This Cow Knee-ds Help

A Case Report on Specific Stifle Injuries in the Bovine

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Introduction:

Bovine stifle injuries and disease are considered a primary source of lameness in cattle and can be economically demanding on producers and farmers due to the significant production lost the injuries and disease can cause. The economic losses that can be associated with any stifle injury or disease include increased recumbency, failure of conception in cows, decreased food and water intake, decreased milk production, and hesitation of mounting in bulls[1]. Stifle injuries in the bovine include a variety of different diagnoses including but not limited to traumatic injuries to the numerous soft tissue structures that can lead to arthritis, osteoarthritis, septic arthritis, and degenerative joint disease. History, presentation, and a thorough physical and lameness exam are keys to narrowing down a lameness to the stifle. In bovine orthopedics, a wide variety of diagnostics have been used to evaluate the stifle including radiography, ultrasound, magnetic resonance tomography (MRT), and computed tomography (CT)[3]. Treatment is based on the primary source of the lameness and depends on the value of the cow or bull. This case report focuses on a specific case of cruciate ligament injury, a collateral ligament avulsion fracture, and meniscal injury in a cow.

History and Presentation:

A 9-year-old Scottish Highland cow presented to MSU-CVM Food Animal Service for lethargy and a left hindlimb lameness. The owner stated that the cow had been lethargic and not feeling well for about a week. She is pastured with the herd, but it was noticed prior to presentation, for her to be isolating herself from the group. The owner also had noted that she was very stiff, kept her head low at the walk, and was reluctant to bear weight on the left hindlimb. Previously, she had history of an interdigital fibroma that was removed on her front right foot.

Upon presentation, the patient was quiet, alert, and responsive with a heart rate of 80 beats per minute, respiratory rate of 40 breaths per minute, a temperature of 103.6 F, and rumen contractions of 1 per minute. Although she had a temperature of 103.6F, this was not considered a true fever. A cow's temperature naturally tends to run high, and at presentation, the outside environment was hot. The patient's body condition score was 8/9, and she weighed 1,402 pounds (637.3 kilograms). All other parameters were within normal limits. Her lameness score was a 4/5. When walking, the cow was reluctant to flex at her stifle with no cranial phase of stride. Cardiothoracic auscultation revealed no abnormalities, only normal bronchovesicular sounds.

Diagnostic Approach/Consideration:

As the investigation continued, a thorough hoof testing exam on the hydraulic table revealed negative results for any cause of lameness on all four distal limbs. The front right interdigital space, where her previous corn was removed, had healed well over time. The left forelimb had a small interdigital fibroma, but it was not causing any lameness at this time. Further investigation proximally, there was increased and marked swelling noted that was proximal to the hock on the left hindlimb.

An ultrasound exam was then performed of the proximal left hindlimb which revealed minor edema in the area of the marked swelling, but this was not intra-articular. A rectal exam was performed to note any crepitus within the pelvis or in the coxofemoral joint, but this exam was unremarkable.

Tarsal and stifle radiographs were then performed the day after presentation. The tarsal radiographs revealed mild osteoarthritis. Stifle radiographs revealed severe osteoarthritis within the stifle joint with mediolateral instability. An avulsion fracture of the medial aspect of the tibia could be appreciated due to the medial collateral ligament being pulled away. Due to the amount of space within the medial aspect of the joint, the cranial cruciate ligament was also thought to be involved.

Pathophysiology:

Bovine stifle injuries or disease processes are an extensive source of proximal hindlimb lameness in cattle.[1] Lameness that originates from the stifle often is due to the complexity of its make up along with hereditary aspects that will predispose a certain breed. Within the stifle there are many anatomic structures that are needed to be considered. The three joints within the stifle are the femoropatellar, medial femorotibial, and lateral femorotibial joints. The femoropatellar and medial femorotibial joints will always communicate in 100% of stifles while the medial femorotibial and lateral femorotibial joints will communicate about 57-65% in bovine stifles[1,3]. All three joints may communicate in 60% of cases[7]. At the proximal aspect of the stifle, the patella has a quadriceps tendon attachment. Distally, the patella has three separate ligaments including the medial, middle, and lateral patellar ligaments that connect it to the tibial crest[1]. Intra-articular and extra synovial, there are crucial ligaments that provide the rotational and craniocaudal reinforcement of the stifle[1]. These include the cranial and caudal cruciate ligaments. Located individually on each side of the stifle is the medial and lateral collateral ligaments that provide medial and lateral support and stability. Sitting distal to each femoral condyle and proximal to the tibial plateau, there are the medial and lateral meniscus that provide cartilaginous cushion for the surfaces of the joints. Unlike the lateral meniscus, the medial meniscus is securely attached to the medial collateral ligament in the bovine stifle. This significantly predisposes the medial meniscus to synchronal injury when there is damage to the medial collateral ligament[1]. Compared to the equine stifle, the bovine stifle has a synovial lining that is more abundant making it more proliferative when inflammatory conditions are present in moments with joint vulnerability and chronic arthritis[1].

Lameness in the bovine species comes in many shapes, forms, and fashions. The more common structures of the stifle that are affected and injured include the cranial cruciate ligament, the medial meniscus, and less frequently the collateral ligaments[1,2]. Osteoarthritis due to a traumatic injury or to the degenerative nature to one of these structures is a common secondary downfall that must be managed after diagnosis. Other injuries of the stifle include fractures, patellar luxation, upward fixation of the patella, septic arthritis, and subchondral bone cyst, but in this case report the cruciate ligaments, medial meniscus, medial collateral ligament, and avulsion fractures will be focused on.

Cranial cruciate ligament rupture due to a traumatic event is a common cause of lameness in cattle. Bulls specifically have a higher incidence of developing a cranial cruciate rupture secondary to degenerative joint disease along with injuries associated with mounting[1]. Also, straight tarsocrural joints (post-leg conformation) in some bulls predisposes them to a decreased stifle angulation which can lead to secondary meniscal damage, an unstable joint, degenerative joint disease risk, and finally the cranial cruciate ligament fraying until it ruptures[1]. Cows with higher body condition scores are at high risk for cruciate ligament injuries due to obesity[1]. In the specific case discussed, a body condition score of 8/9 easily put her in this category. This was a 1,400-pound cow on a 1,000-pound frame.

A thorough physical exam allows for diagnosis in most cases. Presentation can vary, but a cruciate ligament injury commonly presents with a nonspecific lameness[1]. The lameness can be marked with an acute injury or in some other cases the patient may present with a milder lameness that can fluctuate with a normal gait to a marked lameness. It is important that any distal limb lameness is ruled out first before a full investigation is taken to the stifle. During manipulation of the stifle joint, pain can be elicited, crepitus can be palpated, a cranial drawer can be initiated, and increased internal rotation can be found[1]. After a complete physical exam, radiographic evaluation of the stifle is of high consideration to provide support of a presumptive diagnosis of cranial cruciate injury. When evaluating a normal stifle radiographically, the femoral condyles overlap the tibial eminences in the lateral view[1]. In cattle that have cranial cruciate ligament injury, the lateral radiograph may reveal the femoral condyles being caudal to the tibial intercondylar eminences[1]. In more chronic cases, there can be evidence of degenerative joint disease and craniocaudal views, can confirm any presence of avulsion fragments and collateral ligament ruptures seen by joint space incongruity[1]. Recently, ultrasonography has become an applied diagnostic tool in bovine orthopedics[8]. Ultrasound is even more highly favorable over radiographic imaging for soft tissue structures and swelling[8]. Synovial effusion and arthritis along with tenosynovitis, and bursitis are all detectable even in early stages with ultrasound. Arthroscopy is still considered the gold standard for evaluation of the stifle and a definitive diagnoses of cranial cruciate ligament injury and meniscal damage[1]. Due to economic situations, lack of significant equipment, and slight unfamiliar arthroscopic landmarks and techniques, arthroscopy in not as common in the bovine as it is in the equine species.

The diversity in treatment options for cruciate ligament injuries and disease depends on the economic value of the patient, the severity of the disease, secondary progression of degenerative joint changes, and the access to the right equipment, facilities, and surgeon to perform the surgical repair[1]. Surgical repair of this injury is the preferred treatment choice yielding the best prognosis[1]. It is reported that the best results can be seen in cattle that have no evidence of degenerative joint disease at the time of any surgical intervention[1]. Surgical repair options include extracapsular imbrication of the tissues surround the joint and ligament replacement[1]. In certain cases, with smaller cattle or for economic reasons, strict stall rest with good footing and limited activity will help minimize the cartilage damage that may result due to joint instability. Over conditioned cattle will benefit from losing weight as well. Nonsteroidal anti-inflammatories can be dispensed for analgesia during long term management[1]. Two common medications include meloxicam orally every 24-72 hours and flunixin meglumine (Banamine) intravenously every 12-24 hours.

Prognosis depends on the treatment chosen. Without any treatment of a completely torn cranial cruciate ligament, the prognosis is poor usually resulting in deterioration of the joint and animal itself leading to the animal being culled or humanely euthanized due to poor productivity on the farm. When there is a partial tear in the cranial cruciate ligament, stall rest is initiated, and if the patient has a low body condition score, the prognosis is greater depending on how much sufficient fibrous tissue is laid down to stabilize the stifle joint which allows for continued productivity[1]. Surgical intervention is most likely to have the best prognosis and better long-term successful rate. Failure is most likely to occur when the patient is overweight or has a more advanced case of degenerative joint disease[1].

Meniscal injury, specifically to the medial meniscus in this case evaluation, in cattle are most often acquired due to medial collateral ligament rupture. This is unlike the canine species or the equine species. In dogs meniscal damage if often parallel to cranial cruciate rupture, and in the horse, they are more likely to establish primary meniscal damage[1]. Injuries to the medial and lateral collateral ligaments are often associated with a luxation, subluxations, or cranial cruciate ligament rupture[2]. Diagnoses for both a meniscal injury or collateral ligament injury is also made usually on physical exam which can entail a lameness that has a shortened in stride, weight bearing on the toe, and decreased flexion in range of motion of the stifle joint[2]. Effusion of the femoropatellar joint and pain on the medial aspect of the medial femorotibial joint can also be observed. When the limb is abducted there is increased joint laxity indicating a tear of the medial collateral ligament, and then if adducted with increased joint laxity it can indicate that the lateral collateral ligament is torn[2].

On radiographic evaluation, joint widening of the medial femorotibial joint can be appreciated on stressed craniocaudal views where avulsion fractures at the origin or the insertion can be evaluated as well[1]. Ultrasound and arthroscopy can again be key diagnostic equipment for use as with cruciate ligament damage. These diagnostic procedures are most often done in horses where there is limited literature for them being evaluated in cattle[1]. On an ultrasound evaluation, there can be a partial or complete tear detected to support a presumptive diagnosis.

Treatment consist of conservative therapy such as increased stall confinement is ideal for cases where there is no other concurrent injury to other structures within the joint such as the cranial cruciate ligament. Surgical therapy which includes an imbrication of the joint capsule to the affected side which is like the surgical repair seen with a cranial cruciate rupture. Medial meniscal injuries with concurrent medial collateral ligament damage can under go fixation of the medial collateral ligament with cortical bone screws and washers. A medial imbrication of the medial tissues surrounding the joint can also be performed in coexisting injuries[1,2].

Treatment and Management:

After radiographic evidence of the avulsion fracture on the medial aspect of the left hindlimb stifle and suspected cranial cruciate involvement, it was determined that the patient would be a good candidate for stifle surgery. Before surgery was scheduled, 5mls of Adequan was administered intramuscularly prior to surgery and 16 days post operatively. Adequan is a polysulfated glycoaminoglycan which is a chondroprotetive and inhibitor of enzymes that will degrade articular cartilage[4]. Meloxicam tablets at 1mg/kg were administered orally daily for pain and inflammation that was associated with her stifle injury. The following day stifle fracture fixation surgery was performed. Under general anesthesia, a 60mm lag screw was placed through the avulsion fragment of the tibia then into the medial aspect of the proximal tibia. Intraoperative radiographs were taken to visualize where the 60mm lag screw was placed. A regional intra-articular injection into the left stifle joint was performed with 10mg of morphine and 1-gram vial of ampicillin. A medial imbrication of the joint capsule was then performed in order to strengthen the support of her stifle. This will increase the fibrous tissue formation around the stifle and help delay the heightened onset and continued progression of the degenerative joint disease by reducing the amount of joint laxity[1]. The skin was closed with 3 vicryl with a ford interlocking suture pattern. An arthroscopy was not performed due to time constraints under general anesthesia and the excess amount of periarticular fat (5 inches) that surrounded the joint. Perioperative antibiotics included florfenicol (Nuflor) at 40mg/kg given subcutaneously in her neck to help combat any infection that could have been introduced during surgery. Flunixin meglumine (Banamine) at 1.1mg/kg was given intravenously prior to surgery and then every 12 hours for 3 days to help manage inflammation and pain after surgery. Five days post-operatively tiludronate disodium (Tildren) was mixed with 10cc of sodium chloride and then added to one liter of sodium chloride and then administered once intravenously over three hours.

Tildren is pharmacologically classified as a bisphosphonate. The action of tildren and other bisphosphonates are to inhibit or decrease bone resorption by blocking osteoclast metabolic pathways[5,6]. Osteoclast are responsible for breaking down bone and reabsorbing the minerals that bones contain such as calcium. By administering a bisphosphonate like tildren, the osteoblast, which enable bone to be laid down, can work more efficiently and effectively which will help improve overall bone mass. Tildren has recently been studied and approved for use in horses for the treatment of bone resorptive diseases[6]. It has been approved for lamenesses associated with bone spavin, distal tarsal osteoarthritis, and to treat navicular disease[5,6]. Contraindications and other precautions included are in horses that have impaired renal function, have electrolyte abnormalities, or in horses that are dehydrated. Non-steroidal anti-inflammatories given to the patient may also increase the risk of renal toxicity and acute renal failure[5]. One adverse effect that can happen within hours of treatment can be signs of colic. The signs are usually mild and will generally resolve without treatment. Other adverse reactions that may occur within a 4-24-hour period will be increased urination, decreased appetite, and fever[5].

In the patient's case, flunixin meglumine (Banamine) was discontinued 48 hours prior in order to prepare for the administration of Tildren. The mechanism behind this specific drug would be very beneficial to aid in her recovery process and increase the chance of a good prognosis for her future. While in hospital, she was monitored closely for any of the adverse effects that were recently mentioned above. In order to analyze her kidney function, her creatinine levels were checked at 24 hours post-operatively and 48 hours post administration of tildren which were within normal reference range. Tildren is not medically prescribed to bovine on any normal basis so there are no withdrawal periods in literature or with FARAD (Food Animal Residue Avoidance Datatbank). Tildren is also not on the prohibited or restricted drug list for food animals. Since there is no literature on these aspects and because the drug is not allowed to be used in humans, the patient cannot enter the food chain.

Case Outcome:

After surgery, the patient was hospitalized for monitoring for 17 days. She developed mastitis 3 days post-operatively. In hospital, she was treated with Cephapirin, a first generation cephalosporin, once a day for 6 days. The left hind quarter was stripped every morning, and then a sterile prep was performed before the 10cc of Cephapirin was administered by intramammary infusion. The mastitis resolved well with treatment before being discharged.

Fourteen days following surgery, the sutures were removed, and shock wave therapy was performed to promote healing in her left stifle. 1000 pulses were admitted during this procedure. Recommendations for discharge and recovery included to remain in a small paddock with no other animals for strict restriction up to 8 weeks. A diet program would need to be initiated in order reduce the body condition score as obesity plays a crucial role in the future of the healing of her stifle. It was encouraged that she loose up to 200 pounds to help promote healing and improve her future breeding opportunities.

Today, the patient has now lost a significant amount of weight of about 200 pounds and recovered well from her surgery that took place over a year ago. Her body condition score now is a 6/9. She is out on pasture with the herd and continues to bring joy to her family.

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