navicular syndrome, especially defects that promote concussion. These include upright pasterns, small feet, narrow and upright feet, significant downhill build (Quarter Horses, Paints), and long toes with low heels (Thoroughbreds). Many people inquire if it is genetic. Conformation is genetic which can be passed on to offspring, but there is no specific gene or test to determine if a horse's offspring will also get navicular disease. Poor hoof shape is usually inherited, although poor shoeing and trimming can contribute to these shapes.

The long toe, low heel conformation places constant stress on the navicular bone, even as the horse is standing. With the long toe, low heel conformation, the heels can become contracted heels which further compress the navicular bone and tendon. On the other hand, excessively upright feet increase concussion, especially in the heel region of the hoof where the navicular bone is located. Excess concussion cannot be absorbed as well by the structures designed to do so (the frog, heels, and digital



Long toe/ low underun heel

cushion), so more impact is transmitted to the structures within the foot.

### Shoeing/ Trimming Problems

Poor trimming, shoe selection, or inappropriate shoe attachment are well-known causes of lameness, and navicular disease is fairly common in the modern-day domesticated horse. However, it is also seen in wild horse populations. Those who advocate "barefoot trimming" of domestic horses propose that in nature, a horse's hoof is designed to expand and contract as the horse moves. This expanding and contracting act as an auxiliary blood pump and aids the circulation of blood to the lower extremities. When an inflexible metal shoe is improperly attached to the hoof, the hoof can no longer work as designed, and blood flow is inhibited. This is why some horses do better when the shoes are pulled. If the shoe is not fitted and balanced properly, it may actually make the horse worse.



### Treatment and prognosis

No single treatment works for all cases, probably because there is no single cause for all cases. The degenerative changes are usually quite advanced by the time the horse is consistently lame, and these changes are believed to be non-reversible. At this time, it is best to manage the condition and focus on alleviating pain and slowing the degeneration.

### Hoof care

When treating a horse with caudal heel pain, the simplest change to make involves his trimming and shoeing. Putting the foot into proper balance is crucial. Often navicular horses have long toes and under-run heels with very little inner wall depth or strength. The farrier's goal should be to decrease the deep digital flexor tendon's (DDFT) tension during movement as well as the pressure it applies over the navicular bone. People who choose to treat navicular disease through shoeing may use a shoe designed to lift and support the heels. This can sometimes be accomplished with a flat shoe and trimming alone. Many horses benefit from the farrier shortening or squaring the toe to create an early point of breakover in the stride, which also decreases DDFT tension. Another tension-reducing technique, used in combination with an earlier breakover, is elevating the heel with a wedge or by establishing more heel wall. Some horses benefit from shoes that change the breakover of their foot (like a rolled toe).



Natural balance shoe with rolled toe



Egg bar with rolled toe

There are many shoes designed to treat caudal heel pain specifically which includes natural balance shoes, navicular shoes, egg bar shoes, straight bar shoes, wedged pads, wedged egg bar shoes. It is very

important to get the hoof wall and front of pastern in a straight line and correct the conformation. With or without shoes, the hoof must be trimmed in such a way as to restore the balance and angle that may have been lost. Horses with long toe-low heel conformation need careful trimming to counter this. Horses with upright feet may need their heels lowered and a shoe that will allow their heels to spread. Early intervention is key; in one study, shoeing was successful in 97% of horses treated within ten months of the onset of signs, while only 54% of horses lame for over a year responded. Because detailed care for these horses' hooves is very important, ensure your veterinarian and farrier work together to find the best options for your horse.

Advocates of barefoot trimming cite recent studies which show that removing the shoes can help alleviate the symptoms of navicular disease, and in some cases, reverse some of the damage done to the hoof. Because navicular disease can be caused, or at least exacerbated by shoeing, removing the cause is the first step in this strategy toward the management of pain in the animal. Successive carefully applied trims help to restore the natural angle and shape of the hoof, while walking helps to stimulate circulation to the hoof. It is not uncommon to find horses whose navicular disease is completely manageable through corrective barefoot trimming. However, this does not always work and many horses are worse without shoes or never become sound without shoes.

If there is significant degeneration in the bone, a flexor cortex cyst, adhesions to the deep digital flexor tendon, or avulsion fractures, relief is typically incomplete no matter what foot care technique is used.

### **Exercise**

Horses with navicular syndrome need a less intense work schedule. Working them at high speeds, over jumps or on ground will exacerbate the lameness. It is preferred to work on softer ground and lighter intensity. That being said, horses with navicular disease do benefit from regular turn-out which helps improve circulation to their feet.

### **Medication**

We often prescribe a non-steroidal anti-inflammatory drug (NSAID) to decrease the degree of foot discomfort. The standard NSAID veterinarians offer is phenylbutazone (Bute), which works well in mild to moderately affected horses. There are some side effects to chronic Bute use, however, including gastric ulcers. Firocoxib (Equioxx/Previcox) is an anti-inflammatory drug that is commonly used as it can provide similar anti-inflammatory/pain suppression qualities to Bute, but without the negative side effects on the stomach and kidneys.

Vasodilators may also be prescribed which improve the blood flow into the vessels of the hoof. Examples include isoxsuprine and pentoxifylline.

Your veterinarian might suggest is corticosteroid mixed with hyaluronic acid joint injections directly into the affected areas: the coffin joint or the navicular bursa. The goal is to reduce the inflammation in the foot and provide a better degree of soundness for a period of time. A veterinarian might base his or her choice of navicular bursa versus coffin joint injection on preference, clinical signs, or a specific diagnosis. The steroids generally take about 10-14 days to produce noticeable improvement, and you can generally expect three to 12 months of soundness depending on disease severity.



There are some new products that are specifically labeled for navicular disease... biophosphonates. OsPhos and Tildren are both injectable bisphosphonate solutions for the control of clinical signs associated with navicular syndrome in horses four years and older. OsPhos and Tildren both inhibit bone resorption (disappearance) by inhibiting cells called osteoclasts. Osteoclasts grab onto calcium crystals which comprise bone and dissolve them. By stopping osteoclast activity, OsPhos and Tildren slow bone degradation. Both were approved for treatment of navicular disease in 2014.

Clinical trials conducted by Dechra in order to comply with FDA testing requirements found that 75% of horses treated with OsPhos showed a significant reduction in lameness by 56-days post injection and 67% of horses treated with Tildren improved. There are minimal side effects. One in 10 horses showed signs of abdominal discomfort (pawing, fidgeting, cramping) about 2 hours post-injection, but got over it after a 15 minute walk. Some were given a dose of Buscopan but none had serious or lasting reactions.

OsPhos is administered as three 5 cc intramuscular injections given in three locations on the body all at once. Tildren is given by a veterinarian through an IV catheter slowly over 90 minutes or by IV regional perfusion in the legs. They can be given every 6-12 months depending on the severity of the lameness, but ultimately should only be repeated as needed when signs of lameness recur. Some horses may only need it once, while others many need it two or three times per year. At our clinic, OsPhos costs \$420 per treatment while Tildren is \$1,200. OsPhos shows similar results to Tildren in terms of reduction in lameness and in time of onset. Tildren definitely exerts a long term effect, with many owners reporting that it reaches full performance 3 months following administration and continues to work for years thereafter. OsPhos can take up to 7 weeks for full affect to be achieved. Over the last few years, we have had good success with OsPhos so far and has improved the majority of horses diagnosed with navicular disease.



Another treatment sometimes offered by veterinarians is shock wave therapy. Clinicians aim to provide pain relief and improve tendon and ligament injury healing. Veterinarians apply it directly over the heels and coffin joint as necessary and conduct three to six treatments, two to three weeks apart. Currently, we do not offer this treatment at our clinic.

We do; however, sometimes prescribe intramuscular glucosamines, like Adequan. It has been shown to decrease pain in horses with navicular disease, but this effect wanes after discontinuation of therapy. Oral glucosamines (Cosequin, *GLC*) may have a similar effect. We usually use this supplement in combination with another treatment modality and not alone.

### **Surgery**

Palmar digital neurectomy ("nerving") is commonly the last resort treatment option if the other treatments are either no longer affective, cost-prohibitive long term, or not enough to get the horse sound or the horse's quality of life is an issue. Surgeons can treat navicular disease by performing a neurectomy (severing the nerves supplying sensation to the back of the foot). This generally produces soundness in the foot; however, there are some drawbacks (e.g., DDFT rupture, neuroma, nerve regrowth) that make this option a salvage procedure reserved for when medical management fails. A neurectomy can provide pain relief and even return to athletic function, but generally only for a three- to five-year period.

### **Prognosis**

The prognosis for a horse with navicular syndrome is guarded. Many times the horse does not return to its former level of competition. Others are retired. Eventually all horses with the syndrome will need to lessen the strenuousness of their work, but with proper management, a horse with navicular syndrome can remain useful for some time.