**Stifle Lameness in the Athletic Horse**

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The stifle joint must be considered in any hind limb lameness. The complex nature of this joint in the horse can result in many potential issues. The stifle has major function in hind limb locomotion and is subjected to many stresses while functioning to support the horse. Careful and objective assessment is necessary in establishing a diagnosis of stifle related lameness. Many conditions, especially if detected early in their course, may prove very manageable.

**Anatomy**

The stifle is a complex joint composed of four bones, two menisci, and fourteen ligaments. It is a high motion joint functioning in multiple planes of flexion, extension, and rotation.

The patella provides a point of attachment for major extensors (quadriceps femoris) of the joint and the patellar ligaments tie this function to the proximal tibia. The three patellar ligaments provide distal attachment for the patella while two small femoropatellar ligaments more proximally stabilize the patella within the femoral trochlear groove medially and laterally. The medial patellar ligament attaches to the medial and distal borders of the patella through the parapatellar fibrocartilage. With contraction of the quadriceps femoris muscle, this fibrocartilage can hook over the medial femoral trochlea locking the joint in extension. This is an integral part of the reciprocal apparatus that allows the horse to rest while still standing with no muscular effort. Subsequent contraction of the quadriceps and pull by the tensor fascia latae will release the joint from extension. The medial and lateral menisci are anchored cranially and caudally by meniscotibial ligaments and a meniscofemoral ligament on the caudal aspect of the lateral meniscus. The menisci cradle the medial and lateral femoral condyles in cup-like fashion to allow for smooth articulation and shock absorption as they slide cranially in extension and caudally in flexion. The medial and lateral collateral ligaments and the cruciate ligaments (cranial and caudal) firmly connect the femur and tibia/fibula.

There are three distinct joint compartments within the stifle joint and these can have significant ramifications relative to diagnostics and therapy of this joint. Cranially is the femoropatellar joint (FP) with a suprapatellar pouch and medial and lateral recess adjacent to the trochlear ridges. Cranial to the joint, proximal and distal to the patella, a large fat pad is present. This structure can be inadvertently injected compromising diagnostic anesthesia and medication responses. Medially is the medial femorotibial pouch (MFT) that variably communicates with the FP. Laterally is the lateral femorotibial pouch (LFT), and it less commonly communicates with the other joint.
spaces. There is some evidence that diffusion of anesthetic can occur between all compartments in some horses. The separateness of the joint compartments may require multiple injections in diagnostic anesthesia and therapeutic applications. Some surgeons advocate breaking down the separations between these compartments during arthroscopy as this may provide some long term benefit in chronic stifle conditions. Development of a communication of the compartments sometimes occurs secondary to severe trauma of the joint.

**Function**

As is commonly known, the stifle functions in the reciprocal apparatus that allows the horse to stand with minimal muscular effort. The superficial flexor tendon on the caudal aspect of the limb connects the femur and the calcaneus thus extending the hock with extension of the stifle. The peroneus tertius tendon arises on the lateral aspect of the distal femur and attaches distally to the proximal metatarsus. Subsequently, flexion of the stifle results in flexion of the hock joint. Injury to this tendon may occur as the result of hyperextension of the hock and stifle. As a result, the two joints may function somewhat independently, producing a dimpling of the gastrocnemius tendon and lack of hock flexion on flexion of the stifle.

As stated previously, the stifle functions in rotation in addition to the more commonly recognized flexion and extension. This provides for improved adaptation to changes in terrain and forces exerted on the hind limb while turning or stopping abruptly. However, such forces that can occur while functioning in an athletic fashion can contribute to strain on the ligaments and joint capsule that lead to gonitis (inflammation). Torsion may create shear forces on the menisci resulting in damage to these structures. Milder chronic injuries to these soft tissues no doubt contribute to development of osteoarthritis through repetitive trauma as time goes on. Recognition of soft tissue injuries early in their progression may go a long way in prolonging the health of the stifle joint.

The stifle is placed under considerable strain in both the English and Western performance horse. Not only is the stifle joint critical in propulsion of the horse forward but it is an essential mechanism in deceleration and directional change. The speed and vector forces from the horse’s body mass in athletic performance results in profound energy that can negatively impact the stifle joint under load-bearing.

**Lameness Evaluation**

Localization of lameness to the stifle can be challenging. While often a cause of hind limb lameness, conditions of the stifle are less frequently encountered than other issues such as distal tarsitis or suspensory desmitis. Various manipulative tests, while not conclusive, may aid in identifying the stifle as the source of lameness. Full limb flexion may suggest involvement of a joint in the hind limb but little else, and positive response to upper limb flexion may suggest something at the hock level or above. A stifle flexion test, where the hind limb is held behind the horse with the tibia parallel to the ground and the hock in relatively less flexion, may prove useful for indicating pain associated with
the stifle joint. Abduction of the limb, subsequently stressing the medial collateral ligament, may prove painful in horses with injury to this ligament, the medial meniscus or hip joint. Adduction of the limb across the ventral midline from the opposite side of the horse may also indicate pain in the stifle but cannot be considered specific. The cruciate test, as described by O. R. Adams, may indicate cruciate ligament instability, but can be difficult to perform in the painful or nervous horse. Likewise, upward pressure on the patella may induce upward fixation or lameness in some horses affected with problems related to the patella, but again may prove difficult to perform in painful or nervous horses.

To determine conclusively that the stifle is the source of lameness, intra-articular anesthesia is necessary. Each joint is best anesthetized, but because of potential communication, the author will generally choose the femoropatellar or the medial femorotibial joint space for an initial block. Large volumes of anesthetic are advisable, such as 20-30 ml of mepivicaine\(^a\) and waiting as long as 30 to 45 minutes to assess results is recommended. Many conditions, such as subchondral cysts and severe meniscal injury may not become completely sound. The key is to look for significant improvement.

Radiography may indicate a number of problems; however, many soft tissues issues, especially in their early stages, may be overlooked. Osteochondrosis, fragmentation of the patella, femoral condylar cysts, and enthesiopathies of ligamentous attachments may be viewed in many cases with radiography. Subtle changes in ligament attachments may be indicators of more serious soft tissues injuries to the menisci. With regard to enthesiopathies, digital radiography has greatly enhanced our ability to evaluate the stifle. Multiple views of the stifle are essential to properly evaluate the joint. In addition to the more commonly used lateral to medial and caudal to cranial views, a caudal lateral to cranial medial oblique view and a flexed lateral to medial view may give valuable information and are simple to perform. A proximal to distal skyline view of the patella and distal femur can yield important information as well. Today’s digital radiographic systems allow for excellent radiographs using a relatively low powered portable x-ray generator in field or clinic use.

Ultrasound examination of the stifle has proven to be a valuable tool in evaluating conditions within this joint. Such examination takes practice but is an essential tool in the lameness clinician’s diagnostic armamentarium. Injuries and disease of multiple ligaments, the menisci and the joint surfaces may be viewed. An 8 MHz linear probe is most often used by this author for evaluation of the stifle joint.

Nuclear scintigraphy is less useful in the evaluation of stifle lameness than with some other joints. Extreme uptake of radioisotope in the medial femoral condyle may indicate cyst formation; however, these may go undetected. Likewise, osteochondrosis of the femoral trochlea may variably show increased uptake. Severe osteoarthritis will often result in increased radioisotope uptake within the joint but may well have been detected with radiographs or ultrasound.

\(^a\) Carbocaine, Pfizer, NY, NY
Conditions

Numerous conditions that can produce lameness and affect function are recognized in the stifle of the athletic horse. The more commonly encountered conditions are:

1. Osteochondrosis and Osseous Cyst like Lesions
2. Upward fixation of the patella
3. Meniscal injury
4. Desmitis of the collateral and patellar ligaments
5. Cruciate ligament injury
6. Articular cartilage injury
7. Gonitis and osteoarthritis

The previously mentioned conditions and potential therapies for each will be discussed in the remainder of this paper. Although fractures of the stifle are not infrequently encountered, the therapy and surgical management of these injuries will not be discussed except as they apply to the above mentioned conditions.

Osteochondrosis and Osseous Cyst-like Lesions

Failure of proper bone formation can result in abnormal subchondral bone that results in defects at or under the joint surface. Such defects often appear as incomplete ossification and subsequent fragments of the femoral trochlear ridges, more commonly on the lateral ridge. Subchondral defects on the femoral condyles are not infrequently encountered and some may be a form of osteochondrosis. Such defects may appear only as a small depression on the condyle or extend to a large interosseous cyst. While some of these defects may be due to osteochondrosis, there is no doubt that some are secondary to trauma.

Lesions that are a product of true osteochondrosis may go undetected in the athletic horse until it reaches a stage of work sufficient to stress the stifle joint. In the English sport horse this could be until the horse is five years old or greater. Osseous cyst-like lesions of the medial femoral condyle may develop in older horses, and this author has seen acute lameness associated with these in horses greater than 12 years of age.

Joint surface defects result in instability and a constant source of irritation and wear and tear on the joint. Secondary osteoarthritis may develop if such lesions are not detected early in the course of causing inflammation. Moderate FP effusion is often seen with osteochondrosis of the femoral trochlea. Effusion of the MFT is frequently encountered in cases of medial femoral condylar lesions. Abnormalities of the medial meniscus are frequently detected with ultrasound in conjunction with lesions of the medial femoral condyle. While many lesions of the medial femoral condyle may be detected with radiography, some are only evident when viewed with ultrasound.
Upward Fixation of the Patella

Upward fixation can be complete resulting in a limb that is locked in extension with only the fetlock flexing distally. The condition may also present as an intermittent or delayed release of the patella that can affect the horse’s motion. The intermittent form is more common, and is frequently evident after periods of inactivity when the stifle appears to catch briefly as the horse initially moves. This phenomenon may also be observed as the horse makes a downward transition from the canter to trot, or trot to walk, resulting in a jerk or “collapse” of the hind limb momentarily following extension of the limb in slowing the gait. Some horses with more severe upward fixation can be forced into locking the stifle by backing up. Some cases can be induced to lock by upward pressure on the patella with the limb in extension, although this can be hard to accomplish in a horse that is painful or nervous. Horses with gonitis from other sources may be more inclined to develop upward fixation.

Immaturity and lack of fitness are frequently seen in association with this condition. Horses that have been previously unaffected may develop upward fixation following long rest periods related to other illness or injury. Recurrent upward fixation can be irritating to the joint and may produce secondary inflammation and subsequently osteoarthritis if left unattended.

Meniscal Injury

Trauma and inflammation related to the medial and lateral menisci are probably much more common than once thought. Chronic repetitive trauma to these structures may produce low grade lameness and minimal joint effusion, while more serious injury can produce overt lameness and severe effusion. Acute trauma may result in tears in the meniscus or strain of the ligamentous attachments. Radiographic lesions are not always detectable. More chronic cases may demonstrate lytic areas at the attachment of the cranial and caudal ligaments but these may be easily overlooked. Dystrophic mineralization may occur within the meniscus, especially in joints that have been repeatedly injected with corticosteroids. Chronic lesions of the menisci frequently accompany osseous cyst-like lesions of the femoral condyles. Injury to the medial meniscus is more common, but this author has seen numerous cases of lateral meniscal injury in jumping sport horses.

Ultrasound examination is the best non-invasive tool for evaluation of the medial and lateral menisci. It is relatively easy to evaluate the menisci with practice. The greatest challenge is determining the difference between real lesions and artifact. Mild trauma may respond to rest and intra-articular therapy. Persistent lameness, with lameness reduced or eliminated by intra-articular anesthesia and suspicious findings on ultrasound is justifiably investigated with arthroscopy. Delaying surgical intervention on meniscal lesions may lead to serious osteoarthritis.
Desmitis of the Collateral and Patellar Ligaments

Acute stress on the stifle joint may result in strain of the medial and lateral collateral ligaments of the joint. In the author’s experience, the medial ligament is most often affected presumably from torsion or abduction of the limb. Injuries of the lateral collateral ligament have been seen in conjunction with fractures of the head of the fibula as might occur from a fall on the side or a kick wound. Strain of the patellar ligaments can result secondary to extreme flexion of the joint and is most often seen in higher level jumpers.

In any case of acute trauma of these more superficial structures, edema and some joint effusion will usually be present. Lameness can be variable but will often be quite significant initially. Flexion tests are typically positive and the horse may have an “on the toe” stance. Symptoms usually improve within a few days unless there is significant instability of the joint. In cases of serious medial collateral ligament injury, abduction of the leg may be quite painful, and positioning the leg for a stress radiograph in this fashion may demonstrate an increased joint space on the medial side.

Ultrasound examination can be conclusive for these injuries. Examination of the medial collateral is very simple because of its superficial location. The lateral collateral is a bit more difficult to image clearly but can be easily located on the surface of the fibula and followed proximally. Care should be taken to identify lesions in transverse as well as longitudinal views. The middle patellar ligament often has a slightly variable “core” that may appear as a lesion more distally, and thus confirming a lesion on longitudinal scan can minimize over-diagnosis.

Cruciate Ligament Injury

Fortunately, cruciate ligament injury is not as common as other injuries to the stifle. When affected, the cranial ligament is the more often injured structure. Lameness is usually severe and of sudden onset with variable degrees of joint effusion. Rest may improve soundness transiently with rapid return to severe lameness. Flexion tests normally exacerbate the lameness. A cruciate “drawer” test that has been described is difficult to perform and in my experience unreliable. Intra-articular anesthesia may be helpful but variable in the complete elimination of lameness. Radiographs may demonstrate fractures of the intercondylar eminence of the tibia, new bone formation or possibly lytic areas at the sites of attachment of the cruciate ligaments. Visualization of the cruciate ligaments with ultrasound can be difficult but should be attempted. Final evaluation and therapy will be via arthroscopy and debridement of affected structures. Ligaments are often found to be partially torn or degenerative, and these horses may eventually recover if osteoarthritis has not developed. Prognosis is guarded at best for athletic purposes.
Articular Cartilage Injury

Trauma to the articular cartilage can affect the joint surfaces of the femur, tibia and patella. Most often, such trauma accompanies other injuries of the joints; however, it may be found as the sole abnormality. Lameness is frequently mild but persistent. Often such horses will respond to intra-articular therapy to become lame again. Radiographs are most often negative unless there is subchondral damage while ultrasound may prove useful in identifying some lesions of the femoral condyles that are not apparent on radiography. Diagnostic anesthesia is helpful in determining the likelihood that there is a cartilaginous lesion; however, arthroscopy is necessary to confirm the diagnosis. Unrecognized articular cartilage damage can result in a progression to osteoarthritis.

Gonitis and Osteoarthritis

Mild to moderate inflammation of the stifle joint of unknown origin is quite common. The degree of lameness in these cases can vary considerably. Synovitis and capsulitis may result from athletic strain on the joint. Mild trauma to the menisci and their supporting ligaments may produce moderate synovitis, but the actual locus of inflammation can prove elusive. Because of the potential for stifle conditions to become chronic and evolve into osteoarthritis, a concerted effort should be made to determine the probable origin of the inflammation. Mild synovitis often responds successfully to intra-articular medication, but a return of inflammation and lameness most often indicates a need for further diagnostics and arthroscopy.

Intra-articular anesthesia may confirm the joints to be the source of lameness, and radiographs demonstrating significant bony changes (osteophytes, changes in the shape of the femoral condyles, dystrophic mineralization) can confirm the presence of osteoarthritis. The prognosis for such joints is usually not good in the long term and symptomatic treatment may be the best option. Newer techniques of arthroscopy and regenerative therapy may offer some hope for some of these severely affected joints.

Treatment of Stifle Lameness

As with any instance of joint related lameness, therapy can vary considerably from very palliative to major surgical and medical intervention. Sudden onset lameness with joint effusion and periartricular edema often responds favorably to rest, icing or cold hosing and the brief use of NSAIDS such as phenylbutazone. Recently developed topical anti-inflammatory therapy may be particularly applicable following acute trauma. An adequate rest period of two to four weeks may prove sufficient to avoid other more aggressive forms of therapy. The use of systemic PSGAG and sodium hyaluronate have been demonstrated to be effective in reducing joint inflammation and may benefit the stifle in cases of acute synovitis.

b Bute Tabs, Bimeda, LeSueur, MN
c Surpass, IDEXX, Greensboro, NC
d Adequan, Luitpold, Shirley, NY
e Legend, Bayer, Shawnee Mission, KN
Persistent joint effusion is a reliable sign of continued gonitis and should be handled with the long term health of the joint in mind. Determining the likely cause is important because of the significant variability of stifle injuries and possible consequences of inadequate treatment. The synovitis and capsulitis seen with mild ligamentous strain, lesser injuries to the menisci and mild articular cartilage damage often respond favorably to intra-articular therapy with corticosteroids alone or in combination with sodium hyaluronate (HA) and a rest period. Considering that the stifle is a high motion joint, it is the author’s opinion that methylprednisolone is probably not the drug of choice in acute synovitis of the stifle, but rather a product such as triamcinolone or betamethasone may be a wiser choice for the future health of the joint. The choice of intra-articular medication in more chronic cases of osteoarthritis may be much less critical. This author normally uses approximately 5-15 mg of betamethasone with 22 to 44 mg of HA per joint space in the stifle. The dose of corticosteroid is determined to some extent by the total number of joint spaces to be injected and the preference not to exceed 30-45 mg of betamethasone in any one horse. Larger joints spaces require larger doses of HA in the author’s opinion. Relatively small doses of corticosteroid properly placed within synovial cavities seem effective in reducing synovitis.

An alternative to corticosteroid/HA preparations is autologous conditioned serum (ACS). This commercial process employs the role of interleukin-1 receptor antagonist protein and other cytokines produced by white blood cells to suppress inflammation in the early stages and may actually provide growth factors that contribute to constructive healing. The horse’s own blood is used to manufacture ACS and multiple injections are given in a series over several weeks. Issues of infection and potential additional articular cartilage damage appear to be less of a concern. The therapy is more costly and will require multiple treatments; however, concern for potential side effects of corticosteroids and drug testing issues for competition doesn’t exist.

Horses that demonstrate a good initial response to intra-articular injection therapy followed by a return to lameness are candidates for arthroscopy. Likewise, those joints demonstrating obvious subchondral lesions, OCD fragments, or severe meniscal damage should be taken directly to surgery when at all possible. Surgical treatment with debridement and removal of debris may prevent development of osteoarthritis. Meniscal tears, especially if detected early, respond well to debridement and 4 to 6 months rest. Some subchondral cysts (especially in younger horses) will respond to direct injection with corticosteroids and rest (McIlwraith). Recent work in treating subchondral cysts with curettage and grafting with autologous mesenchymal stem cells shows promise for returning horses to their previous level of function (Nixon). These horses will require approximately 6 months convalescence. Following up arthroscopy during convalescence with intra-articular HA or ACS may enhance the recovery from synovitis. Additionally, periodic systemic injections of PSGAGS or HA are thought to improve joint health.

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1. Depo Medrol, Pharmacia & Upjohn, Kalamazoo, MI
2. Celestone, Schering, Kenilworth, NJ
3. Hyvisc, Boehringer-Ingelheim, St. Joseph, MO
4. IRAP, Arthrex Inc., Naples, FL
More chronic cases of osteoarthritis and cruciate ligament trauma not amenable to surgical repair have responded symptomatically to high energy extracorporeal shock wave therapy (K Allen). Such cases may achieve sufficient relief to continue some level of performance. These cases may also benefit from the judicious use of NSAIDS and other products that reduce joint inflammation.

Acupuncture and muscle relaxants such as methocarbamol may prove to be of some benefit in more chronic cases of stifle lameness as an aid in relieving muscle soreness of the croup and low back that frequently accompanies such conditions.

In the case of upward fixation of the patella, the goal is to improve quadriceps muscle tone and tension in the patellar ligaments to achieve stability and reduce the apparent laxity in the medial patellar ligament. In the younger horse, this goal may be achieved by simply increasing work that develops the hindquarter musculature. Controlled hill work and trot rails that extend the stride may prove beneficial. If there is any current gonitis, this should be addressed with systemic or intra-articular therapy based on the severity. The administration of estrone sulfate\(^1\) at 25 mg intramuscularly twice weekly has anecdotally improved this condition in conjunction with exercise. More severe cases may require the application of an internal counter-irritant (internal blister) within the patellar ligaments and in the fascia proximal to the patella. A suspension of 2% iodine in almond oil\(^k\) is preferred by this author. This procedure will cause some thickening and stiffening of the ligaments and reduce the incidence of upward fixation in the vast majority of cases in the author’s experience. An alternative to internal blister is a surgical procedure of splitting the medial patellar ligament with a small scalpel or large gauge needle in multiple sites to induce a desmitis. This may be the best choice in refractory cases. Medial patellar desmotomy should not be performed except in those cases of permanent upward fixation that stay persistently locked despite other therapies. Fragmentation of the patella can develop and lead to further lameness following medial patellar desmotomy, and therefore this procedure should be limited to only the most severe cases (McIlwraith).

**Suggested Reading**


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\(^1\) Estrone sulfate, Wickliffe Pharmacy, Lexington, KY  
\(^k\) Iodine in almond oil 2%, Wickliffe Pharmacy, Lexington, KY

Ross MW and Dyson SJ, Diagnosis and Management of Lameness in the Horse, Saunders, Philadelphia, 2003, 455-470.

