Case File: Contrast-Enhanced Computed Tomography (CT)

SIGNALMENT AND HISTORY

- 1-year-old Morgan colt
- January 1, 2011, Trooper was found with his left fore foot hung up in a gate.
- A bolt in the gate had created a puncture wound in the medial heel bulb, but no other obvious injuries were noted.
- The wound was cleaned and the limb was bandaged.
- Trooper’s lameness worsened significantly January 18, 2011.

DIFFERENTIAL DIAGNOSES

- Septic joint or tendon sheath
- Abscess
- Vascular damage
- Fracture
- Tendon or ligament damage

REFERRING VETERINARY PRACTICE

- Radiographs and Venogram (Fig. 1)

Fig. 1: Venogram performed to assess blood flow to the foot. In order to perform a venogram, a tourniquet is placed above the area of interest. A small butterfly catheter is then inserted into a vein and contrast material is injected. A radiograph is then taken and the contrast material appears throughout the vasculature in that area. In this venogram, the referring veterinarian was concerned that the vessels were not all visualized all the way down the foot, suggesting loss of perfusion.
CONCLUSIONS

- Possible medial collateral ligament damage of the coffin joint
- Loss of visible vasculature in the distal portion of the foot
- Prognosis – grave

JANUARY 24, 2011

- Presentation to Colorado State University Veterinary Teaching Hospital
- Goal: Second opinion and further diagnostics

PHYSICAL EXAM

- Grade 4/5 lame on the left front
- Tachycardic
- Wound on the medial heel bulb with a triangle of thickened skin
- Left front hoof wall was cool to the touch
- Left front coronary band was warm to the touch
- Digital pulses were within normal limits on all feet
- Bright, alert, responsive
- Respiratory rate and temperature were within normal limits
- Small abrasions over the left front third metacarpal bone

DIFFERENTIAL DIAGNOSES

- Septic joint or tendon sheath
- Abscess
- Vascular damage
- Tendon or ligament damage

PLAN

- Contrast-enhanced computed tomography (CT)

Fig. 2: A contrast CT image from the distal pastern region. The large white object located is the distal portion of the second phalanx. An area of avascularity can be seen in the medial heel bulb region (red circle).
CONCLUSION
• Probable necrosis or abscess in the medial heel, extending into the sensitive lamina of the medial aspect of the hoof. This area is represented by a region of avascularity (loss of blood supply) on the CT images (Figs. 2 and 3).

SURGERY
• Goal: Treat that area as an abscess and by opening up the area, pressure would be released and the area could fill in with healthy tissue
• Debride the area of devitalized tissue
• Regional limb perfusion – with amikacin (1g) and Timentin (ticarcillin and clavulanate, 1.5g)

POST-OPERATIVE TREATMENT
• Repeat regional limb perfusions (~36 hours)
• Hospitalization – 4 days
• Bivalved, half limb bandage cast
• Bandage changes
• Topical Cephapirin (Today)

PROGNOSIS
• Guarded
• Highly dependent upon improved weight bearing on the left front

POTENTIAL COMPLICATIONS
• Support limb laminitis
• Support limb acquired angular limb deformity
• Spread of infection into synovial structure
• Collateral blood supply not sufficient

Trooper was sent home with instructions to remain on stall rest for 6 weeks (Fig. 4). He would need to be bandaged and in the bivalved cast during this time. An increase in activity would be allowed depending on how his lameness progressed.
FOLLOW UP
- Stall rest with controlled rehabilitation (handwalking, asking him to pick up the right front for increasing lengths of time)
- Trooper’s lameness waxed and waned for months.
- At the end of April, he became very lame again.
- Trooper returned to CSU for further evaluation.

FOOT RADIOGRAPHS
- Distal 1/3 of the distal phalanx had become a sequestrum (Fig. 5).
- The hoof had grown excessively and was trimmed, thereby removing the sequestrum.
- Again, Trooper’s prognosis was guarded.

OUTCOME
Trooper showed great improvement over the next month. Unfortunately, he suffered another setback in June when the remainder of the coffin bone failed to stay attached to the hoof wall. This complication left little hope for a normal life for Trooper, and with much difficulty, the Cook family elected to put Trooper down.

CASE SUMMARY
Recently, there has been an increase in the number of publications regarding contrast-enhanced CT in horses.\(^1\)\(^-\)\(^6\) It has been used to assess angiogenesis of the deep digital flexor tendon,\(^3\) to assess its use as an imaging modality in horses with lameness localized to the foot,\(^5\)\(^,\)\(^6\) and for characterization of soft tissue structures within the hoof capsule.\(^4\) There are very few reports of contrast-enhanced CT being used to assess blood supply following trauma to the limb of a horse. In Trooper’s case, the contrast-enhanced CT provided us with a 3-dimensional view of the foot and the vessels associated with it. We could easily visualize an area of avascularity, but it wasn’t until much later that we were able to realize the clinical
significance of this lesion. We now can appreciate the significance of such a lesion and can use that knowledge for future cases.

With the addition of a new 16-slice, big bore CT unit in radiology, we are able to scan our equine patients with greater efficiency. A specialized table was engineered to accommodate horse head and legs. The speed at which the CT unit acquires the images allows for a 3-phase (arterial, venous, and delayed) contrast study. This translates into greater accuracy in diagnosing soft tissue injuries in the extremities. Additionally, imaging acquired from the head greatly increases the accuracy in diagnosing and ultimately treating problems associated with the teeth, sinuses, and bones of the skull. Studies are currently being performed with intra-articular contrast to further evaluate the soft tissue and bony structures to help in prognosis and return to athletic performance.

Fig. 5: Radiographs taken in May 2011 revealed separation of the lower part of the coffin bone (red circle). This bone sequestrum was being pushed out. The excessive hoof was trimmed away, and with it, the sequestrum was removed.