What finally doomed Barbaro was not the fracture itself, which occurred in the right foot, but severe inflammation of his left rear foot, a condition known as Laminitis.
There are many causes for the condition, but in this case it was a side effect of the surgery on the right foot. Since Barbaro couldn't put weight on his injured foot, he was standing in an unnatural position, putting extra stress on the remaining three hooves. The strain caused inflammation of the delicate tissues that connect to the hoof, the laminae.
The laminae are tens of thousands of tiny fibers that connect the horse's foot bone to the surrounding hoof. They form a fibrous mat perhaps half an inch thick, between the bone, known as the Coffin Bone, and the hoof.
"If the horse loses the connection between the bone and the hoof, it's exquisitely painful to the horse because the horse needs that connection to walk around … it's a painful condition. It's a serious condition. And it's a very difficult, long-standing problem to deal with," said Dr. Dean Richardson, Chief of Surgery at the University of Pennsylvania's Bolton Center, where Barbaro was being treated, at a press conference Thursday.
If those fibers begin to break down, the hoof can slough off, like a human fingernail. The problem for a horse is that the hoof and laminae hold the coffin bone in place. If the laminae and hoof break down, that bone can bend and twist, and even poke through to the outside, an extremely painful condition.
"A horse, for all its beauty and athletic ability, is a very fragile animal when you come down to it," said Kenneth H. McKeever, a professor at the Equine Sciences Center at Rutgers University.
Many things can cause the laminae to break down, including chemicals or poor nutrition, but in this case it appears to have simply been a question of Barbaro trying to shift his weight off his injured right leg. There is only so much weight the laminae can handle and they can break down when put under too much extra weight. This is a common condition in horses that suffer a leg injury.
"It's something we always fear when you've got a horse with a significant degree of lameness" in one leg, said Dr. Steve Adair, an associate professor of equine surgery at the University of Tennessee, who has not treated Barbaro but has followed reports of the horse's injuries closely and has treated similar cases.
It appears that doctors at the University of Pennsylvania went to great lengths to prevent this from happening, trying to keep the weight evenly distributed on all four feet, but, Adair said, it is difficult to force an injured horse to remain perfectly balanced and completely eliminate the risk of the condition.
"It's a devastating problem in horses that nobody has a solution to," Richardson told reporters Thursday.
The usual answer, Adair said, is to put the horse in a sling that keeps him in a standing position and can take some of the excess weight off all four feet. Barbaro's doctors had the horse spend part of each day in just such a sling.
But a horse in a sling suffers the same kind of problems as a human who is bed-ridden, including bedsores and intestinal trouble caused by a lack of exercise.
Nor can doctors force horses to lie down for extended periods - the animals need to stand most of the time or they can develop serious respiratory and intestinal problems.

And, unlike a human, you can't explain to them why you are subjecting them to certain treatments. Horses sometimes resist being put in a sling and sometimes try to kick off casts or the special shoes they must wear while recovering from laminitis.

"A horse is not made to lie in a bed with a leg elevated," Adair said. "He has to be standing. You have to keep him in an upright position."

A horse has the same general bones and muscles as a human, but arranged in a very different way. Where humans walk around on a flat foot with toes at the end, the horse actually walks on a single bone that is the equivalent of a human finger. What humans would know as a wrist and elbow are far up on a horse's leg.

"If you think about it, the horse is walking around on four fingers," Adair said. The laminitis, which doctors at the University of Pennsylvania described as "as bad as it gets," was so severe that surgeons removed much of the hoof on Wednesday (July 12).

Adair said this is fairly standard for treating severe laminitis, Adair said. The idea would be that the hoof would eventual regrow, exactly like a human fingernail, and develop new and healthy laminae to connect it to the coffin bone.

Ironically, the setback came as news on his severely injured right leg seemed to be good. He broke the leg in three places on May 20 while running the Preakness Stakes in Baltimore. The horse underwent a series of surgeries at the George D. Widener Hospital at the University of Pennsylvania's New Bolton Center at to secure the broken bones with metal plates and screws.

Just days before the laminitis developed, Richardson had replaced the cast on Barbaro's shattered leg, the sixth cast since the injury, and reported that the bones appeared to be healing well. The hospital described him at the time as "comfortable" and "eating well." Richardson reported that they had treated "an abscess in his left hind foot that was bothering him."

But it quickly became clear that more was bothering the horse than an abscess. The next day, the hospital stopped doing media interviews and hurriedly called a press conference for Thursday, setting off speculation that Barbaro had taken a dramatic downturn.

"He's facing tough odds and his condition is guarded," Richardson wrote in a statement released by the hospital on Wednesday.

On Thursday Richardson told reporters that he had been quite optimistic before the laminitis was diagnosed.

"If you had asked me two weeks ago I really thought, I really thought we were going to make it two weeks ago," he said.

Despite Richardson's optimism, it was clear that Barbaro's prospects always had been rocky at best because of the enormous complications of treating injuries like this.

Because a horse cannot stay off his legs for long, Adair said, leg fractures are extremely serious matters. Doctors much figure out how to heal broken bones while the patient is still using them - the equivalent of trying to treat a human with a broken leg who insisted on getting up and walking around the day after a serious accident.

That's why Barbaro's surgeons inserted screws and plates to fix the bone, Adair said. They were trying to put something in place that would bear the enormous weight of the horse while the bones heal themselves.

But even the strongest metal plates and screws have a breaking point. Walking on them

"It's a race against time," Adair said. "It's a race between bone healing and implants failing."

The second major risk for an inured horse is infection from the surgery. Barbaro had, apparently, suffered some infection, but was recovering nicely.

Laminitis is the third major complication that surgeons fear, Adair said.

Broken bones and laminitis are not in themselves life threatening, but the pain and complications of treating them can become so great that it is simply impossible to save the horse, specialists say.

Consider "the pain alone," McKeever said. "You wouldn't want to ask [suffering] that of such a magnificent athlete. It just gets more and more complex" to keep them alive in a humane way.

Adair agreed, but said that putting a horse down is never a decision taken lightly by a doctor.

"You do have to think of the humane aspect of it," he said. If "the horse is suffering, in inhumane suffering, then euthanasia is a choice. Perhaps not a good choice, but a choice."

There are drugs, such as morphine, that work on horses, but they can't block pain completely, and many cause serious side effects, he said.

In his Thursday press conference, Richardson had vowed to try everything to save Barbaro, but only as long as they could assure that he remained reasonably comfortable and pain-free.

"We are not torturing this horse … I guarantee there's no veterinarian out there whose goal in life is to inflict pain on animals," he told reporters. "We're trying to save his life."

There is no perfect way to decide when an animal has had enough, he said. It's a decision doctors have to make after watching the animal's behavior.

"If he's not comfortable, horses tell you … you look in their eye. You look for whether or not they're eating. You see if he wants to spend more time down, whether or not he's sagging," he said Thursday.

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