



EQUINE REPRODUCTION SVC

*** CLICK HERE ***

Current Articles &
Research

Reproduction
Foil Disorders
Lameness

Check back often for
new additions

Small, but mighty, bone chips can be a proper pain in the joint

It wasn't so long ago that mention of a broken-thin or a shattered—that meant a horse's demise. But with time, research, and improved imaging technology, veterinarians have determined that some fractures aren't so terrible. One such example is a classic chip fracture.

Chips, short for bone chips, are technically osteochondral fragments—pieces of cartilage-covered bone ("osteo" for bone and "chondral" for cartilage) that have "chipped" off, often times into a joint.

"Osteochondral 'chip' fragments are common in athletic horses, especially racehorses," says Robert J. Hunt, DVM, MSc, Dipl. ACVS, surgeon at Hagyard Equine Medical Institute, in Lexington, Kentucky. "With proper management, chips do not have to be either the career- or life-threatening problem that other types of fractures are."

Bones chip in a variety of ways and for a number of reasons, and veterinarians sometimes have their work cut out for them in finding these miniscule insults among the protuberances, eminences, and cuboidal bones that comprise the complex equine skeleton. In this article we'll discuss these tiny chips that can cause big pain, and, of course, what to do about them.

Why Does Bone Chip?

Horse's bones might seem like rods of steel, but even steel has its breaking point, as we learned from the Titanic. Hunt explains that there are three ways bones can fracture. In the first scenario, the bone structure fails due to momentary loading beyond its strength. This can occur due to acute trauma from getting kicked, striking a firm object, or falling down, among other misadventures. Other chips occur because the bone has weakened due to infection, neoplasia (tumors), osteoporosis (reduced bone mass), or other bone disease, making it unable to withstand normal amounts of loading. This is called a pathological fracture. Finally, an accumulation of microdamage and an imbalance between bone remodeling and resorption (bone breakdown, which is a normal part of bone turnover) can lead to a fatigue fracture. Specifically, microdamage accumulation causes excessive resorption, making the bones prone to fracture. "Fatigue fracture is the most common cause of chip fractures within joints of racehorses," says Hunt.

"The carpus and fetlock are far more likely to be victims of chip fractures than other joints." Dr. Robert J. Hunt. Chips can range in size from flakes to pebbles or even slabs of bone. As with any fracture, clinical signs include sudden onset of heat, pain, fluid accumulation within the affected joint, and lameness.

Where the Chips Lie

Theoretically, chips can fracture off the edge of any bone, but veterinarians see them most commonly in specific joints. "The carpus (knee) and fetlock are far more likely to be victims of chip fractures than other joints because of focal cyclical loading (repeated weight-bearing) on a relatively small surface area together with a high range of motion," says Hunt. "Those factors allow stress concentration and weakening of the underlying bone. Eventually, the straw breaks the camel's back, and a chip will displace from parent bone. It is generally the integrity of the underlying bone and the surrounding cartilage or other soft tissues that determine the prognosis for return to function."

Within those vulnerable joints are "preferred" locations for chipping, he adds. Some of the top locales for bone chips include:

The proximal (top) or distal (bottom) aspect of the radial carpal or intermediate carpal bones;

The third carpal bone (these can be simple chips or full slab fractures, in which the fracture extends completely from one side of the bone to the other);

The distal radius (both medial and lateral—or inner and outer—aspects);

Any one of the eminences (small, protruding areas of bone) of the proximal aspect of the first phalanx (long pastern bone) in the fetlock; and

The sesamoid bones, either of the fetlock or the navicular.

Know Your Knee Anatomy

The carpus has three separate joints: dorsal (between the radius and the first row of carpal bones), middle (between the two rows of carpal bones), and distal (between the second row of carpal bones and the cannon bone). The first row of small carpal bones includes the ulnar, intermediate, radial, and accessory carpal bones; the second row of small carpal bones are numbered and include the second, third, and fourth carpal bones. Stacy Oke, DVM, MSc

Not surprisingly, chip location can vary depending on the horse's use. In U.S. racehorses, for example, fetlock chip fractures occur most frequently in the left forelimb off the medial eminence. Veterinarians believe this is because that inner aspect of the limb is subject to high loads when the horses run in a counterclockwise direction around the track.

Scrutinizing Chips

Veterinarians have a number of ways to diagnose even the smallest of fragments. After conducting a physical and lameness examination, radiography (taking X rays) is usually the first tool practitioners reach for when they suspect a horse has a chip fracture. Veterinarians recommend taking a series of standard views of the affected joint from a variety of angles to best determine chip size, shape, and exact location. Sometimes chips are difficult to find, and it can take several X ray views to locate them. Other times fragments don't displace completely from the bone, making fracture lines difficult to visualize.

Despite its wide recognition as a soft-tissue diagnostic tool, ultrasonography is useful for diagnosing chip fractures if chips occur in lower limb joints, particularly around joint margins, says Roger Smith, MA, VetMB, PhD, DEO, Dipl. ECVS, MRCVS, a professor of equine orthopedics at the Royal Veterinary College, in the United Kingdom.

Veterinarians can also use MRI to diagnose bone chips, but this modality is less widely available, and MRI equipment is more expensive than X ray units. Similarly, CT, nuclear scintigraphy (bone scanning), and thermography are additional but far less commonly used options for detecting equine osteochondral chip fractures.

Surgery vs. Conservative Care

Treatment approach all boils down to whether the horse can live with a chip or if he'd be better off without. The answer to that problem is not always obvious.

"Information about the use of the horse, location of the chip, presence of more than one chip in a joint, more than one affected joint, size or shape of the chip, and whether there is evidence of degenerative joint disease all help veterinarians decide whether surgery is the best option or not," says Hunt.

Consider some of the following cases:

Most horses (except for elite show jumpers, due to the repeat concussion on landing) can tolerate fractures in the top (radiocarpal) joint of the knee;

Chip fractures in the lower joint of the knee will remain a constant problem for all horses except those involved in only very light work, such as infrequent trail riding;

Pleasure horses with well-rounded chip fractures (a sign that the chip has been present for some time) and no evidence of active degenerative joint disease often do not require surgery; and

Chip fractures at the proximal and dorsal (front) aspect of the first phalanx can be found in sound horses and do not necessarily cause lameness. That said, surgeons might need to remove those same chip fractures in some performance horses that are not living up to their owner's expectations.

Basically, there is no rule of thumb for chip removal. Just remember that the higher the horse's athletic level, the less tolerant the joint will be of any insult, no matter how small the chip.

Conservative options include either ignoring the problem if the chip does not cause overt lameness, or using nutritional joint supplements or other chondroprotective medications, such as polysulfated glycosaminoglycan, to help support and maximize joint health.

Surgical Options: Present and Future

If you do elect to take your horse to surgery to remove his chip(s), he will most likely be anesthetized and undergo arthroscopic surgery recumbent and on a table. Compared to arthrotomy, where the surgeon cuts the joint open with a scalpel to find and remove the chips, arthroscopic surgery involves making only two tiny incisions into a joint: one for the camera and one for the surgical instruments. The surgeon can easily locate and remove the chips using an endoscopic camera with far less trauma to the joint than with arthrotomy.

"Arthroscopic surgery is currently considered the 'standard of care' for the surgical removal of chip fractures in horses," says Alicia Bertone, DVM, PhD, Dipl. ACVS, the Trueman Family Endowed Chair and a professor at The Ohio State University.

Rarely, horses can develop complications following recovery from general anesthesia, so surgeons have been looking for ways to perform some orthopedic surgeries in the sedated, standing horse (e.g., chip fractures in the front of the fetlock joint). Benefits to standing surgery, in general, are that it permits the horse to be treated as an outpatient with lower care and anesthesia costs and shorter procedure length because there is no need for general anesthesia induction/recovery.

At this point, though, widespread use of standing surgery for routine arthroscopies does not appear to be particularly popular, primarily because most surgeons can find and remove bone chips rapidly in the anesthetized recumbent horse without any concerns about the horse moving during the procedure. Besides, as Bertone points out, most arthroscopic surgeries can be performed relatively quickly using short-acting general anesthesia.

Therefore, at this point in time, Bertone recommends early removal of chip fractures under general anesthesia in healthy horses.

"In general, I believe a better job and faster job can be done with the horse not moving under general anesthesia," she says.

The Aftermath

"The prognosis for horses that have a chip fracture removed is usually excellent," Hunt says. "Most horses return to function within three to four months after surgery, and many also return to their previous level of performance."

If surgery is not performed, the chips can remain in the joint for the remainder of the horse's life with two potential outcomes. One is that the chip might attach to the underlying bone or the overlying soft tissue and remain inert, and the second is that the chip can potentially irritate the joint and cause inflammation or degrade the articular cartilage.

"Joints are designed for frictionless motion," Hunt adds. "The opposing bones within a joint are like a lock and key, fitting together perfectly to perform their function. Therefore, any abnormality within a joint is generally not well-tolerated."

Chronic irritation and inflammation within a joint ultimately results in the development of degenerative joint disease or osteoarthritis (OA). In turn, OA can cause chronic pain and deterioration of horses' athletic careers and quality of life. Such animals will require OA management (e.g., non-steroidal anti-inflammatory drugs, nutritional supplements, etc.) for the duration of their lives.

"That said, even horses that have one or more chips removed can also go on to develop OA later in life because the 'trauma' of the surgery can also incite inflammation and initiate the development of OA," warns Hunt.

Take-Home Message

If your horse must fracture something, cross your fingers it is a chip fracture. Outcomes for chip removal are very good to excellent in most cases. And with the continued development of surgical techniques, such as standing chip removals and the use of progressively smaller endoscopic cameras, we can hope that outcomes might become even more successful and complication-free.