Orthopedic injuries account for the majority of career-limiting diseases in horses used for athletic purposes ranging from pleasure riding to high-performance sports such as jumping, racing, endurance or dressage competitions. We often hear about fractures that occur in horseracing, perhaps because the high rate of speed involved and the forces exerted on each leg tend to produce catastrophic fractures. But bone fractures can occur anywhere, even in a barn stall or a pasture.

On that fateful day when Barbaro broke down at Pimlico, one of the first things done was to apply a Kimzey splint to his fractured hind leg to prevent any further injury to it. After Barbaro’s leg was stabilized by the splint, he was then transported by ambulance to the barn where his injury could be x-rayed and the damage fully assessed. Even during the x-ray procedure, Barbaro’s leg remained in the Kimzey splint, which was designed with aluminum so it could be worn during an x-ray.

“As Barbaro stood quietly, [veterinarians] Dreyfuss, Meittinis, and Palmer flipped through the different views, getting an appreciation of just how catastrophic the injury was. Three breaks: a condylar

--- Continued on page 3 ---
In the decade of the 1970s, sophisticated orthopedic surgery and fracture repair techniques for horses was still in its infancy. The use of stainless-steel plates for long-bone fractures and the now well-known Bramlage technique of fetlock joint fusion were still in development. As those methods began to be more widely used, injured horses that in the past would certainly have been destroyed were given the possibility of life.

On the heels of these early improvements in fracture repair, those of us who were developing and employing the new techniques realized that how our patients were handled before they came to surgery was fundamental to the eventual outcome of our surgical interventions. Furthermore, what happened in the first 30 minutes after injury was perhaps the most critical determinant to the success of the operative procedures that followed.

Several of us who were involved in Thoroughbred racing in Southern California began to develop first-aid ideas and concepts for treating horses on the track immediately after sustaining an injury. The ideas came quickly once the need was identified. The problem was that we had no one with the skills necessary to construct the tools we conceived — until we met John Kimzey who had founded Kimzey Welding Works in Woodland, CA, following World War II service as a Marine infantryman in the Pacific. John was a sort of country engineer, a man who could look at a problem and figure out how to make a tool needed to solve the problem.

In a few years, his inventions dramatically changed the way injured horses were handled on the racetrack. His work in conjunction with veterinarians has been responsible for saving countless equine lives over the past 35 years.

Prior to John’s intervention, what had passed for an ambulance for horses was nothing more than an open-topped livestock trailer in most racing jurisdictions. The development of the Kimzey Ambulance began with my visit to Woodland to see if this farm implement maker could put our ideas into action. I described to John what we needed: an ambulance that could be lowered to ground level, one that had a moving interior wall that could be used to secure unstable horses and that could also load down horses on some kind of stretcher device easily and quickly. He listened carefully, asked a few questions, and told me to give him a couple of weeks to think about it.

Two weeks later, John called me and told me to come back to his shop. Upon arrival, he had a scale model of the ambulance with all its working parts to show me. I was amazed, to say the least. In two weeks, John Kimzey had developed a tool I had been dreaming about for years! I asked how much it would cost to build, he gave me a price, and with the financial assistance of the Oak Tree Racing Association that ambulance was built, delivered and immediately put to use.

That first ambulance, has been reproduced multiple times, with only slight modifications, and is in use at most major racing jurisdictions around the world to this day. An amazing feat, to say the least! Yet there is more.

As a racetrack practitioner in the 1970s, I frequently used a splinting technique for horses with fetlock and pastern injuries that had been taught to me as a student by the late Dr. J. D. Wheat. This method involved the use of a hardwood board that was wired to the horse’s shoe at the toe and then raised in such a way to flex the fetlock joint. Once the leg was properly padded and this simple board device was secured to the leg with bandage material, the horse’s lower leg injury was completely stabilized and secured. The animal could then be shipped anywhere for surgery or maintained for several weeks to allow healing to occur. The problem with this method was that, while it was a good first-step solution to many racing injuries, it took some time to apply. This meant that it could not be used on the racetrack immediately after injury, when it could prevent any further damage to the injury.

Well, as fate would have it, the day John Kimzey delivered the ambulance, I had an injured horse that needed the application of this board splint. I asked John if he would accompany — Continued on page 13
Equine Fractures
— Continued from page 1

fracture of the cannon bone; a break of the sesamoid bone in the ankle; and a comminuted—shattered—pastern bone. The pastern bone was in twenty pieces. The ankle was also dislocated. The condylar fracture had occurred first; the rest a chain reaction to the first piston out of place. God’s ultimate joke when making species; man sprains an ankle or cracks a bone, he stops and hobbles off the field. The horse—a species of flight—sprains an ankle or cracks a bone and every step compounds the injury to the point of disintegration.” (Excerpted from Barbaro, The Horse Who Captured America’s Heart, by Sean Clancy, 2007.)

With equine bone fractures, appropriate first aid immediately after injury plays an enormous role in the outcome. If the horse is forced to walk on a broken bone or is transported to a hospital without a proper splint, what began as a relatively simple fracture can become irreparable.

Bone fractures that penetrate the skin present another difficult challenge due to tissue damage and the introduction of bacteria. In Barbaro’s case, even a small nick in the skin could make it an open fracture and decrease his already gloomy odds. Some fractures damage the skin to the point where the skin loses its function as a protective layer. Again, immobilizing a fracture with an emergency splint can help prevent shattered bones from piercing the skin and compounding the injury.

Barbaro’s skin was examined and judged to be in good shape. At this point, his leg was cleaned and prepared for yet another type of emergency temporary splint designed to immobilize the leg and minimize the chances of the broken bones moving or breaking through the skin. A modified Robert Jones bandage was applied to provide more stabilization during transport to New Bolton Center for surgery. The bandage, named for a World War I field surgeon, consists of a thick membrane of rolled cotton, gauze, and splints cut from six-inch PVC pipe. The bandage is applied in layers and is about three times the size of the horse’s leg when finished.

The fact that Barbaro not only survived the initial six-hour surgery but went on to thrive for eight months afterward (challenges along the way notwithstanding) is a testament to his indomitable spirit and to optimal medical treatment and care, beginning with the Kimzey splint.

For any horse with a fractured limb, the inability to use the broken leg, along with the attendant pain, can cause considerably anxiety. Frantic attempts to use a broken leg or to regain balance can cause a horse to damage his leg beyond repair. A simple fracture can become a comminuted (compound) fracture. Movement of the broken bones’ jagged edges can irreparably damage muscles and nerves or penetrate the skin, introducing serious infection. And, arteries can stretch and be damaged to the point where blood flow to the fracture site is impaired, preventing factors necessary for healing from reaching the site of injury.

There are immediate benefits to applying a temporary emergency splint to a fractured limb. Foremost, it reduces the horse’s anxiety because it allows him to regain control of the leg even though he can put only a small amount of weight on it. Once the limb is stabilized, most horses will rest the leg rather than try to use it for support. This stabilization should be done even before taking x-rays or performing any other diagnostic procedures, as illustrated by Barbaro’s case.

Responsible horse owners will familiarize themselves not only with the most common maladies affecting the horse and their emergency treatment but with the stabilizing splinting techniques—first aid for bone fractures—presented here as well.

In the following sections, Dr. Larry Galuppo, Chief of Equine Surgery at the UC Davis Veterinary Medical Teaching Hospital, presents a discussion on emergency first aid and stabilization techniques recommended for horse owners. In the online (Zmag) version of this Horse Report, which includes a video, he demonstrates the application of a Kimzey splint, which is commonly used to stabilize bone fractures and severe soft tissue injuries of the distal limb. Other common splinting techniques are also illustrated in a chart accompanying this Horse Report. Originally presented in an earlier issue (2004), the chart has been updated recently to include some changes to the section on distal hindlimb fractures.
Lacerations (tears in the skin and underlying muscle), punctures and fractures comprise the vast majority of injuries in horses. A successful outcome for an injury requires prompt recognition of the injury and appropriate treatment even before a veterinarian arrives on the scene or a horse is transported to a hospital. To accomplish this, horse owners should be prepared for a variety of emergency situations.

With equine fractures in particular, each step of treatment, beginning immediately after injury (first aid and stabilization), is critical for improving the chances for a successful outcome. Without appropriate first aid and emergency splinting, the overall prognosis for survival can be poor. However, if emergency first aid is performed properly, the chances for a successful outcome can be increased, sometimes significantly so.

**Initial Management of Horses with Fractures**

With many fractures, damage continues to occur after the original injury due to lack of stabilization of the broken bone(s). Moreover, horses will constantly attempt to bear weight on an unstable limb. Consequently, the most important action an owner can take is to immediately immobilize the fracture site and protect the injury from contamination.

Attempt to keep the horse quiet and do not move it until the limb is adequately stabilized. If the horse is extremely distressed, it may be necessary to sedate it. If sedation is needed, use the lowest possible dose that provides the desired effect. Too much sedation could compromise coordination and reduce pain sensation, resulting in greater damage as the horse moves around. Pain relief may be provided with nonsteroidal anti-inflammatory drugs, but if the veterinarian is already on the way, it is better to wait.

If there is an open wound associated with the fracture injury, the wound should be immediately cleaned with water and bandaged to protect it from further contamination. Do not use disinfectants since some can cause tissue damage and complicate healing. Do not apply ointments or other topical medications before a veterinarian can assess the injury, because medications can impair evaluation and treatment.

If bleeding is excessive, control it by putting direct pressure over the wound. Pressure bandages for controlling bleeding should be applied before splinting is attempted.

**Stabilizing Fractures**

Fractures that do not have a wound or opening can become open and contaminated if the horse flails about or moves excessively. This is why stabilization, using an appropriate splinting technique for the fracture location, should be attempted as soon as possible. **Note that inappropriate first aid or stabilization measures can have devastating results by exacerbating skin, muscular and neurovascular trauma and destroying all potential for fracture healing.**

Preparation is the key to being successful in any emergency situation. Having the necessary emergency supplies organized and easily obtainable will greatly increase the success of treatment for all orthopedic emergencies. Typical supplies needed for orthopedic injuries include bandage material, clean wound dressings, and splints made from common building materials such as boards, PVC pipe, electrical conduit and duct tape.

**Transportation**

If a veterinarian cannot come to your horse, it will be necessary to transport your horse to a veterinary hospital for appropriate diagnosis and treatment. Transportation is extremely stressful for horses with an unstable limb; even with an appropriate splinting device, they still must balance most of their weight on three legs. Anything that can be done to improve transportation of the fracture patient will increase the chances for a successful outcome.

In some areas, commercial horse ambulances equipped with slings or other stabilization devices designed to transport injured horses may be available. Check with your veterinarian to find out if this service is available in your area.

If you are using a regular horse trailer or van, make sure that the horse is confined closely enough with partitions or with the use of straw bales to help the horse maintain its balance without using the injured leg during the transport. This will ensure that further injury does not occur.
Another good choice is a large slant-loading trailer with a low step, moveable partitions, and a ramp. Horses require a lot of room to load and unload but need a firm wall to lean on during transportation. Having a step trailer that is low to the ground or a trailer with a ramp will greatly facilitate loading and unloading the fracture patient.

Horses with either forelimb or hindlimb fractures should be loaded forward. However, when unloading, horses with forelimb fractures should be unloaded backward, and horses with hindlimb fractures should be unloaded forward. With all of the position changes required for loading, transportation and unloading, it is easy to see that a large trailer with movable partitions is necessary. Horse ambulance services are available in some locations.

Once loaded, horses with forelimb fractures should be positioned facing backward in the trailer. It is much easier for them to support their weight if there is a sudden stop. Similarly, horses with hindlimb fractures should be transported facing forward.

**Decision-Making Before Definitive Treatment**

Once the fracture patient has been temporarily stabilized, the next step is to consider the options for treatment and to determine whether the horse is a candidate. The main factors that should be considered are:

- Patient condition and temperament
- Location of fracture
- Patient size
- Open fracture grade
- Severity of the fracture
- Cost of treatment

In general, a small horse (500-700 lb) that has an excellent temperament and is in good condition with a closed, simple fracture of the distal (lower) limb has the best overall chance for survival. Large horses with highly fragmented open fractures of the proximal (upper) limb have poor prognoses for survival. Horses that have lost blood supply to the limb should be humanely destroyed.

Although there are many variables to consider for each patient, one of the main factors is cost. The cost for treatment can often exceed $25,000 in more complicated cases, so it is important to request an estimate for surgery and to discuss with a board-certified (American College of Veterinary Surgeons) veterinary surgeon the risks, potential complications, and success rate of the procedure before making your decision.

Long bone fracture repair in horses is extremely challenging and should only be attempted by an experienced veterinary surgeon in an appropriately equipped facility. ACVS-certified veterinary surgeons have the advanced training and experience to undertake these types of fracture repair.

**Conclusions**

Each step of treatment, beginning immediately after injury (first aid and stabilization), is critical for improving the chances for a successful outcome. Without appropriate first aid and emergency splinting, the overall prognosis for survival can be poor. However, if emergency first aid is performed properly, the chances for a successful outcome can be increased, sometimes significantly so.

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**What To Do If Your Horse Sustains a Limb Fracture**

- Keep the horse quiet and do not move it from the location it is in until the limb is adequately stabilized with an appropriate temporary splint.
- Provide pain relief with non-steroidal anti-inflammatory drugs only.
- If there is an open wound, clean it with water only and bandage it to protect it from further contamination.
- Control blood loss by applying direct pressure over the wound with bandages. Pressure bandages should be applied before splinting is attempted.
- For all fractures, stabilize as soon as possible using an appropriate splint based on the location of the fracture.
- Ask your veterinarian for a referral to a board-certified veterinary surgeon.
Emergency Splinting Techniques for Stabilizing Equine Fractures

**DISTAL FORELIMB FRACTURES**

Includes cannon bone, long and short pastern bones and sesamoid bone.

The goal of splinting is to align the bony column and protect the soft tissues in the fetlock and pastern from excessive compression. The splint should cover the entire foot and extend to the upper portion of the cannon bone. A commercially available splint that has been specifically designed for these injuries is the Kimsey Leg Saver. This splint is easy to apply and is very effective for stabilizing all of the above-listed injuries.

**Splint Application**

- Apply a bandage of medium thickness from the coronary band to the upper portion of the cannon bone.
- Place a board or other rigid material against the front lower portion of the limb and secure it with nonelastic tape or casting material. It is important to include the entire foot within the splint to avoid causing more trauma at the fracture site.
- A Kimsey Leg Saver can be applied in place of the dorsal splint.

**MID-FORELIMB FRACTURES**

Includes cannon bone, knee and forearm.

The goal of splinting is to realign the bony column and prevent the lower limb from moving in four directions. This is best accomplished by applying two splints placed at right angles: a caudal (on the back of the leg) splint placed from the ground to the top of the olecranon (point of elbow), and a lateral (on the side of the leg) splint placed from the ground to the elbow.

**Splint Application**

- Apply a bandage of moderate thickness from the coronary band to the highest point of the elbow. Typically, three levels of bandage are required to reach the elbow.
- Place a caudal splint extending from the ground to the point of elbow against the limb and secure it with nonelastic tape.
- Place a lateral splint extending from the ground to the elbow joint against the limb and secure it with nonelastic tape.
- The entire foot should be included in the splint to increase stability.

**MID-FOREARM FRACTURES**

Includes the forearm above the knee.

The goal of splinting is to realign the bony column, prevent movement of the bone in all directions, and protect the skin on the inside of the limb from being lacerated by the sharp bone ends. Two splints should be applied at right angles: a caudal (on the back of the leg) splint placed from the ground to the top of the olecranon (point of elbow), and a lateral (on the side of the leg) splint placed from the ground to above the shoulder to prevent lateral movement of the limb.

**Splint Application**

- Apply a bandage of moderate thickness from the coronary band to the highest point of the elbow. Typically, it will require three levels to stack the bandage to the elbow.
- Place the caudal splint from the ground to the highest point of the elbow and secure it with nonelastic tape.
- Place the lateral splint from the ground to above the shoulder joint and secure it with nonelastic tape.
- Secure the highest portion of the splint to the trunk, as shown, by wrapping elastic bandage material around the neck and chest, through the forelimbs, over the withers, and under the girth in a figure-eight pattern.
PROXIMAL FORELIMB FRACTURES

Includes the elbow, shoulder above elbow, and shoulder blade.

The goal of splinting is to fix (lock) the knee (carpus). By doing so, horses that have lost triceps function will immediately become more comfortable. Fixing the knee and aligning the bony column is best achieved by applying one splint that extends from the ground to the elbow on the caudal (back of the limb) aspect of the limb.

Splint Application

- Place a bandage of medium thickness from the coronary band to the highest point of the elbow. Typically it will require three levels to stack the bandage to the elbow.
- A caudal splint extending from the ground to the elbow point is taped to the limb with nonelastic tape.

PROXIMAL LIMB FRACTURES

Includes shoulder blade.

Splinting is contraindicated, either above or below the fracture, and could increase trauma directly at the fracture site.

DISTAL HINDLIMB FRACTURES

Includes lower cannon bone, sesamoid bone, and long and short pastern bones.

The goal of splinting, as with the forelimb, is to align the bony column and protect the soft tissues in the fetlock and pastern from excessive compression. This can best be accomplished by applying a board or other rigid material to the lower-back aspect of the limb. It is very important to incorporate the entire foot in the flexed position to avoid causing more trauma at the fracture site. A Kimsey Leg Saver splint is as effective as a plantar splint.

Splint Application

- Apply a bandage of medium thickness from the coronary band to the top of the cannon bone.
- Place a board or other rigid material to the lower-back aspect of the limb and secure it with nonelastic tape. It is very important to incorporate the entire foot within the splint to have it be effective. If the entire foot is not incorporated, it will cause more trauma at the fracture site.
- A Kimsey Leg Saver is as effective as a plantar splint.
MID-HINDLIMB FRACTURES

Includes cannon bone and hock.

The goal of splinting is to realign the bony column and prevent movement in any of the four directions (back, front and sides). This is best accomplished by applying two splints placed at right angles: a caudal (on the back of the leg) splint placed from the ground to the highest point of the hock, and a lateral (on the side of the leg) splint placed from the ground to the hock. For fractures involving the tarsal bones, the lateral splint should be bent in the shape of the hindlimb to extend the splinting device higher up.

Splint Application

- Apply a bandage of moderate thickness from the coronary band to the stifle (see skeleton). Typically, three levels of bandage are required to reach the appropriate level.
- Place a caudal splint extending from the ground to the highest point of the hock against the limb and secure it with nonelastic tape.
- Place a lateral splint extending from the ground to the highest point of the hock, or to the stifle (as in photograph), against the limb and secure it with nonelastic tape.
- The entire foot should be included in the splint.

MID-PROXIMAL HINDLIMB FRACTURES

Includes hock, tibia, fibula and stifle (gaskin area).

Splinting for fractures located above the stifle is contraindicated and could increase trauma directly at the fracture site.

Splint Application

- Apply a bandage of moderate thickness from the coronary band to the stifle. Typically, three levels of bandage are required to reach the appropriate level.
- Place a lateral splint extending from the ground to the hip against the limb and secure it with nonelastic tape.
- Secure the upper portion of the splint with elastic tape placed over the hip, through the legs, under the flank, and over the lumbar spine in a figure-eight pattern.
- It is important to incorporate the entire foot in the splint.
ACUTE TRAUMA IN HORSES:
WHAT TO DO BEFORE THE VET ARRIVES

by K. Gary Magdesian, DVM, DACVIM, DACVECC, DACVCP

After acute traumatic injuries such as fractures or wounds, horses may experience internal or external bleeding. In addition, they often experience anxiety and pain. You should have an action plan in place with your veterinarian in case an emergency does arise. Here are some general guidelines:

1. Keep your horse as quiet and relaxed as possible, in a safe, dry stall or shelter, preferably one they are accustomed to.

2. If there is active bleeding, do your best to stop or slow it with direct pressure. If it can be done safely, you can place a firm bandage on the leg. With severe hemorrhage occurring on a limb, a tourniquet may be needed above the level of the injury. This can be accomplished with the use of Vet Wrap wrapped firmly around the leg. However, the tourniquet should not be kept on for prolonged periods, just long enough for the vet to arrive. If the injury is up high in a location that cannot be wrapped, bleeding can be slowed through direct pressure. Wearing a gloved hand, use gauze or clean towels to put direct pressure on the site of bleeding.

3. If the site is not bleeding, then it should be kept clean until your veterinarian arrives. Exam gloves should be worn whenever handling the wound. Do not apply ointments or other medicatons directly on the wound, as some of these can be harmful to the underlying tissues. Sterile, physiological saline can be used to keep the tissue hydrated. The site can be gently covered and fly repellent ointment can be placed around (but not on or in) the wound to keep flies away.

4. If the horse is lame, try to prevent it from moving in order to avoid further injury.

5. Because horses may suffer blood loss and shock after a major injury, they may be experiencing low blood pressure. Many sedatives and tranquilizers can further lower blood pressure. Therefore, avoid the use of sedatives until you have talked with your veterinarian, or have an action plan in place regarding their use ahead of time. Many horses will require sedation after major trauma, but making sure they receive the appropriate drug and dose is very important.

6. Do not administer phenylbutazone ("Bute") or other nonsteroidal anti-inflammatory drugs (NSAIDs) unless prescribed by your veterinarian or until you can speak with her/him. Horses with dehydration can develop kidney or GI side effects after NSAID use.

7. If the horse does not have injury to the head or jaw and has not experienced colic, it can be offered water. Small amounts of food can be fed if the horse is not in shock. If in doubt, do not feed the horse until your vet arrives.

8. If your horse has experienced head trauma and is standing, keep the head from getting too low to the ground whenever possible. This can help to minimize the amount of brain swelling. A neutral position is optimal.

9. If the horse is down and cannot get up, the most important thing to remember is to remain safe. If the horse is struggling violently, there is often nothing you can do until the veterinarian arrives. If the horse is quiet, then leave him or her alone. If the ambient temperature is too low, the horse can be covered with a blanket. Do not feed or water a horse that is down and cannot sit up because there is a high risk of aspiration pneumonia.

10. Learning how to take your horse's vital signs is an important part of evaluating their well-being after major trauma. Go through the technique of safely taking a pulse or heart rate and body temperature with your veterinarian. As normal values vary from horse to horse, it is advisable to know what is normal for your horse. Normal body temperature in adult horses ranges from 99 to 100.8°F; pulse or heart rate ranges from 28 to 44 beats per minute; and respiratory rate ranges from 8 to 24 breaths per minute.
Frequent Flyer Switches Careers
A Case Study from the William R. Pritchard Veterinary Medical Teaching Hospital

Frequent Flyer’s career change may not have been planned, but clearly the mare had enough spunk to survive a complex fracture with significant damage to the bone and surrounding soft tissue structures. The 7-year-old Thoroughbred Morgan cross mare presented to the Equine Emergency and Critical Care Service of the Veterinary Medical Teaching Hospital for a fracture of her left fore short pastern bone. Earlier that evening she was being exercised at the canter and while on the left lead she became acutely lame in her left forelimb.

The referring veterinarian had sedated the horse, taken radiographs, splinted the injured leg with a dorsal splint, administered phenylbutazone, and referred her to UC Davis for further work-up and treatment. Radiographs showed a multifragmented, bi-articular (involving both the pastern and coffin joints) fracture of the short pastern bone.

On admission, the horse was able to bear some weight on the fractured limb because it had been stabilized with an appropriately applied dorsal splint. The photo below shows an example of the type of dorsal board splint used to stabilize Frequent Flyer’s fracture of the short pastern bone while she was transported to the VMTH. This splint aligns the bony column and protects the soft tissue structures on the back of the pastern.

Based on the radiographic exam, the fracture was determined to be complex, so contrast enhanced computed tomography (CT) was performed to evaluate the extent of bone, soft tissue and vascular injury before appropriate therapy was initiated.

Although there was significant damage to the bone and pertinent soft tissue structures, vascular supply was intact. Based on this evaluation, the prognosis for obtaining a sound performance horse was guarded at best. The owner consented to proceed with surgery, and if accurate and secure fixation could not be obtained the horse would be humanely destroyed while under anesthesia.

Using the information gained from the CT procedure, open reduction and surgical fixation of the bone fragments and fusion of the pastern joint was successfully achieved. A cast, extending from the proximal cannon bone to include the entire foot, was placed on the limb to protect the surgical repair and the injured deep digital flexor tendon. An Anderson Sling was used to ensure a safe recovery from general anesthesia.

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A complete radiographic study of Frequent Flyer’s left front short pastern bone. The complex fracture has many fragments and communicates with the coffin joint.

Left: A sagittal section of the contrast-enhanced CT exam showing rupture of the medial lobe of the deep digital flexor tendon (arrow). The sharp bone fragment on the back part of the bone likely caused the tendon damage. Right: A three-dimensional image obtained from digital reconstruction of a contrast-enhanced CT evaluation of Frequent Flyer’s fracture. The intact vascular supply is a positive factor for potential healing. It was likely spared from excessive damage because a dorsal splint was applied appropriately before transporting the horse to the VMTH.

Three-dimensional images obtained from digital reconstruction of CT evaluation of the fracture. The 3D images clarify fracture complexity and configuration, which allows surgeons to develop an optimal surgical plan for fixation.

After 1 year, radiographs showed complete fusion of the pastern joint with minimal bony reaction around the implants and mild arthritis of the coffin joint.
Frequent Flyer
— Continued from page 10

Frequent Flyer recovered well from anesthesia and, after the sling was removed, she was transported to a recovery stall. She initially appeared agitated with the cast and constantly shifted her weight on the front limbs. With appropriate pain control, this behavior diminished after 3 days and she began to appear very comfortable, bearing full weight on the fractured limb.

After 16 days, the cast was changed under standing sedation and the sutures were removed from the surgery site. The incisions appeared healthy and recheck radiographs at this time indicated good surgical reduction of the fracture.

A standing bandage cast was applied to the distal limb to protect the surgical fixation as the fracture was in the process of healing. This type of cast was maintained (being changed as needed) for an additional 9 weeks. Complete stall rest was recommended during this stage to aid in fracture healing.

After 5 months, Frequent Flyer was being hand-walked for 5 minutes twice daily and was sound at the walk. She continued to increase the amount of hand walking by 5 minutes per week with gradual increase in turnout size. Walking under tack was not begun until one year after surgery.

After one year, Frequent Flyer was being ridden at the walk and trot for 4 to 5 days per week. A mild lameness was apparent on hard ground at this time. Radiographic examination showed complete pastern fusion, with minimal arthritis of the coffin joint.

However, at this time there was persistent deep flexor tendonitis as seen on ultrasound exam. This degree of tendonitis would likely preclude her from achieving full athletic soundness as a performance horse.

Although Frequent Flyer was being ridden and had mild lameness, it was recommended that she be used for light riding only because it was likely that the deep digital flexor tendon injury would cause persistent lameness.

Frequent Flyer is currently used as a broodmare and is still getting around comfortably 4 years after the injury. ☀

Frequent Flyer with her foal.

The Anderson sling is extremely valuable to ensure a safe recovery from general anesthesia for horses undergoing fracture repair procedures.
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UC Davis Center for Equine Health

**Director’s Message**
— Continued from page 2

me for a bit while I attended to this horse, not thinking that this request would ever amount to anything but a chance for us to have an extended conversation. John became very attentive as I began the process of applying this splint. He asked what it was supposed to do, why it was applied the way it was, and how effective it was in accomplishing my goals for its use. I told him that, in spite of its primitive appearance, it worked quite well but that the only problem was that it really should be applied on the racetrack as soon after the injury occurred as possible to best serve its intended goal. This was not possible, I told him, because it took too long to apply. “Interesting,” he said. “Let me think about it; maybe I can come up with something.”

I had totally forgotten about the incident until about a month later, when a package arrived for me at the main stable gate at Santa Anita. I opened the package to find this aluminum splint, accompanied by instructions for its use and a note that said, “Try this, I think it might work.”

Think it might work! I’ll say! Today, there are probably hundreds or thousands of Kimzey Splints in use by veterinarians worldwide. How many horses has it helped save? Countless, I’m quite sure.

In the years that followed, many veterinarians would return again and again to this country engineer for help with a needed tool or device to use with sick or injured horses, and he never failed to deliver. He invented surgery tables, neonatal foal care stall boxes, instrument tables, and many other surgical devices to make the work of equine veterinarians easier and more successful. What a guy! It was my great pleasure to work with him and to know him. He is long gone now but should not be forgotten by anyone who loves horses.

**Congratualtions to Dr. Amanda Arens, Winner of 2011 Wilson Award**

This year’s James M. Wilson Award was presented to Dr. Amanda Arens for her work on equine bone fragility syndrome. The Wilson Award is given each year to an outstanding equine research publication authored by a graduate academic student or resident in the UC Davis School of Veterinary Medicine. Dr. Arens’ publication, “Osteoporosis Associated with Pulmonary Silicosis in an Equine Bone Fragility Syndrome,” was honored with the Wilson Award.

Horses from certain regions in California are developing a bone fragility disorder that results in bony deformities and spontaneous fractures. This study aimed to describe visible, radiographic and microscopic postmortem findings in affected horses and to assess any associations between the bone disorder and pulmonary silicosis (a chronic lung disease), heavy metal, and trace mineral abnormalities.

A postmortem evaluation of nine horses with the disorder and three unaffected horses was conducted. Bones and soft tissues were evaluated visibly and microscopically. Bone, lymph nodes, and lung tissue were evaluated radiographically. Tissues were evaluated for silicon levels, the presence of crystalline material, heavy metals, and trace minerals. All nine affected horses had osteoporosis and clinical or subclinical lung disease due to pulmonary silicosis (8/9) or pneumoconiosis due to dust inhalation (1/9).

All affected horses had radiographic low bone density and microscopic toxic silica dioxide polymorphs including cristobalite, tridymite, quartz, and mixed silicates. Lung and liver tissue from affected horses had elevated levels of elemental silicon. Osteoporosis was highly associated with the presence of pulmonary silicosis. No abnormalities in heavy metal or trace minerals were detected.

This evaluation indicated that most horses with the bone fragility disorder have systemic osteoporosis associated with pulmonary silicosis. The actual cause and mechanism of the bone disease is unknown. However, this study provides circumstantial evidence for a silicate-associated osteoporosis.

Dr. Arens received her DVM from UC Davis in 1999 followed by an MPVM with an emphasis on quantitative epidemiology in 2005. She is currently finishing her work on a PhD in comparative pathology with an emphasis on general pathology, bone biology and epidemiology and expects to receive her degree in December 2011.
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The Center for Equine Health is supported with funds provided by the State of California Pari-Mutuel Fund and contributions by private donors.

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