Evaluation and treatment of flexural limb deformities in neonates.

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Flexural limb deformities are commonly seen in neonates and offer some significant challenges. The most common areas affected are the carpal joints, metacarpo/tarsophalangeal joints, phalangeal joints, and rarely the tarsal region. The etiology is multifactorial and the cause of the contracture can be due to shortening of the muscle/tendon unit or of the joint capsule itself and can range from mild to severe. The most critical aspect of evaluation is carefully examining the entire patient, i.e., ruling out concurrent disease. It is easy to focus on a limb that will not straighten but these foals often have failure of passive transfer, neonatal encephalopathy, or other systemic compromise. The next step is determining what structures are involved and whether the problem will likely be resolved. Generally, this can be ascertained from a good physical examination. In my experience, most flexural limb deformities can be alleviated if they can be manually reduced/improved with or without mild sedation (diazepam or midazolam). Rarely can one make the limb straight, but if some improvement is made, it is usually worth trying. Treatment consists of external coaptation to align the limb, allowing weight bearing and stretching of the contracted structures, pharmacologic management to aid in tendon relaxation/pain management, and controlled exercise. A common pitfall is failure to use the treatment strategies in conjunction or to do so inadequately. External coaptation is in my opinion the most important aspect and also the one that can easily lead to life threatening complications. It can be achieved through a variety of splinting techniques and commercial products. I have had the least complications using a well-placed bandage and fiberglass casting tape as a custom splint changing every 12-24 hours. Oxytetracycline is one of the mainstays of therapy for moderate to

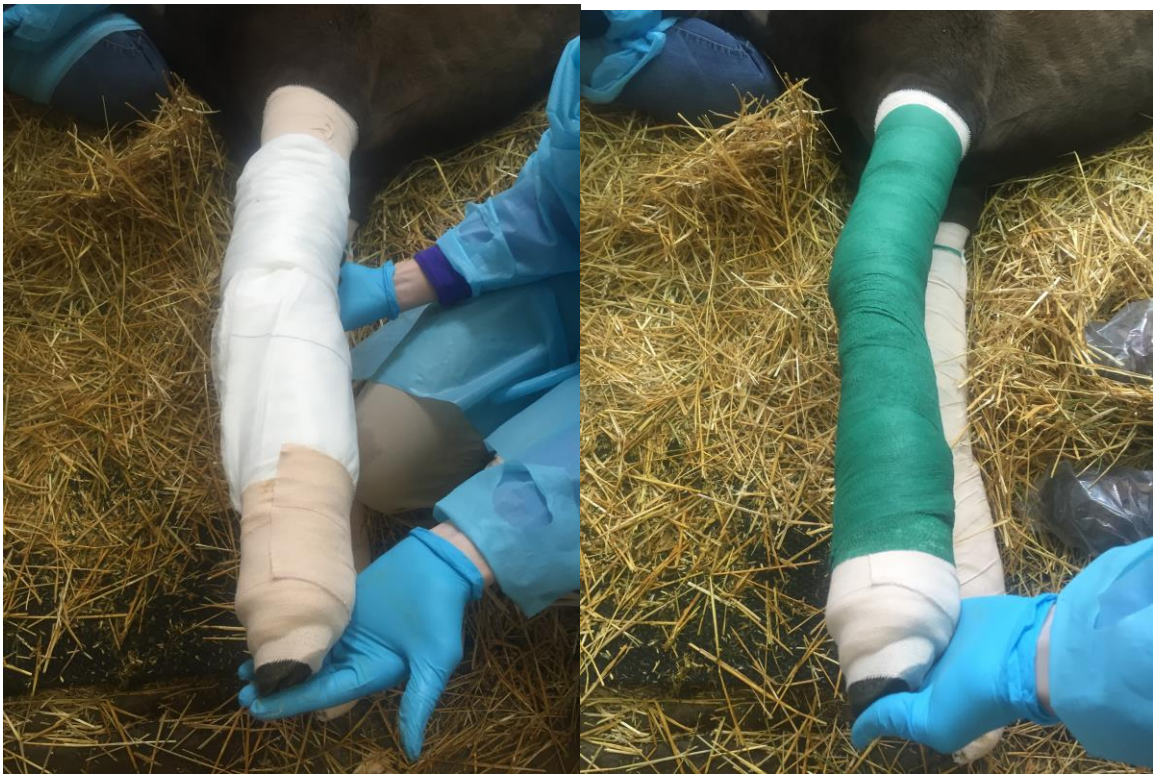
severe congenital flexural limb deformity. The exact mechanism is unknown, but it is thought to bind to calcium, inducing relaxation of the muscle/tendon unit, and there has been some research demonstrating an age-dependent response to the viscoelastic properties of tendons in rats and a dose-dependent regulation of MMP-1 mRNA in equine tendon myofibroblasts in vitro.[1,2] Generally, I use 1-2 grams intravenously diluted in 500-1000 ml sodium chloride for over 20-30 minutes. I will repeat every 24 hours up to three times. It is essential to evaluate renal function prior to administration and ensure the foal is maintaining adequate hydration. In an oxygen deprivation state either before, during, or immediately post parturition, the central nervous, digestive, and renal systems are most sensitive to hypoxemia. This is why evaluating the patient for concurrent disease is vital. Non-steroidal anti-inflammatories such as ketoprofen or banamine are also crucial for pain management. I also include gastroprotectants such as gastrogard and sucralfate when utilizing NSAIDS. Controlled exercise consists of stall confinement with encouragement or assistance to stand and move around the stall every 2 hours which allows adequate nursing as well as weight bearing. Most failures of resolution are due to monetary restrictions, inadequate case selection, ineffective splinting, or systemic compromise.

Materials:

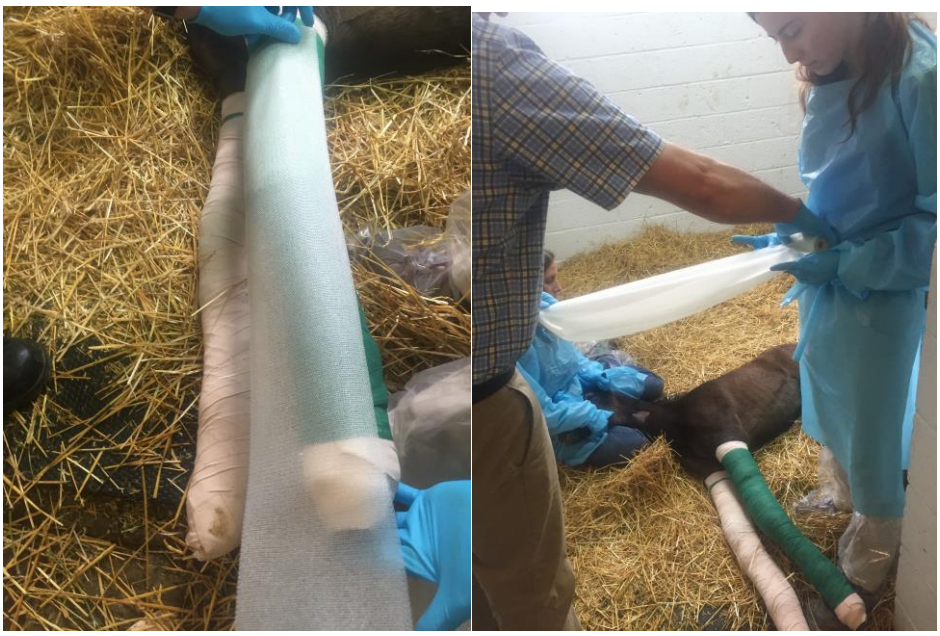
Bandaging material, Brown gauze, elastikon, vetwrap, 3 or 4 inch fiberglass casting tape, Warm water

Step 1: Sedate and restrain foal. Generally midazolam 0.02-0.1 mg/kg plus or minus butorphanol

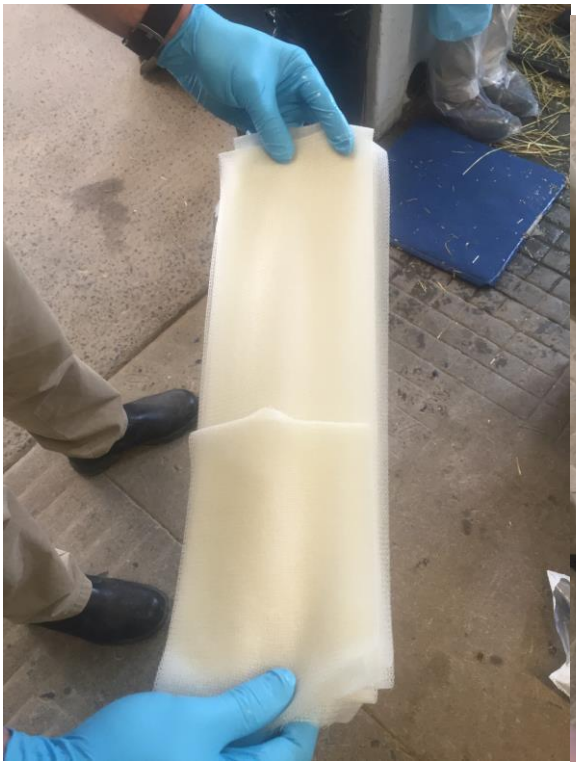
Step 2: Bandage material applied snug with elastikon to top and bottom to prevent slippage. Then brown gauze and vet wrap

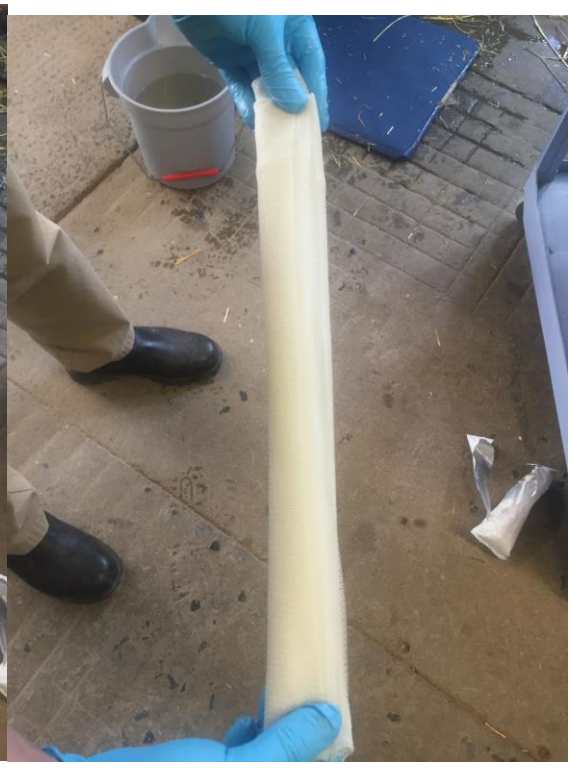


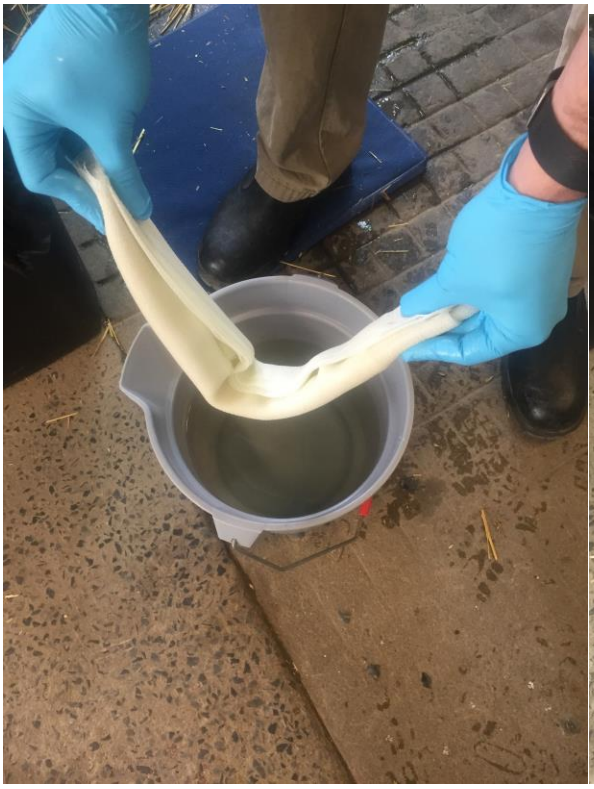
Step 3: Unroll fiberglass casting tape prior to getting wet. Pre-measure as well as possible and unwrap layering back and forth over itself

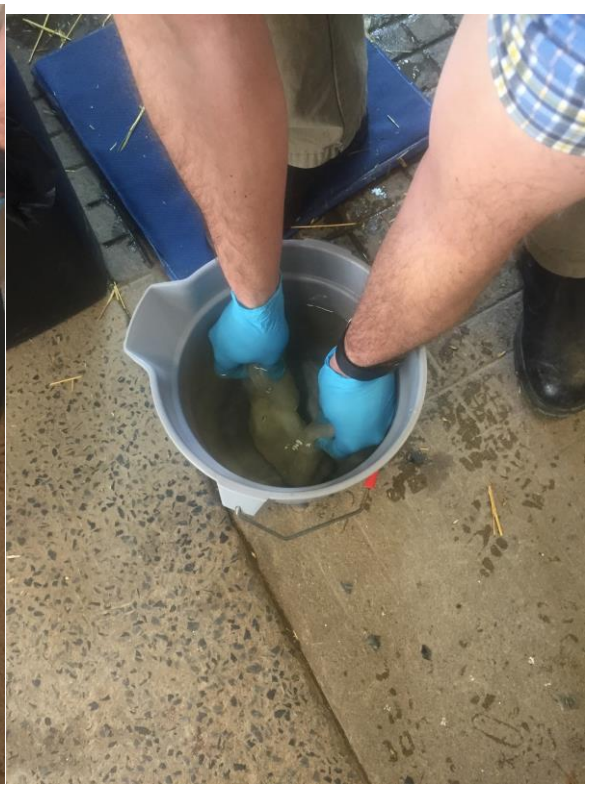


Step 4: Double casting tape over itself and dip.

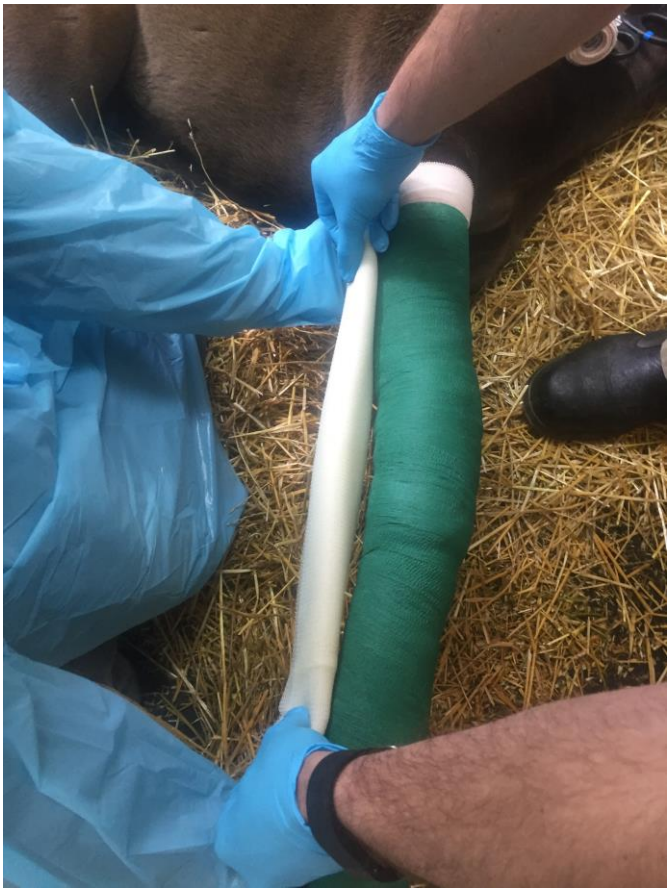


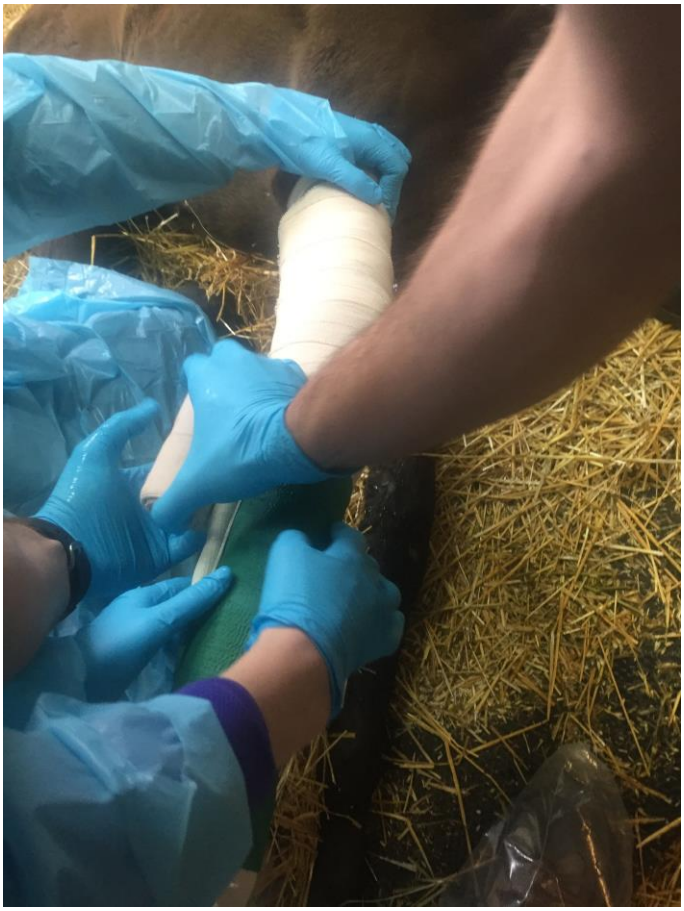


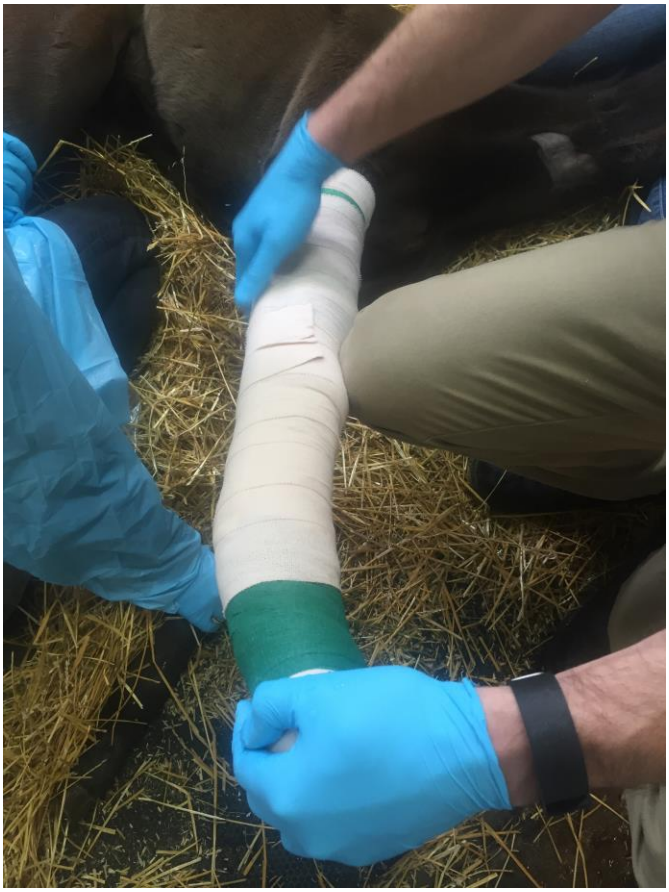


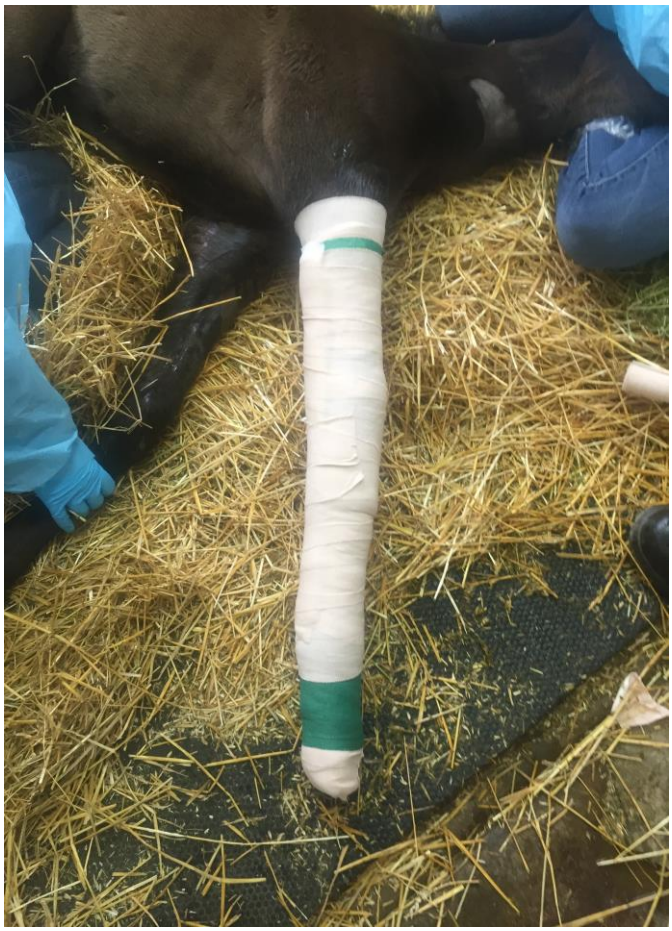


Step 5: Apply to the back of the limb, elastic tape into place, and apply pressure to the desired conformation until hardened.









Results: Functional non-bulky splint allowing ambulation, rare rubs or complications

References:

1. Arnoczky SP, Lavagnino M, Gardner KL., et al: In vitro effects of oxytetracycline on matrix metalloproteinase-1 mRNA expression and on collagen gel contraction by cultured myofibroblasts obtained from the accessory ligament of foals. Am J Vet Res 65:491-5, 2004

2. Wintz LR, Lavagnino M, Gardner KL., et al: Age dependent effects of systemic administration of oxytetracycline on the viscoelastic properties of rat tail tendons as a mechanistic basis for pharmacological treatment of flexural limb deformities in foals. Am J Vet Res 73: 1951-6, 2012