Injuries to the hoof wall and feet of horses are common in equine practice.\textsuperscript{1–3} The most common injuries to the foot and hoof wall are secondary to trauma (hoof wall avulsions, heel bulb lacerations, etc) or penetrating foreign bodies.\textsuperscript{1–5} Regardless of the type of hoof wall or foot injury, injuries that affect synovial-lined structures are considered an emergency.\textsuperscript{1–6} They require more extensive diagnostics and treatment and typically have a less favorable prognosis for return to soundness than injuries that do not involve synovial-lined structures.\textsuperscript{6,7}

Although the hoof wall and sole are hard, keratinized tissue, penetrating wounds are still common.\textsuperscript{4} Penetrating foreign bodies occur most commonly in the sole of the foot and are usually associated with stepping on some form of a metal object (ie, nail, screw, wire, etc).\textsuperscript{6,8} Penetrating wounds of the coronary band are much less common. In the horse, wood foreign bodies are much more common in the upper extremities or axial skeleton\textsuperscript{9} and much less common in the foot or hoof wall.\textsuperscript{1,10} This report describes the historical and clinical findings, diagnostics, treatment, and outcome of horses with a penetrating wood foreign body of the coronary band.

**Methods**

Electronic and hard copies of the medical records from Blue Ridge Equine Clinic between January 1, 2004, and December 31, 2023, of horses that had a confirmed diagnosis of a penetrating wood foreign body of the coronary band were reviewed. Information retrieved from the medical records included history, signalment, diagnostics, treatment, and outcome. Thirteen of 15 horses that sustained a penetrating wood foreign body (PWFB) to the coronary band were participating in foxhunting. Penetrating wood foreign bodies occurred more frequently near the central axis or toe region (11/15) and more commonly in the forelimbs (11/15). Removal of PWFBs can be performed with the horse standing and sedated with regional anesthesia. Complete removal of the PWFB required partial removal of the adjacent hoof wall.

Penetrating wood foreign bodies occurred in the coronary band and lodged distally in the hoof wall of horses. Foxhunting may be a risk factor for this type of injury. Penetrating wood foreign bodies occurred most commonly in the front feet, near the central axis of the coronary band. Complete removal of the PWFB required removing a section of the adjacent hoof wall. The prognosis for return to the previous level of activity following treatment was favorable.

**Keywords:** equine, wood, foreign, body, hoof

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**Objective**

To retrospectively report the historical and clinical findings, diagnostics, treatment, and outcome of horses with penetrating wood foreign bodies (PWFBs) of the coronary band.

**Animals**

15 client-owned horses.

**Clinical Presentation**

Horses had varying degrees of lameness and soft tissue swelling of the coronary band and pastern region. A defect in the coronary band was identified, but the actual wood foreign body was not always readily visualized.

**Results**

Medical records of horses diagnosed with PWFBs of the coronary band between 2004 and 2023 were reviewed. Information retrieved from the medical records included history, signalment, diagnostics, treatment, and outcome. Thirteen of 15 horses that sustained a PWFB to the coronary band were participating in foxhunting. Penetrating wood foreign bodies occurred more frequently near the central axis or toe region (11/15) and more commonly in the forelimbs (11/15). Removal of PWFBs can be performed with the horse standing and sedated with regional anesthesia. Complete removal of the PWFB required partial removal of the adjacent hoof wall.

**Clinical Relevance**

Penetrating wood foreign bodies occurred in the coronary band and lodged distally in the hoof wall of horses. Foxhunting may be a risk factor for this type of injury. Penetrating wood foreign bodies occurred most commonly in the front feet, near the central axis of the coronary band. Complete removal of the PWFB required removing a section of the adjacent hoof wall. The prognosis for return to the previous level of activity following treatment was favorable.

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Penetrating wood foreign bodies (stob) of the coronary band in horses: 15 cases

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body to the coronary band were reviewed. Information on breed, age, and sex was recorded. Other information collected from the medical record included history, physical examination findings, diagnostic imaging, surgical findings, and postoperative treatment. Follow-up information was obtained from the medical records and by contacting the horse owners or referring veterinarians by telephone. Descriptive statistics (mean, range) were calculated for the appropriate data. Fifteen horses were identified with a penetrating wood foreign body of the coronary band and were included in the study.

Results

Animals

Horses ranged in age from 7 to 19 years (mean, 11.6 years). Breeds included Thoroughbred or Thoroughbred cross (n = 7), Warmblood or Warmblood cross (5), draft cross (1), Connemara (1), and quarter horse (1). There were 11 geldings, 4 mares, and no stallions. Thirteen of 15 horses were participating in foxhunting at the time of onset of the injury. The other 2 horses were found in the pasture. Twelve horses were examined on a referral basis, and 3 horses were examined on our primary care basis. Of the 12 referral horses, unsuccessful removal of the wood foreign body was attempted in 6 horses by either the referring veterinarian or the owner. The time at which the penetrating wood foreign body occurred was not always clearly noted by the owners. The time from perceived onset of injury to referral was recorded in 12 horses (mean, 25.5 hours; range, 4 to 72 hours). The injury was often reported by the owner to be associated with falling or jumping into or out of a wooded area. The owners reported that the horses were lame immediately after coming out of the wooded area (n = 7), at the end of the ride (6), or unknown (2).

Clinical examination

All horses had a lameness evaluation and physical examination performed. Fourteen of 15 horses were lame at the walk (American Association of Equine Practitioners grade 4 to 5/5). Seven of 15 horses had an elevated (> 48 beats/min) heart rate at admission. Four horses had a rectal temperature above 38.89 °C (102 °F). All horses had mild to moderate soft tissue swelling around the coronary band and pastern region. Ten horses had digital pulses that were decreased compared to the unaffected foot. No horses had hooves that were cold to the touch. No horses had digital pulses that were palpated as being positive. All horses had a defect in the coronary band. A wood foreign body was sticking out of the coronary band in 8 horses (Figure 1). Seven horses had a wood foreign body that could not be readily visualized, but with palpation, a raised area could be detected. Five of 7 horses in which the wood foreign body could not be readily visualized had an attempted wood foreign body removal before referral, and a segment of wood breaking off was reported while removal was attempted. Wood foreign bodies were found in the coronary band of the forelimbs (11/15) more commonly than the hind limbs (4/15). Wood foreign bodies were located more commonly at or near the central axis or toe region (n = 11), versus abaxially in the quarter (3) and heel (1) regions.

Diagnostics

All horses had foot radiographs performed, including the lateromedial, horizontal dorsopalmar/plantar, and dorsoproximal, 60° palmar/plantar views. Additional oblique horizontal dorsopalmar views were taken to try to highlight the penetrating wood foreign body. Radiographic exposure techniques were purposely underexposed to attempt to better visualize soft tissues. Gas shadows or radiolucent defects and changes in soft tissue radiodensities were reported in the hoof wall of 12 horses and interpreted to be associated with the wood foreign body. Contrast radiographic studies were attempted on 3 horses. In 2 horses, the contrast material dispersed down the hoof wall and did not demonstrate a filling defect. In 1 horse, there was a filling defect that partially outlined the wood foreign body. No advanced imaging MRI or CT was performed in this study.

An ultrasound examination was performed on 6 horses. The wood foreign body was identified as a focal, hyperechoic foci compared to the surrounding soft tissue of the coronary band. The typical distal acoustic shadowing of a foreign body was not commonly observed because of the proximity to the bone and/or hoof wall. The keratinized hoof wall limited the use of the ultrasound distal to the coronary band. In addition, ultrasound was used to assess whether there was any gas or air present in the distal interphalangeal joint as well as the cellularity of the joint fluid. An arthrocentesis of the distal interphalangeal joint was performed in 4 horses to rule out distal interphalangeal joint sepsis. Joint fluid analysis demonstrated that the WBC count, total protein, and cell morphologies were normal in all samples.

Treatment

In 6 of 15 horses, the owner or referring veterinarian had attempted to remove the wood foreign
body from the coronary band and were unsuccessful, and typically the wood foreign body broke at the level of the coronary band. In 12 of 15 horses, removal of the wood foreign body was performed with the horses sedated and standing with regional anesthesia (abaxial) nerve block. Three of 15 horses were placed under general anesthesia to facilitate either further diagnostics or treatment. An Esmarch tourniquet (Jorgensen Laboratories LLC) was placed at the level of the pastern and/or fetlock to help control hemorrhage during the limited hoof wall resection in 9 horses.

All of the wood foreign bodies entered at the level of the coronary band and then became lodged distally in between the epidermal (insensitive) and dermal (sensitive) lamina. Removal of the wood foreign body was facilitated by use of a motorized burr (Dremel Rotary Tool; Robert Bosch Tool Corp) with a pear-shaped head attachment (Dremel Carving Bit 121; Robert Bosch Tool Corp). The motorized burr was used to remove the epidermal lamina directly at and distal to the location of the wood foreign body (Figure 2). Motorized removal of the epidermal lamina was performed until the wood foreign body could be visualized. The wood foreign body was grasped with a hemostat and rocked back and forth gently and then removed by traction proximally. Failure to remove a sufficient amount of epidermal lamina resulted in the wood foreign body breaking upon trying to dislodge it. The size of the wood foreign bodies was only recorded in 7 cases (Figure 3) and varied in length (range, 8 to 40 mm), width (range, 4 to 20 mm), and thickness (range, 2 to 10 mm). No attempt was made to identify the type of wood removed from the hoof wall.

The area of hoof wall removal was lavaged with saline or saline with a dilute disinfectant (betadine or chlorhexidine). All horses were placed in a protective foot bandage. Ten horses had a poultice bandage (Animalintex; 3M Animal Health) applied to the hoof wall to reduce coronary band and surrounding soft tissue edema. All horses were treated with various systemically delivered antibiotics (gentamicin, cefazolin, potassium penicillin, sulfamethoxazole/trimethoprim, metronidazole, and ceftiofur crystalline-free acid), which varied among clinicians. The lengths of antibiotic coverage (range, 1 to 7 days; mean, 3.4 days) varied. Two of 3 horses that underwent general anesthesia had regional limb perfusion performed with antibiotics (amikacin). All horses were treated with NSAIDs (phenylbutazone or flunixin meglumine), and treatment varied in duration (range, 1 to 10 days; mean, 4.78 days). Owners were instructed to keep the foot in a protective bandage or foot boot (range, 5 to 14 days; mean, 7.2 days) postoperatively. Thirteen of 15 horses were sound at a walk within 24 hours of removal of the foreign body. Two other horses took up to 72 hours to become sound at a walk. Horses were discharged from the hospital (range, 1 to 7 days; mean, 3.2 days) after wood foreign body removal. At a 2-week telephone follow-up, all horses were sound at a walk (n = 13). At a 60- to 75-day telephone follow-up, all horses (n = 9) had returned to their previous level of work. Three owners noted...
that their farrier had placed an acrylic patch at the site of the previous partial hoof wall resection to prevent debris from collecting into the defect.

Discussion

Penetrating foreign bodies of the foot have been commonly reported in the horse. These injuries tend to be traumatic in origin, often involve metallic foreign bodies, and typically come through the sole of the foot. There are a few reports of wood foreign bodies in the sole of the foot, but there are no reports of penetrating wood foreign bodies involving the coronary band in the horse. In some locations and cultures, a wood foreign body is colloquially referred to as a "stob." A stob is defined as a short, straight, piece of wood; stake; or a broken branch.

The reasons that foxhunting appears to be a risk factor for penetrating wood foreign bodies of the coronary band are unclear. Foxhunting involves horses moving at various speeds and jumping in and out of uneven terrain, which can be littered with woody plant material such as tree branches or broken board fences. Wood foreign bodies were not analyzed for the type of wood in this case series. We cannot comment on whether hard or soft woods are more likely to be involved in the injury. Both softwood and hardwood trees, as well as wood fencing, are common to central Virginia and the local foxhunting venues. Signalment of the horses involved in this clinical case series was representative of breeds typically involved in foxhunting.

Wood foreign bodies entered the coronary band and were advanced or driven distally. The reason for entrance at the coronary band was unclear. It can be hypothesized that the coronary band is softer and more pliable and creates an easier entrance point. The softness of the coronary band may have also provided an opportunity for the wood foreign body to gain traction compared to the hoof wall, which is hard and typically would have deflected it away. It is assumed that the path of least resistance was between the epidermal (insensitive) and dermal (sensitive) lamina and why the wood foreign bodies were advanced or driven in that direction. The fact that wood foreign bodies advanced distally into the hoof wall suggests that the horse was potentially elevating its foot or limb and the wood was fixed or stationary as the foot advanced or was extended against it.

In the first few cases of penetrating wood foreign bodies to the coronary band, there was concern about the potential for distal interphalangeal joint involvement. Fortunately, this did not occur in any horses in this case series and the diagnostic assessments over time were modified to reflect that. The potential for penetrating wood foreign bodies of the coronary band to involve the distal interphalangeal joint should be considered when evaluating these cases. If horses are not responding favorably to having the wood foreign body removed, synovial involvement should be considered and appropriate diagnostics initiated.

Radiography is not very sensitive to definitively determine the presence of wood foreign bodies in a horse's foot. However, gas and air radioluencies and changes in the soft tissue radiodensities of the hoof wall were suggestive of a foreign body and its location within the hoof wall. Ultrasound was able to identify changes in the echogenicity of the coronary band and was suggestive of a foreign body. The presence of the hoof wall minimized the use of ultrasound distal to the coronary band. The ability to soak or immerse the foot in water and hydrate the hoof wall may have enhanced the ability of ultrasound to generate a diagnostic image of the hoof wall.

Advanced imaging was not required to diagnose or treat the horses in this study. However, it should be noted that MRI and especially CT are much more sensitive imaging modalities for diagnosing wood foreign bodies in the hoof wall compared to radiographs or ultrasound. These imaging modalities might have been required for horses in which the wood foreign body had been broken deeper to the surface of the hoof wall or if there was concern about communication with the distal interphalangeal joint.

The clinical presentations of horses with penetrating wood foreign bodies into the coronary band were similar to those of horses with other types of hoof wall injuries. Horses were lame at a walk, had elevated digital pulses, and often had an elevated heart rate. In many horses, the offending piece of wood was readily identified, as it was sticking out during the examination or historically noted by the owner before self-treatment or referral. For cases in which the wood foreign body was broken, it typically broke flush with the level of the hoof wall, which made it challenging to recognize without careful and thorough examination including palpation and imaging.

Successful removal of wood foreign bodies in the coronary band of horses required partial removal of the epidermal lamina to facilitate complete removal of the wood foreign body. When owners tried to remove the penetrating wood foreign body, horses were not sedated or blocked with regional anesthesia and often moved their foot or leg when any pressure was placed on the wood, resulting in fragmentation. When referring veterinarians performed sedation and regional anesthesia and attempted to remove wood foreign bodies without partial hoof wall removal, they also tended to break at the level of the hoof wall. It appeared that there was some type of interdigitation of the wood foreign body between the epidermal and dermal lamina. It can also be hypothesized that swelling and inflammation, secondary to the wood foreign body, of the immediately surrounding lamina created pressure and aided in trapping the wood foreign body. Removal of the section of epidermal lamina directly adjacent to the wood foreign body seemingly negated the effect of the interdigitation and/or relieved pressure and allowed for complete removal.

The horse's lameness improved immediately after the removal of the wood foreign body, suggesting that the wood foreign body exerted some form of pressure, inflammation, and pain to the foot. Generalized treatment of hoof wall injuries often included
antibiotics, NSAIDs, and some form of a protective bandage or boot.\textsuperscript{1,3,6} In this case series, these treatments were performed. However, as experience was gained in case management, the duration of antibiotics and NSAIDs was decreased to typically just a few days since no synovial-lined structures were involved. There were no adverse reports related to the limited hoof wall removal, and many horses were back into normal work a few weeks after the procedure. Because these injuries involved the coronary band, the hoof wall defect did remain until the hoof wall had grown down completely from the coronary band. A few owners reported that some farriers performed an acrylic hoof patch to minimize the hoof wall defect collecting dirt and debris as it grew out.

This was a small clinical case series with retrospective analysis. Like all retrospective studies, the limitations of this study were attributed to incomplete records, loss of follow-up, and a small sample size. Nonetheless, important information regarding the clinical presentation, diagnosis, treatment, and outcome of horses with penetrating wood foreign bodies to the coronary band can be derived from this study.

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