Dixie's Downfall

Juliana Santiago

Mississippi State University

College of Veterinary Medicine

Class of 2020

Clinicopathologic Conference

June 14th, 2019

Advisor: Alison Eddy, DVM, Diplomate, ACVS

Introduction

Limb contracture in equids can be either congenital or acquired. Congenital contracture is most common in foals occurring in the coffin, fetlock, or carpal joints of the forelimb. Etiologies and causes are various and speculated but may include in-utero malpostioning, genetics, or exposure to teratogens in-utero.[1] Typical treatment for congenital contracture includes oxytetracycline for muscle relaxation, non-steroidal anti-inflammatories (NSAIDs) for pain management, and gastroprotectants to counteract the NSAID adverse effects.[1] Physical therapy may be added on top of medical intervention, and if treatment fails surgery is the last option. For the purpose of this case, we will focus on acquired contracture. Acquired contracted tendons can occur in any age horse and are usually a result of a painful injury with inadequate management and treatment. The distal interphalangeal joint or metacarpophalangeal joint are the two most common joints affected by acquired contracture.[1] Analgesics and corrective shoeing may be implemented, and surgery is again the last choice for the more severe cases in the form of a tenotomy or desmotomy. To determine the severity of contracture, radiography or ultrasound may be used to detect soft tissue or bony changes. Prognosis depends on severity and chronicity of disease.

History and Presentation

Dixie is an 18-year-old Tennessee Walking horse who presented to MSU-CVM Equine department on July 30, 2018 for right forelimb tendon contracture. She had a history of injuring her right front limb after stepping in a hole in her pasture over a year ago. She was stall rested for about 3 months before being let back out to pasture. The tendons started to contract causing her to flex at the fetlock dorsally, which had recently been affecting her gait and ambulation more.

She was previously used for pleasure riding but since the injury, she had been retired as a pasture horse.

On presentation, Dixie was bright, alert, and responsive with a body condition score of 4/9 and weight of 408.2 kg. Her vitals were within normal limits with a temperature of 100.0 degrees Fahrenheit, a pulse of 40 beats per minute, and a respiration rate of 40 breaths per minute. No discharge was noted from her eyes or nose and she had pink mucus membranes with a capillary refill time of less than 2 seconds. Thoracic auscultation revealed a normal cardiac rhythm with normal bronchovesicular sounds. Abdominal auscultation revealed normal borborygmi in all four quadrants. Digital pulses of her hind limbs were slightly stronger, but the pulses of the front limbs were normal and slight.

There was visible muscle atrophy all along her right forelimb and it was also dorsally flexed at the fetlock causing her to walk more on her toe and with more effort. She had a 4/5 lameness that was easily seen at the walk. Upon palpation of the superficial digital flexor tendon (SDFT) and deep digital flexor tendon (DDFT), it was noted that both were very thickened, taught, and contracted. It was also not possible to separate the SDFT from the DDFT while palpating.

Diagnostic Approach/Consideration

A baseline complete blood count (CBC) was taken. A mild leukocytosis and mild neutrophilia were found, while the rest of the values were within normal limits. A serum biochemistry profile was also obtained, and the results were unremarkable. All findings were without concern.

An ultrasound was performed on Dixie's affected limb as well. Thickening of both the SDFT and DDFT was evident and a clear demarcation between the two tendons was unable to be visualized. The lack of division between the tendons was suggestive of adhesion formation. It was determined that the plan of treatment would not be changed based on radiographic findings, so radiographs were not taken at this time due to financial concerns.

Pathophysiology

Acquired limb contracture does not have a common signalment. It can occur in any age, gender, and breed of horse. There are a wide variety of etiologies causing this condition and it may commonly be multifactorial. Foals growing quickly and on increased nutrition may develop flexural deformities. Pain is a very important contributor to acquired contracture and it can be caused by acute trauma, osteochondrosis dessicans, joint infections, or physitis.[5,11] The pain from these conditions causes an altered stance leading to contraction of the muscular part of the musculotendinous unit.[2,11]

The most common site of contracture is the distal interphalangeal joint or the metacarpophalangeal joint. Clinical signs related to acquired contracture depend on the joint and tendons affected. If the SDFT is affected, an upright pastern with knuckling over at the metacarpophalangeal joint, or fetlock joint, will be visible. If the DDFT is affected, an upright hoof with the heel off the ground and knuckling over at the distal interphalangeal joint, or pastern joint, will be apparent.[7] Ultrasound is commonly used to detect changes to the tendons and radiography is used to identify any osteoarthritic changes that have occurred.[12] Navicular and sesamoid bony changes can be seen in most cases of severe metacarpophalangeal flexural deformities.[12]

Management options depend on the site affected and the severity of the site affected as well. Severity can be determined with radiography or ultrasound as well as visual examination of the limb and comparing the patient's joint angles to normal. Oxytetracycline, while a mainstay of treatment in congenital contracture, does not seem to have the same effect on older horses with acquired contracture.[2] Mild contracture may be managed medically and with some physical therapy. Medical options include analgesics such as NSAIDs and physical therapy. Farrier work is commonly used in the milder cases in order to try and manipulate the angles of the distal limb to stretch out the musculotendinous units affected. Heel trimming, toe extensions, heel wedging, and a combination of these techniques with surgery are all options depending on the angle of the affected joints.[4] Moderate contracture may require surgery but can be treated with medical management first. Severe or chronic contracture will require surgery. Surgery for distal interphalangeal joint contracture may include a distal check ligament desmotomy or a DDFT tenotomy if severe enough. Surgery for involvement of the metacarpophalangeal joint may include superficial check ligament desmotomy or a SDFT tenotomy if severe enough. Arthrodesis of the fetlock joint has been attempted as a treatment option for severe flexural deformities but has only been shown successful in smaller species of large animals but has been shown to be successful in managing metacarpophalangeal osteoarthritis.[3,13]

Prognosis depends on severity of disease and type of management selected as well. Mild contracture successfully managed will have a good prognosis of returning to athletic activity. Moderately affected horses have a good to guarded prognosis dependent on chronicity. Severe contractures requiring surgery have a more grave prognosis of return to athletic function.[12] Horses that have to have a DDFT tenotomy are much less likely to return to performance as it is considered a salvage procedure and most will only return to pasture soundness.[2,8] In several

studies of SDFT tenotomy to treat metacarpophalangeal joint contracture, few to none of the horses with severe disease responded enough to surgery to return to athletic training.[12] Other postoperative complications, such as hyperextension or subluxation of the coffin joint should be monitored via serial radiographs as well.[8,9,13]

Treatment and Management

Evaluation of Dixie's condition indicated she had a severe contracture of the SDFT affecting the metacarpophalangeal joint with possible involvement of the DDFT and distal interphalangeal joint as well. It was decided that a SDFT tenotomy with possible DDFT tenotomy would be performed in order to correct the contracture and allow her distal limb to regain proper angulation.

Dixie was prepared for surgery on July 31, 2018 and received 6.6 mg/kg of Gentamicin, 22,000 IU/kg of Procaine penicillin G, and 4.4 mg/kg of Phenylbutazone preoperatively. She was then induced and maintained on a triple drip combination of Guaifenesin, Ketamine, and Xylazine as well as intravenous fluids for the duration of the surgery. She was placed in left lateral recumbency with her right leg propped up. The lateral mid-metacarpus was clipped and steriley prepared for surgery. A 6 cm skin incision was made on the palmar-lateral aspect of the right mid-metacarpus. Blunt dissection was performed in order to visualize the superficial and deep digital flexor tendons. Both tendons were enlarged and adhered together with scar tissue. It was decided at this point that both tendons would have to be transected in order to allow the limb to reach normal angulation again. Two curved hemostats were placed around the SDFT and DDFT to isolate them from surrounding tissue. Both tendons were transected with care taken to avoid adjacent vessels and nerves. Pressure was then put on the toe in order to assess extension possible after transection. The subcutaneous tissues were closed with 2.0 Vicryl in a simple

continuous pattern, 2.0 PDS used for intradermal closure in a simple continuous pattern, and 2.0 PDS used in a cruciate pattern to close the skin. A sterile bandage with a telfa pad, Kerlix, and standing bandage materials was applied followed by casting material. Pressure to the toe was applied during bandaging in order to achieve the desired angle of the foot. While tension was reduced, the metacarpal bones were only now roughly in line with the phalanges. The toe up to the carpus was included in the cast. Dixie was then recovered from anesthesia in a padded recovery stall with no complications.

Aftercare for a tenotomy can be intensive depending on the structures incised. Bandaging and splinting as well as stall rest and exercise restriction should always be utilized, but the duration will depend on specific cases. Bandaging should occur for at least 30 days after surgery.[8] If the DDFT is incised, bandaging and restricted exercise is recommended for at least 3 weeks.[1] For SDFT tenotomies, splinting is recommended for 1-2 weeks depending on progress.[1] Analgesics in the form of an NSAID such as phenylbutazone or flunixin meglumine should be implemented and maintained for at least the duration of bandaging and as exercise begins to increase. Since pain is a known factor in the cause of tendon contracture, it should be avoided at all costs especially during the recovery period to avoid re-contraction.[1] Corrective shoeing should also be an integral part of the postoperative and recovery period.[8]

Although treatment options are available for acquired limb contracture, prevention is the best management. In the case of Dixie, proper tendon injury care and management following her initial injury may have prevented the contracture and subsequent surgery. Most tendon injuries take a minimum of 6 to 8 months of stall rest and rehabilitation for most of the healing to occur.[6] Dixie was only stall rested for about 3 months after the initial tendon trauma. A slow, but progressive, return to work should be followed as well to prevent reinjury to the tendon by not

allowing the musculotendinous unit adequate time to stretch and regain strength.[10] It is also essential for recheck examinations including ultrasound of the affected limb and tendon to be performed until healing is concluded to ensure excessive inflammation or reinjury does not occur.[6] Because Dixie was only used for light riding and as a pasture horse, this may not have been considered as essential for her.

Case Outcome

Post-surgery, Dixie was placed on 2.2 mg/kg orally every 12 hours of phenylbutazone and 30 mg/kg orally every 12 hours of Trimethoprim sulfa (TMS). Acepromazine at 0.05 mg/kg intramuscular was given as well for anxiety. Three days post-surgery, she was sedated for a cast change. Although Dixie was comfortable in the cast placed after surgery, the angle achieved when placing the cast would have predisposed her to re-contracture. Because of this, it was decided that a double standing bandage with no casting tape would be applied at this cast change to allow further stretching of the joint capsule and eventual return to a normal angle. A heel extension shoe was also added to the affected right forelimb. Ranitidine at 7 mg/kg and Sucralfate at 25 mg/kg both orally every 8 hours were added at this time as well. Six days post-surgery, short walks to allow grazing time were added. Seven days post-surgery a second bandage change was performed. At this time, the toe was noted to be off the ground and the fetlock angle was more extended than at the previous bandage change. A more supportive bandage with casting tape incorporating the hoof was applied in order to keep the desired angle. Standing bandages were also applied to the support limb and proximal affected limb to prevent swelling and stocking up. Twelve days post-surgery, Dixie received her third cast change. Significant strike through and edema along her cannon bone were noted and the limb was re-casted in a slightly more upright angle to continue to support the fetlock. Changes in fecal

consistency and appetite suggested possible GI ulceration so the Sucralfate and Ranitidine were discontinued and switched to Misoprostol orally at 3.5 mcg/kg every 8 hours. Around 15 days post-surgery, significant strike through from a cast sore on her palmar fetlock was noted and her comfort level in the current cast began to decline. At this time, she was only receiving TMS and phenylbutazone. At 21 days post-surgery, her cast was removed and replaced with a standing bandage. A custom shoe was also placed with a heel extension and a support sling for the fetlock. Her fetlock angle continued to drop slowly and at day 28 post-surgery, a bandage with casting tape was reapplied in order to maintain the desired angle. Due to cast sore strikethrough, the casting bandage was changed the following day. Dixie was discharged to return home on August 31st, 2018 with strict instructions for stall rest and exercise restriction, as well as returning for a cast change in about two weeks.

Dixie returned to MSU-CVM Equine department on September 11th, 2018 for her cast change. Owner's reported at this time an increase in lameness and cast sore strikethrough. Significant full thickness cast sores were noted on her cannon bone and in the fetlock region of the affected limb. After cast removal, she had a padded bandage, splint, and heel extension shoe applied. She stayed in-hospital for monitoring as she had appeared more uncomfortable on her right forelimb at home. In-hospital, she was noted to be bearing less weight on her affected limb putting her at an increased risk for support limb laminitis. At this time, she was still on TMS and phenylbutazone. Day 4 in hospital, increased digital pulses were noted on her left forelimb and she was administered DMSO intravenously and started on Gentamicin at 6.6 mg/kg and potassium penicillin. A heel wedge was added to her shoe as well. Her digital pulses continued to be monitored, the amount of time standing or laying down noted, bandage with splints changed periodically, and flunixin meglumine and TMS administered over the next several days. Day 20

in hospital, short walks to allow time to graze were added into Dixie's daily regimen. Day 27, the splint bandage was removed, and a Robert-Jones bandage was applied instead. A biopsy of tissue over her right front heel bulbs was taken and submitted to discern if it was proliferative granulation tissue or coronary corium. These samples were determined to be granulation tissue. Day 33 in-hospital, her bandage was changed and while her limb was unbandaged, the angle of her fetlock continued to drop drastically. Upon examination of the underside of her right front hoof, the medial hoof wall appeared to be poorly attached. The granulation tissue above the coronary band was also speculated to extend into the hoof capsule, possibly contributing to the loose hoof wall. With concern for her loose hoof wall and declining distal limb angles that may not return to normal, humane euthanasia was elected.

Conclusion

Dixie's management and outcome, although difficult and lengthy, was not out of the ordinary. Severe acquired tendon contracture is difficult to treat and the more chronic the injury, the worse the prognosis. If Dixie's injury had not been as chronic and her superficial and deep digital flexor tendons not adhered together, a singular tenotomy could have been performed leaving her affected leg more supported. However, the tendons were not able to be separated and therefore, this technique was not possible. Another surgical alternative was to perform an arthrodesis in order to avoid tenotomies and ensure better limb support. However, this was a more financially involved treatment and was not chosen due to Dixie being a pasture horse. As with any limb injury, support limb complications are a problem as well. Support limb laminitis was a concern for Dixie the longer her recovery continued. Support limb complications, coronary band changes, and the worsening fetlock angle of her affected limb were the deciding factors leading to the decision to stop treatment.

References:

1. Adams, Stephen B., et al. "Management of Congenital and Acquired Flexural Limb Deformities." *International Veterinary Information Service,* vol. 46, 2000, pp. 117-125.

2. Caldwell, Fred J. "Flexural Deformity of the Distal Interphalangeal Joint." *Veterinary Clinics: Equine*, vol. 33, 2017, pp. 315-330.

3. Chapman, Hannah-Sophie, et al. "Arthrodesis of the Metacarpophlangeal and Metatarsophalangeal Joints to Treat Osteoarthritis in 17 Horses." *Veterinary Surgery,* 2019, pp. 1-8.

4. Curtis, S. J., "Farriery in the Treatment of Acquired Flexural Deformities and a Discussion on Applying Shoes to Young Horses." *Equine Veterinary Education*, vol. 4, no. 4, 1992, pp 189-193.

5. Getman, L. M. "Surgical Treatment of Severe, Complex Limb Deformities in Horses." *Equine Veterinary Education,* vol. 23, no. 8, 2011, pp. 386-390.

6. Gillis, Carol L. "Rehabilitation of Tendon and Ligament Injuries." *International Veterinary Information Service,* vol. 43, 1997, pp. 306-309.

7. Greet, Timothy R. C. "Managing Flexural and Angular Limb Deformities: The Newmarket Perspective." *International Veterinary Information Service,* vol. 46, 2000, pp. 130-136.

8. Kramer, Joanne. "Deep Digital Flexor Tenotomy." *Manual of Equine Field Surgery*, by David A. Wilson et al., Elsevier Urban & Partner, 2009, pp. 98–102.

9. Lloyd-Bauer, Penny M., et al. "Correction of Acquired Flexural Deformity by Deep Digital Flexor Tenotomy in a Miniature Horse." *Canadian Veterinary Journal,* vol. 30, 1989, pp. 585-589.

10. Smith, Roger K. W. "Tendon and Ligament Injury." *International Veterinary Information Service,* vol. 54, 2008, pp. 475-501.

11. Trotter, Gayle W. "Flexural Deformities." *College of Veterinary Medicine and Biological Sciences*, 2016, csu-cvmbs.colostate.edu/academics/clinsci/equine-orthopaedic-research-center/orthopaedic-topics/Pages/flexural-deformities.aspx.

12. Wagner, Pamela C., et al. "Management of Acquired Flexural Deformity of the Metacarpophalangeal Joint in Equidae." *JAVMA,* vol. 187, no. 9, 1985, pp. 915-918.

13. Whitehair, Karen J., et al. "Arthrodesis for Congenital Flexural Deformity of the Metacarpophalangeal and Metatarsophalangeal Joints." *Veterinary Surgery*, vol. 21, no. 3, 1992, pp. 228–233.