

“Bad to the Bone”

Coxofemoral Joint Luxation and Osteomyelitis in the Foal

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INTRODUCTION:

Coxofemoral luxation is uncommon in horses due to numerous ligaments and heavy musculature surrounding the joint in horses. The fibrocartilagenous rim around the acetabulum, the femoral accessory ligament, and round ligament stabilize the coxofemoral joint.¹ In the equine species, coxofemoral joint luxation is most frequently seen in foals, miniature horses, and ponies.¹ Horses generally fracture the ilium before the hip luxates.¹ Coxofemoral joint luxation is typically the result of a traumatic event and mostly seen in younger animals due to anatomic stabilization, increased muscle mass in larger horses.⁴ Typically, closed reductions are unsuccessful due to swelling of soft tissues, presence of blood clots, and capsular and ligament debris within the acetabulum.⁴ Successful management of these types of luxation presents a significant challenge to equine surgeons due to the depth of the joint, technical nature of the procedure, condition of affected structures, and uncommon nature of the injury.

Osteomyelitis in the foal is thought to be established by the delivery of bacteria from the circulatory system, direct extension from another system, or by direct inoculation.⁹ The most common route is hematogenous spread of bacteria resulting in direct infection of synovial structures and bone.⁹ Differentiation of infections of bones and joints in foals is important as most foals with osteomyelitis also have septic arthritis in one or more joints.⁹ The most commonly affected joints are femoropatellar, tarsocrural, carpal, and fetlock joints and occasionally infections in the elbow, shoulder, and hip joints have been reported.⁹ Umbilical infections and failure of passive transfer can predispose foals to the development of septic arthritis and/or osteitis and osteomyelitis.

HISTORY AND PRESENTATION:

On May 14, 2016, a 3-week old Quarter Horse foal presented to MSU-CVM for lameness in the right rear limb. Four days prior to presentation, the owner noticed he was toe-touching lame in his hind feet and hoof tester positive on his right rear hoof. At that time, the owner suspected a hoof abscess, and Banamine and a foot soak were administered. A few days later the foal became non-weight bearing lame on his right rear limb. The foal had no other prior histories of lameness or illness and lived on a farm with numerous other horses. On presentation, the foal was bright, alert, responsive, and nervous, and had a grade 4/5 lameness on the right rear limb. His temperature was moderately elevated at 102.8 F, heart rate was 140 beats per minute, and respiratory rate was 30 breathes per minute. He showed reluctance to bend his right stifle joint, which showed effusion on palpation. No other joints showed effusion, and the umbilicus was small, not swollen, and not warm on palpation. His heart and lungs auscultated normally and all other aspects of his physical exam were within normal limits. Blood work, radiographs, and an arthroscopy of right stifle were performed demonstrating septic arthritis with subsequent osteomyelitis of the distal femur. The foal was hospitalized for roughly five and a half weeks and underwent local antimicrobial therapy of intra-articular amikacin 500 mg, systemic chloramphenicol 50 mg/kg orally every 6 hours for 30 days, and daily-hospitalized care. At the time of discharge, the foal was sent home on Adequan injections, copper sulfate supplements, and Accel Lifetime supplements. The foal was confined to a stall with instructions to provide controlled exercise with his dam for 10 minutes to help improve his range of motion.

However, 6 weeks following discharge, the foal presented to MSU-CVM AHC again for continued and worsened right rear limb lameness and an unusual appearance of his right hip. On presentation, the foal was bright, alert, and responsive with a temperature of 102.1 F, heart rate of 76 beats per minute, and a respiratory rate of 36 breathes per minute. He was noted to have a

good body condition score weighing 257 lbs. and a grade 4/5 right rear limb lameness and very little weight bearing on the right rear limb. When looking along his topline from behind, the coxofemoral joints were noted to be uneven in height at his tuber ischi with the right side being lower than the left. Additionally, effusion of his left rear limb was noted from the coffin joint to the pastern joint, and the right hip was noted to have a sunken appearance. All other portions of his physical exam at this time were within normal limits.

PATHOPHYSIOLOGY:

Osteomyelitis is an infectious/inflammatory disease of the bone and its marrow cavity usually of bacterial origin but may rarely have mycotic origins.¹⁰ It may be an acute or chronic infection involving the epiphyseal, metaphyseal, or diaphyseal region of the bone originating hematogenously, secondary to a contiguous area of infection, or direct inoculation.¹⁰ In foals, those that are affected usually have a history of failure of passive transfer, and the bacteria localizes around low-flow circulation areas such as the physes and joints.¹ The infection may be classified based on the area of the infection with “s-type” involving synovial structures, “e-type” involving epiphysis, and “p-type” involving the physis.^{1,10} Diagnosis of osteomyelitis is typically made based off clinical signs, diagnostic imaging, and/or bloodwork and cultures. Infection of the coxofemoral joint, in particular, can be a diagnostic challenge since joint effusion, heat, and pain are not typically palpable.¹ Most commonly, foals are less than four months of age and present with a unilateral lameness of unknown cause.¹ Foals with coxofemoral osteomyelitis usually have a characteristic toe-out, stifle-out, hock-in appearance with pain elicited with deep palpation over the greater trochanter and hip region.¹ Infection of the coxofemoral joint may often be confused with trauma to the limb; however with infection, the lameness often progressively worsens over time, whereas trauma will typically improve over

time.¹ It is believed, by the author, that if the infection persists untreated, it can weaken the joint enough that even slight trauma could cause traumatic luxation of the coxofemoral joint as demonstrated by the foal referenced above in this paper.

DIAGNOSTIC APPROACH AND CONSIDERATIONS:

Diagnosing osteomyelitis in foals usually occurs through utilization of a thorough history, physical exam, blood work, cultures of the joint, and radiographic findings of the joint. Acute cases may exhibit localized inflammation, soft tissue swelling, pain on palpation, an obvious lameness, and occasionally fever, depression, anorexia, or general malaise may be observed.¹⁰ Chronic infections can be challenging as they will often not present with fever or depression and can exhibit clinical signs such as firm swelling, reluctance to bear weight, mild to moderate lameness, and presence of a draining tract.¹⁰ Acute bacterial infections are usually seen in very young animals spread hematogenously but frequently may be secondary to gastrointestinal and respiratory tract infections with a history of prematurity, failure of passive transfer, or peripartum difficulties.^{9,10} Radiographic signs of early osteomyelitis are often subtle and may be difficult to interpret with soft tissue swelling adjacent to the affected area as the only visible sign in acute cases.¹⁰ Osteolysis can be observed as early as 3 days; however, most bony changes will take 7 to 14 days to appear once infection has started.¹⁰ In chronic cases, sclerotic bone, cortical resorption and thinning, and periosteal proliferation can be present with occasional bony sequestra present.¹⁰ Definitive diagnosis may be made through culture of the suspected focus of infection gained through deep needle aspirates or surgical debridement/culture for both anaerobic and aerobic organisms; however, absence of growth does not definitely rule out infection.^{1, 9, 10} Common organisms involved include: *Escherichia coli*, *Actinobacillus equuli*, *Salmonella* spp., *Streptococcus*, *Staphylococcus*, and *Rhodococcus equi*.⁹ Blood work may reveal a degenerative

left shift in the leukogram of acute cases, elevated plasma fibrinogen levels, and then return of the leukogram to normal with chronic cases.^{9,10} Synovial fluid may reveal elevated leukocyte counts and total protein concentrations with gram stain being helpful in determining the type of bacteria present to aid in antibiotic selection prior to culture results.¹⁰ Normal synovial fluid should be slightly yellow, viscous, and contain less than 2500 nucleated cells per deciliter and a total protein of less than 2.5 mg/dl.^{1,9} For joints to be typically considered infected the nucleated cell count should be greater than 10,000 cells/dl.⁹

Diagnostically approaching luxation of the coxofemoral joint can be challenging in horses. Typically diagnosis is based on characteristic clinical signs and radiographic appearance. However, due to heavy musculature in this area advanced imaging such as ultrasound, CT, or MRI is required for surgical planning. Radiography may confirm luxation and rule out pelvic fractures, acetabular fractures, and other fractures; however, the heavy musculature around this area may make radiographs have limited diagnostic value, many structures are obscured by overlying soft tissue structures.¹

TREATMENT AND MANAGEMENT:

For osteomyelitis of the coxofemoral joint combined with luxation of the joint, treatment methods would need to be combined and extensive. For osteomyelitis, treatment is similar to any types of synovial infections with the use of broad spectrum systemic antimicrobials, intra-articular antimicrobials, and joint lavage/drainage with arthroscopy often being performed in smaller horses and foals.¹ Synovial infections should always be considered an emergency with the mainstay of treatment being local lavage and antimicrobials that may be applied in a number of ways.⁵ This may include direct injection of the antibiotic or local antimicrobial therapies such as antimicrobial-containing beads made of bone cement with the beads removed after resolution

of infection.⁵ Additionally, regional limb perfusion may be used in some cases.⁵ If not diagnosed and treated before significant osteomyelitis is present, the prognosis is generally poor.¹ The one exception is that if radiographic changes are not present, many foals may have some athletic function similar to other joint ill foals with aggressive antimicrobial treatment.¹ Treatment of coxofemoral joint luxation can be problematic, especially in adult horses.¹ Horses are typically euthanized diagnosis due to poor prognosis and often unsuccessful treatment options.¹ These treatment options include both closed reduction or surgical approaches, described for foals or small breed horses.¹ Surgical options include: open reduction alone, transposition of the greater trochanter, femoral head and neck resection, toggle pinning, and augmentation of the lateral joint capsule with synthetic sutures attached to screws.¹ The use of a femoral head ostectomy was used to successfully treat a donkey with a traumatically luxated coxofemoral joint where the donkey was sound at the walk, had a grade 2/5 lameness at the trot, and no apparent shortening of the limb at 22 months post op.¹¹ One paper followed an Arabian filly four years after a femoral head ostectomy was performed due to chronic luxation of the coxofemoral joint, which showed soundness to the level of a broodmare with an acceptable quality of life despite angular limb deformities in the contralateral limb.⁶ A total hip arthroplasty was attempted in a small equine patient with success immediately post-op; however, the patient rapidly deteriorated due to a jejunal infarction and multiple thromboemboli.⁷ In ponies, several techniques have been described with relative success such as a femoral head ostectomy and the use of prosthetic capsule technique with both techniques associating earlier diagnosis and reduction of the coxofemoral joint with increased success.^{2,3,8} For any surgical treatment option, the patient should be confined to a clean, dry stall and slowly reintroduced to activity and interactions with other horses. For many owners, the financial cost and limits in available facilities, as well as the

quality of life of the patient and athletic use or expected use of the patient, are strong determining factors in whether or not treatment is pursued for either condition individually and more so when combined, as in this case.

In conclusion, aggressive treatment and early diagnosis of both conditions is extremely important in prognosis and eventual case outcome. In the case of the foal presented in this report, the presence of both disease processes and the severity of the clinical signs made aggressive treatment options preferred. Clinicians must always take into account the value of the animal and the financial constraints of the owners when diagnosing these cases and the long term care and management options they will need.

CASE MANAGEMENT:

The foal in this case was sedated on 7-19-16 for radiographs that revealed little of diagnostic value other than the wings of the ilia looked irregular. An ultrasound revealed soft tissue trauma surrounding the joint capsule of the right coxofemoral joint, an avulsion fragment fracture was noted proximally at the joint; however, no definitive diagnosis was able to be made due to the quality of the images. Two days later, the patient was anesthetized to perform a CT of the right coxofemoral joint, which revealed a subluxated right coxofemoral joint, a collapsed right femoral head, and lytic lesions on the wing of the right ilium. Due to the results of the CT, it was evident that the right coxofemoral joint would not be able to be reduced in a close manner making surgical options the only option in this case. The owners hope was to preserve the foal's future breeding value and elected for an aggressive surgical approach for a femoral head and neck ostectomy. The foal was placed under general anesthesia and femoral head ostectomy was performed. A curvilinear 40 cm incision was made over the femoral head tracking down the thigh, allowing transection of the superficial gluteal muscle and reflection of the middle and deep

gluteal muscles to visualize the coxofemoral joint capsule. The joint capsule was incised to visualize the femoral head. An oscillating saw was used to remove the femoral head and neck. The femoral head showed areas of wear and tear consistent with improper placement within the joint and joint sepsis. The cut edge of the femur was smoothed and debrided and smoothed via curettage and the joint was lavaged with normal saline. The soft tissue surrounding the joint was closed with absorbable suture in order to create a false joint capsule and offer stability during the healing process. The muscular layer and subcutaneous layer were also sutured with absorbable suture before the skin was closed with a combination of non-absorbable suture and staples. Joint fluid and the femoral head were submitted for bacteria culture and sensitivity testing, which resulted in growth of *Staphylococcus wernerii* and *Staphylococcus epidermidis*.

CASE OUTCOME:

The foal was managed in the hospital until his discharge seventeen days post-op. While hospitalized the foal recovered well with improvement in the lameness and behavior. Treatments while hospitalized included: Ranitidine 7mg/kg 3tabs PO Q8 hours, Maalox 30cc PO BID, was discontinued and replaced with NeighLox PO on feed TID, Banamine 2.5mL IV Q12hours, began giving it PO on 7-23-2016 and was decreased to a half dose (0.55mg/kg) of 1.25mL q12h 2 weeks after surgery. Potassium penicillin (22,000 IU/kg IV) and Gentamicin (6.6 mg/kg IV) was administered immediately post-operatively and continued q6h for 5 days. Excede (6.6mg/kg IM q4d) was administered intramuscularly for an additional 3 weeks. Aspirin (25mg/kg PO q24h) was administered for treatment of thrombophlebitis. The owner's were to continue administering the following medications at home: Ranitidine 7mg/kg PO q8h, NeighLox, 1 scoop, PO TID, Banamine 200 pound dose PO q12 hours, and Aspirin, 25mg/kg PO q24h. The foal should be kept confined to a small paddock and gradually be reintroduced to exercise and

other foals and horses as his healing progresses. For several months, the owners reported that the foal was doing well, did not appear painful, and they had plans to begin training him to be handled for breeding purposes and potentially lite work depending on how his hip progressed. Unfortunately in the late winter of 2017, the owners elected humane euthanasia and a necropsy was not performed.

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