Treatment of Coxofemoral Luxation by Toggle Pin Technique in a Calf: Case Report

Bir Buzağıda Koksofemoral Luksasyonun Toggle Pin Tekniği ile Sağaltımı

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ABSTRACT A 7-day-old calf with a left craniodorsal coxofemoral luxation was involved in a case report. The case was assesing after clinical and radiographical examination. Initially closed reduction procedure was performed under deep sedation. Failing of closed reduction attempt, toggle pin technique was carried out for reduction of the luxation by using polydioxanone suture material. In the postoperative term, ehmer sling application was performed to the operated limb for a 7 day. Clinical recovery was achieved at the end of the 2nd month. This is the preliminary report that a long term absorbable suture material polydioxanone used as a prosthetic ligament in toggle pin stabilization which provided succesfull reduction of the coxofemoral joint.

Key Words: Calf; orthopedics; hip dislocation; polydioxanone

ÖZET Sol kraniodorsal koksofemoral luksasyonu bulunan 7 günlük bir buzağı çalışma materyalini oluşturdu. Olgunun klinik ve radyolojik muayeneleri yapıldı. İlk olarak derin sedasyon altında kapalı redüksiyon denemesi uygulandı. Kapalı redüksiyon tekniğinin sonuç vermemesinden dolayı, polidioksanon dikiş materyali kullanılarak uygulanan toggle pin tekniği ile açık redüksiyon gerçekleştirildi. Opere edilen bacağa 7 gün süreyle askılı ehmer bandajı uygulandı. Postoperatif 2. ayın sonunda klinik iyileşme sağlandı. Bu çalışma, uzun süreli, emilebilir polidioksanon dikiş materyalinin, toggle pin tekniğinde prostetik ligament olarak kullanıldığı ilk çalışmadır ve kalça ekleminin redüksiyonunda başarıyla kullanılmıştır.

Anahtar Kelimeler: Buzağı; ortopedi; kalça çıkığı; polidioksanon

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Coxofemoral luxation, arthritis, and fracture of the femoral neck are among the most common orthopedic diseases of the pelvis in cattle.[1-3] Hip luxation with a craniodorsal position of the femoral head relative to the acetabulum is the most common luxation in calves.[1,2,4] Coxofemoral luxations occur both in cows and calves. In calves, luxations often are a consequence of dystocia with caudal presentation and application of excessive traction.[4-6] Untreated cases reveal severe lameness or even recumbency.[1,7] The aim of present case report is to share a possible alternative surgical method for the treatment of coxofemoral luxation in calves.

CASE REPORT

A 7-day-old, 28 kg, female Holstein calf was taken to the hospital with the complaint of hind limb lameness. With respect to the anamnesis, lameness

was notifed to be started three days after parturition. Physical examination revealed a nonweight-bearing left hind limb lameness. Additionally; adduction and externally rotation of the leg, crepitus with pain on manipulation and asymmetry of the great trochanters were observed. Neurological examination of the limb was normal. Under the sedation of xylazine hydrochloride (0.1 mg/kg IV, Alfazyne®, Egevet, Turkey) ventrodorsal pelvic radiographs were obtained and craniodorsal coxofemoral luxation was diagnosed (Figure 1). There was no evidence of concomitant fractures. Closed reduction under deep sedation was tried immediately after the pelvic X-rays. But the procedure was not succeeded. Because closed reduction attempts were failed, open reduction was decided to perform. The owner was informed about the operation procedure and the all procedures were performed according to the animal ethics. The next day after preoperative planning, the calf was sedated with xylazine hydrochloride (0.1 mg/kg IV, Alfazyne®, Egevet, Turkey), and anesthesia was induced with ketamine hydrochloride (1 mg/kg IV, Alfamine®, Egevet, Turkey). Anesthesia was maintained with isoflurane 3% (Isoflurane-Usp®, Adeka, Turkey). Operation area was shaved, prepared and draped for aseptic surgery. With the animal in right lateral recumbency, a 15 cm skin incision was made from a point 5 cm cranioproximal to the greater trochanter, extending distally to the proximal third of the femur. The fascia lata at the cranial border of the biceps femoris was incised. The tendon of the superficial gluteal muscle was also incised from the insertion point and extended caudodorsally. After partial myotomy and craniodorsal retraction of the middle gluteal muscle, femoral head was exposed. In order to reach to the acetabular fossa, profund gluteal muscle retracted and femur externally rotated. Hematoma, fibrin, granulation tissue and remnants of the ligament of the femoral head (LFH) were removed. Articular surfaces were lavaged with sterile saline to identify probable cartilage lesions. Because no detrimental cartilage lesion that can trigger osteoarthritis was seen, the case was found to be favorable for toggle pin application. Firstly, a tunnel orginating from fovea capitis to the head and neck of the femur through the greater trochanter was made with a drill (4.5 mm diameter). Secondly the same drill was inserted in secured fashion from the caudal aspect of the fascies lunata of the acetabulum to the pelvic space in order not to injure the vital organs and vessels. Custom-made toggle pin was constructed from 1.5 mm Kirschner wire according to the method described in the veterinary literature and sterilized preoperatively.[8,9] Toggle pin used in this study was 25 mm long and had a 3 mm diameter center hole. Also a double center holed toggle button was constructed from a 1 mm Kirschner wire. Following two strands of no. 3 polydioxanone (PDS®, Ethicon, USA) suture material were threaded through the center hole of the toggle pin, the pin was fully routed into the acetabular hole. To lock and test the safeness of the pin on the medial surface of acetabulum, mild traction force was applied from the ends of the suture material. After pulling the suture material through the tunnel in the femoral neck by a loop of cerclage wire, coxofemoral reduction was performed. Then the suture material was knotted on the lateral surface of the subtrochanteric region by using toggle button. The stability of the coxofemoral luxation was tested in both extension and flexion. The superficial and medial gluteal muscles were sutured by using no.1 polyglactin 910 (Vicryl®, Ethicon, USA) in a loc-

FIGURE 1: Left coxofemoral joint luxation (arrow) on the ventrodorsal projection.

king loop suture pattern. The fascia lata and subcutaneus tissues were sutured using no. 2-0 polglactin 910 (Vicryl®, Ethicon, USA). Skin was sutured using no. 0 polypropylene (Prolene®, Ethicon, USA). Postoperative control radiographs were taken (Figure 2). The limb was placed in an ehmer flexion sling, and the calf was allowed to recover from anesthesia in a bordered soft padded box. After surgery, the ehmer flexion sling remained in place for 7 days. Amoxycillin clavulanic acid was administered (17.5 mg/kg, s.i.d., Synulox®, Pfizer, Italy) pre-operatively and for 5 days following surgery. Flunixin meglumine was administered (2 mg/kg IV, b.i.d., Finadyne®, Sanofi, Turkey) for 3 days. After removal of the ehmer sling 7 days after surgery, mild lameness was observed. During the following 2 weeks, the lameness gradually resolved and the calf was able to bear weight on the limb, however residual lameness was evident. According to the owner's telephone information at the 2nd month postoperatively, it was notified that the functional capacity of the limb was full. In addition, at the postoperative 6th month it was informed that the calf was normally grown up as its coevals without any symptom of lameness. Long term radiographic examinations could not be obtained however the clinical symptoms found to be satisfactory for a good clinical outcome

FIGURE 2: Postoperative radiography of the case after fixation with toggle pin technique.

DISCUSSION

Coxofemoral luxations nearly always caused by trauma and mostly seen in craniodorsal direction.[1,2,4,7,8,10,11] The most common causes of hip luxation in young calves are extraction force used in dystocia and excessive adduction force that affects the limb in extension. In this calf the trauma is thought to be occured due to gliding on icy surface.

The three major stabilizers of the coxofemoral joint are the LFH, the joint capsule and the dorsal acetabular rim.[12,13] In order that a complete luxation occur, the joint capsule and LFH have to be torn. The technique choosen depends on the patients body weight, luxation type, preexisting disease, cartilage damage, integrity of the joint capsule, activity level, owner's compliance and economic constraints.[11] Presence of concurrent femoral or pelvic injuries such as acetabular, trochanteric, femoral neck and capital physeal fractures influences treatment procedure, too.[14] Closed reduction in cattle have been reported, but usually reluxation occurs.[3] One of the main cause of reluxation in cattle is the shallowness of acetabulum which is more significant in youngs, results in less acetabular coverage of the femoral head.[15] Not only remnants of the round ligament, hematoma, fibrin and granulation tissue in the acetabular cavity, but contractures of the gluteal muscles due to chronic luxation constitutes diffuculty in closed reduction. Delay in reduction increases the extent and severity of cartilage injury and allows progression of inflamation, fibrosis and pelvic muscle contracture. Reduction becomes appreciably more difficult after 4 or 5 days.[16] In this case, the closed reduction failed concern about gluteal contraction and acetabular repletion due to a 4 day duration of luxation. And open reduction performed. Although remnants in the acetabular cavity can be removed in open reduction, care must be taken in order not to harm the articular cartilages if not degenerative joint disease may constitute in long term. Repetitive, aggressive closed reduction attempts can also degenerate femoral head cartilage. If cartilage damage is severe, the prognosis after open reduction is guarded, and a salvage procedure (femoral head and neck ostectomy) is considered.

The toggle pin technique for surgical management of coxofemoral luxation relies on a prosthetic replacement for the LFH to maintain joint reduction.[8,17] Maintaining coxofemoral reduction until fibroplasia increases the strength of the surrounding scar is enough for the continuity of the reduction.[18,19] In this case, the aim of using an absorbable suture material as a LFH prosthesis was to prevent excessive pressure on the growth plate of femoral head because of the risk of a possible joint abnormality. The prosthetic sutures need to be tightened enough to prevent luxation but not so tightly as to limit motion severely. Because if the sutures are so tight, motion is severely restricted and the sutures fail prematurely. Long term success of this technique depends on inherent conformation of the coxofemoral joint, strenght of the toggle implant and the mechanical properties of the round ligament prosthesis. Reluxation after toggle pin technique ranges from 7% to 25% in dogs.[19-21] The most common cause of early reluxation is breakage of the suture material because of inadequate or strengthless suture material choice. The prosthetic ligament most likely fails at the edge of the femoral bone tunnel, where the suture material is subjected to high cyclic stresses at the time of ambulation.[19] In this study toggle button placement for prosthetic suture anchorage avoided a sharp bony edge, which may cause early suture breakage. Toggle pin technique not only sustain greater weightbearing loads without reluxation compared with capsulorraphy, also provides early weightbearing and functional use of the extremity. Because the stabilized joint is unable to sustain loads approximating maximum loads for the intact joint, a nonweightbearing flexion sling should be used and activity should be restricted after toggle pin technique. Modified ehmer sling maintains the joint in flexion with the limb in slight abduction and approximately 20° of internal rotation. Placing the limb in this position directs the femoral head into the acetabulum.[11,20] A variety of materials have been used to replace the LHF, including braided caprolactam, polyester, nylon, stainless steel wire, plastic, fascia lata, sac--rotuberous ligament and skin.[5,17,18,20,22-25] This is the preliminary report that a long term absorbable suture material polydioxanone used as a prosthetic ligament in toggle pin stabilization. As a result, toggle pin used with absorbable suture material provided adequate strength for the stabilization of coxofemoral luxation in this case.

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