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Treatment of coxofemoral luxations by new modified toggle pin technique in cats

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Abstract: *It was evaluated of early stage results using new modified toggle pin technique in treatment of craniodorsal coxofemoral luxations in cats which appears to be technically easy and quick. The material of the study consisted of 9 cats diagnosed with coxofemoral luxation as a result of orthopedic and radiological examination brought to the Animal Hospital of Firat University with the complaint of hind limp lamenness. The craniolateral surgical approach has been choosed for providing adequate exposure of acetabulum and femoral head. Clinical and radiological examination were performed for all cases at weeks 1,2 and 8. Clinical examination included pain, crepitation, range of motion of the operated joint, evidens of infection and lameness. Radiographic examination was made to evaluate the implant position and the possible evolution of dejenerative joint disease. It was concluded that the new modified toggle pin could be used for the treatment of coxofemoral luxations in small animals.*

Keywords: *Cat, coxofemoral, luxation, pin, toggle.*

I. Introduction

The coxofemoral luxation is the displacement of the caput femoris at different grades and directions. Coxofemoral luxation is very common in dogs and cats. In the etiology are playing important role traffic accidents (especially in dogs), falling from high (high-rise syndrome), unexplained traumas and spontaneous dislocations[1].

The coxofemoral luxation is classified according to the relative relationship of the head of the femur to the acetabulum. The classifications are craniodorsal, cranioventral, caudodorsal, caudoventral and intrapelvic[2,3]. The intrapelvic luxation always involves an associated fracture of the acetabular structures[3]. Caudoventral displacements, in which the femoral head may lodge within the obturator foramen, occur less often. This type of luxation may be associated with fracture of the greater trochanter[4]. Craniodorsal is the most common type of coxofemoral luxation, seen in 78% of affected dogs and 73% of cats. The head of the femur rests dorsal and cranial to the acetabulum[2,4,5].

Coxofemoral luxation can be treated by open and closed reduction. The goal of the surgical treatment is to restore joint stability by reducing the luxation in order to control the pain and lameness and also to reduce the formation of osteoarthritis[6].

In this retrospective study, It was evaluated of early stage results using new modified toggle pin technique in treatment of craniodorsal coxofemoral luxations in cats which appears to be technically easy and quick.

II. Material And Methods

This retrospective study was made with the permission of Firat University Animal Hospital. Surgical procedure was performed after the animal owners' consent was obtained (Date: 23.03.2015, Decision: 21).

The material of the study consisted of 9 cats diagnosed with coxofemoral luxation as a result of orthopaedic and radiological examination brought to the Animal Hospital of Firat University with the complaint of hind limp lamenness. Antibiotic treatment was started the day before the operation. Modified toggle pins were made of the kirschner wire (2 mm in diameter, 0.6 cm in length with a 2 mm circular recess in the center). At the middle part the 105 cm length monoflament nylon fishing line (Mr-Captain, Turkey) (0.4-0.5 mm in diamater) was knotted at the circular recess of the toggle pin. Thus, two nylon monofilament fishing line with a length of 50 cm were obtained (Fig. 1). The prepared modified toggle pins were sterilized with concentrated chlorhexidine solution.

General anaesthesia was provided with Xylazine HCI (0,1 ml/kg, IM. Alfazyne %2, Egevet, Turkey) and Ketamine HCL (15 mg/kg, IM., Ketasol %10, Richer Pharma, Germany) combination. The affected coxofemoral joint area was shaved, then the animal was placed in the lateral position on the operation table. Surgical area was disinfected with povidone iodine (Batticon, Adeka). After routinely reaching the hip joint with craniolateral approach, the acetabulum center was drilled with a 2 mm diameter drill from lateral to medial, being careful to avoid damaging the articular surface. Care was taken that the drill bit did not "drop-in" to the

pelvic canal. Later, without the use of auxiliary tools such as drill guides, a tunnel was opened from the center of the fovea capitis of the femoral head to the trochanter tertius via 1 mm drill. The modified toggle pin along with the monofilament fishing line were passed through the acetabular drill hole into the pelvic canal using forseps to hold the rod and pulled back to anchor it to the medial aspect of the acetabulum (Fig. 2A,B). Later, two monofilament fishing line was inserted throught the femoral tunnel starting from the femoral head and continuing to the trochanter tertius. A second tunnel was drilled perpendicular to the first tunnel in a cranial-caudal direction. The monofilament fishing line ends were then passed through the second femoral tunnel; one end from the cranial side and the other from the caudal side, and were tightened while joint stability and range of motion were assessed (Fig. 3A,B). Sutures were tightened so that reluxation would be prevented. The coxofemoral joind capsule was closed with a simple suture via polyglactine 910 (Vicryl, Ethicon) USP 2/0 and operative wound closure was routine. No Ehmer sling was applied to the patients' extremities. Radiographs were taken at ventrodorsal and lateral positions of all patients after the operation. Postoperatively, parenteral antibiotic (8.75 mg/kg, I.M. Synulox, Pfizer) and nonsteroidal anti-inflammatory drug (4 mg/kg, S.C. Rimadyl, Pfizer) were made for five days. Clinical and radiological examination were performed for all cases at weeks 1,2 and 8. Clinical examination included pain, crepitation, range of motion of the operated joint, evidens of infection and lameness. Radiographic examination was made to evaluate the implant position and the possible evolution of dejenerative joint disease.

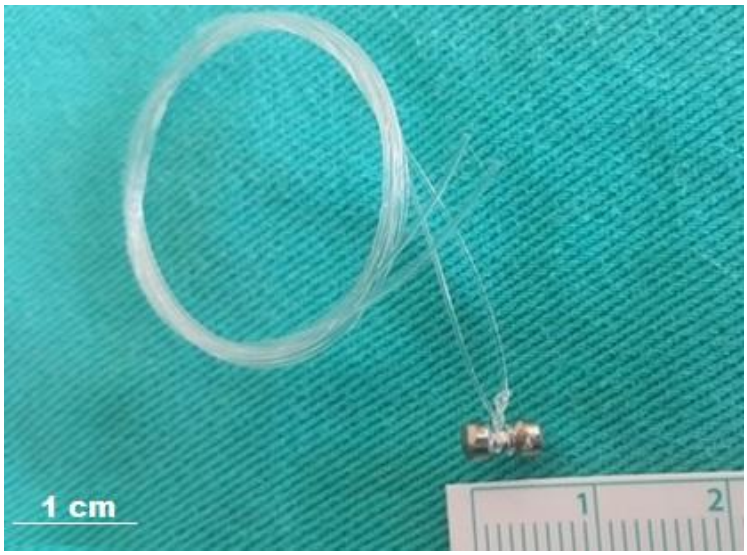

Figure 1. Appearance of modified toggle pin and a 50 cm double lenght monofilament nylon fishing line.

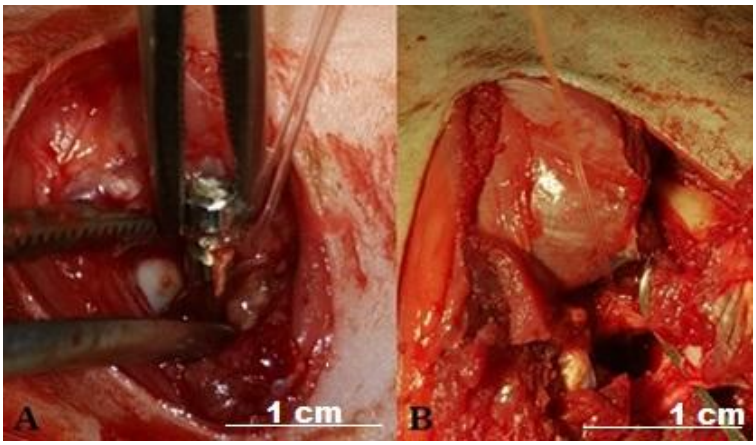

Figure 2. The modified toggle pin along with the monofilament nylon fishing line were passed through the acetabular drill hole into the pelvic canal using forseps to hold the rod (A) and pulled back to anchor it to the medial aspect of the acetabulum (B).

Figure 3. A: Appearance of modified toggle pin in the mediale of the acetabulum on the cadaver model **(**white arrow). **B:** The first tunnel on the trochanter tertius (White arrow), cranial entry of the second tunnel, drilled perpendicular to the first tunnel in a cranial-caudal direction (black arrow head).

III. Results And Dıscussıon

A total of 9 cats treated for unilateral craniodorsal coxofemoral luxation by modified toggle pin were included in this study. During the clinical examinations, it was observed that the cases could not use the relevant limbs, signs of pain in joint palpation and change in position of trochanter major. The craniodorsal coxofemoral luxations were observed in radiologic examinations (Fig. 4A,B). The most of the cases were taken to the operation 1-2 days after the formation of the luxation. Soft tissue infection and reluxation were not observed in all treated cats. Operated cats started to use their limb after one-two days. It was observed mild lameness and signs of pain within first week. It wasn't detected pain and lameness in clinical examinations on the 14th day and radiologically joint range of motion and implant position was normal. No complications were encountered. Joint abnormality (osteoarthritis), crepitation and loss of function were not observed in the clinical and radiological examinations on the 60th day (Fig. 4C,D). The signalements and clinical data are listed in Table 1.

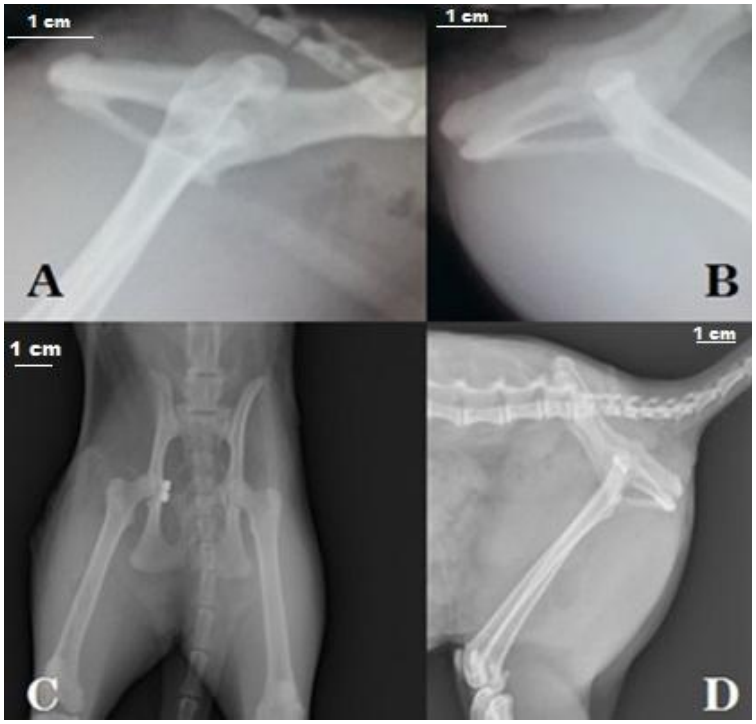

Figure 4. Preoperative lateral radiograph of craniodorsal coxofemoral luxation(A). Postoperative lateral radiography (B). Postoperative ventrodorsal (C) and lateral (D) radiograph at 8. week.

Table 1: Information about cats with coxofemoral joint luxation.

Case	Breed	Age (years)	Sex	Weight (kg)	Etiology	Place of luxation	Result
1	Crossbred	1	M	3.5	HRS	Right, CD	Very good
2	Crossbred	1	F	3	HRS	Left, CD	Good
3	Turkish Van	3	M	4.5	Unknown	Left, CD	Very good
4	Crossbred	1	F	2,5	Traffic accident	Right, CD	Very good
5	Turkish Angora	1,5	F	3.5	HRS	Right, CD	Good
6	Crossbred	1	M	3.5	HRS	Left, CD	Good
7	Crossbred	3	F	4	Unknown	Right, CD	Very good
8	Crossbred	2	F	3	Traffic accident	Left, CD	Very good
9	Crossbred	1	M	3	HRS	Right, CD	Very good

M: Male, F: Female, HRS: High-rise syndrome, CD: Craniodorsal.

It has been reported that clinical examinations are not sufficient to establish the diagnosis of coxofemoral luxations, and that radiological evaluation is mandatory for verification of the resulting injury[7]. In the present study, radiological examinations were used both in the diagnosis of coxofemoral luxations and in the postoperative healing process. During trauma, part of the joint capsule and lig. capitis femoris are torn; More severe trauma may result in partial or complete rupture of one or more gluteal muscles. Coxofemoral joint luxations can also be seen with joint-related fractures. Dorsal acetabular margin fractures or avulsion fractures involving the origin of lig. Capitis femoris in caput femoris may also be formed[2]. Therefore radiographic evaluation should not be neglected in the diagnosis of coxofemoral luxations to receive positive results from the treatment.

Various closed and open reduction techniques are used for repair of coxofemoral joint luxation. Closed reduction associated with an Ehmer sling. The closed technique has to be performed within 3-4 days after trauma, and reduction must be performed under general anaesthesia[5,8]. Open reduction techniques include capsulorrhaphy and extracapsular suture stabilization, modified extracapsular suture stabilization, trochanteric transposition, De-Vita pinning, triple pelvic osteotomy, transposition of the sacrotuberous ligament, transacetabular pinning or transarticular pinning, toggle pin fixation, fascia lata loop stabilization, anchor sutures, total hip replacement, and femoral head and neck excision[2,8-18]. A toggle pin technique may be beneficial, such as chronic luxations, multiple limb injuries, mild hip dysplasia, and when early use of the luxated limb is desirable. The synthetic round ligament created will not last indefinitely, but if properly placed will provide stability until capsular fibroplasia occurs[2,4]. In this study, the craniolateral surgical approach has been choosed for providing adequate exposure of acetabulum and femoral head. It was not made osteotomy of the trochanter major as was reported in other studies[5,13].

Toggle rods include the Piermattei toggle (Steinmann pin), modified Piermattei toggle (Kirschner wire), Mini TightRope system, and commercial toggle rods[6,19,20]. In this study, modified toggle pins were made of the kirschner wire (2 mm in diameter, 0.6 cm in length with a 2 mm circular recess in the center). This new modified toggle pin may be easily applied for small animals. Different suture materials are used in the toggle pin technique for the treatment of coxofemoral luxations. The most commonly used suture materials are multiflament polyester, monofilament polypropylene and monofilament polyamide[8,12]. Also, nylon monofilament fishing line has been successfully used in several studies[12,21,22]. It is reported that the monofilament fishing line is easy to find, cheap, does not react, and has high durability[12]. It has been used nylon monofilament fishing line in 0.4-0.5 diameter to prevent tear of suture material until capsular fibroplasia occured in this study.

It has been reported that the knotting of the monofilament suture material in a tight manner may cause osteoarthritis[12]. In this retrospective study, the suture materials were knotted with sufficient degree without causing osteoarthritis and reluxation. Thus, osteoarthritis and reluxation were not observed in all treated cats.

It is very important to attempt as soon as possible to minimize the destruction of articular cartilage after luxation, to prevent muscle contraction, and to prevent negative conditions before fibrosis is formed[1]. In this study, most of the cases were taken to the operation 1-2 days after the formation of the luxation. There was no difficulty due to muscle contractions during the operation in all cases.

IV. Conclusion

In this retrospective study, It was evaluated of early stage results using new modified toggle pin technique in treatment of craniodorsal coxofemoral luxations in cats. It would be appropriate to investigate of long-term results. This new method appears to be technically easy and quick. The materials of new modified toggle pin is easy to find, cheap, does not react, and has high durability.

It was concluded that the new modified toggle pin could be used for the treatment of coxofemoral luxations in small animals.

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