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## Sesamoid Injuries: Diagnosis, Treatment, and Prevention

*Sesamoid injuries can be difficult to repair and even catastrophic; here's what can go wrong and how to prevent it from happening*

Two little bones sitting at the back of the fetlock both amaze and confound veterinarians. The sesamoids, as they're called, anchor the suspensory apparatus that allows a horse's foot and fetlock to move properly. Yet their location and anatomy make them vulnerable to injuries that can be difficult to repair and even catastrophic.

Given the sesamoids' location, it isn't surprising that high speeds can lead to fractures and soft tissue injuries. In a racehorse, for example, the fetlock can sometimes extend to the point that the sesamoid bones actually make contact with the ground. If the pressure is too great, those bones can shatter to a point that requires euthanasia.

"Horses have two proximal sesamoid bones on each limb," says Jeff Blea, DVM, racetrack practitioner and past American Association of Equine Practitioners president. "They, together with the cannon bone and long pastern, make up the fetlock joint."

Blea explains that the sesamoids are surrounded by an intricate system of ligaments. The suspensory ligament begins at the top back of the cannon bone, runs down the cannon bone, and splits into two branches—one attaching to each sesamoid. Other ligaments connect the sesamoids to each other, and the distal sesamoidean ligaments extend down to the pastern bones. "If you look at it from a physiological standpoint, it's a highly mechanical area," says Blea. "It's an area that is susceptible to increased tension, increased force, and increased pressure."

While the sesamoids' anatomy might make them seem like an accident waiting to happen, Emma Adam, BVetMed, Dipl. ACVIM, ACVS, a PhD candidate at the University of Kentucky's Gluck Equine Research Center and former assistant to champion racehorse trainer Sir Michael Stoute, points out the remarkable way the bones facilitate a horse's movement.

"Our patella is a sesamoid bone," she says. "It is gliding over this amazing structure called our knee. In horses, the sesamoids provide a groove for these immensely strong flexor tendons, and they also provide mechanical support for this incredible unidirectional joint that sits in front of them. And they do both at the same time."

Sesamoid bones are small—about the size of a walnut—and somewhat pyramidal in shape. That alone makes it difficult for surgeons or the body itself to repair a fracture. But Adam notes other challenges.

"Sesamoid bones have a really hard time," she says, "because they don't have the blood supply that many other bones do, they don't have any musculature around them that can lend blood supply, and they don't have a periosteum (the soft, protective tissue covering bone)."

Both blood supply and periosteum help bones heal. So without them the sesamoids are basically left to their own devices.

### What Goes Wrong

Like any bone, sesamoids can fracture if overstressed. Because so many ligaments attach to them, any or all of those ligaments can also become injured. The more elements involved, the worse the prognosis.

Blea says when sesamoids fracture, they do so in one of three ways—apical (the top third), mid-body, or basal (at the bottom).

Veterinarians typically can remove an apical fragment arthroscopically (a minimally invasive surgery involving a fiberoptic camera), with a good prognosis for return to performance.

"The limiting factor regarding prognosis depends upon if the suspensory is involved and how much of that suspensory branch attachment is involved," says Blea. "If the suspensory is damaged as well, your prognosis goes way down."

Mid-body and compound (breaks through the skin) fractures usually result in a guarded to poor prognosis for return to performance, says Blea. Those horses sometimes can go on to successful second, less rigorous careers.

Blea is most pessimistic about basal fractures. "Some people are putting screws in there and having some success with them," he says. "But the difficulty is that at the bottom of the sesamoid, you have those distal sesamoidean ligaments pulling, which creates more tension."

Unfortunately, fractures can also occur catastrophically, where the sesamoids break into too many pieces to remove or reassemble. Many of these cases end in euthanasia.

Some horses in this situation can be saved for breeding or companion purposes through arthrodesis, or fusing the joint, says Blea. They will never be athletically sound, but they can be pain-free.

Horses can also develop sesamoiditis, or bone inflammation. While too much stress on the joint can cause this, so can rapid growth in young, developing horses.

Further research is needed to determine whether sesamoiditis correlates with an increased chance of future fractures. Other variables, including conformation, training regimens, and galloping speed, can be predisposing factors to sesamoiditis.

Age and breed also play roles. Adam says Warmbloods experience different types of sesamoid injuries than Thoroughbreds, likely because of body type differences and because Warmbloods destined for jumping, dressage, and eventing typically begin training later than racehorses.

"Warmbloods don't get that many sesamoid injuries," Adams says. "They typically get some changes related to osteoarthritis. They can get bony changes at the insertion of the suspensory ligament and the distal sesamoidean ligaments."

If a Warmblood fractures a sesamoid, Adam says it is usually an apical or small basal fracture. "When you've got a horse doing a canter piaffe, you can understand the amount of strain being placed on the suspensory apparatus," Adam says. "There is a lot of work going into that maneuver."

### Diagnosis Difficulties

Injuries can weaken bones before a fracture occurs. In addition, fractures might not show up immediately on radiographs because it takes time for a bone's repair work to appear. Both of those things complicate sesamoid fracture diagnosis.

Sesamoids can fool people, says Blea. If a horse comes up lame, diagnostic anesthesia (blocking) might not pinpoint the problem. "A lot of times people think it's a foot (problem)," says Blea. "They'll do diagnostic anesthesia on the foot, and the horse will go sound. So they work on the foot, and a few weeks later the horse ends up with a sesamoid fracture."

If diagnostic anesthesia does narrow the search to the fetlock and a possible sesamoid injury, yet the radiograph does not show anything, Blea recommends waiting and resting the horse 10-14 days and radiographing the area again, by which time a fracture might appear.

"You often don't diagnose (issues with) sesamoids until after they've fractured," says Blea. "You may not see any inflammation, heat, or swelling in the bone," prior to fracture.

The rehabilitation program in such cases typically starts with keeping the horse stallbound for up to 30 days and hand-walking him for up to 60 days. Blea recommends limited turnout after the hand-walking period so the horse can move around on his own, which aids the healing process. He then takes more radiographs four months after the injury to monitor healing.

### Preventing Sesamoid Issues

The ideal solution to sesamoid injuries is preventing them in the first place. Blea and Adam stress the importance of establishing a good training foundation for any athletic horse before asking for top performance.

"Sesamoids can undergo responses to training," says Adam. Bone, muscle, and ligaments get fit at different rates, however, and training regimens need to take that into account. A horse also needs to be fit to avoid fatigue, which can lead to injury. Consistent, even footing and good shoeing practices are also extremely important for keeping the fetlock area sound.

"It's important to have good medial to lateral (inner to outer) balance in the foot," says Blea.

Other standard management techniques, including providing good nutrition, play equally important roles.

Perhaps the most significant thing any owner or trainer can do is constantly monitor for signs of sesamoid injury. "Due diligence by the trainer and the vet are essential," says Blea. "Have conversations about the horse. Check the legs. Talk to the rider."

Newer diagnostic methods can also aid greatly in prevention. Such options include nuclear scintigraphy ("probably the most common way we diagnose sesamoid problems," says Blea, by visualizing bone remodeling), MRI, or CT.

Sue Stover, DVM, PhD, Dipl. ACVS, professor of anatomy, physiology and cell biology at the J.D. Wheat Veterinary Orthopedic Research Laboratory in Davis, California, and John Peloso, DVM, MS, Dipl. ACVS, owner, partner, and surgeon at the Equine Medical Center of Ocala, Florida, are researching sesamoid issues. Stover, in analyzing results from the post-mortem program in place at California racetracks, has determined that catastrophic fetlock failures account for more than 50% of the cases received. The work she is doing includes investigating radiographic techniques that could eventually lead to better and earlier diagnoses.

Peloso and others are finding that standing MRI, which does not require general anesthesia, is extremely helpful in diagnosing early sesamoid problems.

In studies Peloso uncovered two major risk factors—increased density of sesamoid bones that makes them more brittle, and problems in the opposing fetlock (contralateral limb) that cause the horse to compensate on the brittle limb.

He says using MRI to look at bone density and also for early signs of injury in the contralateral limb could catch some sesamoid damage before fractures occur.

Peloso cited a paper by veterinarians in Newmarket, England, in which they used standing MRI in racing Thoroughbreds and identified cannon bone fracture pathology in 35.8% of study cases "pre-fracture" that they could not confirm radiographically.

"The clinical signs of these injuries are very subtle and difficult to identify because they originate inside the bone below the cartilage surface," says Peloso.

### Take-Home Message

High speeds coupled with suspensory apparatus anatomy can lead to sesamoid fractures and other injuries. Fracture diagnosis can be tricky because changes aren't always evident when using traditional methods such as palpation and radiographs. Veterinarians have determined that nuclear scintigraphy, MRI, and CT are good diagnostic tools to detect problems. But nothing can prevent sesamoid injuries better than good management techniques and monitoring the fetlock consistently for the earliest sign of lameness or injury.