

ARND BRONKHORST PHOTO

Striking A Nerve: No Pain, More Gain?

Neurectomy or "nerving" a horse has long held a reputation as an unscrupulous practice, but what exactly is the surgery, and does it have an ethical place in the performance world?

By **Laura Lemon**

The tension disappeared from his eyes and, along with it, the look of disdain that Kelly White* had come to associate with this horse. Starting with those dark irises, the effect rippled and expanded. The muscles surrounding his brows and cheekbones relaxed, and it was as if he was letting out a deep breath, his face visibly transforming.

She hadn't owned him long—about a year and a half—but in that time he'd never displayed a pleasant personality, though he performed his job as an eventing partner for her husband. The gelding would kick, and he kept his ears pinned, tail swishing and mouth open while under saddle.

From August of 2018 to November of 2019, White tried to understand the horse and solve his discomfort. Prominent British veterinarian and researcher Sue Dyson, VetMD, Ph.D., DEO, DipECVSMR, FRCVS, performed nerve blocks to pinpoint potential pain, and she tried medicating his sacroiliac and distal interphalangeal joints, which did help his jumping form tremendously. But by November, White felt the horse was deteriorating.

"[He displayed] four-time stilted canter, not going forward, twisting the pelvis over the fence, split hindlimb

**Name changed to protect the horse owner's privacy.*

take-off, tapping poles, head tilting, mouth opening, ears back, tail swishing," said White. "These were all subtle and not all present at the same time. I should stress that he was not lame, that he was coping and would have passed any pre-purchase exam, but I don't like working any horse that I know is compromised and therefore wanted to try to sort out the root causes."

A thorough diagnostic work-up revealed the extent of his pain. Ultrasound indicated mild-moderate proximal suspensory desmopathy in both hind limbs, while an MRI showed osteoarthritis in the coffin joints with mild navicular bone pathology. There were no significant soft tissue injuries apparent in the front feet.

That month, he underwent neurectomy of the palmar digital nerve in his forelimbs and the deep branch of the lateral plantar nerve in his hind limbs. In the months that followed, White witnessed a metamorphosis that extended beyond his performance.

"He's a different horse all together—hugely different," said White. "I used to say that for a big horse he had a little pony, piggy eye. He would just stare at you sometimes, and you'd just think, 'He looks at me like he hates me.' That's gone. His eyes have grown larger in appearance and softer, so he doesn't look like he's frowning anymore. The muscles around the eyes have changed shape. I only assume that this is because he's no longer holding his face tense. If you've got a headache or a toothache, you kind of screw your eyes a little, don't you? I think he's just been screwing his face up for years. Now his face has actually physically altered. It is quite extraordinary.

"His muscles are mature now. He's round; you wouldn't say he's got saddle hollows at all," she continued. "He's rounder by his quarters. He's developing a little bit of a neck now. The whole topline is changing, and his abdominals are starting to look a little bit higher and tighter. The horse physically has changed, and he's starting to move like a big horse should instead of like somebody running to the bus in a miniskirt."

"He's starting to move like a big horse should instead of like somebody running to the bus in a miniskirt."

—Kelly White

These improvements were accomplished by removing sensation from the heels of his front feet and the suspensory ligaments of his hind legs. But are there ethical ramifications to such a procedure? For decades, the concept of "nerving" a horse has had negative connotations, a questionable operation performed to satisfy a human's desire to win even when it comes at a cost to the horse. But is that assessment fair given modern medical advancements? Does this surgery actually help the horse's comfort without endangering his welfare?

"He's 10 times the horse that we bought," said White. "I think there is still a lot of resistance to joint medication and neurectomy because people don't ever want to admit that the horse has a problem anyway, or admit, even to themselves, that they need to keep ongoing treatment going. You can't treat a horse once—it's a management thing. It's like painting your house; you have to keep doing it in order to keep it looking optimum. We expect horses to do all these things that they weren't designed to do. This is a moral issue here—if we're going to put these sorts of stresses and strains on them, we need to be prepared, if necessary, to manage the result of that.

"I think if you can ask yourself honestly the question, 'Is this in the best interest of the horse?' and be completely honest in your answer to yourself, 'Yes,' then to me there is no doubt," she continued. "Don't worry about what everybody else thinks, and do what's in the best interest for your horse."

THE EVOLUTION OF CUTTING

In a neurectomy, a veterinary surgeon cuts and removes several centimeters of a nerve, thus eradicating sensation to the area where that nerve was providing sensory innervation. The surgery removes the feeling of pain, but it doesn't heal or solve the underlying injury. By cutting



Neurectomy has long been a last resort for taking away pain when no other option seems to be working, but this surgery comes with some complicated ethical questions. *ARND BRONKHORST PHOTO*

out a portion of the nerve, the horse won't feel anything in that area for several years, or ever again if the nerves don't grow and rejoin.

Why remove painful sensations instead of fixing the issue? Neurectomy is traditionally a last resort for dissipating the discomfort from an unsolvable problem.

"We are far better, even historically, at making a diagnosis than treating," said Dyson. "So there are many conditions [for] which we can say, 'Yes we can diagnose.' We can diagnose, for example, navicular disease, but we cannot effectively treat it. Once the horse has gotten navicular disease, there is nothing really that will successfully treat it on a long-term basis. They say either this horse is destined to be constantly lame, or you take away its pain to enable it to work. It is a way of prolonging a horse's working life in a pain-free manner."

But there's danger in not feeling.

"The risk is that you get further injury or re-injury, and maybe you don't realize that because the pain signaling is not functioning," said Omar Maher, DVM, DACVS, DACVSMR, a lameness specialist and founder of Atlantic Equine Services, which has locations in New England and Florida. "And at that time, you have further injury to the structure."

Most people think of neurectomy in relation to the horse's hooves. Historically, neurectomy of the palmar digital nerve was a way to fix foot pain that couldn't be cured. This pain was broadly called navicular disease before technological advancements allowed veterinarians to make a more precise diagnosis.

"When I started studying veterinary medicine back in the day, when surgeons started doing this surgery, all they had access to to diagnose the source of the pain were just plain films or the traditional radiograph that had a very low diagnostic capacity or diagnostic ability," said Santiago Gutierrez-Nibeyro, DVM, DACVS, DACVSMR and an assistant professor at the University of Illinois College of Veterinary Medicine. "People would do neurectomies on horses for what they kind of thought was the source of the pain, but they really didn't [know] because X-rays and radiographs are not very sensitive to determine the source of foot pain.

"So if you have a horse with a soft tissue injury, for example a torn tendon or ligament," he continued, "cutting the nerve may have thus been contraindicated because that soft tissue injury will progress and will potentially become a full tear, and then it could potentially lead to complications."

Without sensation in its hoof, a horse with an undiagnosed deep digital flexor tendon lesion might continue to load the injured tendon until it ruptured, a catastrophic injury for the horse, and potentially one for its rider as well.

A MORE INFORMED AGE

In 1997, veterinarians at Washington State University College of Veterinary Medicine performed their first test of magnetic resonance imaging on a live horse. Since then the use of MRI technology, in conjunction with ultrasound and computed tomography scans, has increased, providing more information about the source of pain in horses and allowing researchers to better understand the cause and effect.

Gutierrez-Nibeyro said MRI is a fantastic screening

tool to differentiate between horses that will benefit from a palmar digital neurectomy versus those that require a different treatment approach. "The use of the MRI has really changed how we go about diagnosing this and selecting cases for the procedure," he said. "MRI allows us to confirm that the horse has indeed navicular disease or pathology within the navicular bone and allows us to rule out a soft tissue injury, such as the digital flexor tendonitis or tear of the digital flexor tendon. And that is what has drastically changed or has drastically decreased the complication rate of the procedure, at least the very serious complications associated with it such as rupture of the soft tissue and things of that nature."

Maher agreed, saying that before MRI, veterinarians would turn to a neurectomy earlier in the treatment process. "Now we have the advantage of having the advanced imaging that gives us more information about whether we have a bone injury that's causing pain; do we have a tendon injury that's causing pain; do we have a ligament injury that's causing pain," he said.

If the horse's hoof isn't structurally at risk, or if the patient has navicular disease or navicular pathology, that horse could thrive after undergoing a palmar digital neurectomy and return to athletic function.

> *"It is a way of prolonging a horse's working life in a pain-free manner."*
>
> —Dr. Sue Dyson

Gutierrez-Nibeyro led a retrospective study that was published in 2015 where researchers evaluated the outcome of 50 cases of palmar/plantar digital neurectomy done on horses with chronic foot pain over a six-year period. They found that 92% of the cases responded positively after surgery, with 80% returning to previous



Magnetic resonance imaging provides specific information on what type of disease or injury is occurring in the hoof, and it's allowed veterinarians to make more informed decisions on whether a horse is a good candidate for a neurectomy. *ARND BRONKHORST PHOTO*

athletic use for anywhere from one to five years. However, horses with MRIs that revealed a pre-existing deep digital flexor tendon lesion stayed sound for a much shorter period of time after the procedure.

With MRI providing more definitive diagnoses and the opportunity to learn which conditions respond most positively to a palmar digital neurectomy, the surgery is once again becoming more common, according to Dyson. "I certainly would be recommending far more now than I was, say, in the '90s," she said. "With the use of MRI, we can better select which horses are likely to be helped by neurectomy."

Though less risky, the surgery still presents potential complications. Sometimes the surgeon can't access small deep branches of nerves, which means the procedure will fail to desensitize the foot. Other times the horse may develop painful swellings, called neuromas, around the severed ends of the nerves, and these can cause lameness. This problem is treated with corticosteroids and may require another surgery. Conformation can also play a role, as poor pastern angles or hoof shape may make a horse prone to complications following a neurectomy.

The main source of complications, however, rests outside the veterinarian's hands. Depending on the details of the palmar digital neurectomy, the horse will lose partial or all feeling in its hoof. This means it won't know if it's stepped on a rock or a nail.

Gutierrez-Nibeyro said it's important that anyone responsible for a horse that's undergone neurectomy put extra care into protecting the bottom of the hoof. "That will require a shoe, and most people will use a foot pad as a way to avoid punctures, bruising and potentially abscessation agitation—all of them the horse wouldn't feel or be aware of until the infection gets pretty severe or is very advanced," he said. "Horses can still get abscesses and such, but [owners] have to be extra, extra careful or extra diligent. If there is a slight sign of lameness, they really need to check the foot."

A SOLUTION FOR SUSPENSORIES

With the exportation of race horses from the United Kingdom to the United States in the early 2000s, Dyson noticed a trend. The Thoroughbreds leaving the U.K. often had suspensory ligament injuries. Through ultrasounds, Dyson and her colleagues knew that these proximal suspensory lesions differed from other soft tissue problems in that they didn't respond to prolonged periods of rest. Yet these horses went on to have successful U.S. racing careers.

"These horses were not allowed to race on any medication here but went and ran in the USA with their suspensory ligament injuries lasting while being medicated with phenylbutazone," said Dyson. "And they did fine like that—the suspensory ligament injuries didn't get worse. So we knew that the suspensory ligament could withstand maximum loading, but it was potentially a source of pain."

Veterinarians wondered whether neurectomy could work in relation to the high suspensory when medication was forbidden.

"So then we said, 'OK, well, let's try and take away that pain by cutting the principle nerve that innervates the ligament,' " said Dyson. "And we did that and found that yes indeed it was a successful procedure. In fact, with appropriate case selection—and case selection is very, very important—we have a success rate of 78% of horses

that go back to full athletic function at the same level they were performing at previously or higher for a minimum of two years and some for considerably longer than that."

The neurectomy of the deep branch of the lateral plantar nerve differs greatly from that of the palmar digital nerve. Whereas the latter causes loss of sensation in the majority or all of the foot, when the lateral plantar nerve is cut, the horse only loses sensation in the suspensory ligament. Therefore, the nerving of the suspensory presents significantly fewer risks.

"The deep branch of the lateral plantar nerve goes directly from the lateral plantar nerve and goes into the suspensory ligament and nowhere else," said Dyson. "With the neurectomy of the deep branch of lateral plantar nerve, I think it is much less of an ethical issue because we know that it is functionally allowable, and therefore for me, if I can extend a horse's working life for several years, that has to be a good thing. But I have to select my horse carefully because if I select horses badly, either it won't work, or the horse may get worse."

The first requirement for neurectomy of the lateral plantar nerve is to rule out other potential sources of pain using ultrasound, CT scans and MRI to ensure that the horse is, in fact, only dealing with a high suspensory injury.

"I've got to be confident that there is nothing else contributing to pain and lameness that I can't also treat," said Dyson. "If the suspensory ligament is not the primary source of pain, if your horse has got some other sort of pain in the area, the surgery won't work. So we've got to be absolutely sure about that diagnosis based on nerve blocks and on ultrasonography. Then we also have to look at the horse's conformation because horses with very straight hocks—a very large hock angle where the angle on the front of the hock is 165 degrees or greater—are in my mind not surgical candidates because they have a very high risk of progressive degeneration of the suspensory ligament after surgery and will get worse."

While still not the first option for treatment, this type of neurectomy isn't a last resort either.

"We're not going to take a horse that has a suspensory injury last week to surgery this week and send him back to work a month after," said Maher. "It's always a process, and we try with conservative management, whether it is rest or biologic injections or stem cells, things like that, and rehab for a bit of time. If that does not cut it, only then, with the information we get from the imaging and whatnot, we decide if it is a suitable candidate for a neurectomy."

IS A NERVING BAN ENFORCEABLE?

Governing bodies may prohibit neurectomies, but officials struggle to police the rule, since it's difficult to test and determine, without a doubt, that a horse is hyposensitive, i.e. it has a lack of sensation or feeling.

"You can look for incisions, but further than that there is no standardized way that is legally proven and sound enough to be able to determine [the horse has had a neurectomy] for a fact," said Omar Maher, DV, DACVS, DACVSMR.

A Fédération Equestre Internationale spokesperson confirmed that hyposensitivity testing has been challenging for them. In 2018, Morgane Schambourg, DMV, MSc, DACVS/ECVS, worked with the FEI to develop the Hyposensitivity Control System.

"It is the first scientifically proven and peer reviewed testing program endorsed by the FEI," stated an FEI spokesperson. "Previously, testing for hyposensitivity was undertaken when the FEI was provided with credible intelligence that there were hyposensitivity concerns about a horse. In these cases a limb sensitivity clinical examination was carried out on the horse."

Officials started using the Hyposensitivity Control System for endurance in 2019.

"A significant number of endurance horses in the Middle East get nerve blocked in order to compete in 160-kilometer endurance races, which is why some of them sustain catastrophic fractures because they've got underlying problems, and they are being allowed or made to go despite their injuries by desensitizing them," said Sue Dyson, VetMD, PhD, DEO, DipECVSMR, FRCVS.

The Hyposensitivity Control System was based on a study led by Schambourg that utilized pressure algometry. "You can apply a known force, a measured force, to the coronary band and see when the horse shows a withdraw response," Dyson explained. "It has been demonstrated that even with stoical horses, you can see a difference between a horse that has been nerve blocked and a stoical horse. Now that might be something that can be used to detect a neurectomy or otherwise, but it hasn't been tested for that so far."

Maher, who is also an FEI veterinarian, said endurance is the only discipline with a protocol and a standardized technique to reliably recognize hyposensitivity. "For jumpers at this stage, we test mostly for hypersensitivity to make sure that the horse has not been made more sensitive to the touch and therefore [have] respect for the fences," he said. "That is what is tested—those are the only tests that are done from an FEI level for those horses as far as I know."

But he cautioned that waiting too long to perform the procedure can also be harmful.

"Horses are not like machines; you cannot decide to change a tire after three years of being in the garage," Maher said. "They need to function. They're athletes. They need to stay going. Basically, you take a middle-aged man or woman and have them sit in their room for the quarantine period, and then all of a sudden let them go out and go for a run; it's going to be difficult."

IS IT ETHICAL?

The goal for neurectomy, whether in relation to the hoof or the suspensory, is to relieve a horse's chronic pain and help it regain soundness and athletic function. For many surgeons the ethical question arises during their case selection.

"I've seen horses in which the diagnostic criteria has not been fulfilled, and people have gone ahead and done surgery, which to me, that is unethical," said Dyson. "I think you have to be sure that you know what you're dealing with."

Veterinarians should discuss what the client's goals are for the horse post-surgery.

"As long as that type of procedure is not prohibited within that type of activity, we can certainly do it," said Gutierrez-Nibeyro. "I do the procedure because I trust the client, and the client has full ownership of the horse. And I always look at it this way—if a client is looking to do a neurectomy or have a horse undergo a neurectomy, I feel like I'm probably going to be better to do that procedure than somebody else because I have the knowledge and experience, and I have done the research to find that the horse is a good candidate for this surgery or not."

Depending on the country and discipline, neurectomies may be banned by the horse sport governing body out of concern for the safety of horse and rider.

"If you nerve a front foot, some of the horses are less surefooted than they were historically because they don't feel the foot, so the safety issue comes with it," said Dyson. "I personally feel that horses with foot pain are more likely to stumble than a horse which is pain free, so I do not perceive a safety problem—but my mentors always raised that as a potential problem. And with respect to racing, this is a reason that has been given for it being

illegal, arguing that should the horse stumble and fall it could have catastrophic consequences for other horses."

Fédération Equestre Internationale officials banned neurectomies in 2009, stating that, "Horses are not eligible to compete when a limb, or part of a limb, is hyposensitive or hypersensitive (both of which constitute 'abnormal limb sensitivity')" under Limb Sensitivity, Article 1048.2.

However, the U.S. Equestrian Federation hasn't banned the surgery. "While U.S. Equestrian does not specifically prohibit neurectomy procedures in its rules, the organization does not condone or support the procedure and remains open and active in exploring new practices to methodically identify horses who have undergone a neurectomy and continue to actively compete," said a USEF spokesperson.

Dyson believes that the neurectomy of the lateral plantar nerve should not be restricted for high performance horses, as it does not pose the same risks to the horse as the palmar digital neurectomy.

"For me [neurectomy of the deep branch of the lateral plantar nerve] is non-controversial because we have done so many, and we've seen the results," she said. "It's been transformative for so many horses. I personally don't see any controversy about it at all, assuming that you make the right diagnosis.

"Horses are not like machines; you cannot decide to change a tire after three years of being in the garage."

—Dr. Omar Maher



Conformation plays a role in determining whether a horse is a good candidate for a neurectomy, and faults such as straight hocks, like those pictured here, or severe pastern angles make a horse more prone to complications following surgery. *SUE DYSON PHOTO*

"Neurectomy as a whole is allegedly forbidden under FEI rules," Dyson continued. "But the FEI has decided that neurectomy of the deep branch of the lateral plantar nerve is acceptable, so they don't police that. It cannot be reliably detected, so they have no method of policing it. And they realize that there are so many horses [that have had the suspensory neurectomy] that would leave the upper-level sport horse population that it would impact on their entries, and they also know that there are not the same potential risks as associated with de-nerving the foot."

Selling a horse post-neurectomy is another potential ethical problem.

"As long as the seller has disclosed or has made the potential buyer aware of what the horse has had, I don't think it is an issue," Gutierrez-Nibeyro said. "It would be an issue if it's not disclosed, and the veterinarian doing the pre-purchase exam finds out about it. And that's why, when I do a lameness exam for a pre-purchase, I always, if I have the option, ask the seller, 'Has this horse had any previous injuries or surgeries?' It is in their best interest for the seller to tell you, because you'll find out. It would not be any different than horses that have undergone arthroscopic procedures for OCDs or some of those joint chips that are so commonplace these days and get operated on all the time."

In certain cases, a neurectomy will allow a horse to return to work rather than being retired or euthanized.

"We are treating problems that were not going to get better on their own," said Dyson. "You can wait and wait and wait, and the hind end suspensory ligament is not going to repair adequately to withstand the loads required to be comfortable with upper-level work. So we have no alternative treatments. We're using this as a treatment of last resort, but we're also doing it knowing that in the way we're doing it, we're doing it faithfully because we're carefully selecting which patients we are choosing to do surgery on and which we are not. And so we know that despite the fact that the underlying problem is not going to go away, we also know that the likelihood of it getting worse is slim, and therefore there is unlikely to be any untoward effects of enabling the horse to work."

For White, electing *not* to do the neurectomies on her horse would have been unethical.

"The horse is likely to have less good quality of life if you don't do it," she said. "Touch wood, we've managed him now, and he will be more comfortable, and he'll put it behind him and carry on and be useful with a good career and many years ahead of him. Whereas the option was to go down the food chain—if he wasn't going to be suitable for somebody to compete on, he'd go down to a less experienced owner and be worked perhaps less well and have less good management. So I think there is a pretty strong welfare argument to keeping horses working well because they're more valuable, and they will be more valued."

No surgical procedure is risk-free, and the veterinarian and owner must work together to determine what's going to work best for a particular horse. Disclosure is important, especially with a horse that's undergone a palmar digital neurectomy, as it will require some specific management to keep it safe and healthy.

"People that decide to do it, they don't take the decision lightly," said Maher. "They are educated on the pros and cons of doing it, and what it would require after it is done.

"I think those techniques are useful and for some horses are basically lifesaving because they are going to allow them to keep doing what they're doing and not be in pain," he continued. "The more we have data, the more we can analyze it and the more we can make better recommendations going forward."