Fragmented acupuncture needle as a linear metallic foreign body near the proximal interphalangeal joint of a horse

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OBJECTIVE
To describe the clinical presentation, diagnosis, and treatment of a fragmented, migrating acupuncture needle near the palmar proximal interphalangeal joint (PIPJ) of a horse.

ANIMAL
A 9-year-old Warmblood cross mare.

CLINICAL PRESENTATION, PROGRESSION, AND PROCEDURES
The mare presented for evaluation of a linear metallic foreign body on the palmar lateral aspect of the PIPJ following acupuncture treatment. The mare had a pinpoint puncture wound and sensitivity to palpation over the lateral aspect of the PIPJ region. The referring veterinarian performed radiographs and found a linear metallic foreign body near the lateral palmar PIPJ. Ultrasonographic examination demonstrated a hyperechoic lesion consistent with a metallic object in the soft tissues of the palmar lateral aspect of the PIPJ.

TREATMENT AND OUTCOME
The horse was anesthetized, and the linear metallic foreign body was removed. The use of intraoperative ultrasound and digital radiographs assisted in determining the location of and surgical approach to remove the foreign body. The linear metallic foreign body was the fragmented segment (body) of an acupuncture needle. The mare recovered from surgery uneventfully and returned to the previous level of activity.

CLINICAL RELEVANCE
This report demonstrates the potential risks of prolonged retention and or delayed removal of acupuncture needles in the form of needle fragmentation and migration. It also demonstrates the use of imaging in determining the location and position of small, thin metallic foreign bodies to aid in surgical approach and removal.

Keywords: equine, needle, fragmentation, breakage, acupuncture
acupuncture treatment and confirmed that needle placement had been performed on the lateral aspect of the pastern region (acupoint HT-9) and that the acupuncture needle that was used was 15 mm long (0.35 X 15-mm Jing Mei needle with colored plastic handle; Wuxi Jiajian Medical Instrument Co Ltd). The mare was administered an NSAID (phenylbutazone) and referred for further evaluation.

Diagnostic Findings and Interpretation

On referral presentation, the mare was sound at a walk. There was a pinpoint wound on the lateral PIPJ (Figure 1). The mare was moderately sensitive to palpation of the area, but no foreign object could be palpated beneath the skin. The mare had an otherwise normal physical exam and unremarkable blood work. Additional radiographs of the limb were taken to further evaluate the position of the linear metallic body. Radiographs (Figure 2) demonstrated

Figure 1—Photo of the lateral aspect of the proximal interphalangeal joint (PIPJ). Cranial is to the left, and palmar is to the right. There is a pinpoint wound (black open arrows) over the lateral aspect of the PIPJ.

Figure 2—Dorsopalmar (A) and dorsolateral-palmaromedial oblique (B) radiographic views. Open red arrowheads demonstrate the obliquely oriented linear metallic foreign body adjacent to the caudolateral proximal palmar aspect of the second phalanx. LF = Left front.
a thin (< 1-mm-wide), 15-mm-long, linear metallic foreign body that was located approximately 20 mm below the skin surface, adjacent to the proximal lateral palmar eminence of the second phalanx.

Ultrasonography of the left front PIPJ was performed. On the long axis view, the linear metallic foreign body was identified between the soft tissues and adjacent to the palmar aspect of the lateral palmar eminence of the second phalanx. The linear metallic foreign body was hyperechogenic, and there was a minimal hypoechoic rim of fluid. There was no accompanying detectable acoustic shadowing or reverberation artifact due to the proximity to bone. It did not appear that the object had entered either the palmar pouch of the PIPJ or the digital flexor tendon sheath.

A diagnosis of a linear metallic foreign body at the level of the PIPJ was made, and it was most likely a fragmented segment (body) of an acupuncture needle on the basis of the clinical presentation and imaging findings. It was hypothesized that the acupuncture needle had broken at the junction of the handle and body (Figure 3) and that the body of the acupuncture needle had migrated into the surrounding soft tissues.

Figure 3—Photo of an acupuncture needle identical to the one used in this horse. The body length of the needle was 15 mm. The abrupt transition in geometry between the head and body of most acupuncture needles potentially results mechanically in a stress concentration at that head-body junction and is typically the most common location of needle fragmentation.

Treatment and Outcome

The owner was advised of the findings and offered options of (1) advanced imaging to gain more information about the location of the foreign body and soft tissue structures involved, (2) conservative medical treatment and monitoring, or (3) performing surgery under general anesthesia to remove the metallic foreign body. Because of the close proximity to synovial-lined structures and fear of it migrating further, the owner elected to have the metallic foreign body removed under general anesthesia. The mare was placed under general anesthesia in lateral recumbency with the affected limb upward. Intraoperative ultrasound (Figure 4) was used to evaluate whether there was further migration, identify the linear metallic foreign body, and aid in determining the location of the surgical approach. A 4-cm-long, vertically oriented skin incision was made palmar to the original pinpoint wound. The incision was directly over the lateral palmar digital neurovascular bundle. The neurovascular bundle was retracted cranially, exposing the soft tissues. No foreign body tract was identified during the dissection. Fibers of the palmar abaxial ligament were divided along their long axis. A series of rare earth (neodymium) magnets (Harbor Freight Tools) were placed into a sterile, self-sealing bag (Ziploc; SC Johnson & Son Inc) and placed in the incision in an attempt to identify and retract the linear metallic foreign body. This was unsuccessful. Further exploration of the fibrous middle scutum identified the proximal end of the linear metallic foreign body. It was grasped with hemostats and removed with gentle traction. Intraoperative radiographs were taken to confirm complete foreign body removal. The incision was lavaged with saline. The subcutaneous tissues and skin were closed in standard fashion. The mare recovered from surgery uneventfully and remained hospitalized for 2 more days for monitoring because of the proximity to synovial-lined structures. The mare was treated with antibiotics (cefazolin, gentamicin) and an NSAID (phenylbutazone) and received incision care and bandaging. Telephone correspondence with the owner reported that the horse returned to the previous level of activity 3 weeks following surgery and remained sound.

Comments

Complications of acupuncture treatment are rare in animals and humans. Acupuncture needle fragmentation and migration have been reported in humans\textsuperscript{1,2} and in the back of 1 horse,\textsuperscript{3} but not in small animals. Reasons for acupuncture needle fragmentation remain unclear; acupuncture needles are relatively thin, filamentous, malleable, and commonly made of stainless steel. In humans, the suggested causes of acupuncture needle breakage include poor quality and inconsistencies in manufacturing,
erosion between the shaft and the handle, strong muscle spasms or sudden movement of the patient, incorrect withdrawal of a stuck or bent needle, and prolonged use of galvanic current.\textsuperscript{1} Acupuncture needle design creates a potential for a mechanical stress riser to develop because of the stark geometric change at the junction of the head and body of the acupuncture needle.\textsuperscript{1} When acupuncture needles are inserted into tissues, a fixed fulcrum effect can be created, which could result in breakage by repeated cycling or a single forceful event.

Clinically, it was unclear when the acupuncture needle fragmented in this case. The owner reportedly did remove the acupuncture needles as directed but didn’t specifically recall removing the needle from the left pastern region and thought it fell out. The horse may have rubbed or struck the leg against an immovable object to bend or fragment the needle at any time or potentially when the fly boots were placed. The orange-colored handle of the needles used in this horse should have been easily noticeable, but it may have been bent back with the needle retained in the tissues.

The length of time the acupuncture needle remains in situ for treatment varies among acupuncturists and is as low as 20 to 30 minutes to hours.\textsuperscript{2} Intuitively, prolonged retention and or delayed removal of acupuncture needles increases the risk of fragmentation. The practice of delayed needle removal because of either medical reasons or increased work flow and efficiency coupled with owners (nonqualified personnel) removing them increases the risk of complications. The reasoning for why metallic foreign bodies tend to migrate over other types of foreign bodies is unclear. It has been postulated to be because they are generally thin, flexible, and have a point so they can penetrate through and slide between tissues more readily than other types of foreign bodies.\textsuperscript{2}

Metallic foreign bodies can be readily diagnosed with conventional imaging such as radiographs and ultrasounds.\textsuperscript{4,5} Advanced imaging such as MRI and CT was not required in this case but may have added more information about the surrounding soft tissues affected by the foreign body. Some report that the use of intraoperative ultrasound is more beneficial than advanced imaging in isolating and identifying foreign bodies.\textsuperscript{4}

Management of foreign bodies in soft tissues remains debatable. Some foreign bodies remain in tissues and are relatively innocuous, while others can either migrate or become a persistent nidus of infection. We elected to surgically remove the broken acupuncture needle because of its proximity to synovial-lined structures and the concern that it might continue to migrate. Surgical retrieval of foreign bodies, especially small metallic foreign bodies, can be challenging and very tedious. Image-guided surgical approaches and interventions help make the surgical procedure more successful.\textsuperscript{5} We attempted to use magnets to help localize and/or retract the metallic foreign body, but it did not prove to be helpful in our case. The degree of magnetism of stainless steel varies greatly and is dependent upon the alloy composition. In older, more chronic conditions, oftentimes a draining tract forms and can be followed or some type of dye or contrast agent injected into the draining tract to aid in localizing the foreign object.

**Acknowledgments**

None reported.

**Disclosures**

The authors have nothing to disclose. No AI-assisted technologies were used in the generation of this manuscript.

**Funding**

The authors have nothing to disclose.

**References**