Delayed Patellar Release

(Also described as: intermittent upward fixation of the patella (IUFP), upward fixation of the patella (UFP), ‘stifled,’ catching stifles, locked stifles, sticky kneecaps…)

Horses, as we all know, have many special abilities. Among the less dramatic, but no less important, of these abilities is their ability to sleep standing up. Horses have a complex system called the passive stay apparatus that allows them to do this while using minimal muscular effort. One of the keys to this system is the ability to lock the kneecap (patella) in place, which keeps the stifle extended. Normally, the horse can lock and unlock the patella with no resistance. Horses affected with delayed patellar release (DLP) have an alteration to their hind limb movement that can affect performance.

Anatomy

Without the passive stay apparatus, the quadriceps muscle would be in constant use. Figure 1 shows the alignment of a normal stifle, which is analogous to the human knee. Imagine standing with your knees bent at this angle and trying to relax, or even rest one leg the way a horse does. We would fatigue very quickly in this position. Humans minimize muscular effort at rest by bringing our knees back so that the thigh and shin are in a straight line. This takes minimal muscular effort to maintain, and allows the downward forces to travel straight through the bony column.

Horses have three ligaments connecting the patella to the tibia (shin bone), while humans and most other species have one ligament right in front. The end of the femur (thigh bone) in horses and in humans has a smooth, cartilage covered, pulley-shaped structure at the lower end where the patella glides. This structure is called the trochlea (which means ‘pulley’ in Latin). In horses, the groove and the ridges are fairly pronounced (Figure 2) when compared with other species, which is part of the reason why patellar luxation (where the patella slips out of the trochlear groove to the side) is not common in horses except the miniature horse. The top of the medial trochlear ridge in the horse is very pronounced, giving the patella a place to latch on.

The medial patellar ligament is connected to the patella with a flexible extension called the parapatellar fibrocartilage. This is the portion that actually ‘locks’ onto the prominent medial trochlear ridge of the femur. (Figure 3)
In the normal situation, the patella is pulled up by the quadriceps and to the side by the biceps femoris muscle, allowing the patella to move instantaneously off of the medial ridge. (Figure 4) In affected horses, there is some degree of hesitation as the patella moves off of the ridge. This can be subtle, to the point where it is difficult to detect. It can be extreme, where the stifle becomes locked and the horse is unable to flex the leg at all. Far more commonly, the condition is somewhere in between, where there is some degree of notable hesitation.

Affected horses show signs more significantly at the start of exercise, and in milder cases may move completely normally once warmed up. Common signs include stumbling in the hind end (which can lead to stumbling in the front end and occasionally falling). This feels as though one of the rear ‘corners’ drops out from under the rider. Horses may have difficulty cantering in one or both leads, and often have very awkward canter-trot and canter-walk transitions. Horses may become hesitant performing jobs that they had previously performed with ease.

This gait abnormality is caused by a mechanical abnormality with varying degrees of pain. In contrast, the gait abnormalities seen with bone spavin or ringbone are primarily caused by pain. Horses with only a mechanical component will not respond to anti-inflammatories, and do not ‘block out’ with nerve blocks or joint blocks. If a horse does have a pain component, it is important to determine whether the stifle is the entire source of pain, a partial contributor, or non-painful.

**The Chicken or the Egg**

Horses with delayed patellar release often have lameness originating from the hind limb. Delayed patellar release itself can lead to lameness in the stifle: the increased friction of the patella against the trochlea of the femur can cause joint inflammation, and the patellar ligaments are sometimes strained. The joint inflammation can be treated, but unless the delayed patellar release is resolved, the lameness component will continue to resurface as a problem.

It is also common to have a lameness problem somewhere else in the limb, such as the hocks, which can be a contributing factor in the development of delayed patellar release.
Because there can be a mixture of factors occurring at the same time, it can sometimes be difficult to determine which is the ‘chicken’ and which is the ‘egg.’ In these cases, treatment directed at several areas may be necessary to resolve the issues.

**Causes**

Upright conformation (Figure 5) through the stifle is an important risk factor. This causes the patella to sit higher above the trochlea, and for the prominent medial trochlear ridge to be directed somewhat more forward instead of mainly upward.

Overlong patellar ligaments have also been blamed, with the possibility of strain and repeated stretching as a potential risk factor.

Decreased muscle tone in the quadriceps muscles is known to be a factor. The other muscle that is important for patellar function is the biceps femoris, which helps to pull the patella to the side, releasing it from the trochlea.

Lack of fitness is often blamed as the cause. While unfit horses are definitely at risk, it is also not uncommon to see very fit horses affected. However, these fit horses often have what could be considered a hidden fitness issue: decreased or altered range of motion in the hind limb. Horses with an altered range of motion probably do not develop normal coordinated movement in the quadriceps and biceps femoris muscles.

**Contributing Factors**

- **Lack of fitness** - This includes rapidly growing horses that have not developed the muscling and coordination to fit their bodies yet. Retired and other sedentary horses comprise another group at risk. Horses in lay-up for an injury will sometimes develop delayed patellar release as they are starting back into work. The common thread is decreased muscle tone.

- **Concurrent lameness** - Horses with lameness issues, particularly originating in the hind end and/or back, may develop delayed patellar release. Horses with sore hocks, for example, often have an altered range of motion, sparing their hind ends. This limited effort from the hind end probably causes deconditioning in the quadriceps and biceps femoris muscles.

- **Neurologic disease** - Wobblers and horses with other causes of neurologic disease can be affected. Neurologic disease can contribute directly and indirectly to delayed patellar release. If the nerve supply to the quadriceps or biceps femoris is affected, there is a direct effect on patellar release. Neurologic horses often lose overall muscle tone and coordination as well.

- **Training factors** - Fatigue is thought to contribute to delayed patellar release, particularly in young horses. Horses that use the hind end heavily, such as in cutting and dressage, particularly if in heavy training, may become fatigued. Fatigue may lead to uncoordinated movement. These are the classic horses that do not fall into the ‘unfit’ category. Some believe that these horses may be affected because of stretching of the patellar ligaments.
Horses with jobs that limit motion may also be affected. Western pleasure horses are often trained without doing any significant extended trot. This limited range of motion can contribute to delayed patellar release.

Keeping the horse in an ‘inverted’ or ‘hollowed out’ position during exercise are also thought to lead to poor patellar function.

- **Mechanical factors**- Hind foot balance is an often-overlooked factor. Horses with a long toe/low heel conformation in the hind feet have an altered footflight: stride length does not tend to be affected, but the forward part of the stride is exaggerated and the back part of the stride is limited. These horses tend to overreach or forge, and tend to stumble. This alteration of range of motion probably changes the development in the quadriceps and biceps femoris muscles.

  Horses with this conformation often have a bullnosed appearance to the foot. When viewing the horse from the side, imagine a line following the coronary band of the hind foot up to the front leg of the horse. This line should hit around the chestnut of the front limb. In affected horses, this line will hit closer to the elbow or even back to the girth area. Some horses, when standing squarely on hard footing may be seen to have their heels slightly off of the ground. Some horses appear to have normal foot conformation when viewed from the side. X-rays of the hind foot (figure 6) can define the angulation of the coffin bone most precisely, and can be used to measure sole depth. Often, this can be corrected through trimming alone. At times, if sole depth at the toe is minimal, wedges can be used.

- **OCD**- Osteochondrosis in the stifle can affect the gliding surface of the patella. Osteochondrosis dissecans (OCD) is a condition where the cartilage and underlying bone on the surface of certain joints develops abnormally. The trochlear ridges of the femur and sometimes the patella itself can be affected in the stifle.

**Diagnosis**

In severely affected horses, diagnosis is obvious: the hind leg gets completely stuck in extension. Far more commonly, the patella is not completely locked, but hesitates in release, causing a gait abnormality that varies from barely perceptible to relatively obvious. While observing the horse at rest, rocking the hind end from side to side causes the stifle to engage and disengage. Affected horses have a snapping movement to the patella that can be seen, felt, and occasionally even heard as a ‘clunk’ as it snaps back into place.
While watching the horse in movement, affected horses tend to have a mechanical movement in the hind end at the walk. Some will drag the hind toes. Some affected horses move well at the trot, although there is sometimes an exaggerated snapping movement that can be seen along the Achilles’ tendon at the attachment to the hock. Some affected horses may prefer the trot to the canter. The canter may be affected in one or both leads, and may appear awkward or mechanical. Canter-trot and canter-walk transitions are often very awkward in affected horses.

Because delayed patellar release is primarily a mechanical issue, nerve blocks and joint blocks typically do not change the patellar function. However, lameness is often present, so it is important to determine the source(s) of lameness, whether the lameness is a cause or a result of delayed patellar release.

X-rays of the stifle are helpful to rule out OCD and other bony abnormalities in the stifle. Radiographs of the hind feet are also useful to measure angles if low heels are a potential contributing factor.

Ultrasound can be useful in evaluating the patellar ligaments and other soft tissue structures of the stifle, including subtle OCD lesions not visible on x-rays.

**Treatment**

- **Conditioning** - In some horses, resolution of delayed patellar release can be as simple as improving fitness level. This is often effective in horses that are obviously out of shape. Conditioning exercises are important for all affected horses, but exercise alone may be inadequate to resolve the issue in many horses. Helpful exercises include extended trot, trotting up hills, trotting over poles, and (with the right horse and a Western saddle) dragging objects such as hay bales or railroad ties.

- **Resolution of underlying issues** - When possible, underlying lameness issues should be resolved. Similarly, horses with neurologic disease will typically improve if the neurologic disease is treatable. Horses with low heel angles should have their balance corrected.

- **Hormone injections** - A series of injections of estrone sulfate (similar to estrogen) can be used to treat the condition. Estrogen causes relaxation of ligaments. One theory is that these injections relax some of the pelvic ligaments, altering the angulation of the pelvis and stifle. Another theory is that the patellar ligaments themselves relax. In some horses, this can be a very effective treatment. Disadvantages include the need for repeated injections and hormonal behavioral changes, particularly in mares.

- **Internal blistering** - Injections of Iodine in oil in the medial patellar ligament or the medial and middle patellar ligaments can be an effective treatment.

- **Medial patellar ligament transection** - In this procedure, the medial patellar ligament is cut all the way through. This procedure has fallen from favor with most veterinarians because of the potential for development of arthritis in the joint and/or fragmentation in the patella due to rotation of the patella relative to the trochlea. This is the treatment of last resort for most veterinarians, reserved for those rare severely affected horses that become completely locked and do not resolve with other treatments.
• **Medial patellar ligament splitting**- In this newer procedure, instead of cutting through the ligament, multiple very small incisions are made into the ligament parallel to the fibers. This procedure is considered much safer for the joint than complete transection. This procedure was initially only done under general anesthesia, but some veterinarians prefer to perform the procedure with the horse standing under sedation.

• **Joint therapy**- Because many horses develop inflammatory joint disease from the increased friction in the joint, treatment for joint disease can be helpful. As with other joint issues, there are many levels of treatment. Because the inflammation is often not arising from the cartilage, but with the tissue that produces the joint fluid, IV hyaluronic acid (Legend®) can be effective, particularly in mildly affected horses. Joint fluid in an inflamed joint becomes watery, and is a less effective lubricant. Horses with lameness originating from the stifle may benefit from injections into the joint itself. The use of nutraceuticals may also be of some benefit.

**One clinic’s approach to treatment**

At our clinic, the typical approach to treatment for a horse with delayed patellar release is to define as many risk factors as possible, including underlying lameness, neurologic, or shoeing issues, and attempt to remedy these. Depending on the severity, some horses may do well with conditioning exercises once the underlying issues are resolved. Horses affected more significantly will be started on intravenous Legend® and sometimes intramuscular Adequan®. Horses with stifle lameness may also receive stifle injections. We have moved away from hormone therapy and iodine injections, in favor of the patellar ligament splitting procedure, which we feel is very safe and very effective. We prefer to perform the procedure with the horse standing. Arthroscopic surgery is typically recommended for horses with OCD lesions.

**Conclusion**

Although delayed patellar release is a relatively common cause of decreased performance in horses, most cases can be treated effectively, allowing horses to return to full performance.

Image sources: Figures 1, 2 (left), 3, & 4: Sisson and Grossman’s Anatomy of the Domestic Animals. Figure 2 (right: Michigan State University School of Veterinary Medicine. Figures 5 & 6: Steinbeck Country Equine Clinic.

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