LET'S TALK

THOROUGHBRED KNEES

Presented by
Keeneland Sales & BloodHorse

An ongoing series to provide education and context to the topics that commonly appear on vet reports

Leading Veterinarians Discuss Knee Issues Found in Young Horses

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Understanding ideal conformation can help potential buyers select horses built for racing careers as well as identify potential future problems

AS BUYERS, CONSIGNORS, and veterinarians alike will tell you, an issue in a Thoroughbred's knee is unlikely to make anyone's list of favorite things. However, understanding more about knees as well as why and where lesions tend to occur can potentially help ease concerns when it comes to future racing prospects.

Equine knees, which are crucially important for mobility, are made up of multiple small bones that actually function more like a human's wrist than a knee. These bones are known as carpal bones. They connect in three distinct joints, and all of the bones are connected with ligaments. At least, that is true anatomically. Conversationally, it is a bit different.

"There are three joints in the knee," said Dr. True Baker, medical director and chief of surgery at Bluegrass Equine Surgery. "The lower carpal joint is the most distal and connects the cannon bone to the third carpal bone. It is an immoveable joint, and it is often fairly forgotten about. That's because it doesn't generally cause problems in the Thoroughbred racehorse.

"So, when most people say upper and lower joints, they are usually talking about the upper joint and the middle carpal joint, which is colloquially known as the lower joint."

Unsurprisingly, given the amount of 'equipment' in a knee and how active

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>
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When looking over digital X-rays in the sales repository, it's important to evaluate the current status of the knee joint

knee joints are, it is a highly susceptible part of the equine anatomy.

"As with other areas, there are a lot of things that can happen in the knee," said Dr. Colton Thacker, an ambulatory associate at Rood & Riddle Equine Hospital. "The anatomy of the carpus includes multiple bones, ligaments, and tendons that need to work together to allow for proper range of motion of the limb. When there is a problem with one of the structures, it can cause an increased load on another structure and may result in injuries."

As one might imagine, conformation plays a large role in healthy knees. Understanding ideal conformation can help potential buyers select horses built for racing careers as well as identify potential future problems.

"It's important to remember that we are pretty much talking about front legs," said Dr. Kathleen Paasch, a veterinarian at Rood & Riddle Equine Hospital. "You like to see the leg as a straight boney column, with the bones stacked on top of each other. That is the most efficient and most stable way for a horse to run, and we are asking Thoroughbreds to run at speed. They are not trail horses. When you deviate from that boney column, you start to put more stress and strains on joints and bones."

The biggest reason poor conformation is problematic is that it may cause increased and unnecessary stress on the horse's joints, which is why buyers can become risk averse. That said, veterinarians caution that being hypercritical is an issue, too.

"With a young unproven athlete, evaluation of conformation is often a main area of focus in assessing potential athletic ability," said Thacker. "Sometimes it can be easy to forget each horse is an individual and may be better served with less than perfect conformation. When evaluating the sales yearling, the entire physical should be considered."

Two of the main angular limb deformities in yearlings that buyers need to be aware of are carpal valgus, which refers to equines that are knock-kneed, and carpal varus, which means bow legged. While neither are ideal, there is a difference in concern levels.

"Carpal varus angular deformities are thought to cause the most concern

ANNE M. EBERHARDT

in racehorses," said Thacker. "Placement of transphyseal screws has become a common practice to improve conformation in early yearlings. When managed properly, it can be quite successful with minimal to no negative effects on the horse."

If the knee cannot function in an efficient and safe manner, that is not promising for racing. It is important, however, to remember that weanlings and yearlings are still growing. Paying attention to how and why changes are occurring is a relevant piece of the puzzle.

"We start looking at conformation at a couple weeks of age, but a horse's conformation can change until the long bone physis close," said Paasch. "By the time the horse is a yearling, the physis near the fetlock has closed but the radial physis, which is the growth plate at the knee, still has growth. Sometimes we refer to this as 'open.'

"Horses can develop a varus or valgus conformation. Neither is desirable as a deviation from a straight bony column puts abnormal stress on the bones and particularly the small bones in the joints. A marked deviation from a straight leg also results in an inefficient gait. A varus conformation is less desirable, as it puts more stress on the medial carpal bones, making them more vulnerable to injury. If you can picture a horse in your mind that is bow legged, when that horse works at any speed, they are going to be putting pressure on the inside of their knees. Picture those knees moving in a bow-legged way. It makes them more susceptible to injury there. That's probably the most concerning conformation flaw, a varus knee.

"A valgus knee, a knock-kneed one, when it is pronounced, it's not desirable. Imagine a horse running with knock-knees. It puts stress on the outside of the joint, but it doesn't carry quite as much weight as the inside of the joint. It's just not an efficient gait."

Just like conformation concerns, when it comes to the knee joints, there are lesions that are more problematic than others. Location and severity play a role in determining future racing prospects.

"Generally speaking, horses are much more forgiving in the upper joint," said Baker. "The radial carpal joint is more forgiving than the middle carpal joint, or what people would normally call the lower joint. I think people know that and are fairly accepting of that at the sales.

"The knee itself is a hinge joint that opens and closes, and so at the front of the hinge where it closes is where you get fragmentation. It's not generally deeper within the bone, it's on that front edge. That's where you get the most remodeling or spurring, in that area."

Understanding the typical radiographic changes that can appear when a horse is being presented at the sales can help buyers decide their own personal levels of comfort.

"Some common radiographic findings present at yearling sales include changes on the proximal intermediate carpal bone or distal radiocarpal bone," said Thacker. "Occasionally there will be significant radiograph changes at other sites in the carpus, but the intermediate and radiocarpal bones are the first ones that come to mind. As a general rule,

Meet the Veterinarians

DR. TRUE BAKER

Dr. Baker is the medical director and chief of surgery at Bluegrass Equine Surgery, which opened in 2022. His professional interests include Thoroughbred sales, orthopedic surgery, and upper airway surgery. He attended Auburn University, where he graduated with honors from the College of Veterinary Medicine in 2006. Baker then furthered his education through an internship and surgical residency at the prestigious Peterson and Smith Equine Hospital in Ocala, Fla. After concluding his residency in 2010, he joined his father at Woodford Equine Hospital before joining Hagyard Equine Medical Institute in 2014.

DR. KATHLEEN PAASCH

Dr. Paasch is a veterinarian at Rood & Riddle Equine Hospital. She graduated from Washington State University with a Doctorate of Veterinary Medicine in 1999 and later completed an internship at Rood & Riddle from 1999-2000. Her primary focus of practice includes lameness, diagnostic imaging, and acupuncture.

DR. COLTON THACKER

Dr. Thacker is an ambulatory associate at Rood & Riddle Equine Hospital. He attended Utah State University and graduated from Washington State School of Veterinary Medicine in 2016. Upon graduation from veterinary school, he completed an ambulatory internship at Rood & Riddle. Following his internship, he underwent a one-year imaging fellowship at Rood & Riddle, where he developed additional skills, primarily ultrasonography and radiographic interpretation. His areas of interest include lameness, diagnostic imaging, and sales work.

the distal radiocarpal bone is more critically assessed by veterinarians. It is an important area and often takes a lot of stress when a horse is in training.

"When we see changes there in a yearling that has not been in race training, we proceed with a little more caution. Not all changes in the distal radiocarpal bone are bad or deal killers. In many of these cases, it just indicates a need for a little slower start or extra monitoring in training. This is to make sure the bone is adapting appropriately to the horse's training."

If a horse does have a knee chip, that isn't automatically the end of a potential racing career. Although the idea of removing troublesome chips can be worrisome, it is actually the best thing to do.

"If removed early, they don't tend to cause a problem in the joint," said Paasch. "Buyers should know that just because a yearling has a chip in a knee, or one taken out, it doesn't necessarily mean you shouldn't consider the horse. The chip almost always needs to be removed, but if the rest of the joint is OK, the horse shouldn't have long-term problems."

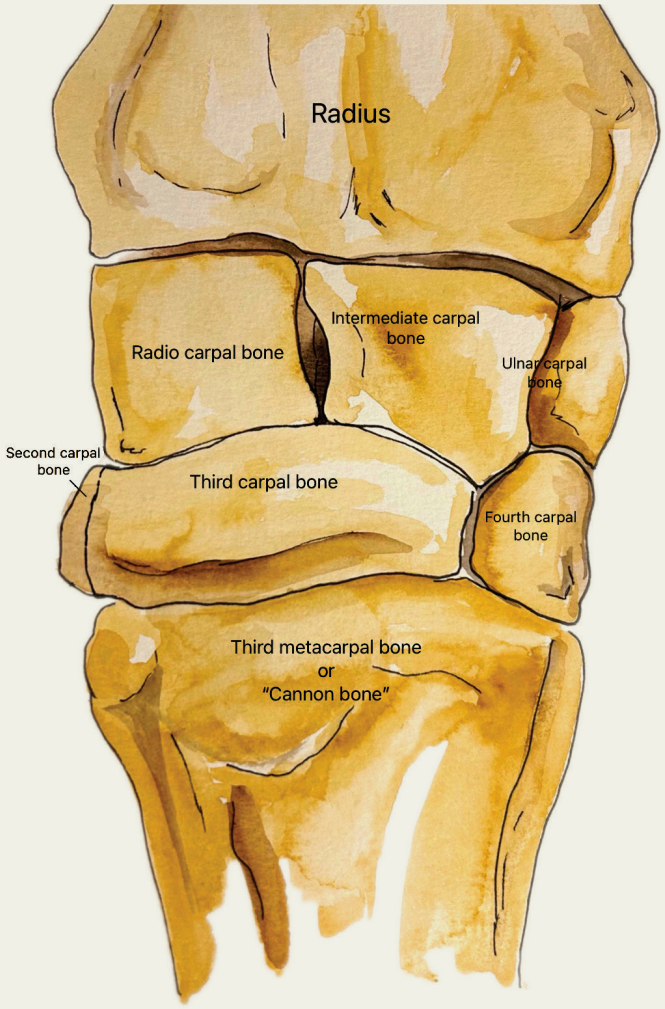
When trying to understand the severity of a lesion in a finding, it is incredibly important to be comfortable with the terminology a veterinarian is using. With knees in particular, that can be a taller task than normal due to the subjectiveness of some of the language that will be used, including lips, points, and spurs.

"Buyers or agents will read reports in the barn, and one person's lip might be another person's spur," said Paasch. "Talk to your vet, have them read it, and discuss your level of tolerance. A lip to most people is a mild change. Something that is called a spur is generally considered bigger and more serious. That said, there are not concrete definitions that you learn in vet school. It is very subjective."

This does not mean that veterinarians are trying to hide something from buyers, but rather that they have different opinions on the severity or lack thereof when it comes to knee issues. Because that language can be confusing, it is important to go into the sale with a good working relationship with a veterinarian.

"Radiograph reports on yearling sale horses bring a wide variety of terminology, which in turn can bring some confusion amongst veterinarians, consignors, and buyers," said Thacker. "A few terms commonly used in reference to radiograph changes in the knee include spur, point, or lipping.

Overview of the Knee



COURTESY OF ROOD & RIDDLE EQUINE HOSPITAL

> "BUYERS SHOULDN'T AUTOMATICALLY GO, 'OH MY GOD, THIS HORSE HAS HAD KNEE SURGERY, I SHOULDN'T BUY IT.' THEY REALLY SHOULD TALK TO THEIR VET AND SEE IF THE JOINT LOOKS GOOD NOW."
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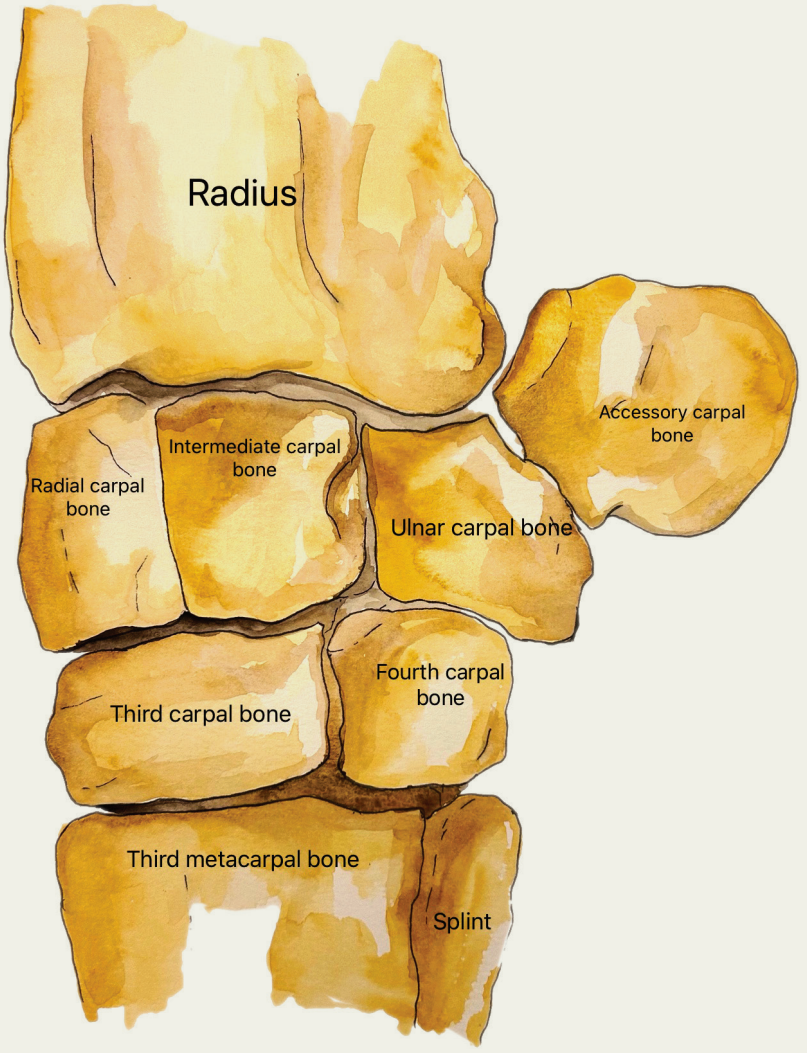

All of these could be describing the same radiographic change, and the usage is dependent on individual experience.

"A strong veterinarian/client relationship is critical to buyers in sorting out the significance of findings listed on a report. To provide my clients with an accurate risk assessment, I would personally need to review the repository radiographs before feeling confident providing any recommendations."

While words such as lips, points, and spurs may be used interchangeably, where they are located is more important than what they are called.

"It's all nomenclature, and there is a bit of personal preference that goes into that," said Baker. "For me, the concern is location-based. I think the intermediate carpal bone in the upper joint is a lot more tolerant of lesions than the radial carpal and lower joint, or the third carpal bone. When you see opposing changes, a reduction in the space between those two areas of the joint margin, that can create a clinically increased chance of injury due to repetitive stress."

While dealing with knee lesions is not something that anyone hopes

Helpful terms to know

CARPAL/CARPUS: derived from the Latin carpus and the Greek καρπός (karpós), meaning wrist commonly referred to as the "knee" of the horse

DISTAL: situated away from the center of the body or from the point of attachment

EPIPHYSITIS/PHYSITIS: inflammation of the physis

INTERCARPAL: the middle joint

LESIONS: a region in an organ or tissue which has suffered damage through injury or disease

PROXIMAL: nearer to the center or to the point of attachment to the body

PHYSIS: commonly called the growth plate

RADIOCARPAL: upper joint

RADIOGRAPHS: typically digital images that provide an in-depth, noninvasive look at a horse's bones or organs, also called X-rays

SEQUELA: a condition which is the consequence of a previous disease or injury

TRANSPHYSEAL SCREWS: 3.5mm locking screws with a 10mm or 15mm smooth, trocar tip designed to cross the physis without thread interference

VALGUS KNEES: the bone distal to the joint is angled outward from midline (laterally); knock-kneed

VARUS KNEES: the bone distal to joint is angled inward towards midline (medially); bow legged

for, depending on location and proper treatment, the horse can go on to be a successful racehorse. Meanwhile, an area of concern that might get overshadowed is long-term inflammation.

"The worst can be a deep inflammation of the bone," said Paasch. "We will see inflammation or sclerosis in the distal radiocarpal bone, and that can be more serious than a chip because that is an indication of longstanding inflammation. The bone is not healthy there, and it takes a long time to get over.

"A chip you can take out and move on, but you may not know why that horse has deep inflammation. Sometimes it is caused by a varus, or bow legged, conformation. Sometimes it is trauma. Sometimes the horse is just growing so fast it just can't keep up. You don't like to see that on a horse that hasn't been working or doing anything."

In a horse, epiphysitis/physitis is inflammation at or near the growth plate. This can be caused due to a multitude of factors including rapid growth rates, excess load due to attempts to correct conformation, or other systemic stressors. Understanding the cause is a key part of the prognosis.

"There is a difference between physitis that is a common sequela to longitudinal bone growth versus clinically significant physitis that can actually cause conformational deviations through asymmetric growth across that growth plate," said Baker. "A normal amount of physitis is not generally a concern provided it is not causing a secondary change.

"When you get to the 11-15 month

Buyers should meet with their veterinarian to discuss issues and risk tolerance

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age range, in central Kentucky, depending on when the horse is born and the grass greens up, they have this big calorie input, and you have fast growth rates. They might even be getting a bit of food and starting on exercise. All of this can mix together in sales prep, and you get hot knees. Generally, it is more common on the medial aspect. With medial physitis, if anti-inflammatories calm it down, it is probably not very clinically significant at all. But if it causes some asymmetric growth, you will have a horse that is sore and starts pushing its knees out. It actually changes its gait because it's sore, and the pressure applied to the distal limb actually starts to create a varus deviation through the knees."

Although extremely hot summers come with their own set of challenges, those high temperatures can help keep physitis numbers down.

"Luckily, usually this time of year we get this hot summer weather and hot brown grass kill, which can actually help with physitis," said Baker. "Last year was more temperate and greener, and we saw a little more clinically significant physitis than we have so far this year. That said, you are still going to see it anyway. It's still out there."

Physitis is not something anyone prepping for yearling sales wants to be dealing with, but it is important to understand it.

"It can be a very quick onset but be very, very slow to resolve," said Paasch. "Physitis in a sale horse tells buyers that this horse needs time before breaking and training, and some don't want to wait. It is common in larger horses, and uncommon in smaller ones. We have no quick fixes for this. It just takes time and sometimes correction of conformation. A key point though is that it will eventually resolve. There are no adult horses with physitis."

Good knees are important when considering the future abilities of a racehorse. However, understanding the anatomy of the area and being proactive with issues that do occur can help that horse still have a productive career.

"There is the pre-purchase lens as well as the surgical lens to look at this problem," said Baker. "We are talking yearling Thoroughbreds, and worries and risks, and I think we can get hypercritical with knees. It is important to know what the risk is.

"The risk is a chip fracture, and if addressed early—by removing a small fragment—before there is secondary cartilage damage, the prognosis can still be good for racing. Something that is more a chronic change that has been nursed and managed and has more

Good knees are important when considering the future abilities of a racehorse

cartilage damage has a less favorable prognosis. These young horses that have early acute chip fractures, with time off and rehabilitation, can still have a good prognosis."

That is why having a quality working relationship with a veterinarian can help tremendously when trying to determine if a knee issue is a deal breaker for a particular buyer.

"People have different levels of risk tolerance," said Paasch. "Some buyers are not bothered by a knee chip taken out, and there are others that just say they don't even want to bother with that. There will always be people who hear 'knees' or 'stifles' and are out, which isn't necessarily fair to the horse, but everybody has a different level of risk tolerance. Buyers shouldn't automatically go, 'Oh my God, this horse has had knee surgery, I shouldn't buy it.' They really should talk to their vet and see if the joint looks good now."

Thacker echoed those sentiments, saying: "An open discussion with your veterinarian is priceless. They can help navigate the findings that could be acceptable for your risk tolerance and goal as a buyer. At the end of the day, there will still be some horses that will outperform their radiograph findings. My goal is always this: a thorough evaluation of the risks that help clients make informed decisions which in turn allow them to gain value and success with their purchases." B

TOP: KEENELAND PHOTO; BOTTOM: ANNE M. EBERHARDT