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**Short Communication**

# Treatment of coxofemoral dislocation and short oblique mid shaft tibial fracture by modified toggle pin technique with locking compression plate method in a dog

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## Abstract

**A one-year old, male, non-descriptive dog weighing 16 kg was presented to the Veterinary Hospital, Veterinary College, Hassan with a history of an automobile accident, with limping on right hind limb. Physical examination revealed shortening of right hind limb along with swelling and pain on palpation of hip joint and tibia. Orthopaedic and radiographic examinations revealed cranio-dorsal hip dislocation and complete, short oblique, mid diaphyseal tibial fracture of right limb. Under general anaesthesia, coxofemoral dislocation was corrected using toggle pin (1.5 mm K-wire) and nylon thread (1 mm diameter) via caudo-dorsal approach. A 3.5, 10 hole locking compression plating (LCP) was done to stabilize the tibial fracture. Postoperative radiographs revealed proper relocation of coxofemoral joint and apposition of tibial fragments. The animal started using limb on the second postoperative day with slight lameness and without lameness by the 15th postoperative day. The animal recovered uneventfully with excellent weight bearing. In conclusion, toggle pin technique and LCP were found to be effective methods for the repair of coxofemoral dislocation and tibial fracture.**

**Keywords:** Coxofemoral dislocation, Locking compression plate, Tibial fracture, Toggle pin

## Highlights

- Surgical correction of coxofemoral dislocation in a dog by modified toggle pin technique and locking compression plating for tibial mid diaphyseal fracture resulted in satisfactory clinical outcome.
- No complication was observed in the postoperative period, and the dog was able to ambulate and bear full weight on the 15th postoperative day onwards.

Coxofemoral luxation is the separation of the femoral head from the acetabulum. About 40 to 90% of all luxations in dogs and cats are coxofemoral luxations (Shivakumar, 2015). Road traffic accidents and less serious events like jumping, getting struck or being kicked were the main causes of coxofemoral luxation in dogs (Kilic *et al*., 2002). According to Cetinkaya and Olcay (2010) closed reduction is linked to a 50-70% probability of reluxation. Coxofemoral luxation in dogs has been treated with modified toggle pin method (Ergin *et al*., 2016). Open surgical reduction enhances stability and lessens the possibility of relaxation when compared to closed reduction.

According to Abd El Raouf *et al*. (2019), tibial fractures rank second among long bone fractures in dogs, occurring in roughly 15.5% of cases, after femur fractures (27.13%). Diaphyseal fractures account for 73% of all tibia fractures, with distal tibial fractures in 20% and proximal tibial fractures in 7% cases. Restoration of anatomy, shorter period of immobilisation, stable internal fixation and an early return to function are possible by internal fixation of fractures using plating techniques. The LCP has limited contact between implant and bone which preserves the periosteal blood supply.

Present case describes the management of craniodorsal coxofemoral dislocation and tibial fracture using toggle pin technique with locking compression plating.

A one-year old, non-descriptive, male dog weighing about 16 kg was presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, with a history of automobile accident and non-bearing weight on right hindlimb. Upon clinical and orthopaedic examination, lameness, abnormal mobility and crepitation of the tibia and hip region of the right hind limb were observed. Upon radiographic examination, craniodorsal coxofemoral luxation and complete short oblique, mid diaphyseal tibial fracture were confirmed (Fig. 1).

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**Fig. 1. Preoperative VD pelvis and ML tibia radiograph**

Dog was pre medicated with inj. ceftriaxone @ 25 mg/kg BW and inj. meloxicam @ 0.2 mg/kg BW intravenously. Pre-anaesthetised with intravenous inj. butorphanol @ 0.2 mg/kg BW and inj. midazolam @ 0.3 mg/kg BW. Inj. propofol @ 4 mg/kg BW was administered intravenously for induction of anaesthesia which was maintained with 1.5% isoflurane.

Dog was positioned in lateral recumbency with the affected limb upwards and coxofemoral luxation was treated with toggle pin technique by using handmade toggle pins (Fig. 2) and nylon. Caudodorsal approach to coxofemoral joint exposed the dislocated femur head from the acetabulum and torn joint capsule. A 1.5 mm hole in the femoral neck starting at the third trochanter level was drilled and ending at the fovea capitis using a pointed drill guide. 2.5 mm hole was created on dorsal acetabular fossa using drill bit, enough to pass the toggle pin (26 mm, 1.5 mm K-wire) which was attached with single strand of non-absorbable nylon thread (1 mm diameter). Nylon thread was pulled while rotating the toggle pin to anchor it against the medial acetabular rim. Nylon thread was passed through the femoral tunnel, reduced the hip and tightened the nylon threads. Sutures were secured via passing another toggle pin (24 mm, 1.5 mm K-wire) through the nylon thread near third trochanter of the femur. Knot was tied securely enough to maintain routine movement or ambulation. After coxofemoral joint reduction and stabilisation, the surgical site was closed as standard protocol.

A cranio-medial approach was used to expose the tibial shaft fracture fragments and were reduced by application of traction and toggled to bring fractured fragments to normal anatomical alignment. The reduced fracture fragments were stabilized by using 3.5, 10 hole LCP with self-tapping, locking head cortical screws (Fig. 3). The plate was pre-contoured according to the shape of bone using plate benders. The plate holes were drilled using a drill bit of size 2.8 mm for 3.5 mm plate. Size of the screws was measured using depth gauze and appropriate screws were fixed to the plate using hexagonal screw driver. After fracture fixation, the surgical site was closed as standard protocol.

Post operatively dog received full limb, over the hip Robert Jones bandage to support the operated limb for 10 days. Tab. amoxicillin + clavunate @ 12.5 mg/kg BW PO BID, tab. carprofen @ 4.4 mg/kg BW PO OD, trypsin tablets PO BID for five days along with oral calcium supplementation were advised. Owners were instructed to limit the dog's activities with short leash walks for four weeks.

The 1.50 mm K-wire was bent 360º around the 2.50 mm Steinman pin. The center diameter of toggle pin will have same diameter as used Steinman pin diameter. The two ends of the Kirschner wire were bent 180º with same Steinman pin and both ends cut near the center hole. Coxofemoral luxation was easily reduced and toggle pins placed via caudo-dorsal approach to hip joint. The cranio-medial approach to tibia provided sufficient exposure of fracture fragments for reduction and stabilization with 10 hole 3.5 mm LCP implant. Minimum of three bi-cortical screws were used on either of the fracture fragments. Immediately postoperative radiography revealed the reduction of dislocated femur head into acetabulum, proper

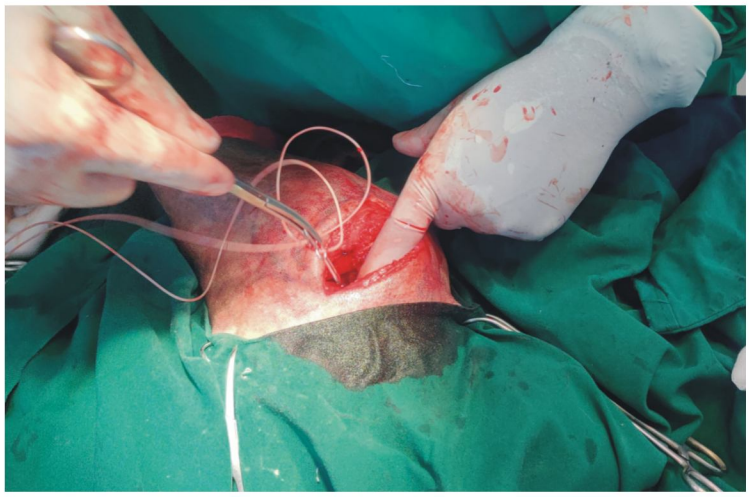

**Fig. 2. Passing of toggle pin in pre-drilled hole in dorsal acetabular fossa for hip reduction**

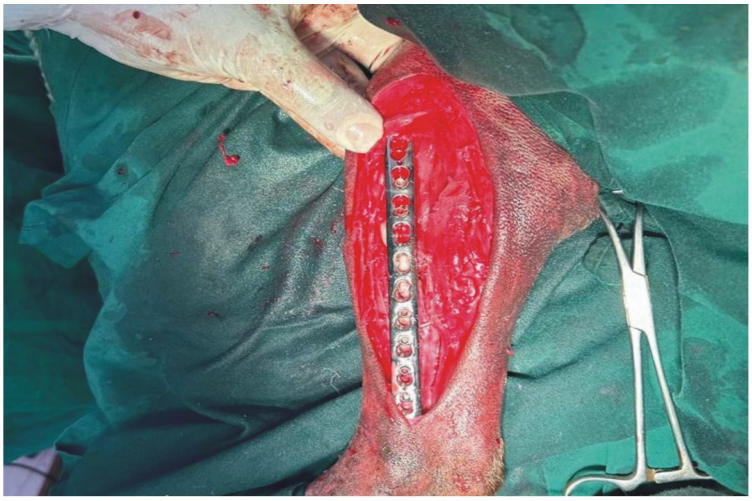

**Fig. 3. Reduction of fracture fragments were stabilized by using 3.5 mm 10 hole LCP**

**Fig. 5. 30$^{th}$ post-operative day photo showing excellent weight bearing and limb usage**

placement of toggle pins along with proper reduction of tibia (Fig. 4).

Post-operatively the dog showed excellent weight bearing and limb usage on 15th day onwards (Fig. 5). Postoperative radiography revealed proper alignment and configuration of coxofemoral joint, toggle pins were in position, no arthritic changes were observed in the acetabulum and femoral head along with adequate apposition of tibia. Reluxation, toggle pin breakage and nylon thread breakage were not observed either in early or long term postoperative periods (Fig. 6).

The caudo-dorsal approach facilitated reaching the coxofemoral joint and acetabulum (Tamburro *et al*., 2022). Coxofemoral luxation was easily reduced, and toggle pins were placed. This could be due to adequate exposure from caudo-dorsal approach to the hip joint in lateral recumbency with the affected limb upside. Placement of toggle pins was quicker due to removal of debris, blood clots and remnants of ligamentum teres in the acetabulum and femoral head.

The LCP system functions as an internal fixator for fractures with a wider gap and provides optimal stability that is conducive to secondary bone healing through endochondral ossification. This system was ideal for bridging severely comminuted diaphyseal/ metaphyseal fractures in osteoporotic bone (Egol *et al*., 2004). The cranio-medial approach to tibia facilitated to reach the fracture site and provided sufficient exposure to fracture fragments for reduction and stabilization with a 10 hole 3.5 mm LCP implant (Sirin *et al*., 2013). Haaland *et al*. (2009) suggested that minimum of two screws should be fixed on either side of the fragments to provide stable fixation.

The most common complication is relaxation due

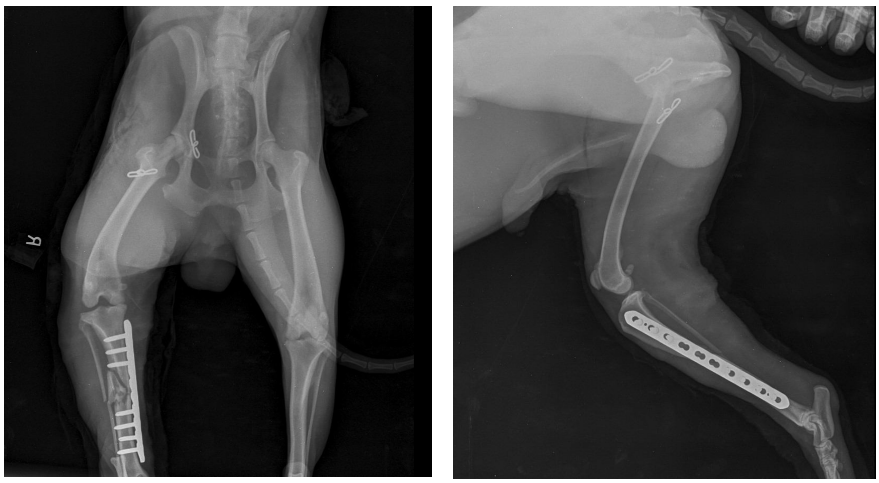

**Fig. 4. Immediate postoperative radiographs with appropriate placement of toggle pin and appropriate reduction of tibial fractured fragments with 10 hole 3.5 mm locking compression plate**

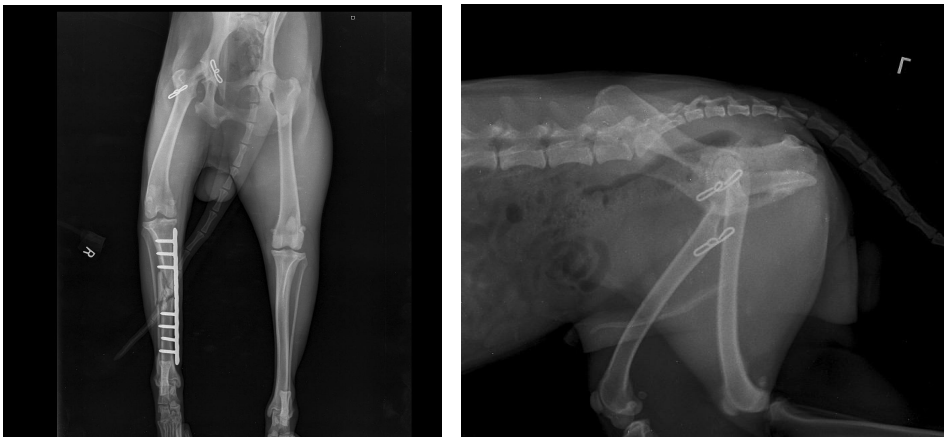

**Fig. 6. 30th day postoperative radiographs showing no reluxation, normal coxofemoral joint with no arthritic changes and adequate reduction of fractured fragments of tibia**

to breakage of used material in the toggle pin technique (Jordan *et al*., 2023). In the present case, there was no complication in the postoperative period, and the dog was walking with full weight bearing on the 15th day post-operatively.

In conclusion, locking compression plating and toggle pin techniques were found to be simple and practical methods for veterinarians in cases of concurrent tibia fracture and coxofemoral dislocation in the same hind limb with excellent clinical outcomes.

**Conflict of interest:** Authors have no conflict of interest in this study.

**Author's contribution:** KMJ, DRM, NN, KPM: Planning and performing surgery, draft and revision of the manuscript; DV, NMR: Planning of surgery, revision of the manuscript and technical support.

**Data availability statement:** All data generated or analyzed during this study are included in this article. The corresponding author is willing to provide the raw data upon reasonable request.

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